



2015 Environmental Report

To build on KUB’s legacy of environmental responsibility, KUB completed a corporate Environment and Sustainability Strategic Initiative in 2015. Through the initiative, existing environmental programs and opportunities for new initiatives were reviewed. KUB also adopted a corporate environmental policy to serve as the foundation for environmental stewardship with continual improvement.

Corporate Environmental Policy



Knoxville Utilities Board’s (KUB’s) mission is to act as good stewards of our communities’ resources, including the environment. KUB demonstrates environmental responsibility by making financially sound investments in our utility systems and facilities in ways that protect and sustain the environment. We serve as a resource for our customers who would like to do the same.

We are committed to achieving this by:

- Meeting or exceeding environmental laws and regulations.
- Utilizing resources efficiently.
- Educating our employees on environmental best practices.
- Assisting our customers with sustainable use of utility services.
- Engaging in sustainability partnerships.
- Continually improving and communicating our environmental performance.

Environmental Report 2015

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Environmental Stewardship

KUB is proud to have a long history of making environmental responsibility a priority. Our mission is to act as good stewards of our communities' resources, safeguarding those resources for the communities we serve today and generations to come.

To identify opportunities now and for the future, KUB completed a corporate Environment and Sustainability Strategic Initiative in 2015. The initiative works toward effective and innovative programs that will continue KUB's mission of environmental stewardship.

KUB operates in accordance with green business practices, engaging our employees to identify new opportunities for efficiency and environmental responsibility. There are many ways for employees to participate by volunteering at environmentally focused agencies and participating in programs like River Rescue, EarthFest, WaterFest, and more.

In some areas, like transportation and fleet management, KUB has been finding more environmentally efficient options for decades. The fleet programs have long been a critical support function for all areas of KUB and in the 1970s, KUB first began using alternative fuels by converting some vehicles to compressed natural gas (CNG). We continue to build

on that legacy by increasing our use of hybrid electric vehicles in our fleet. And the construction of the new public CNG fueling station will provide clean fuel for our fleet, as well as the Knoxville community.

We continue to support efforts by TVA, the City of Knoxville, and other agencies to promote conservation and improve the environment and quality of life for our community. Programs like Round It Up and Knoxville Extreme Energy Makeover are weatherization programs aimed to provide a root-cause solution to an ongoing problem – low-income residents in energy-inefficient homes that are costly to heat and cool. Through partnerships like these, KUB and our partners can achieve a better environmental impact together than we could alone.

It is an exciting time for environmental stewardship at KUB. We look for affordable ways to incorporate sustainability improvements in everything we do. That means our efforts benefit the environment and make good business sense.

Mintta Roach



Award Winning Environmental Results

KUB is dedicated to being environmentally responsible in our operations and supporting the sustainability of our communities' natural resources. We continue to build on our legacy of environmental responsibility with award winning results and partnerships that offer new opportunities to support the environment.

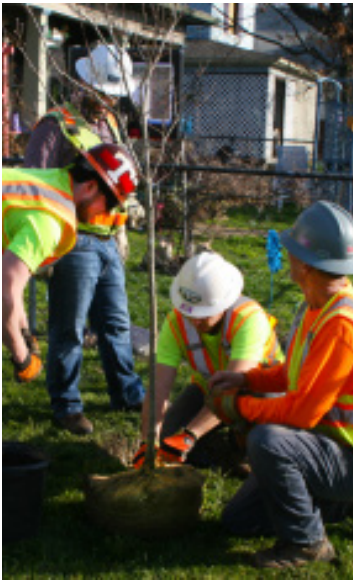
Notable Recognitions:

- EPA ENERGY STAR certification for KUB's Miller's Building headquarters
- Numerous Silver, Gold, and Platinum awards for wastewater plant operations
- National Biosolids Partnership Platinum certification
- Kentucky-Tennessee Water Environment Association Beneficial Use of Biosolids award
- TVA EnergyRight® and Renewable Energy Solutions Program Top Performer awards
- TVA Green Power Switch Leader of the Year award
- Sierra Club Tennessee Chapter Sustainable Energy Leader Award
- Annual Tree Line USA designation since 2001
- Government Fleet Magazine's "100 Best Fleets in the Americas" recognition
- Knoxville News Sentinel Best of Knoxville "Green Business"

A Tree Line USA Utility

Since 2001, KUB has been recognized by the Arbor Day Foundation as a Tree Line USA utility for national leadership in properly caring for trees while providing safe, reliable electric service. KUB serves nearly 200,000 customers with more than 5,000 miles of electrical lines, which are pruned on a three- to four-year schedule to prevent power outages. To ensure this work is performed with proper techniques to preserve tree health, KUB has a team of professional arborists overseeing the work and conducts annual training. KUB has an education program to encourage customers to Plant the Right Tree in the Right Place, avoiding conflicts with utilities, and a tree planting program, with approximately 400 trees planted each year.

KUB began a Habitat for Humanity tree planting program in 2008, where a tree is planted for each new Habitat home built in our service area. Trees add beauty and life



to our community, as well as help conserve energy, increase property values, and clean our air and water. We are proud that more than 200 trees have been planted as a result of this program.



Energy Efficiency Partnerships

KUB's commitment to the environment includes partnerships with state and local government and non-profit groups to educate the community about conservation.











Based on recommendations of the 2013 IBM Smarter Cities Challenge report for Knoxville, KUB is collaborating with other agencies on the Round It Up and Knoxville Extreme Energy Makeover (KEEM) weatherization programs. The Round It Up program partners KUB with the City of Knoxville and Knoxville-Knox County Community Action Committee (CAC) to raise funds through KUB bills to help weatherize the homes of low-income homeowners and renters in our community. KUB sends 100 percent of donations to CAC to aid the efforts of the CAC Weatherization Assistance Program, a program recognized by both state and federal agencies for meeting or exceeding all technical and fiduciary requirements. Weatherization provides a root-cause solution to an ongoing problem – low-income residents in energy-inefficient homes that are costly to heat and cool. In addition to helping our environment, it also reduces the need for recurring bill payment assistance. The voluntary program began in May 2015 and more than \$500,000 has been raised at the time of this report.


KEEM is a project to provide cost-effective, comprehensive energy efficient retrofits for older homes located in low-income communities. In August 2015, the KEEM team, consisting of City of Knoxville, CAC, The Alliance to Save Energy, and KUB, received a \$15 million TVA grant to begin makeovers for eligible homes. The upgrades will retrofit 1,200 homes,

resulting in a 25 percent reduction in each home's electric energy use – an estimated energy savings of 1,000 kilowatt hours (kWh)/year at approximately \$10/square foot. These retrofits could include: weatherization, air sealing, high-efficiency heat pumps, high-efficiency air conditioners, replacing/repairing ducts, ENERGY STAR® windows, building envelope insulation, high efficiency light fixtures, crawl space and attic insulation, heat pump water heaters, ENERGY STAR® appliances, and whole-house ventilation. Makeovers are already underway with the program slated to conclude in late 2017.



Low-income Weatherization Assistance

 KEEM	 Round It Up
 \$15 Million Grant	 More than \$500,000 raised in 2015
 2 year program	 Sustainable funding source beyond KEEM grant
 Assistance for approximately 1,200 homes	 Serves KUB customers in any county



These efforts help support the City of Knoxville's participation in the Georgetown University Energy Prize competition. Knoxville is competing with 52 communities across the nation to reduce residential and municipal energy use and win up to \$5 million to invest in additional energy efficiency work.

LED Streetlight Conversion

Since 2014, KUB has assisted the City of Maynardville in converting its streetlights to energy efficient LED lights. A total of 102 lights have been converted, with an expected savings of more than \$40,000 annually.

KUB also continues to work with the City of Knoxville to develop a plan to convert nearly 30,000 streetlights throughout the city to LED lights. The project would allow the city to achieve significant energy savings and its goal to reduce greenhouse gas emissions by 20% by 2020. Other benefits to the city include improved light quality and visibility, reduced light pollution, and improved safety.



Above: Weatherization retrofits provide long term savings for low-income homeowners and renters. Measures can include air sealing, insulating walls or roofs, and improving ventilation, all aimed to reduce the homeowner's utility bills.



Above: Partners come together to celebrate the \$15 million KEEM program for low-income home weatherization.

EnergyRight® and Renewable Energy Solutions

KUB's commitment to supporting the sustainability of its communities' natural resources was illustrated in 2015 by TVA's recognition of KUB with eight top performer awards for delivery of energy efficiency and renewable energy programs to its customers.

EnergyRight® Solutions

KUB partnered with TVA in December 2014 to launch eScore, the EnergyRight® Solutions program for residential energy efficiency. Since then, more than 1,200

KUB customers have participated in the program. The customers earned more than \$200,000 in rebates, and the energy efficiency improvements are expected to save approximately 1.4 Gigawatt hours (GWh) of electricity.

TVA advisors audit a customer's home and rate its energy efficiency on a 1 to 10 scale. Customers receive a report with recommendations to help them conserve energy and save money, as well as a list of available rebates for improvements. Customers can participate in eScore multiple times—possibly with multiple rebates—until their home is a '10,' providing customers an opportunity to increase their homes' indoor quality and value while saving on energy bills.



The EnergyRight® Solutions program is also available for commercial and industrial customers. KUB customers can make their businesses more energy efficient, save money, and demonstrate their commitment to the environment by adopting more sustainable practices, receiving incentives to help transition the business to a more energy efficient facility. In the 2015 program year, 169 projects were completed with an estimated savings of nearly 13 GWh. The customers earned more than \$280,000 in incentives.

These programs not only lower utility costs for the participating customers, but have the environmental benefit equal to taking more than 2,000 cars off the road for a year.



Renewable Energy

With the Green Power Switch program, KUB customers are consistently among the leading purchasers of green power in the Tennessee region. Over a year's time, \$8 a month for two blocks of green power has the same environmental impact as planting an acre of trees in your community or not driving for four months. In 2015, KUB customers purchased the equivalent of more than 100 GWh of electricity, with the environmental impact of removing nearly 14,000 cars from the road for a year (or benefit equal to over 594,000 acres of forest).

Through the Green Power Providers program, KUB customers generate their own renewable energy and sell it to TVA. KUB has more than 100 solar installations interconnected to its system through this program (nearly three megawatts (MW) of capacity).

In addition to providing programs for customers to invest in renewable energy, KUB is evaluating renewable energy options for its operations and facilities. For the Kuwahee Wastewater Treatment Plant, KUB is studying options to increase beneficial use of biogas produced as a byproduct of the plants' processes. KUB currently utilizes a portion of the biogas to meet heating needs for the wastewater treatment process, and the excess gas is flared. KUB's feasibility study of a potential combined heat and power system for the plant is nearly complete. The project could potentially provide approximately 1.4 MW of clean, renewable energy for up to 85% of the plants' energy demand. KUB is also conducting solar feasibility studies for its facilities.



KUB Customer Participation

eScore

- 1,200 participants
- \$200,000 in rebates
- \$1.4 GWh saved



EnergyRight® for Business - Industry

- 169 Projects
- \$280,000 in rebates
- 13 GWh saved



Wastewater Collection and Treatment

PACE 10

Sewer overflows and aging wastewater system infrastructure have been growing concerns across our nation for years. KUB implemented Partners Acting for a Cleaner Environment (PACE 10), a \$650 million, ten-year program, to focus on wastewater system improvements and accelerate KUB's efforts to reduce sanitary sewer overflows, as well as meet increasingly strict regulatory requirements. PACE 10 has also significantly improved wastewater treatment plant performance to help ensure compliance during peak wet weather flows.

Since PACE 10 began in 2004, KUB has upgraded an average of 25 miles of sewer line per year, which represents two percent of the system annually, or a sustainable 50-year replacement cycle. PACE 10 is the largest project in KUB's history and required a transition from spending about a million dollars per month for system improvements to a million dollars a week.

Many utilities have federal Consent Decree (CD) requirements to make system improvements. KUB's CD was entered into the federal court record in 2005, shortly after the PACE 10 launch. KUB delivered on time and on budget the construction of six wastewater storage tanks and 134 collection system projects required under the CD, and then rolled the system replacement and maintenance into the Century II infrastructure replacement program. In 2012 and 2013, KUB completed two of the major plant upgrades (\$71 million), and will complete the final two required plant projects (\$51.5 million) by the end of the CD term in 2021.



"KUB has demonstrated a serious commitment to address its long-standing sewage overflow problems by implementing the Partners Acting for a Cleaner Environment sewer improvement program and meeting major consent decree milestones. KUB's efforts have resulted in a dramatic 82 percent drop in SSOs between 2003 and 2014."

—Heather McTeer Toney
EPA Regional Administrator

Wastewater Treatment Plants

One of the most important things KUB does for the environment everyday is treat more than 30 million gallons of wastewater from the community. KUB's four wastewater treatment plants use the most advanced and reliable procedures available to ensure the protection and preservation of East Tennessee's natural water supply for domestic, commercial, and recreational use.

This commitment translates into ongoing improvements in wastewater collection and treatment systems that allow KUB to meet or exceed standards for effluent quality. This is achieved with the use of state-of-the-art computer control systems to monitor and optimize treatment.

We are proud that our wastewater plants continue to be recognized with peak performance awards. In 2015, KUB's four plants received awards from the National Association of Clean Water Agencies (NACWA) for their 2014 performance. This marks the fifth year that Eastbridge has qualified for a Platinum award by having no violations for five consecutive years. Fourth Creek and Loves Creek qualified for a Gold Award with no violations in the previous year. Kuwahee qualified for a Silver Award, which NACWA gives to plants with five or fewer violations.

Eastbridge, Fourth Creek, and Loves Creek also



received Operational Excellence Awards for their 2014 performance from the Kentucky-Tennessee Water Environment Association (WEA).

Biosolids Management Program

The National Biosolids Partnership (NBP) gave KUB's Biosolids Management Program its highest Platinum level certification. KUB's program, which first achieved Platinum status in December 2011, is one of only 34 nationwide and two in Tennessee to achieve NBP certification. The recognition demonstrates a high level of commitment to industry best practices and rigorous quality control. Additionally, the Kentucky-Tennessee Water Association (WEA) presented KUB with an award for Beneficial Use of Biosolids in 2014.

Biosolids are a nutrient-rich byproduct resulting from the treatment of wastewater, which can be applied like fertilizer to condition soil and improve yields. Rather than send the material to landfills, the program provides nearly 30,000 tons of biosolids material annually to local farmers as a fertilizer registered with Tennessee Department of Agriculture.



Water Quality

KUB customers can count on KUB for safe, reliable, and high-quality drinking water. We are proud of our excellent water quality record, and we are committed to maintaining it. KUB's state-of-the-art Water Quality Laboratory performs about 100,000 tests annually—many more than required by law—to ensure our customers' water is safe. We also check for over 150 contaminants to help protect our drinking water and waterways.

To meet our obligation to our community's health now and in the future, KUB is focusing on more than 1,400 miles of pipe and dozens of pump stations and storage facilities that help deliver water to our community. Aging infrastructure is an issue for utilities across the nation, and KUB has successfully been able to accelerate our rate of replacement for older pipes under Century II, our system replacement and maintenance program. KUB replaces 1 percent of our water system per year with pipe that has an average life of 100 years, which keeps us on a sustainable cycle.

KUB voluntarily began its river monitoring program in 2001 to determine the impact of the activities at KUB's wastewater treatment plants on the water quality of the Knoxville section of the Tennessee River system below the Forks of the River. Samples are collected monthly and data results show that the water returned to the river after treatment is actually cleaner than the water in the river.

KUB's creek sampling program is another important environmental safeguard that monitors the quality of local waterways. We work with businesses on waste pretreatment to ensure the effluents they discharge are within legal limits. The routine sampling of area creeks also helps KUB monitor sewer leaks.

As an EPA WaterSense® partner, KUB encourages efficient use of water resources to protect the environment, preserve resources for future generations, and reduce water and wastewater treatment costs by avoiding unnecessary water consumption.



Air Quality

KUB looks for sustainability improvements in everything we do, particularly major utility initiatives. That means our efforts benefit the environment and make good business sense. The South Loop Natural Gas Pipeline project partnered KUB and the University of Tennessee (UT) to bring expanded natural gas service to UT's coal-fired steam plant. At the start of the project, the steam plant was the second largest airborne polluter in East Tennessee with the plant's emissions at approximately 90,000 metric tons of carbon dioxide equivalent (MTCDE), accounting for 20-25% of UT's total emissions. KUB's construction of a new high pressure natural gas pipeline delivers cleaner burning fuel to UT, allowing for replacement of three coal-fired boilers with three high efficiency natural gas boilers. This conversion reduces UT's emissions by 39,000 MTCDE, which is equivalent to removing 7,000 passenger vehicles from the road each day.

As part of restoration of the area disturbed during construction, KUB is working with the City of Knoxville on a pedestrian greenway along a section of pipeline route. In addition, community aesthetics are improved with the removal of the UT steam plant's smokestack, electrostatic precipitator, and coal pile located at one of the primary entrances to UT's campus.

KUB's investment of \$27 million for the project required construction of ten miles of high pressure steel natural gas pipeline, including eight miles of 16-inch and two miles of 8-inch pipeline. To minimize environmental impact, KUB routed the pipeline through areas with existing overhead electric utility easements, to the extent possible. Construction required crossing an inlet of the Tennessee River and Third Creek, and KUB utilized horizontal directional drilling technology to ensure little or no disturbance of the waterways.



Fleet Programs

KUB first led the industry in the 1970s when we began using alternative fuels by converting some fleet vehicles to compressed natural gas (CNG). In 2005, KUB began increasing use of alternative fuels. Since then, KUB has added biodiesel (5 percent soy-based) and E85 for flex fuel vehicles. KUB continues to expand alternative fuel options, and the construction of a new CNG fueling station will support our goal to increase KUB's alternative fuel fleet and provide clean fuel to the public. Planned for completion in January 2017, the station will replace the current aging station used only by KUB fleet and will be the first in Knoxville to provide clean fuel to the public, as well as KUB's fleet. The CNG market is growing, but commercial stations are sparse. KUB's new public station will not only promote a broader adoption of alternative fuels in our community, it will also provide a new source of revenue which makes good business sense.



KUB also includes hybrid technology in its everyday operations. KUB's fleet includes 24 Plug-In Hybrid Electric Vehicle (PHEV) bucket trucks. The bucket trucks are equipped with Odyne proprietary hybrid technology, which will reduce fuel consumption by 50 percent or greater and lower emissions by an estimated 19.25 metric tons of carbon dioxide equivalent per year. It will also allow the truck to operate quietly while still powering all attachments and tools and heating or cooling the cab. In the hybrid model, the quiet operation improves safety by allowing workers in the bucket to better hear instructions from the ground. [In traditional models, the vehicle must be idling to operate the bucket.]

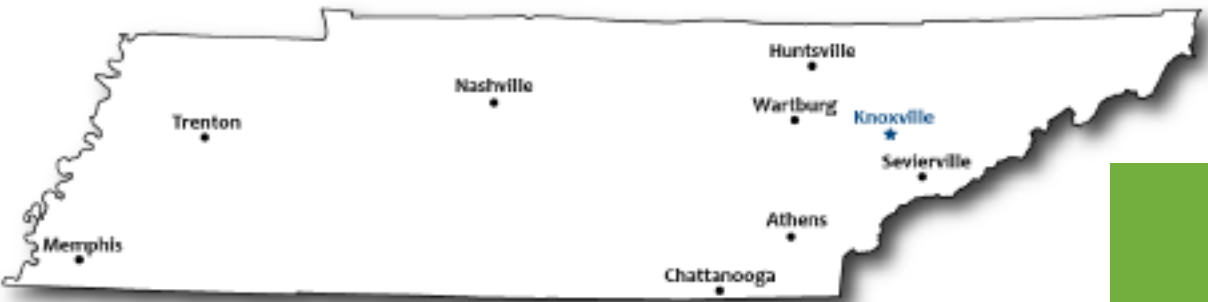
KUB serves on the East Tennessee Clean Fuels Coalition Board of Directors, and has been a Gold Partner with the organization since 2004. Through this long-standing partnership, KUB stays informed of sustainable alternatives and grant opportunities for its fleet and participates in education and research to support regional air quality and clean fuel initiatives.



Above: KUB's fleet was again recognized as one of the 100 Best Fleets for 2015 by Government Fleet Magazine and The 100 Best Fleets in the Americas.

Key Features of the CNG Fueling Station

- Scheduled to open by January 2017
- \$2.5 million design/build project with TruStar Energy CNG
- New revenue source for KUB
- Public access to clean fuel
- Expandable for future growth
- Fast fill dispensing for a wide range of vehicles from tractor-trailers to passenger vehicles
- Self-service, 24/7 operation
- Station capacity: 300 gas gallon equivalents (GGE) per hour
 - o 1 dispensing island dedicated to KUB vehicles
 - o 2 dispensing islands dedicated to public use
- Sustainable lighting and landscaping



Above: This map illustrates the locations of existing public CNG fueling stations across Tennessee. Without one currently in the Knoxville area, KUB's project will meet the need to expand availability of this clean fuel.

KUB Fleet By The Numbers

- CNG - 49
- Electric - 1
- Electric Hybrids - 24
- Ethanol (E85) - 51
- Biodiesel (B5) - 326



Customers will have a cleaner and more affordable transportation fuel option for all classes of personal and commercial vehicles.

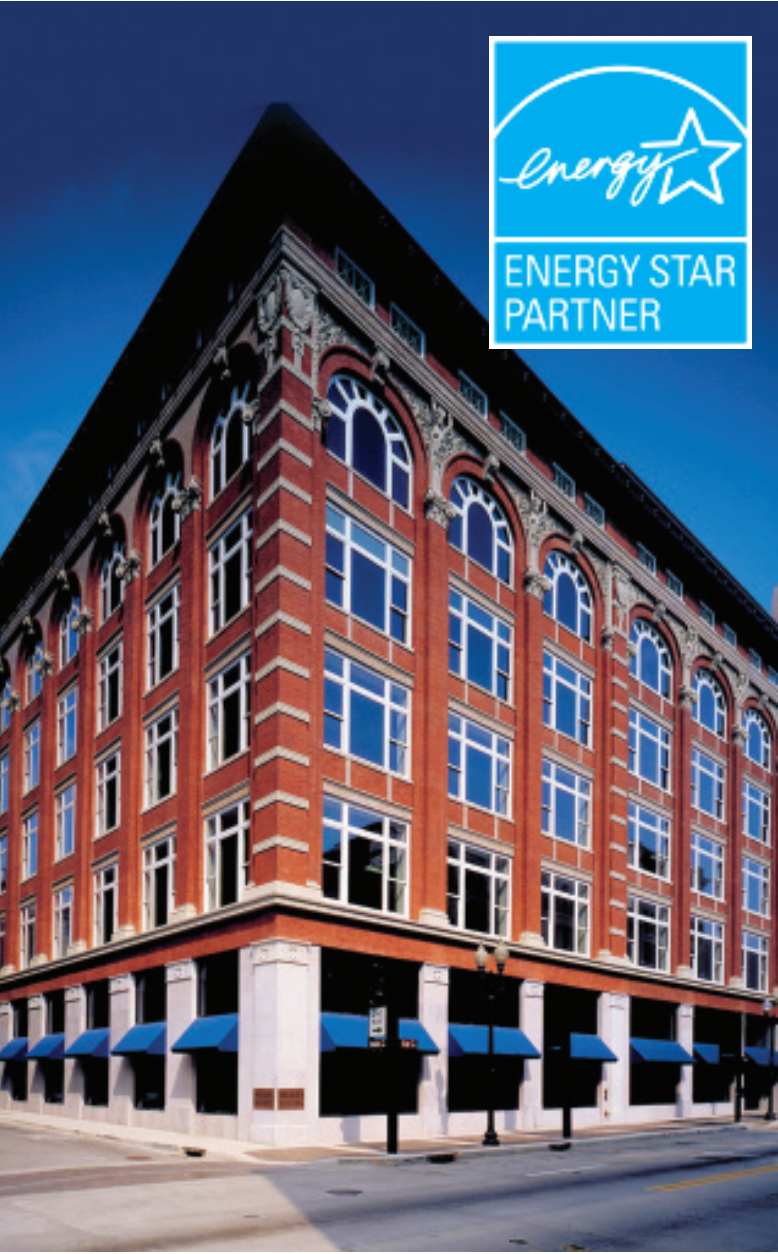
Facility Upgrades

KUB works hard to incorporate environmental initiatives into our daily operations. These efforts include everyday changes in the workplace aimed to conserve energy and promote sustainability, as well as updates and retrofits to our facilities to ensure efficiency and advance our environmental mission.

KUB has taken a comprehensive look at the lighting in many of our facilities, focusing on replacing outdated, inefficient lighting with more efficient bulbs and controls. In the Overhead Construction truck bays, more than 50 metal halide high-intensity discharge (HID) light fixtures have been replaced with light-emitting diode (LED) fixtures controlled by occupancy sensors. Prior to the project's completion in November 2015, the lights were turned on in the truck bays 24/7. Lights can now be brought on in banks of rows so that only the specific area being utilized for work is lit, creating more energy efficiency.

In a multi-phase collaboration with TVA and the Electric Power Research Institute (EPRI), KUB is also upgrading the lighting in its Transformer Warehouse as part of the Energy Efficiency Demonstration—Controllable High Bay Lighting Pilot Project. The first phase replaced approximately half of the warehouse's 1,000 watt HID light fixtures with a more efficient alternative, and some light fixtures were removed from the warehouse. The project also incorporated

automated controls to monitor trends in usage and compare kilowatt usage of the new fixtures and the remaining HID fixtures. The final phase, currently underway, is monitoring ambient light levels produced by skylights to determine the feasibility for utilizing natural light, which would dim the fixtures based on the level of ambient light available in the area.



The downtown home of KUB is an iconic building, and its Edwardian style has stood the test of time. Inside, the Miller's Building exhibits energy efficiency with:

- A closed-loop water source heat pump
- Efficient lighting, including compact fluorescent bulbs and fluorescent T8 tubes with electronic ballasts
- Large exterior windows and open atrium to augment lighting needs with daylight
- LED exit signs and ENERGY STAR computers and copiers
- Water-saving fixtures

KUB's Miller's Building has earned the U.S. Environmental Protection Agency's 2015 ENERGY STAR certification, the national symbol for superior energy efficiency and environmental protection. Commercial buildings and industrial plants that rate in the top 25 percent of facilities in the nation for energy efficiency qualify for the ENERGY STAR.

Plans are also underway for a full retrofit of the HVAC systems at the Hoskins Operations Center campus, which houses more than 50% of KUB's employees. Over the next five years, the project will replace 40-year old systems in every building on campus with new energy efficient HVAC systems. The new systems will incorporate building automation, providing energy control management to reduce overall consumption.



Above: The Hoskins Operations Center (HOC) houses more than 50% of KUB employees, including the departments of Human Resources, System Operations, Engineering, Overhead Construction, Safety and Technical Services, and others.



Above: In the Overhead Construction truck bays, more than 50 metal halide high-intensity discharge (HID) light fixtures have been replaced with light-emitting diode (LED) fixtures controlled by occupancy sensors.

Employee Initiatives

KUB and its employees are proud to be good stewards of our community and its natural resources. In 2015, KUB introduced a new volunteer time policy to support employees' volunteer efforts, providing the opportunity for employees to find service projects with an environmental focus. Employees have used Vol Time to help agencies like Living Lands & Water, Habitat for Humanity, and Ijams Nature Center.

Employees also support environmental stewardship by making adjustments to their office routines—reducing paper use, utilizing recycling bins, employing GoToMeeting or conference calls instead of travelling to other KUB facilities for meetings, among other things. Employees coordinate events throughout the year such as River Rescue and Adopt-a-Stream to maintain the natural beauty of the areas surrounding our campuses.

Right: A KUB employee helps clean up during the River Rescue.

Below: Employees volunteer at EarthFest on Saturday, April 18. Customers received materials on energy conservation and "green" options like Paperless Billing.



The KUB Retirees Association (KUBRA) collects and recycles aluminum cans to raise money for local organizations such as Angel Tree and United Way. In addition, KUB employees support Project Help by recycling newspapers.



KUB offers incentives to employees who use greener commuting options. Green options such as riding a bike, carpooling, or riding the bus to work are good for the environment and employees, improving their health and saving money. KUB partnered with Smart Trips in 2011, a local not-for-profit that promotes green commuting options, creating incentives for commuters that track their commutes.



KUB supports employees' volunteer efforts, providing the opportunity for employees to find service projects with an environmental focus. Agencies assisted include Living Lands & Water, Habitat for Humanity, and Ijams Nature Center.



KUB works hard to reduce its amount of landfill waste. Materials we recycle include:

- Aluminum cans
- Antifreeze and solvents
- Batteries
- Cardboard
- Cell phones and electronics
- Light bulbs
- Mixed paper
- Oil
- Pallets
- Plastics
- Printer cartridges
- Scrap metal
- Utility poles



Let's conserve together.

www.kub.org