

The West Virginia Division of Energy (WVDOE) is required by 5B-2F-2(f) of the *West Virginia Code* to submit an annual report to the Governor and the Joint Committee on Government and Finance. It requires that the report “shall relate to the division’s implementation of the energy policy and the activities of the division during the previous year” on or before the first day of December of each year. This submission addresses activities for the period Dec. 1, 2015-Nov. 30, 2016.

The activities for the reporting period are addressed by energy resource as described in “West Virginia Energy Plan 2013-2017”: fossil fuels, renewable energy and energy efficiency. This report will address each energy resource and the activities of WVDOE in supporting them.

Fossil fuels

- West Virginia’s fossil fuels industry continues to face challenges from national initiatives to reduce coal-fired emissions. In 2015, Appalachian Power closed three power plants in response to the Mercury and Air Toxic Standards (MATS). Earlier, First Energy closed three of its plants that did not have low-NO_x burners or SO₂ controls. In total, the MATS standards caused roughly 2,000 megawatts of West Virginia coal generation to close representing 18 percent of the state’s generation base. Within the PJM grid, MATS standards have caused roughly 25,000 MW within its 13-state region to close. Both utilities have engaged in transmission upgrades to accommodate these closures. In February, the U.S. Supreme Court stayed implementation of the U.S. EPA’s Clean Power Plan while legal challenges play out but West Virginia remains challenged with the carbon dioxide reduction requirements. The concern is that the CPP could cause functioning, environmentally compliant coal-fired power plants to close. Earlier assumptions by grid operator PJM, which is the regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states including West Virginia and the District of Columbia, that coal-based electricity would be the cheapest source on the grid have not materialized. Cheap coal electricity could enable emission trading, which would enable the buyer to take responsibility for the carbon. West Virginia’s mass-based goal is a 29 percent CO₂ reduction from 2012 levels. This CO₂ reduction goal could roughly equate to the equivalent of 3,500 MW of coal-based power. Earlier plant closures and emissions trading (described above) hopefully will accommodate this target. One innovative solution to addressing CO₂ emissions is to claim West Virginia’s tree growth as a carbon sink. West Virginia is the third most-forested state in the nation after Maine and New Hampshire and harvests 150,000 acres of timber each year, roughly 2.5 percent of the state’s forest cover. West Virginia demonstrates sustainable forestry. At the 2016 Governor’s Energy Summit, a researcher from WVU concluded that West Virginia’s tree growth accommodates all the state’s CO₂ emissions. While the CPP as written by EPA does not recognize the benefits of terrestrial sequestration, given the relevance of tree growth to reducing the state’s CO₂

emissions, West Virginia is obligated to continue to support the relevance of this issue. EPA's intention is to use the CPP to advance renewable energy and energy efficiency. While West Virginia will continue to support these energy resources, the state should not expect new renewable energy and efficiency programs to meet the state's carbon reduction goals. Recently announced grid-scale solar, wind and hydro projects in West Virginia would total less than 200 MW, less than 6 percent of the EPA goal. While the economic development potential of renewable energy and energy efficiency is appreciated, West Virginia's coal-based infrastructures is a national energy resource benefitting West Virginia and its markets. West Virginia's interest is in assuring that economic benefits associated with coal are maintained in the state's economy.

- Since its inception, WVDOE has coordinated annual Governor's Energy Summits. The summits are sponsored by the West Virginia Governor's Office and the West Virginia Department of Commerce and gather energy experts on a wide range of topics. In 2016, the 10th annual event, "Tackling America's Energy Challenges," featured "WVU Energy Research: Leveraging Our Strengths, Expanding Our Impact," "Defining the Future – The Imperative of Fossil Energy Research," "EPA's Impact on West Virginia's Economic Assets," "Status of Coal Production," "Ohio Valley University Alternative Clean Energy Center," "Carbon Uptake by West Virginia Forests," "New Creek Wind Project," "Evaluation of Coal-derived Diesel Fuel," "Characterizing Rare Earth Elements in West Virginia Coal Measures," "Status of the Solar Energy Industry in West Virginia," "Grid Scale Solar Projects in West Virginia," "A Geological Perspective on WV's Natural Gas Resources," "Current State of the Oil and Natural Gas Industry in West Virginia," "Planned Natural Gas Electric Generation," "West Virginia: Rich in Energy and Rich in Nature," "Projects With Industry," "Residential Energy Code Field Study," "Plugging In to Unplug at a West Virginia State Park," "A Brief Overview of Coal to Chemicals: Opportunities and Obstacles," "Fossil and Geothermal Energy Resource Assessments and Energy Solution Options at Camp Dawson," "Mountain Valley Pipeline," and "Longview: The Future of Clean Coal."
- WVDOE co-sponsored the fifth annual TransTech Energy (TTE) Business Development Conference October 25-26, 2016, in Morgantown and has been a co-sponsor since its inception in 2012. The TTE Innovation and Business Development Program is hosted by the WVU National Research Center for Coal and Energy. An objective of the program is to facilitate commercialization of innovations from research universities, national labs, corporate development centers, and inventors working in garages and basements across the multi-state region, but especially from West Virginia. A longer-term goal is creation of companies that can provide solutions to energy, environmental, and economic development challenges such as creating good jobs and prosperous communities. The 2016 TTE Conference included:
 - Approximately 220 participants: entrepreneurs, investors, academic, industry, national laboratory, state and federal government, students, technology-based economic development, and the general public.
 - Twenty-four pitches for funding for startup companies and commercializable projects from PA, OH, WV, OR, and FL.
 - Conference awards valued at \$68,000 were presented to 14 startup companies. 2016 Award winners from West Virginia were ARIDEA LLC, Charleston; 9Three Solutions, Morgantown; and GloGames LLC, Phillipi, LLC.

- Approximately 45 exhibits, demos, and posters (including 15 WVU research groups) were featured at the Link-Up and Learn! conference reception.
- The 2016 TTE Conference Book, the Link-Up and Learn! Conference Reception Book, and the Charles M. Vest Tribute Book are available at <http://TransTechEnergy.org>.

Overall, the first five TTE Conferences (2012-2016) have enabled 99 pitches for funding by startup companies and commercializable projects representing 15 states, though mostly from PA, OH, and WV. Technologies pitched include robotics, sensors and controls, energy efficiency, water treatment, waste heat recovery and use, automotive engines, compressors, renewable energy, electric vehicles, biofuels and products, CO₂ capture, productive uses of CO₂, advanced materials, health and safety, and more.

- WVDOE's primary role in energy emergency planning is as the energy emergency liaison between the state of West Virginia and the U.S. Department of Energy. The office also works in collaboration with the WV Public Service Commission, WV Division of Homeland Security and Emergency Management (WVDHSEM) and WV Voluntary Organizations Active in Disaster (VOAD) to maintain current energy emergency response capability by continuing to develop and refine the operational aspects of the State Emergency Plan as conditions warrant. Throughout the 2016 program year, staff worked with multiple state agencies to update and rewrite the WV State Emergency Operations Plan Manual, and to reassess agency roles and responsibilities. A WV DOE staff member was appointed to serve as an energy emergency assurance coordinator (EEAC) for West Virginia, and participated in a training webinar hosted by the National Association of State Energy Officials. This training was for individuals designated as an EEAC by their state. EEACs serve as points of contact during an energy emergency and in related preparedness activities and information sharing. EEAC roles and responsibilities were discussed.
- WVDOE worked with development prospects advancing coal-to-liquids and coal-to-gas projects. Low electricity costs and environmental costs have rendered coal non-competitive with natural gas. At what point natural gas infrastructure will create new markets for gas, thereby increasing the price, is not clear. This reinforces the concern for the Clean Power Plan's impact on existing plants. Innovative natural gas technologies surfaced. Developers from Pennsylvania are working on repowering projects at West Virginia's closed power plants. Financing is being sought for clean coal technology that would produce clean CO₂ as a by-product for sale to the chemical industry. Development assistance continues to be provided to coal-to-liquids projects; however, developers have not made these projects public. Coal has the potential to produce liquid fuels of higher environmental quality than petroleum. Coal-derived diesel fuel has lower particulate content than petroleum-produced diesel. Coal-derived diesel burns at a lower temperature than petroleum-derived diesel, reducing NO_x emissions. Developers of coal-derived diesel reference the health benefits of producing liquids from coal. A coal developer sponsored a test by WVU's Center for Alternative Fuels, Engines and Emissions to run tests of Chinese-produced diesel fuel from coal. The vehicle tested is the same engine and model Volkswagen that failed the EPA tests. WVU determined the coal-derived diesel can meet the emissions requirements that petroleum diesel could not.

Renewable energy

- Marshall University's Center for Environmental, Geotechnical and Applied Sciences, through its West Virginia Brownfields Assistance Center, has completed activities for "Identifying Redevelopment Opportunities on Surface-Mined Lands," funded through an Appalachian Regional Commission grant to WVDOE. This project included three initiatives, conducted during the period of March 1, 2014, through October 31, 2016.

Initiative #1: Increase Renewable Energy Research/Demonstration/Education Projects on Surface-mined Land:

■ Initiative 1, Project 1:

- **Applicant:** West Virginia Research Corporation/Appalachian Hardwood Center
- **Project Title:** "Establishment of Woody Biomass Plantings on Arch Coal Company Lands in West Virginia"
- **ARC Amount Requested:** \$28,550
- **Project Partners:** Arch Coal (property owner)
- **Project Description:** Site is located on reclaimed surface mine near Mount Storm in Preston Co, WV. Approximately fifteen acres of a 23.85-acre permitted tract, owned by Arch Coal, were used for tree planting to establish tree cover on surface mine land for short-term and long-term benefits. Short-term benefits include bio-energy feedstock production. Long-term benefits include production of hardwood timber and nut crops. The project followed Appalachian Regional Reforestation Initiative practices for soil preparation prior to planting, which includes mechanical soil ripping. Tree species planted included multiple Willow tree species and American Sycamore for short-term biomass production, hybrid chestnut, hybrid hazelnut, and Allegheny Chinkapin for nut production for energy, and Northern Red Oak, Sugar Maple, Red Maple, Black Cherry, Red Spruce and White Pine for long-term timber production. Sugar Maple was also planted for monitoring for potential future maple syrup production. A total of 12,845 trees were planted as part of this project.

■ Initiative 1, Project 2

Applicant: West Virginia Division of Environmental Protection, Division of Land Restoration (DLR)

Project Title: "Off-Grid Solar Power Installation at Former Buffalo Coal Surface Mine Site"

ARC Amount Requested: \$35,000

Project Partners: NA

Project Description: Site is located on a former surface mine near Bismarck in Grant County, WV. All surface mining operations have ceased and mining permits were revoked in September 2006. Acid mine drainage (AMD) exists at several locations, with treatment under the direction of the DLR's Office of Special Reclamation using manual lime feeding methods. AMD treatment is expected to continue at multiple locations for approximately 20 or more years. DLR has incorporated automated AMD treatment equipment, using off-grid electricity generated from solar panels

and storage batteries. The goal of the project is to automate the lime feeding station at one location to reduce labor, travel and related expenses. The project has been successfully completed, and is being monitored for potential use as a model for other AMD treatment sites in WV. A total of twelve 240-watt solar panels were installed as part of this project, including an 11.7 kW battery bank, and 6,000-watt inverter power supply. A propane generator was added for backup power needs.

■ **Initiative 1, Project 3**

Applicant: West Virginia State University

Project Title: “Southern Coalfield Woody Bioenergy Demonstration Farms”

ARC Amount Requested: \$35,005

Project Partners: Penn Virginia Resource Partners (now part of Energy Transfer Partners PVR) and Mingo County Redevelopment Authority (property owners)

Project Description: Two sites: (A) 35-acre section of the Four Mile surface mine east of the community of Hernshaw, near the Kanawha State Forest in WV; and (B) 10-acre tract within the Mingo County Wood Products Industrial Park near Holden, WV. Project goal was to develop woody bioenergy demonstration farms on 45 acres of surface mine land. Appalachian Regional Reforestation Initiative practices were followed for soil preparation prior to planting, including mechanical soil ripping. A total of 1,216 hybrid poplar trees were planted, with multiple management practices implemented in order to test and identify superior varieties of plants capable of growing in reclaimed surface mine soils. Growth rates and related factors, including macro and micro nutrient content, were monitored and recorded. Field activities included training of undergraduate students in surface mine reclamation and reforestation methodologies. The U.S. Forest Service is also analyzing plant performance from both test sites. A presentation on this study has been compiled for future presentation purposes. In addition to the hybrid poplar plantings, a total of 300 tree seedlings were planted on the Four Mile surface mine site. Tree species included Sugar Maple, Black Locust, and Hawthorn, which are being monitored for future growth.

■ **Initiative 1, Project 4**

Applicant: Central Appalachia Empowerment Zone of West Virginia (CAEZ)

Project Title: Golden Delicious Apple Project

Project Partners: West Virginia National Guard, John Hutchinson (property owner), Amhurst Industries (coal company property owner), West Virginia Department of Agriculture, and West Virginia Department of Environmental Protection

Project Description: The original site identified for this project was part of a reclaimed surface mine on property owned by Natural Resource Partners (NRP) and Consolidated Energy, located in the central part of Clay County, WV. Due to bankruptcy and related legal issues associated with the property, it was determined that the site would not be available

for use. As a result, steps were taken to secure a new former surface mine location for this project. The new property is called the Green Dale site, located in southern Clay County, on the border with Nicholas County, and is owned by John Hutchinson and Amhurst Industries, who agreed to participate in the project. The property is under the West Virginia Department of Environmental Protection's Special Reclamation Program, who partnered with CAEZ on this project to ensure reclamation efforts and future apple tree growing activities coincide. Golden Delicious apple trees were the main variety of apple tree to be planted. This apple variety was first discovered in Clay County, and was purchased by Stark Brothers in the early 1900s. The goal of this project was to establish a Golden Delicious apple orchard that will be the basis for future apple harvesting, plus long-term establishment of additional apple orchards and an apple industry in Clay County and surrounding counties. ARC funding was used solely for purchase of apple tree seedlings. Trees were delivered in the Spring of 2016. The first phase of the tree planting occurred in late April and early May 2016. A total of 1,800 trees were planted. A second planting was performed in the autumn months of 2016. An additional 652 trees were planted. Installation of an electric fencing system was also completed. As a result of this project, the WV Guard has begun a large-scale apple tree planting operation in adjoining Nicholas County. Up to 100,000 apple trees are anticipated to be planted, also utilizing former mine land area. As much as 500 acres of land has been made available, and the WV Guard intends to use displaced coal miners and veterans for various labor tasks.

■ **Initiative 1, Project 5**

Applicant: Williamson Health and Wellness Center

Project Title: Veteran Agriculture on Surface Mine Lands

ARC Amount Requested: \$10,000

Project Partners: Mingo County Redevelopment Authority, Wounded Warriors

Project Description: The project included the utilization of 1.5 acres of former surface mine property, owned by the Mingo County Redevelopment Authority (MCRA), located in Mingo County near the community of Newtown, WV. This property is part of a 20-acre site owned by MCRA, and is located near Mingo Central High School and adjacent to the King Coal Highway. The former surface mine site was reclaimed using traditional soil compaction techniques, with surface soils currently of poor quality for agriculture use. Soils were loosened and amendments added to enrich the quality of the soil for future agriculture use. Efforts included education and training of veterans for future farming pursuits. Results are being used for future agriculture-based redevelopment of former surface mine lands in Mingo County and southern WV. The MCRA has donated the land for this project, which has access to water, sewer, and electric. Crops planted on the site include blueberries, watermelon, and raspberries, which have and will be sold seasonally at the local farmers' market and associated locations throughout Mingo County. Hay is also being grown on part of the property, to be sold locally.

■ Initiative 1, Project 6

Applicant: West Virginia State University

Project Title: Off-grid Solar Power System for Aeroptic High Tower Gardens

ARC Amount Requested: \$26,445

Project Partners: WV National Guard

Project Description: An off-grid solar power with battery energy storage system was installed on a high tunnel, located on a reclaimed valley fill approximately 3 acres in size, part of a large surface mining complex in southeastern Kanawha County near the WV Turnpike (Interstate 64/77). The high tunnel houses up to 20 aeroptic tower gardens, used to grow a multitude of crops, including lettuce, leafy greens, peppers and various herbs. Crops grown are to be used by the WV National Guard. The high tunnel will be managed by West Virginia State University Extension Service staff, plus personnel from the WV National Guard and veterans in the local area. ARC funding was used for installation of the solar panel array with battery energy storage to power pumps and equipment within the high tunnel. The solar panel array was installed during the final project reporting period, and will be operational for the start of the 2017 growing season. Training for solar array maintenance was also conducted on the system; training provided by a WV-licensed contractor.

Initiative #2: Identify Wind Feasibility Indicators for Wind Projects on Surface-mined Sites:

Initiative Summary of Activities: Sonic Detection and Ranging (SODAR) studies have been completed during this project timeframe at three surface mine land locations. The SODAR technology used (Triton Wind Profiler, manufactured by Second Wind, now Viasala) records wind speed and wind direction at altitudes ranging from 40 meters to 200 meters above the earth's surface. This data can then be utilized to assess wind energy generation potential at that location. A summary of each site evaluated during the project performance period is provided below.

- ICG Arch Coal, Cowen, Webster County, WV: SODAR equipment was placed on this site on November 11, 2013, and operated until June 24, 2014. This site had been evaluated previously by CEGAS using SODAR equipment; however, recordings during the winter and early spring months, when average wind speeds are normally at their highest, had not been performed. Results of this study were compiled with data from the previous study to estimate yearly wind speed averages and associated wind energy outputs.
- Bolt Mountain, Wyoming County, WV: This location was in an active rock quarry, and while not a surface mine site, was located in close proximity to multiple contour surface mine land properties. SODAR equipment operated on the site from June 25, 2014, through March 30, 2015.
- Bechtel Boy Scout Summit, Fayette County, WV: The Bechtel Boy Scout Summit is located in an area near multiple surface mine locations. SODAR equipment was placed in the Garden Grounds ridgeline section of the facility, operating for a full 12-month period (March 31, 2015, through March 29, 2016). Collected data was

shared with Boy Scout personnel for their use in future renewable energy-related initiatives and educational use.

Initiative #3: Develop and Provide Re-use Options and Opportunities on Properties on Former/Existing Surface-Mine Lands

Initiative Summary: During the project timeframe, multiple surface mine properties were evaluated. From these efforts, information sheets were compiled on a total of 21 surface mine locations that may have potential and realistic future use for new development. These information sheets include data on various existing site features, property owner, location, size, site amenities, etc. These information sheets also include information on potential deep mine aquifers beneath the surface mine site, mine pools that might be utilized in the future as a water source for industrial, commercial and/or related use. CEGAS interacted with WVDEP's Office of Water Resources (OWR) and their initiative on deep mine pool water quality studies. Information on the 21 surface mines compiled by CEGAS was used as a basis for OWR's deep mine pool studies. Water quality studies were completed on deep mine pool water quality information associated with six of the specified locations during the project timeframe. Additional water quality studies are currently underway by OWR. CEGAS has met and interacted with multiple agencies, property owners, companies and groups to discuss opportunities for surface mine redevelopment throughout the project timeframe. Numerous sites offer potential for new developments. Below are three example sites of interest:

- 1. One site of prominent interest is the Hobet mining complex (now Rock Creek Park), located in Boone and Lincoln counties. This +12,000-acre complex, situated next to Corridor G (Rt. 119) includes both reclaimed and existing mine land areas, and contains a major road network throughout. CEGAS has conducted multiple site visits, and has compiled site data and associated mapping for use by the WV Development Office and associated agencies and entities for future development. Drone flights were conducted by CEGAS for aerial videos and photos on several sections of the property. 3D visualization on select sections of the property, using current site topography and existing road network, were conducted, displaying potential property uses available. Visualization subjects included warehousing, manufacturing, agriculture and business parks. Future site plans include transferring surface ownership to the WV Economic Development Authority for future industrial, commercial, residential and related developments. Videos of drone flights conducted are available by contacting CEGAS.
- 2. A second site of significant interest is the Hill Fork/Hewitt Creek site, located in Boone County near Julian. This surface mine, currently owned by ERP Compliant Fuels LLC is nearing completion of mining activities. Post mine land use is permitted for industrial use; multiple flat areas are included as part of the final reclamation plan. Site access is directly off Rt. 119. Drone flights were conducted by CEGAS for aerial videos and photos across the property. After reclamation activities are complete, the site should have excellent potential for new development, including industrial and commercial use. Videos of drone flights conducted are available by contacting CEGAS.
- 3. A third prominent surface mine site evaluated as part of this initiative was the Argus Energy mining complex in Wayne County (and a small section in Lincoln

County). This area includes several thousand acres of property, owned by various entities, where surface mining has ceased (since early 2014). Future mining is not expected to occur, and Argus Energy has entered discussions with the Wayne County Economic Development and CEGAS on future use of the properties for recreation and agriculture uses. CEGAS collected initial site information, and toured the properties, collecting additional site data, plus interacting with entities involved to determine a path forward for potential future use of this now idled mine land area. An information package was not compiled for this site, as the Hatfield McCoy Trails organization, as a result of these initial efforts, toured the property and is currently documenting existing trails and roads. This information will be used in evaluating options for inclusion of a large-scale off-road all-terrain vehicle park and trails network in the area.

- WVDOE works with the WVU Division of Forestry (DOF) and the hardwoods industry on utilizing West Virginia hardwoods as an energy resource. Wood pellets, co-firing of wood and coal, combined heat and power systems for kiln applications, bio oil from wood and residue-fired power plants have been promoted at wood focused conferences. Energy from wood remains relevant, especially in residential and small commercial applications. WVDOE has supported an annual survey of primary and secondary wood producers from West Virginia and adjacent counties in neighboring states to maintain a listing of wood residues available for resale. WVU DOF makes this information available to the industry. West Virginia's three wood pellet manufacturers add to the diversity of the state's energy production and produce pellets for regional markets. Wood pellet use has been on the agenda of the Governor's Energy Summit and was a focus of a Morgantown conference. Wood pellet use in the European Union has provided a strong regional market. Through a collaboration with West Virginia's timber industry and WVU, WVDOE has supported planting hardwood trees on surface-mined lands. Funded through the Appalachian Regional Commission (and referenced earlier in this report), these projects add to the diversity of West Virginia's forest resources. Typical plantings are 20 acres or less.
- For the past several years West Virginia has had two wind projects with exempt wholesale generator (EWG) permits from the West Virginia Public Service Commission (PSC) but had not begun construction. One project, New Creek in Grant County, was recently sold by AES, the owners of the existing Laurel Mountain project in Randolph/Barbour counties, to Everpower, a wind developer. This project has now been sold to Enbridge and is under construction. The 103 megawatt (MW) project will include up to 49 wind turbines on an approximate 5,000-acre area. The project will be located along a ridgeline used as recreational land with a point of interconnection located onsite.
- West Virginia's first grid-scale solar project has been submitted for EWG approval to the PSC. This project is a 5.9-MW system at Sam Black Church in Greenbrier County. The developer, Solar Thin Films (STF) led by Jim Solano, plans two additional projects in West Virginia as well. Solano's West Virginia partner is from Summersville. The developer continues to work with WVDEP on the necessary permits.
- Advanced Hydro Solutions is advancing two new hydro projects in West Virginia, one at Jennings Randolph Lake and the other at the Tygart Dam. Both sites are Army Corps of Engineers' installations. The project at Jennings Randolph Dam is on the North Branch of the Potomac River. The license for 14-MW project was issued at the

end of March 2012. The second project is on the Tygart Dam. The final license for this 30-MW project was issued in 2016. The permit includes 1.55 miles of 138 kilovolt (KV) transmission lines.

Energy efficiency

- WVDOE continues to partner with the Home Builders Association of West Virginia (HBAWV) to ensure that builders are trained in the new energy codes. Several municipalities in WV with code officials have been requesting training sessions as code officials begin implementing the residential 2009 International Energy Conservation Code as an integrated part of the standard building permit. WVDOE has been working with the WV ASHRAE Chapter (a commercial energy standards group) and the WV Fire Commission codes committee, as there is consideration in adopting the 2015 International family of building codes. WVDOE also recognizes the importance of educating other segments of West Virginia’s built community including architects, code officials, affordable housing entities, home inspectors, realtors and appraisers, as well as the general public, through home shows and retail outlets. In September 2016, a series of five International Energy Conservation Code (IECC) training classes were held around the state. Participants learned which codes to use, impact on energy use and upfront costs; basics of building engineering; building envelope, sealing and pressure tests; lighting; HVAC; and commissioning. In addition, ResCheck software workshops were provided to 132 building professionals throughout West Virginia.
- WVDOE works with the WV Manufacturing Extension Partnership (WVMEP) to perform carbon footprint (ISO 13000) evaluations, providing efficiency and operational improvement recommendations to manufacturers. More than 70 professionals, including engineers, provided hands-on technical assistance to 20 manufacturers, retailers, and other commercial entities throughout the state, conducting energy audits and carbon footprint studies. Estimated potential savings through these projects are more than 11,000,000 kWh and \$370,000, encompassing over 5,000,000 ft² of building area. Individual projects are outlined in the table below.

Company	Location	Potential Savings (KWh)	Space audited (ft ²)	Potential lean process Savings (\$)
Simex	St. Marys	1,233,422	250,000	\$50,000
Simonton Windows	3 locations	1,029,456	455,000	\$110,000
Skana Aluminum	Clarksburg	447,699	110,000	\$10,000
West Electric	Morgantown	19,000	10,000	\$5,000
Brunetti Bakery	Kenova	15,000	54,000	\$5,000
Terramite	Cross Lanes	41,000	60,000	\$10,000
Braskem	Kenova	4,373,840	2,613,600	\$25,000
Automated Merchandising*	Keyser	39,280	76,000	\$10,000
Mohawk-Unilin	Holden	906,062	150,000	\$15,000
Service Pump	Huntington	100,282	4,000	\$5,000
Continental Brick	Martinsburg	295,729	500,000	\$5,000
Touchstone Labs	Triadelphia	175,192	70,000	\$10,000
Gilco Lumber	Roderfield	261,297	132,000	\$5,000

Technocap*	Glen Dale	511,330	243,000	\$10,000
Allied Logistics*	Six locations	910,074	1,222,700	\$10,000
Real Alloy	Friendly	1,153,422	334,000	\$10,000
Huntington Plating	Huntington	66,000	27,000	\$15,000
WV Wilson Glass	Wheeling	103,669	70,000	\$10,000
AMS Vendors*	Kearneysville	39,280	76,000	\$50,000
Greenfield Cabinetry*	Elkins	85,319	50,000	\$5,000
Total		11,806,353	5,284,600	\$375,000

*Audit performed in FY15, but report completed in FY16

- WVDOE worked with WVMEP to cost-share a WVMEP representative at Southern W.Va. Community and Technical College (SWVCTC). This agent will identify/assist manufacturers in Logan, Mingo, Boone, Lincoln, McDowell, and Wyoming counties.
- Through the Industrial Assessment Center and the WVU College of Industrial and Management Systems Engineering, WVDOE supports energy assessments for West Virginia businesses meeting certain energy use criteria, including annual energy costs greater than \$100,000 but less than \$2 million. To date, the Industries of the Future program has performed energy assessments for companies such as Homer Laughlin China and Steel of West Virginia, two of West Virginia's largest employers, and has assessed energy costs for a tofu manufacturer and energy use in commercial chicken houses. A total of 16 energy and E3 assessments were conducted for manufacturing facilities throughout WV. These projects provided learning opportunities for 50 graduate engineering students. Total floor area audited was 2.92 million ft² and recommended annual energy savings total 7.95 million kWh, 57,627 MMBtu and \$914,417 in annual costs. In collaboration with WVMEP, three industrial E3 assessment reports were prepared for Continental Brick Co. One E3 assessment was completed for Automated Packing Systems and six E3 assessments were done for multiple Allied Logistics sites (Parkersburg, Kenova, Huntington, Greenfield, Techo Cap and Automated Merchandising).
- WVDOE received notification of USDOE's 2016 State Energy Program Competitive Grant Award in the amount of \$75,000 to increase industrial stakeholder participation in statewide energy efficiency and emissions technical assistance. This is the first time WV has received an award from this highly competitive funding stream.
- Through a partnership with the College of Mechanical and Aerospace Engineering (MAE) at West Virginia University (WVU), the Projects with Industry program uses senior-level engineering students to provide no-cost energy services and technical assistance to West Virginia businesses. Participating students receive credit in two three-credit-hour classes offered in senior design by the MAE. Projects focus on process and technological improvements. During the SEP program year ending Sept. 30, 2016, more than 27 students participated in projects involving energy audits, a public transit project and a robotic device design project manufacturers, commercial establishments, school districts and municipalities. Estimated potential savings through these projects is more than 2,000,000 kWh and \$400,000, encompassing more than 600,000 ft² of building space. In Spring 2016, six students completed a project to design a robotic device for B&E Aerospace, to improve the manufacturing of their aircraft deicer products. Students participated in an energy efficiency study on the WVU PRT Rapid Transit System during the fall of 2015. Four students completed projects at

Ambit Power Plant in Grant Town, WV, to determine the best methods to improve efficiency of the plant that uses waste coal. Of particular interest is utilization of ammonia to lower nitrous oxide emissions. A team of six students has been working with Ohio County Schools to complete a detailed energy audit on the elementary and middle schools. Five students are currently working on an energy efficiency project of Aurora Flight Sciences, in Bridgeport, WV, to improve composite processes, hampered by humidity in composite chambers for aerospace applications. A team of six students has begun working with Simex Corporation in St. Marys, WV, to improve material handling of extruded window frames. The company spends over \$200K a year on pallet frame damages. Students will be designing a new pallet system.

- In the program Energy Conservation in K-12 Schools, meetings with the WV School Building Authority focused on energy efficiency issues in public school facilities including qualified energy conservation bonds, energy performance contracting, and high performance building design, with two workshops planned for January and July 2017.
- WVDOE partners with the Center for Business and Economic Research (CBER) at Marshall University to develop and disseminate a quarterly newsletter, the Energy Efficiency and Renewable Energy (EE & RE) Tracker. This publication educates West Virginians on energy efficiency and renewable energy, announces workshops and conferences, provides consumer information on energy-related building products and services and helps establish a core competency in energy efficiency throughout West Virginia. Four quarterly editions of the EE/RE Tracker were developed and distributed to more than 1,300 recipients per quarter.

Transportation

- A U.S. Department of Agriculture Biofuel Infrastructure Partnership Grant to West Virginia in the amount of \$2.5 million will expand the use of ethanol blends E85 and E15 through the installation of 107 dispensers at 22 fueling stations throughout the state. Construction on this project began November 2016 and is slated to be completed by June 30, 2017. Monitoring of this grant will continue through February 2022.
- WVDOE's W.Va. Clean State Program (WVCS) partnered with WVU's National Alternative Fuels Training Consortium (NAFTC) to host alternative fuel and vehicles workshops in the state. The first, March 24, 2016, as part of EXPO, presented an electric vehicle workshop at the 2016 W.Va. Construction & Design Exposition (Expo) in Charleston. On 6/15/16, WVCS participated in "Electric Drive Vehicles and Electric Vehicle Supply Equipment Workshop" in Hinton, WV, presenting "Making It Happen In WV - Electric Vehicles and Electric Vehicle Supply Equipment Workshop." WVCS has provided technical support to its host agency, the W.Va. Division of Energy, and to the W.Va. Division of Natural Resources (WVDNR) since January 2016 on a project that will result in the installation of Level 2 EVSE at all nine state parks in West Virginia that have lodges. Among the 35 attendees were personnel from nearly every affected state park. WVDNR's slogan for the project is "Plug in While You Are Unplugged" at a state park. Chargers will be available at no cost to lodge guests. WVDNR reports that all chargers have been procured and two are installed, and operational, at Pipestem State Park, and one each at Twin Falls, Tygart Lake and Cacapon parks.

- On 9/21/16, W.Va. Clean State Program presented at the 2016 WV Department of Transportation/Metropolitan Planning Organization/Federal Highway Administration Planning Conference at Chief Logan Conference Center in Logan, WV, with around 70 people in attendance. The presentation focused on alternative fuels and vehicles in the state with an emphasis on electric vehicles.
- W.Va. Clean State Program collected alternative fuel and vehicle use data points from stakeholders for inclusion in the program's annual report, submitted to U.S. Department of Energy on 03/15/2016. Stakeholders improved gasoline gallon equivalent reductions by 57 percent compared to 2014, from 341,404 to 536,827. Additionally, the state of West Virginia's vehicle fleet included 21 compressed natural gas (CNG) vehicles, 2,843 flex fuel vehicles that can use E85, and 14 hybrids.
- WVDOE's W.Va. Clean State Program has begun a tracking project on the number and type of alternative fuel vehicles registered with the W.Va. Department of Motor Vehicles. As of Feb. 2, 2016, there were 147,642 vehicles including 8,328 hybrid vehicles, 89 all-electric vehicles, 243 plug-in hybrid vehicles, 138,893 high content ethanol-capable vehicles, 81 compressed natural gas vehicles and eight propane vehicles. WVDOE is tracking trends for each type of vehicle.
- Electric vehicle (EV) chargers were installed on the campus of Shepherd University and are now featured on the school website with their own dedicated page (suieps.org/ev-chargers/) and were highlighted as part of Earth Day 2016 events. The chargers are also now integrated with the ChargePoint EV charging station network and usage data such as energy usage (kWh) and greenhouse gas savings (GHG, kg) are being collected. A total of 15 unique drivers/vehicles have used the charging stations. The monthly data is being collected and analyzed. Preliminary data for 2015 showed a peak in the month of July. The chargers are also being used as demonstrations to enhance the curriculum of energy unit in introductory environmental science course with twenty students.
- On 4/25/16, W.Va. Clean State Program participated in the 2016 Earth Day event at W.Va. State University in Institute, WV. Stakeholders exhibited several electric vehicles. WVCS distributed 2016 alternative fuels and vehicles guides, stickers and bookmarks to around 25 participants.
- WVCS participated in the Clean Cities Buddy System, created in 2010 by the U.S. Department of Energy's Clean Cities program, by providing weekly support and resources to the Palmetto State (South Carolina) Clean Fuels Coalition.
- WVCS participated in the 2016 National Clean Cities Coordinator Training Workshop at Oak Ridge National Laboratory.