



# CLEAN TENNESSEE ENERGY GRANT EXTERNAL RECIPIENT PROJECTS

## FY19 ANNUAL REPORT

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

OFFICE OF POLICY AND SUSTAINABLE PRACTICES

312 ROSA L. PARKS AVENUE, 2<sup>ND</sup> FLOOR

NASHVILLE, TN 37243

# Executive Summary

## Background

In 2011, Tennessee and several other states were awarded financial compensation from a settlement with the Tennessee Valley Authority (TVA) relating to violations of the federal Clean Air Act. A part of the consent decree obligated TVA to provide Tennessee with \$26.4 million to fund energy reduction and air quality improvement projects during a five-year grant process. The Tennessee Department of Environment and Conservation (TDEC) was designated by the Governor as the lead state agency to develop and manage a process for selection and implementation of these projects for Tennessee. TDEC determined that the purpose of the grant would be to provide capital for eligible entities to conduct activities that promoted social, economic, and environmental well-being in the state of Tennessee.

## Cause and Effect

By providing technical assistance and financial resources to these communities, we know that informed citizens and municipalities have leveraged additional resources to strengthen social, environmental, and economic goals. TDEC knows that the State's communities, both big and small, deserve the opportunity to be practitioners of sustainability and to create a more environmentally friendly, resource-conscious, and healthier state.

As designed by TDEC, the Clean Tennessee Energy Grant (CTEG) identified and funded projects that result in emissions reductions, utilization of new technology, and support of environmental and economic goals across the state. The CTEG provided financial assistance to municipal government, county government, utility districts, and other entities created by statute (e.g. airport authority, housing authority) in Tennessee to purchase, install, and construct projects that fit into one of the following categories:

- **Clean Alternative Energy:** Examples include biomass, geothermal, solar, wind
- **Energy Conservation:** Examples include lighting, HVAC improvements, improved fuel efficiency, insulation, idling minimization, wastewater treatment technologies
- **Air Quality Improvement:** Reduction of Carbon Dioxide (CO<sub>2</sub>), Sulfur Dioxide (SO<sub>2</sub>), Volatile Organic Compounds (VOCs), Oxides of Nitrogen (NO<sub>x</sub>), Hazardous Air Pollutants (HAPs), and Greenhouse Gases

## Selection Process

A total of six rounds of grants were awarded from FY2012 through FY2017. Each fiscal year, a percentage of the total grant funding was allocated for disbursement by the department. A portion of those annual funds were set aside for municipal governments, county governments, utility districts, and other entities to apply. The remaining portion of the grant funded energy efficiency projects within various State facilities.

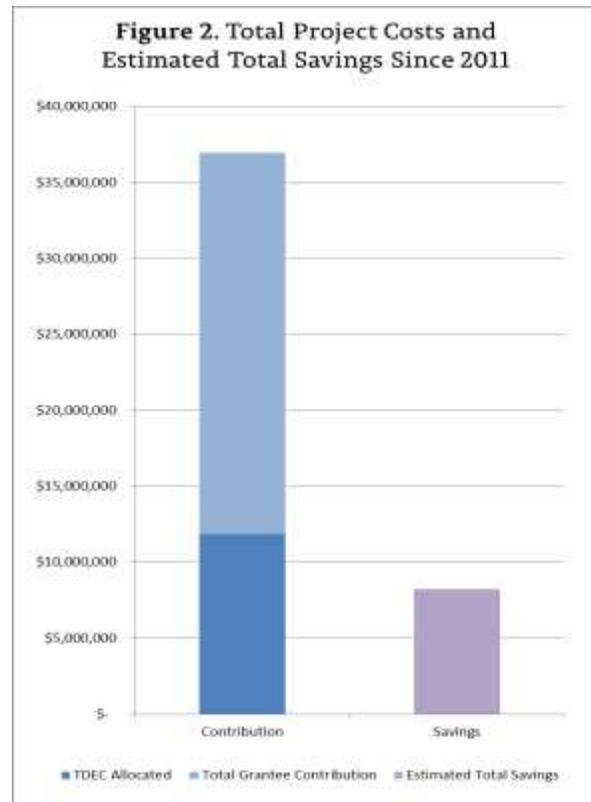
Several factors were considered during the process of selecting projects for funding. First, a project was required to meet the criteria outlined in the settlement; specifically, the applicant needed to demonstrate that the project would result in a reduction in energy usage and subsequently a decrease in harmful greenhouse gas emissions. Projects were also prioritized

based upon return on investment. Applicants were required to submit calculations showing the estimated energy cost savings. These savings were compared to total project cost to calculate each project's simple payback period. Lastly, special consideration was given for those projects located in economically distressed counties and communities<sup>1</sup>. Investment in these communities can provide an economic stimulus for some of the state's most disadvantaged communities and more specifically, can result in improvements to built infrastructure. Figure 1 shows the distribution of the funds within the ninety-five counties across Tennessee since 2011.

## Financial and Environmental Impacts

As shown in Figure 2, since 2011 TDEC has awarded nearly \$12 million in funding to 122 external grantees. Grant recipients were required to provide at least a 50% match, which resulted in the leveraging of an additional \$25.1 million in funds or in-kind contributions, such as volunteer labor, materials, equipment, and professional fees, in support of alternative energy, energy efficiency, and air quality improvement projects. Since 2011, grantees have avoided an estimated **\$9.5 million**<sup>2</sup> in energy costs as a result of projects funded through CTEG awards. Most grantees have experienced or anticipate payback periods ranging from one to ten years.

Energy efficiency projects reduce energy consumption, which in turn reduces the need to generate power. Depending on generation source, the process of generating power can result in production of harmful air emissions, such as CO<sub>2</sub>. Grantees have eliminated large amounts of these harmful air pollutants through innovations in the built environment by integrating renewable energy technology, and efficiency measures into new-builds and rehabilitation projects. Since the inception of the grant, these projects have improved the efficiency of energy consumption resulting in the cumulative reduction of energy demands by more than **93.7 million kilowatt-hours (kWh)**<sup>3</sup> and CO<sub>2</sub> emissions by more than **73,000 tons of carbon dioxide equivalents (CO<sub>2</sub>e)**.<sup>4</sup>



<sup>1</sup> Distressed counties rank among the 10 percent most economically distressed counties in the nation as defined by the Appalachian Regional Commission. See the [Transparent Tennessee County Economic Status Map](#) for additional information.

<sup>2</sup> Based upon data provided by grantees in Annual Energy Savings Reports. Cost savings based upon [US Energy Information Association](#) data.

<sup>3</sup> Based upon data provided by grantees in Annual Energy Savings Reports.

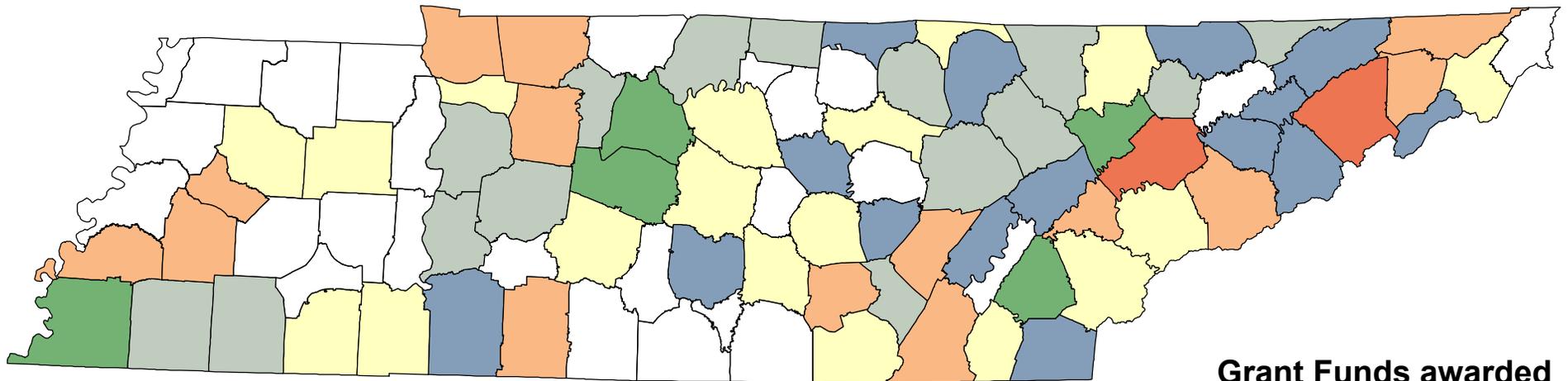
<sup>4</sup> [EPA Greenhouse Gas Equivalent Calculator](#) converted usage data to CO<sub>2</sub>e

## Appendices

Appendix I of this report provides tables that detail the costs and estimated and actual savings for each of the projects selected from Round 1 through Round 6. These savings are based on data provided by grantees in their annual reports.

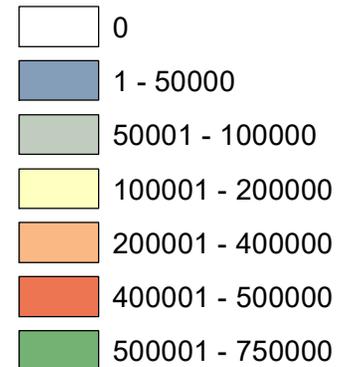
Appendix II of this report provides summaries describing each energy saving project that is being completed and the benefits it will provide to the grantee's operations or community.

# Clean Tennessee Energy Grant Annual Report FY 2012 - FY 2017 External



**Grant Funds awarded**

**per county**



**Clean Tennessee Energy Grant Annual Report  
FY 2012-FY 2017**

County	Funding
<b>\$1 - \$50,000</b>	
Clay	\$ 4,997.26
Unicoi	\$ 6,970.00
Rhea	\$ 10,000.00
Polk	\$ 12,459.50
Roane	\$ 14,274.00
Jefferson	\$ 14,445.00
Fentress	\$ 14,804.25
Bedford	\$ 15,000.00
Van Buren	\$ 16,391.00
Dekalb	\$ 18,928.00
Cocke	\$ 19,095.00
Wayne	\$ 20,025.00
Henderson	\$ 23,900.00
Hamblen	\$ 27,506.85
Hawkins	\$ 32,486.00

County	Funding
<b>\$50,001 - \$100,000</b>	
Claiborne	\$ 50,000.00
Hardeman	\$ 51,950.00
Cumberland	\$ 52,801.30
Cheatham	\$ 56,174.00
Union	\$ 61,410.00
Humphreys	\$ 62,500.00
Fayette	\$ 66,530.00
Overton	\$ 67,247.50
Sequatchie	\$ 69,367.00
Madison	\$ 70,676.18
Bradley	\$ 71,309.24
Macon	\$ 75,043.50
Hancock	\$ 78,012.00
Scott	\$ 78,599.22
Hickman	\$ 87,500.00
Sumner	\$ 88,018.50
Morgan	\$ 93,490.96

County	Funding
<b>\$100,001 - \$200,000</b>	
Perry	\$ 93,950.00
Dyer	\$ 110,834.00
Hardin	\$ 112,300.74
Coffee	\$ 121,392.10
Houston	\$ 123,900.00
Pickett	\$ 126,000.00
Warren	\$ 128,253.00
Wilson	\$ 140,000.00
Blount	\$ 149,863.00
Marion	\$ 151,854.00
McNairy	\$ 172,381.50
Rutherford	\$ 173,212.35
Gibson	\$ 173,450.00
Carter	\$ 176,000.00
Carroll	\$ 180,797.85
Campbell	\$ 189,830.00

County	Funding
<b>\$200,000 - \$400,000</b>	
Maury	\$ 193,909.78
Lauderdale	\$ 211,908.34
Monroe	\$ 227,500.00
Haywood	\$ 232,623.00
Tipton	\$ 250,000.00
Dickson	\$ 265,362.00
Bledsoe	\$ 282,725.00
Sevier	\$ 284,790.98
Lawrence	\$ 298,100.00
Stewart	\$ 317,500.00
Grundy	\$ 324,144.00
Crockett	\$ 350,000.00
Hamilton	\$ 364,447.87

County	Funding
<b>\$400,001 - \$500,000</b>	
Loudon	\$ 371,261.00
Sullivan	\$ 400,605.20
Putnam	\$ 407,224.38
Knox	\$ 425,438.02
Greene	\$ 443,797.00

County	Funding
<b>\$500,001 - \$750,000</b>	
Montgomery	\$ 450,000.00
McMinn	\$ 534,038.63
Davidson	\$ 550,920.77
Anderson	\$ 610,333.46
Washington	\$ 633,995.00
Williamson	\$ 667,448.61
Shelby	\$ 749,150.00

74 Counties  
133 grants  
**\$ 13,625,491.84**

# APPENDIX I

**ROUND 1  
FY 2012 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Calfee River Farms</b> McMinn County	Installation of a 49.92 kW roof-level solar photovoltaic system	11/15/2012	\$166,037	\$5,581	55,808	39	29.8	\$5,874	58,743	46	28.3
<b>Campbell Crossing, LLC</b> Montgomery County	Implementation of E3 Next Generation Energy Management Service to track utility billing and energy consumption at 622 dwelling units	3/31/2013	\$528,000	\$73,059	872,200	613	7.2	\$206,400	2,063,999	1,609	2.6
<b>City of Athens</b> McMinn County	Installation of 50 kW solar arrays at various locations in the City including City Hall, Public Works Center, and Keep McMinn Beautiful Earthen Center Office	7/31/2013	\$547,000	\$13,711	137,117	96	39.9	\$58,546	292,474	228	9.3
<b>City of Brentwood</b> Williamson County	Replace two boilers at the Brentwood Public Library	8/8/2013	\$97,135	\$12,055	349,078	71	8.1	\$37,038	370,380	289	2.6
<b>City of Chattanooga</b> Hamilton County	Installation of variable frequency drive (VFD) units on four oxygenation tank mixers at their wastewater treatment plant	7/31/2014	\$399,962	\$325,609	7,168,054	5,038	1.2	\$342,824	4,191,052	3,267	1.2
<b>City of Covington<sup>1</sup></b> Tipton County	Waste Biomass Gasification-to-Energy project to offset treatment plant operating cost using municipal wood waste as feedstock	7/31/2014	\$2,262,505	\$150,000	550,000	409	15.1	\$82,324	36,000	28	27.5
<b>City of Johnson City</b> Washington County	LED lighting upgrade and blower replacement at wastewater treatment plant	7/31/2014	\$300,777	\$83,574	1,044,680	779	3.6	\$124,684	1,547,610	1,206	2.4
<b>City of Kingsport</b> Sullivan County	Three zero-emission Nissan LEAF electric vehicles and two electric vehicle charging stations	3/1/2014	\$98,730	\$3,514	19,100	5	28.1	\$2,329	36,592	29	42.4
<b>Debord Family Partnership</b> Hamblen County	Installation of an 11.73 kW solar photovoltaic array on the rooftop of an historic building in downtown Morristown	9/17/2012	\$55,014	\$3,035	14,117	11	18.1	\$982	9,823	8	56.0
<b>Maury Regional Medical Center</b> Maury County	LED lighting upgrade in the Regional Hospital and the Plaza Building	12/31/2012	\$841,288	\$198,371	2,274,279	1,762	4.2	\$282,894	2,173,874	1,695	3.0
<b>Metro Water Services</b> Davidson County	Replace 13 outdated HVAC units and old ductwork throughout the Omohundro Water Treatment Plant	11/12/2012	\$247,422	\$3,570	35,700	28	69.3	\$6,580	94,000	73	37.6
<b>Northeast Knox Utility District</b> Knox County	Upgrade high efficiency pumps and motors equipped with new variable frequency drives at their wastewater treatment plant	7/4/2013	\$1,490,708	\$25,000	357,744	277	59.6	\$16,854	240,777	188	88.4
		<b>TOTAL</b>	<b>\$7,034,578</b>	<b>\$897,078</b>	<b>12,877,877</b>	<b>9,128</b>	<b>7.8</b>	<b>\$1,167,330</b>	<b>11,115,325</b>	<b>8,665</b>	<b>6.0</b>

1. Funds may be refunded. City is interested in selling equipment

**ROUND 2  
FY 2013 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>City of Cleveland</b> Bradley County	Reroof the South Cleveland Community Center with a thermoplastic polyolefin roof over 1-inch thick poly-insulation	4/1/2014	\$150,000	\$16,181	161,810	125	9.3	\$5,717	57,174	47	26.2
<b>City of Elizabethton</b> Carter County	Installation of two high-efficiency treatment systems with new rotary aerators, motors, and submersible mixers at the waste treatment plant	3/1/2015	\$352,000	\$20,826	213,600	165	16.9	33,784	482,629	376	10.4
<b>City of Gatlinburg</b> Sevier County	Replace 124 400-watt metal halide bulbs with 250-watt inductive lighting fixtures in the Great Hall of the Gatlinburg Convention Center	12/31/2013	\$61,923	\$11,248	140,601	109	5.5	\$3,948	39,475	32	15.7
<b>City of Middleton</b> Hardeman County	Replace motors and self-priming centrifugal pumps with variable frequency drives and vertical turbine pumps at wastewater treatment plant	4/30/2015	\$130,000	\$3,780	50,232	35	34.4	\$11,423	163,180	127	11.4
<b>City of Oak Ridge</b> Anderson County	Replace fluorescent lighting with LED lighting at the Civic Complex Center and Municipal Building	4/1/2015	\$600,000	\$50,000	250,000	194	12.0	\$21,357	213,568	166	28.1
<b>Clinton Utilities Board</b> Anderson County	Replace motors and self-priming centrifugal pumps with variable frequency drives and vertical turbine pumps at wastewater treatment plant	6/30/2015	\$863,920	\$21,900	271,650	210	39.4	\$16,604	237,200	195	52.0
<b>Cumberland County</b> Cumberland County	Retrofit several existing buildings with energy efficient lighting, network thermostats, and install a solar array	5/31/2014	\$105,602	\$14,952	12,808	10	7.1	\$16,563	165,630	129	6.4
<b>Cumberland Utility District</b> Cumberland County	Retrofit the 61-year old water treatment plant to include insulated roofing, efficient windows, and new HVAC system	7/31/2016	\$500,000	\$126,840	1,454,000	1,126	3.9	\$21,706	310,090	242	23.0
<b>Duck River Utility Commission</b> Coffee County	Retrofit the wastewater treatment plant with LED lighting, efficient windows, window film, and hybrid water heater	12/14/2014	\$75,000	\$11,942	173,122	134	6.3	\$7,000	70,000	55	10.7
<b>Hardin County Fairgrounds</b> Hardin County	Replace 220 34-watt bulbs with new 17-watt energy efficient lights, installation of a new HVAC system, and upgraded roofing at Hardin County Fairgrounds site	6/30/2015	\$75,000	\$2,244	17,962	14	33.4	\$1,759	17,590	14	42.6

**ROUND 2  
FY 2013 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Knoxville Utilities Board</b> Knox County	Installation a new "Cool Roof" and upgraded insulation at the Knoxville Fleming Training Center	7/31/2014	\$175,000	\$1,230	20,364	16	142.3	\$8,643	123,468	96	20.2
<b>McMinn County</b> McMinn County	Installation of 96 geothermal wells for new HVAC system at McMinn County Justice Center	6/1/2014	\$1,162,000	\$45,000	750,000	581	25.8	\$3,900	65,000	51	297.9
<b>Metropolitan Nashville Airport Authority</b> Davidson County	Installation of 50-kilowatt solar-array and electric vehicle charging stations at their covered parking area	6/30/2015	\$372,500	\$5,500	60,500	47	67.7	\$5,789	57,894	45	64.3
<b>Sumner County Government</b> Sumner County	Replace 1,133 fluorescent tubes with LED lights and 12 sodium lights with Light Emitting Plasma (LEP) lights, installation of new HVAC and Building Automation System at the Criminal Justice Center	6/30/2015	\$148,977	\$14,513	130,929	101	10.3	\$13,682	272,750	213	10.9
<b>Sweetwater Utility Board</b> Monroe County	Replace existing pumps and electrical switch gear with new pumps that have high efficiency motors controlled by variable frequency drives	6/15/2016	\$2,444,000	\$15,000	140,525	109	162.9	\$2,682	38,315	30	911.3
<b>Town of Ashland City</b> Cheatham County	Upgrade water and wastewater treatment plant including replacing two HVAC units, installation of LED lighting, installation of high-efficiency Variable Frequency Drives	6/30/2015	\$106,300	\$19,200	172,968	134	5.5	\$674	9,624	8	157.8
<b>Transportation Management Association Group</b> Williamson County	Implement an idling reduction and public awareness campaign through the School Pools program. Develop educational materials to support their environmental impact software	6/1/2015	\$210,000	NA	NA	NA	NA	NA	NA	NA	NA
<b>Water and Light Commission of Greeneville</b> Greene County	Replace three pumps, with one energy efficient pump and adding two variable frequency drives at their water treatment plant	6/30/2015	\$546,863	\$243,194	2,895,140	2,243	2.2	\$21,655	249,640	195	25.3
		<b>TOTAL</b>	<b>\$8,079,085</b>	<b>\$623,550</b>	<b>6,916,211</b>	<b>5,353</b>	<b>13.0</b>	<b>\$196,885</b>	<b>2,573,226</b>	<b>2,021</b>	<b>40.0</b>

**ROUND 3  
FY 2014 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Carroll County Emergency Communications District</b> Carroll County	Retrofit to include energy efficiency windows, insulation, and LED lighting	1/30/2016	\$23,596	\$2,568	27,049	21	9.2	\$2,963	29,630	23	8.0
<b>City of East Ridge</b> Hamilton County	Upgrades to Camp Jordan Arena include HVAC units, thermostats, and associated insulated ductwork	4/30/2018	\$145,000	\$26,057	289,525	224	5.6	\$3,880	38,800	30	37.4
<b>City of Kingsport</b> Sullivan County	Upgrades to aeration system at wastewater treatment plant through installation of efficient blowers/diffusers	7/31/2016	\$418,740	\$28,000	382,800	297	15.0	\$27,171	388,164	303	15.4
<b>City of Lenoir City</b> Sullivan County	Upgrades at historic War Memorial building including HVAC, LED lighting, and energy efficient windows, and insulated roof	2/1/2017	\$500,000	\$6,952	35,687	27	71.9	\$3,175	31,750	25	157.5
<b>City of Pikeville</b> Bledsoe County	Upgrades to the Elementary School including Low-E windows, LED lighting, HVAC, and insulation	7/31/2017	\$427,157	\$10,005	54,625	42	42.7	NR	NR	NR	NR
<b>City of Red Bank</b> Hamilton County	Upgrades at several municipal facilities including HVAC, LED lighting, windows, and energy efficient furnace	7/31/2015	\$87,924	\$20,033	186,249	144	4.4	\$4,562	50,697	40	19.3
<b>City of Waynesboro</b> Wayne County	Upgraded four variable frequency drives and existing pump motors at wastewater treatment plant	7/31/2015	\$47,200	\$2,386	21,300	17	19.8	\$2,376	33,936	27	19.9
<b>Cleveland Utilities</b> Anderson County	Installation of low-horsepower motors at the Hiwassee River Wastewater Treatment Plant	10/14/2015	\$61,545	\$7,535	93,727	73	8.2	\$7,564	96,685	75	8.1
<b>Dickson Housing Authority</b> Dickson County	Retrofit 47 housing authority properties with HVAC, LED lighting, and energy efficient windows	8/31/2015	\$643,900	\$31,534	233,276	181	20.4	\$8,601	86,014	67	74.9
<b>Lawrenceburg Utility Systems</b> Lawrence County	Upgrades at water treatment plant to include installation of efficient motors, variable frequency drives and a control system	5/1/2015	\$65,000	\$6,917	107,748	84	9.4	\$14,909	212,980	166	4.4
<b>McMinnville Housing Authority</b> Warren County	Upgrades to 20 housing development units including insulation, efficient doors and windows, HVAC units and water heaters	12/1/2015	\$265,253	\$13,382	167,324	130	19.8	\$14,953	149,530	117	17.7
<b>Milan Housing Authority</b> Gibson County	Upgrades to 27 homes including HVAC, LED lighting, and water heaters	9/1/2016	\$218,450	\$13,346	134,811	104	16.4	\$4,036	39,991	31	54.1

NR - No Report

\* Estimated values used instead of actual numbers

**ROUND 3  
FY 2014 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Morgan County</b> Morgan County	Installation of 24.9 kW solar array	6/30/2015	\$82,782	\$3,824	31,867	25	21.6	\$2,400	18,000	14	34.5
<b>Rutherford County - Adult Detention Center</b> Rutherford County	Upgrades to Adult Detention Center including new energy efficient roof and LED lighting	12/30/2015	\$325,602	\$53,358	764,943	593	6.1	\$18,996	286,200	223	17.1
<b>Rutherford County - Hybrid Vehicles</b> Rutherford County	Purchase of 2 Ford C-Max Hybrid vehicles to replace utility vehicles	12/30/2015	\$52,000	\$3,221	52,086	40	16.1	\$417	6,345	5	124.6
<b>Savannah</b> Hardin County	Upgrades at Savannah City Hall including LED lighting, HVAC units, new roof, and vestibules	6/1/2016	\$183,208	\$3,126	27,601	21	58.6	\$2,958	29,580	23	61.9
<b>Shelby County Corrections Office*</b> Shelby County	Upgrades to Corrections facility including 55 solar tube water heating system and ozone laundry system	12/30/2015	\$538,850	\$83,483	435,133	33	6.5	\$83,483	435,133	339	6.5
<b>Tellico Area Services System*</b> Loudoun/Monroe County	Upgrades at water treatment plant including new HVAC, windows, replacement of mixers, drivers, and motors	9/30/2015	\$58,000	\$10,087	76,216	59	5.7	\$5,978	85,405	67	9.7
<b>Town of Greeneville</b> Greene County	Purchase of Hybrid Hydraulic waste collection truck	12/1/2015	\$394,000	\$8,957	97,157	75	44.0	\$955	25,080	20	412.4
<b>Tulahoma Utilities Board</b> Coffee County	Upgrades to wastewater treatment plant replacing blowers and installing variable frequency drives and aeration membranes	7/20/2016	\$250,000	\$36,000	570,000	442	6.9	\$30,068	348,850	272	8.3
<b>Water Authority of Dickson County</b> Dickson County	Replace 128 lighting fixtures with LEDs at the water treatment plant	1/5/2016	\$30,724	\$13,869	173,363	134	2.2	\$16,156	230,793	180	1.9
		<b>TOTAL</b>	<b>\$4,818,931</b>	<b>\$384,640</b>	<b>3,962,487</b>	<b>2,766</b>	<b>12.5</b>	<b>\$255,602</b>	<b>2,623,562</b>	<b>2,047</b>	<b>17.2</b>

NR - No Report

\* Estimated values used instead of actual numbers

**ROUND 4  
FY 2015 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Bledsoe County</b> Bledsoe County	Upgraded 15 SEER HVAC unit at the Bledsoe County Nursing Home	5/1/2016	\$65,450	\$11,761	130,686	101	5.6	\$5,178	80,347	63	12.6
<b>Blount County Government</b> Blount County	Upgrades at the Blount County Court House including windows and seven HVAC units	5/1/2016	\$309,863	\$4,299	31,877	25	72.1	\$6,487	64,867	51	47.8
<b>City of Algood</b> Putnam County	Upgrades to City Garage and Community Center including HVAC and LED lighting	12/30/2015	\$25,850	\$2,216	8,237	6	11.7	\$2,498	24,977	20	10.3
<b>City of Ducktown</b> Polk County	Purchase of Ford Fusion Hybrid to replace outdated and inefficient Dodge Ram pickup	3/1/2016	\$30,000	\$1,318	22,050	17	22.8	\$584	8,275	6	51.3
<b>City of Etowah</b> McMinn County	Installation of R-38 ceiling insulation at the Historic GEM Theatre.	11/15/2016	\$8,000	\$1,214	23,062	18	6.6	\$3,529	35,285	27	2.3
<b>City of Franklin</b> Williamson County	Replacing 175 watt metal-halide lights with energy efficiency LED lighting in parking garage	12/1/2015	\$38,500	\$4,200	42,000	33	9.2	\$1,514	12,083	9	25.4
<b>City of Gatlinburg</b> Sevier County	LED lighting upgrade at Community Center and Post Office	7/31/2014	\$14,805	\$2,996	23,967	19	4.9	\$3,501	35,008	27	4.2
<b>City of Jamestown</b> Fentress County	Jamestown Community Center LED lighting upgrade	12/28/2016	\$12,675	\$5,548	55,476	43	2.3	\$2,152	21,520	17	5.9
<b>City of Jefferson City</b> Jefferson County	Jefferson City Community Center LED lighting upgrade	10/1/2016	\$28,890	\$1,800	56,887	44	16.1	\$944	9,439	7	30.6
<b>City of Knoxville</b> Knox County	Installation of closed-loop geothermal heat pump at Public Works Complex	8/1/2016	\$481,000	\$3,119	33,060	26	154.2	\$36,798	419,465	327	13.1
<b>City of Lebanon</b> Wilson County	Construction of waste-to-energy processing facility that will utilize various feedstocks to produce renewable energy	8/1/2016	\$3,500,000	\$341,000	4,871,429	3774	10.3	\$27,479	392,562	306	127.4
<b>City of Loretto</b> Lawrence County	Swimming Pool with multiple sustainable features	8/1/2016	\$1,048,000	NA	NA	NA	NA	NA	NA	NA	NA
<b>City of Millington *</b> Shelby County	Upgrades at the Police and Court Municipal Building including HVAC and LED lighting	5/1/2016	\$480,000	\$14,931	236,655	183	32.1	\$14,931	162,731	127	32.1
<b>Clay County</b> Clay County	Energy efficiency upgrades at Public Library including HVAC and LED lighting	12/1/2016	\$12,765	\$1,318	12,820	10	9.7	\$3,587	35,865	28	3.6
<b>Fentress County</b> Fentress County	Energy efficiency upgrades at County Courthouse including LED lighting	7/15/2016	\$16,934	\$4,060	30,478	24	4.2	\$3,045	30,447	25	5.6

NR - No Report

NA - Not Applicable

\* Estimated values were used for actual values

**ROUND 4  
FY 2015 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Franklin Housing Authority</b> Williamson County	Upgrades include HVAC, programmable thermostats, insulation, LED lighting	5/31/2017	\$205,539	\$10,435	104,769	81	19.7	\$11,739	117,392	92	17.5
<b>Humboldt Utilities</b> Gibson County	Upgrades to replace the 75hp pumps with turbine pumps and install variable frequency drives	1/1/2016	\$130,000	\$10,000	50,682	39	13.0	\$7,464	106,633	83	17.4
<b>Jellico Housing Authority</b> Campbell County	Upgrades to 24 housing authority units including replacing existing roof with thermoplastic cool roof and insulation	1/13/2017	\$139,660	\$2,119	20,797	16	65.9	\$2,143	21,434	17	65.2
<b>Lenoir City Housing Authority</b> Loudon County	Installation of tankless water heaters	1/13/2017	\$264,261	\$7,992	234,166	181	33.1	NR	NR	NR	NR
<b>Marion County</b> Marion County	Replacing existing skylights and installation of seven skylight smoke hatch units at justice	6/1/2016	\$35,000	\$2,994	33,900	26	11.7	\$5,926	81,000	63	5.9
<b>Nashville Metropolitan Transit Authority</b> Davidson County	Installation of 50 kW Fast Charger for electric bus fleet on the Music City Circuit Route	9/1/2016	\$600,000	\$75,092	836,254	648	8.0	\$41,152	179,580	140	14.6
<b>Overton County</b> Overton County	LED Lighting upgrade and chiller replacement	12/1/2016	\$134,495	\$10,758	97,801	76	12.5	\$12,801	128,005	100	10.5
<b>Pickett County</b> Pickett County	Upgrades include LED lighting, insulation, and roof replacement	6/1/2017	\$315,000	\$5,143	60,908	47	61.2	\$3,532	35,315	28	89.2
<b>Putnam County</b> Putnam County	LED lighting upgrades at several public buildings	3/1/2017	\$291,373	\$52,781	537,928	417	5.5	\$44,116	441,160	344	6.6
<b>Rogersville Housing Authority</b> Hawkins County	Upgrades to 9 housing authority units including HVAC, ductwork, and programmable thermostats	10/6/2016	\$81,215	\$3,723	36,674	28	21.8	\$2,493	24,932	19	32.6
<b>Rutherford County Emergency Management Agency</b> Rutherford County	LED lighting upgrade and installation of 2-inch insulation	5/1/2016	\$46,020	\$7,532	75,320	58	6.1	\$3,221	31,760	25	14.3
<b>Stewart County Government</b> Stewart County	Energy upgrades to municipal buildings including LED lighting, HVAC controls, windows/doors	10/27/2016	\$525,000	\$19,634	272,798	211	26.7	\$28,754	287,541	224	18.3
<b>Town of Ashland City</b> Cheatham County	Police and fire station lighting upgrade from metal halide bulbs to LED	6/15/2017	\$16,678	\$224	1,866	1	74.5	\$1,992	24,960	20	8.4
<b>Town of Centerville</b> Hickman County	Installation of variable frequency drives to the high service and raw LED lighting upgrade and	11/30/2016	\$175,000	\$38,864	555,193	430	4.5	\$10,184	145,482	119	17.2
<b>Town of Farragut</b> Knox County	installation of automated lighting controls	5/1/2016	\$60,932	\$6,235	46,874	36	9.8	\$3,821	75,323	59	15.9

NR - No Report

NA - Not Applicable

\* Estimated values were used for actual values

**ROUND 4  
FY 2015 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Town of Oneida</b> Scott County	Reroofing and insulation to improve thermal properties at municipal building	5/26/2016	\$177,713	\$1,586	39,497	31	112.1	\$1,624	21,288	17	109.4
<b>Town of Tazwell</b> Claiborne County	Upgrades to City Hall including HVAC, windows and doors, LED lighting, and roof insulation	3/31/2017	\$100,000	\$1,493	11,083	9	67.0	\$961	9,610	8	104.1
<b>Town of Tracy City</b> Grundy County	Learning Center upgrades include HVAC, insulation, sealing of exterior windows	5/1/2017	\$250,000	\$5,294	52,942	41	47.2	NR	NR	NR	NR
<b>Town of Unicoi</b> Unicoi County	Upgrades to Visitors Center including window replacements and HVAC	2/3/2016	\$16,000	\$1,292	12,922	10	12.4	\$728	7,284	6	22.0
		<b>TOTAL</b>	<b>\$9,636,618</b>	<b>\$662,970</b>	<b>8,661,058</b>	<b>6,709</b>	<b>14.5</b>	<b>\$294,877</b>	<b>3,071,568</b>	<b>2,404</b>	<b>26.7</b>

NR - No Report

NA - Not Applicable

\* Estimated values were used for actual values

**ROUND 5  
FY 2016 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
Anderson County Anderson County	Upgrade three public buildings with LED lighting	5/31/2017	\$36,047	\$7,200	56,064	43	5.0	\$1,150	11,495	8	31.4
City of Franklin Williamson County	Upgrade to the City's biosolids processing including a biogas combined heat and power (CHP) system		\$1,613,170	\$297,360	4,248,000	3291	5.4	NR	NR	NR	NR
City of Hendersonville Sumner County	Upgrade Public Works building with LED lighting	12/15/2016	\$28,561	\$15,721	157,211	122	1.8	\$9,131	93,600	77	3.1
City of Huntingdon Wilson County	Installation of Variable Frequency Drives at WTP	5/30/2018	\$338,000	\$20,400	324,268	251	16.6	\$4,963	14,800	12	68.1
City of Johnson City Washington County	Upgraded WWTP aeration system and LED lighting		\$462,700	\$32,638	365,900	283	14.2	NR	NR	NR	NR
City of McMinnville Warren County	Upgrade of Civic Center's lighting from metal halide to LED		\$26,000	\$5,083	46,208	36	5.1	NR	NR	NR	NR
City of Rockwood Roane County	HVAC and LED lighting upgrades at Community Center and City Garage	7/6/2018	\$28,548	\$18,298	36,100	28	1.6	\$9,704	97,040	76	2.9
City of Spring Hill Maury County	Upgrades to City Hall and Library including LED lighting, HVAC, and programmable thermostats	12/15/2018	\$55,320	\$19,802	198,025	153	2.8	\$3,685	37,049	29	15.0
Laguardo Utility District Wilson County	Installation of Variable Frequency Drives at WTP and LED lighting upgrade		\$280,000	\$85,749	1,224,980	949	3.3	NR	NR	NR	NR
Morgan County Morgan County	SCADA system upgrade with solar panel installation	7/1/2017	\$111,000	\$11,738	54,333	42	9.5	\$33,500	24,450	19	3.3
Town of Dover Jefferson County	Installation of Variable Frequency Drives at WWTP and replace HVAC at Town Hall	4/30/2018	\$135,000	\$15,644	223,491	173	8.6	\$3,301	47,160	37	40.9
Van Buren County Van Buren County	Upgrade five public buildings with LED lighting	6/15/2018	\$32,782	\$6,145	60,988	47	5.3	\$4,280	42,800	33	7.7
		<b>TOTAL</b>	<b>\$3,147,128</b>	<b>\$535,778</b>	<b>6,995,568</b>	<b>5,418</b>	<b>5.9</b>	<b>\$69,714</b>	<b>368,394</b>	<b>291</b>	<b>11.0</b>

**ROUND 6  
FY 2017 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Bedford County Utility District</b> Bedford County	Upgrade water treatment plant with LED lighting	7/26/2018	\$30,000	\$21,780	198,000	162	1.4	\$13,694	329,976	257	2.2
<b>Bell's Theater</b> Crockett County	Renovation of 1936 building including HVAC upgrades and LED lighting retrofit		\$350,000	\$2,333	23,333	19	150.0	NR	NR	NR	NR
<b>City of Erin</b> Houston County	Installation of Variable Frequency Drives at WTP and LED lighting upgrade		\$130,000	\$47,469	431,534	354	2.7	NR	NR	NR	NR
<b>City of Jellico</b> Campbell County	LED lighting retrofit in City Hall	6/1/2019	\$40,000	\$6,954	66,146	54	5.8	NR	NR	NR	NR
<b>City of Lafayette</b> Macon County	LED lighting retrofit in Police Station	5/15/2018	\$20,417	\$8,138	63,300	52	2.5	\$366	3,660	3	55.8
<b>City of LaFollette</b> Campbell County	HVAC upgrades at Community Center	6/30/2018	\$200,000	\$22,000	145,000	119	9.1	NR	NR	NR	NR
<b>City of Maynardville</b> Union County	LED lighting retrofit in City Hall	6/1/2018	\$45,200	\$4,589	20,779	17	9.8	\$276	2,760	2	163.8
<b>City of Memphis Government</b> Shelby County	LED lighting retrofit in Lichterman Nature Center	8/1/2019	\$36,500	\$6,482	68,959	57	5.6	NR	NR	NR	NR
<b>City of New Johnsonville</b> Humphreys County	Replacement of aerators at wastewater treatment plant	6/1/2019	\$125,000	\$14,110	117,582	97	8.9	NR	NR	NR	NR
<b>City of Tennessee Ridge</b> Houston County	Installation of Variable Frequency Drives at WTP	6/1/2019	\$117,800	\$12,000	76,000	62	9.8	NR	NR	NR	NR
<b>Cocke County</b> Cocke County	LED lighting retrofit in County Courthouse	1/1/2019	\$38,190	\$12,036	121,740	100	3.2	NR	NR	NR	NR
<b>DeKalb County</b> DeKalb County	LED lighting retrofits in County Courthouse and Jail	6/30/2018	\$37,856	\$11,275	94,881	78	3.4	\$7,832	65,320	51	4.8
<b>Fayette County</b> Fayette County	LED lighting retrofits in County Courthouse and Justice Complex	8/1/2019	\$173,460	\$32,068	392,150	322	5.4	NR	NR	NR	NR
<b>Grundy County</b> Grundy County	LED lighting retrofits, HVAC upgrade, and window and door replacements in multiple county facilities		\$398,288	\$12,805	128,045	105	31.1	NR	NR	NR	NR
<b>Haywood County</b> Haywood County	LED lighting retrofits in multiple county facilities and new heat pumps in the courthouse		\$471,546	\$56,000	578,981	475	8.4	\$16,038	160,379	125	29.4
<b>Marion County</b> Marion County	LED lighting retrofits in multiple county facilities as well as a cooler replacement and window upgrades	12/1/2018	\$309,207	\$31,756	317,563	261	9.7	\$414	4,600	4	746.9

**ROUND 6  
FY 2017 PROJECTS**

PROJECT NAME	PROJECT DESCRIPTION	COMPLETION DATE	TOTAL PROJECT COST	ESTIMATED ANNUAL SAVINGS			ESTIMATED SIMPLE PAYBACK (years)	AVERAGE ACTUAL ANNUAL SAVINGS SINCE PROJECT COMPLETION			ACTUAL SIMPLE PAYBACK (years)
				COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)		COST (\$)	ENERGY (kWh)	EMISSIONS (TONS CO <sub>2</sub> e)	
<b>Macon County</b> Macon County	LED lighting retrofits in multiple county facilities		\$129,670	\$42,715	337,567	277	3.0	NR	NR	NR	NR
<b>McNairy County</b> McNairy County	LED lighting retrofits in multiple county facilities and 50kW solar installation	5/18/2018	\$351,263	\$52,957	512,461	420	6.6	\$28,456	284,556	222	12.3
<b>Morristown Housing Authority</b> Hancock County	LED lighting retrofit and new heat pumps in 25 dwellings	11/3/2018	\$173,561	\$16,718	181,269	149	10.4	\$31,480	314,795	245	5.5
<b>Perry County</b> Perry County	LED lighting retrofit, HVAC upgrades and roof renovation		\$187,900	\$21,038	219,214	180	8.9	NR	NR	NR	NR
<b>Rhea County</b> Rhea County	LED lighting retrofits in County Courthouse		\$20,000	\$6,302	70,030	57	3.2	\$459	5,067	4	43.6
<b>Sequatchie County</b> Sequatchie County	LED lighting retrofits in multiple county facilities	8/21/2018	\$144,234	\$42,645	412,022	338	3.4	\$540	6,000	5	267.1
<b>Sevier Solid Waste</b> Sevier County	Upgrade 3 gearboxes for vessel digesters	11/1/2018	\$587,770	\$25,536	272,260	223	23.0	\$28,694	286,936	224	20.5
<b>Union County</b> Union County	HVAC replacements in County Courthouse and Jail	7/28/2018	\$77,620	\$16,586	127,168	104	4.7	\$2,102	21,020	16	36.9
		<b>TOTAL</b>	<b>\$4,195,482</b>	<b>\$526,292</b>	<b>4,975,984</b>	<b>4,082</b>	<b>8.0</b>	<b>\$130,350</b>	<b>1,485,069</b>	<b>1,158</b>	<b>17.4</b>

# APPENDIX II

# Round 1

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Project Summaries



## Calfee River Land Farms

The 49.92 kW solar array provides many environmental and agricultural benefits. Ed Harlan, Director of TDA Agribusiness Development states “the Calfee River Land Farms Solar PV project directly promotes the agenda of the Tennessee Department of Agriculture through supporting local agribusiness, saving natural energy resources, and promoting environmental benefits.” These benefits include reducing grid-based electrical demand and line losses associated with long distance power transmission, preserving green space by utilizing pre-existing building space, and purchasing locally manufactured solar modules to benefit local tax bases and employment resources. Additionally, 40% of the aluminum, 80% of the steel, and 100% of the cardboard and wood used for construction is recycled material.



## Campbell Crossing

The NexGEMs technology reduces energy load and load peaks using a combination of innovative energy monitoring and control devices while optimizing home performance. The Campbell Crossing project implemented this technology in 623 homes to improve energy efficiency by seven percent or more. Key components of NexGEMs include smart load control devices such as programmable thermostats, a communication device that conveys information between the smart load devices and the centralized external energy management center, remote monitoring accessibility, system operations training for property managers and residents, and full installation and system support and monitoring to ensure continued energy and cost savings levels.



## City of Athens

The City of Athens installed three 50 kW solar arrays and an earth shelter for Keep McMinn Beautiful. The shelter is powered with geothermal energy and the implementation of these systems has reduced energy costs by up to 80%. The structure offers a near-zero carbon footprint with no runoff and fully pervious surfaces. The structure is covered with 2 feet of soil that is vegetated with native plants. Since this is currently the only earth shelter in the United States, the manufacturer of the technology is referring people to Athens to look at the structure. The site has continued to receive recognition from local news, social media, and local and national magazines. In addition, the City of Athens has also received a “Silver Communities” TVA Sustainable Community Credential.



## City of Brentwood

The City of Brentwood implemented an energy-saving and emissions-reducing project at the Brentwood Public Library – one of the city’s most frequently used and highest energy use public facility. They replaced two 14-year-old inefficient boilers that required a high volume of combustion air to be delivered to the boiler room. The new boilers operate at a much lower temperature; this significantly improves operating efficiency. The state-of-the-art condensing boilers use combustion air that can be piped directly to the unit from outdoors. The new system allows the boilers and other elements of the building’s heating, ventilation and air conditioning (HVAC) system to be remotely monitored from any computer. The systems are tightly controlled and turned off or down when not needed, reducing cost and saving energy.



## City of Chattanooga

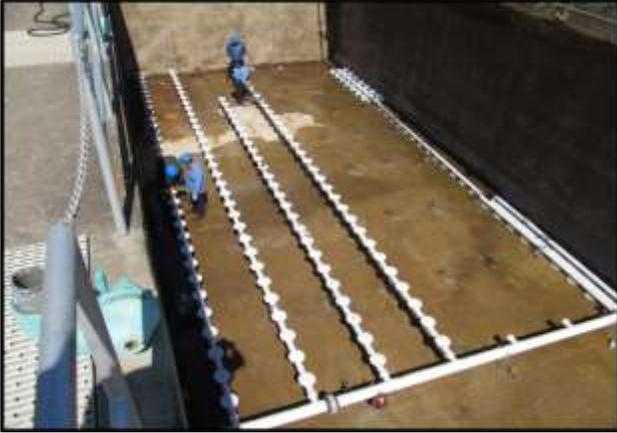
The City of Chattanooga installed variable-frequency drive (VFD) units on four UNOX Oxygenation Tank Mixers utilized by the Moccasin Bend Wastewater Treatment Plant. The previous oxygenation tanks processed water and operated at fixed speeds. The installations of the new motors allow flexibility to operate at varying speeds, hence, increasing efficiency by using only the power and energy necessary to meet specific demand. The new system uses real-time data to monitor energy usage: dissolved oxygen sensors that reduce operations by around 20% and drives that can control rotations per minute for the mixers. The reduction of energy demand reduces particulate matter that has a direct effect on air quality in Chattanooga.



## City of Covington

The City of Covington built a Waste Biomass Gasification to Energy Project that creates electricity and utilizes the city's wood waste and biosolids as fuel. The system uses landfill-bound waste to provide a continuous stream of domestically produced energy that is clean, carbon neutral and renewable; it converts approximately 12 tons per day of the wood and sludge waste collected by the city into electricity. The thermal energy is converted to electrical energy via closed-loop refrigerant cycle and also uses treated sewage effluent for non-contact cooling water to "condense" the refrigerant. Part of the new gasification system differs from traditional incineration methods and will significantly reduce the amount of nitrous oxides, sulfur dioxide, and fly ash. Aires Energy is using this site as a test location for other waste-to-energy projects.





### City of Johnson City

The City of Johnson City increased the efficiency of the wastewater treatment plant and operations by upgrading some of the more energy-intensive components of the treatment process. Project activities included: increasing the diffuser upgrade from two tanks to four tanks; using dissolved oxygen-based controls; and replacing the previous metal halide lighting with LED lighting fixtures. The previous aeration system was a major user of electricity at the plant. These efforts also support the City of Johnson City as part of the Ozone Action Partnership (OAP). This partnership works to educate local governments, businesses, and industries about the impacts of reducing ozone levels in the region.



### City of Kingsport

The City of Kingsport purchased two zero-emission Nissan LEAF Electric Vehicles (EVs) along with the purchase and installation of two EV charging stations and began promotion of an EV/alternative fuels public “Going Green” campaign. The purchase of the two Nissan LEAFs allowed the city to remove two gasoline vehicles from service. A grant amendment was approved for the purchase of a third electric vehicle to displace and decommission a Crown Victoria Police Car utilized by the Police Department for Code Enforcement. The unit has been featured in the *Government Fleet* magazine and the City of Kingsport produced a leaflet for the East Tennessee Fuel Coalition as an educational tool to be distributed to the general public regarding benefits of alternative fuel and electrical vehicle usage. Public perception continues to improve; tax dollar savings, reduction in fossil fuels, and the first “marked” electric police car in the nation.



### Debord Family Partnership

The Debord Family Partnership installed an 11.73 kW solar Photo-Voltaic (PV) array on the rooftop of the 144 West Main Street building in Historic Downtown Morristown. The project uses aesthetic and innovative solar technology that was installed within the design requirements of the local Historic Zoning Commission and adds to the historic building's complete renovation. Morristown is a "Tennessee Main Street Community," which promotes revitalization and management of traditional downtowns. The project was acknowledged by the *Citizens Tribune* and Chamber of Commerce. Additionally, employee satisfaction has increased, and customers have responded well to the sustainability efforts.



### Maury Regional Medical Center

Maury Regional Medical Center installed Light Emitting Diode (LED) lighting at the hospital. The installation reduces the overall energy consumed by retrofitting 16,618 four foot fluorescent bulbs and 1,189 two foot fluorescent bulbs with low-wattage LED tube lights. The new system has encouraged the hospital to reconsider some of their old practices. Because of the trend in energy reductions internally, the hospital has determined that they could reduce natural gas usage by reducing the steam pressure and cooling temperatures during fall and spring. Savings from the original project were used to complete lighting retrofits for a separate building.



## Metro Water Services – Nashville

Metro Water Services updated HVAC units and ductwork throughout the Omohundro Water Treatment Plant. The project replaced 13 HVAC units throughout the site that ranged in age from 16 to 20 years old, with a seasonal energy efficiency ratio (SEER) rating of 10 or less. Metro Water Services was able to add a fourteenth unit for replacement because the bids came in lower than expected. In addition to the cost savings from improvements in utilities, Metro Water Services has had no equipment breakage, no maintenance cost for labor and parts, and more evenly distributed temperatures throughout office spaces and greater control of temperature. A culture of saving energy, as evidenced by this project, saves agency funds and decreases emissions.



## Northeast Knox Utility District

The Northeast Knox Utility District found that the age of its previous water treatment pumps were causing a high air emissions impact due to inefficient energy and fuel consumption. To address the problem, they decided to upgrade and expand their operation. The project included the installation of high efficiency pumps and motors equipped with variable frequency drives (VFD). VFDs maximize the treatment plants pumping efficiency which allow for the engine to “throttle” and only use energy to meet the specific demand. The new high service pump station has increased production of treated water at the plant and throughout to the distribution system, while reducing electricity consumption. Increased output has resulted in reduced operating hours per day at the plant, leading to the reduced costs and increased employee satisfaction.

# Round 2

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Project Summaries



## City of Cleveland

The City of Cleveland re-roofed the South Cleveland Community Center. They removed the existing ballasted flat ethylene propylene diene monomer (EPDM) roof and the sloped mechanically attached EPDM roof. They also installed a new, fully adhered Thermoplastic polyolefin (TPO) roof over new 1" thick poly-is-insulation over the existing EPS insulation. The reflective roofing membrane decreases heat loss and heat gain, increasing energy efficiency of the HVAC system. The TPO membrane is 100% recyclable upon the termination of its useful life. This decreases waste that would normally end up in the landfill. The project also included the replacement of existing gutters and downspouts, the installation of new metal coping around the perimeter, and a new access ladder. The roof replacement was part of a larger plan to make the Community Center more energy efficient.



## City of Elizabethton

The City of Elizabethton provides water, wastewater, and electric services out of their wastewater treatment plant (WWTP). All of the influent wastewater is split into two separate biological treatment trains. The primary treatment system, or train, was last upgraded in 1983, and the secondary train was completed in 2001. During the construction of Train 2, a second oxidation ditch was constructed with an equivalent treatment capacity but without rotary aerators, motors, and submersible mixers. The installation of these components allowed the city to decommission the Train 1 process and utilize a 115 horsepower system, as opposed to a 315 horsepower system. This improves efficiency, reduces utility cost, and improves the air quality by reducing emissions.



## City of Gatlinburg

The City of Gatlinburg replaced 124 400-watt metal halide bulbs with 250-watt fixtures in the Great Hall of the Gatlinburg Convention Center – a 67,000 square foot facility which uses a tremendous amount of electricity for lighting. All existing fluorescent bulbs were recycled. The project has strengthened the City of Gatlinburg's energy efficiency program – which has been active since 2012 – to use energy efficient lighting in all of the City's public facilities. The success of this project has prompted other city departments to consider lighting retrofits with similar technology. The customers and exhibitors have also noted the improvement in lighting. The Convention South Media Group recognized the city as being a Green Meetings Approved Supplier.



## City of Middleton

The City of Middleton has improved the existing wastewater treatment plant by replacing the 20 year old, inefficient motors and self-priming centrifugal pumps. The old equipment was replaced with variable frequency pumps (VFD), energy efficient motors, and vertical turbine pumps. It is estimated that the new motors exceed an efficiency rating of 90% and the pumps operate at an efficiency of 74%. Additional approved project activities included retrofitting aging and leaking manholes.



### City of Oak Ridge

The City of Oak Ridge replaced and retrofitted their existing fluorescent lighting fixtures in the Oak Ridge Municipal Building and the Oak Ridge Civic Center Complex. Both buildings contained outdated lighting and were expensive to operate. This project enhanced the actual lighting, saved on electricity bills, and made the buildings more energy efficient. Using University of Tennessee interns, an accurate lighting inventory was performed in all the buildings that were upgraded using this grant. The public has noticed immediate results by having brighter meeting rooms and hallways.



### Clinton Utilities Board

Clinton Utilities Board (CUB) replaced existing aeration system equipment, including six large rotary air compressors, with three energy-efficient blowers and fixed-grid in both of CUB's two aeration basins at the wastewater treatment plant. The project utilizes the latest technology in the aeration systems equipment, which is fine-bubble, membrane-disc diffused air systems and blowers having variable frequency drives that run more efficiently.







## Duck River Utility Commission

Duck River Utility Commission (DRUC) implemented Tennessee Valley Authority Energy Audit recommendations by replacing all inefficient light fixtures with high-efficiency fixtures and installing occupancy sensors, which resulted in utility cost savings. The substantial savings in electrical cost reduces DRUC expenses through lower water rates for area residents while offering significant additional public benefits. These savings in power consumption represent large reductions in electrical production emissions and lowered use of natural resources. The DRUC was approved to conduct additional energy efficiency activities including: replacing inefficient windows, installation of a suspended ceiling, window tinting, and replacing a water heater.



## Water and Light Commission of Greeneville

The Water and Light Commission of the Town of Greeneville (Greenville Water Commission) replaced three inefficient pumps with one energy efficient pump and installed two variable speed drives on existing pumps in order to reduce energy consumption and operate the pumps more efficiently. The Commission purchased a new 8 million gallon/day (MGD) capacity pump, motor and variable speed drive to be placed in the second finished water pump station that replaced three older pumps. Additionally, the Commission installed variable speed drives on the existing 12 MGD pump and 12 MGD raw water pump.



## Hardin County Fairgrounds

Hardin County has implemented energy efficiency upgrades to the Hardin County Fairgrounds. The Fairgrounds site is home to many civic organizations and events. The building has not been upgraded for new technology since its construction in 1950. The upgrades consisted of replacing (220) 34W bulbs with new 17W energy efficient lighting and installing a new HVAC system. The improved HVAC system maintains good air quality and removes some hazardous materials from the air. Hardin County also informed their citizens of energy conservation standards, some of which include: outreach programs and energy saving tips. Additionally, the new bulbs that were used for the project have double the lifetime of the existing bulbs therefore cutting disposal in half.



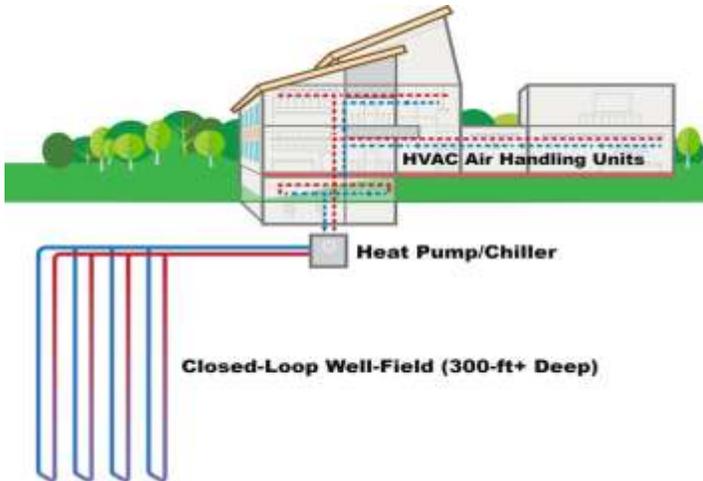
## Knoxville Utilities District

Knoxville Utilities Board (KUB) replaced an existing black roof with a cool white roof at the Fleming Operations Center. The Knoxville Utility Board's cool roof is part of a larger corporate effort that KUB adopted in 2001 to replace black roofs that have reached the end of their useful life with cool roofs. Since then, 30 cool roof projects have been completed across five KUB campuses in and around Knoxville. The Center's campus had over 27,300 square feet of black rooftop that reached the end of its useful life. The project has reduced the urban heat island effect by increasing solar reflectance by 75%.



## McMinn County

McMinn County used grant funds to construct 96 geothermal well fields that are each 300' deep. McMinn County also purchased and installed HVAC systems that provide climate control to the expansion of the McMinn County Justice Center. In addition to the savings in cost from reduction in energy, the HVAC systems require less maintenance and therefore save money due to reduced repair cost. The project complied with all EPA and American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standards for maximum efficiency. These new systems were incorporated into construction of the 16,000 square foot inmate pod and a 27,000 square foot courthouse addition to the justice center.



## Metro Nashville Airport Authority

The Metro Nashville Airport Authority (MNA) installed a 50 kilowatt solar array on top of a covered parking area to serve at least three new electric vehicle (EV) charging stations at the Nashville International Airport (BNA). The solar array canopy provides equivalent power usage to offset grid power in conjunction with power required to charge the electric vehicles. The solar array generates approximately 60,500 kWh of renewable energy per year. Excess power is used to power a light bank which was retrofitted with LED lighting. This was a milestone for the MNA in promoting solar technology and electric vehicles at the Nashville International Airport.





## Sumner County Government

Sumner County utilized the grant funds to complete lighting and HVAC improvements at the Sumner County Criminal Justice Center (jail facility). The project involved the installation of Light Emitting Diodes (LED) and Light Emitting Plasma (LEP) lights which are more energy efficient. Additionally, these improvements reduce utility cost, annual maintenance cost, and an overall reduction in carbon emissions. The approved project involved replacing 1,133 four-foot fluorescent tubes with LED lights and 12 sodium lights with LEP lights. The lighting replacement project provides a reduction in noise and heat output. They also purchased and installed a Building Automated System (BAS) controller for the HVAC system.



## Sweetwater Utilities Board

Sweetwater Utilities Board renovated their water treatment plant. The last time construction took place at the plant was 1982 and items were at or near their useful life. Phase one of the renovation replaced their existing pumps and electrical switch gears with new pumps that have high efficiency motors controlled by variable frequency drives (VFD). The filter media at the plant was also replaced. The existing “hard” starting pump motors increased peak electrical demand. The work eliminated many low efficiency motors and across the line starters, thereby saving energy and lowering emissions. Sweetwater Utilities Board currently provides water services to approximately 4,500 clients in a 34 square mile service area. This rehabilitation project has increased operational flexibility and plant service life while reducing energy consumption





## Town of Ashland City

In the flood of 2010, the Town of Ashland City's lab building and office for the water and sewer treatment plant were destroyed. Since the flood, employees have been conducting testing and lab work in a small office trailer, which is not sufficient for operations. The town upgraded and expanded the water and wastewater plants by replacing the three Heating Ventilation and Air Conditioning (HVAC) units with a ones that have a Season Energy Efficiency Ratio (SEER) rating of 16.5, installing low-wattage LED lighting and Variable Frequency Drives (VFD) on water treatment pumps to use only the energy necessary to meet demand. These savings have lowered the maintenance cost for the Town and the utility cost to the customer.



## Transportation Management Association Group

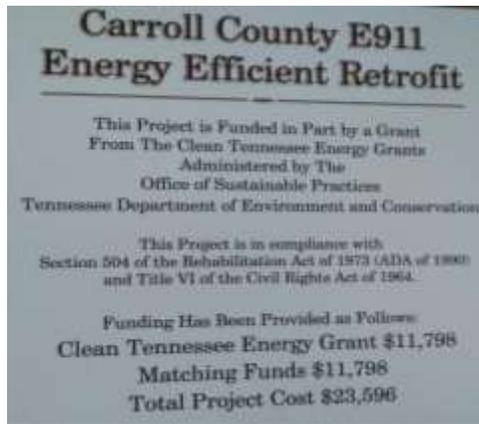
The Transportation Management Association (TMA) Group is a program of the Clean Air Partnership of Williamson County. The program goals include reducing idling in and around schools and raising public awareness for transportation related air quality issues. The public awareness campaign began with the planning and taping of the January 2014 episode of *Air Care*, which is a family-oriented, half-hour, television series addressing transportation, air quality, and other environmental issues. Progress toward TMA's School Pool program includes:

- Meeting with Tennessee Charter Schools Consortium to discuss the possibility of piloting.
- Investigating possible pilot schools in Williamson County and Franklin Special School District.
- Looking at GPS tracking options (vehicle and people tracking) to offer parents and schools.
- Templates designed for group dashboards on website and mobile application to get a feel for how they will work.

# Round 3

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Project Summaries



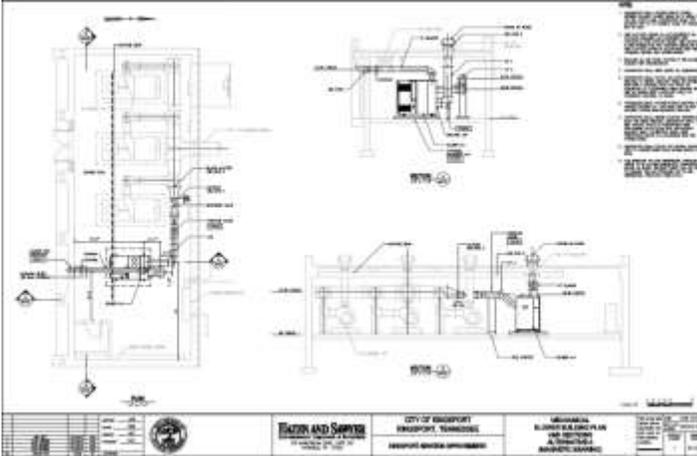
## Carroll County Emergency Communications District

Carroll County Emergency Communications District retrofitted their communication center with new energy efficient lighting, more efficient windows, and additional attic insulation. The existing building consisted of 24 metal frame casement style windows with single pane glass. These were replaced with energy efficient double pane vinyl clad units to decrease thermal heat loss and heat gain depending on the time of the year. The first phase of the project was the installation of the new lighting. After that was complete, the windows were replaced. Finally, the additional attic insulation was installed to cut down on extra energy used by the heating and air conditioning system.



## City of East Ridge

The City of East Ridge installed energy efficient Heating Ventilation Air Conditioning (HVAC) units at Camp Jordan Arena. The grant covered the replacement of the HVAC units, addition of a concrete pad, the reconnection of ductwork/electrical lines/gas piping, and the replacement of the thermostats. The arena is a 34,000 square foot facility with 27,000 square feet of exhibition space, used as an indoor soccer arena during the winter months and year-round for a variety of community events and activities. Both private and nonprofit groups may rent the facility, which makes it a popular venue for exhibitions and trade shows. The City hopes that these activities will incentivize other efficiency improvements at other city-owned facilities.



## City of Kingsport

Kingsport's wastewater treatment plant (WWTP) has an aeration system for the activated sludge treatment process. The WWTP is rated at 112.4 million gallons per (MGD) day and was equipped with three 300 horsepower multistage centrifugal blowers for aeration of activated sludge. The purpose of this project was to reduce energy usage through the installation of a properly sized and more energy efficient blower system. An aeration system evaluation was performed to determine the potential electrical savings associated with installing a smaller capacity blower with higher electrical efficiency.



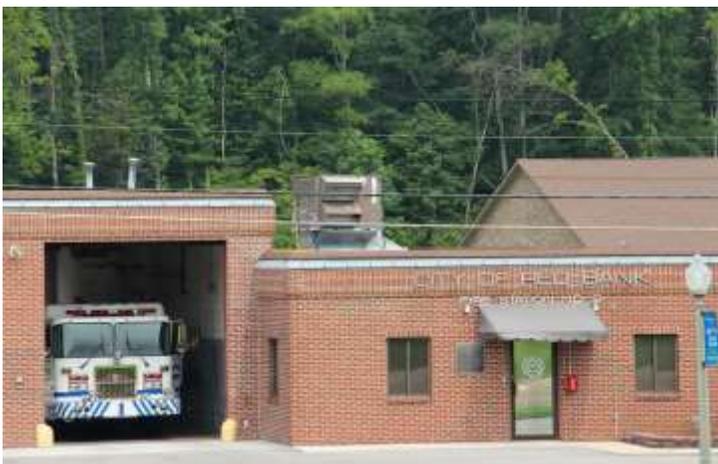
## City of Lenoir City

Lenoir City renovated the War Memorial Building which was erected in 1951; it was originally built as a memorial to fallen veterans. These renovations included improving the Heating Ventilation Air Condition (HVAC) units, lighting upgrades, window upgrades, roof and insulation improvements as well as gymnasium wall improvements. All of the interior light bulbs were converted to LED bulbs, which reduce interior lighting load. A total of 15 large windows and 8 small windows were replaced with insulated glazed windows and were approved by the National Historic Registry. The roof was replaced with 3-inch, R-30 rigid insulation, and vapor barrier. Wall improvements included demolishing the existing walls and replacing them with R-19 batt insulation. The objective of this project was to restore an aging community landmark by making it as energy efficient as possible and leave a greatly improved building to be used by current and future citizens of Lenoir City.



## City of Pikeville

The City of Pikeville installed new windows, lighting, Heating Ventilation Air Condition (HVAC) systems, and insulation at the old Pikeville Elementary School. HVAC improvements include an energy-efficient mini-split systems; this allows for independent areas that are thermally zoned. The windows were replaced with 1-inch insulated glass with tinted glazing over the Low-E double system. Lighting improvements included occupancy sensors within each room, which turn off the lights when not in use. Insulation improvements include installation of R-38 in the ceiling and R-19 insulation in the walls. This project was an essential first step toward retrofitting the old school and bringing it online as the new Pikeville Municipal Complex, which will house the city's municipal offices, utility, police departments, courtroom, community kitchen, and training facilities to aid with workforce development and industrial recruitment.



## City of Red Bank

The City of Red Bank has made improvements that have drastically increased the energy efficiency at several municipal facilities. At the City of Red Bank Fire Station #2, the City installed a new HVAC unit, made lighting improvements and installed energy efficient windows. The City of Red Bank public tennis courts also had an energy efficient furnace installed that reduces gas usage. Lastly, the lighting fixtures at the City of Red Bank Police Department were upgraded. These energy efficient improvements also lessen the city's impact by lowering carbon emissions. All of these improvements were part of the City's action plan, which is part of a collaboration with the Chattanooga Electric Power Board.



### City of Waynesboro

The City of Waynesboro owns and operates a surface water treatment plant that draws water from the Green River at mile point 13.78. The plant discharges treated water to the Waynesboro distribution system, and surrounding Wayne County. The building was constructed in 1960 and has experienced several flood and weather-related damage issues in the last ten years. This project upgraded the control of four existing pump motors to allow more uniform pumping into the distribution system due to the large swing in day-to-day demands on the system. The existing high service pumps operated on an on-off basis, based on water tank elevation in the system. Due to the extreme age and residual flood damage, the controls that operated these pumps could only be operated manually, which was not efficient, and wasted both energy and labor.



### Cleveland Utilities - Hiwassee

The Hiwassee River Wastewater Treatment Plant utilizes a flow through sequencing batch reactor treatment type of process to treat wastewater. The facility utilizes six-200 horsepower motors and blowers that force air through wastewater for treatment. Three of the six motors are not premium efficiency motors. The project is to replace the three lower efficiency motors with premium efficiency motors to reduce electrical demand and energy consumption. The cost savings and energy reductions have direct benefits for the customers and the environment. Money saved has been used to support other capital expenses.



## Dickson County Housing Authority

The Dickson Housing Authority (DHA) operates 125 units of public housing in Dickson County. The project included: the replacement of 47 inefficient heating and air conditioning systems with new Energy Star rated heating and air-conditioning, replacement of 850 compact fluorescent light bulbs with Energy Star rated LED bulbs, and replacement of 703 existing single pane windows with Energy Star rated insulated windows. Besides the improvements in air quality and resource consumption, the improvements have created a more comfortable, safe, and healthy living environment. Additionally, all of the proposed materials had a high return on investment which saved money for the DHA and lowered operating expenses.



## Lawrenceburg Utility Systems

The City of Lawrenceburg, operating through the Lawrenceburg Utility System (LUS), maintains a water treatment facility along Shoal Creek. This project replaced 90% efficient electric motors with new premium efficiency motors, which operate at 94.5% efficiency, and installed variable speed drive units on each pump to allow reduced operational pressures and lower power costs. Additionally, LUS has installed a level monitoring and control system that utilizes the Variable Frequency Drive (VFD) units to regulate the spring overflow, while maximizing the withdrawal rate to the City.



## McMinnville Housing Authority

This project scope included: addition of insulation to all exterior walls, replacement of exterior doors and windows, replacement of HVAC ductwork, installation of Energy Star rated HVAC systems, replacement of water heaters with more energy efficient water heaters, additional attic insulation, building envelope sealing, and controlled ventilation as a part of the overall renovation of a 20 unit housing development built in 1963. This project is second in a proposed series of green/energy retrofits to bring all of the McMinnville Housing Authority properties in compliance with the International Energy Conservation Code. The incorporation of renewable/sustainable products involved in project activities include: low or no VOC paint and sealing products, recycled lumber, and natural fiber attic insulation.



## Milan Housing Authority

The Milan Housing Authority (MHA) operates 100 units of public housing. MHA has completed numerous renovation projects to these units over the years. However they had not received the necessary funding to completely leverage more efficient improvements. Energy conservation improvements included replacing 27 inefficient electric wall heating units and window air-conditioners with new Energy Star rated air source heat pumps as well as replacing 27 old electric water heaters with new Energy Star rated water heaters. The overall goal of this project was to create a more comfortable, safe and healthy living environment for the MHA residents while lessening the MHA's overall impact on the environment by reducing energy use and implementing green, environmentally friendly construction practices.





## Morgan County

Morgan County installed a turn-key, fixed photovoltaic (PV) roof mounted solar array totaling 24.9 kilowatts that generates 31,867 estimated kilowatt-hours for the Morgan County Highway Department building. The panels are placed on the southern facing slope of the building and also allow the arrays to span across the roof above the corrugated metal roof seams. The solar arrays also have adjustable tilt legs to allow for maximum peak sunlight and generation.



## Rutherford County (Detention Center)

The Rutherford County Adult Detention Center was built in 1987 and has been expanded over the years as the county's population has significantly increased. Rutherford County has renovated the previously leaking roof of the Adult Detention Center with a VFI 540 Aluminum two part polyurethane roofing system, and increased the roof's R-value with 1.5 inch minimum of polyurethane roof foam. Rutherford County has replaced 3,149 outdated lights with new LED lighting that reduced energy cost and increased overall bulb life.





## Rutherford County (Hybrids)

This project involved replacing two ordinary gas powered 2000 vehicles with two fuel efficient 2014 Ford C-Max Hybrids. The C-Max provides substantial reductions in CO2 emissions and delivers greater fuel efficiency. The C-Max averages 42.5 MPG while the previous vehicle averaged 16 MPG. Rutherford County is one of the fastest growing counties in the nation and was designated as being in nonattainment by the EPA in 1978 and a maintenance area in 1996. This project serves to demonstrate how new technology may be used to produce both economic and environmental benefit.

## City of Savannah

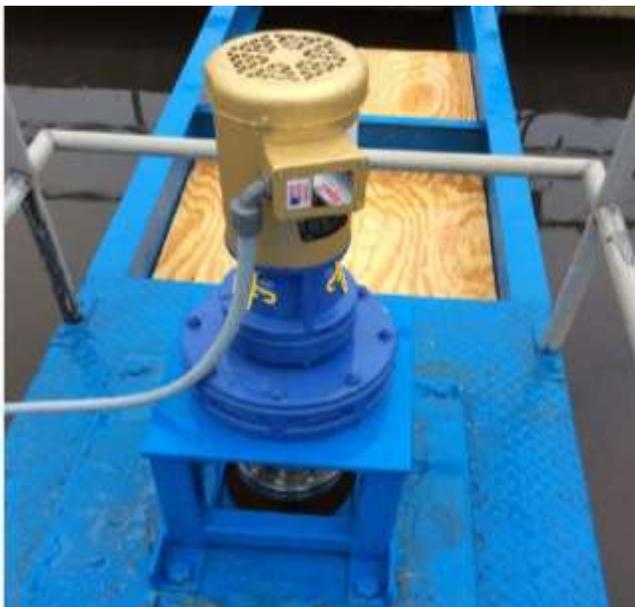
Savannah has used the grant funds to implement energy savings measures into the City Hall. They did so with the installation of energy efficient ceiling lights, replacement of 10 dated and inefficient HVAC units, reconstruction of a 4600 square foot section of flat roof with energy saving materials to reduce energy consumption for heating and cooling purposes, and construction of vestibules at the main three entrances to the City Hall lobby. Project activities also include education and outreach activities.





## Shelby County Government

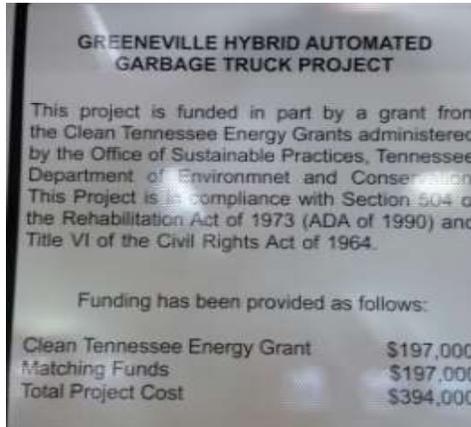
The Shelby County Corrections facility is the highest energy consuming facility in Shelby County. The facility was constructed in 1928, with the addition of thirteen new housing, educational, and multi-purpose units in 1989. Shelby County added multiple solar thermal systems on housing units to use as the primary source for heating water instead of natural gas and an ozone laundry system to conserve on both natural gas and water. The Corrections Office also installed a new solar thermal water system, which consists of 55 solar panels located on ballast racks, which were installed near the boiler room. Inmates gained valuable skills during the installation and maintenance of these products as a re-entry strategy. The personnel were trained first at the Solar America Solutions facility. The personnel facilitated the primary installations and the inmates conducted the remainder of the installations.



## Tellico Area Services System

The project replaced the existing HVAC system, windows, mixer drives and motors, and lighting fixtures at the Tellico Area Services System (TASS) water treatment plant. The water treatment plant currently provides water to over 3,000 residents and has been in operation for over 40 years. Due to the age of the structure, the upgrades and improvements significantly improved efficiency. The existing HVAC and lighting systems were inefficient and were replaced with new high efficiency units. The mixer motors and drives were replaced with high efficiency lower horsepower units. The new, high efficiency heat pump, lighting fixture, new flocculation drives, and building windows have significantly reduced power consumption.





## Town of Greeneville

The Town of Greeneville purchased an Autocar E3 Hybrid automated garbage truck that is utilized in its Municipal Solid Waste Division. The Autocar E3 Hybrid utilizes RunWise technology, which replaces a conventional transmission to utilize hydraulic pressure to propel the truck. When the truck is started, the engine, primary bent axis pump, and motor charge high pressure accumulators. When the driver engages the throttle, the truck's stored energy is used to drive the truck hydraulically. The stored hydraulic energy is used until it is gone, at which point the truck's engine engages and supplies the power. Each time the driver presses the brakes (which for a garbage truck is several hundred times a day) energy is stored in the accumulators, reducing the need for power from the engine.



## Tullahoma Utilities Board

The Tullahoma Utilities Board (TUB) operates a 5 million gallon per day wastewater treatment plant. The plant utilizes four 75 horsepower Roots positive displacement (PD) single speed blowers to provide the aeration required by the WWTP in the main reactor basins. Two of those blowers ran continuously. There are also two 25 hp Roots PD single speed blowers that provide air for the WWTP's pre-react basins. One of those ran continuously. The project also involved the installation of a variable speed turbo compressor to replace the inefficient positive displacement blowers and the replacement of the Sanitare Silver Series fine bubble disk membranes. Two of the reactor blowers and one pre-react blower were operating at all times. These were single speed systems and were continuously pulling full load.



The Water Authority of Dickson County (WADC) was formed as a regional water and wastewater service provider in 2002 by the consolidation of the City of Dickson Water and Wastewater System, Turnbull-White Bluff Utility District, and Harpeth Utility District. Combining these entities resulted in centralized water service to approximately 75% of the land mass and population of Dickson County as well as portions of surrounding counties. This project upgraded lighting fixtures in the water treatment plant, replacing 128 light fixtures with energy efficient LEDs. The upgrades decrease energy consumption and associated greenhouse gas emissions.



# Round 4

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Project Summaries



### City of Algood

The Algood City government upgraded the performance and efficiency operations at both the Community Center and the City Garage. The two outdated and inefficient split gas furnaces (13 SEER rating) in the Community Center were replaced with two full electric heat pumps (17 SEER rating). This reduces energy costs and helps to adequately maintain comfort levels. The City Garage is utilized as a location to maintain city vehicles like police cars, fire trucks, and EMS vehicles. The upgraded lighting included replacing outdated T8 fixtures with high efficiency LED lighting.



### Bledsoe County

Bledsoe County performed HVAC improvements at the Bledsoe County Nursing Home, which is operated by Erlanger Hospital. They replaced 35 old packaged terminal air conditioner (PTAC) units with 13 SEER PTAC units. They also replaced the home's existing heat strip with twinned gas furnaces, which also included duct work modifications. Finally, they replaced a 3 ton gas pack HVAC rooftop unit with a 15 SEER HVAC unit. These improvements - as well as many other non-grant funded improvements - are helping the entity align with their goals to reduce energy consumption by 20% in all county-owned facilities. All project activities exceed EPA guidelines and ASHRAE standards for maximum HVAC efficiency.



## Blount County Government

The original Blount County Courthouse was built in 1907 with additions in 1954. Multiple aspects of the building were old and using energy inefficiently. The project at the Blount County Courthouse included the replacement of old wood, single pane windows and installation of seven Energy Star Rated HVAC Systems. The overall goal of the project was to restore the aging community landmark by making it as energy efficient as possible and to create a more comfortable County Courthouse. This facility will be used by current and future citizens while lessening the building's impact on the environment by reducing energy use and implementing green, environmentally friendly construction practices.



## City of Ducktown

The City of Ducktown purchased a Ford Fusion Hybrid - which has an estimated 44 miles per gallon - to replace its existing Dodge Ram pickup truck with an estimated 15 miles per gallon. The Dodge truck was the primary vehicle for City business and was highly inefficient and expensive to operate. The Ford Fusion Hybrid greatly reduces fuel costs and consumption while also improving air quality by reducing emissions. The fuel economy is more than double that of the old, gas guzzling Dodge Ram.





## City of Etowah

The City of Etowah has replaced the outdated and inefficient attic insulation at their historic GEM Theatre. The GEM Theatre was built in 1906 and has gone through several upgrades - roofing and polyurethane roofing foam - and was in need of some additional insulation to reduce heating and cooling costs. Blown-in R-38 ceiling insulation was used to replace the outdated insulation in the 7,500 square foot attic space of the GEM Theater and Etowah Arts Commission Building. Not only did the upgrade help regulate inside temperatures but also reduced the wear and tear on the HVAC system that ran longer with the inefficient insulation.



## City of Franklin

The City of Franklin completed a lighting project at their parking garage in downtown Franklin. The City retrofitted existing 175 watt metal halide lights with energy efficient LED Lighting. The 78 high-bay garage lighting fixtures were on constantly and in need of repair. Additionally, there are several vehicle charging stations in the parking garage which will be complimented by other sustainability measures. The LED lights give off a strong white light that provides better illumination than what was previously installed, thus improving public safety while reducing costs and environmental impacts.





## City of Gatlinburg

The City of Gatlinburg completed lighting retrofits at the community post office and basketball courts in their Community Center. Sixty-nine existing two bulb fluorescent type fixtures with 2-40 watt T12 bulbs in each fixture at the Post Office were replaced with electronic ballasts and 2-32 watt T8 bulbs. They also replaced twenty-four existing 400 watt metal halide type fixtures with twenty-four 200 watt induction type fixtures to illuminate two basketball courts at the Gatlinburg Community Center. These efforts compliment the City's "Gatlinburg Goes Green" program, a voluntary educational program for businesses to evaluate their operations, set goals, and take specific actions towards environmental, social, and economic sustainability.



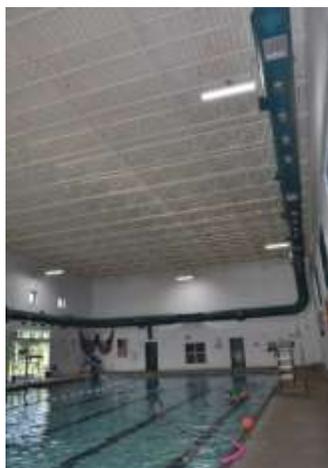
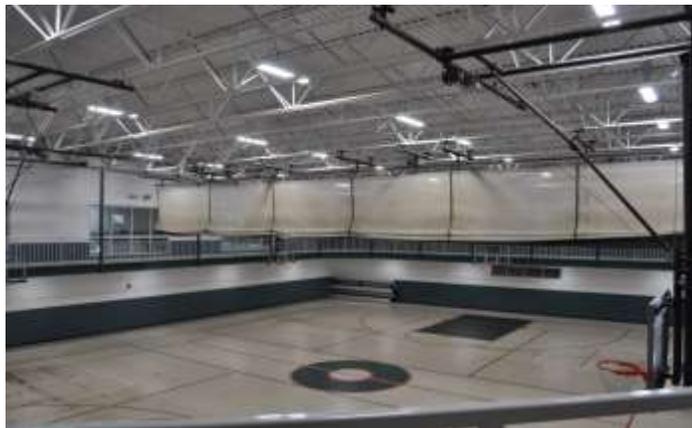
## City of Knoxville

The City of Knoxville installed a closed-loop vertical geothermal heat pump to improve the energy efficiency of a new Public Works Complex. This was part of a major initiative led by Mayor Madeline Rogero, and the City strives to embed energy efficiency and sustainability principals into its policies and actions. The geothermal, or ground-source, heat pump utilizes the naturally stable temperatures in the earth as a heat source (in the winter) and heat sink (in the summer) in order to reduce the building's demand for traditional heating and cooling throughout the year. The reduction in the need for traditional energy for heating and cooling results in significant monetary and energy savings and reductions in pollutant emissions.



### City of Jamestown

The City of Jamestown Community Center was built without a focus on energy efficiency, and to date, only minor efficiency upgrades had been undertaken. The Center, built around 1974, consists of a number of classrooms along with a large auditorium and cooking facilities. The facility is used by the community extensively for many purposes and is occupied almost daily throughout the entire year. In order for the Community Center to become more energy efficient, renovations were necessary. The City of Jamestown replaced the existing 325 fluorescent lights with LED tube lights, which has saved the City of Jamestown both energy and money.



### City of Jefferson City

The City of Jefferson City conducted a lighting retrofit at their Community Center. The project utilized local suppliers and installers, when possible. The project utilized the latest technology for LED lighting. The project also involved demolition of some of the existing structure. All of the demolition materials were taken to a Class IV landfill for proper disposal keeping it out of a Class I landfill. As community centers around the State get older, costs will continue to rise to maintain these facilities. The implementations of new technologies, like this project, are needed to serve as a guide for other communities.



## City of Lebanon

The City of Lebanon completed a waste-to-energy project that is sited at the wastewater treatment plant (WWTP). This project not only creates electricity, but also utilizes existing wood waste, WWTP sludge, and the county's discarded tires as fuel, creating an ideal situation for reducing waste and producing renewable energy. The designed system is the integration of three well-established commercial technologies: a biomass gasifier; a thermal oxidizer/hot oil exchanger; and Organic Rankine Cycle (ORC) power generator. The system design is fundamentally different from incineration since it uses gasification to reduce NO<sub>x</sub>, SO<sub>x</sub>, and fly ash.



## City of Millington

The City of Millington upgraded lighting and HVAC systems at their Police and Court Buildings. The project included improvements to their 70-ton air-chiller that was manufactured in 1995 and has experienced severe degradation on the coils. They incorporated an automation system which controls all HVAC equipment. They also replaced all of the T-12/T-8 fluorescent lighting with high efficiency LED lighting. This project greatly improved the Police and Court buildings, by providing a more comfortable working environment for the staff and the residents that go there on a daily basis.





## Clay County

Clay County took a comprehensive approach to upgrade the overall performance and efficiency of the Clay County Public Library. The Library, completed in 1974, is a well-preserved example of midcentury modern architecture. While this style has regained relevance in the past decade and should be preserved, the 40 year old HVAC and lighting fixtures were in dire need of being upgraded. Improvements included HVAC and lighting. The Library was previously fitted with T-12 fluorescent lighting fixtures, which provide poor reading conditions and were inefficient. A total of 148 T-12 bulbs were replaced with highly efficient LED lighting. They also replaced the 4 decade old HVAC equipment with a modern, high efficiency unit.



## Fentress County

Fentress County replaced 533 inefficient lighting fixtures with more efficient LED lights at their County Courthouse. The Courthouse was built in 1905 and is a vital part of the community as a centralized location of elected county officials as well as General Session's Court and Criminal Court. It was built without the focus on energy efficiency, and to date, there were only minor efficiency updates. The project effectively replaced the existing 533 lighting fixtures with 263 LED tube lights. Within an economically distressed community such as Fentress County, the savings over the lifetime of the LED bulbs is a great benefit.



## Franklin Housing Authority

The Franklin Housing Authority conducted energy efficiency upgrades on 22 of their units. The project scope included:

- Removing existing baseboard heaters and window air conditioning
- Installing new energy star heat pump system including ductwork, grills, registers, programmable thermostats and all accessories
- Providing a duct blaster test to meet 4% or less duct leakage
- Installing attic insulation to achieve an R-38 rating
- Replacing incandescent and fluorescent lighting with new LED lighting



## Humbolt Utilities

Humboldt Utilities needed to reduce energy consumption and peak demand of their high service pumping operation at the water treatment plant. They did so by maximizing efficiency on the pumping systems. The previous high service pumping system consisted of 4 pumps. Pumps 1 and 2 were vertical turbine pumps with 40 hp motors. Pumps 3 and 4 were vertical turbine pumps with 75 hp motors. Pump 1 was out of service. Pump 2 was rarely brought on line. Under normal operation, pumps 3 and 4 were the only ones running. The project replaced the two 40 hp pumps with new efficient vertical turbine pumps with variable frequency drives.





### Jellico Housing Authority

Jellico Housing Authority completed energy efficiency projects to better the community and save energy. The residents of the housing authority are persons of extremely low income; often the income of these families is at or below the poverty level for the area. In extreme weather conditions residents incurred significant utility bills which they had to pay from their very limited resources. This project decreases the utility bills for these families.

The project scope included:

- Removing existing built up membrane roofing and gravel down to the deck
- Adding 7" expanded polystyrene insulation to bring up to current energy codes
- Installing a new energy saving Thermoplastic polyolefin roof system at one building consisting of 24 dwelling units and a 1,322 square foot community room



### Lenoir City Housing Authority

Lenoir City Housing Authority completed energy efficiency projects to better the community, economically and sustainably. The overall goal of this project is to create a more comfortable, safe and healthy living environment for the residents while lessening the overall impact on the environment by reducing energy use and implementing green, environmentally friendly construction practices.

The project scope included:

- Removing existing gas tank type water heater
- Installing new natural gas tank-less water heaters including all venting, and accessories for a complete installation in 108 dwelling units



## Marion County

Marion County completed energy-efficient improvements at the Marion County Justice Center. Activities included the replacement of existing skylights and installation of seven skylight smoke hatch units in the area of inmate housing. These smoke vents are required by the State of Tennessee to ensure proper air ventilation for inmate safety in the event of an emergency. The skylights reduce the amount of lighting energy needed to keep the facility nicely lit.



## Nashville Metropolitan Transit Authority

The Nashville Metropolitan Transit Authority purchased one 500 KW Overhead Fast Charger for all electric/zero emission Music City Circuit buses. The charger is an on route conductive system that offers the highest power and lowest cost charging solution for transit buses. 500 KW capabilities means less time charging and more time on route. It also has higher throughput that allows more buses to utilize the same charging station than lower power alternatives where the station would then become a bottleneck. Since this project does not necessarily reduce emissions, the savings have come in charging costs. Primarily, the use of non-diesel buses will produce the largest emissions reductions.



## Overton County

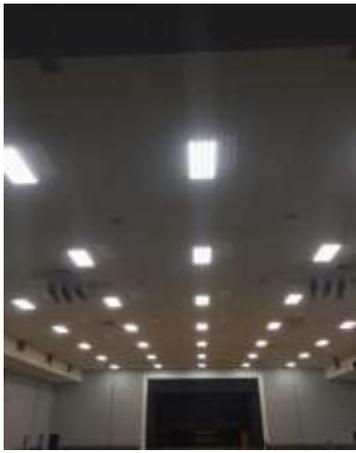
Overton County has improved energy efficiency and performance at their Justice Center. The project consisted of upgrades to the outdated lighting to modern LED fixtures. The Justice Center is a large building, well over 25,000 square feet, and operates 24 hours a day, 365 days a year. Such a large building operating full-time means significant lighting needs, which were being met by a total of 1,154 T8 bulbs and 26 250W fixtures. They have now been replaced with energy efficient, more illuminating LEDs. With leftover funds, Overton County also replaced the chiller unit in the Community Center to update the HVAC system.



## Pickett County

Pickett County conducted various energy efficiency upgrades to their Community Center. The Community Center, constructed in the 1970's, was not equipped with the common energy saving technologies available today. The building was constructed of concrete masonry walls with no insulation. Similarly, the roof was flat and composed of a rubber membrane that did not offer the insulation capacity of modern construction. According to an audit prepared by the Volunteer Electric Cooperative, recommendations for improving energy efficiency include: upgrade lighting fixtures and bulbs; replace the existing roofing membrane; and upgrading doors and windows at the facility. All of the recommended upgrades were completed.





## Putnam County

The government of Putnam County greatly improved the performance and efficiency of several of its public buildings, including the Justice Center, EMS, Health Department, Community Center, and Agriculture Center. The County is dedicated to energy savings, as evidenced by prior completion of TVA Energy Audits for all buildings listed with the exception of the Community Center and the Ag Center. Through the audits, lighting was identified as a great opportunity for energy conservation. Putnam County utilized the grant to upgrade the deficient lighting in each of these buildings.

## Rogersville Housing Authority

This project is an ongoing effort for Rogersville Housing Authority to bring all of the properties in compliance with the International Energy Conservation Code.

The project scope included the following upgrades to 9 housing units:

- Removing existing baseboard heaters or inefficient central furnaces and window air conditioning units
- Installing new Energy Star heat pump systems including ductwork, grills, registers, programmable thermostats and all accessories
- Providing a duct blaster test to meet 4% or less leakage
- Removing existing attic insulation and installing new blown attic insulation to achieve R-38
- Replacing existing incandescent lighting with new LED light fixtures





## Rutherford County Emergency Management Agency

An energy survey was conducted by TVA and the Murfreesboro Electric Department at the Rutherford County Emergency Management Agency Building. The energy survey identified that considerable energy cost savings could be realized by making improvements to the lighting and roofing systems. The first part of the project was to improve a large portion of the leaking roof with a seamless, two part polyurethane roofing system. The new roofing system prevents water intrusion into the building and greatly increases the roof's R-Value. The second part of the project was to replace the existing fluorescent and incandescent lighting system with more energy efficient LED lights.



## Stewart County Government

Stewart County Government hired Ameresco, an Energy Savings Performance Contractor, to conduct an energy audit of county buildings. Ameresco conducted a very detailed lighting audit. A majority of the buildings had T-12 fluorescent lighting; all of the new lights are LEDs. The Courthouse was built in 1962 and had windows, doors, and entrances that were in very bad condition. One of the driving factors of the Ameresco project was to get the building envelope in the best shape possible for the courthouse. The courthouse replaced all windows and building entrance glass and doors.





### Town of Ashland City

The Town of Ashland City completed the following project: replaced older, metal halide lighting in the Fire Department emergency bay and replaced the older fluorescent lighting in the Police Department offices and bay. Ashland City Fire Station II bay had 12 metal halide lights in their truck bay where they load equipment and prepare trucks for fires in the City. The metal halide lighting required heavy maintenance, resulted in high costs, and gave poor illumination and required lengthy start-up times. At the Police Department, the offices and bay used the older fluorescent lighting which release heat, contain harmful chemicals, and are only about 20% efficient. Energy efficient LEDs were used to replace all of the lighting.



### Town of Centerville

The Town of Centerville installed variable frequency drives (VFDs) to the high service and raw water pump motors at the water treatment plant. The installation of the VFDs reduces the power costs to operate the water treatment plant. This allows the City to contain its treatment costs, thus keeping water rates low. The Centerville water plant uses soft starts for its motors. VFD's were not widely used when the plant was constructed. The installation of the VFD's has upgraded the Centerville system with the latest energy saving technology.



## Town of Farragut

The project consisted of the installation of LED lighting and automated lighting controls for the interior of the Town Hall, the office building that houses the majority of Town staff, meeting spaces, a community room, museum, and rental space for select Knox County offices. Indoor, overhead lighting in the Town Hall previously consisted of a combination of T12 fluorescent tubes and compact fluorescent and incandescent screw-in bulbs, which had no automated lighting controls in place. The improvement utilizes "green" technology to enhance energy efficiency, while addressing the issue of select lighting being phased out.



## Town of Oneida

The Town of Oneida's Municipal Building project scope included:

- Removing existing built up membrane roofing and gravel down to the deck
- Adding 7" expanded polystyrene insulation to bring up to current energy codes
- Installing new energy saving Thermoplastic polyolefin roof system

The overall goal of this project was to create a more comfortable, safe, and healthy environment for the residents while lessening the overall impact on the environment by reducing energy use and implementing green, environmentally friendly construction practices. The improvements are expected to have a useful life of 15 years or more.



## Town of Tazewell

The Town of Tazewell completed projects to increase the energy efficiency of the Tazewell City Hall. The following were basic TVA recommended improvements.

The scope of the City Hall upgrades that were completed included:

- Replacement of the previous propane heat and electric air system and installation of a dual fuel (natural gas and heat pump) system to reduce the energy consumption with an 18 seer rating
- Replacement of the existing exterior and air lock foyer doors
- Removal and replacement of existing vinyl windows
- Installation of R-38 insulation in the attic
- Replacement of existing fluorescent lighting with LEDs



## Town of Tracy City

The Town of Tracy City installed energy efficiency retrofits to the Adult Education Wing of the South Cumberland Learning and Development Center. The building, which served as Tracy City's High School from 1937-1996, was vacant before the project. The Town of Tracy City desired to renovate the building and turn it into the South Cumberland Learning and Development Center. The facility is now used as an adult education center, business incubator, and a general community building with a gymnasium and auditorium. The project scope included:

- New HVAC split system high efficiency heat pumps
- New R-19 fiberglass ceiling insulation
- Caulking of all exterior windows to reduce unwanted heat loss/gain





## Town of Unicoi

The Town of Unicoi acquired the Tourist Information Center building in 2012 and made cosmetic renovations to the building to create an inviting Tourist Information Center. But, the renovations were very energy inefficient. The building was constructed in 1974 and contained the original single pane windows and doors which were quite drafty. They replaced 12 windows and three sliding glass doors with Energy Star qualified windows and doors. They replaced the HVAC unit with a gas heat unit and an electric air conditioning unit. This allows them to use the emergency generator they currently have, if needed, since the generator will not have to power the heat system. The ability to use the emergency generator is important because the Tourist Information Center is also used as an emergency shelter for travelers during bad weather.

# Round 5

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Project Summaries



## Anderson County

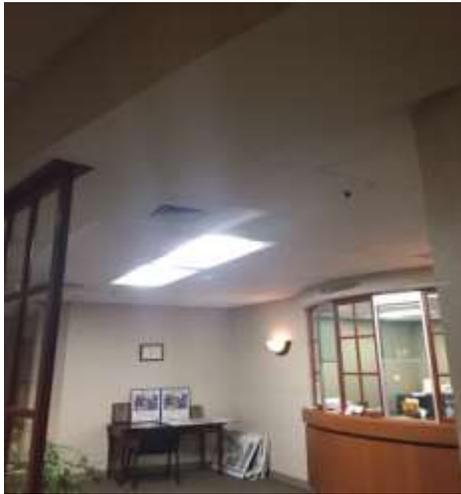
Anderson County completed a project at the County's Fleet Service Facility, Highway Facility, and Dickens Building with upgrades to LED lighting. As other government and community buildings around the area get older, the costs will continue to rise to maintain these facilities. New technologies like those used in this project serve as a guide for other communities. The project involved demolition and removal of some of the existing fixtures. All of these materials were taken to a Class IV landfill for proper disposal thereby keeping them out of a Class I landfill. Any of the metal parts that were removed were taken to the recycling center for handling and taken to an end user to be reused.



## City of Franklin

The project uses various emerging technologies such as the thermal hydrolysis process and solar dryers that will significantly improve the City of Franklin's biosolids management systems for their wastewater treatment plant in significant ways including:

- Near elimination of landfilling biosolids, thereby reducing the risks of hauling, fuel consumption, and staffing and equipment requirements
- Beneficial reuse of Class A material
- Beneficial reuse of fats, oils and grease to increase the generation of biogas
- The use of biogas through a combined heat and power system to generate heat and power to help run the biosolids processes
- The use of solar energy to dry solids material versus thermal drying



### City of Hendersonville

The City of Hendersonville Public Works Department is committed to providing high quality essential services and infrastructure for a safe and healthy community through innovation and professionalism. To uphold the City's commitment of innovation they are taking progressive measures as it relates to the lighting method used by the City Hall facility. Previously, the facility's interior was illuminated with 1,292 fluorescent lights. The City phased-out the use of fluorescent lighting by installing 323 LED retrofit kits.



### City of Johnson City

The City of Johnson City has proposed to complete an aeration system and lighting upgrades at the Regional Wastewater Treatment Plant. Aeration system improvements include installing a smaller blower to serve the oxidation ditches and sludge holding tanks/digesters and piping and electrical work. Lighting system upgrades include the use of LED technology in interior and exterior fixtures. The City of Johnson City had an energy conservation study completed by the University of Memphis Civil Engineering Department and the University of Tennessee Municipal Technical Advisory Services. Based on this study, the City of Johnson City worked with its engineer to evaluate implementation of the recommendations.



### City of McMinnville

The project will substantially improve the energy efficiency of lighting and exterior metal doors at the McMinnville Civic Center. They will replace eighty-eight existing high-bay metal halide lights with high intensity discharge (HID) and light emitting diode (LED) bulbs as well as eleven un-insulated exterior metal entry doors. With these improvements, McMinnville will be able to continue their dedication to improve environmental and fiscal sustainability. From an environmental perspective, the proposed project is anticipated to reduce overall power consumption and thus decrease power plant emissions and lower the facility's carbon footprint.



### City of Rockwood

The scope of work consists of replacing or retrofitting various sizes and types of fixtures in the City of Rockwood's public library, community center, and city garage with LED fixtures and/or lamps. After evaluating the city garage, and finding the HVAC system inadequate, the City determined it was necessary to replace the furnace in the back room and add an AC heat pump to bring higher efficiency. The City is replacing the furnace, and removing all the air conditioning window units. Adequate ductwork and ceiling tile replacement were also necessary.





## City of Spring Hill

The City of Spring Hill aims to reduce electrical and HVAC consumption at the following municipal facilities: City Hall, Spring Hill Water Plant, and Spring Hill Library. City Hall will retrofit the existing basic thermostats with 7-day multi-time setting thermostats and will replace existing on/off light switches with passive infrared wall switch occupancy sensor or lighting controlled passive infrared ceiling sensors. The City will install a single room Energy Efficient Ductless Mini-Split HVAC unit into a server/electronics room for controlled temperature. The City of Spring Hill Water Plant will retrofit the existing 400 watt metal halide ceiling fixtures with 150 watt LED High Bay Base with lamp. The City of Spring Hill Library will install an automated Energy Management System for HVAC efficiency reduction.



## Laguardo Utility District

The LaGuardo Utility District will perform the following work:

- Install variable frequency drives to the high service and raw water pump motors within the water treatment plant
- Replace the existing fluorescent lighting with LED lights within the water treatment plant

The installation of the variable frequency drives and LED lights will reduce energy and power costs to operate the water treatment plant. This reduction will allow the District to reduce its treatment and operating expenses, thus keeping water rates low to the customers.





## Morgan County

The project scope for Morgan County is the placement of solar panels at the existing ten tanks, six pumps, and two treatment plants located within the Cumberland Utility District. The utility has constructed eight water storage tanks, water booster stations, and two water treatments plants across the District to serve water customers in Morgan and Roane County. The District has no way to monitor these facilities except to travel to them five days of the week to check the sites and perform maintenance as necessary. This project involves the installation of eighteen solar powered Supervisory Control and Data Acquisition systems to provide monitoring at each of the eighteen sites, reducing the need to perform site visits unless deemed necessary.

## Town of Dover

The Town of Dover desires to replace twenty year old HVAC units at the Town Hall, install Variable Frequency Drives (VFDs) to three blower motors, and install a dissolved oxygen control system at the wastewater treatment plant. These improvements will greatly reduce the demand for electricity from the local distributor. This is possible due to the higher efficiency of the HVAC condensing units, and reduced use of the blower motors for the aeration system at the wastewater treatment plant due to the installation of the VFDs on the motors and dissolved oxygen control system.





## City of Huntingdon

The Tennessee Valley Authority performed an energy audit of the two existing groundwater supply wells and two finish water high service pumps located at the Huntingdon Water Treatment Plant. The energy audit showed that the City of Huntingdon has the potential to save a significant amount of energy and money by implementing certain energy efficiency improvements. These include the installation of Variable Frequency Drives (VFDs) for the water treatment plant and more efficient HVAC equipment.



## Van Buren County

The government of Van Buren County is proposing to greatly improve the performance and efficiency of several of its public buildings, including the Burritt Building (Administrative Building), Fairgrounds Building, Health Department, Public Library, and Recycling Center. The County is dedicated to energy savings, as evidenced by prior completion of TVA Energy Audits for all the facilities listed. Through the audits, lighting was identified as a great opportunity for conservation so LED lighting is being installed to replace all the older, inefficient lights.



# Round 6

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Project Summaries



## Bedford County Utility District

The Bedford County Utility District replaced the fluorescent lighting within its water treatment plant with new LED lighting. These improvements have greatly reduced the energy usage by the plant. This is possible due to the higher efficiency of the LED lighting within the building. It should be noted that the building houses the entire treatment plant operations, including mixing, flocculation, sedimentation and filtration. The District has been working with the Tennessee Valley Authority to find ways to reduce the energy consumption at the plant.



## Bells Theatre

The Bells Theatre is one of the most iconic buildings in downtown Bells. For the last 13 years the building has remained vacant, leading local citizens to rally together and create the "Save the Bells Theater" campaign. This campaign led to the renovation of this 1938 original building which brought the structure down to the shell, with all building envelop areas receiving repair work, including new insulation to meet the current energy standards. The design also includes all new HVAC, plumbing, electrical services, new LED lighting and bringing the facility into ADA compliance. The original art-deco design elements remain a key architectural feature. Due to the building's vacancy the savings estimates assume full use and occupancy once open. Lighting, HVAC, insulation, LED lighting, and energy improvements are estimated to decrease energy use by 1/3 of the previous use. Bells Theatre also received funding from the Recreation Educational Services Grants (RES) within TDEC as a joint venture.





### City of Erin

The City of Erin water treatment plant uses soft starts to operate the motors for the high service pumps. Variable frequency drives (VFD) were not used when the plant was constructed. The installation of the VFD's has improved the Erin treatment system using the latest energy saving technology. These energy reductions have allowed the City to reduce its treatment and operating expenses, thus allowing for lower water rates for customers. In addition, the plant's previous lighting was fluorescent in the treatment plant and office areas. The installation of LED lighting has reduced power consumption and operating costs at the plant.



### City of Jellico

The City of Jellico proposed to replace all interior lighting with LED light fixtures at the City Hall. Jellico's City Hall building houses local governmental offices, the police department, fire department and utility offices for Jellico Electric and Water. The previous lighting at City Hall was very old and did not comply with the 2006 International Energy Conservation Code. The improvements made at Jellico City Hall have provided immediate energy savings in the day-to-day operational costs of the City, allowing Jellico to use savings on more critical priorities.





### City of Lafayette

The City of Lafayette, TN proposed an upgrade to the performance and efficiency of the Lafayette Police Station. The facility had a Gexpro Achieve Zero Energy Audit completed, which identified the outdated, inefficient lighting fixtures as the most beneficial scope of work. Many of the lights throughout the building were comprised of T-8 fluorescent bulbs, 60w incandescent bulbs, and 90w halogen bulbs that require a large amount of electricity. Through these enhancements, the City of Lafayette will be able to continue its dedication to improve its environmental and fiscal sustainability.



### City of LaFollette Parks and Recreation

The City of LaFollette Parks and Recreation Department energy efficiency improvements project focused on replacing 24 old and ineffective HVAC units with new, energy efficient units and programmable thermostats. These new HVAC units were installed at the City's community building to provide notable energy savings. Prior to the update, the building operated very inefficiently and there were numerous repair costs associated with the ongoing maintenance of the equipment. The 24 HVAC units were almost 40 years old, which is 20 years past the useful life according to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards.





## City of Maynardville

After an energy analysis was completed for the City of Maynardville's Town Hall, it was determined that there were two main strategies that could increase energy efficiency. The first was the replacement of all interior lighting within City Hall with LED light fixtures. Previously, City Hall lighting did not comply with the 2006 International Energy Conservation Code and consisted of 28-8ft lighting fixtures and 11-4ft lighting fixtures. The second recommendation was the replacement of two outdated, independent HVAC systems servicing City Hall. The previous units required frequent maintenance, driving up the costs for the City. Also employees frequently complained about temperature variations throughout the building. This was due to one thermostat controlling space temperature for areas with several different exposures.



## City of Memphis Government

The Lichterman Nature Center is run by the City of Memphis Division of Parks and Neighborhoods and Memphis Museums, Inc. and is an urban nature center with an arboretum, an accessible forest boardwalk, Backyard Wildlife Center and Visitor Center. The project's scope was to replace the previous inefficient lighting with LED lighting as well as install an education kiosk. The Lichterman Nature Center was the best fit for this type of large-scale energy efficiency project because of the large number of visitors, including approximately 40,000 students each year.



### City of New Johnsonville

The City of New Johnsonville efficiency improvements project focused on the replacement of previously existing aerators at the New Johnsonville Wastewater Treatment Plant (WWTP) with new high efficiency aerators. While the previous aerators were rated at approximately 5-6 horsepower (HP), requiring 4.5 kW of power each, the new aerators provide the same amount of aeration with approximately 3 HP motors requiring only 2.2 kW. These improvements maximize the treatment efficiency of the WWTP aerated lagoons reducing electrical usage.



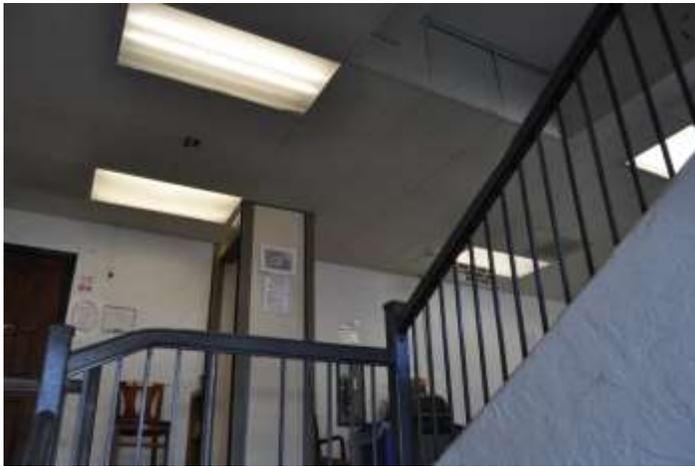
### City of Tennessee Ridge

The Tennessee Ridge pump station efficiency project focused on the improvement of two pump stations to reduce electrical consumption. The first improvement involved the replacement of existing pump, motor, and starter assemblies at the Highway 147 Wastewater Lift Station. The second improvement was for the Tennessee Ridges Water Treatment Plant. Previous hydraulic system conditions were causing the end suction centrifugal high service water pumps to operate very inefficiently. The situation caused extra energy consumption and led to severe cavitation damage of the pump impellers.



## Cocke County

The Cocke County courthouse was constructed in 1930 and was added to the National Register of Historic Places in 1995. With an addition in 2002, the building houses the court, Sheriff's Offices, and the 120-bed Cocke County Jail. The Sheriff's Office and Jail are 24-hour operations rather than typical 12-hour public buildings, so a significant portion of the lights remain constantly illuminated. Conservatively, there were over 500 fluorescent and incandescent light fixtures and bulbs in the building that were upgraded to LEDs.



## DeKalb County

The government of DeKalb County proposed to upgrade the performance and efficiency of its County Courthouse and Jail. The greatest need for improvement for the County Courthouse was to retrofit the outdated, inefficient lighting fixtures. Many of the lights throughout the building were comprised of T-8, T-12, T-8 U tubes, and linear fluorescent bulbs that use a great deal of electricity. The jail was being approached in a similar manner; this project consisted of retrofitting the outdated, inefficient lighting fixtures. Previous lighting demands for the jail were met by a combination of obsolete T-8 and T-12 bulbs.



## Fayette County Government

The project focus was to reduce energy consumption at the Fayette County Justice Complex and the Fayette County Courthouse. Fayette County now more efficiently utilizes energy while reducing its impact on the environment and enhancing the quality of the workplace and environment for employees and citizens. The project's scope was to implement energy savings measures with the modernization of previous building lighting systems to all LED fixtures. The immediate result of the project is facilities with dependable lighting at a substantially reduced cost of operation. Long-term benefits of the project include lowered repair costs due to the life of modern lighting components.



## Grundy County

Grundy County determined that the best approach to save energy was to install energy efficient lighting retrofits at multiple county facilities. A majority of the funding provided energy efficiency upgrades to the old Grundy High School Gymnasium, which will ultimately be used as a community recreation facility. This money was used to match funds committed by a 2016 Local Parks and Recreation Fund (LPRF) grant for the facility. The remaining funds were used to replace inefficient fluorescent lights in the Grundy County Courthouse, the Grundy County Health Department, and the Grundy County University of Tennessee Agricultural Extension Office building.





## Haywood County

The Haywood County clean energy project consists of an extensive lighting upgrade from T12, T8, and metal halide lights to LED fixtures in four county owned facilities including the Haywood County Justice Center, the County Courthouse, the Boys and Girls Club Gym, and the Scott Community Center. The project also involves the installation of 51 new self-contained water source heat pumps (WSHP) in the courthouse, which will enhance and create a comfortable work environment for all employees and visitors. A 50 kW solar project on the roof of the Justice Center is another portion of the project. This technology will help the Justice Center offset their annual utility bill and TVA will credit the building for production at the current rate the facility receives for electricity consumed.



## Lake County

Lake County installed a 24.15 kW solar system placed at their EMS station. Utilizing TVA's Green Power Provider (GPP) program, the County receives retail rates for all kWh's of energy produced by the system for 20 years. The installed solar system offsets 60% of the facilities electrical usage by producing over an estimated 30,000 kWh annually.



## Macon County

The government of Macon County proposed to upgrade the performance and efficiency of the County Courthouse, Criminal Justice Center, Sally Wells Fairground Building, and EMS Building in Lafayette, TN. The greatest need for improvement for all of the buildings was to retrofit the outdated, inefficient lighting fixtures. Many of the lights throughout the building were comprised of T-12, lamp U-tubes, and halogen bulbs that require significant energy. There were approximately 214 fixtures at the County Courthouse, 442 fixtures at the Criminal Justice Center, 76 fixtures at the Sally Wells Fairground Building, and 98 fixtures at the EMS Building that had the opportunity to be converted to LEDs.



## Marion County

The Marion County project is an extensive lighting upgrade to four county-owned buildings, which include the Marion County Justice Center, the Marion County Annex, the County Courthouse, and the Election Commission Building. The courthouse building contains approximately 1,540 sq. ft. of single pane windows that are being replaced with new high efficiency, Energy Star rated windows. In the Justice Center, a new closed-circuit cooler is replacing the 16 year-old unit that runs at 60 horsepower (HP). The new unit operates at 30 HP, reducing the energy usage by half.



## McNairy County

The McNairy County project consists of an extensive lighting upgrade to six county owned facilities and a 50 kW solar installation at the UT Martin Education Extension. This extensive lighting retrofit replaced original fluorescent lights with new, state of the art energy efficient LED lights in the McNairy County Justice Center, the UT Martin Extension, the County Courthouse, the Jack McConnico Memorial Library, the County Annex Building, and the Ag. Extension and Head Start Learning building. The 50 kW solar project was installed on the roof of the UT Martin Extension building and will offset the annual utility bill. TVA will also credit the facility for production at the current rate the facility receives for electricity consumed.



## Morristown Housing Authority

The Morristown Housing Authority (MHA) operates 672 units of public housing. The project included removing previous electric furnaces and the installation of new, all electric, Energy Star heat pump systems (16 SEER) including ductwork, grills, registers, programmable thermostats and all accessories in twenty-five (25) dwelling units in Sneedville, Tennessee. Additionally, the MHA provided a duct blaster test to meet a 4% or less leakage goal and replaced previously existing incandescent lighting with new LED light fixtures in the twenty-five dwelling units.





## Perry County

The Perry County energy efficiency project included the renovation of the Perry County Sheriff's Office and Jail Building with a three part project increasing the energy efficiency of the structure and helping save tax dollars for the residents of Perry County. The roof portion consisted of the installation of an energy efficient VFI seamless roof system over the male detention block (the tower) and the administration area with added insulation to the facility's roof. The lighting portion consisted of replacing existing linear fluorescent lamps with new LED units which has decreased electric usage and has eliminated the need to stock and replace costly lamps and ballasts that are nearing the end of their life. The third part of the project replaced three HVAC units that were situated on the jail roof and approximately 15 years old and failing. The new units are Energy Star rated and provide significant energy and maintenance cost savings.



## Rhea County

The courthouse, constructed in 1891 and a designated National Historic Landmark, is an extremely important asset in Rhea County. Through a preliminary audit of county facilities, lighting improvements were identified as the project which would generate the most energy savings for the county. The Rhea County project consisted of the installation of energy efficient lighting in the Rhea County Courthouse and Annex. The replacement of the T8 and T12 fluorescent lighting with energy efficient LEDs contributes to Rhea County's energy saving strategy . Rhea County is using the funds saved to implement other aspects of their energy conservation strategy and to continue the operational assessment of county-owned facilities.



## Sequatchie County

Sequatchie County has welcomed energy saving opportunities at three county managed buildings in an effort to reduce electrical usage and costs, increase comfort and productivity, and improve lighting levels and aesthetics. Targeted buildings included the Sequatchie County Justice Center, the County Courthouse, and the Sequatchie County Health Department. The solutions for the county included upgrades from T12, T8, and metal halide lighting to energy efficient LEDs. Benefits associated with this energy upgrade are most visible to the public at the Health Department and the courthouse where patients and citizens rely on these facilities on daily basis.



## Sevier Solid Waste Inc.

Sevier Solid Waste Inc. (SSWI) operates the largest municipal solid waste (MSW) mixed co-composting facility in the nation. SSWI receives all MSW and bio-solids from Sevier County and the entire Great Smoky Mountains National Park. Therefore, anything that is thrown away from these locations is processed through SSWI. The waste taken to SSWI, 300 tons of MSW per day, is pushed into Eweson Digesters for three days. During this time, organics (including food waste and paper products) are broken down into compost. To increase efficiency, SSWI replaced three gearboxes for Digesters D3, D4, and D5. Previously the gearboxes were rated for a 200 hp motor with a 250 hp motor turning the digesters. The low rated gearboxes were inefficient, caused long term maintenance issue, and caused material to be sent to the Class I landfill due to downtime.





## Union County

The Union County energy efficiency project involved upgrading the HVAC units in the County Courthouse. The courthouse building also houses the County jail on the lower level of the facility. The project consisted of the installation of a 15 ton, a 12.5 ton, and a 10 ton Trane, high efficiency rooftop gas package unit for the main courthouse section of the building. In the jail, it consisted of the installation of a 15 ton Trane high efficiency split heat pump on the ground and a 7.5 ton Trane high efficiency split gas unit on the roof. The energy retrofits will be used as a model for future projected energy efficiency upgrades to other County buildings.