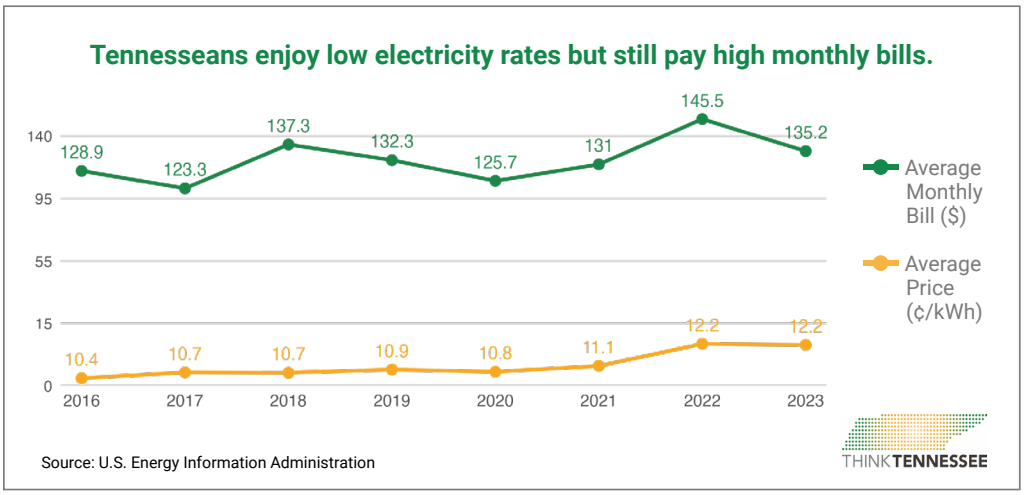
THINKTENNESSEE

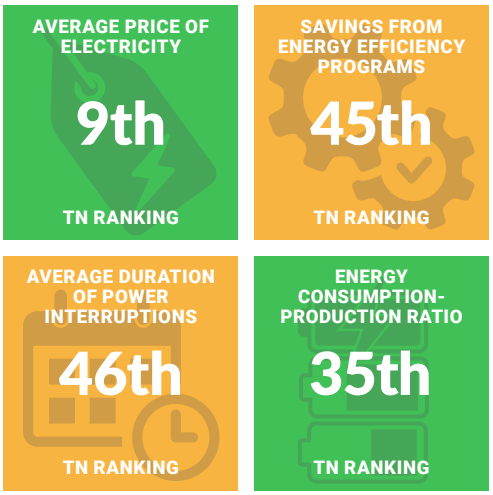
REPORT

Powering Up: Tennesseans Could Benefit from Energy that is More Affordable, Reliable, and Clean

Energy production and consumption are critical issues for Tennessee—affordable, reliable, and clean energy is needed to fuel the state's economic growth, and energy utilities are a critical household necessity impacting a family's cost of living, health, and safety.

Energy affordability, insecurity, and reliability are challenges for many Tennesseans; the state is experiencing a growing number of residents struggling with rising living costs and energy burdens. Despite having some of the lowest energy rates in the United States, many Tennesseans (especially those in low-income households) spend a disproportionate amount of their income on home energy bills. Implementing more comprehensive energy efficiency programs, including strengthening building standards, could be an effective strategy to reduce monthly utility expenses for thousands of households. At the same time, over the last 10 years, energy reliability in the state has decreased across all three measures—duration of power interruptions (46th), frequency of power interruptions (50th), and time to restore power (42nd).





KEY FINDINGS

- **Lack of Affordability:** The average price for electricity in Tennessee is among the lowest in the nation (ranking 9th), however the state ranks 47th in monthly residential electricity consumption and has the 29th highest monthly electricity bills. In 64 counties, low-income households pay 30% or more of their income on energy bills.
- **Need for More Energy Efficiency Programs:** Tennessee's high energy bills are, in part, due to lagging energy building standards and enforcement and a lack of energy efficiency programs; Tennessee ranks 45th nationally in savings from energy efficiency programs.
- **Low Energy Reliability:** Tennessee ranks 46th in average duration of power interruptions, 50th in average frequency of power interruptions, and 42nd in average time to restore power per customer.
- **TN Consumes More Energy than it Produces:** Tennessee is one of 40 states that consumes more energy than it produces and ranks 35th in the consumption-production ratio.
- **Main Energy Sources:** Nuclear energy is now the primary source of electricity in the state (49%). Together with coal (20%) and natural gas (19%), these three sources account for 88% of Tennessee's energy consumption.
- **Opportunities for More Clean Energy:** Renewable energy currently represents only 5.4% of the state's energy consumption, placing Tennessee 40th in the nation. Most of the state's renewable energy is hydroelectric (86%). When nuclear energy is included, 23% of consumption comes from clean energy.

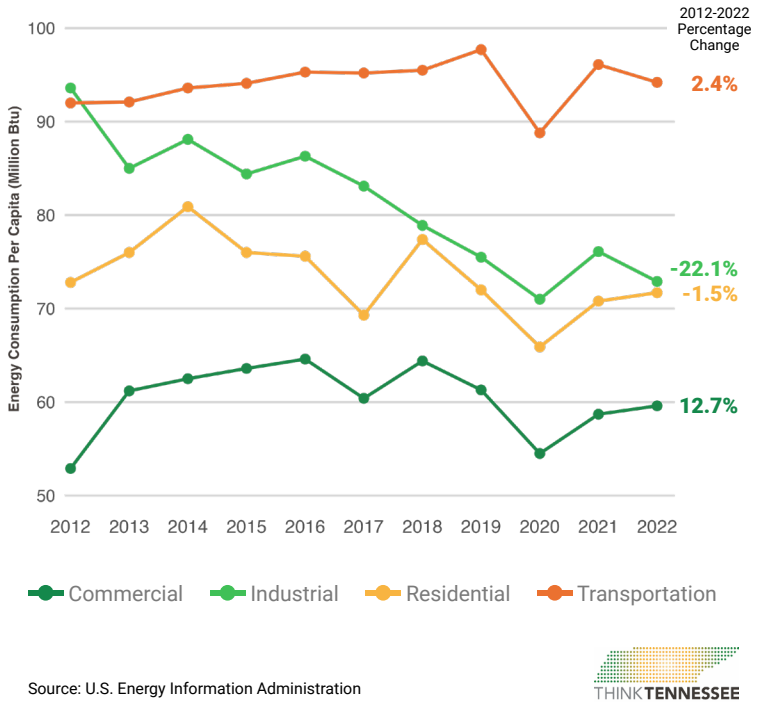
Tennesseeans consume more energy than residents in other states and pay higher energy bills.

Overall, Tennessee ranks 30th nationally in total energy consumption per capita by year (298.2 million Btu). While Tennessee's rank is better for the industrial sector (25th), the state ranks worse in per capita energy consumption in the residential (39th), transportation (36th), and commercial sectors (40th).[1]

TOTAL ENERGY CONSUMPTION PER CAPITA
30th
TN RANKING

Tennessee's average residential electricity consumption—1,109 kWh per month—is 30% higher than the national average (855 kWh per month). The price of electricity in Tennessee, however, is significantly lower than the nation as a whole—12.19 cents/kWh compared to 16.00 cents/kWh, resulting in an average monthly electricity bill in Tennessee of $135.22 (slightly lower than the national average of $136.84).[2]

Overall energy consumption per capita has decreased (by 4.2%) from 2012-2022, while increasing in the commercial sector (12.7%) and dropping in the industrial sector (22.1%).



Source: U.S. Energy Information Administration

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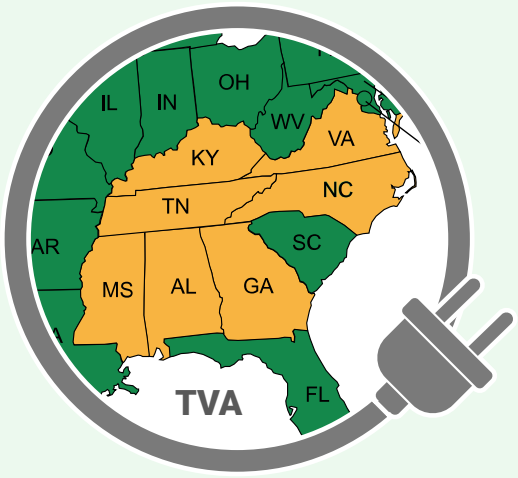
Since 2016, Tennessee has moved up six positions in the national rankings on average monthly bills, despite costs increasing by 4.9%. The cost for electricity, however, has risen faster for other American families. In the average U.S. state, monthly electricity bills have increased by 18.8%.[3]

Among Tennessee's local power companies (LPCs), cooperatives charge a higher electricity rate than municipalities. In 2023, the average price of electricity among cooperatives was 12.10 cents/kWh for all sectors, compared to municipal utilities at 10.73 cents/kWh. In the residential sector, the average price is higher: 12.72 cents/kWh from cooperatives and 11.99 cents/kWh from municipalities. The five highest electricity rates—all above 14.00 cents/kWh—are from cooperatives.[4,5]

AVG. MONTHLY ELECTRICITY CONSUMPTION RESIDENTIAL
47th
TN RANKING

PRICE OF ELECTRICITY RESIDENTIAL
9th
TN RANKING

AVG. MONTHLY ELECTRIC BILL RESIDENTIAL
29th
TN RANKING



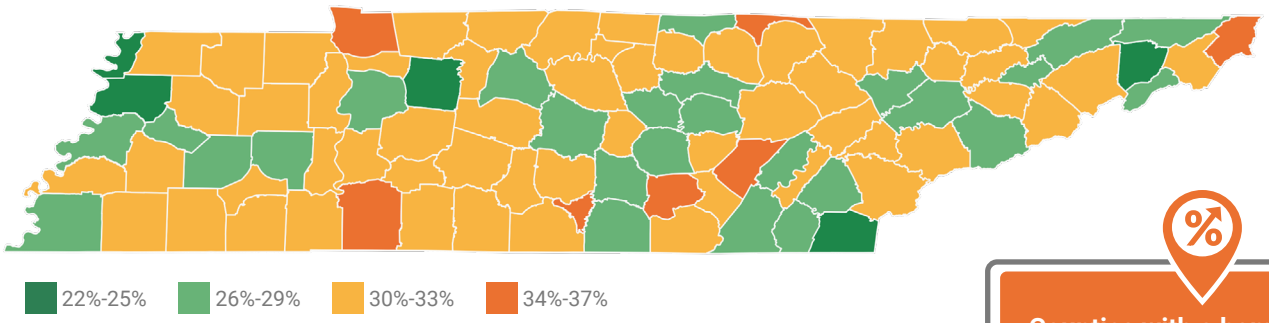
Tennessee: A Unique Case When Discussing Energy Policy

Established by the federal government in 1933, the Tennessee Valley Authority (TVA) is the country's largest public power corporation in terms of generating capacity. TVA owns over 90% of Tennessee's electric generating capacity and around three-fifths of the power plants.[6] Consequently, TVA sets most of the state's energy-related policy. TVA serves over nine million people across Tennessee, Alabama, Mississippi, Kentucky, Georgia, North Carolina, and Virginia. In September 2024, TVA released the 2025 Integrated Resource Plan (IRP) draft, which includes a set of scenarios and strategies TVA is considering to meet the demand for power in the Valley up to 2050. The final IRP is expected in Spring 2025.[7]

Energy costs are particularly burdensome for low-income Tennessee households.

Home energy costs are a financial burden for low-income Tennesseans. Over 169,000 low-income Tennessee households—whose incomes are below 50% of the Federal Poverty Level (FPL)—pay almost a third (29%) of their annual income on home energy bills (significantly higher than the 6% of household income that is considered affordable). In the past decade, Tennessee's home energy affordability gap* has increased by 18%, reaching over $940 million in 2022 compared to $800 million in 2011.[8,9]

In 64 counties, low-income households pay 30% or more of their income on energy bills.



Source: Fisher, Sheehan & Colton (2023)

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Counties with a home energy burden of at least 34%

Bledsoe	Johnson
Pickett	Wayne
Grundy	Moore
Stewart	

In Tennessee, one in ten households has experienced energy insecurity, placing Tennessee 37th nationally. Home energy insecurity disproportionately affects households in the lower income brackets: 84% of Tennessee households earning less than $50,000 a year reported that they had forgone basic necessities in order to pay their home energy bill.[10,11]

Tennessee could improve its energy efficiency programs.

Tennessee consumes more energy per real dollar of GDP than the average U.S. state, ranking 28th nationally at 5.10 kBtu/$ (2017). Given that Tennesseans are consuming significantly more energy than peers in other states and paying above-average energy bills, state and local leaders could identify more opportunities to reduce energy consumption and increase energy efficiency.[12,13]

ENERGY EFFICIENCY PROGRAM SAVINGS

45th

TN RANKING

Tennessee ranks 45th in annual savings from energy efficiency programs (96,279 MWh).[14] Additionally, Tennessee ranks 28th on energy efficiency, scoring 11 points out of 50 on the American Council for an Energy-Efficient Economy's energy efficiency scorecard.** Tennessee is either equal to or above the national average on state-led initiatives and industrial energy efficiency, but there is significant room for improvement in transportation, appliance standards, building policies, and utilities.[15]

Tennessee's energy efficiency scores could improve significantly across all policy areas.

State-Led Initiatives	Transportation	Appliance Standards	Utilities	Building Policies	Industry
2/4.5 points	3.5/13 points	0/3 points	1.5/15 points	2.5/12 points	1.5/2.5 points

Source: American Council for an Energy-Efficient Economy (ACEEE)

(*) (**)

Tennessee families could save thousands by transitioning to newer energy codes.

Tennessee is one of 42 states with a statewide residential building code and ranks 24th in energy savings resulting from state building code policies. In 2020, Tennessee adopted the 2018 International Energy Conservation Code (IECC) with amendments for residential buildings; however, the current energy savings in Tennessee are more comparable to a 2009 IECC due to poor enforcement and the amendments made.[16]

ENERGY SAVING BUILDING CODE POLICIES
24th
TN RANKING

By transitioning to new energy codes, the average Tennessee family has more savings opportunities[17,18]

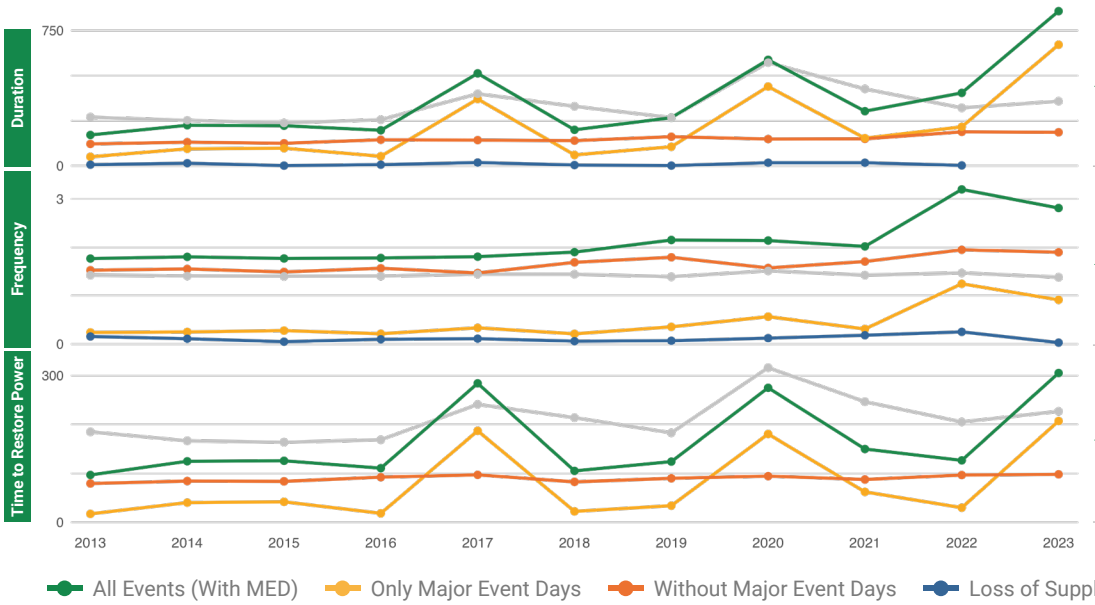
	2018 IECC	2021 IECC
First Year Savings	$280	$463
Over 30 Years	$4,650	$15,312

Tennessee has implemented High-Performance Building Requirements for new construction and renovations of state-owned facilities and higher education campuses, mandating compliance with 2010 standards and encouraging performance above those standards. There is also significant room for improvement at the local level. Among the nation's 75 major cities, Nashville ranks 33rd, while Knoxville is 37th, Memphis is 55th, and Chattanooga is 73rd in energy efficiency policy efforts. Memphis is the only major city in the state to have adopted the 2021 IECC code with local amendments. Chattanooga, Knoxville, and Nashville have independently implemented energy efficiency programs for municipal buildings.[19]

Tennessee is falling behind on energy reliability.

Tennessee ranks 46th in average duration of power interruptions, 50th in average frequency of power interruptions, and 42nd in average time to restore power per customer. In 2023, the average Tennessean lost power for 858 minutes (14 hours) in 2.8 power interruptions, including those occurring during Major Event Days (MED).* The average time to restore power was five hours (305 minutes).[20] Tennessee's local distribution systems are especially vulnerable to major events (i.e., extreme weather conditions). In 2023, 78% of power interruptions and 68% of the average time to restore power occurred during MEDs.[21] However, the frequency of outages does not seem to be driven as much by MEDs, which could signal issues with Tennessee's transmission grid.

From 2013 to 2023, Tennessee's energy has become less reliable across all measures.**



Average duration of electric interruptions increased by 401%.

Average frequency of electric interruptions increased by 59%.

Average time to restore power increased by 215%.

Source: U.S. Energy Information Administration [22]

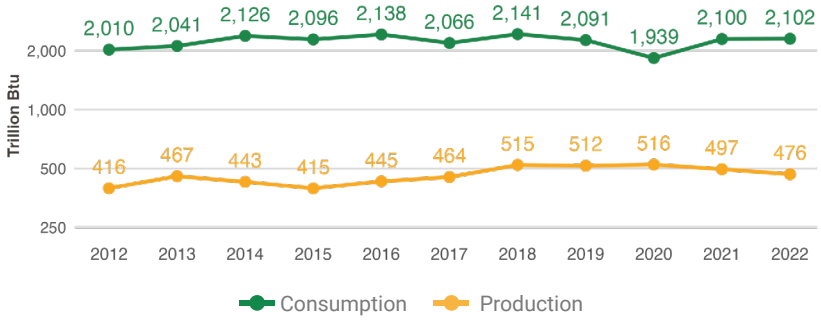
THINKTENNESSEE

(*) (**)

Tennessee consumes four times more electricity than it produces.

On average, Tennessee consumes 4.45 times more electricity than it produces every year. In 2022, Tennessee produced 475.88 trillion Btu in electricity but consumed 2,101.81 trillion Btu (442% more). Tennessee is one of 40 states that consumes more energy than it produces, indicating that this fact is not uncommon. However, the state ranks 35th in the consumption-production ratio, signaling that Tennessee's production gap is larger than other states.[23] This makes Tennessee particularly vulnerable to extreme weather events that impact the entire region, since TVA relies on purchasing power from adjacent states.

Tennessee's electricity consumption-production gap exceeds 1.5 trillion Btu.



Source: U.S. Energy Information Administration

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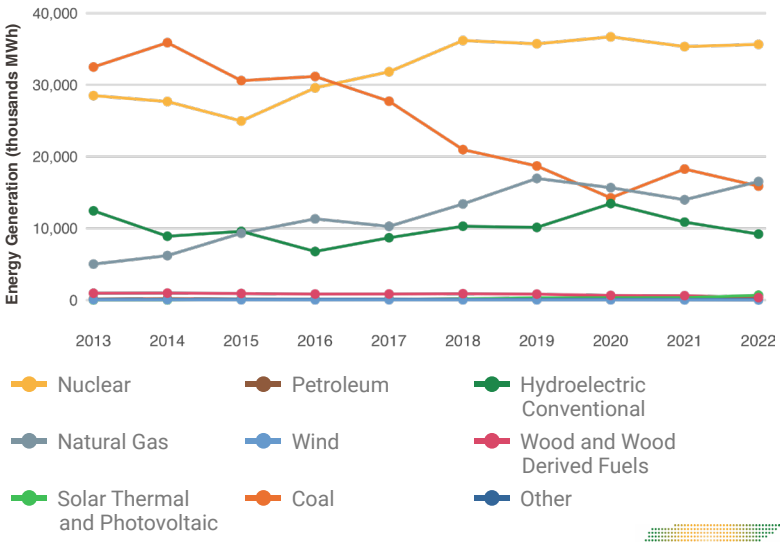
Nationally, Tennessee has the fourth largest share of nuclear energy generation.

Nuclear energy has become Tennessee's primary energy source.



Source: U.S. Energy Information Administration

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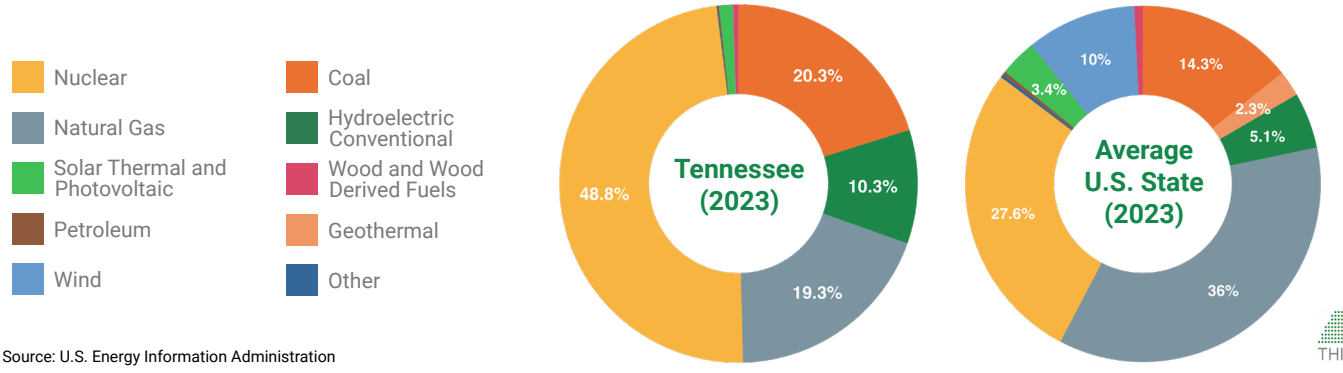
Nuclear energy is the state's largest energy source by far. Tennessee was home to the nation's first nuclear fuel enrichment plant in 1942 and has two nuclear power generating sites today. In recent years, nuclear energy has become the primary source of electricity in the state, increasing from 36% in 2013 to 49% in 2023.[24] Coal has decreased from 41% to 20% of energy production over the same period. Natural gas has increased from 6% to 19% over that same time period.

Tennessee generates almost twice as much energy from nuclear and hydroelectric sources (as a share of the total energy generated) compared to the average U.S. state. However, Tennessee also produces more energy from coal and significantly less from solar and wind sources than the average state. Gas energy generation as a share of the state total is the 13th lowest in the nation.[25,26]

Tennessee generates more energy from nuclear, coal, and hydro sources, and less from gas, solar, and wind than the U.S. state average.



Source: U.S. Energy Information Administration

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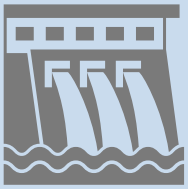
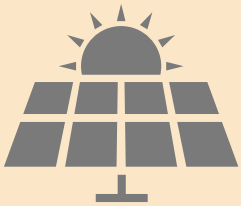
Tennessee has yet to reach its clean energy potential.

Tennessee is a national leader on hydroelectric power; however, **renewable energy (defined as wind, solar, and hydro) currently represents only 5.4% of the state's energy consumption, placing Tennessee 40th in the nation.**[27] When including nuclear, 23% of the state's energy consumption comes from clean sources.[28] Tennessee lacks a formal renewable portfolio standard (RPS) that requires a certain amount of electricity to originate from renewable sources, which 31 states and D.C. have. As of 2023, 104,000 homes—3% of all housing—can be powered by renewable energy generated in the state.[29] For the first time, TVA recently began allowing municipal power utilities and electric cooperatives to generate up to five percent (5%) of their own electricity, permitting them to produce some solar or other renewable power generation.[30]



From 2013 to 2023, hydroelectric sources produced the largest share of renewable electricity in Tennessee; however, it has varied significantly from a high of 16.7% in 2020 to a low of 8.5% in 2016.[31] Tennessee has the potential to generate an additional 5.6 million MWh/year from new stream-reach hydropower development in watersheds across the state.[32]



Tennessee ranks 32nd in total installed solar capacity, with 895.12 MW installed. From 2013-2023, Tennessee's solar electricity generation increased by over 4000%. Solar remains only 1.2% of the state's electricity, significantly behind other states, ranging from a high of 23% in Nevada to lows of less than 1% in Arkansas, New Hampshire, and Oklahoma.[33] Tennessee has a solar technical generation potential of 1.8 billion MWh in utility solar photovoltaics (PV), 15 million MWh in commercial PV, and 13 million MWh in residential PV.[34]

Tennessee ranks 40th in wind electric generation; only 0.02% of Tennessee's electricity comes from wind energy, with 16,213 MWh generated in 2023.[35] Tennessee has a potential wind capacity of 116 thousand MW and a potential wind generation of 215 million MWh.[36] Despite this, the state has only installed 27 MW of wind capacity in a single wind farm near Oliver Springs, Tennessee.[37]

Natural gas alone won't solve Tennessee's energy reliability challenges.

Extreme weather events are the leading cause of power outages nationwide. The increase in frequency and intensity of these events, as a result of climate change, has created resilience challenges for our electric grids.[38] In 2022, conventional energy sources experienced their highest rate of forced outages* since 2013, at 8.5% (14% for coal, 8% for gas, and 5% for hydro).[39] That same year, 76% of all power outages affecting customers in Tennessee occurred during the winter months (October-March).[40]

Twice in 11 years, reliability of natural gas delivery has been jeopardized by extreme cold weather events. **During Winter Storm Elliott (December 2022), 1,702 electricity generating units experienced outages, derates, or failures—the largest share of which were natural gas-fired (47%).** Generating units from renewable sources had a minor contribution to the experienced outages: 3% from solar, 5% from hydro, and 21% from wind.[41]

TVA's draft 2024 IRP proposes between 4 to 19 GW of new gas plants in its six scenarios. However, as North American Electric Reliability Corporation's (NERC) 2022 State of Reliability report shows, electricity from gas-fired generation has become increasingly unavailable in the winter months, whereas there are "no apparent trends" regarding unavailability of other electric generation sources.[42]

Solar and wind—intermittent but unlimited sources—can contribute to grid reliability through adequate transmission capacity and energy storage. In recent years, investments toward energy storage solutions and expanding and modernizing transmission grids have contributed toward achieving a more flexible and reliable grid system nationwide.[43]

*

Energy Reliability*

District of Columbia (71.9 minutes)
Nebraska (72.6 minutes)
South Dakota (77 minutes)
Colorado (99.2 minutes)
Rhode Island (104.6 minutes)
Iowa (104.9 minutes)
Arizona (106.8 minutes)
Delaware (108.2 minutes)
New Jersey (108.3 minutes)
Montana (118.7 minutes)

BEST PERFORMING STATES

Three states—South Dakota, Iowa, and Montana—lead nationally in both renewable energy generation and in energy reliability.

Renewable Energy Generation

Vermont (97%)
South Dakota (79%)
Washington (68%)
Idaho (67%)
Maine (65%)
Oregon (62%)
Iowa (61%)
Montana (51%)
Kansas (47%)
California (47%)

Energy production costs are decreasing, with solar as the least expensive option today and in 2040.

Energy production costs for nearly all sources of energy are decreasing, with solar projects entering service today (2028) as the least expensive, and solar and geothermal projected to be the cheapest options in 2040. In the U.S., the average cost of operating nuclear, gas, solar, and wind power plants has decreased over the past decade; from 2013 to 2023, the average cost of operating gas, internal combustion, solar, and wind power plants declined by 30.2%. In the case of nuclear power plants, costs have decreased by 19.4%.[44]

In the Tennessee Valley region, solar projects entering service in 2028 have the lowest average cost of production at $21.47/MWh, lower than the regional average ($23.22/MWh) and in the neighboring regions of the East Carolinas, West Ohio Valley, and the Mississippi Valley. Solar generation is now less expensive than production via gas-fired combined-cycle projects ($41.01/MWh) or onshore wind projects ($45.65/MWh).[48,49]

Standalone solar is projected to be the cheapest technology among U.S. plants entering service in 2040.[45,46,47]

Standalone Solar Technology
$31.07
/MWh

Geothermal
$39.63
/MWh

Onshore Wind
$40.08
/MWh

Hybrid Solar
$40.08
/MWh

Gas-Fired Generation
Combined Cycle Technology
$44.05
/MWh

Gas-Fired Generation
Combustion Turbine Technology
$121.87
/MWh

THE STATE OF OUR ENERGY: MOVING FORWARD

While Tennessee continues to be a leader in nuclear energy generation and its residents can enjoy some of the lowest electricity rates in the nation, many households (particularly those with lower incomes) face disproportionate energy burdens due to high consumption and outdated building standards. By prioritizing the implementation of robust energy efficiency programs, updating building codes, modernizing the state's transmission grid, and investing in renewable energy sources, Tennessee can create cleaner, more reliable, and more affordable energy for residents.

*

Notes

Page 3:

* The Affordability Gap results from the value of actual home energy bills minus the value of affordable energy bills.

** ACEEE's Energy Efficiency Scorecard ranks the state's energy efficiency program across utilities, transportation, building policies, industry, appliance standards, and state-led initiatives.

Page 4:

* Major Event Days (MED) are calendar days in which a major event occurs. Under IEEE standards, major events are catastrophic events in which at least 10% of customers within a given electric power system experience sustained service interruption during a 24-hour period. Utilities that do not follow IEEE standards dictate their own MED criteria. R. Christie et al. (2018). P1366 Major Event Day Language Draft 2.5 Beta Method. IEEE. https://cmte.ieee.org/pes-drwg/wp-content/uploads/sites/61/2002-08-P1366MajorEventDayLanguageDraft4.pdf.

** Power interruptions refer to the loss of electric power in energized conductors delivering power to customers connected to the distribution portion of the system, whereas power outages refer to the inability of the equipment to deliver power. Loss of supply accounts for power outages resulting from the high-voltage/bulk power system (including generation and transmission systems). Energy reliability reporting on loss of supply is only available for utilities using IEEE standards. Teixeira, John. (2019). IEEE 1366- Reliability Indices. IEEE. https://site.ieee.org/boston-pes/files/2019/03/IEEE-1366-Reliability-Indices-2-2019.pdf.

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* The Weighted Equivalent Forced Outage Rate (WEFOR) measures the likelihood of a collection of generating units failing to meet their generating requirements because of forced outages or forced derates. The weighting gives larger units more impact to the metric relative to smaller units. NERC. (2024). General Availability Review (Weighted EFOR) Dashboard. https://www.nerc.com/pa/RAPA/pages/generalavailabilityreview.aspx#:~:text=Weighted%20Equivalent%20Forced%20Outage%20Rate,forced%20outages%20or%20forced%20derates.

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* Energy reliability is measured as the average duration of power interruptions (SAIDI) including Major Event Days in 2023. U.S. Energy Information Administration. (2024). Table 11.4 SAIDI Values (Minutes Per Year) of U.S. Distribution System by State, 2013 - 2023. 2024. https://www.eia.gov/electricity/annual/html/epa_11_04.html.

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