OFFICE OF ENERGY PROGRAMS
PY 2022 ANNUAL REPORT

http://www.tn.gov/environment/energy

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OFFICE OF ENERGY PROGRAMS

The Tennessee Department of Environment and Conservation's Office of Energy Programs (TDEC OEP) provides education, outreach, technical assistance, and/or funding and financing opportunities for the following:

- energy efficiency
- energy management
- renewable energy
- energy security planning, preparedness, and response
- energy in transportation

OEP is comprised of two sections: the State Energy Office (SEO) and the State Facility Utility Management Section (SFUM). Through its activities, OEP promotes the efficient, effective use of energy to enhance the environmental and economic health of the state. Learn more about OEP at http://www.tn.gov/environment/energy.

ANNUAL REPORT REQUIREMENTS

Tenn. Code Ann. §§ 4-3-510(9) and 4-3-1012(b)(5) require TDEC OEP to submit annual reports to the Governor, the Speakers of the Senate and House of Representatives, and the Chair of the Senate and House Committees on government operations, energy, and conservation, or their successor committees. TDEC OEP's Program Year runs concurrent with the Federal Fiscal year; thus, this combined report covers the period from October 1, 2021, through September 30, 2022.

TENNESSEE'S STATE ENERGY OFFICE

TDEC OEP serves as the Governor-designated SEO for the State of Tennessee. The SEO is tasked with developing and overseeing energy-related programs and initiatives that promote a cleaner environment and a stronger economy. The SEO's activities fall into five main areas of focus: energy security planning, preparedness, and response; K-12 energy education; energy in transportation; clean energy financing; and stakeholder collaboration and outreach.

The SEO receives annual formula funding from the U.S. Department of Energy (U.S. DOE) State Energy Program (SEP). SEP provides funding and technical assistance to states, territories, and the District of Columbia to enhance energy security, advance state-led energy initiatives, and maximize the benefits of decreasing energy waste.

3 Energy Security Planning, Preparedness, and Response

Pursuant to Tenn. Code Ann. §4-3-510, OEP has the duty and responsibility to "promote state and local energy emergency preparedness in coordination with other appropriate state agencies, such as the military department." Subsequently, OEP is responsible for coordinating Emergency Support Function 12 – Energy (ESF-12) activities related to transportation and heating fuels under the Tennessee Emergency Management Plan to enhance Tennessee's preparedness for disruptions to the state's energy resources.

This work includes the ongoing management of the State's Energy Security Plan, the Tennessee Petroleum Shortage Response Guidance, OEP's Standard Operating Procedures checklists, and other energy emergency response reference materials in cooperation with other State agencies and private industry stakeholders. Tennessee's strategic plans and operating procedures are often cited by U.S. DOE as good resources for other SEOs across the country to reference and emulate.

ESF-12 activities also require OEP staff to attend U.S. DOE energy emergency planning seminars, participate in training exercises, and serve as the primary ESF-12 Emergency Services Coordinators (ESCs) for the Tennessee Emergency Management Agency (TEMA). In addition, OEP staff members serve as the State's Energy Emergency Assurance Coordinators (EEACs) for the U.S. DOE's Office of Cybersecurity, Energy Security, and Emergency Response (CESER). Under this program, EEACs act as points of contact in each state during energy emergencies.

State Heating Oil and Propane Program

As participants in the U.S. DOE State Heating Oil and Propane Program, OEP collects weekly propane prices during the winter heating season from a random sample of propane distributors across the state. OEP shares this data with the Energy Information Administration (EIA), which publishes the data to assist government and private sector entities with monitoring winter propane markets.[1]

Energy Security Planning and Preparedness

- The Tennessee Energy Security Plan was revised to reflect operational lessons learned during the COVID-19 pandemic and recent fuel emergencies. The revision included improvements to the cyber, mitigation, and interdependencies sections. The State Energy Profile section information was also updated to reflect data published by EIA in 2022. The revised plan was officially adopted in September 2022.
- OEP serves as the Vice-Chair of the State Mitigation Planning Committee, which includes the TDEC Office of Policy and Sustainable Practices, TDEC Office of Emergency Services, U.S. Army Corps of Engineers, TEMA Planning staff, and TEMA Mitigation staff.
- The Primary ESC began working with the Tennessee Department of Homeland Security and TEMA Planning to establish critical infrastructure surveys in each county. The survey data will include information regarding the backup generation status for critical infrastructure and will be integrated into the Hazard Mitigation Planning cycle for each county's Hazard Mitigation Plan.

Energy Security Education and Outreach

The OEP Primary ESC served as Energy Security Committee Chair for the National Association of State Energy Officials (NASEO) and co-hosted national webinars, reviewed NASEO documents, trained energy security staff in other states, participated in U.S. DOE's State Energy Security Training Working Group, and

1. EIA makes this data available through its Winter Heating Fuels website, which is updated weekly during the winter heating season (October 1 through March 31): https://www.eia.gov/special/heatingfuels/#/US-TN;propane;week. For additional information, EIA releases its "This Week in Petroleum" report every Thursday: https://www.eia.gov/petroleum/weekly/

served as a State, Local, Tribal, and Territorial representative for FEMA's Mitigation Framework Leadership Group.

Additionally, OEP engaged in several awareness efforts on the topic of energy security:

- **Outreach:** OEP distributed an Energy Security Quarterly Newsletter to stakeholders in the public and private sectors. The newsletter shared data, case studies, and news items related to energy security and included information on cybersecurity, EIA's short-term energy outlook, seasonal weather concerns, and more. OEP ESCs also prepared several articles on energy resilience for the TDEC Green Star Partnership quarterly newsletter, which was distributed to industrial and public sector stakeholders across the state.
- **Workshops:** OEP ESCs conducted energy security workshops and webinars on a variety of topics, including fuel supply, cybersecurity, hazard mitigation, energy data analysis, power grid, and the protection of critical infrastructure information during energy emergencies. The team worked with partners TEMA, NASEO, U.S. DOE's CESER, the Cybersecurity Infrastructure Security Agency (CISA), and the Tennessee Department of Safety and Homeland Security to conduct these training sessions.
- **Stakeholder Education:** OEP also participated in targeted engagement and education activities, including the preparation and presentation of situation briefs for energy security stakeholders (e.g., TDEC, CISA, TEMA, Tennessee Department of Transportation [TDOT], Governor's Office, U.S. DOE) on the Tennessee Energy Security checklist, Tennessee Energy Security Plan, Petroleum Shortage Response Guidance, fuel supply chain, pending pipeline and terminal projects, and the State's response to the COVID-19 pandemic.

Energy Security Preparedness and Training Exercises

OEP ESCs participated in several training exercises and energy security briefings with industry personnel, including the following:

- The Oak Ridge National Lab Y-12 annual onsite tabletop exercise, in addition to meetings with the Tennessee National Guard and Y-12 emergency services staff, as well as a meeting with the National Guard and the City of Oak Ridge Emergency Operations Center staff;
- An EPA Region 4 Water Security cybersecurity virtual tabletop exercise;
- The U.S. Coast Guard tabletop exercise regarding a hypothetical oil spill in the Cumberland River;
- The annual State Emergency Operations Center training, including a Tennessee Valley Authority (TVA) Nuclear Plant Integrated Training drill, TVA Nuclear Plant Emergency training, and a U.S. DOE Oak Ridge Reservation emergency exercise; and
- ExxonMobil Pipeline Terminal tabletop exercises for the Nashville and Memphis terminals.

Additionally, the Primary ESC facilitated the NASEO-National Rural Electric Cooperative Association Fractured Freeze: Disaster Response Exercise. The exercise focused on building relationships between rural electric cooperative statewide coordinators and the state energy offices and had attendees from 19 states.

Event Spotlight: Operation Catfish - Electricity Outage Tabletop Exercise and Workshop

OEP hosted and facilitated Operation Catfish: Electricity Outage Tabletop Exercise and Workshop in Franklin. This regional exercise included ninety participants from eight states, including representation from all levels of government and the private sector. The workshop featured expert speakers who discussed how the electric grid works at all levels, from electricity generation to local delivery.

Other presentations focused on grid resilience energy projects, physical grid security, and hazard mitigation funding opportunities. U.S. DOE CESER, CISA, and the Electricity Information Sharing and Analysis Center gave briefings on recent cyber incidents impacting the energy sector and discussed available federal and private resources to assist with cybersecurity.

TEMA, TVA, and NASEO collaborated on the development of the Situational Manual, which is now available for other State Energy Offices and state emergency management agencies for duplication and reference. OEP collaborated with pipeline companies, local power companies, and the National Weather Service to validate the scenario's technical aspects. The exercise scenario involved hypothetical severe winter weather, a bomb cyclone causing long-term power outages, and further complications from a "catfish"-based cyberattack impacting operations of a natural gas pipeline.

TDEC OEP Primary ESC facilitating Operation Catfish.

A local IT director who attended the exercise followed up the following week with a potential cyber issue. To assist, the Primary ESC connected him with CISA, the Fusion Center, and the Tennessee Bureau of Investigation (TBI) Special Agent for Cybersecurity. This resulted in improvements to the notification process for ESF-17 Cyber at TEMA's 24-hour operations center.

A TDEC Alternate ESC for the agency attended Operation Catfish and soon after notified the OEP Primary ESC and EPA's Office of Water Security of a ransomware attack in a Tennessee city; the attack impacted the water system's business enterprise systems but not its operations. Upon learning of the situation from the Alternate ESC, the Primary ESC notified TEMA ESF-17 Cyber, CISA, the Fusion Center, and the TBI Special Agent for Cybersecurity to provide awareness and assistance to the town. After attending the exercise, the TDEC Alternate ESC was prepared to respond to the threat.

To view a short video overview of Operation Catfish, visit https://tinyurl.com/bde4bzd3.

Emergency Response

Tennessee experienced another challenging year of disasters. Beginning in January 2022, severe winter weather struck Sevier County, followed in February by more severe winter weather impacting Shelby County primarily.

Sevier County was affected by severe weather again in March and April, this time by wildfires, thankfully with no fatalities. The Primary ESC coordinated with the TDEC Division of Underground Storage Tanks to alert at-risk gas stations and notified the Tennessee Fuel and Convenience Store Association to request that their members shore up fuel supplies in Sevier and surrounding counties. For each of these activations, the Primary ESC served as the Infrastructure Branch Manager to coordinate activities of TDEC, TDOT, TEMA Communications, and private sector partners.

During hurricane season, Tennessee often provides volunteers to respond to emergencies in the Gulf Coast states. When Hurricane Ian hit South Florida, the Tennessee National Guard responded to mutual aid requests. The Primary ESC provided the National Guard with daily U.S. DOE Situational Reports (SitReps), which detailed key fuel and power outage data that influenced daily operational decisions in Florida. The Guard used key figures from the SitReps in daily leadership briefings and credited OEP and U.S. DOE with providing key intelligence that led to the successful support of their deployment in Florida.

Operation Catfish participants during discussion report out.

K-12 Energy Education

OEP has a long history of supporting K-12 Energy Education through professional development and student learning opportunities. OEP's offerings for the Program Year included an Energy Education Camp, workshops for educators and students, outreach events, and continued support of the National Energy Education Development (NEED) Project. These offerings connect the broad topic of energy to science, technology, engineering, and math (STEM) subjects and provide educators and students with the knowledge and resources necessary to teach energy concepts.

OEP strives to prioritize schools in economically distressed or at-risk counties[2] and/or schools whose low-income student population is greater than 60% of the total student body.[3]

K-12 Energy Education Workshops & Outreach for Students and Educators

Energy Camp and workshop information was sent to more than 6,853 educators in all 95 Tennessee counties. OEP hosted six K-12 Energy Education Workshops and one K-12 Energy Education Camp throughout 23 counties across all three grand divisions of the State. These efforts reached more than 450 students and educators in one distressed county and seven at-risk counties, and 17 schools whose low-income student population is greater than 60% of the total student body.

2. Economically distressed and at-risk counties are defined by the Appalachian Regional Commission. https://www.arc.gov/classifying-economic-distress-in-appalachian-counties/. Each year, the ARC prepares an index of county economic status for every county in the United States. Economic status designations are identified through a composite measure of each county's three-year average unemployment rate, per capita market income, and poverty rate. Based on these indicators, each county is then categorized as distressed, at-risk, transitional, competitive or attainment. Distressed counties rank among the 10 percent most economically distressed counties in the nation.

3. Data used to determine low-income student population percentage of total student body comes from https://www.greatschools.org/

In Program Year 2022, OEP reached:

450+
students and educators

23
counties

Energy Education Camp

OEP's 2022 Energy Education Camp for educators was held at Montgomery Bell State Park. The tuition-free camp was comprised of three-day training sessions and was offered to a total of 40 educators from 22 counties.

The Camp provided energy-related lesson plans and resources designed for use in the K-12 classroom. These lessons promoted energy literacy related to STEM subjects and introduced educators to topics including, but not limited to, electricity generation, consumption, and measurement; renewable energy; and energy efficiency and conservation. Participants received educational products to utilize in their energy-related education lessons, including Green Electric Circuits Kits, Wind Energy Kits, and Kill-A-Watt meters that measure the energy consumption of appliances, tools, and devices.

> *"I've taught for 20 years and the Energy Camp is hands down the best training I have been to! High quality, easy to implement activities including teamwork, the opportunity for hands-on learning, awesome demos, and ideas for review. It's evident how much thought, preparation, and organization went into this program."*
>
> *– Rockvale Middle School, Rutherford County*

"First of all, thank you so much for this amazing camp. I loved all the activities. Especially how I will be able to modify for many different grade levels. I'm so excited about the next school year and the plethora of information I have to take back with me. I really liked how I can do most of the activities with recycled materials, things bought in bulk, etc., and not have to purchase one-time kits. Thanks again for the hard work you put into this camp. The organization, planning, time management, everything about it was a learning experience that I can take back to my classroom."

– Ramer Elementary, McNairy County

Energy Camp participants working on a solar car.

Energy Education Workshops

Humphreys County:

During the early morning of Saturday, August 21, 2021, heavy rainfall resulted in widespread flash flooding across western Middle Tennessee. In a catastrophic situation, much of a five-county area, including Humphreys County and the cities of Waverly and McEwen, received up to a quarter of normal annual rainfall in under twelve hours, totaling up to 10 to 15 inches in many areas.

Waverly Elementary and Middle School are adjacent to each other along a small creek in Humphreys County. Waverly Elementary, which has 485 students in Pre-K-3rd grade, and Waverly Middle School, with 600 students in 4th-8th grade, were not in session when the 17 inches of rain fell. However, this flood, which was the third flood in a span of 11 years, resulted in these schools being condemned. Waverly's educators lost their entire classrooms and years' worth of teaching materials, and the student populations were relocated to neighboring schools.

TDEC OEP's K-12 program reached out to the Humphreys County Director of Schools and Waverly Elementary and Middle School principals to offer materials and lesson plans to teachers affected by the catastrophic flooding. OEP provided materials and lesson plans for energy education workshops for two schools:

- Lakeview Elementary
- McEwen Elementary (70% low-income)

Blythe Bower Elementary:

During the Program Year, OEP continued a partnership with the Creative Discovery Museum in Chattanooga to offer virtual learning opportunities to Tennessee students. These virtual lessons were taught through a View It and Do It format, allowing teachers and students to experience exciting, hands-on energy lessons either in the classroom or at home. The View It and Do It format provided a video of science educators performing a variety of energy experiments (View It) and activity kits for students to use to conduct their own energy experiments after watching the lesson (Do It). Lesson offerings included Forces and Motion, Good Vibrations: Science of Sound, and Electrified. OEP conducted two virtual Energy Education Workshops at Blythe Bower Elementary in Bradley County, which reported 88% of the student population as low-income, for 434 students.

Smith County High School:

TDEC OEP partnered with Nashville-based Mr. Bond's Science Guys to host a live energy education show at Smith County High's Summer Freshman Bridge Program. The show is based on OEP's Energy Education program and includes demonstrations on energy-related topics, including sound energy, potential energy, chemical reactions, and radiant energy. They performed over a dozen educational experiments during the show.

Flooding in the hallway of Waverly Elementary School.

Students from Waverly Elementary School using KitBooks.

National Energy Education Development Project

OEP is the state coordinator for the National Energy Education Development (NEED) Project. The mission of the NEED Project is to promote an energy-conscious and educated society by creating effective networks of students, educators, and business, government, and community leaders to design and deliver objective, multi-sided energy education programs. NEED works with energy companies, agencies, and organizations to bring balanced energy programs to the nation's schools, focusing on strong teacher professional development, timely and balanced curriculum materials, signature program capabilities, and turnkey program management.

During OEP's Energy Education Camps for K-12 educators, teachers learn how to participate in the NEED Youth Awards for Energy Achievement competition. Through this competition, teachers take their energy education program beyond the classroom and get students involved with school and community outreach so that they can share what they have learned about energy efficiency and conservation. Students and teachers set goals and objectives throughout the year and keep a record of their activities. Schools then combine their materials from the year into scrapbook presentations and submit these presentations to the competition for review. Winners are selected at the state level by OEP and are submitted for award consideration at the national level.

The 2022 NEED Project Youth Award Winners were announced in June, and Michie Elementary was named the State School of the Year. Michie Elementary's Project, "Exploring Energy," included activities from a previous OEP Energy Education Workshop as well as resources from Energy Camp.

Michie Elementary School students experimenting with electromagnets.

Energy camp participants testing their wind turbine design.

Energy in Transportation

According to EIA, the transportation sector is Tennessee's largest energy-consuming end-use sector, representing 30.6% of Tennessee's total energy consumption in 2021.[4] To address this critical energy sector, OEP promotes and educates Tennessee citizens about alternative fuels, advanced vehicle technologies, and sustainable transportation options. By prioritizing and educating citizens regarding energy use in transportation, OEP seeks to reduce energy costs within the transportation sector, increase the energy efficiency of the transportation sector, enhance resiliency and emergency preparedness through diversification of available fuels, and promote economic growth with improved environmental quality.

Tennessee Sustainable Transportation Forum & Expo

The Tennessee Sustainable Transportation Forum & Expo (STF&E) is an annual conference coordinated and hosted by OEP, TDOT, the TDEC Office of Sustainable Practices, and the East Tennessee Clean Fuels Coalition. STF&E allows attendees to share and discover projects that can reshape what is possible in transportation and mobility. The research, technology, planning, and policy developments shared at STF&E aim to improve transportation efficiency, reduce vehicle emissions, and address the mobility needs of all. Panelists and speakers from across the country highlight best practices to efficiently, affordably, and sustainably transform transportation systems. Learn more about STF&E at www.sustainabletransportationforum.com.

The 2021 STF&E was held as a free, two-part webinar series. These webinars focused on the following topics:

- **Pedestrian Travel and Safety:** Pedestrian travel is often complicated by limited walkable and bikeable infrastructure in neighborhoods, which instead prioritize design that favors automobile traffic. What are the key aspects of road and city design that help address these challenges and enhance pedestrian safety? And what are the overall benefits of granting greater access to pedestrian travel? The STF&E panelists discussed these considerations and how to make walking a safer option for all.
- **Sustainable Transportation Opportunities in Tennessee:** This webinar featured a digital "fireside chat" between TDEC Commissioner David Salyers and TDOT Deputy Commissioner Preston Elliot, moderated by Deputy Commissioner Greg Young of TDEC. Speakers highlighted upcoming opportunities from the Infrastructure Investment and Jobs Act that can support transportation projects across the state's diverse geographies and communities, as well as several State-organized resources, programs, and tools.

Hosted by TDEC and TDOT during STF&E, the Tennessee Sustainable Transportation Awards (TSTAs) recognize outstanding initiatives to improve the efficiency, accessibility, affordability, and sustainability of transportation systems in the state, consistent with ongoing efforts to improve the health and well-being of Tennesseans, provide for a strong economy, and protect the state's natural resources. Summaries of the award-winning projects can be accessed here: http://www.tn.gov/environment/TSTA.

These webinars were recorded and have since been posted on the STF&E website for public reference.

4. Energy Information Administration, "Tennessee State Profile and Energy Estimates." Accessed on April 26, 2023. https://www.eia.gov/state/?sid=TN

Middle-West Tennessee Clean Fuels

U.S. DOE's Clean Cities program advances the nation's economic, environmental, and energy security by working locally to advance affordable, domestic transportation fuels and technologies. A national network of nearly 100 Clean Cities Coalitions brings together stakeholders in the public and private sectors to deploy alternative and renewable fuels, idle-reduction measures, fuel economy improvements, and new transportation technologies as they emerge. Tennessee has two U.S. DOE-designated Clean Cities Coalitions: the Middle-West Tennessee Clean Fuels Coalition (MWTCF) and the East Tennessee Clean Fuels Coalition (ETCF). The website for these two Coalitions, known collectively as Tennessee Clean Fuels, may be accessed at http://www.tncleanfuels.org/.

As Director for MWTCF, OEP provides technical assistance and targeted outreach within the Coalition's territory to raise awareness and foster a greater understanding of alternative fuels and advanced vehicle technologies. Additionally, OEP tracks, validates, analyzes, and reports on critical information and performance metrics necessary to gauge consumer acceptance and track the growth/adoption of technologies and practices in the marketplace.

In compliance with eligible activities and U.S. DOE grant deliverables, OEP staff conducted the following key activities on behalf of MWTCF:

- Identified and tracked alternative fuel station opening and closing information and kept U.S. DOE abreast of any refueling site openings, closings, and status changes;
- Organized several stakeholder meetings and events to disseminate Clean Cities and alternative fuel vehicle information;
- Filmed and distributed videos on alternative fuel vehicles and associated emissions reduction calculations, both for use in the K-12 classroom and for the education of the general public via the Fuels Fix Alternative Fuels Library; and
- Conducted targeted outreach to fleets, fuel providers, and consumers regarding the use of alternative fuel vehicles and advanced vehicle technologies.

TENNESSEE CLEAN FUELS

MIDDLE-WEST TN CLEAN FUELS
TNCLEANFUELS.ORG

Annual Reporting to U.S. DOE

Each year, MWTCF reaches out to fleets and alternative fuel stations that the Coalition has engaged with or supported during the year to request data on alternative fuel usage and/or sales; data is then compiled and submitted in an Annual Progress Report to U.S. DOE.

This report was completed in April of 2022 and covers activity by 29 fleets and 14 fueling station owners in Middle-West Tennessee for calendar year 2021. Key findings from this report are shown in the figures below.

MWTCF's Calendar Year 2021 Impact:

Tennessee State Parks Alternative Fuel Strategy

MWTCF worked with Tennessee State Parks (TSP) leadership and the TN Department of General Services Division of Vehicle and Asset Management to implement aspects of the five-year alternative fuel strategy for the TSP fleet. Specifically, TSP purchased 12 all-electric Ford F-150 Lightning Trucks to replace vehicles leaving service within the TSP fleet across the state. TSP provided a list of 134 vehicles within the fleet that were ready for replacement, and these vehicles were analyzed using the Atlas DRIVE tool to prioritize replacement vehicles based on cost savings, considering the upfront cost of the vehicle, maintenance costs, daily mileage, fueling costs, insurance costs, and depreciation.

Volkswagen Diesel Settlement

OEP is the lead administrator of the Volkswagen (VW) Environmental Mitigation Trust (EMT) allocation, in coordination with a multidisciplinary Technical Advisory Committee (TAC), which oversees the implementation of the State's Beneficiary Mitigation Plan (BMP). The TAC is comprised of representatives from the following TDEC divisions: OEP, Air Pollution Control, Office of Sustainable Practices, Office of External Affairs, and the Office of General Counsel. The BMP notes TDEC's plans to release separate project solicitations in the following order for each of the environmental mitigation action (EMA) categories that it has selected to fund, with the percent of the initial total funding allocation noted:

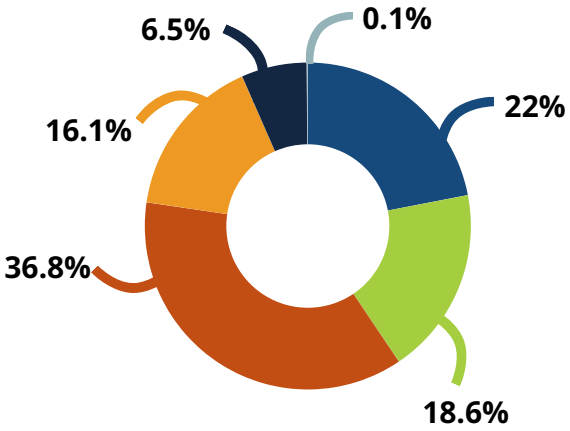
- Class 4-8 School Buses (~20%);
- Class 4-8 Shuttle and Transit Buses (~40%);
- Class 4-7 Local Freight Trucks (15%), Class 8 Local Freight Trucks and Port Drayage Trucks (10%); and
- Light Duty Zero Emission Vehicle (ZEV) Supply Equipment (15%).

The State's BMP targets Tennessee's largest contributors to mobile NOx emissions, including the on-road, diesel heavy-duty, and non-diesel light-duty sectors. As NOx emissions contribute to the formation of ozone and particulate matter, reductions in emissions will assist in the State's efforts to maintain compliance with the National Ambient Air Quality Standard (NAAQS) for Ozone and Particulate Matter.

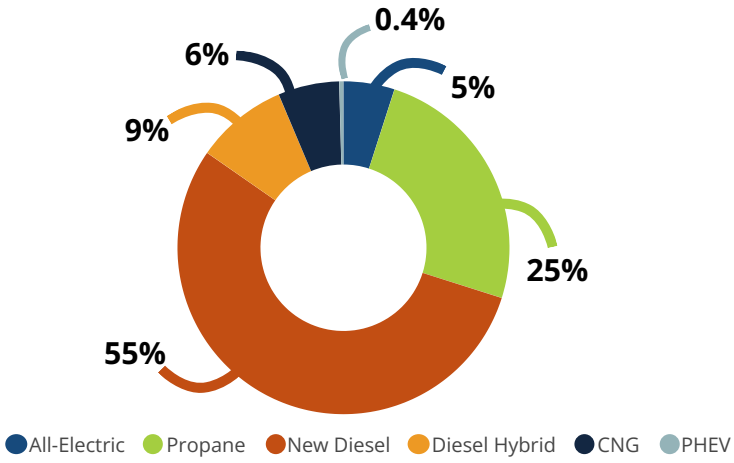
As of September 2022, OEP has obligated $22,702,263.94 in VW Settlement EMT funding to 66 School Bus, Shuttle Bus, Transit Bus, Medium Truck, and Large Truck projects in Tennessee. Overall, 63% of project funds have been obligated to support alternative fuel projects, including propane, compressed natural gas (CNG), and electric.

VW Settlement EMT Funding Breakout in Tennessee

Total Funding Obligated by Fuel Type



Percentage of Vehicle Replacements by Fuel Type



Learn more about the VW Settlement at http://www.tn.gov/environment/VWSettlement. Access the State's BMP at http://www.tn.gov/environment/VW_BMP.

School Bus Replacement Grant Program

Launched in the fall of 2018, the VW Settlement EMT School Bus Replacement Grant Program provides funding to selected projects that replace eligible diesel school buses with new diesel, alternate-fueled, or all-electric vehicles. Thirty-five grantees were selected to replace a total of 134 engine model year 2009 or older school buses with 65 new diesel, one all-electric, 65 propane, and three CNG school buses.

These projects are expected to yield NOx emissions reductions of an estimated 111,542 pounds, or 55.77 tons, over the lifetime of the new vehicles. All projects under this grant program were completed in 2022. OEP reimbursed nearly $8 million in grant funding to school bus grantees that have successfully purchased and put into service qualifying vehicle replacements.

Of the school buses to be funded by the VW Settlement EMT, 26 operate 70% or more of the time in former nonattainment areas for ozone and/or fine particulates (PM2.5) NAAQS; 42 operate in State Fiscal Year (FY) 2019 economically distressed counties.[5]

School Bus Replacement Grant Program:

$7,710,801.94

total funding provided under the School Bus Replacement Grant Program in Tennessee

111,542

anticipated pounds of NOx emissions to be reduced over the life of all funded school bus replacement projects

35
grantees selected

133
school buses to be replaced

Transit and Shuttle Bus Grant Program

In September 2019, TDEC released its second solicitation for projects under the VW Settlement EMT to replace transit and shuttle buses with new alternate-fueled or all-electric vehicles. In May 2020, TDEC announced that three major transit providers in Tennessee would receive funding to replace a total of nine engine model year 2009 or older diesel transit buses with six all-electric and three diesel-hybrid vehicles. These projects are expected to yield NOx emissions reductions of an estimated 17,027.46 pounds, or 8.51 tons, over the lifetime of the new vehicles. The nine transit buses funded will operate 70% or more of the time in former nonattainment areas for ozone and/or PM2.5 NAAQS and will collectively travel more than 400,000 miles each year.

By the end of 2022, OEP reimbursed more than $1.6 million in grant funding to transit bus grantees that have successfully purchased and put into service qualifying vehicle replacements. In the coming Program Year, OEP will reimburse approximately $4 million more in grant funding under this program.

5. Economically distressed and at-risk counties are defined by the Appalachian Regional Commission. https://www.arc.gov/classifying-economic-distress-in-appalachian-counties/.

Medium and Large Truck Grant Programs

In August 2020, TDEC released an additional solicitation for projects under the VW Settlement EMT to replace eligible class 4-7 local freight truck (medium truck) projects and class 8 local freight truck and port drayage truck (large truck) projects. The grant programs would provide financial assistance to Tennessee public, non-profit, and private fleets that replace and/or repower eligible medium and large trucks with new diesel, alternate fueled, or all-electric trucks and/or drivetrains. In April 2021, TDEC announced the selection of 25 entities to receive approximately $3.8 million for medium truck projects and $5.8 million for large truck projects across the state, nearly $10 million in all.

For the Medium Truck Grant Program, selected awardees will replace a total of 34 engine model year 1992-2009 diesel trucks with ten new diesel, two all-electric, 12 hybrid, one plug-in hybrid electric, and eight propane trucks. These selected medium truck replacement projects are expected to reduce 22,561.47 pounds, or 11.28 tons, of NOx emissions over the lifetime of the new vehicles, with a vehicle cost-effectiveness rating of $166.44 per pound of NOx reduced.

For the Large Truck Grant Program, selected awardees will replace a total of 43 engine model year 1992-2009 diesel trucks with 34 new diesel, one all-electric, one hybrid, and seven compressed natural gas trucks. These selected large truck replacement projects are expected to reduce 38,295.78 pounds, or 19.15 tons, of NOx emissions over the lifetime of the new vehicles, with a vehicle cost-effectiveness rating of $146.40 per pound of NOx reduced.

Of the funded vehicle replacements, 63 trucks will operate 70% or more of the time in former nonattainment areas for ozone and/or PM2.5 NAAQS. Twenty-eight funded trucks will operate in counties that bear a disproportionate share of the air pollution burden.[6] Additionally, six funded trucks will operate in two of the state's FY 2020 economically distressed counties,[7] supporting local government and business economies by offsetting the cost of new and cleaner vehicle and transportation technologies.

As of September 2022, a cumulative total of $1,731,045.24 has been paid to Medium and Large Truck Grantees for successful vehicle replacement. OEP will continue processing reimbursements for these programs within the coming Program Years after grantees have purchased and put into service qualifying vehicle replacements.

Fast Charge TN Network Grant Program

TDEC and TVA are partnering to develop a statewide electric vehicle fast charging network to power the growth of electric vehicles across Tennessee and reduce barriers to transportation electrification. Specifically, the two signed an agreement to collaborate and fund a network of fast charging stations every 50 miles along Tennessee's interstates and major highways. The "Fast Charge TN Network" will add approximately 40 new charging locations along prioritized corridor infrastructure gaps.

TDEC and TVA will leverage various funding sources to support the development of the fast-charging network with an anticipated total project cost of $20 million. This partnership advances the State's goal of establishing a statewide corridor fast charging network that improves transportation efficiency, reduces vehicle emissions, promotes electric adoption, and strengthens the resiliency of our transportation network. TDEC has committed 15%, the maximum allowable, of its VW EMT allocation to fund light-duty electric vehicle charging infrastructure. Approximately $5.2 million from this fund has been allocated to fast charging infrastructure along corridors. The remainder of the project will be funded by TVA, other program partners, and program participant cost share.

In the fall of 2021, TDEC and TVA began seeking project proposals from TVA-served Local Power Companies (LPCs) and other local utilities that distribute electricity in Tennessee whose service territory is located along prioritized corridor gaps (eligible applicants) to develop the Fast Charge TN Network across Tennessee. As of September 2022, a total of 32 project locations with a total of 77 direct current fast charging units were selected by TDEC and TVA, representing proposals from 25 LPCs.

Fast Charge TN Network charger installed in Martin.

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6. The State Trust Agreement requires Beneficiaries to include within the BMP a "description of how the Beneficiary will consider the potential beneficial impact of the selected Eligible Mitigation Actions on air quality in areas that bear a disproportionate share of the air pollution burden within its jurisdiction." To address these requirements, the State has developed a "Disproportionate Burden Index" (DBI), which combines environmental, economic, and demographic datasets in a geospatial format to determine geographic units in Tennessee that have the highest air quality burden. For more information on the DBI, refer to Section VI. Consideration of Disproportionate Burden and Appendix 7 – Identification of Areas that Bear a Disproportionate Share of Air Pollution of the State of Tennessee's Beneficiary Mitigation Plan.

7. Economically distressed and at-risk counties are defined by the Appalachian Regional Commission. https://www.arc.gov/classifying-economic-distress-in-appalachian-counties/.

Drive Electric Tennessee

Drive Electric Tennessee (DET), a consortium of State agencies, utilities, local governments, universities, research institutions, EV manufacturers, businesses, and advocacy groups, was formed in 2019. DET's Electric Vehicle Roadmap identifies "Opportunity Areas" that will increase electric vehicle adoption across multiple Tennessee use cases and sectors, with a goal of 200,000 electric vehicles on the road in Tennessee by 2028.[8]

Three Opportunity Area committees address various projects and initiatives highlighted in the Roadmap: Charging Infrastructure Availability, Policies and Programs, and Awareness. Each of these Opportunity Areas is co-chaired by OEP and MWTCF personnel, who guide and oversee DET efforts to complete projects that promote electric vehicle adoption. The list that follows notes the committees' accomplishments and priorities for Program Year 2021-2022:

- **Charging Infrastructure Availability:** 1) evaluation of funding opportunities and ownership models to support the implementation of a public, statewide electric vehicle charging network; 2) development of guides for charging station site hosts and site selection, including information on site prep, charging station installation, and planning for ongoing charging station operation; and 3) the creation of Task Forces to focus on developing tools and resources to assist with planning for the following infrastructure categories: Multifamily Housing, Community Charging Planning, Older / Second Use Batteries, and Workplace Charging.
- **Policies and Programs:** 1) creation of a Local Action Plan video series for use by local governments seeking to accelerate transportation electrification; 2) development of an Electric Vehicle Workplace Charging Infrastructure Best Practices Guide for use by Tennessee employers; and 3) creation of a statewide E-VIP or electric vehicle tourism program to connect electric vehicle drivers with electric-friendly driving routes and destination chargers.
- **Awareness:** 1) creation of electric vehicle charging station signage recommendations; 2) compilation of electric vehicle case studies for a variety of fleet types and applications; 3) promotion of a robust DET social media and website presence; 4) coordination of EV Chapters across Tennessee, to serve as local resources for electric vehicle education; and 5) development of educator training programs, both for electric vehicle ride and drive training as well as electric vehicle dealership education.

Electric vehicle stakeholder engagement is at a historic high for Tennessee, with multiple organizations partnering on the promotion of electric vehicle awareness activities as well as on the build-out of a suite of electric vehicle related resources. DET and partners will continue addressing the priorities and projects in 2023. For more information on DET, visit www.DriveElectricTN.org.

8. As of Q3 2022, there were approximately 22,413 electric vehicles registered in Tennessee. This number is provided by the Tennessee Department of Revenue to OEP on a quarterly basis, based on actual vehicle registration data for the state.

Example of electric vehicle charging.

Clean Energy Financing

Energy Efficiency and Renewable Energy Loan Program

The Pathway Lending Energy Efficiency Loan Program (EELP), a low-interest revolving loan fund, was launched in 2010 to assist Tennessee for-profit and not-for-profit commercial and industrial businesses with implementing energy efficiency and renewable energy improvements. The EELP was later expanded to offer financing to local government entities, including municipalities, counties, school districts, and other public agencies. Pathway Lending, a US Treasury certified community development financial institution, administers the $29 million revolving loan fund, comprised of loan capital provided by the State through TDEC OEP, TVA, and Pathway Lending.

Eligible projects under EELP include but are not limited to energy-efficient equipment upgrades, lighting, building envelope retrofits, cool roofs, renewable energy installations, and co-generation. Qualifying entities can apply for loans between $20,000 and $5 million. EELP obligated $4,510,156 in new loans to 16 Tennessee businesses and organizations during the Program Year, with an average estimated annual energy savings of $19,560 per program participant.

Home Uplift Program

Over the past two decades, new electric technologies, appliance standards, and increased energy efficiency requirements in state and local building codes have dramatically lowered residential energy consumption and increased the comfort and health in family homes across the Tennessee Valley. However, these benefits have flowed primarily to homeowners with the disposable income to take advantage of technological advances and the utility programs that promote their use.

Residents in the Southeast face historically high rates of poverty, and low-income families often live in homes that are inefficient, uncomfortable, and, in many cases, unhealthy for occupants. Despite the TVA's low residential energy rates ranking in the top quartile nationally, disproportionately high electricity usage represents a greater burden on low-income families who already spend a larger proportion of their resources on electricity. Energy efficiency and weatherization measures can help lower energy bills for low-income households and have also been proven to improve indoor air quality, safety, and comfort, thereby positively impacting human health.

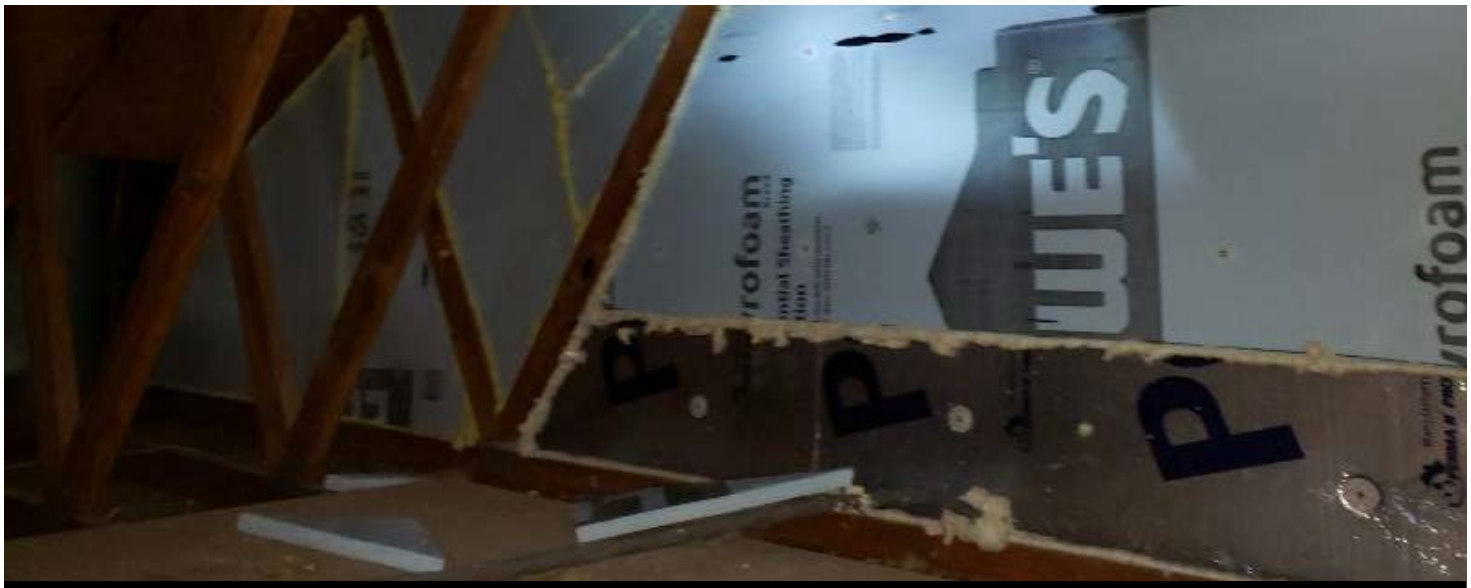
TVA created the Home Uplift Program to address the significant energy efficiency and weatherization needs for low-income households in Tennessee and across the Tennessee Valley. OEP has since leveraged TVA's Home Uplift Program and partnered with LPCs to invest in the vision to create a sustainable, quality program to increase energy efficiency weatherization for low-income families in Tennessee. Throughout the course of the program, TDEC OEP provided grants totaling $3 million to EPB of Chattanooga (EPB), Knoxville Utilities Board (KUB), Memphis Light Gas and Water (MLGW), and the Nashville Electric Service (NES). This funding was used to cover the costs of energy efficiency and weatherization measures for limited-income homeowners that are customers in the LPCs' respective service areas.

Customers who qualified for the Home Uplift program received valuable energy efficiency upgrades. In addition to saving money on their energy bills, participants also reported improvements in the comfort and air quality of their homes. During the Program Year, 270 homes were retrofitted.

The energy efficiency upgrades included 664 window replacements, 92 door replacements, 165 HVAC cleaning and tuning/replacements, 171 attic insulation repair/replacements, 146 duct sealing/replacements, 198 air sealing repairs, 61 heat pump water heaters, 7 refrigerators, and 376 LED bulbs.

Over the course of the entire program, a total of 1,108 window replacements, 169 door replacements, 232 HVAC cleaning and tuning/replacements, 226 attic insulation repair/replacements, 198 duct sealing/replacements, 252 air sealing repairs, 88 heat pump water heaters, 21 refrigerators, and 1,070 LED bulbs were completed on 407 homes.

> "I called to get help with my electric bills and found out about the program. I thought it was too good to be true. The improvements have been substantial. My water heater was not working properly so I went without hot water most of the time. It is nice to be able to take a good hot shower. This is the first summer in 10 years I have been comfortable in my home. Before my HVAC was replaced, I would have to stay with neighbors or family members to cool off. My HVAC did not work properly for 10 years, and I did not have any air for the last two years. I have a lot of health problems. I was having issues with mold and dust accumulating. This is no longer an issue, and my health has improved. I have seen a difference in my electric bills. I received one for under $100 for the first time. I don't think I would have made it without the Home Uplift Program. People say there are no miracles but there are"
>
> - NES Homeowner William Hall



Home Uplift home's attic before, with no insulation.

Home Uplift home's attic after the addition of insulation.

Stakeholder Collaboration and Outreach

Communications

OEP curates and distributes two monthly newsletters, the Energy Edition and the Transportation Edition. These monthly newsletters are disseminated to a listserv of over 6,000 stakeholders and serve as the primary vehicle for OEP to announce timely news items, upcoming events, funding opportunities, and new resources. Additionally, OEP develops and maintains web content and continually improves the functionality of its website to create a better user experience. Visit OEP's website at http://www.tn.gov/environment/energy.

OEP also works with communications partners to share energy-related content via social media, reaching individuals that may not already be subscribed to OEP's mailing list. One partner, TDEC Communications, manages TDEC's Twitter and Facebook accounts (@TNEnvironment). The accounts have over 4,800 and 9,900 followers, respectively. Another partner, Tennessee Clean Fuels, maintains a social media presence on Twitter, Facebook, and Instagram (@TNCleanFuels), reaching approximately 4,300 additional followers. OEP provides energy and transportation content to both partners for inclusion on their separate platforms.

In accordance with Tenn. Code Ann. §4-3-501(3), OEP is responsible for providing "information and educational programs for local governmental units and the general public, including the operation of a toll-free energy hotline." As such, OEP maintains an updated overview of its programs on the OEP website and provides technical assistance to internal and external customers by responding to energy-related inquiries received via email or through OEP's energy hotline. During the Program Year, OEP handled over 200 requests from the residential, government, utility, commercial, industrial, institutional, and other sectors for energy-related information and resources.

These general requests for technical assistance are in addition to inquiries that OEP received regarding its specific programs and activities.

Interagency and Nonprofit Collaboration

A key component of OEP's outreach strategy is the multi-faceted work from cooperation with external partners and organizations. OEP collaborates with various stakeholders to support the execution of targeted outreach and improved programs across the residential, commercial, industrial, and public energy sectors. Key activities during the Program Year include the following:

- OEP worked with State agencies, educational institutions, and other entities to research, gather information, and prepare a response to the American Council for an Energy-Efficient Economy's (ACEEE) request for information related to the organization's 2022 State Scorecard. To determine states' reports for the 2022 Scorecard, ACEEE considered seven policy areas where states typically pursue energy efficiency: building code stringency and stretch codes, building disclosure and compliance, healthy buildings, transportation, state government, advancing equity, and industry. On the final 2022 ACEEE State Energy Efficiency Scorecard, Tennessee ranked 28th nationally.
- OEP supported and cross-promoted the work of the Tennessee Advanced Energy Business Council (TAEBC), which champions advanced energy as a job creation and economic development strategy. OEP shared information with its stakeholders on TAEBC's ongoing events, resources, and programming, helping draw attention to TAEBC and its mission in Tennessee.

OEP also participated in or supported collaborative applications to major U.S. DOE funding opportunities.

With OEP's involvement, these applications leveraged stakeholder partners, diverse cost share commitments, and the state's strong research community to bring new, innovative energy programs to Tennessee.

As an example, in response to a National Science Foundation Regional Innovation Engines Program funding opportunity, TDEC OEP provided a letter of commitment to the University of Tennessee – Knoxville to serve as a core partner in building the statewide Tennessee Technology-Enabled Advanced Mobility Engine (T2EAM-Engine), an innovation ecosystem partnership between industry and community stakeholders, economic development organizations, state government agencies, and researchers and educators in higher education (community colleges, technical colleges, and four-year institutions) invested in making Tennessee the leader of the future mobility economy.

Additionally, OEP supported Tennessee Tech University (TTU) on their application to U.S. DOE for their Second-life Battery in Mobile EV Charging Application for Rural Transportation project. The project was awarded approximately $4.5 million and aims to develop affordable mobile charging stations that will utilize second-life batteries retired from electric vehicles. OEP will assist TTU with education, outreach, data analysis, and project implementation.

Boards, Councils, and Working Groups

OEP engages with stakeholders from federal, state, and local government, the utility sector, as well as with other SEOs and non-governmental organizations (NGOs) on topics related to strategic energy planning:

- The OEP Director serves as the Governor's designee to the State Energy Policy Council, the TDEC Commissioner's designee to the Energy Efficient Schools Council, and the SEO representative on the Tennessee Housing Development Agency's Energy Efficiency and Weatherization Advisory Board.
- The OEP Deputy Director of Programs, Innovation and Transportation, and Communications serves as the Governor's designee on the TVA Regional Energy Resource Council, a TDEC representative on the TVA Connected Communities Steering Committee, the TDEC representative on the Nashville Mayor's Sustainability Advisory Committee, and on the Executive Board for Urban Green Lab, a sustainability education non-profit serving the greater Nashville area.

Conferences, Workshops, Presentations, and Speaking Engagements

OEP staff presented at various workshops and conferences to promote programs, funding and technical assistance opportunities, initiatives, and U.S. DOE efforts. Examples include the Tennessee Environmental Show of the South Conference, the Tennessee Municipal League Annual Meeting, the Tennessee Chamber of Commerce & Industry's Environment, Energy, and Recycling Conference, and several other state and regional speaking engagements.

Additionally, OEP sponsored and assisted in planning and promoting the 2021 Tennessee Valley Solar Conference, hosted by the state chapter of the Solar Energy Industries Association, TenneSEIA. The event took place on October 13, in-person and virtually.

In August 2022, OEP assisted with the planning for the 2022 TennSMART Smart Mobility Expo at the Music City Center in Nashville. The Expo showcased the latest transportation research, technologies, and solutions developed, built, and deployed in the state. Also in August, OEP curated and moderated a panel for the Tennessee Chamber of Commerce and Industry's 2022 Environment, Energy & Recycling Conference.

Infrastructure Investment and Jobs Act and Inflation Reduction Act

Throughout the Program Year, OEP staff reviewed and responded to a variety of Notices of Intent, Requests for Information, Funding Opportunity Announcements, and Administrative and Legal Requirements Documents issued by U.S. DOE and DOT regarding Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) formula and competitive programs (e.g., IIJA State Energy Program, Energy Efficiency and Conservation Block Grant, State Energy Office Energy Efficiency Revolving Loan Fund capitalization grant, competitive funding opportunities tied to building energy codes and energy efficient schools, IIJA Grid Resilience formula funding, competitive funding for Hydrogen Hub development, the EPA Clean School Bus Program, the National Electric Vehicle Infrastructure (NEVI) formula program, etc.). In addition, OEP shared information on these funding opportunities with relevant stakeholders and convened working groups, where applicable, in order to position eligible applicants to be prepared to apply for and secure funding for applicable projects.

National Electric Vehicle Infrastructure (NEVI) Program

In November 2021, the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), was signed into law. This law includes $7.5 billion in dedicated funding to help make EV charging infrastructure accessible to all Americans for local and long-distance trips. This funding includes a $5 billion NEVI Formula Program to help states create a network of EV charging infrastructure along nationally designated Alternative Fuel Corridors (AFCs). The State of Tennessee expects to receive approximately $88 million over five years (FY2022-2026).

During the Program Year, OEP staff supported TDOT with stakeholder engagement and plan development for the NEVI program. OEP supported the development of a website, online survey, and stakeholder engagement strategy to solicit public input. OEP staff also supported TDOT in drafting the State's NEVI Deployment Plan and submitting it to the U.S. Department of Transportation. The plan was approved by the federal government in September 2022.

Grid Resilience Formula Grant Program

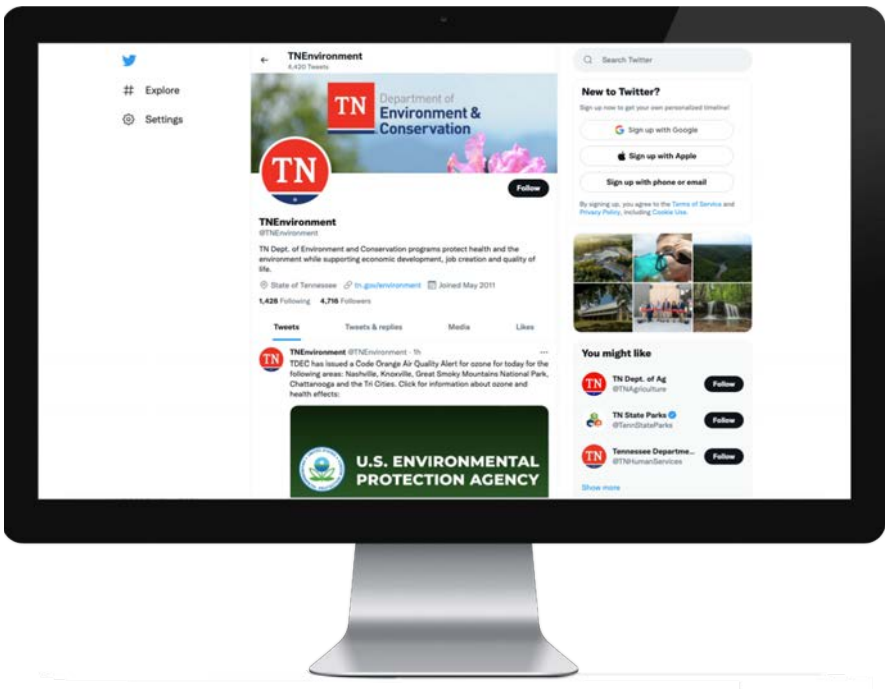
U.S. DOE will provide grants to States (including U.S. Territories) and Indian Tribes under the IIJA-funded Grid Resilience Formula Grant Program to improve the resilience of the electric grid against disruptive events. Throughout the Program Year, OEP staff met with key stakeholders to discuss the next steps with regard to establishing the program's stakeholder working group, addressing outage data reporting gaps and identifying needs or resources that could be leveraged to fill such reporting gaps, identifying and prioritizing eligible projects, and other initial steps that will inform the development of Tennessee's plan for implementation of its Grid Resilience formula allocation.

In September, OEP released a draft Program Narrative on its Grid Resilience Formula Grant Program website regarding the utilization of the State of Tennessee's allocation under the Program. OEP also held a public hearing on September 15 regarding the draft Program Narrative and the utilization of the State of Tennessee's allocation. In addition to providing an overview of this Program and related compliance requirements, OEP reviewed the criteria and methods the State of Tennessee anticipates using to grant awards to eligible entities and potential approaches for distributing funding (e.g., formula grants and competitive grants).

National Association of State Energy Officials (NASEO) Engagement

NASEO is the only national non-profit association for the governor-designated energy officials from each of the 56 states and territories. Formed by the states in 1986, NASEO facilitates peer learning among state energy officials, serves as a resource for and about state energy offices, and advocates the interests of the SEOs to Congress and federal agencies. Throughout the Program Year, OEP supported NASEO through membership dues and through participation on the NASEO Board and on several committees:

- The OEP Director served as Treasurer for the Executive Committee of the NASEO Board of Directors during the Program Year.
- The OEP Senior Energy Programs Administrator for Energy Security / Critical Infrastructure serves as Chair on the NASEO Energy Security Committee, the OEP Deputy Director of Programs, Innovation and Transportation, and Communications serves as the Co-Chair for the NASEO Transportation Committee, and the OEP Deputy Director of Operations serves on the NASEO Energy Equity Taskforce.
- The OEP Deputy Director of Programs, Innovation and Transportation, and Communications serves as a "state advisor" for the NASEO / NACAA VW Diesel Settlement Working Group, which enables state-to-state communication on the VW Settlement Environmental Mitigation Trust.



STATE FACILITY UTILITY MANAGEMENT

To maximize utility savings opportunities for State facilities, the State building energy management statutory responsibilities for State-owned and managed properties (Tenn. Code Ann. §§ 4-3-1012 and 4-3-1017-1019) were transferred from the Department of General Services (DGS) to TDEC OEP via Executive Order No. 63 on January 1, 2017, and a new section, State Facility Utility Management (SFUM), was formed under OEP.

SFUM strives to provide actionable utility insights to State facilities, enabling them to make informed decisions that optimize their facility energy consumption and associated utility savings. To support this goal, SFUM administers several utility savings and building energy management initiatives, including the following:

- Development, maintenance, and end-user training for an online Utility Data Management (UDM) platform for approximately 77 General Government agencies and Higher Education campuses.
- Publication of an annual Utility Data Analysis Report that provides in-depth utility usage, cost data, and utility analysis for State-owned and managed properties. The report also highlights case study examples of UDM platform features and benefits for General Government agencies and Higher Education campuses.
- Oversight of energy efficiency projects under the EmPower TN initiative, designed to reduce energy consumption and utility costs for participating State facilities by implementing energy conservation measures and/or energy-efficient technologies.
- Provision of no-cost technical assistance programs and support to State agencies and public higher education facilities to promote the implementation of energy management, energy efficiency, and/or renewable energy projects that meet the needs, budgets, and priorities of participating entities.

Utility Data Management Platform Overview

The UDM platform serves as a central repository for the historical and ongoing utility cost and usage data[9] of approximately 8,164 State-owned and -managed facilities, representing approximately 106.4 million square feet of building space. The platform is predominantly used for utility tracking, reporting, and benchmarking for General Government agencies and Higher Education institutions, as well as utility bill auditing and approval for payment for General Government agencies.[10] The UDM platform serves the 77 General Government agencies and Higher Education public institutions and contains data regarding approximately 8,796 accounts and 10,532 utility meters.

Since launching the UDM platform in 2019, the SFUM team has provided aggregated utility usage and cost data for these facilities to help fiscal personnel, State building maintenance staff, utility and facility managers, sustainability professionals, and technical assistance providers gain actionable insights into their utility data. Before the launch of the UDM platform, obtaining this data required significant effort to locate utility accounts, gather utility bills, and manually enter data. As a result, utility cost and usage data were rarely analyzed by State personnel.

The SFUM team's successful integration of the UDM platform into the General Government's bill payment system, Edison, continues to support remote work and workplace flexibility for General Government agency accounts payable staff through automated bill entry and by allowing multiple users to perform online bill review, approval, and editing simultaneously.

Additionally, the platform facilitates team collaboration through the use of bill notes, assigned flags, shared dashboards, and reporting. The UDM platform's ability to track, record, and date individual user activities has accommodated remote and alternative workplace solutions for most fiscal departments since the onset of the COVID-19 pandemic.

The SFUM team provides ongoing data quality control of the UDM platform for both General Government agencies and Higher Education institutions to address data gaps, identify new or inactive accounts, verify meter serial numbers and rate schedules, correct bill service dates, unit of measurement disagreements, and cost adjustments, in addition to ensuring that meters are assigned to their correct buildings and that associated building stock information (e.g., building names, address, longitude/latitude, square footage, construction date, and use type) is updated accordingly.

Total Monthly State Commodity Use Cost for FY2022*

Commodity	Use	Cost
Electric	1,232,915,058 kWh	$123,553,170
Natural Gas	71,084,609 Therms	$36,462,930
Steam	175,203 Mlb	$3,479,058
Propane	832,389 Therms	$793,787
Chilled Water	18,742,676 ton-hr	$4,359,659
Water/Sewer	3,260,969 kgal	$38,291,968
	Total	**$206,940,572**

**Costs and usage for Fiscal Year 2022 are subject to change should additional billing data be obtained. These figures do not include all propane commodity use and costs, as some agencies procure the fuel via purchase orders that are processed outside of the UDM platform.*

9. Cost and usage data for most utilities are predominately captured monthly. Some utility bills are captured on a quarterly or other basis.

10. For FY2022, the UDM platform contains utility bill data for 99.99% of the utility meters (as of March 2023) that have been identified for General Government agencies and Higher Education institutions.

In addition to UDM platform maintenance, SFUM continues to administer remote and in-person UDM platform training and presentations for new and existing platform users and public inquiries. Throughout the Program Year, the SFUM team conducted ten trainings on the UDM platform covering topics such as end-user roles and responsibilities, platform configuration, navigation, reporting, dashboards, and bill processing to strengthen end-user familiarity, knowledge, and utilization of the UDM platform for more than 103 facility managers, maintenance staff, accounts payable personnel, and sustainability professionals within State service. SFUM also participated as a panelist in a virtual webinar discussion for more than 250 attendees across the United States on energy accounting best practices and how General Government agencies with the State of Tennessee are using the UDM platform to uncover billing errors and anomalies and to ensure the accuracy of an organization's energy bills.

Utility Data Analysis Report

The overarching goal of the Utility Data Analysis report is to communicate the State's utility cost and consumption to a broader audience and to underscore the capabilities and benefits of the UDM platform, which has facilitated the transition away from manual data collection, entry, and analysis. The report compares utility usage data for the current and prior Fiscal Year across the four organizational groups: General Government, the University of Tennessee (UT) System, the Tennessee Board of Regents (TBR), and Locally Governed Institutions (LGIs). It also provides data on the six types of utility commodities: electric power (electric), natural gas, steam, propane, chilled water, and water/sewer.

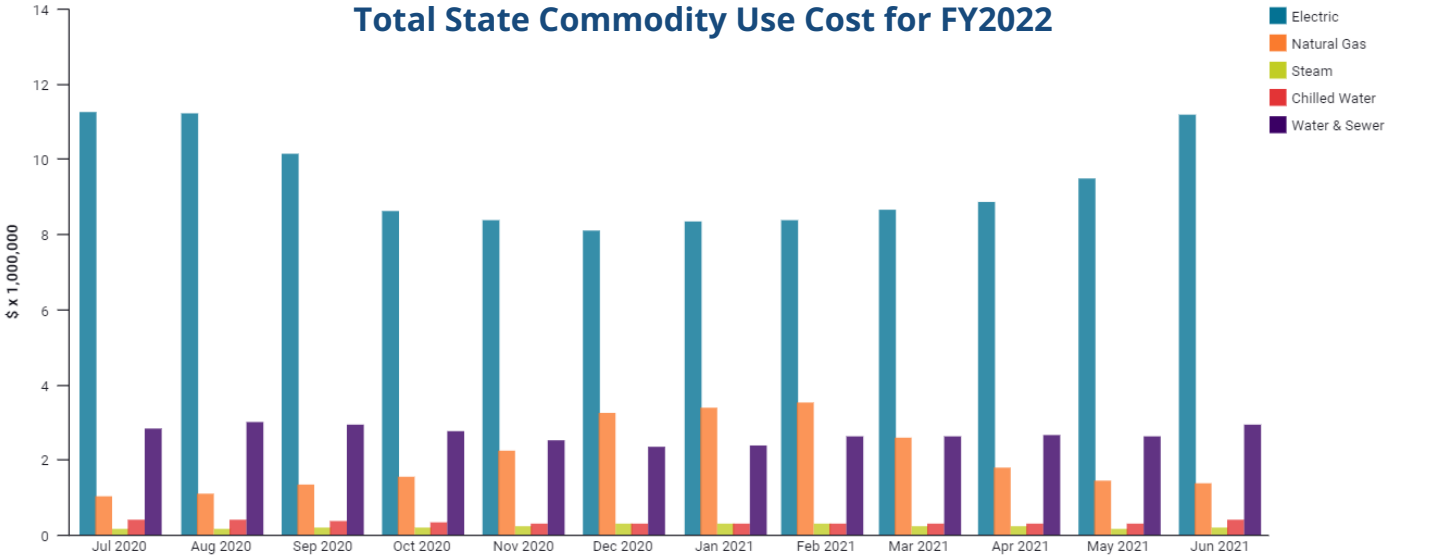
The chief benefits of the UDM platform utilization for facility managers, accounting staff, and administrators alike featured in the report is the value-added ability to:

- Remotely track, benchmark, and report utility usage
- Accommodate remote and alternative workplace solutions
- Easily identify billing errors, billing discrepancies, potential energy-inefficient facilities, and faulty meters or water/ gas leaks
- Automate bill entry to reduce human errors occurring from manual bill entry as well as time spent manually entering bills
- Share standardized reports with leadership
- Provide greater accountability and capability for cross-functional collaboration.

Several case studies included in the FY 2021 report[11] highlight the successful integration of the UDM platform in State General Government operations. For example, the UDM platform has assisted in tracking savings at the Ellington Agricultural Center Office building for the Tennessee Wildlife Resource Agency following the execution of various energy conservation measures (ECM) for mechanical, such as HVAC, and electrical, such as lighting. Other examples include the leveraging of UDM data to evaluate the performance of each of the photovoltaic (PV) systems at the Tourist Development Welcome Center locations participating in the TVA Green Power Providers Generation Agreement and the detection of abnormal increases in energy and water use by the Department of Transportation, Department of General Services, and the Department of Military.

Work on the FY 2022 report has already begun, and the SFUM team anticipates a 2023 distribution. In the meantime, the SFUM team continues to provide technical assistance and additional training opportunities to UDM end-users (e.g., State fiscal personnel, utility and facility managers, building maintenance personnel, and sustainability professionals) from across the State to maximize the utilization of UDM.

11. FY2021 Utility Data Analysis Report, https://www.tn.gov/content/dam/tn/environment/energy/documents/sfum/TDEC-SFUM-UDM-Data-Analysis-Report-FY2021.pdf



UDM Platform Utilization & Technical Assistance

The SFUM team and UDM end-users continue to utilize the UDM platform to assist in the tracking, development, and validation of ECM projects and fulfillment of technical assistance requests to resolve issues involving billing errors (such as overbilling), faulty metering, energy spikes, water leaks, and unauthorized charges such as charitable contribution charges, taxes, and other fees. During the Program Year, General Government agencies recouped over $182,980 in utility cost reimbursements due to utility issues identified by SFUM and the UDM platform.

Example of Water Leak Detection: Tennessee Volunteer Challenge Academy (TNVCA)

A water leak at TNVCA was brought to the attention of the Department of Children's Service's (DCS) Facility Management because of a UDM bill audit, in which abnormally high water usage and costs were identified. The average water usage for this meter was less than 10 Centum cubic feet (ccf) but increased to 305 ccf and, over the next three months, as high as 2,048 ccf. The unexpected rise prompted SFUM to contact the facility manager for that location to investigate the cause of the uptick in water consumption. The facility manager identified the water leak's source and fixed it promptly, preventing the State from incurring additional water cost overages. DCS received an adjustment credit on their account from Metro Water Services for $14,032 for the period of the water loss.

Example of UDM Data Being Used for Enhanced Analysis: Tennessee Department of Correction Prisons

During the Program Year, the Tennessee Department of Correction (TDOC) decided to evaluate the energy efficiency of various Correctional Complexes with granularity. SFUM supplied TDOC with summary and monthly cost and consumption trend data reports generated from the UDM platform, broken down by facility, account, and utility commodity (electric, natural gas, and water/sewer), for the Women's Tennessee State Prison and the Northeast Correctional Complex for the three years from June 2019 through May 2022.

To better understand the water and sewer usage for all 11 of their State-managed prisons across Tennessee, SFUM provided Year-over-Year cost and consumption comparison trend reports broken down by account number and site location for the past decade from FY 2013 through FY 2022.

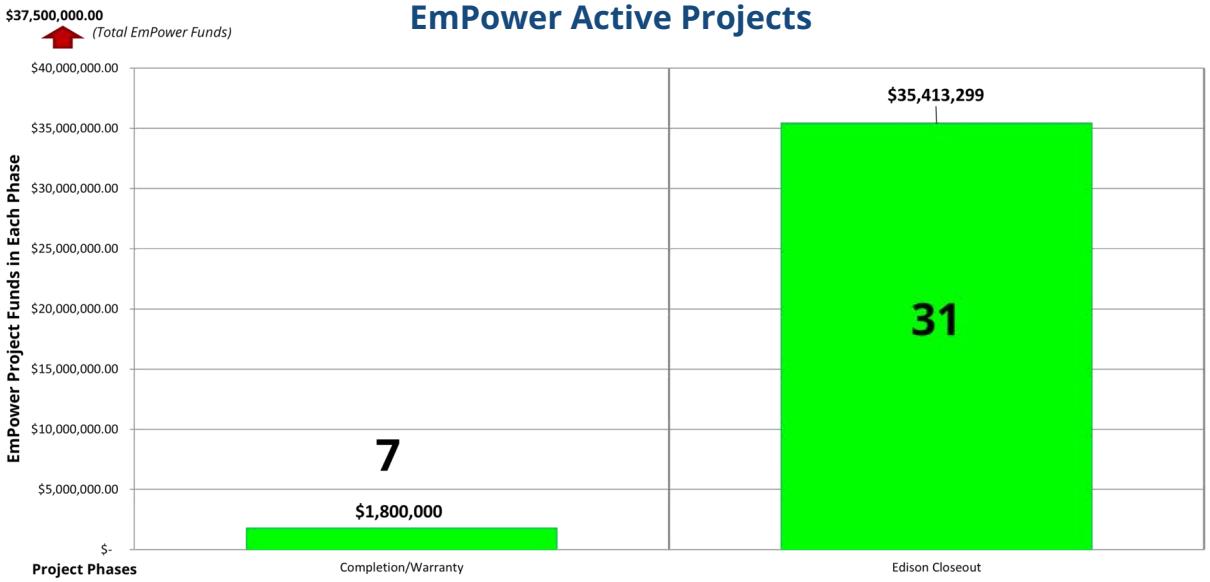
EmPower TN

The Tennessee General Assembly appropriated $37.5 million in FY 2016 funding for EmPower TN energy efficiency projects in State-owned and -managed facilities. SFUM, in coordination with implementing agencies, campuses, and the capital projects groups under DGS, UT, the LGIs, and TBR, is responsible for monitoring the progress of these projects and providing technical assistance to ensure successful completion.

As of the end of the Program Year, $36,860,609 has been obligated to 38 projects that have reached substantial completion under the General Government, UT, LGI, and TBR real estate portfolios. The projects' cumulative estimated annual energy savings is $4,130,163. The projects' cumulative average simple payback (EmPower funding/total estimated annual energy cost saved) is nine years.[12]

The following bar chart only highlights the progress of active EmPower TN projects through each phase of the capital project process and is current as of the end of Program Year 2021-2022. The left-hand side of the graph references the EmPower TN energy efficiency allocation of $37.5M, and each bar represents the total number of projects and the dollar amount for each phase.

12. The obligated dollar amount, estimated annual energy savings, and average simple payback are based on the projections from the original EmPower TN energy efficient projects applications that were submitted to and approved by the State Building Commission. Average simple payback based on actual spend / annual energy savings cannot be reported until *all* projects have been completed, closed out in Edison, and have gone through post-project measurement and verification.



All EmPower TN energy efficiency project savings are measured and verified. For certain projects, the SFUM team works with TVA's contractor, TRC Companies, to perform pre- and post-measurement and verification. TRC determines the energy usage baselines and creates detailed energy surveys specific to the individual project and energy conservation measures. Through inspections, short-term metering activities, spot measurements, and surveys, the baseline physical conditions (energy consumption, control strategies, equipment inventory and conditions, occupancy, nameplate data, etc.) are established and compared to the post-installation energy use to determine estimated savings.

Throughout the Program Year, TVA's third-party contractor focused their resources on completing the post-measurement and verification analysis, modeling, and reporting for several outstanding projects from last year's reporting cycle that had completed their site visits but had not received a final post-measurement and verification evaluation report. TRC plans to schedule and conduct all remaining post-measurement and verification audits during the next Program Year.

Deferred Maintenance Projects

Deferred maintenance is often referred to as planned or unplanned maintenance that must be postponed due to cost, inaccessibility, unavailability of parts, insufficient information, budget constraints, or lack of resources. A backlog of deferred maintenance can increase the cost of breakdown repairs, reduce overall equipment effectiveness, cause an entire system failure, create health and safety risks, and result in inadequate regulatory compliance. The EmPower project funding allowed for some of these deferred maintenance issues to be addressed through the implementation of energy and water efficiency measures.

Example Project: Trenton Readiness Center

The Trenton Readiness Center was one of several Department of Military projects that utilized the EmPower funding to implement energy conservation measures to reduce energy consumption at the facility and address any corresponding deferred maintenance. The Trenton Readiness Center's EmPower energy efficiency project upgraded three areas: heating, ventilation, and air conditioning (HVAC) systems; interior and exterior lighting; and potable water plumbing systems. The project expects to reduce electrical consumption by 62,890 kWh per year and water consumption by ~20.4k gallons yearly, totaling a collective annual utility bill savings of $7,061. The savings were a result of replacing the light fixtures or lamps with LEDs, installing occupancy sensors, installing programmable thermostats and optimizing setpoints, and substituting new low-flow faucets/aerators, in addition to swapping out antiquated HVAC units with newer, energy-efficient units.

Trenton Readiness Center's new thermostat.


Trenton Readiness Center's new occupancy sensor.


Trenton Readiness Center's new HVAC units.

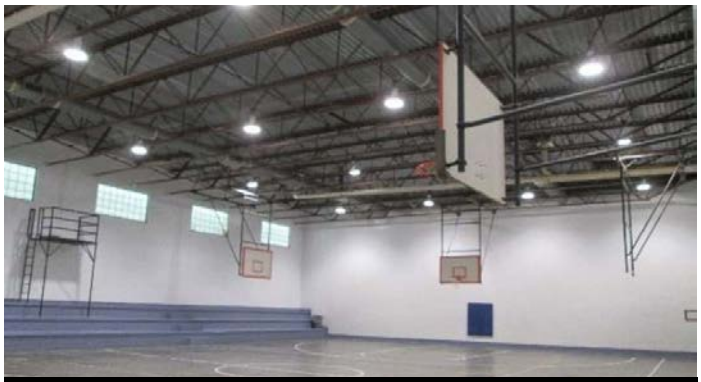
LED Lighting Retrofit

LED lighting is more efficient, longer lasting, and more cost-effective than ever before, adding substantial operation and maintenance savings opportunities. LED retrofits, incorporated in the scope of larger capital projects, can allow for an overall lower payback on the entire project. LED lighting can also be expanded to include control systems to enable control strategies for dimming, daylight harvesting, occupancy sensing, capping, task tuning, and scheduling for greater energy savings and a better work environment.

Example Project: Northeast Correctional Complex

The Northeast Correctional Complex (NECX) implemented an EmPower TN energy efficiency lighting project that reached substantial completion during the Program Year. Lighting upgrades were completed throughout the complex interior and exterior. Existing fluorescent and metal halide bulbs were replaced by LEDs and are estimated to generate an annual energy savings of 1,788,787 kWh and cost savings of $152,047.

NECX laundry area with new LED lighting



NECX gymnasium with new LED lighting

NES Enel X Demand Response Program

DGS, in collaboration with NES, has continued to implement the Enel X Demand Response Program (previously known as EnerNOC) in nine major State office buildings. Each of these buildings has an Energy Management System that allows the automation of ECMs to meet the target demand reduction. During a demand reduction event, these buildings reset space temperature set points, shut off non-essential lighting, manually curtail select air conditioning units, and/or voluntarily shed non-essential loads, such as lighting, printers, etc.

The Enel X program not only saves the State money but also serves as a revenue stream to help offset the cost of utility expenses. This program is a valuable introduction to automated demand reduction. The figure below depicts the energy savings realized through December 2022 from energy reduction and continued participation in the Enel X Demand Response Program, as evaluated by the SFUM team.

Energy Liaison Program

During the Program Year, OEP continued to work with Milepost Consulting on the development of its Energy Liaison Program (ELP), per Tenn. Code Ann. § 4-3-1018. Two focus groups were conducted with participants representing 11 General Government and Higher Education organizations to gather input on program components. The program is being designed for facility, sustainability, maintenance, and energy managers in State-owned and -operated facilities to provide them with technical assistance and professional development opportunities, including peer-to-peer learning and sharing of best practices, regarding topics such as:

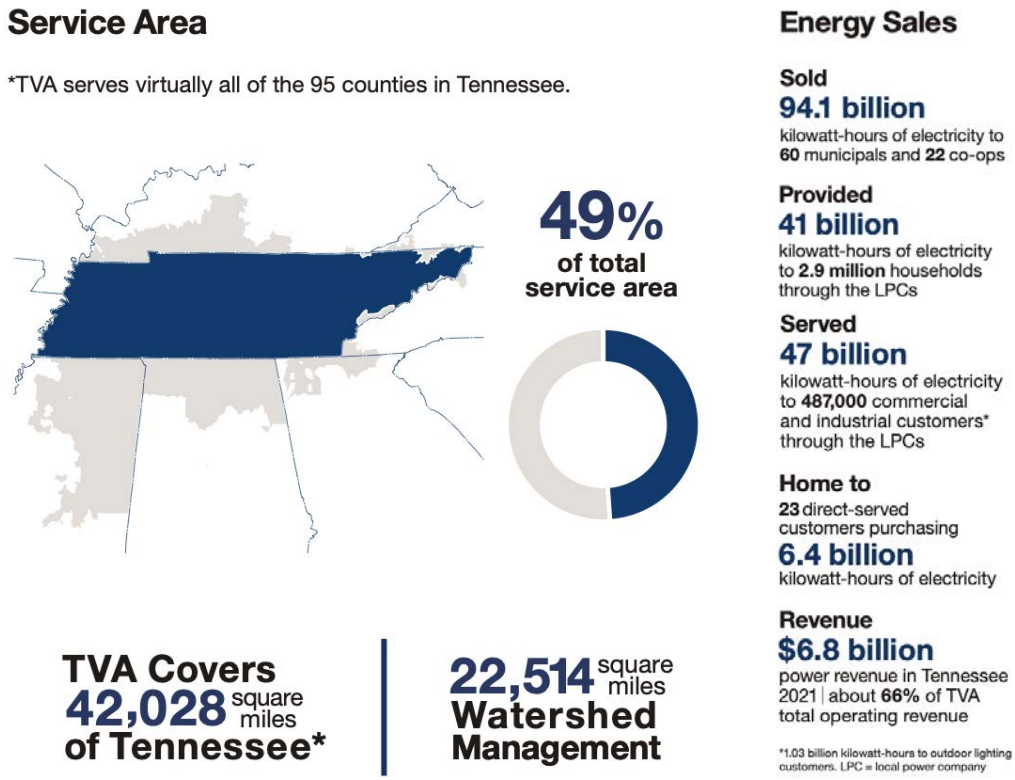
- Energy Tracking and the UDM Platform;
- Low-to-No-Cost Energy Savings Measures and Maintenance/Operations Practices; and
- Energy Efficient Technologies.

The ELP launched in 2023 and will be covered in greater detail in the Program Year 2023 report.

State of Tennessee – Cumulative Savings Total: $55,726.57

TENNESSEE'S ENERGY, EMISSIONS, AND EMPLOYMENT PROFILE

Tennessee is unique in the energy utility sector in that TVA, a federally-owned corporation, provides electricity to approximately 99.7% of the electricity service territory in the state. TVA is self-regulated with regard to fuel mix and associated power generation. The images below are taken from TVA's "TVA in Tennessee" fact sheet.

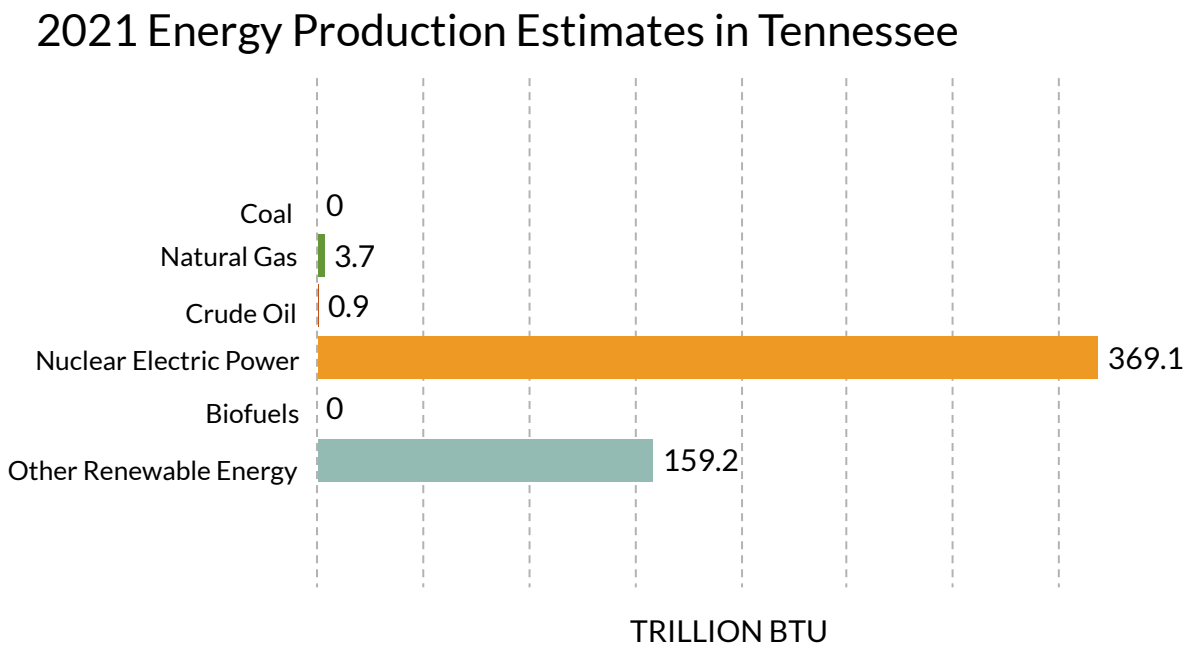


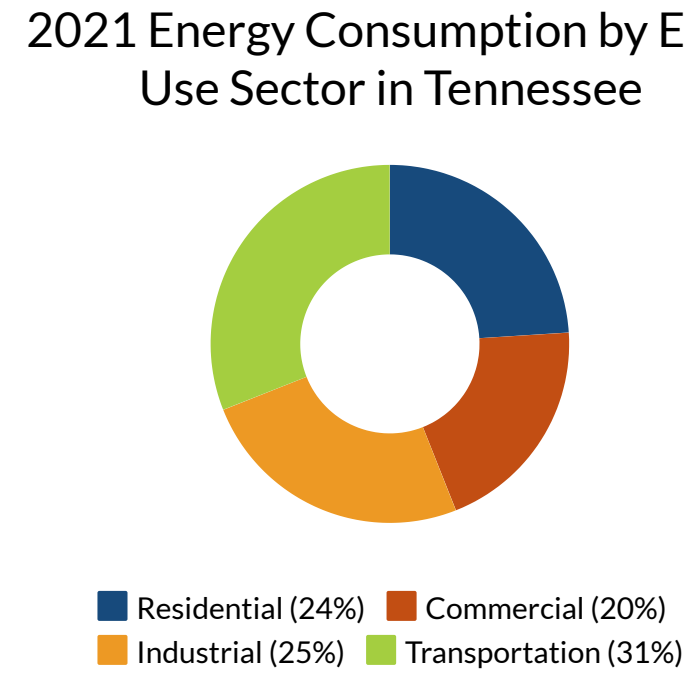
The following bullets highlight a few key facts about the energy sector in Tennessee:

- In Tennessee, TVA operates 19 hydroelectric dams, four coal-fired power plants, two nuclear power plants, seven combustion turbine sites, and a pumped-storage plant, with a combined generating capacity of more than 20,192 megawatts (MW).
- Unit 2 of the Watts Bar power plant entered service in 2016, becoming the nation's first new nuclear reactor in the 21st century. Tennessee's two nuclear power plants provided 43% of in-state electricity in 2021.
- TVA's 1,616 MW Raccoon Mountain pumped-storage plant, which began operating in 1978, is the fourth-largest power plant and the largest hydroelectric facility by generating capacity in Tennessee.
- Tennessee is the largest ethanol-producing state in the Southeast and was the 14th-largest ethanol producer in the nation in 2020.
- By early 2022, Tennessee had nearly 400 MW of total solar power generating capacity, and most utility-scale solar PV generating facilities are in the state's southwestern region. Tennessee's largest solar farm, with 150 MW of capacity from 500,000 solar panels, came online in March 2022.
- The average electricity price in Tennessee is below the national average, and the average price for the residential sector is among the lowest ten states. About six out of ten households in Tennessee use electricity as their primary energy source for home heating.

Energy Consumption and Production

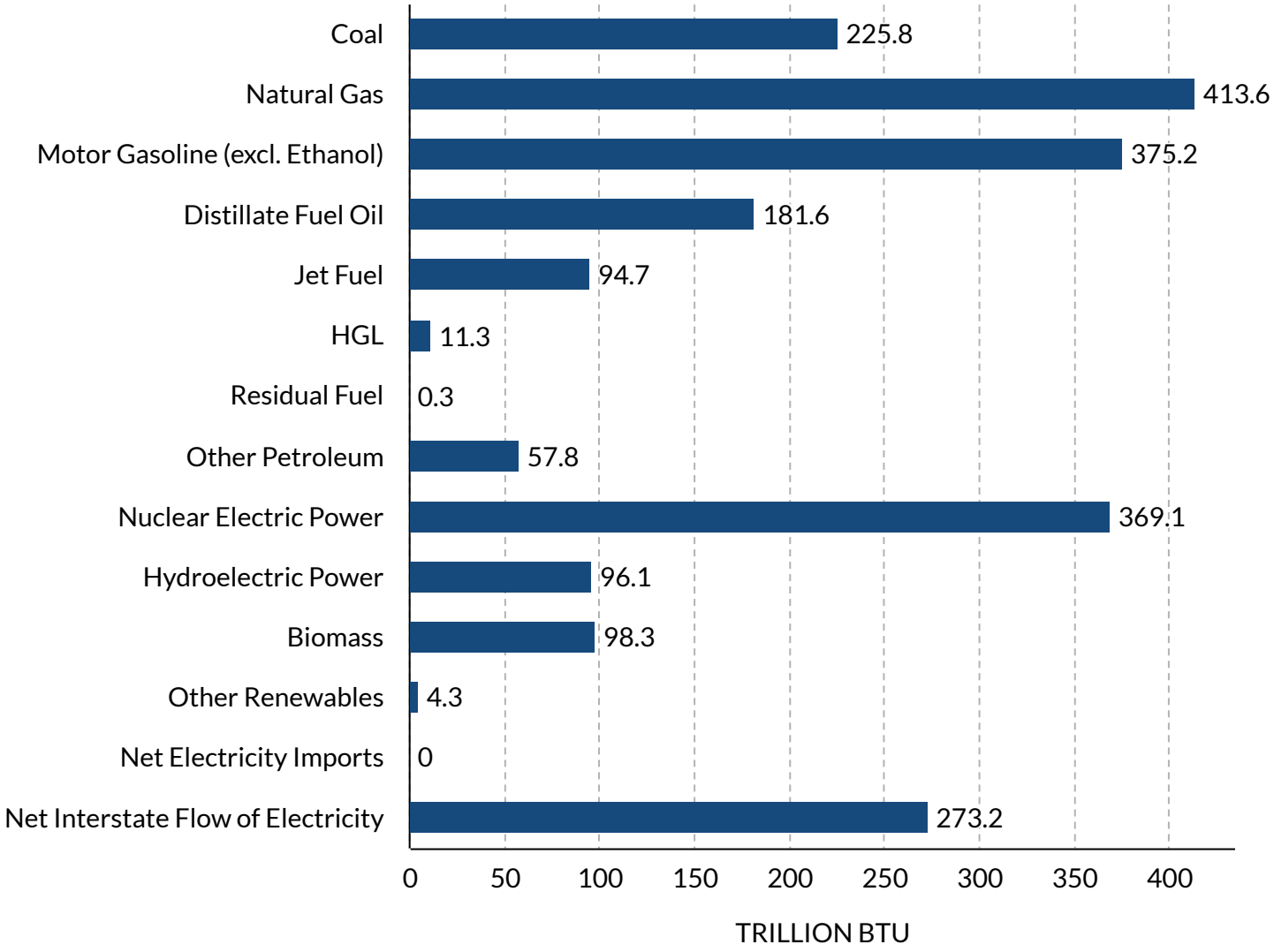
U.S. Energy Information Administration (EIA) maintains some of the most comprehensive state-specific data on energy consumption, production, prices, and expenditures by source and sector. The following graphs detail Tennessee's energy production estimates, energy consumption by end-use sector, and energy consumption estimates for calendar year 2021.[13] For additional information and data on Tennessee, please visit https://www.eia.gov/state/?sid=TN.





13. Data from two years prior is finalized by the EIA annually, typically in the third quarter of the calendar year.

2021 Energy Consumption Estimates in Tennessee



According to the 2022 Southern Regional Energy Profiles Report,[14] published by the Southern States Energy Board, Tennessee ranks among the top one-third of the states in total energy consumption and among the top 15 states in both the residential sector and total electricity sales. The report also contextualizes the state's overall energy consumption performance:

- The long travel distances across Tennessee, combined with the state's role as a logistics hub and popular tourism destination spot, contribute to the transportation sector, accounting for 30% of the state's total energy consumption.
- Manufacturing is a leading component of the state's economy, and the industrial sector accounts for about one-fourth of the state's energy consumption. The industrial activities that make the largest contributions to Tennessee's GDP include the manufacture of food, beverages, and tobacco products; motor vehicles and automotive parts; chemicals; fabricated metal products; and electrical equipment.
- The residential sector, where heating and air conditioning are widely used, accounts for slightly less than one-fourth of the state's end-use energy consumption. The commercial sector is responsible for about one-fifth of the state's energy use.

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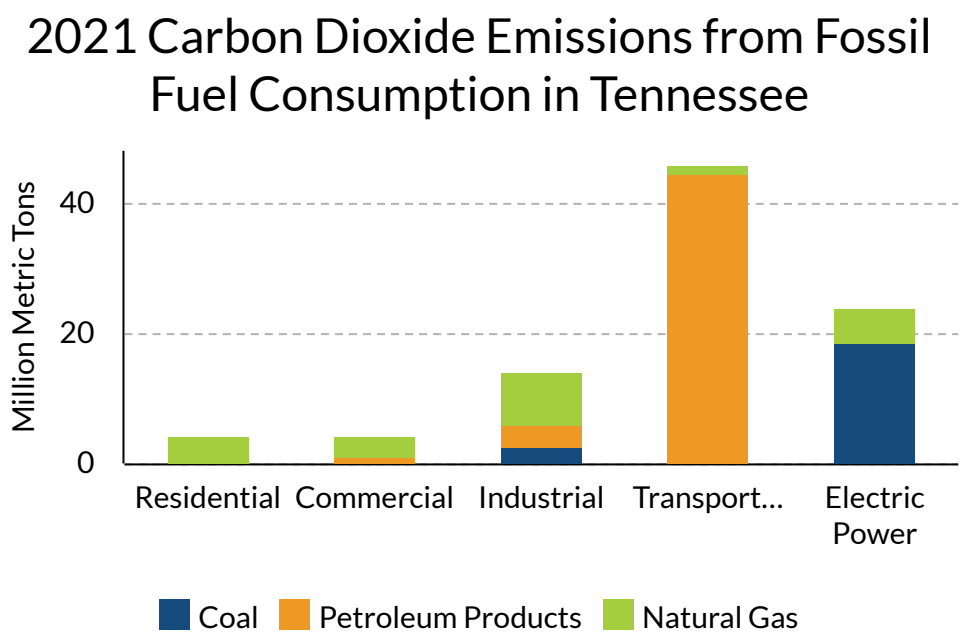
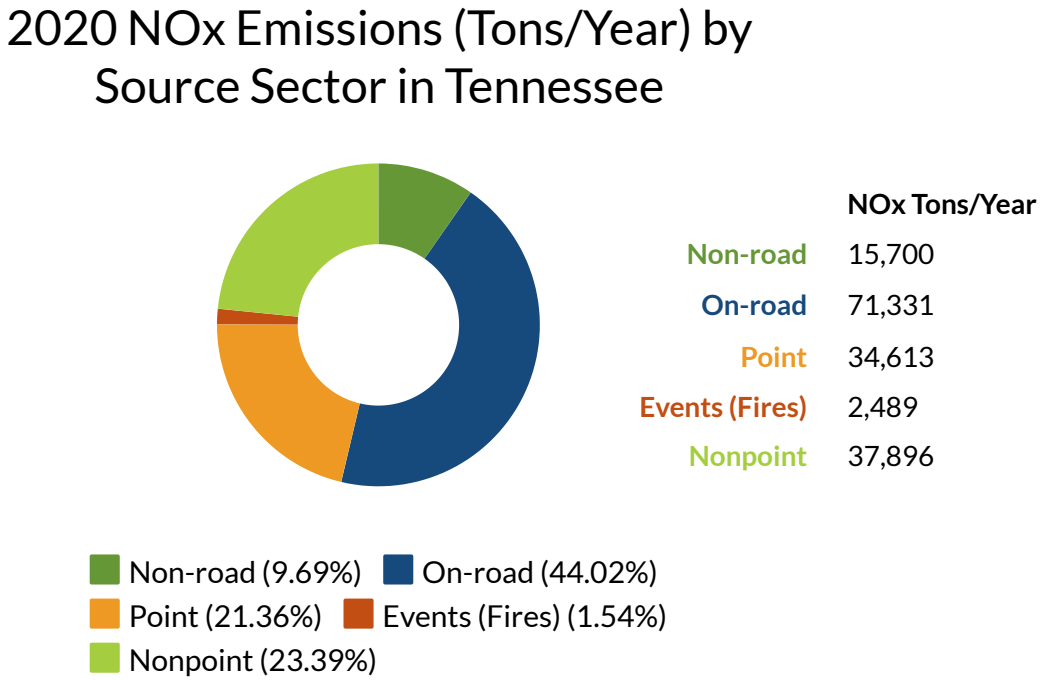
14. The Southern States Energy Board updates this report regularly with data from EIA. The 2022 report can be accessed at https://www.sseb.org/wp-content/uploads/2023/02/REP_final_web.pdf.

Energy Sector Emissions

Statewide emissions data associated with energy consumption can be found through EIA and the National Emissions Inventory (NEI).[15]





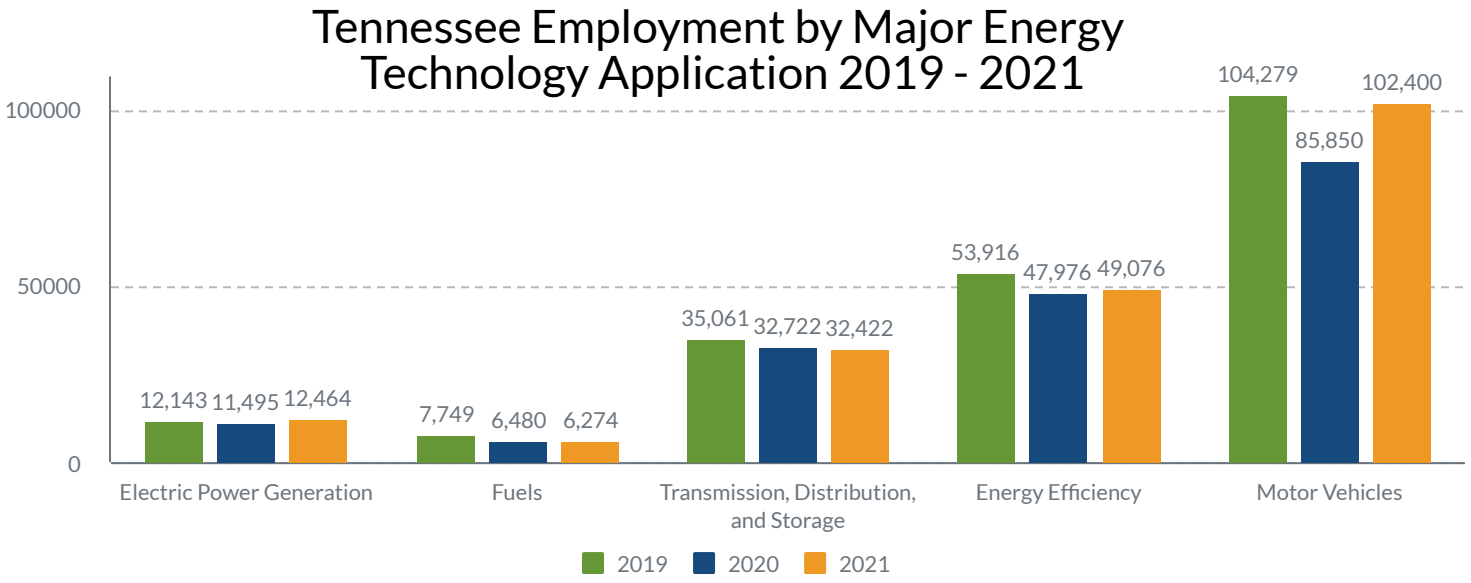
15. Aggregated data from two years prior is typically finalized by EPA every three years. The NEI can be accessed at https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei

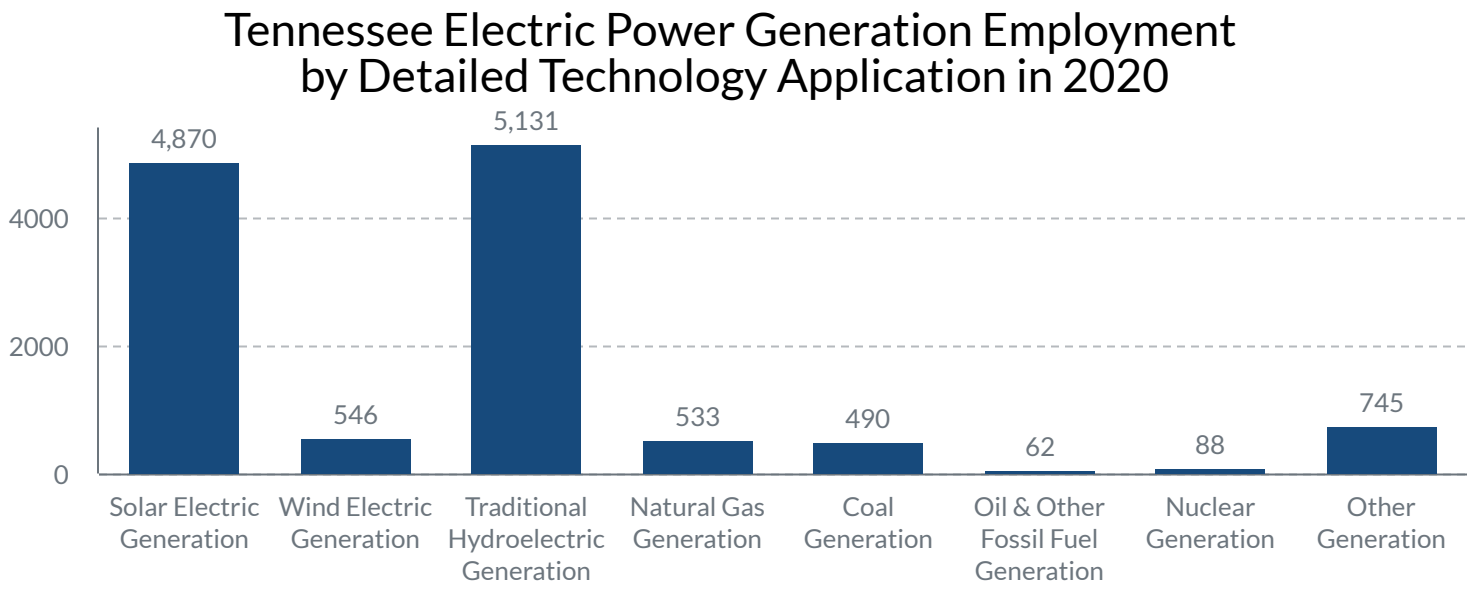
Energy Sector Employment

According to the 2022 U.S. Energy and Employment Report (USEER),[16] jointly compiled by NASEO and the Energy Futures Initiative, Tennessee had 202,637 energy workers statewide in 2021, representing 6.7% of total state employment and 2.6% of all U.S. energy jobs. These energy jobs are distributed in the following areas:

- 12,464 workers in Electric Power Generation (1.5% of the national electricity total)
- 6,274 workers in Fuels
- 32,422 workers in Transmission, Distribution, and Storage
- 49,076 workers in Energy Efficiency
- 102,400 workers in Motor Vehicles

In 2021, Tennessee saw a 19% increase in motor vehicle jobs, the second-highest increase in the nation, and an 8.4% increase in the electric power generation sector. Utilities work, with 45.2% of jobs, represents the largest industry sector in the electric power generation sector, and professional and business services, with 21.2% of jobs, represents the second largest.





16. To access the USEER, please visit https://www.energy.gov/policy/us-energy-employment-jobs-report-useer.

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IMAGE ATTRIBUTION

All photos are courtesy of TDEC OEP staff, TDEC OEP stakeholders, Piktochart.com, or Pixabay.com.

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