

# OFFICE OF ENERGY PROGRAMS PY 2019 ANNUAL REPORT



Department of  
**Environment &  
Conservation**



<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; and
- alternative fuels and sustainable transportation options.

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, 2018 through September 30, 2019.



# 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; strategic energy planning and stakeholder engagement; public education and outreach; K-12 energy education; energy in transportation; and clean energy financing.

The SEO receives the majority of its 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.



# 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. 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 (SHOPP), 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 regionally to assist both government and private sector entities with monitoring winter propane markets.<sup>1</sup>

## Emergency Response Action

In February and March 2019, severe flooding across Tennessee resulted in official emergency activation, during which OEP ESCs convened at the State Emergency Operations Center (SEOC) to monitor fuel and power outages and to provide energy updates to the SEOC Direction and Control Officer. OEP ESCs also worked with petroleum industry stakeholder associations and large fuel distributors in Tennessee to track propane and gasoline supplies.

In July, OEPs ESCs were again activated to the SEOC to monitor Tropical Storm Barry and potential impacts to the fuel supply chain. This involved surveying petroleum industry stakeholders for current inventory levels and identifying the storm’s potential impact on statewide fuel security.

## Energy Security Education and Outreach

The OEP Primary ESC served as Energy Security Committee co-chair for the National Association of

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<sup>1</sup> 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/index.php>.

State Energy Officials (NASEO) and co-hosted national webinars, reviewed NASEO documents, trained energy security staff in other states, and participated in U.S. DOE's State Energy Security Training Working Group.

Additionally, OEP engaged in a number of education and outreach efforts on the topic of energy security. These efforts included the following:

- OEP distributed an Energy Security Quarterly Newsletter to stakeholders in the public and private sectors. The newsletter shared updated 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 conducted training sessions for select OEP and TDEC staff on energy security topics.
- The OEP Primary ESC presented on Tennessee's fuel supply at the Emergency Management Association of Tennessee/TEMA annual conference in Chattanooga.
- OEP ESCs provided an overview of "Energy Security Planning, Preparedness, and Emergency Response Activities" at the American Petroleum Institute Southern Region meeting in Nashville.
- The OEP Primary ESC presented on several panels at the U.S. DOE Better Buildings Summit on energy security, cybersecurity, water/wastewater energy planning, and OEP's Energy Security Checklist.
- The OEP Primary ESC presented on SEOs and their associated energy security responsibilities at the Petroleum Marketers Association of America's executive directors meeting in Nashville.

## Energy Security Preparedness and Training Exercises

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

- A grid resiliency briefing conducted by the Tennessee Valley Authority (TVA) for the Tennessee Department of Transportation (TDOT), TEMA, OEP, and the Tennessee Bureau of Investigation (TBI).
- A joint tabletop training exercise held by the U.S. Department of Homeland Security and the Shelby County Office of Preparedness.
- The Electric Infrastructure Security Council's Black Sky Start workshop, which gathered major electric grid operators and government officials to discuss fuel interdependencies during a potential catastrophic grid failure.
- A Black Sky tabletop exercise hosted by the Central U.S. Earthquake Consortium (CUSEC) and the Energy Infrastructure Security Council, which simulated a wide scale, sustained electricity grid power outage.
- The 2019 CUSEC New Madrid Seismic Event tabletop exercise, which discussed potential impacts on critical energy infrastructure in the event of a New Madrid earthquake.
- Marathon Petroleum's Ohio Valley Response Zone Tier II Functional Exercise and Drill, which provided OEP ESCs with training on the basic operations, redundancies, and emergency planning efforts associated with the Marathon and Colonial Pipelines.

OEP ESCs also assisted in the planning and execution of both U.S. DOE's Clear Path tabletop exercise and FEMA's national Shaken Fury exercise, which were designed to simulate a New Madrid seismic event and examine the energy and infrastructure impacts of said natural disaster throughout the Mississippi River Valley region, with a particular focus on large urban areas along the fault line (e.g., Memphis). U.S. DOE personnel observed both exercises, the latter of which required full activation of Tennessee's SEOC and OEP's ESCs in response to a simulated high magnitude New Madrid earthquake.

## Mission Moon Pie: A Fuel Shortage Tabletop Exercise and Workshop

On August 7, TDEC OEP, in collaboration with TEMA and NASEO, conducted *Mission Moon Pie: A Fuel Shortage Exercise and Workshop* with 66 participants from four federal agencies, six State agencies, and seven local governments, five private sector fuel partners from different entities, and three non-governmental organizations. Representatives from SEOs in Alabama, Georgia, Florida, Kentucky, and Pennsylvania attended to provide a regional perspective.

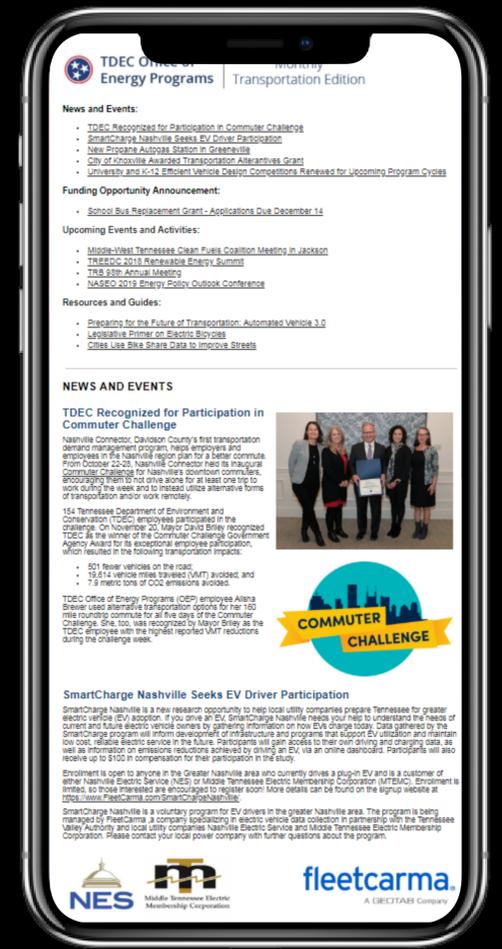
Attendees heard from experts regarding the following topics: U.S. DOE's federal emergency response role and associated preparedness efforts; TVA's electricity grid hardening projects; the TN Department of Safety and Homeland Security's cybersecurity planning efforts; and OEP's role in tracking Tennessee's fuel supply chain during emergencies.

Participants also exercised complex but plausible disaster scenarios involving cyberattacks, power outages, severe weather, and a prolonged fuel shortage. (The scenarios were developed by OEP and NASEO and were distributed to participants via a Situation Manual. The Situation Manual is available to other SEOs and contains helpful references regarding the petroleum sector.) The exercise's group report-outs and plenary discussions provided participants with the opportunity to learn about and share feedback regarding potential actions their federal, State, local, and industry colleagues may take during such emergencies. These valuable insights were captured in an After Action Report, which Tennessee and other stakeholders will be able to reference to inform future preparedness and response efforts.



“ [After this exercise,] I feel confident that Tennessee can survive a short-term fuel shortage.”

Dan Pallme, Assistant Chief of Environment and Planning/Freight and Logistics Director, TDOT



# Public Education and Outreach

OEP engages in public education and outreach to promote awareness of energy efficiency, energy management, renewable energy, energy security, and sustainable transportation options for individuals and organizations throughout the state.

## 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 7,000 stakeholders, and together, serve as the primary vehicle for OEP to announce timely news items, upcoming events, funding opportunities, and new resources. OEP also curates and distributes an Energy Security Quarterly Newsletter, which is sent out to a select listserv of energy security stakeholders (such as emergency management personnel). Additionally, OEP develops and maintains its own 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 (@TNEEnvironment), with each account boasting 4,000 to 6,000 followers, respectively. Another partner, Tennessee Clean Fuels, maintains a social media presence on Twitter, Facebook, and Instagram (@TNCleanFuels), reaching approximately 3,000 additional followers. OEP pitches energy and transportation content to both partners for inclusion on their separate platforms.

Finally, in accordance with Tenn. Code Ann. §4-3-501(3),

## In Program Year 2019, OEP reached:

  
**7,000+**  
email  
stakeholders

  
**10,000+**  
social media  
followers

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. OEP handled 361 requests for energy-related information and resources during the Program Year. These general requests for technical assistance are in addition to inquiries that OEP received regarding its specific programs and activities.

## 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 Chamber

of Commerce and Industry's Environment and Energy Conference, the Tennessee Renewable Energy Economic Development Council's Renewable Energy International Conference, the Tennessee Valley Solar Conference, and the TDEC Environmental Show of the South.

### **Interagency and Nonprofit Collaboration**

A key component of OEP's communications strategy is the multi-faceted work that stems 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. This resulted in the following key activities:

- 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 2019 State Scorecard. To determine states' rankings, ACEEE considers the six policy areas in which states typically pursue energy efficiency: utility and public benefits; transportation policies; building energy efficiency policies; combined heat and power (CHP); state government initiatives; and appliance and equipment efficiency standards. The State of Tennessee ranked #30 in the 2019 State Scorecard, moving up substantially from its 2018 ranking of #35 due to revisions in ACEEE's scoring methodology (e.g., ACEEE gave credit to Tennessee for several energy efficiency and renewable energy programs and their ability to reduce energy consumption among program participants), in conjunction with improvements in other categories. Tennessee's 2019 ranking represents a significant improvement for Tennessee, which was ranked #38 in 2014 and #46 in 2008.
- OEP supported the development of the 2019 U.S. Energy and Employment Report (USEER), which was compiled by NASEO, the Energy Futures Initiative, and BW Research. Since its initial publication in 2016, the annual USEER survey and analysis supplement federal Bureau of Labor of Statistics data to account for evolving energy market business models and to provide an independent, data-driven account of energy jobs in power generation and fuels; transmission, distribution, and storage; energy efficiency; and motor vehicles, including alternative fuel vehicles.
- OEP supported and cross-promoted the work of the Tennessee Advanced Energy Business Council (TAEBEC), which champions advanced energy as a job creation and economic development strategy. OEP shared information with its stakeholders on TAEBEC's Tennessee Advanced Energy Economic Impact Report, which was compiled by the Howard H. Baker Center for Public Policy at the University of Tennessee.

TAEBEC's 2018 report is a follow-up from the 2015 inaugural report, and notes that Tennessee's advanced energy economy:

- Employs nearly 360,000 Tennesseans (up from 325,000 in the 2015 report);
- Contributes \$39.7 billion to the state's GDP (up from \$33.4 billion in the 2015 report);
- Includes more than 18,000 businesses; and
- Shows stronger growth than the overall state economy.

### **Boards, Councils, and Working Groups**

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

- Participating in various external stakeholder working groups, such as those convened by TVA (e.g., Energy Efficient Information Exchange, Distributed Generation Information Exchange).
- Leveraging the resources of NASEO, the National Governors Association, and National Laboratories, specifically technical assistance, research, and training opportunities.
- Participating on various boards, councils, and working groups:
  - The OEP Director serves as a member of the Executive Committee of the NASEO Board of Directors. The OEP Energy Programs Administrator for Energy Security / Critical Infrastructure serves as Co-Chair on the NASEO Energy Security Committee, the OEP Energy Programs Administrator for SEP / Energy in Transportation / OEP Communications serves on the leadership team for the NASEO Transportation Committee, the OEP Deputy Director serves on the NASEO Energy Equity Taskforce, and the OEP Senior Consultant for Strategic Energy Initiatives participates in the NASEO Grid Interactive Efficient Buildings Working Group.
  - The OEP Director serves as a "state advisor" in the NASEO / NACAA Volkswagen (VW) Diesel Settlement Working Group, which enables state-to-state communication on the VW Settlement Environmental Mitigation Trust.
  - 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 as the SEO representative on the Tennessee Housing Development Agency's Energy Efficiency and Weatherization Advisory Board.



# 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 include Energy Education Camps for K-12 educators, Energy Education Workshops for both educators and students, energy education outreach events, and 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 with the knowledge and resources necessary to teach energy concepts.

OEP strives to provide energy education opportunities to schools in as many of Tennessee's 95 counties as possible, prioritizing schools in economically distressed or at-risk counties (as defined by the [Appalachian Regional Commission](#)) and/or schools whose low-income student population is greater than 60% of the total student body (as determined using data from [greatschools.org](#)). Over the course of the Program Year, OEP's K-12 energy education activities engaged more than 5,000 students and educators in 56 counties, eight of which were classified as distressed and 12 of which were classified as at-risk in State Fiscal Year 2019 (July 1, 2018 – June 30, 2019).

## Energy Education Camps for K-12 Educators

OEP hosted three Energy Education Camps for K-12 educators in West, Middle, and East Tennessee at Tennessee State Park facilities. The three-day training sessions promoted energy literacy as it relates 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. Participating educators were provided with lesson plans, energy-related

## In Program Year 2019, OEP reached:



**5,000+**  
students



**120+**  
educators



**56**  
counties

classroom materials valued at \$200, and complementary lodging and meals. A total of 120 educators from 42 Tennessee counties attended.

In addition to addressing Tennessee science curriculum standards, the camp offered "team building" energy-related activities for teachers on topics such as electric circuits, wind energy, solar ovens, and more. Following these activities, special breakout sessions were conducted with grade-level clusters to ensure that all participating teachers left the camps with ideas for their classrooms.

## K-12 Energy Education Workshops

OEP hosted 23 Energy Education Workshops for K-12 students and educators across the state. These workshops allowed participants to explore energy concepts through hands-on, interactive demonstrations on topics such as energy transfer, electric circuitry, chemical and radiant energy, and solar and wind power. At several workshops, OEP

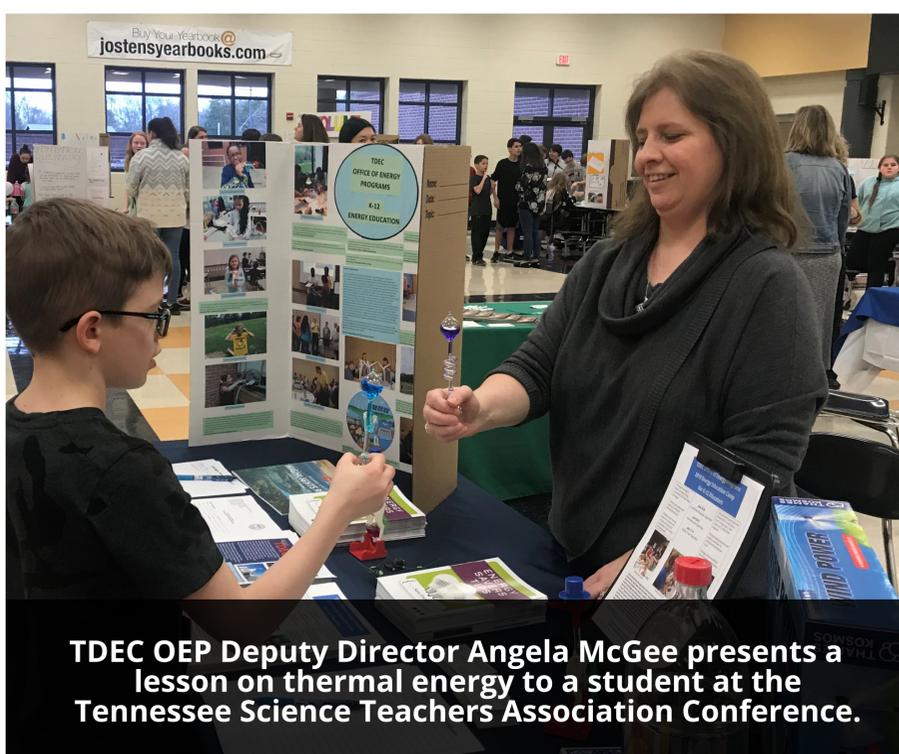
partnered with local K-12 educational programs (e.g., Super Science TN, Mr. Bond's Science Guys) to provide enhanced demonstrations and activities. At each workshop, OEP provided lesson plans and classroom materials to participating educators, to ensure that the demonstrations from the workshop could be implemented in classrooms across the school in future years.

## Outreach Events

OEP conducted energy education outreach at a variety of public events (e.g., after-school STEM nights, summer camps, Earth Day festivals) to share information on OEP's K-12 Energy Education offerings and program. OEP participated in six such events at no cost to the hosting schools, libraries, and organizers, including the Tennessee Science Teachers Association Conference, Christiana Middle School STEM Night, the Jackson Earth Day Festival, the Nashville STEM Innovation Summit, the Metro Nashville Public Schools Science and STEAM Teacher In-service Symposium, and the Clinch School STEM/Family Engagement Night. Each of these events was attended by hundreds of students, families, and educators.



Participants at a 2019 Energy Education Camp build a model wind turbine before testing their design's efficiency and energy output. This lesson, and many more, will be replicated by participating educators in K-12 classrooms across the state.



TDEC OEP Deputy Director Angela McGee presents a lesson on thermal energy to a student at the Tennessee Science Teachers Association Conference.

## National Energy Education Development (NEED) Project

The NEED Project promotes energy education among students, educators, and civic leaders through the design and delivery of energy education programs. NEED works with energy companies, local government agencies, and community organizations to provide balanced energy programs to the nation's schools with a focus on strong teacher professional development, timely and balanced curriculum materials, signature program capabilities, and turn-key energy education strategies.

OEP is the state coordinator for the NEED Project and includes information on the initiative in its K-12 Energy Education Camps curriculum. Camp attendees also learn how to participate in the NEED Youth Awards for Energy Achievement, a competition where

“This was, quite frankly, the BEST training I have been to in my thirteen years of teaching. Totally immersive, completely interactive, and hands-on. All of the staff were knowledgeable and helpful. I was kept thoroughly engaged the entire three days. I cannot say enough good things about this camp. I know I am walking away with at least a semester of lesson plans and supplies!”

– Kat Osborn, Unity Learning Center

teachers take their energy education programs beyond the classroom and encourage students to engage with school and community outreach to share what they have learned about energy efficiency and conservation.

To participate in the NEED Youth Awards competition, schools compile their energy education activities for the year and submit an electronic scrapbook of their efforts. Tennessee's state winners are selected by OEP and are submitted for consideration at the national level. Tennessee schools have been recognized nationally every year since the program's inception.

The 2019 NEED Project Youth Award Winners were announced in June. Michie Elementary was named the State and National Elementary School of the Year, and Lipscomb Academy was named the State and National Primary School of the Year. State winners, finalists, and staff members represented Tennessee at the National Awards Ceremony in Washington, D.C. from June 21-24. Michie Elementary's winning NEED Project highlighted activities taken from a previous OEP K-12 Energy Education Workshop as well as resources and materials given to participating teachers at a previous year's K-12 Energy Education Camp.

# A CLOSER LOOK AT OEP'S 2019 K-12 ENERGY EDUCATION WORKSHOPS



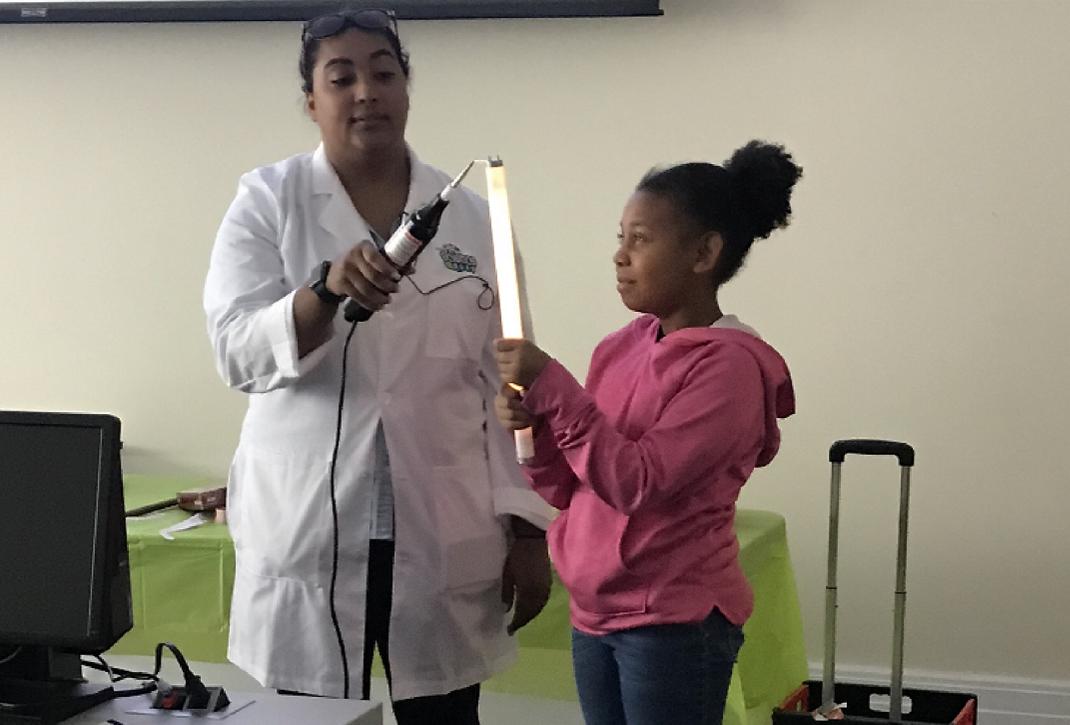
## Fort Loudon Middle School

OEP hosted a workshop for 113 sixth grade students and educators. Professor Graybeard of the Nashville-based Mr. Bond's Science Guys joined OEP to provide interactive energy demonstrations with the students, including lessons on tesla coils and electromagnetic induction. According to [greatschools.org](http://greatschools.org), more than 70% of this school's population is comprised of low-income students.



## Summer Feeding and Environmental Education Program

Throughout the summer, OEP hosted six Energy Education Workshops at Overlook Ridge Apartment Complex and Margaret Robertson Apartment Complex as part of the Summer Feeding and Environmental Education Program, supported through collaboration between the TDEC Office of Policy and Sustainable Practices, local community organizations, and the U.S. Department of Agriculture's Summer Food Service Program. The program provides fun, environmentally-themed activities and lunch one day a week to youth who may not otherwise have the opportunity to receive a nourishing meal and learn about topics such as energy, sustainability, geology, and recycling. OEP provided 75 children with free energy education activities and take-home materials that explore topics such as ultraviolet light.



## Play Like a Girl STEM Camp

OEP participated in the Play Like a Girl STEM Camp in Davidson County, providing energy education to 22 fifth and sixth grade students and educators. Participating students learned about electric conductivity and solar energy. The day camp program is designed to expose middle school girls to exciting and unique career opportunities in STEM subject areas.



# Energy in Transportation

According to EIA, the transportation sector is the largest energy consuming end-use sector in Tennessee, representing 29.4% of Tennessee's total energy consumption in 2017.<sup>2</sup> 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 the aspects of 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 and Expo**

The Tennessee Sustainable Transportation Forum & Expo (STF&E) is an annual conference, coordinated and hosted by OEP, TDOT, the TDEC Office of Policy and Sustainable Practices (OPSP), the TDEC Office of External Affairs (OEA), and the East Tennessee Clean Fuels Coalition (ETCF). 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 transform transportation systems efficiently, affordably, and sustainably. Learn more about STF&E at [www.sustainabletransportationforum.com](http://www.sustainabletransportationforum.com).

OEP coordinated with its STF&E partners to complete planning and logistics for the fifth annual STF&E, which was held on October 1-2, 2019 at the University of Tennessee Conference Center in Knoxville. Staff from

each of the organizing agencies assisted with event preparation and execution. The forum featured new research and technologies that improve transportation efficiency, reduce vehicle emissions, and address the mobility needs of all Tennesseans. Guest panelists and speakers from Vanderbilt University, Oak Ridge National Laboratory, Denso, VanHool, State and local government agencies, sustainability-focused nonprofits, and more highlighted innovative solutions and implementation best practices for a more sustainable transportation future.

In addition to the forum, the 2019 STF&E provided the following offerings:

- A poster session highlighting projects or research focused on the implementation of sustainable transportation and enhanced mobility solutions; and
- An alternative fuel vehicle and equipment showcase and, new in 2019, an alternative fuel vehicle ride and drive.

STF&E concluded with a luncheon to honor winners of the Tennessee Sustainable Transportation Awards (TSTAs). Hosted by TDEC and TDOT, the 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>.

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<sup>2</sup>. Energy Information Administration, "Tennessee State Profile and Energy Estimates." Accessed on April 14, 2020. <https://www.eia.gov/state/?sid=TN>.



(Above) Winners of the 2019 Tennessee Sustainable Transportation Awards. From left to right: Metropolitan Nashville/Davidson County Planning Department, Metropolitan Nashville/Davidson County Public Works Department, Shelby County Health Department, Weakley County Schools, City of Knoxville, Walk Bike Nashville, City of Lebanon.

(Below) From left to right: 1. STF&E attendees engage with poster presenters on sustainable transportation projects and research in Tennessee. 2. TDEC Commissioner Salyers opens the awards luncheon, honoring winners of the 2019 Tennessee Sustainable Transportation Awards. 3. The STF&E alternative fuel vehicle and equipment showcase allows attendees to speak with alternative fuel users and experience the vehicles and technologies firsthand.



The luncheon also honored new inductees to the Tennessee Green Fleets program, coordinated by ETCF to recognize local fleets that have leveraged alternative fuel technologies to decrease petroleum consumption and achieve associated vehicle emissions reductions.

### 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. In Tennessee, there are two U.S. DOE-designated Clean Cities Coalitions: the Middle-West Tennessee Clean Fuels Coalition (MWTFC) and ETCF. The website for these two Coalitions, known collectively as Tennessee Clean Fuels, may be accessed at <http://www.tncleanfuels.org/>.

As Coordinator for MWTFC, 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 MWTFC:

- 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;
- Planned and executed several technology listening sessions with small, targeted groups of alternative fuel adopters to identify data, technology, and/or information barriers that may exist during alternative fuel vehicle and/or infrastructure procurement and deployment;

- Collaborated with TDOT highway signage personnel to discuss recommendations for signage along Federal Highway Administration (FHWA) designated alternative fuel corridors in Tennessee (I-40, I-65, I-75, and I-24)
- Conducted outreach to fleets, fuel providers, and consumers regarding the use of alternative fueled vehicles, advanced technology vehicles, and alternative fuels;
- Worked with the National Fire Protection Association to execute alternative fuel vehicle incident trainings for first responders in both Memphis and Nashville.



**MWTCF hosts an electric vehicle ride and drive at a Tennessee workplace, encouraging attendees to experience these zero emission vehicles firsthand.**

### Electric Vehicle Ride and Drives

MWTCF coordinated and hosted eight electric vehicle outreach events across Tennessee. Such events included vehicle demonstrations, presentations, and electric vehicle ride and drives, each designed to educate attendees about the benefits of driving electric and the availability of electric vehicles in the Tennessee market. For the ride and drives, MWTCF collected pre- and post-event survey data from its attendees in order to measure the effectiveness of the ride and drives in providing electric vehicle education and encouraging associated vehicle adoption.

- 64% of post-drive respondents entered the event with a "very positive" perception of electric vehicles; of those who did not, 90% indicated an improved favorability following the event.
- 63% of respondents who were not already "very likely" going to consider owning an electric vehicle indicated a higher likelihood of considering an electric vehicle for their next vehicle purchase following the ride and drive event.
- 80% of post-drive respondents reported an increased awareness of electric vehicle charging options and vehicle availability following the event.

Many of these ride and drives were organized as part of Tennessee Clean Fuels "EV Experience," an initiative that provides electric vehicle ride and drives at no cost to workplaces across the state. Through the EV Experience, both MWTCF and ETCF worked with automotive manufacturers and local dealers to secure vehicles for employees to test drive at their participating workplaces. The group educated employees and fleet managers about electric vehicles, related cost savings, how and where to charge, and more. The following table summarizes the

outreach impacts from electric vehicle demonstration events conducted within the Program Year.

Electric Vehicle Event Impact		
Event	Impact (# of individuals)	Ride and Drives given
Earth Day	50	0
<u>Lungforce Walk</u>	50	0
Nashville Cars n Coffee	100	5
Middle TN Electric	30	25
Nashville Technology Council	40	30
National Drive Electric Week	60	40
TDEC Field Office	25	15
Metro Nashville	30	20
<b>Total</b>	<b>385</b>	<b>135</b>

### Event Highlight: National Drive Electric Week

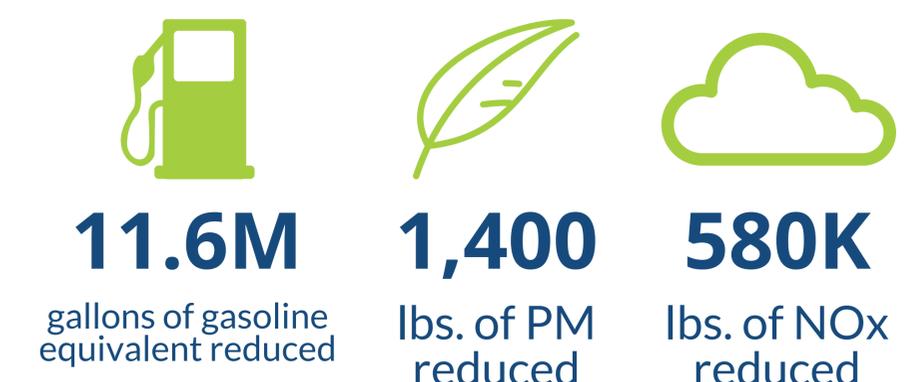
National Drive Electric Week (NDEW) is a nationwide campaign to heighten awareness of electric vehicle availability and highlight the benefits of all-electric and plug-in hybrid-electric cars, trucks, motorcycles, and more. NDEW events were held from September 14-22 across the country, including in Chattanooga, Memphis, Millington, and Knoxville.

On September 22, MWTCF hosted its own NDEW event at Nissan Stadium in Nashville. This free event featured 20 passenger electric vehicles, a Proterra electric bus from WeGo Public Transit, and electric bicycles from Pedego. Attendees were able to test drive several electric vehicles provided by representatives from Freeland Chevrolet, Audi Nashville, Jaguar Land Rover Nashville, and Tesla. Additional event supporters included Zero Logistics, LLC and Drive Electric Nashville, a local, self-organized group of electric vehicle owners and enthusiasts.

### 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 March of 2019 and covers activity by 22 fleets and 15 stations in Middle-West Tennessee for calendar year 2018. Key findings from this report are shown in the figures below.

### MWTCF's Program Year 2018 Impact:



## Volkswagen Diesel Settlement

In 2015, Volkswagen (VW) publicly admitted that it had secretly and deliberately installed a defeat device—software designed to cheat emissions tests and deceive federal and state regulators—in approximately 590,000 model year 2009 to 2016 motor vehicles containing 2.0 and 3.0 liter diesel engines. Under the ensuing Volkswagen Diesel Settlement (VW Settlement) First and Second Partial Consent Decrees, VW has agreed to: (1) dedicate \$10 Billion to the recall of at least 85% of the affected 2.0 and 3.0 liter vehicles; (2) invest \$2 Billion in zero-emission vehicle infrastructure and promotion (“Zero Emission Vehicle Investment Plan”); and (3) establish a \$2.9 Billion Environmental Mitigation Trust (EMT) to mitigate the environmental effects of the excess nitrogen oxide (NOx) emissions from the affected vehicles.

In October 2017, the Court approved two Trust Agreements for Beneficiaries of the EMT: one for the 50 states, the District of Columbia, and the Commonwealth of Puerto Rico (“State Trust Agreement”), and one for the separate allocation for federally recognized Indian tribes in the U.S. The State’s initial allocation under the State Trust is \$45,759,914.40.

Following the designation of TDEC as the Lead Agency for purposes of administering the State’s VW EMT allocation, TDEC formed a multidisciplinary Technical Advisory Committee (TAC) to develop a Beneficiary Mitigation Plan (BMP). The TAC is comprised of representatives from the following TDEC divisions: Air Pollution Control; OEP; OPSP; OEA; and the Office of General Counsel (OGC). On September 21, 2018, TDEC released a final BMP for implementing the State’s initial allocation under the EMT. The BMP noted TDEC’s plans to release separate project solicitations in the following order for each of the EMA categories that it has selected to fund, with percent of initial total funding allocation noted:

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

The State’s BMP targets the largest contributors of mobile NOx emissions in Tennessee, including the onroad, diesel heavy duty sector and the on-road, non-diesel light duty sector. 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.

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](http://www.tn.gov/environment/VW_BMP).

## School Bus Replacement Grant Program

In October 2018, TDEC released its first solicitation for projects under the VW Settlement EMT to provide

financial assistance to Grantees to replace a minimum of one eligible School Bus with any new diesel, Alternate-Fueled, or All-Electric School Bus. After conducting a comprehensive review of all grant applications, TDEC selected 37 Grantees that will replace a total of 137 engine model year 2009 or older School Buses with 68 new diesel, one All-Electric, 65 propane, and three CNG school buses. These projects are expected to yield NOx emissions reductions of an estimated 114,086.22 pounds, or 57.04 tons, over the lifetime of the new vehicles. Of the School Buses funded, 27 will operate 70% or more of the time in former nonattainment areas for ozone and/or fine particulates (PM2.5) NAAQS; 42 will operate in FY 2019 economically distressed counties (as defined by the [Appalachian Regional Commission](#)).

## School Bus Replacement Grant Program:

**\$8,380,826.94**

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

**114,086**

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



**37**  
grantees selected



**137**  
school buses to be replaced

## Grantee and Project Information

**Bledsoe County Board of Education** - \$324,825.00 for 5 diesel buses  
**Bradford Special School District** - \$189,000.00 for 4 propane buses  
**Campbell County Board of Education** - \$42,000.00 for 1 diesel bus  
**Carroll County Department of Education** - \$275,700.00 for 6 diesel buses  
**City of Johnson City** - \$234,375.00 for 5 diesel buses  
**Clarksville Montgomery County School System** - \$625,000.00 for 10 propane buses  
**Clay County Schools** - \$220,500.00 for 3 diesel buses  
**Fentress County Board of Education** - \$146,916.00 for 2 diesel buses  
**Greene County Schools** - \$273,195.72 for 6 propane buses  
**Grundy County Department of Education** - \$539,600.25 for 7 propane buses  
**Hancock County School System** - \$238,440.50 for 3 propane buses  
**Hardeman County Board of Education** - \$318,720.75 for 5 diesel buses  
**Henderson County Board of Education** - \$42,000.00 for 1 diesel bus  
**Hickman County School System** - \$604,500.00 for 13 propane buses  
**Humphreys County Board of Education** - \$45,000.00 for 1 diesel bus  
**Jackson County Board of Education** - \$63,000.00 for 1 diesel bus  
**JLL Transport, LLC** - \$96,166.17 for 1 diesel bus  
**KIPP Nashville** - \$188,325.00 for 3 diesel buses  
**Lake County Board Education** - \$125,550.00 for 2 diesel buses  
**Lynch Bus Lines, LLC** - \$272,100.00 for 4 propane buses  
**Metropolitan Nashville Public Schools** - \$332,092.50 for 5 diesel buses  
**Morgan County Board of Education** - \$139,350.00 for 2 diesel buses  
**Obion County Board of Education** - \$87,740.00 for 2 diesel buses  
**Oneida Special School District** - \$371,250.00 for 3 propane buses  
**Overton County Schools** - \$159,588.00 for 4 diesel buses  
**Perry County Schools** - \$582,375.00 for 8 propane buses  
**Putnam County Board of Education** - \$260,565.00 for 5 diesel buses  
**Roane County Board of Education** - \$55,246.50 for 1 diesel bus  
**Robertson County Board of Education** - \$249,438.80 for 5 diesel buses  
**SCU Bus Lines, LLC** - \$50,000.00 for 1 diesel bus  
**Sequatchie County Board of Education** - \$94,420.50 for 2 diesel buses  
**Sevier County Board of Education** - \$313,125.00 for 3 natural gas buses  
**Stewart County Schools** - \$94,500.00 for 2 diesel buses  
**Van Buren County Schools** - \$80,696.25 for 1 diesel bus  
**Warren County Schools** - \$95,525.00 for 2 diesel buses  
**Washington County Department of Education** - \$219,250.00 for 1 electric bus  
**Weakley County Board of Education** - \$330,750.00 for 7 propane buses

## Tennessee Natural Gas and Propane Vehicle Grant Program

Launched in the fall of 2016, the Tennessee Natural Gas and Propane Vehicle Grant Program provided grant funding to minimize the incremental cost of more than 80 alternative fuel vehicle purchases and/or conversions. Managed by OEP, the Program incentivized the investment in and operation of natural gas or propane-powered light, medium, and heavy-duty vehicles by public, non-profit, and private fleets in Tennessee. Grantees from the first and second rounds include the following organizations:

- Knoxville Utilities Board, to purchase three dedicated natural gas Freightliner M2 112 trucks
- Piedmont Natural Gas, to purchase six dedicated natural gas Freightliner M2 112 trucks
- Sevier County Utility District, to purchase three dedicated natural gas trucks, including a Ford F650 dump truck, an F450 truck, and a Kenworth T880 refuse hauler
- United Parcel Service, Inc., to purchase twelve dedicated natural gas Kenworth T680 trucks
- City of Kingsport, to convert twenty bi-fuel propane Dodge Chargers
- City of Parsons, to purchase five dedicated natural gas trucks, including Ford F-150 and F-250 models
- Great Smoky Mountains National Park, to convert six dedicated propane trucks, including Ford F-150, F-250, F-350, F-450, and Ranger models
- Greater Dickson Gas Authority, to purchase one dedicated propane Freightliner S2G, one bi-fuel propane Ford F-350, four bi-fuel natural gas trucks (including Ford F250 and F350 models), and two dedicated natural gas Ford F750 dump trucks
- Piedmont Natural Gas, to purchase three dedicated natural gas Freightliner M2 trucks
- Rockwood Water Sewer and Gas, to purchase three dedicated natural gas Ford F-150 trucks
- Sevier County Utility District, to purchase five bi-fuel natural gas Ford F-250 trucks
- Waste Management, to purchase seven dedicated natural gas trucks, including Autocar ACX64, Freightliner M2, and Peterbilt 356 models

Throughout the Program Year, OEP continued to manage first and second round grant contracts under this program, which included the disbursement of grant funding, oversight and coordination of grantee reporting, and the implementation of desktop and onsite monitoring visits of grant recipients.

## Electric Vehicle Outreach and Collaboration

### *Tennessee Electric Vehicle Advisory Council (TEVAC)*

The OEP-convened TEVAC consists of representatives from the auto manufacturing, utilities, research, public, and nonprofit sectors and serves as a resource through which members share research and data on electric vehicles to inform best practices. OEP convened TEVAC on a quarterly basis to discuss issues related to electric vehicles, including market developments, infrastructure planning and installation, and vehicle adoption in Tennessee. The TEVAC working group, which is

## Tennessee Natural Gas and Propane Vehicle Grant Program Year 2018 Impact:



**20,700**

gallons of propane consumed by 20 grant-funded vehicles



**2.4M**

total miles driven on alternative fuels



**440,000**

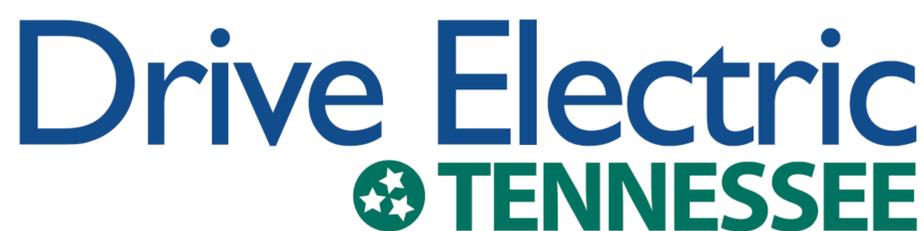
gasoline gallon equivalents of natural gas consumed by 29 grant-funded vehicles



**\$360K**

total fuel savings via alternative fuel use

comprised of a sub-set of TEVAC members, also met quarterly to conduct more in-depth discussions and research related to electric vehicles; the findings and conclusions of this working group were then presented to the larger TEVAC group for consideration. This work informed an application that TDOT submitted to FHWA early in Program Year 2019-2020 for funding to support electric vehicle corridor planning efforts on I-40, to include North Carolina, Tennessee, and Arkansas.



### *Drive Electric Tennessee*

Throughout 2018, a team of Tennessee stakeholders—including State agencies (TDEC OEP and TDOT), utilities, cities, universities, electric manufacturers, businesses, and advocacy groups—worked together on the development of a shared vision for electric transportation in the state. Together, these stakeholders comprise DET, whose goal is to increase electric vehicle adoption in Tennessee from ~9,500 electric vehicles in 2019 to 200,000 vehicles by 2028.

On January 18, DET released the first edition of its Electric Vehicle Roadmap. The Roadmap identifies projects and initiatives for local stakeholder implementation that will increase electric vehicle adoption across multiple Tennessee use cases and sectors. Many of the projects identified by the Roadmap will inform other State programming,

including MWTCF, TEVAC, and Drive Electric Nashville activities as well as solicitations released under the VW Settlement EMT.

DET also conducted a Statewide EV Charging Infrastructure Needs Assessment to evaluate the condition of TN's current EV charging infrastructure and identify charging needs and potential geographic charging locations to support 200,000 EVs in TN. The Needs Assessment was compiled throughout the summer and fall of 2019 and was eventually published early in Program Year 2019-2020. Whereas high demand electric vehicle charging sites can attract private investment (e.g., retail charging, community charging), the Needs Assessment found that lower demand electric vehicle charging sites (e.g., corridor charging, rural charging) are not as appealing for private investors and may require investment from public institutions and/or utilities. The Needs Assessment also concluded that electric vehicle charging infrastructure should be prioritized for highway corridors and rural tourism destinations, to relieve range anxiety and to connect rural and urban areas. Accordingly, several State agencies, including TDEC and TDOT, are working with local stakeholders to evaluate funding opportunities and ownership models to support implementation of a statewide electric vehicle charging network. More information regarding such plans are expected to be released in Program Year 2019-2020.

For more information on Drive Electric Tennessee, visit [www.DriveElectricTN.org](http://www.DriveElectricTN.org).



# Clean Energy Financing

TDEC OEP is currently engaged in two clean energy financing programs. Projects financed under these programs include energy efficiency upgrades, renewable energy power installations, and more.

## Qualified Energy Conservation Bond Program

Qualified Energy Conservation Bonds (QECBs) are low-interest federal bonds (via subsidy) that were available for issuance for qualified energy efficiency, renewable energy, and energy conservation capital projects. Under Tennessee statute, OEP is tasked with serving as the coordinator and administrator of the State's QECB program in partnership with the Tennessee Local Development Authority (TLDA).

Tennessee's QECB allocation totaled \$64,676,000. In 2012, as required by Federal law, the State notified Large Local Jurisdictions (LLJs) of the amount of their allocations, which was based on their proportionate populations. The total amount identified for these fifteen cities and counties was approximately \$36 million. LLJs choosing not to utilize their initial allocation were asked to reallocate their share to the State. These LLJ reallocations were combined with the State's original allocation of \$28.6 million for a total of \$46,543,739. This amount was made available for qualifying projects through a competitive sub-allocation process. Entities eligible to participate in the program included all local government jurisdictions in Tennessee and public universities. A maximum of 30% of the aggregate bonds were eligible to be used for private activity projects.

On December 22, 2017, President Trump signed the Tax Cuts and Jobs Act (HR 1), which made widespread amendments to the Internal Revenue Code. Specifically, Section 13404 of HR 1 provided for the repeal of tax credit bonds, including QECBs. This

amendment repealed QECB issuances effective after December 31, 2017.

TDEC OEP continues to collect and report on data related to previously issued QECB projects:

- **City of Memphis:** The City of Memphis combined its initial \$7,014,356 QECB allocation and its second RFP suballocation of \$3,657,644 to support energy improvement projects under its Green Communities Program: The Crosstown Concourse issuance of \$8,316,000 closed on February 18, 2015. The Self Tucker/Universal Life and Knowledge Quest issuances, which had allocations of \$2,015,300 million and \$340,700, respectively, closed on April 29th, 2015. These three projects, discussed below, all focus on building energy efficiency retrofits. Under the third RFP, OEP recommended and TLDA approved a \$2,142,850 suballocation, which will support energy efficiency upgrades to the Memphis Green Communities Program's Southbrook Towne Center. Issuance on this project closed on September 18, 2017.
  - o **Crosstown Concourse:** The redevelopment of a 1.5 million square foot former Sears distribution center into a mixed use vertical urban village. QECB-related work was completed within the second calendar quarter of 2018. Crosstown's energy consultant, Trane, collected data to compare the current energy use with the original baseline. As a result of data entry into the online Portfolio Manager tool, the Crosstown Concourse has received an Energy Star Score of 84 for the year ending June 20, 2019. The Energy Star Score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity. In addition, the facility's source energy use intensity, which accounts for total energy use and incorporates all

transmission, delivery, and production losses, was measured to be 125.6 kBtu per square foot, which is approximately 43% less than the national median source energy use intensity of 219.8 kBtu. Trane has implemented a chiller plant optimization program to reduce energy consumption by the HVAC system and is developing additional strategies to continue to improve building performance and the Energy Star score.

- o **Knowledge Quest:** The redevelopment of a vacant apartment building into dormitory housing for an urban farming school. Although all QECB-related measures were completed within the third calendar quarter of 2018, construction completion did not occur until the third calendar quarter of 2019. Building occupancy and the tracking of related energy metrics are scheduled to take place in Program Year 2019-2020.
- o **Universal Life Insurance Building:** The redevelopment of a historic African American-owned insurance company building into a new office space. QECB-related work was completed within the third calendar quarter of 2018. The project team provided OEP with energy consumption data for the previous year; the project team also worked with Universal Life's LEED consultant, Entegrity, to benchmark and create metrics for tracking energy performance moving forward and to finalize a measurement and verification report, which will be provided to OEP in Program Year 2019-2020.
- o **Southbrook Town Centre:** The project included the replacement of the roof with an energy efficient roof system, an upgraded HVAC system, and an upgrade to the building's electrical power grid. Although all QECB-related measures were completed within the fourth calendar quarter of 2017, construction completion did not occur until the first calendar quarter of 2019. Southbrook began to track the facility's energy consumption through Portfolio Manager; Southbrook will continue to input utility information into the platform in order to establish a baseline for benchmarking and to track and assess energy and water use within the complex.
- **City of Lebanon:** OEP recommended and TLDA approved a \$3,500,000 sub-allocation for the construction and installation of a waste-to-energy gasification unit. Issuance on this project closed on April 24th, 2015. This project was completed within the third calendar quarter of 2017; the system can provide nearly 200kW of power (half the total load of the wastewater treatment plant) while diverting approximately 28 tons of waste (wood, tires, and biosolid sewer sludge) from landfills every day. The facility has also utilized the byproduct of gasification to develop a biochar that meets U.S. Department of Agriculture certification standards, for use in horticultural applications. The City has successfully used some of this biochar in benchtop testing for effluent nutrient removal, seeing reduction in nitrogen levels. The City is investigating the potential use of this biochar for stormwater applications, to improve effluent quality of certain wastewater treatment discharges, and to promote vegetation establishment and plant health.

- **City of Paris:** OEP recommended and TLDA approved a sub-allocation for an energy savings performance contract that will include the upgrade of street lights to LED technology, conversion of lighting within select City-owned buildings to LED lighting technology, the addition of intelligent thermostats on HVAC systems, the addition of energy-saving vending machine controls, and an upgrade to the Civic Center's indoor pool dehumidifier. Issuance of \$2,530,000 in QECBs closed on June 5, 2017. This project was completed within the second calendar quarter of 2018. A measurement and verification study was completed in May of 2019, to provide a detailed accounting of the first year financial and energy changes. Within the first year, the project realized an energy cost savings of \$101,419. This equates to total energy savings of 1,586,575 kWh of electrical consumption, 148 kW of electrical demand, and 1,701 therms of natural gas. Over the 20-year life of the contract, the project is now expected to generate \$21,686 in additional savings above the guaranteed \$2,852,259.
- **Williamson County:** OEP recommended and TLDA approved a sub-allocation to finance the first of at least three phases of an energy savings performance contract. During the first phase, various energy conservation measures will be performed within 13 Williamson County Schools. Issuance of \$10,115,000 in QECBs closed on August 30, 2017. QECB-related work was completed within the first calendar quarter of 2019. A measurement and verification study will be completed after a full year of operation is achieved; this data will be reported in Program Year 2019-2020.

### **Energy Efficiency and Renewable Energy Loan Program**

The Pathway Lending Energy Efficiency Loan Program (EELP), a low-interest revolving loan fund, launched in 2010 to assist Tennessee for-profit and not-for-profit commercial and industrial businesses in implementing energy efficiency and renewable energy improvements. In January 2016, EELP was 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, oversees the \$33 million revolving loan fund, which is comprised of loan capital provided by the State / TDEC OEP (\$14 million), TVA (\$14 million), and Pathway Lending (\$5 million). 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. Five-year term Energy Efficiency loans have a fixed interest rate of 2%, and ten-year term Renewable Energy loans have a fixed interest rate of 5%. Local government entities are eligible to receive up to six years of financing at a 2% interest rate for qualified energy efficiency and renewable energy projects. Qualifying entities can apply for loans between \$20,000 and \$5 million. EELP obligated nearly \$8 million in new loans to 43 Tennessee businesses and organizations during the Program Year, with an average estimated annual energy savings of \$37,365 per program participant.

# EELP Closed Loans, Program Year 2019

	10/1/18 - 12/31/18	1/1/19 - 3/31/19	4/1/19 - 6/30/19	7/1/19 - 9/30/18
Total Loans (#)	7	9	14	13
Total Loans (\$)	\$1,208,417	\$1,156,534	\$3,607,296	\$2,014,683
East TN	2	0	6	2
Middle TN	4	6	6	7
West TN	1	3	2	4
Jobs Impacted	527	459	588	1035
Building Retrofits	0	0	1	2
Bundles	1	0	1	0
Co-Generation	0	0	3	0
Equipment	0	0	0	0
HVAC	0	0	0	3
Industrial Systems	0	0	0	0
Lighting	6	9	7	8
Renewables/Solar	0	0	2	0
Avg. Annual Savings	\$54,934	\$28,866	\$32,883	\$38,618
kWh Installed	3,259,136	2,468,108	4,267,610	4,608,306
Avg. kWh/\$	2.70	2.13	1.19	2.29
Therms Installed	111,223	72,567	146,100	157,239
Avg. Therms/\$	0.09	0.06	0.04	0.04



## 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. 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 as well as their associated utility savings. To support this goal, SFUM administers several utility savings and building energy management initiatives, including the following:

- Development and maintenance of an online Utility Data Management (UDM) platform for approximately 8,000 State-owned and managed facilities.
- Oversight of energy efficiency projects under the EmPower TN initiative, designed to reduce energy consumption and utility costs for participating State facilities through the implementation of energy efficient technologies and/or energy management systems.
- Provision of no-cost technical assistance 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

The UDM platform is a uniform repository for utility costs and usage for approximately 8,000 State-owned and managed facilities (~103 million square feet) with integrated bill payment, utility tracking, and benchmarking capabilities. The platform provides a means for end-users—such as fiscal personnel, SFUM team members, State facility and utility managers, sustainability professionals, and technical assistance providers—to gain actionable insights into utility data. The SFUM team has completed the three-year UDM project development, configuration, and implementation phase for all 72 General Government agencies and Higher Education campuses. Historical data has been uploaded, and ongoing data feeds established, for all known and active State utility accounts (~8,723) and meters (~10,835). 567 end-users across General Government and Higher Education have been granted access to the UDM platform. As a result, the SFUM team is now able to provide aggregated utility consumption and cost data for these facilities. (SFUM has utility billing data for 96% of the utility meters that have been identified and captured in the UDM platform for General Government agencies and Higher Education campuses).

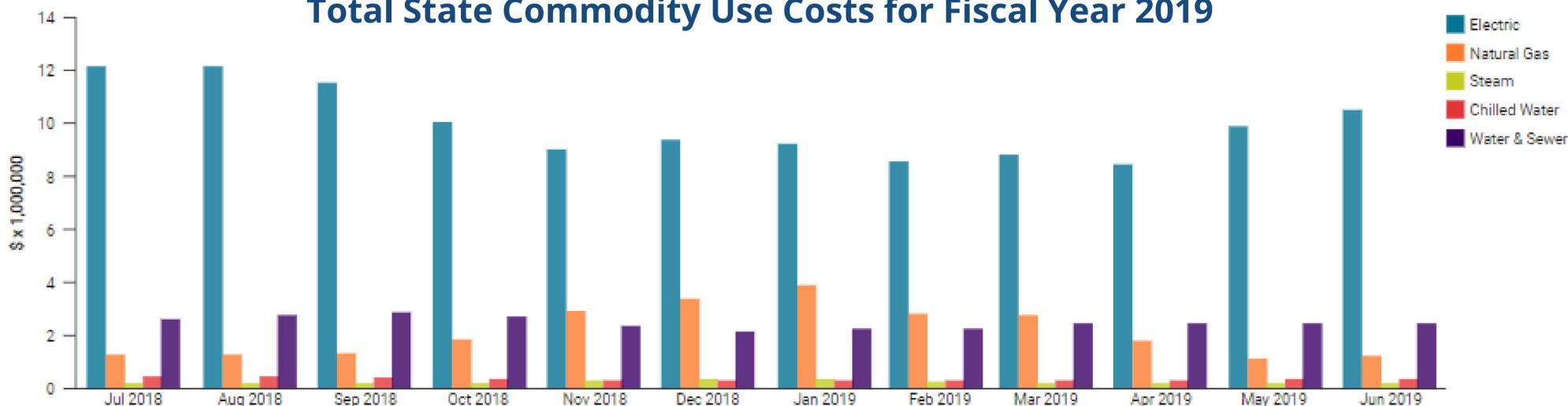
The SFUM team also successfully integrated the UDM platform into the General Government’s bill payment system, Edison, which allows accounts payable users to employ the UDM platform for bill review, approval, payment, and reconciliation. The team continues to perform internal quality control and ongoing UDM trainings for new and existing platform users.

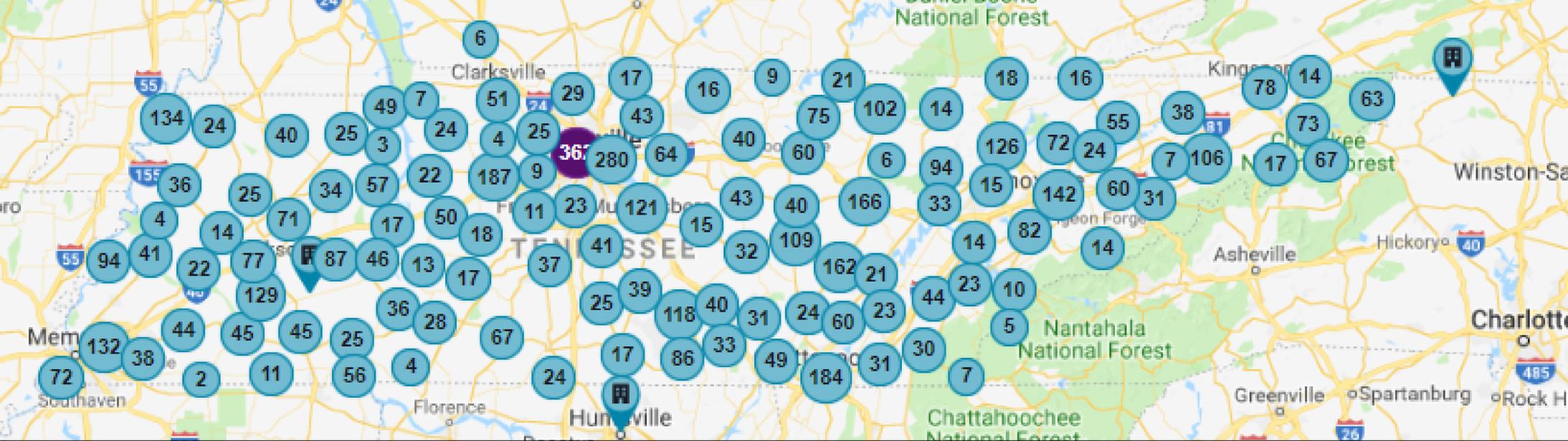
## Summary of State Commodity Use Costs for Fiscal Year 2019\*

Commodity	Use	Cost
Electric	1,291,084,854 kWh	\$119,548,806.10
Water & Sewer	40,939,383 Kgal	\$30,947,939.00
Natural Gas	1,538,804,861 THERM	\$25,621,494.25
Chilled Water	18,473,376 Ton Hr	\$4,249,021.55
Steam	211,509 MLB	\$2,937,978.14
Propane	472,542 THERM	\$581,499.67
<b>Total</b>		<b>\$183,886,738.71</b>

\*Costs and usage for Fiscal Year 2019 are subject to change should additional billing data be obtained. These figures do not include all propane commodity use costs, as some agencies procure the fuel via purchase orders that are processed outside of the UDM platform.

## Total State Commodity Use Costs for Fiscal Year 2019





A map of all State-owned and managed facilities reflected in the UDM platform.



The SFUM team holds a UDM platform training for State facility managers, accounts payable personnel, and sustainability professionals.

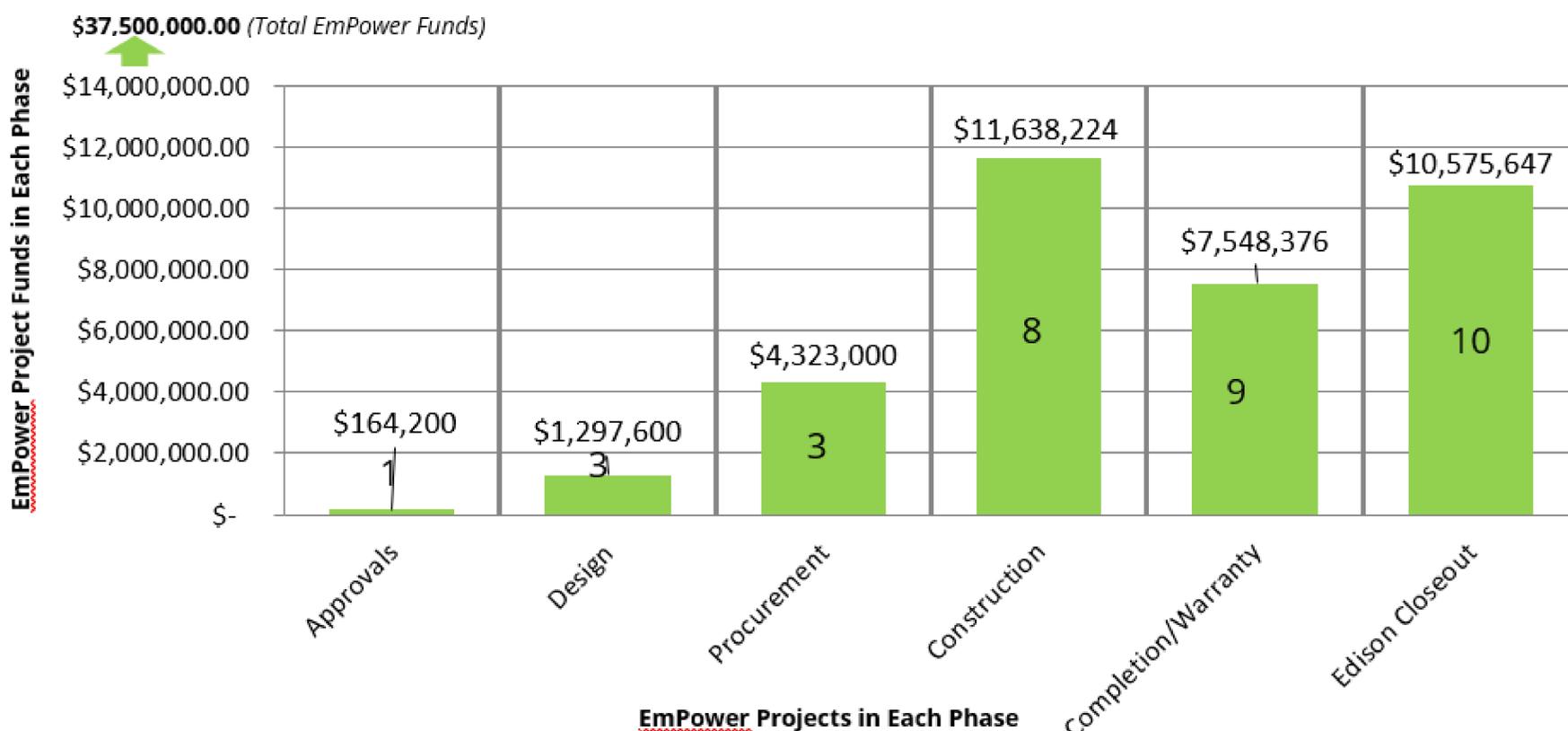
In addition, the SFUM team conducted over 75 in-person or online trainings on the UDM platform for more than 500 facility managers, accounts payable personnel, and sustainability professionals. In conjunction with trainings, the SFUM team created and published to the OEP website several step-by-step guides and resource videos in order to strengthen end-user familiarity and knowledge of the UDM platform and its capabilities. The UDM platform is currently utilized as a tool to bridge billing communications gaps and to promote collaboration between staff, providing a proactive approach for utility risk mitigation through bill review and a way to generate utility data reports for analysis with greater detail and speed.

### EmPower TN

The Tennessee General Assembly appropriated \$37.5 million in FY2016 funding for EmPower TN energy efficiency projects in State-owned and managed facilities. SFUM, in coordination with implementing agencies and campuses as well as the capital projects groups under the Department of General Services (DGS), the University of Tennessee (UT), and the Tennessee Board of Regents (TBR), is responsible for monitoring the progress of these projects and providing technical assistance to ensure successful completion.

As of September 30, 2019, \$35,698,200 had been obligated to 34 projects under the General Government, UT, and TBR real estate portfolios. The projects' cumulative estimated annual energy savings is \$4,496,831. The projects' cumulative average simple payback (EmPower funding/total estimated annual energy cost saved) is 7.9 years.

The following bar chart highlights the progress of the EmPower TN projects through each phase of the Capital project process and is current as of September 2019. 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.



All EmPower TN energy efficiency project savings are measured and verified. For certain projects, the SFUM team is working with TVA's contractor, Lockheed Martin, to determine energy usage baselines and create detailed energy surveys (DES). Each DES is specific to the individual project and energy conservation measure. Baseline physical conditions (energy consumption, control strategies, equipment inventory and conditions, occupancy, nameplate data, etc.) are identified through inspections, short-term metering activities, spot measurements, and surveys. The baseline conditions will be used to determine estimated savings by comparing the baseline energy use to the post-installation energy use. Detailed baseline energy surveys have been completed for the ten locations listed below.

1. Lowell Thomas
2. University of Memphis, Administrative Building
3. University of Memphis, Library
4. University of Memphis, Site Lighting
5. Northeast Correctional Complex
6. Northwest Correctional Complex
7. Riverbend Maximum Security Institution
8. Tennessee Bureau of Investigation Headquarters, Nashville
9. University of Tennessee at Chattanooga, MAPP Building
10. Northeast State Community College, Wayne Basler Library

Additionally, post-installation measurement and verification site visits have been completed for the eight locations listed below.

1. Department of Children's Services, 900 & 1000 2nd Ave. Facilities
2. Mid-Cumberland Regional Health Office
3. East Tennessee Regional Health (B)
4. Northeast State Community College, Site Lighting Project
5. Andrew Jackson Office Building Project A
6. Andrew Jackson Office Building Project B
7. Andrew Johnson Office Building
8. Davy Crockett Office Building

## Additional Highlights

### *NES Enel X Demand Response Program*

DGS, in collaboration with the Nashville Electric Service (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 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, personal fans, 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 into automatic demand reduction. The figure below depicts the energy savings realized through September 2019 from energy reduction and continued participation in the Enel X Demand Response Program, as evaluated by the SFUM team.

### *Existing Building Commissioning*

Existing Building Commissioning (EBCx) applies the commissioning process of system performance optimization to existing buildings. EBCx provides an assessment of a building's current use and system performance. Taking this data into consideration, operational optimization modifications, including controls-based Energy Conservation Measures (ECMs) for the existing HVAC and lighting systems, are then proposed, which can result in the avoidance of significant energy costs and the improvement of occupant comfort and productivity. All building systems suffer decreased energy efficiency performance due to age, unnoticed wear and tear, and potential change of facility function. Monitoring these effects is an integral part of EBCx, which allows the State to maintain high building performance. Ongoing commissioning, as part

## Enel X Demand Response Program Savings

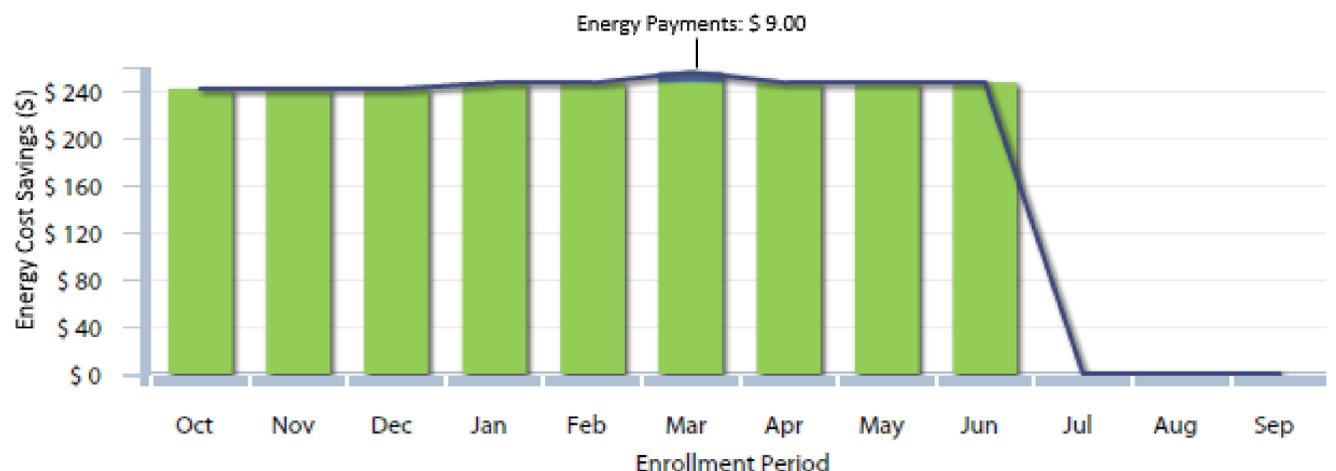
**State of Tennessee - Cumulative Savings Total: \$2,214.99**

### October 2018 - September 2019

Capacity Payments	\$ 2,205.99
Energy Payments	\$ 9.00
Adjustments	\$ 0.00

**Total Payments \$ 2,214.99**

(US only payments)



of DGS's facility maintenance budget, is expected to monitor HVAC and lighting trend data to identify maintenance issues and operational drift before these systems significantly deviate from the optimal operating standards.

*Example Project: Andrew Jackson Office Building*

Various energy efficiency upgrades were implemented within the Andrew Jackson Office Building, including the installation of controllable LED lighting, window film, and an upgrade to the building's chilled water mechanical systems (e.g., the installation of energy smart digital valves with controls integrated into the building automation system). Additionally, EBCx was performed onsite to both extend current equipment life as well as to optimize the building's chilled water system, lighting system, and overall energy performance. As a result of this project, Andrew Jackson Office Building realized substantial savings—daily cost for chilled water alone in the facility has been reduced by 4%, from \$1,346 per day to \$1,291 per day. Total annual savings for all energy efficiency measures are to be reported in Program Year 2019-2020, through post-installation site measurement and verification.

**EBCx Program Year 2019 Impact at Andrew Jackson Office Building:**



*Wireless Control Systems and LED Lighting*

Advances in LED and wireless lighting control systems (LCS) have created savings opportunities for capital projects and maintenance lighting retrofits. LED lighting is more efficient, longer lasting, and more cost effective than ever before. LEDs, in combination with wireless control systems, 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: East Tennessee Regional Health Office Building*

Several EmPower TN projects featuring LED and wireless LCS upgrades reached substantial completion, while previously completed projects continued to benefit from energy-related cost savings. One such project was completed in June at the East Tennessee Regional Health Office Building in Knoxville, where facility managers upgraded the building's lighting with LECs and LCS. In an effort to increase energy reductions and savings, the building went through additional EBCx. As a result of the project, the facility has realized sustained reductions in daily energy use by approximately 8% and reductions in daily energy cost by approximately 6%.

*Example Project: Northeast State Community College*

Another such project was completed at Northeast State Community College, where a campus-wide outdoor LED light fixture upgrade was implemented at the College's main Blountville campus. Although this project was completed in Program Year 2017-2018, Northeast State Community College continues to see tremendous cost savings through ongoing optimization of the controls, wherein facilities staff periodically assess and make adjustments to the lighting control system based on facility operational needs. Post-installation site measurement and verification determined that the College's campus-wide lighting project will reduce electricity consumption by 249,051 kWh and save \$22,913 in utility costs each year.

Due to the success of its outdoor campus lighting project, the College has elected to complete another wireless LCS and LED lighting project within its Wayne Basler Library on the Blountville main campus. The project is anticipated to reach substantial completion in early 2020 and is estimated to reduce electricity consumption by 236,353 kWh and save \$26,120 in utility costs each year.

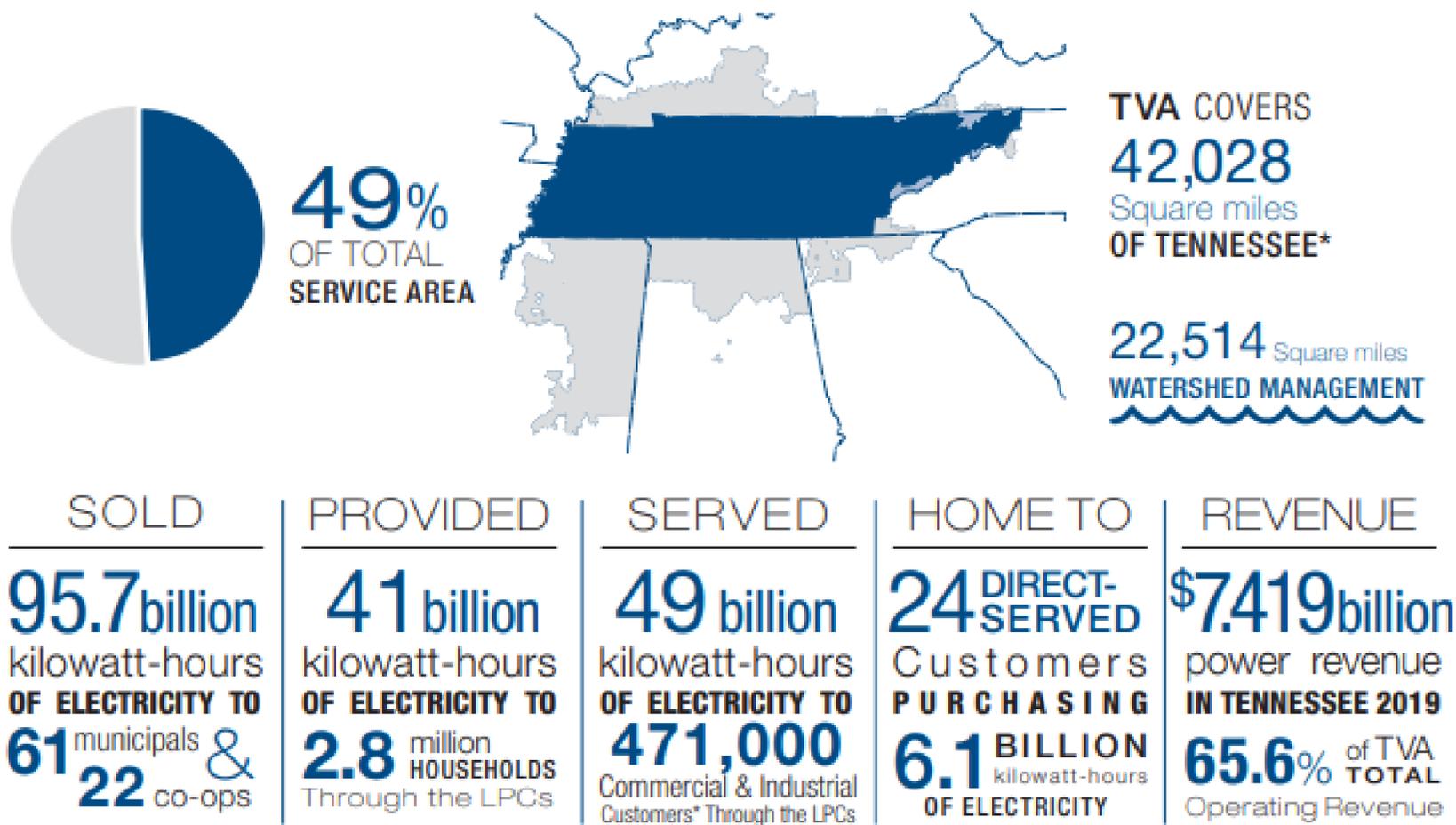
**LED and LCS Projected Impact at Northeast State Community College (outdoor and indoor projects combined):**





# 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 Fiscal Year 2019 "TVA in Tennessee" fact sheet](#).



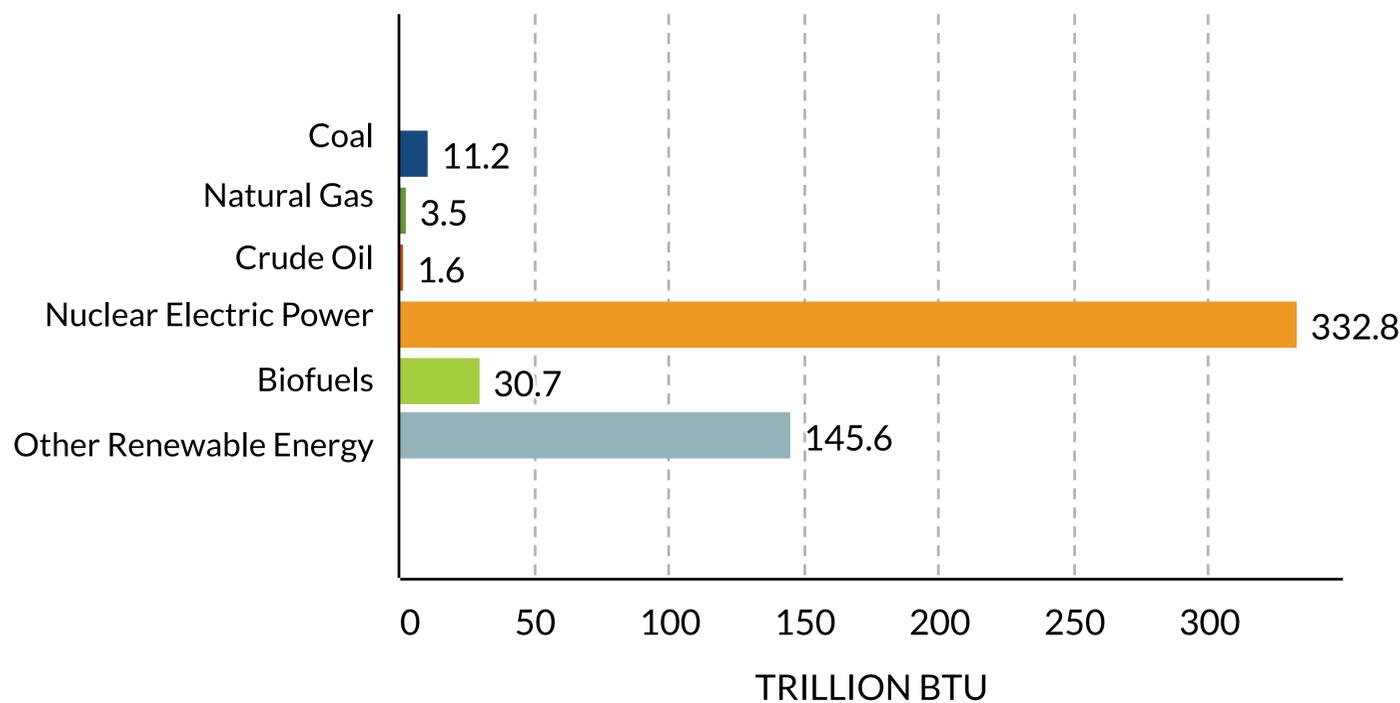
The following bullets highlight a few key facts about the energy sector in Tennessee.

- TVA operates 19 hydroelectric dams, four coal-fired power plants, two nuclear power plants, seven combustion turbine sites, and a pumped storage facility, all with a combined generating capacity of more than 20,600 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.
- In 2018, nuclear power provided 45% of the state's generation, and coal-fired power plants accounted for 26% (down from 35% in 2017).
- In 2017, Tennessee had the third-highest net generation from hydroelectric power among states east of the Mississippi, and the eighth-highest nationwide.
- TVA's 1,616 MW Raccoon Mountain pumped storage plant, which began operating in 1978, is the third-largest pumped storage hydroelectric facility in the U.S.
- The Southeast's first major wind farm, located on Tennessee's Buffalo Mountain near Oliver Springs, began operating as a 2 MW facility in 2001. The wind farm's generating capacity has since been expanded to 29 MW.
- Tennessee's one petroleum refinery, located in Memphis, can process about 180,000 barrels of crude oil per day.
- Tennessee is the largest ethanol-producing state in the Southeast and was the 14th-largest ethanol producer in the nation in 2018.
- Solar photovoltaic (PV) facilities provided about 0.3% of total generation and almost 3% of Tennessee's renewable generation in 2018. The state's largest solar facility, a 53 MW installation in Millington, came online in December 2018.

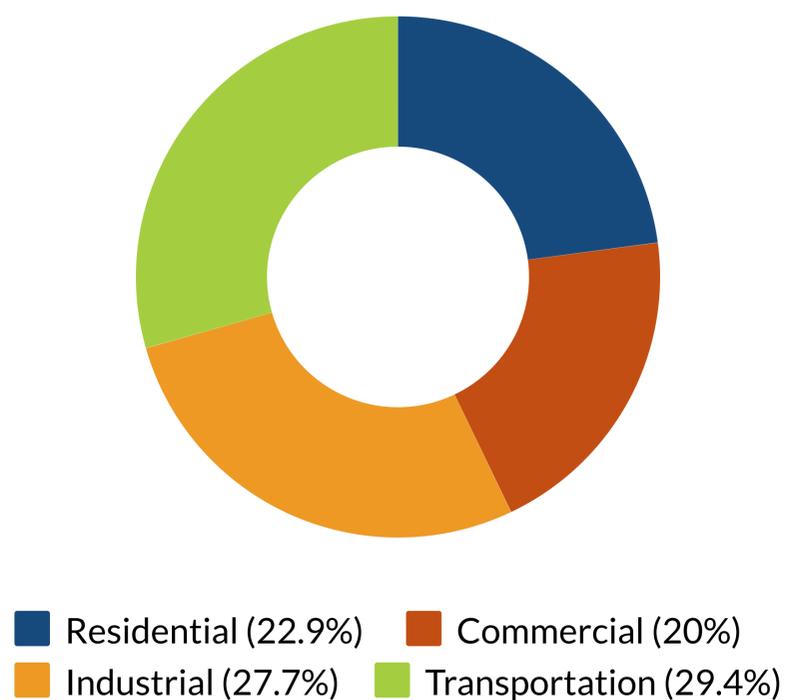
# Energy Consumption and Production

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 2017.<sup>3</sup> For additional information and data on Tennessee, please visit <https://www.eia.gov/state/?sid=TN>.

## 2017 Energy Production Estimates in Tennessee



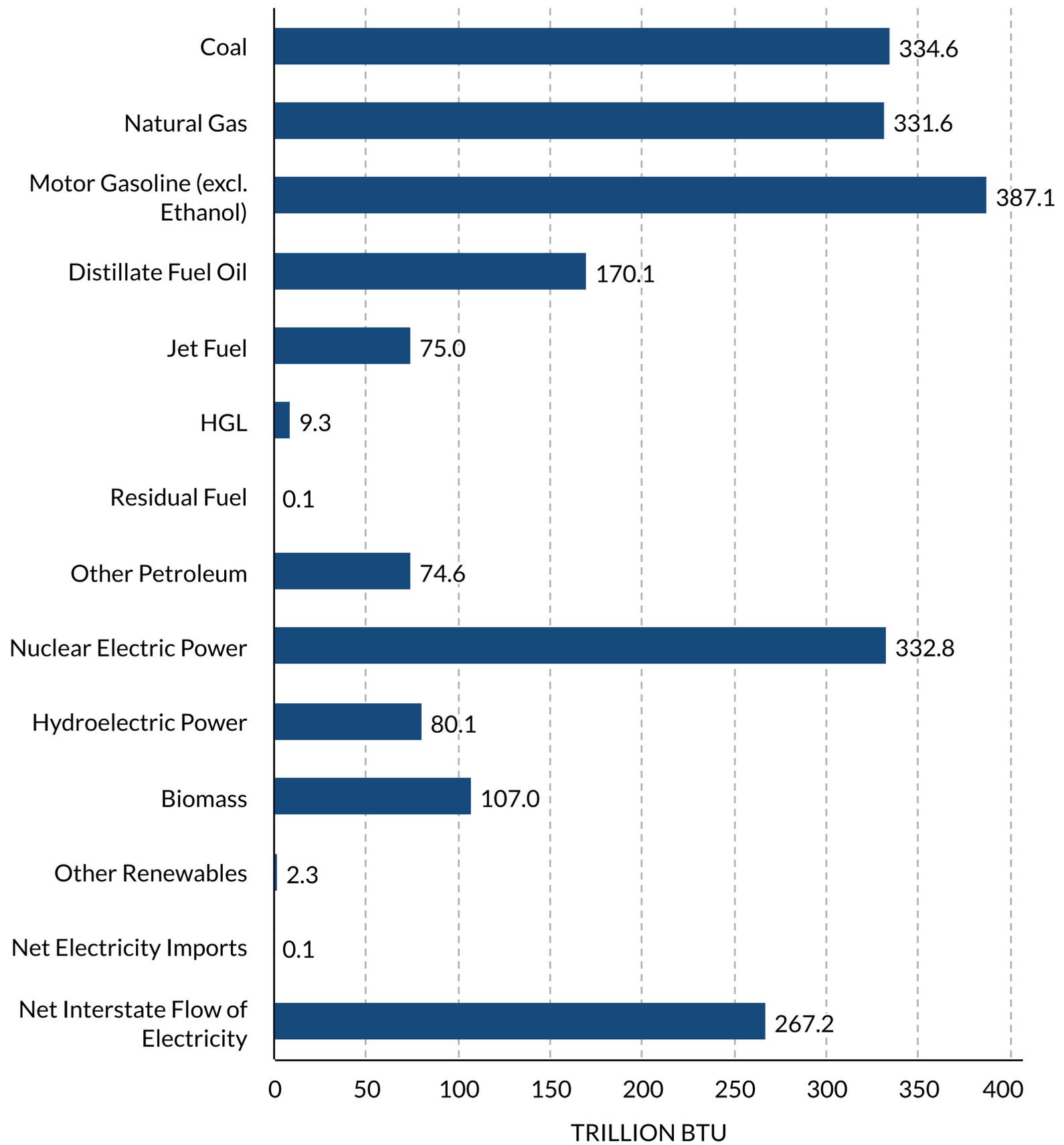
## 2017 Energy Consumption by End-Use Sector in Tennessee



<sup>3</sup>. Data from two years prior is finalized by the EIA annually, typically in the third quarter of the calendar year.



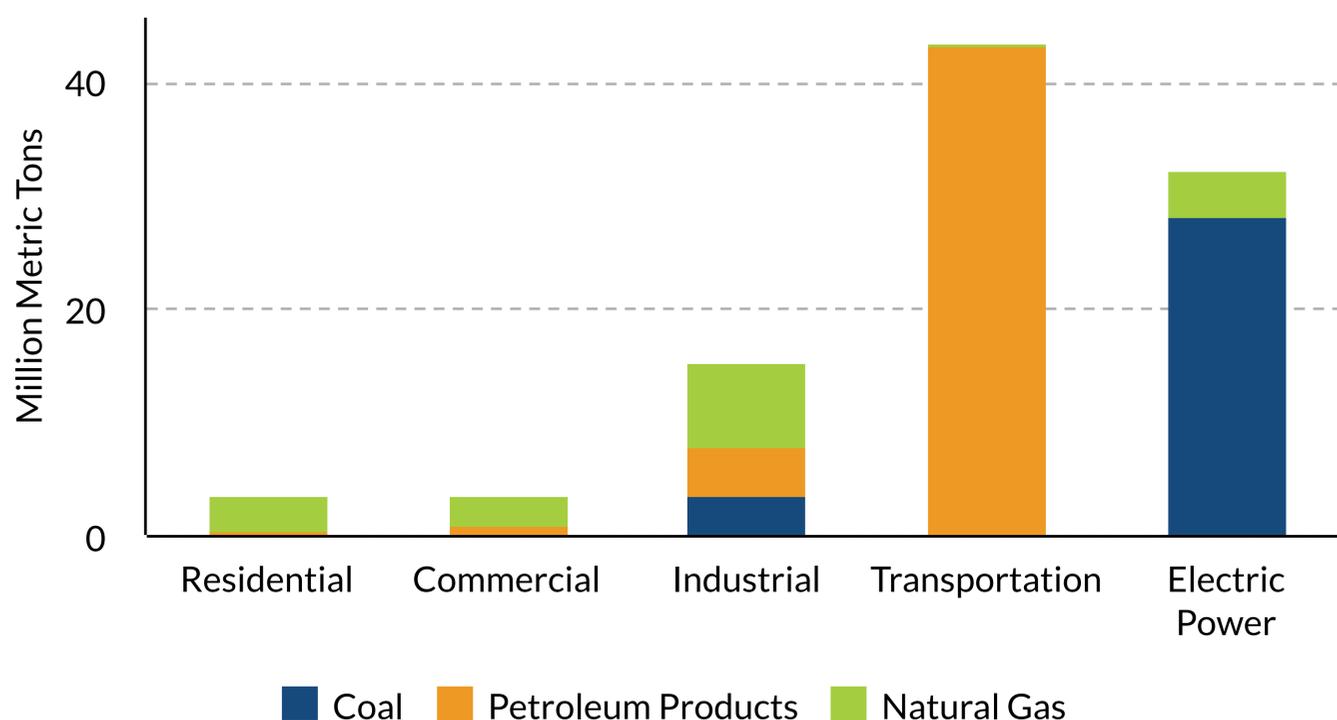
## 2017 Energy Consumption Estimates in Tennessee



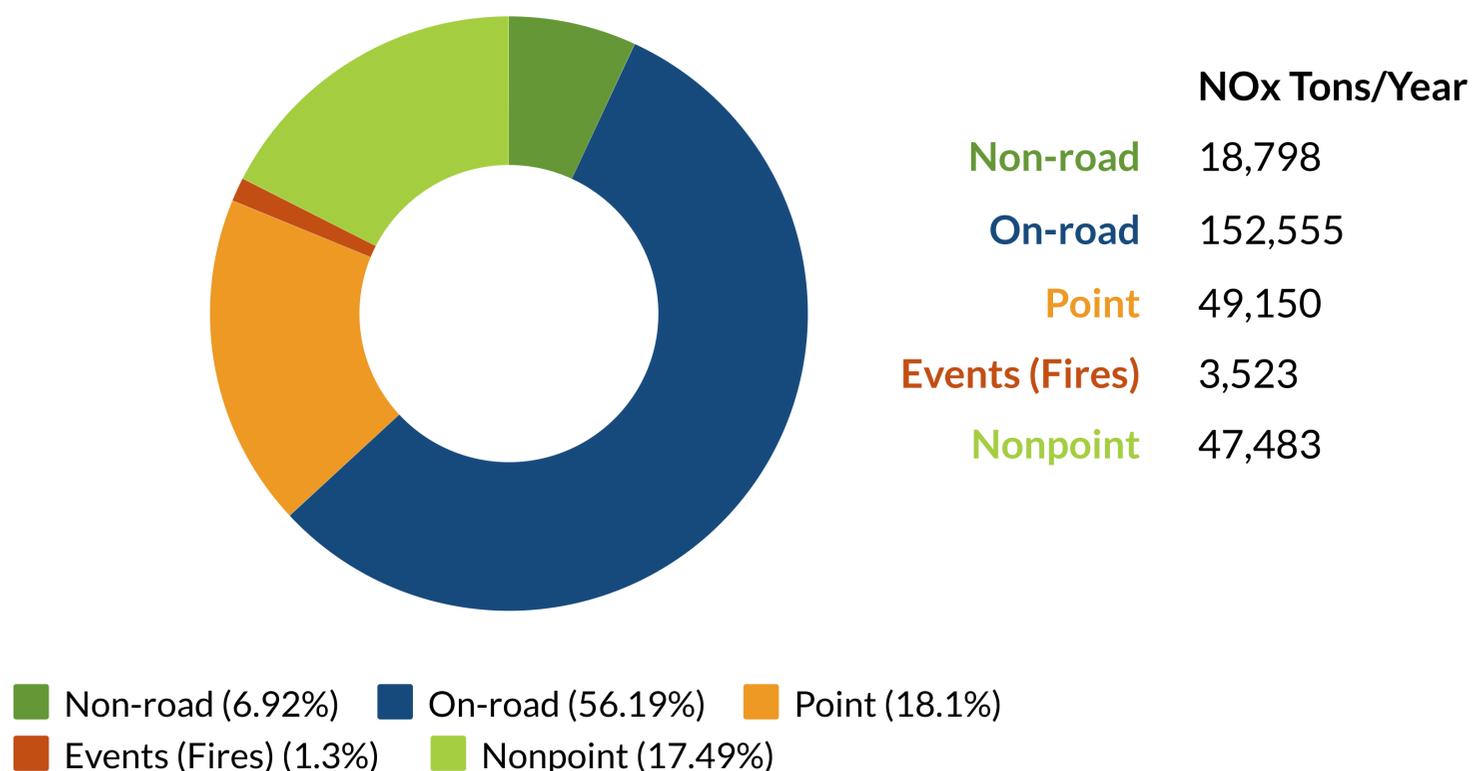
# Energy Sector Emissions

Statewide emissions data associated with energy consumption can be found through both EIA and the National Emissions Inventory (NEI).<sup>4</sup>

## 2017 Carbon Dioxide Emissions from Fossil Fuel Consumption in Tennessee



## 2017 NOx Emissions (Tons/Year) by Source Sector in Tennessee



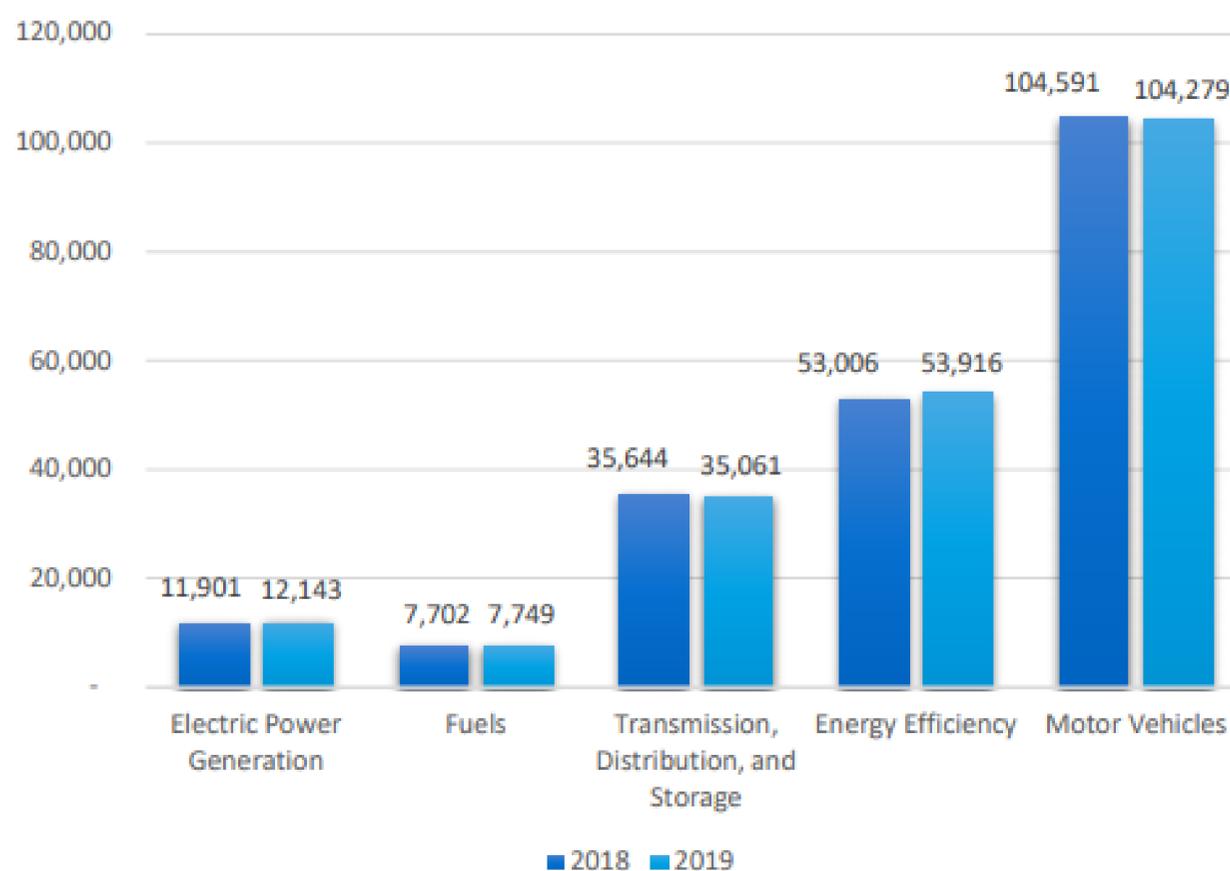
4. Aggregated data from two years prior is typically finalized by EPA every three years. The NEI can be accessed at <https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei>.

# Energy Sector Employment

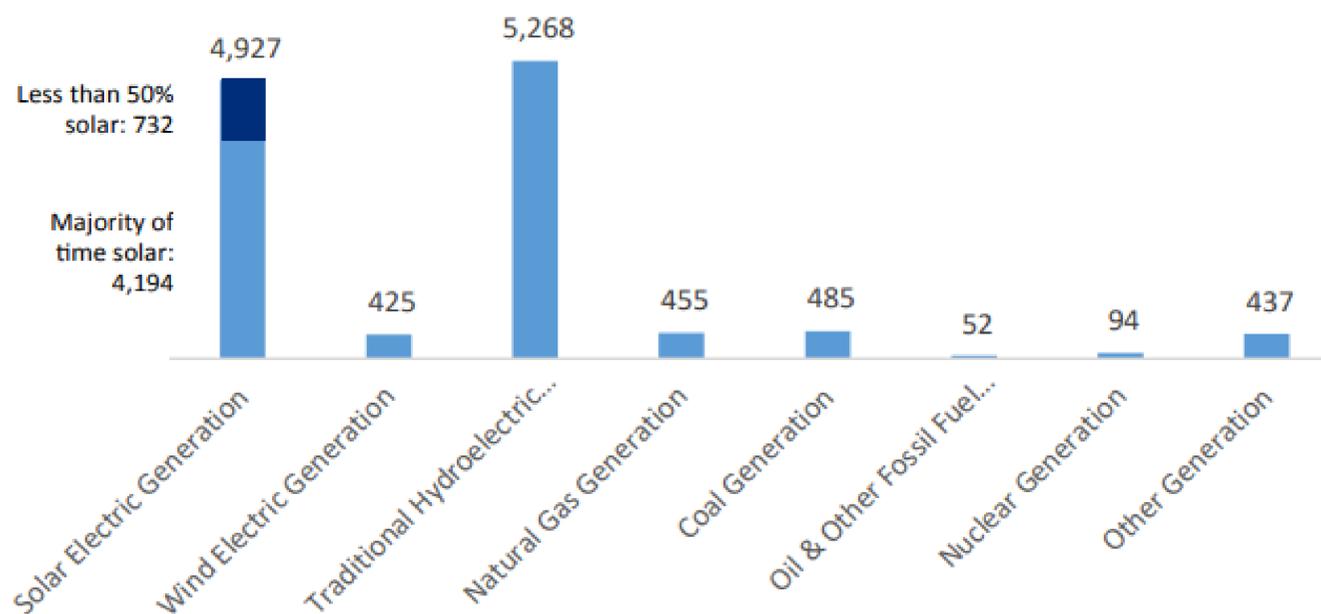
According to the 2020 U.S. Energy and Employment Report (USEER),<sup>5</sup> jointly compiled by NASEO and the Energy Futures Initiative, Tennessee's energy sector employed more than 200,000 workers in 2019:

- Traditional Energy employed 54,953 workers (1.6% of all U.S. Traditional Energy jobs):
  - 12,143 workers in Electric Power Generation
  - 7,749 workers in Fuels
  - 35,061 workers in Transmission, Distribution, and Storage
- Energy Efficiency employed 53,916 workers (2.3% of all U.S. Energy Efficiency jobs)
- Motor Vehicles employed 104,279 workers (4.1% of all U.S. Motor Vehicle jobs)

Tennessee Employment by Major Energy Technology Application in 2018 and 2019



Tennessee Electric Power Generation Employment by Detailed Technology Application in 2019



5. To access the USEER, please visit <https://www.usenergyjobs.org/>.



## **ACKNOWLEDGEMENT AND DISCLAIMER**

The information, data, or work presented herein was funded in part by the Office of Energy Efficiency and Renewable Energy (EERE), U.S. DOE, under Award Numbers DEEE0008295, DEEE00007385, and DE-EI0002982. The information, data, or work presented herein was funded in part by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **IMAGE ATTRIBUTION**

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