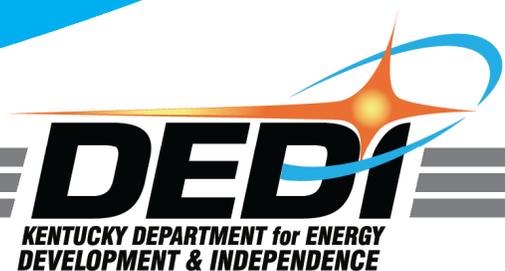


2012 Annual Summary

Kentucky Department for Energy Development
& Independence

Kentucky Energy & Environment Cabinet



Foreword



Over the past twelve months the Energy and Environment Cabinet and the Department for Energy Development and Independence (DEDI) have worked diligently to improve the energy efficiency of Kentucky's homes, businesses and transportation fleet, and increase our use of renewable energy.

We have developed opportunities for biofuels as well as worked to advance the production of alternative transportation fuels derived from our fossil energy resources. Additionally, we have maintained our commitment toward researching carbon capture and storage for coal-generated electricity while at the same time providing a forum to discuss the challenges and opportunities that nuclear power may offer to Kentucky's future electricity portfolio.

Kentucky's and the nation's energy landscape continues to be as dynamic and complex as ever. We have seen low-priced, abundant natural gas coupled with new federal regulations and policies change the demand for Kentucky's fossil energy resources. These changes are challenging Kentucky's long-standing economic models and are requiring the Commonwealth's leadership to reassess the status quo and evaluate future courses of action. Our modeling and data-base analyses have shed new light on the use and production of Kentucky's energy resources that is assisting Kentucky leaders make better informed decisions.

DEDI's efforts have been focused to improve the quality of life for all Kentuckians by simultaneously creating efficient, sustainable energy solutions and strategies; by protecting the environment; and by creating a base for strong economic growth.

This annual summary provides a brief overview of DEDI's programs and projects that are helping shape Kentucky's energy future.

More information about DEDI's activities can be found at <http://energy.ky.gov>.

Dr. Len Peters

My Fellow Kentuckians-

2012 was another busy and successful year for the department. This year we saw Kentucky's energy programs and partnerships receive national recognition, our net-zero energy schools be nationally acclaimed, and perhaps most importantly, we saw Kentuckians benefit from their energy investments. I am proud to say that we continue to make progress toward achieving Governor Beshear's vision of Kentucky becoming a national energy leader.

Energy programs sponsored by the department and its partners have touched every aspect of our economy – from our homes, to our businesses, to our communities. By following the Governor's Energy Strategy and leveraging Recovery Act funding the department helped leapfrog Kentucky's economy toward greater energy efficiency that has improved our energy reliability and enhanced the Commonwealth's energy infrastructure. This year 174 Kentucky school districts continued in the Energy in Education Collaborative and identified more than \$15 million in cumulative avoided energy costs; the University of Kentucky built a new LEED registered energy research laboratory; the Commonwealth was recognized as a 2012 ENERGY STAR Partner of the Year; and the Kentucky Home Performance program completed 1,006 home energy upgrades and was ranked 5th in the nation.

We worked with more than 90 stakeholders across the Commonwealth to develop energy efficiency opportunities under the Stimulating Energy Efficiency in Kentucky collaborative. This initiative helped to implement policy options that were identified in the 2011 Kentucky Climate Action Plan. The department also supported research at our universities to help find solutions to carbon capture and storage barriers. Additionally, we continued our work in

developing biofuels, biomass and renewable energy markets to create new jobs and enhance the diversity of our energy portfolio.

Low priced and abundant natural gas coupled with a recovering national economy and impending federal environmental regulations continues to influence the development of Kentucky's fossil energy resources. As a result, we strive to develop new opportunities and markets for Kentucky's fossil energy potential that balance economic and environmental issues.

Much has been accomplished but our agenda remains full. We must continue to work together to find the best path forward for all Kentuckians. Thank you for the opportunity to serve as your cabinet secretary.



Len Peters, Secretary,
Kentucky Energy and Environment Cabinet

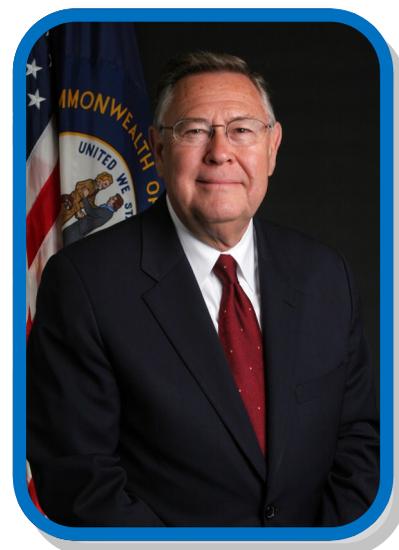


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DEDI Organization



The Kentucky General Assembly enacted legislation that established DEDI within the Energy and Environment Cabinet in 2008. The department was created with six divisions that support implementation of Governor Steve Beshear's energy plan.

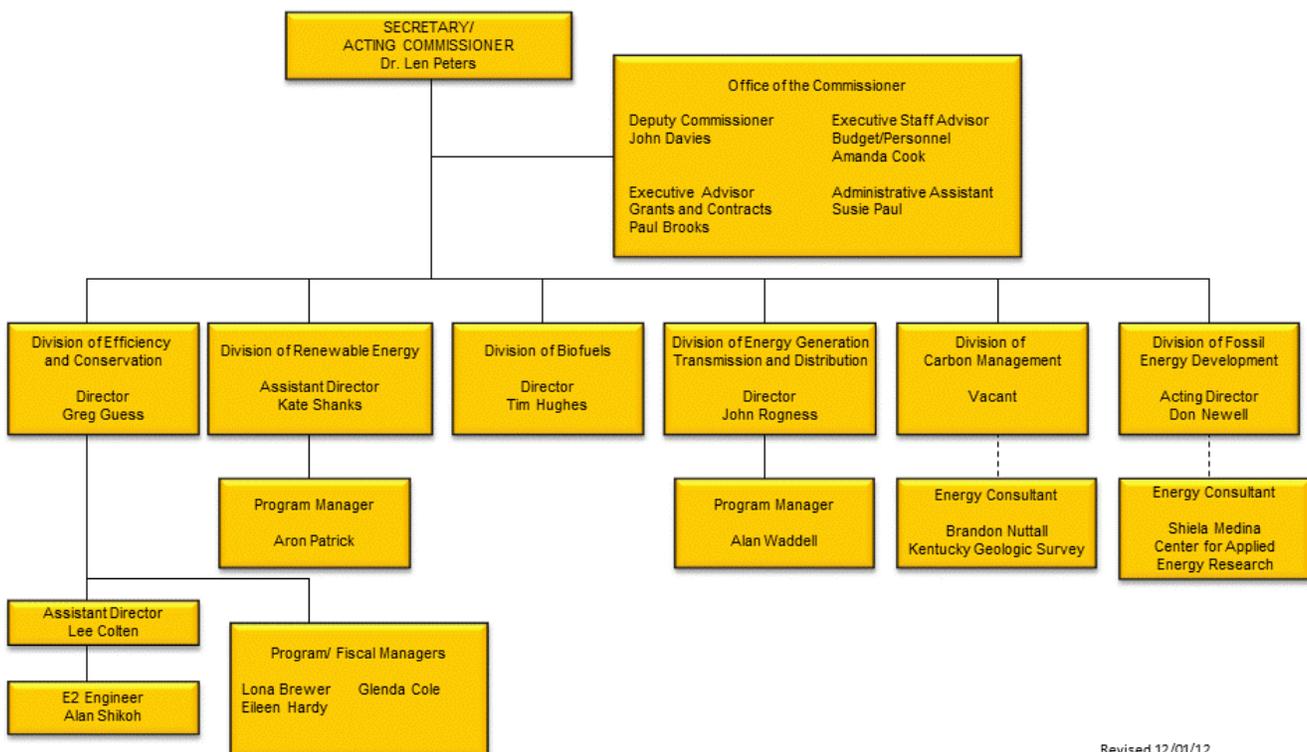
Additionally, the department collaborates with both the University of Kentucky Center for Applied Energy Research and the Kentucky Geological Survey, which provide technical expertise and advice. The Department was authorized 29 fulltime employees of which 12 employees helped to manage the \$68 million in American Recovery and Reinvestment Act funds allocated to DEDI by the US Department of Energy. With the conclusion of Recovery

Act funding, the department realigned its staffing levels and ends the year with 16 employees.

DEDI's mission is to improve the quality and security of life for all Kentuckians by creating efficient, sustainable energy solutions and strategies and promoting clean, reliable, affordable energy sources that help Kentucky improve energy security, reduce emissions, and provide economic prosperity. Additionally, the department supports and encourages energy-related research and development that will benefit Kentuckians.

A short summary highlighting the accomplishments and future direction of each division follows.

DEPARTMENT FOR ENERGY DEVELOPMENT AND INDEPENDENCE



Revised 12/01/12

DEDI Organization

Division of Efficiency and Conservation

The division is charged with implementing the first of the seven strategies in the Energy Plan. The first strategy has the goal of offsetting 18 percent of Kentucky's projected 2025 energy demand through increased energy efficiency. During the first part of 2012 the division was engaged in winding down the activities funded under the American Recovery and Reinvestment Act (ARRA) of 2009, which provided approximately \$68 million for energy efficiency, conservation and renewable energy programs over the last three years. Division staffing levels were scaled back in the final days of ARRA-funded project activities even while final reports were being completed for many of our activities.

Division staff worked with 24 partner agencies and organizations on more than 30 programs that impacted every major sector of Kentucky's economic activity, including K-12 and higher education, local government, state government, residences, industry, commercial buildings, agriculture, and electric utility "smart grid" initiatives.

The primary challenge going forward will be to sustain as many of the programs or program elements as possible given that two major ARRA grants expired this year. Considerable effort went into planning programs that offered the greatest opportunity for sustainability beyond the Recovery Act funding period. For example, the Kentucky Department for Housing, Buildings and Construction used ARRA funding to hire and train inspectors to ensure compliance with the state's new HVAC standards. That inspection program is now being supported by fees generated from inspections.

A number of other projects have demonstrated that they can become sustainable after Recovery Act funding expires. These projects are identified in the descriptions in the following pages and include the Kentucky Green Bank, Commonwealth Energy Management Control System,

School Energy Managers Program and Kentucky Home Performance just to highlight a few.

The division is managing three projects that are a result of DEDI's successful application for competitive grants from U.S. DOE. Two of these are ongoing while the third is in the start-up phase. The two existing grants are Stimulating Energy Efficiency in Kentucky (SEE KY) and Energy Efficiency Awareness and Action (EEAA). The third is the Department for Local Government/Energy Savings Performance Contracting (DLG/ESPC) project. These projects will help to continue the momentum started as a result of the Recovery Act.



Mr. Rick Spurlock and Mr. Rick Montgomery with U.S. Playing Card Company, Erlanger, Kentucky, received an Energy Leadership Award from Secretary Len Peters at the 2012 Governor's Conference on Energy and the Environment.

Another opportunity division is presented with is the administrative oversight of a number of projects being funded from the Tennessee Valley Authority (TVA) Environmental Mitigation settlement, which resulted in some \$11.2 million in funding over the next three years that will be used for 13 projects and programs. This funding will help strengthen existing programs as well as support new energy efficiency and renewable energy projects in the Commonwealth.

DEDI Organization

Division of Renewable Energy

The Division of Renewable Energy is tasked with implementing Strategy 2 of *Kentucky's 7-Point Strategy for Energy Independence*, which calls on Kentucky to triple its renewable energy generation to provide the equivalent of 1,000 megawatts of clean energy while continuing to produce safe, abundant, and affordable, food, feed and fiber. In meeting its objective, staff primarily focus on policy development, policy analysis and education and outreach and provide technical assistance to those pursuing renewable energy.

Despite contributing only a small percentage of Kentucky's electricity generation in 2012, renewable resources produced more than 3.3 million megawatt hours. The majority of the generation is attributed to existing renewable energy capacity from hydroelectric and biomass facilities, but Kentucky did bring online new solar capacity in 2012.

Kentucky continues to see growth in the area of distributed generation. With limited demand coming from utilities for renewable energy, Kentucky is adding capacity from solar, biomass and geothermal systems installed for homes, farms, schools, and business. For example, this past year Kentucky added approximately 900 kilowatts of distributed renewable energy—mostly solar—in the region served by the Tennessee Valley Authority (TVA). The TVA continues to offer an incentive for solar electricity and other forms of renewable electricity, and that incentive is driving growth. Additional projects are slated to come online in the early months of 2013. The TVA program that provides the incentive has been modified multiple times and is now called Green Power Providers. Projects eligible for the incentive payment include wind, solar, biomass and hydro systems rated at 50 kilowatts and below.

Farmers are supplementing incomes with renewable energy. By combining federal and state tax credits with grants and utility incentive payments, farmers are finding solar arrays to be profitable. Specifically, farmers are using U.S. Department of Agriculture Rural Development grants,

Kentucky Governor's Office of Agricultural Policy (GOAP) grants and state and federal tax credits to reduce the cost of renewable energy equipment. Farmers in the TVA territory are using the Green Power Providers incentive to further increase their return on investment. During 2012, the GOAP provided \$375,422 through the On-farm Energy Efficiency program to install 38 solar projects on farms in Kentucky. This program was first initiated with ARRA funds and has been extended using GOAP resources.

Division staff continue to work on policy analysis and policy development related to renewable energy. Emphasis has been placed on policies that encourage or remove obstacles for those who are pursuing distributed renewable energy voluntarily. Policies that encourage distributed renewable energy systems typically include provisions for net metering and interconnection standards, tax credits and power purchase agreements and lease arrangements.

Division staff provide education and outreach services through presentations, webinars and workshops and assist project developers by providing information about permitting, zoning, tax credits and potential partners. For example, wind developers are assessing a few sites in Kentucky for utility-scale wind farms. While Kentucky does not cur-



Solar Film at Richardsville Elementary School, Warren County, Kentucky

DEDI Organization



rently have wind farms, some sites may be favorable for development. Staff assist these developers with understanding the regulatory and economic situation in Kentucky for large-scale renewable energy generation. Provided sites are found to be favorable for development, actual construction could still be many years out.

The Division provided primary staff support for the Kentucky Center for Renewable Energy Research and Environmental Stewardship (CRERES). This past year, CRERES requested the Public Service Commission staff to provide a staff opinion regarding the legality of power purchase agreements and lease arrangements in Kentucky. The Center's board also began discussing the Incentives for Energy Independence Act of 2007 Section 50 Report. This report contains several recommendations for improving energy efficiency and increasing renewable energy. The report was written for the Public Service Commission and published in March 2008.

The Division is also a liaison to the Conn Center for Renewable Energy Research at the University of Louisville. In addition to research related to the Center's core themes, the Conn Center and its partners have been chosen to compete at the U.S. Department of Energy Solar Decathlon 2013.

Division of Biofuels

The Division of Biofuels' mission is to provide leadership to grow Kentucky's biofuels and biomass industries through research, development and commercialization while continuing to produce safe, abundant and affordable food, feed and fiber. The division has oversight in implementing Strategy 3 for biofuels production, and coordinates the biomass power generation features of Strategy 2 for production of renewable electricity.

In response to one of the recommendations of the 2009 Governor's Executive Task Force on Biomass and Biofuels Development, legislation was introduced in the 2012

Kentucky General Assembly to facilitate the establishment of New Generation Cooperatives (NGC). House Bill 441 created KRS 272A - the *Kentucky Uniform Limited Cooperative Association Act*. The NGC business model has been used extensively in other states to help farmers participate in the ownership of a number of ethanol and biodiesel facilities. The law does not alter the organizational structure of existing cooperatives, but allows new entities to be formed that encourage producer ownership and outside investment.

2012 was definitely a dynamic year for the bioenergy industry throughout the nation and in Kentucky as well. Mendel Bioenergy Seeds which had coordinated significant Miscanthus research in southern Kentucky for the past few years held a regional field day in February and within a couple of months curtailed their efforts. During this time frame, Aloterra Energy was establishing over 18,000 acres of Miscanthus in nearby states under the United States Department of Agriculture (USDA) Biomass Crop Assistance Program (BCAP). A portion of Aloterra's rootstock was originating from northeastern Kentucky. Another BCAP project area utilizing Miscanthus was also announced in North Carolina.

A devastating national drought resulted in Kentucky's corn yield being reduced by almost half and heightened the debate on modifying the Renewable Fuel Standard (RFS). The U.S. Environmental Protection Agency (EPA) received numerous requests in support of and against amending the ethanol requirements but ruled that conditions did not warrant a waiver. The ethanol industry has responded to the reduced grain supply by ceasing production at a number of plants and decreasing output at others. Ethanol has become an integral part of our nation's fuel supply as an oxygenate and octane booster.

The EPA also began issuing E15 ethanol registrations during 2012 with the first station offering E15 blended fuel located in Kansas. E15 was approved in 2011 by the EPA for use in automobiles manufactured after 2001, but each state has varying constraints that have limited the fuel's

DEDI Organization



distribution. Various state agencies are looking at the issues surrounding E15 use in Kentucky, but the sale of this fuel has not yet started in our state.

In addition to fuels like ethanol and biodiesel lowering our dependence on fossil fuels, a number of bioproducts are being offered that include renewable alternatives to petroleum. During this year's Governor's Conference on Energy and the Environment, representatives from the USDA, Ford Motor Company and The Goodyear Tire and Rubber Company discussed the USDA Biopreferred Program and their firm's involvement in the research, development, and promotion of these products. The USDA web site can be accessed at: <http://www.biopreferred.gov> and a number of Kentucky companies have certified their products under this program.

The Division of Biofuels was also involved with a number of regional, state, and national conferences and field days this year. The American Society of Agricultural and Biological Engineers met in Louisville and held sessions discussing the logistics of using biomass to produce fuel, electrical, and thermal energy. Murray State University coordinated various events associated with their farmer network which is evaluating a number of bioenergy crop ecosystems. Commonwealth Agri-Energy conducted a trial on using sweet sorghum sugars to produce ethanol and saw favorable results. A regional field day was held in Bracken

County that discussed the history of the switchgrass research program in coordination with East Kentucky Power Cooperative. The University of Kentucky, Morehead State University, and Eastern Kentucky University were involved with the event. Leadership from Bracken and neighboring counties also coordinated a feasibility study looking at various value-added bioenergy options for their region earlier in the year.

Cellulosic and Advanced Biofuel projects transitioned from pilot operations to significant commercial projects in 2012. Companies like KiOR, Chemtex, DuPont, Abengoa, and ZeaChem either started commercial production or initiated construction on projects around the country with cellulosic feedstocks of wood, crop residues, forages, or other dedicated energy crops. Recast Energy, Louisville, finalized their transition of an older coal fired thermal plant to a state of the art facility fueled by woody biomass. The facility expects to utilize over a 100,000 tons of wood residuals from the region.

The impacts of natural gas, regulatory policy, government and private financing, weather, and other factors created volatility in the advancement of bioenergy efforts in 2012. As we look to 2013 and beyond, technological improvements, environmental sustainability, international conflicts, and the desire to create additional economic prosperity in rural communities, bioenergy should create significant opportunities and rewards for the Commonwealth.

Division of Fossil Energy Development

The Division of Fossil Energy Development's mission is to maximize the benefits of Kentucky's fossil energy resources in a clean and sustainable manner while creating a base for strong economic growth and fostering national energy independence and security. The division has oversight in implementing Strategies 4 (coal-to-liquids) and 5 (coal-to-gas). As an area of special interest, the division also assists in the development of waste-to-energy (WTE) projects.



Recast Energy, LLC, Louisville, KY transitioned from a coal to biomass boiler and expects to utilize over 100,000 tons of wood residuals from the region

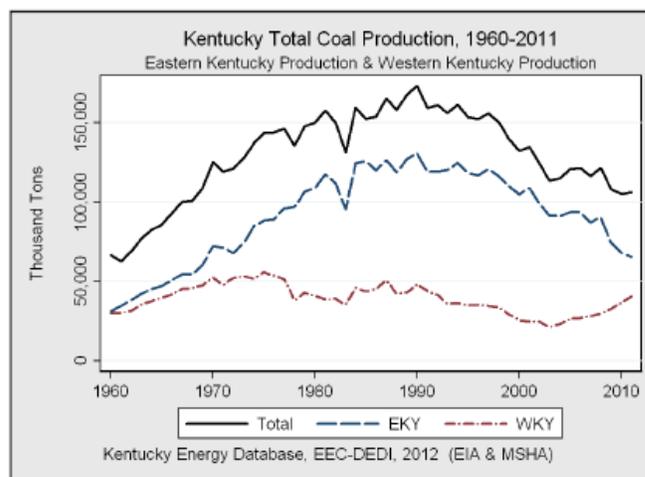
DEDI Organization

Kentucky's electricity demand remains depressed below pre-recession levels. Therefore, there has been virtually no expansion of Kentucky's fossil fueled electricity generation capacity. While the depressed demand situation will not continue indefinitely, future expansion of electric generating capacity fueled by coal is unlikely. Risks to coal-fueled electricity projects include new U. S. Environmental Protection Agency air and water regulations; the probability there will be more regulations and tighter emissions standards; requirements for greenhouse gas control; and difficulties obtaining new mining permits in Appalachia.

Given the current federal regulatory climate, natural gas is considered by many to be the fuel of choice for electricity generation. Improved drilling techniques such as hydraulic fracture drilling or "fracking," have greatly expanded recoverable gas reserves. These increased reserves, relatively cheap and easy to bring to the market, are expected to keep natural gas plentiful and its price stable for the foreseeable future. A short-term result of low gas prices has been that in the past year Kentucky has seen significantly increased run time on natural gas fired single cycle gas turbine power plants that were originally built to provide peak power. This was done to take advantage of the lower operating costs of the gas turbines compared to coal-fired baseload units. In the longer term, the projection of natural gas availability and price stability combined with relatively low construction costs, compared to alternatives such as nuclear and solar, make natural gas combined cycle baseload power plants an attractive choice for new electricity generation.

This shift to natural gas is also having a pronounced impact on the quantity of coal purchased and used by Kentucky's power generation customers in the southeastern United States. As more customers convert to natural gas or retrofit their plants to meet current and expected environmental requirements and to take advantage of low natural gas prices, their demand for Kentucky coal will shrink. To maintain current coal production levels Kentucky will need to find new markets for its coal.

Another area where the roles of various fossil fuels (oil, coal, and natural gas) may soon undergo a fundamental shift is in transportation. While coal and natural gas supplies have been plentiful and their prices have been relatively low and stable, the same hasn't been true of oil. Social unrest in Iraq, Libya, and Iran, civil war in Syria, and environmental concerns over Canadian crude oil derived from tar sands, all contributed to great uncertainty of supply and higher prices. While the International Energy Agency's latest World Energy Outlook (released November 12, 2012) paints a rosy picture for United States oil production, risk and uncertainty in oil supply and refining make a secure domestic alternative or complement to traditional gasoline and diesel powered vehicles attractive.



Kentucky produced 106 million tons of coal in 2011, eastern Kentucky represented 62 percent of statewide tonnage and western Kentucky represented 38 percent

Consequently, there has been renewed interest in coal-to-liquid (CTL) fuel projects and conversion of heavy diesel engines (both on road and off road) to compressed or liquefied natural gas (CNG or LNG). There are currently three CTL plants permitted in the Commonwealth (one in western Kentucky, two in eastern Kentucky), and there are four active projects (one east, and three west) converting fleets of heavy trucks to CNG or LNG. Also, the Cincinnati/Northern Kentucky International Airport is pursuing building a CNG fueling station to service the taxis, buses, other

DEDI Organization

airport vehicles, and privately owned vehicles in Northern Kentucky, and at least three other projects are in the planning stage around the state.

There are also several Waste-to-Energy (WTE) projects being developed in Kentucky. EcoPower Generation is planning a 50 MW wood waste power plant in Eastern Kentucky, and Recycling Solutions Technology in Martin County is in the process of modifying its municipal solid waste (MSW)-to-electricity plant, and will have it operating at its permitted 400 ton per day rate in the spring or summer of 2013. These are just two of the more advanced WTE projects; there are others that have been proposed or are in the planning stage.

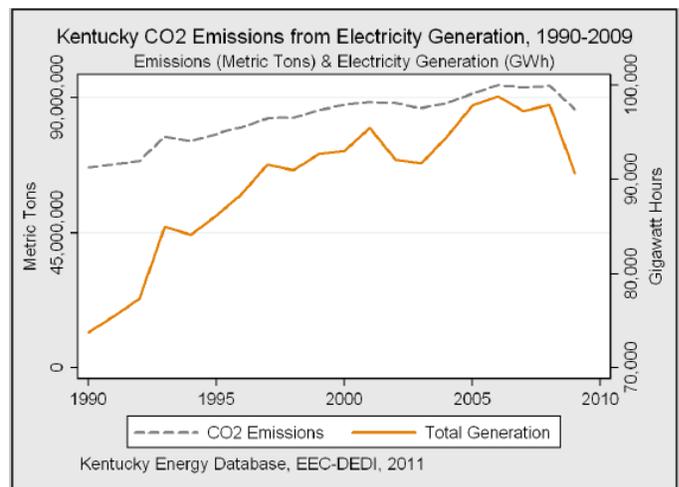
CTL, WTE, and CNG/LNG conversion projects offer the promise of addressing several national and local issues such as energy independence, reduced transportation costs, solid waste disposal, and reduced air pollution. Continued development of these types of projects will enable Kentucky to take a leadership role in a more secure, affordable, and environmentally friendly energy industry.

Division of Carbon Management

The Division of Carbon Management's goal is to investigate, develop, and promote technical solutions for carbon capture, storage and reuse; and to engage with state, regional and federal agencies in the development of state policy designed to manage greenhouse gas emissions, especially carbon dioxide, in a carbon constrained environment. The division has oversight in implementing Strategy 6 of the Governor's energy plan.

Staff, in partnership with the Kentucky Geological Survey (KGS), continued to support projects to investigate and demonstrate the technical feasibility of geologic storage of carbon dioxide (CO₂) in Kentucky. In 2012, KGS conducted a test of carbon dioxide enhanced natural gas recovery in the Devonian Ohio Shale, Johnson County, east Kentucky. During the test, 87 tons of CO₂ were injected

through perforations in a cased, shut-in shale gas well. Industry partners for this research included Crossrock Drilling, Advanced Resources International, Schlumberger, Ferus Industries, and Nabors Well Services. Pre- and post-test data are being analyzed to assess the results of the experiment. Additionally, a request for proposals was issued for drilling and testing a deep well on property owned by Hanson Aggregates, Carter County, east Kentucky. Contracts are being finalized with site construction and drilling



In 2009, the Electric Power Sector of Kentucky emitted 86,155,120 metric tons of carbon dioxide, a 8 percent decrease compared with 2008.

expected to begin in January 2013. As proposed, the well will be drilled to a total depth of 4,800 feet to test the Cambrian Knox Group dolomite and Mt. Simon sandstone and identify the primary seals to ensure stored CO₂ will remain in deep reservoirs (no CO₂ will be used in this test well). Reservoir data will also be acquired for other potential storage zones and sealing units.

Division staff, in collaboration with the UK Center for Applied Energy Research (CAER), remain focused on the design, construction, and demonstration of an algae-based CO₂ mitigation processes suitable for use at Kentucky power plants. This project is designed to develop a process capable of utilizing the flue gas through operation of a continuous algae culture with the algae being harvested into a value-added product.

DEDI Organization

CAER has developed a low-cost, closed-loop cultivation and processing system to suit the CO₂ source, as opposed to allowing the cultivation system to dictate the source, which has been the general direction of most comparable studies. The cultivation and processing system is being installed at Duke Energy's East Bend generating station in northern Kentucky, with operation and testing scheduled for early 2013.

The carbon management division continues to support the Carbon Management Research Group (CMRG), a public/private partnership consisting of most of the Commonwealth's utilities, the Electric Power Research Institute, the Center for Applied Energy Research, and DEDI. The program is broken into nine project areas with six projects devoted to fundamental research, two projects devoted to pilot scale research and one project for a semi-commercial slip stream CO₂ capture system. The nine projects are geared towards addressing the most pertinent issues facing the wide scale deployment of CO₂ capture systems for post-combustion applications. In 2011, CAER was awarded a U.S. DOE cooperative agreement which will allow CMRG to pursue the project for a semi-commercial slip stream



Algae processing system being installed at Duke Energy's East Bend generating station in northern Kentucky

CO₂ capture system, with substantial federal funding and involvement.

Staff also continue to assist with the development of the department's electricity portfolio model to assess the impact of a carbon limited environment on the price of electricity, coal production and Kentucky's economic growth.

Division of Energy Generation, Transmission and Distribution

The primary responsibilities of the division are to analyze and develop policies that will facilitate the generation, transmission, and distribution of secure, adequate, affordable, and clean energy within the Commonwealth; to understand the economic tradeoffs for baseload electricity generation alternatives; to develop policies that will ensure adequate transmission and distribution of energy resources; and to promote economic alternative and renewable sources for electricity generation. The division also has responsibility for initiating research and promoting discussion on all generating technologies and energy strategies, including nuclear energy, as outlined in the energy plan.

During 2012, staff refined the Kentucky Energy Assurance Plan, which outlines the procedures to respond to and recover from an energy emergency, and participated in several emergency training exercises with anticipation of future Interstate Regional Emergency Exercises.

Division staff updated and published the Kentucky Energy Profile that provides an overall picture of energy production, consumption, and delivery in Kentucky. It is intended to serve as an impartial point of reference for data and issues regarding energy within Kentucky. A product of extensive research, database construction, and quantitative analysis, the profile is designed to help identify and explain the dynamics of energy consumption and production that are particular to the Commonwealth. In 2012, the Kentucky Coal Facts publication has been revised and updated,

DEDI Organization



and for the first time, the new publication provides coal production and employment data down to the county level.

To share the staff's database capabilities with other states the division offered state energy profiles to six other states in collaboration with the National Association of State Energy Officials. Additionally, staff developed and published a Southern States Regional Energy Profile for the Southern States Energy Board. The Regional Profile compares and contrasts energy use and production of 16 southeastern states.

Staff continued to monitor changes in environmental regulations affecting the transportation and use of coal, natural gas, and other petroleum liquids as well as electricity production and overall energy prices. Proposed changes will have significant impacts on how energy is produced and priced in Kentucky. Equally important will be the effects of environmental regulations on Kentucky's energy intensive industrial base and overall economy. Division staff also used electricity price forecasting software developed by the department to evaluate the potential changes in electricity prices and the long-run effects of those price changes for Kentucky.

Division staff represent the Governor's office on the Eastern Interconnection States Planning Council (EISPC). The EISPC is a collaboration between state utility commissions and governors' offices of the states east of the Rocky Mountains organized to direct the analysis of electricity system plans for the Eastern Electricity Interconnection. The result of this collaboration will be the identification of needed interstate transmission corridors.

DEDI Partnership Activities



Governor Steve Beshear's energy plan gave DEDI the direction and guidance to grow and strengthen many programs and projects throughout. These initiatives connect with Kentucky's economic sectors to help create jobs, save energy, increase the production of alternative energy, and improve the environment.

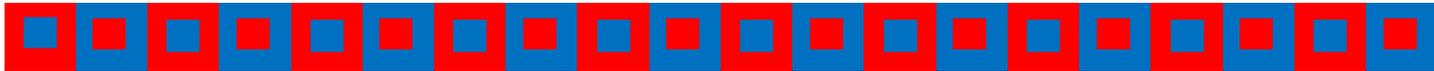
To broaden the impact of these activities, DEDI has developed partnerships with many public and private organizations across the Commonwealth. These partnerships have helped transform good ideas into highly successful projects and programs.

The American Recovery and Reinvestment Act of 2009 (ARRA) helped accelerate implementation of the Governor's energy plan and now these partnerships can help sustain these good ideas.

Public-private partnerships across the Commonwealth are positively influencing our schools, homes, farms, businesses, communities, and government facilities to make a difference for a better energy future. The pages that follow highlight DEDI partnership activities.



DEDI Partnership Activities



Energy in Education Collaborative

DEDI has a long history of providing sustainable solutions to Kentucky's K-12 schools, reducing operational costs through energy efficiency initiatives and supporting student environmental learning.

Three years ago, DEDI created the Energy in Education Collaborative, funded through an \$11 million grant from the American Recovery and Reinvestment Act. The Collaborative was designed as a multi-faceted partnership and included: The Kentucky Pollution Prevention Center (KPPC), University of Louisville; Kentucky School Boards Association (KSBA); National Energy Education Development Project (NEED); and Green and Healthy Schools (GHS), an initiative of the Kentucky Environmental Education Council (KEEC). Each of these partners managed new or existing programs to engage students and educators and to promote energy saving strategies through conservation and energy management. The individual programs included: Kentucky Energy Efficiency Program for Schools (KEEPS); School Energy Managers Project (SEMP); Kentucky National Energy Education Development (KY NEED) Project; and the Kentucky Green and Health Schools (KY GHS) Program.

To further reduce energy costs to net-zero energy usage, DEDI awarded an additional \$3.4 million (through a competitive selection process) to Warren County Public Schools and Kenton County School District for the purchase and installation of solar photovoltaic systems.

By the end of the grant period, the Collaborative demonstrated the importance of establishing energy performance as a core value and promoted energy efficiency as a way to achieve sustainability goals. Ninety-three percent of Kentucky's student population has been impacted directly or indirectly and for the first time, a statewide energy management infrastructure has been put into place, available to all 174 K-12 public school districts.

Energy management has proven to be key to saving energy which translates into cost savings, so vital to today's school districts. Energy managers and KEEPS engineers

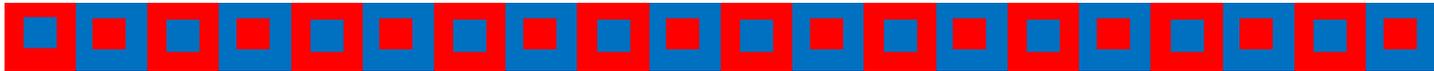


First Lady Jane Beshear at Stamping Ground Elementary School

unleashed savings of more than \$15.9 million in cumulative avoided costs, redirecting public monies to support classroom instruction. These savings resulted from one-time rate and utility analysis, and on-going energy efficiency projects such as lighting retrofits and holiday shutdowns. Even during tough economic times, districts participating in SEMP have retained 19 of the 35 ARRA funded energy management positions.

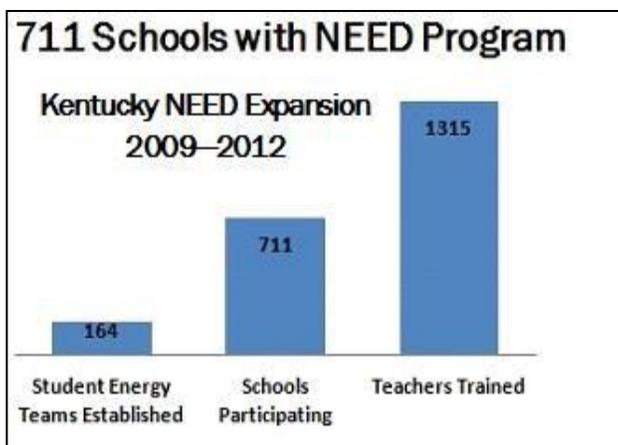
Administrators in all 174 K-12 school districts enrolled in KEEPS in accordance with KRS 160.325, and all have committed to energy in education by adopting energy management policies. Seventy percent of Kentucky's school districts established energy advisory committee teams to implement energy management plans and more than 400 building assessments were conducted by energy managers, utilities and KEEPS engineers. For the first time in Kentucky's history, energy usage data was collected to gauge long-term potential results of energy efficient efforts. Assessments provided school leaders with quantifiable estimates of the economic impact and other benefits of suggested energy reduction action items

DEDI Partnership Activities



Energy in Education Collaborative, Continued

Energy management in schools helped 132 districts to become ENERGY STAR Partners, the first step to meet or exceed national energy performance standards. And by the end of 2012, the number school buildings earning the ENERGY STAR label increased 186 percent (from 68 in June 2010 to 195 buildings by the end of December 2012). The Collaborative expanded the NEED program's energy curriculum development to 711 schools, trained more than 1,315 teachers and established 164 on-going student-based school energy teams actively studying energy usage in schools. KY NEED developed a step-by-step guide entitled, "*The Blueprint for Student Energy Teams*," to assist schools to develop energy teams in the future.



More than 2,845 students have been recognized locally and nationally as "Energy Leaders" through NEED's Youth Awards for planning and facilitating energy projects. These students reached an additional 85,339 students and over 650,000 community members.

Kentucky Green and Healthy Schools (KGHS) projects increased environmental awareness and action in communities, schools, individual students and teachers. As of April 2012, 65 percent of Kentucky's 120 counties have at least one school enrolled in the KGHS program, which reached a total of 244 Kentucky schools.

Although ARRA funding was discontinued in April, 2012, Collaborative partners continued efforts to sustain the momentum begun three years ago. The following summarizes

accomplishments in 2012 and identifies each partner's key role in the Collaborative initiative.



Kentucky Energy Efficiency Program for Schools, (KEEPS)

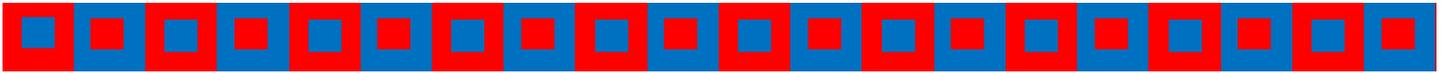
KEEPS continued to conduct school energy assessments, provide training for school energy managers, assist districts establish energy teams and implement a structured energy management program using the proven ENERGY STAR Seven-Step Guidelines for Energy Management. These Guidelines are designed to help school districts take ownership of their energy management programs and promote a culture of responsible fiscal, community and environmental stewardship.

By the end of the 2012 school year, districts were well on their way to fulfilling legislative requirements to report on energy usage, costs and energy savings measures to the Kentucky Pollution Prevention Center (KPPC). KEEPS engineers completed energy assessments for 20 percent of Kentucky's school facilities. These assessments provided school leaders with potential energy saving strategies and quantifiable estimates of the economic impact and other benefits.

KEEPS energy management "toolkit" training resources are available to school districts on line through the KPPC website. In 2012, KPPC worked with the Georgia Environmental Finance Authority to make KEEPS technical assistance resource materials available to a pilot program, "Georgia Energy Challenge," the state is undertaking with 25 participating schools.

KEEPS is administered by the Kentucky Pollution Prevention Center at the University of Louisville's J.B. Speed School of Engineering.

DEDI Partnership Activities



Energy in Education Collaborative, Continued



School Energy Managers Project (SEMP)

The School Energy Managers Project has proven to be a successful business model, based on the premise of districts sharing energy manager expenses as energy savings were realized. By utilizing energy consumption data, schools now can gauge the long-term potential results of energy efficiency efforts. Also key to SEMP's success was the willingness of neighboring school districts to partner and share services and costs of a full-time energy specialist.

2012 brought an end to ARRA funding, but launched a new initiative for KSBA to sustain energy managers in Kentucky schools. Energy savings and improvements in energy efficiency provided school administrators solutions to belt-tightening budgets. In the 2011-2012 school year, energy managers unleashed \$9.9 million in on-going savings (from projects such as lighting retrofits and holiday shut-downs) and \$0.2 million from one-time savings (from one-time rate and utility analysis). In addition to energy reductions and dollars saved, KSBA reports new school districts have been added including Laurel County, Morgan County and Paris Independent.

Last year, 35 school energy managers participated in the High Performance School Workshop sponsored by KY NEED and DEDI. Many also attended intensive week-long certified energy manager training facilitated by the Southern Ohio Chapter of the Association of Energy Engineers. Seventeen of those energy managers received Certified Energy Manager or Energy Manager in Training certifications by the Association of Energy Engineers.

To further enhance energy management initiatives, KSBA formed additional partnerships including: The *Kentucky Interlocal School Transportation Association (KISTA) Energy Improvement Financing Program*— a funding alternative to implement energy improvement projects typically costing less than \$500,000. Benefits of the program are tax-exempt interest rates, splitting of issuance costs among multiple participating districts, repayment terms and fund type flexibility. Examples of qualifying projects include

HVAC upgrades and replacement, lighting, building controls, commissioning, kitchen equipment and building envelope improvements. In partnership with *Fellon-McCord*, KSBA created the *Kentucky Gas Aggregation Program* to provide school districts access to the benefits of pool purchasing of natural gas. KSBA partnered with the *Council for Better Education* to represent districts in utility rate proceedings before the Kentucky Public Service Commission. To enhance facility and energy training for facility directors, custodians and energy managers. KSBA partnered with the *Kentucky School Plant Management Association* to continue providing training opportunities for school energy managers.

KSBA continues to identify future funding opportunities to sustain and expand energy management initiatives and help reduce school facility operating costs through improved energy performance, in accordance with the state energy reduction strategies.

SEMP was administered by the Kentucky School Boards Association (KSBA). Under this program, ARRA funding paid a portion of the salary for energy managers at the local district level. SEMP funded 35 energy managers serving some 130 school districts. For the 14 districts that already had full-time energy managers, SEMP funded energy curriculum coordinators and other educational needs.



Kentucky National Energy Education Development (NEED)

For more than a dozen years, NEED has provided energy workshops for Kentucky's teachers, grade-appropriate curriculum materials and kits for energy activities. Although ARRA funding in 2012 resulted in a reduction in state-wide services, NEED curriculum resources continue to be available on-line at no cost to districts. KY NEED continues to provide energy education programs to Kentucky's schools with support from utility providers and DEDI.

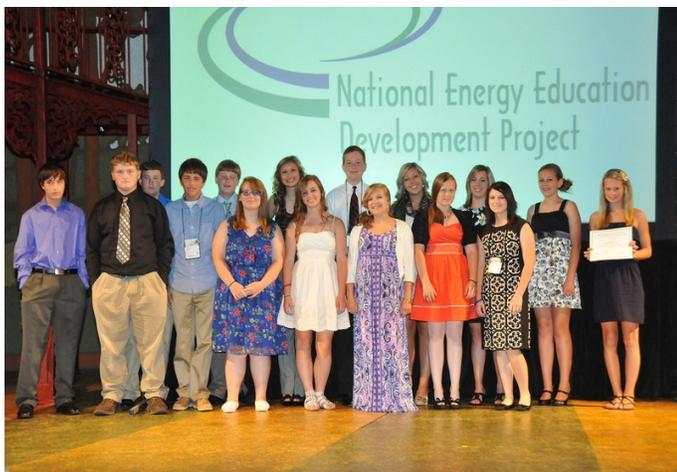
Creating and conducting an energy education project is a powerful way for students to apply what they have learned

DEDI Partnership Activities



Energy in Education Collaborative, Continued

in their classrooms about the science of energy. Each year in May, hundreds of students and teachers come to Frankfort to display projects and be recognized by KY NEED and the Kentucky Green and Healthy Schools program.



Ballard County Middle School, Barlow, receives national recognition at the NEED Youth Awards in Washington DC.

Kentucky joined over 700 participants at the annual NEED Youth Awards Conference in our nation's capitol in June. They gathered to celebrate and to be recognized for their achievements in energy education. Fifty-six students and ten teachers from Kentucky schools were part of the prestigious group. At the awards ceremony, four Kentucky schools received national awards out of only 12 schools selected nationwide. Honored were: Harlow Early Learning Center, Mercer County; Cane Run Environmental Magnet; Jefferson County; Adair County High School and Richardsville Elementary, Warren County.

On July 15, the 2012 Energy Conference for Educators brought together educators that are passionate about bringing energy education to their classrooms. In five interactive days in Arlington, VA, the conference provided teachers with the most up-to-date information on all aspects of energy. Twenty-nine Kentucky participants received training and materials to implement innovative hands-on energy units for their classrooms, multi-disciplinary teams, and after-school programs.

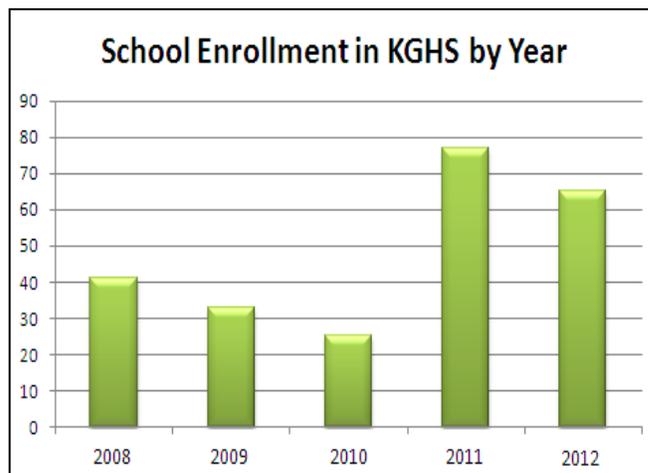
In March 2012, KY NEED and DEDI presented the High Performance Sustainable School Workshop, with support from the U.S. DOE, in cooperation with AIA Kentucky. The two-day workshop held in Louisville, brought architects, engineers, school leaders and energy managers from across the state together to learn about new techniques for high performance schools. Attendees reviewed case studies from five different applications of high performance school building design. Tours at two schools in Jefferson County demonstrated integration of building and curriculum and high performance building features.

The Kentucky NEED Project is the state affiliate of the National Energy Education Development (NEED) Project, a national non-profit organization with a focus on energy education. NEED provides workshops for teachers, grade-appropriate curriculum materials.

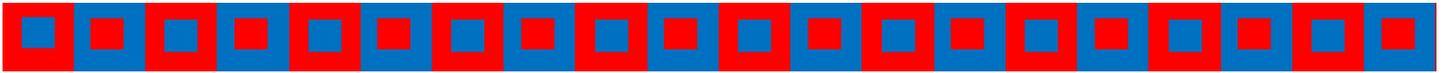


Kentucky Green and Healthy Schools (KGHS)

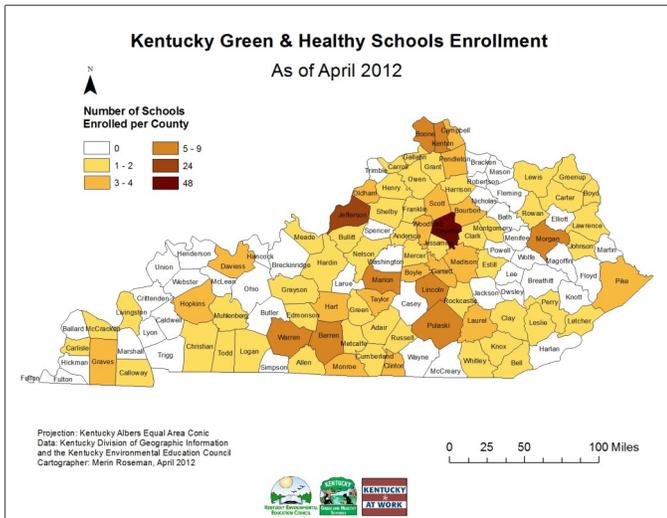
KGHS projects such as recycling and water conservation have empowered students to get involved all across the state. By April 2012, Kentucky schools increased their energy and water conservation; reduced solid waste; and increased use of alternate modes of transit, such as bicycling. The student-focused projects offer opportunities to create healthier, safer and more environmentally sustainable schools and communities.



DEDI Partnership Activities



Energy in Education Collaborative, Continued



Richardsville Elementary, Warren County

Net-Zero Energy Schools

DEDI has long recognized sustainability as a key component of a school district's building portfolio and has sought to market these features in its efforts to transform the state's school buildings. As a part of the state's overall plan, DEDI awarded ARRA funds to support the Net-Zero Energy School project.

This initiative has promoted processes of change in Kentucky's school facilities by establishing new strategies for the construction and operation of school facilities with a focus on reducing energy consumption. Since ARRA funds were awarded two years ago, Kentucky has received national recognition as a leader in energy efficient school design and has demonstrated how an integrated planning approach maximizes efficiency and contributes to student learning.

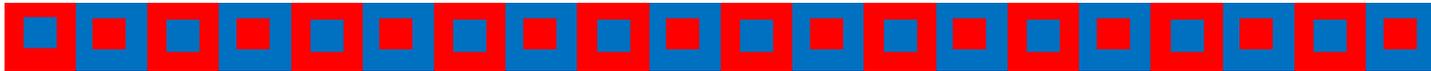
DEDI awarded \$1.3 million to the Warren County Public School District for the Richardsville Elementary net-zero energy school project. The Kenton County net-zero energy project, Turkey Foot Middle School, was awarded \$2 million. The grants paid for a portion of the cost to install photovoltaic solar capacity. Turkey Foot is a near net-zero energy school while Richardsville Elementary has received broad acclaim as the first net-zero energy public school in the nation.

Enrollment in the KGHS program increased significantly in the first four months of 2012. ARRA funds supported the 58 mini-grants awarded by KGHS to pay for the energy projects. Distribution of the mini-grants spanned the entire state, with the highest level of enrollment found in urban areas. The majority of student enrollment was in elementary schools. In fact, 65 percent of Kentucky's 120 counties currently have at least one school enrolled in the KGHS program.

Among other activities the KEEC undertook during this period, the Kentucky Environmental Literacy Plan was revised and subsequently adopted by the Kentucky Board of Education. The full implementation of the KELP will help ensure all Kentucky students are environmentally literate about essential topics including energy, by the time they graduate from high school.

KGHS Program is an inquiry-based program that uses the entire school grounds as a learning laboratory for students. It is administered by the Kentucky Environmental Education Council (KEEC) in the Education and Workforce Development Cabinet.

DEDI Partnership Activities



Energy in Education Collaborative, Continued

More important than financial assistance, the journey to the first net-zero energy school involved strong leadership and school facility building and operations rooted in high performance strategies—a whole-building approach integrating multiple energy-saving strategies early in the design process. High performance strategies require all stakeholders to be a part of the project from the design inception through project completion. These schools also become a learning laboratory for students as designs increase the opportunity for students to explore their building's construction and learn more about the conservation of water, energy and other resources.



Richardsville Elementary, Warren County

Richardsville Elementary School

From its inception, Richardsville Elementary was designed to be an affordable net-zero energy facility. The design team reduced the core building design to an extremely efficient energy index 76 percent lower than the national average. To greatly reduce overall consumption and maintain low levels of energy use, the building features a high performance building envelope; active day lighting; geothermal HVAC; efficient kitchen strategies and an operations and maintenance plan.

With a high performance building design in place, the on-site energy production demands to reach net-zero energy became more affordable. The net-zero energy goal was realized by the roof-mounted solar array which consisted of 208 kW thin film and crystalline photovoltaic (PV) systems

and included 2,000 rooftop panels and an additional 700 on a parking garage structure. Its output on a sunny day is equal to 2,500 kilowatt-hours (KWh) and 245 megawatt-hours (MWh) annually, respectively. By October 2012, the school district received a check from their utility provider in the amount of \$37,227.31 for the surplus energy sent from the school's solar system to the power grid.

The school also includes hands-on learning areas throughout the building. Big-screen televisions show students the real-time energy projection/consumption of the school and hallways feature educational energy themes like geothermal, solar, recycling and water conservation.

The system at Richardsville Elementary School may be viewed in real time on the school's home Website. The cost of the 77,466 square foot elementary school is \$14.8 million with the grant-funded solar PV system; without solar, the cost is \$13 million, or \$199 per square foot.

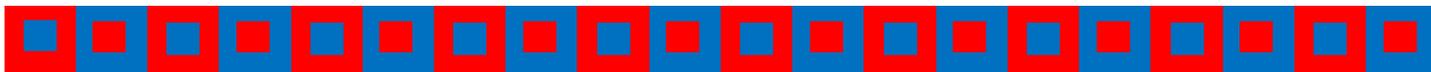
Solar Array at Turkey Foot Middle School



Turkey Foot Middle School

The Kenton County net-zero energy school project provided a 443 kW combination of poly-crystalline and thin film PV system for the new Turkey Foot Middle School. This project is also a testament to the district's commitment to

DEDI Partnership Activities



Energy in Education Collaborative, Continued



Turkey Foot Middle School, Kenton County

energy management, believing school buildings should use less energy, demonstrate sound environmental practices, and serve as fundamental tools for learning.

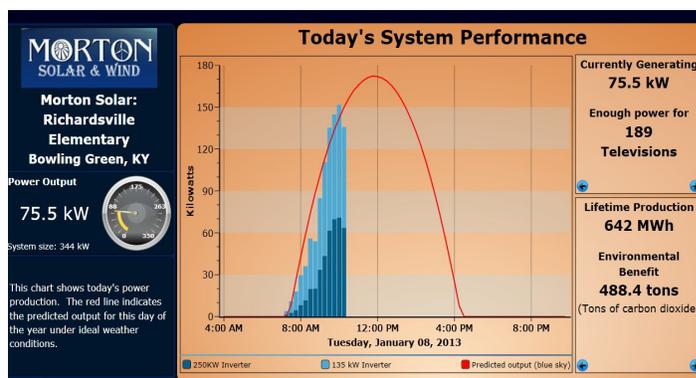
Building on lessons learned from previous high-performance school projects, Turkey Foot Middle School was designed for net-zero, or near net-zero, energy usage. During a “Flip the Switch” event in May 2011, Turkey Foot Middle School connected the first phase of the project with over 60,000 square feet of thin film and crystalline panel solar technology.

At the time of this report, data for a full 12 months was not available. However, Kenton County reported energy use per square foot for Phase 1 between May 2011 and May 2012 was 16.9 kBtu per square foot per year, representing an annual savings of \$134,000. During that time, the PV system generated 414,123 kWh and the district was able to sell back to the local utility 161,115 kWh.

The project’s second phase was completed in April 2012 and included an additional 58kW solar canopy covering the walkway into the entrance of the building. Construction cost without solar of this highly efficient facility was \$23 million, or \$175 per square foot; cost with solar was \$26.6 million or \$200 per square foot. Kenton County also created a STEM (science, technology,

engineering and math) class that focuses on the various “green” elements of the school. One component, solar energy, allows students to monitor the PV system and conduct experiments. The Turkey Foot system may also be monitored and viewed in real time at their on line Website.

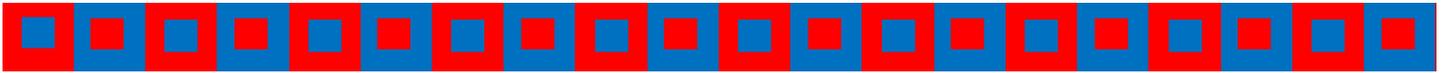
Kenton County School District has made great strides in energy efficiency through committing to ongoing energy management, investing in energy-efficient new construction, involving students in energy efficiency initiatives, and adopting new technology. As a result of the good example set by the district, school districts from across Kentucky, Ohio, Tennessee, and North Carolina have modeled their energy programs after Kenton County and have adopted the district’s E=WISE2 student program.



Net-Zero schools offer Websites that track real-time energy production.

Kentucky’s energy strategies in high performing schools including Richardsville Elementary and Turkey Foot Middle School have been recognized by local and national audiences. Publications such as *Forbes*, *High Performance Buildings* and *Parade Magazine* are among the many sources showcasing our high performing school facilities. More information on Kentucky’s high performing schools may be obtained through the Department for Energy Development and Independence, Division of Efficiency and Conservation, <http://energy.ky.gov>.

DEDI Partnership Activities



Energy in Education Collaborative, Continued

National Energy Education Development Project (NEED) - Distinguished Service Awards

In June 2012, NEED honored two Kentuckians with their Distinguished Service Award at the Annual Youth Awards ceremony in Washington D.C. Mr. Greg Guess, Director for the Division of Efficiency and Conservation, and Mr. John Davies, DEDI Deputy Commissioner, were both recognized for their long-time support of NEED programs. Together they have helped encourage the Kentucky NEED team and NEED's national team, to try new things, explore new opportunities, and to refine programs, especially in energy conservation and efficiency for schools.



Greg Guess and John Davies with Mary Spruill, NEED Executive Director, in Washington D.C.

NEED designs and delivers curriculum and support for virtually any classroom and at any grade level – from kindergarten to high school and beyond – from science and pre-engineering labs to language arts and afterschool clubs. Students use hands-on, inquiry based lessons to explore the physics and chemistry of energy. The program promotes an energy conscious and educated society by creating effective networks of students, educators, businesses, government, and community leaders to design and deliver objective, multisided energy education programs.

Kentucky Energy Club

DEDI has partnered with the Center for Applied Energy Research (CAER) at the University of Kentucky over the past three years to help create an Energy Club network within Kentucky's institutions of higher education. This network has allowed for the formation of a student and community platform that targets energy education, with a focus on coal related production, industry, technology, by-products and environmental issues. The topics explored by the chapters include current issues that impact energy, the

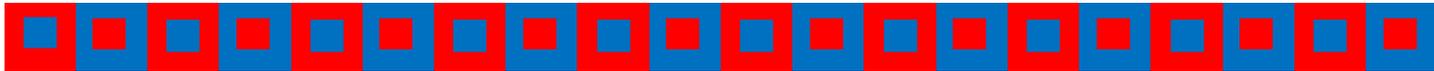


University of Kentucky Energy Club tours Riverview Mine

environment and Kentucky's economy. Kentucky Energy Club chapters are structured in such a way to provide access and resources to the wider campus population, in the form of professionals, industry, research and collaborative support services.

In 2012 the club continued its KY 101 discussion series that covered topics addressing fossil energy, alternative energy resources, building technology, energy dynamics and featured speakers that included Bill Bissett, Kentucky Coal Association, and Jonathan Miller, Recent Kentucky Finance Cabinet Secretary. Club members traveled to underground and surface coal mining operations, energy re-

DEDI Partnership Activities



Energy Education and Research, Continued

search and development centers, a solar production facility and a nuclear power facility.

This year the club encouraged social entrepreneurship and service learning through engagement with community outreach programs, such as the 2012 Energy Fair. The event provided a unique platform for explaining energy and coal topics to over 300 elementary school children from central Kentucky. It involved a diverse group of presenters (Kentucky Geological Survey, UK Sustainability, Kentucky Utilities, Toyota, CAER research groups, Eastern Kentucky University, et. al.) and provided an outstanding venue for the kids to experiment with hands-on displays and interact with presenters.

Two new Kentucky Energy Club chapters were established this year at Bluegrass Community and Technical College and at UK Paducah Engineering College. These new chapters will continue with the core programming structure while tailoring content to school, community and student interests to help reach a diverse audience and address regional and local energy issues.

UK CAER - Renewable Energy and Energy Storage Research Building

On August 15, 2012, the University of Kentucky opened its newest energy research building - a living laboratory devoted to renewable energy and energy storage. The \$20.8 million laboratory building will allow UK to expand research devoted to Kentucky's growing renewable energy industries, including biomass and biofuels, electrochemical power sources, and distributed solar energy technologies. The 43,000-square-foot building is part of the UK CAER.

The laboratory is designed to have at least a 50 percent reduction in energy usage compared to similar facilities and is targeted to be Leadership in Energy and Environmental Design (LEED) gold certified. The energy reduction is accomplished by energy-saving features through-

out the building, including an exterior and roof with twice the amount of insulation normally used. Windows contain a nanogel material that diffuses sunlight and provides the same insulation as brick walls. Among other features are geothermal heating and cooling, occupancy sensors that turn off lights automatically when a space isn't being used, and a ventilation system that recaptures energy.

The facility was funded by a competitive grant from the U.S. Department of Commerce's National Institute of Standards and Technology under the American Recovery and Reinvestment Act's (ARRA) NIST Construction Grant Program. The award consisted of \$11.8 million in federal funds, with matching resources of \$3.5 million provided by the Commonwealth of Kentucky and \$1.9 million from UK. An additional award of \$3.5 million in state ARRA funds was provided by DEDI to achieve

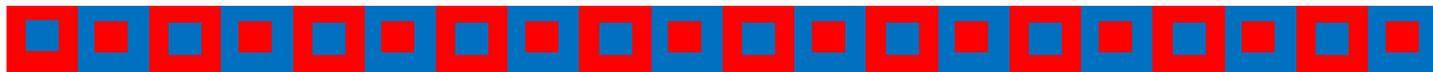


UK CAER - Renewable Energy and Energy Storage Research Building

LEED certification and insure that this new laboratory is a model for energy efficiency and renewable energy technologies.

This funding has enabled UK to develop unique labs including a dry room designed for battery manufacturing and testing, an open-access biofuels research lab, and state-of-the-art solar research facilities. The entire second floor is devoted to research performed by UK De-

DEDI Partnership Activities



Energy Education and Research

partment of Chemistry, whose work includes organic thin-film transistors (for flexible flat-panel displays), organic solar cells (for low-cost electricity generation) and organic light-emitting diodes (for high-efficiency lighting).

In addition to housing non-fossil fuel research, the building is home to the Kentucky-Argonne Battery Manufacturing Research & Development Center laboratories, jointly affiliated with the Commonwealth of Kentucky, the Argonne National Laboratory in Chicago, the University of Kentucky, and the University of Louisville. This is a shared-use facility, with portions of the laboratory purposely designed and specially equipped to accommodate capacitor and battery manufacturing research and development.

Kentucky-Argonne Battery Manufacturing Research and Development Center

The new laboratory of the Battery Manufacturing Research and Development Center in Lexington, which opened its doors in August 2012 as part of the new UK CAER research laboratory, is one of the largest, most advanced open



Kentucky –Argonne Battery Manufacturing Research and Development Center

access labs of its kind in the United States. The center is designed to support cutting-edge research that will help enable collaborations between a variety of users and foster innovation in accelerating advanced battery technologies.

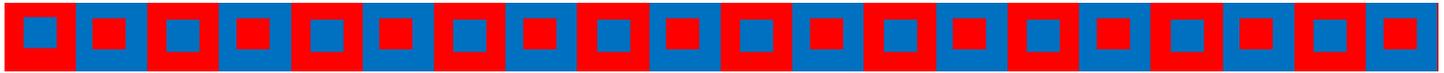
The Kentucky-Argonne Center is the result of a partnership between Argonne National Laboratory, the Commonwealth of Kentucky, the University of Kentucky, and the University of Louisville. CAER worked out an arrangement where it shares one third of its new facility with the battery center. In exchange, companies that locate in the Kentucky-Argonne Center have access to state-of-the art laboratory and testing space. Companies also have access to 2,000 square feet of dry lab for prototype manufacturing; two Class 10,000 clean rooms; materials analysis labs; catalyst research labs; the world's largest carbon spin line; battery test facilities; and environmental and bunker testing.

The relationship with Argonne enables researchers at the center to have expedited access to its expertise and intellectual property. Research partners include Ford, Hitachi Automotive U.S., nGimat, Angstrom Materials, and Zeon Chemical.

A primary focus of the center will be one of the state's key industries — auto manufacturing. Automakers already have the capability to make electric vehicles with models such as Toyota's Prius and Ford's new C-Max. However, there is continued focus on improving and evolving those models. The battery, which is the single most expensive part of the electric vehicle, will play a key role in that future success. The auto industry is working on reducing that cost, as well as overcoming hurdles related to the recharge time and the distance and lifetime they can get out of the battery, which will make these vehicles more marketable.

The Kentucky-Argonne Center offers a unique facility to foster collaboration to find solutions. For example, leaders of both Toyota and Ford are discussing ways that the two companies can pool resources and find ways to work to-

DEDI Partnership Activities



Energy Education and Research

gether to develop the next generation of light-duty vehicles.

Kentuckiana Solar Decathlon

The University of Louisville in partnership with Ball State University, and the University of Kentucky was selected to compete in the U.S. Department of Energy Solar Decathlon 2013. The purpose of the Solar Decathlon is to facilitate widespread adoption of homes that demonstrate solar and energy efficiency technologies in marketable applications. It also develops excellence in building science education in universities with the goal of equipping future design and construction professionals with the skills necessary to design and build quality high performance homes that are healthy, safe, and durable and energy efficient. DEDI is sponsoring the University of Louisville to assist with this project. This will be the second time that Kentucky has been invited to participate in the decathlon. In 2009 the University of Kentucky entered the contest and scored 9th place overall.

The Kentuckiana Solar Decathlon team will primarily involve students in the University of Louisville Speed School of Engineering, the Ball State College of Architecture and Planning and the College of Engineering at the University of Kentucky. Over a two year effort students will design and build a 600 -1000 sq. ft. home that is powered completely by the sun. Competing teams of faculty advisors, industry partners and students will have to design, fund, construct, and transport the home to the competition in California. As part of the competition, the project must include a market study and public outreach and marketing. In addition the student effort must be integrated into the educational offering of the institutions where they are enrolled.

Team Kentuckiana will create the Phoenix House, a low-cost solar powered habitat that can be used for a permanent solution to disaster relief. The team will focus their efforts on designing flexible, easily constructed and trans-

portable systems that are low cost, low maintenance, and easily expanded to meet different and changing needs.

The Phoenix House will serve as a solar powered, immediate post disaster home for two to six people that can also form the nucleus of a permanent, expandable home. The base home will provide basic power and environmental control for 800 to 1000 square feet of space and optional water purification. Both the structure and building systems will be designed to allow expansion of the space, and the power systems will be grid compatible for net metering. Durable, low cost materials will be used as much as possible to ensure the home is an affordable option.



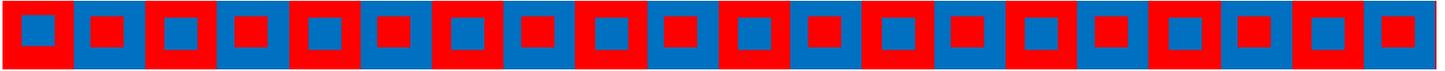
A phoenix embracing the sun.

Power UP!

The UK Vis Center Media for Research Team recently completed a joint project with CAER and DEDI that provides high school teachers around the state with high quality energy education materials.

Entitled Power UP!, the project includes a mobile app, website and seven short videos that teach fundamental elements of energy production, use, conservation and water impact. The project is aimed at high school teachers who often use iPads in the classroom and are able to use short videos on seven topics to supplement their lessons.

DEDI Partnership Activities



Energy Education and Research

Kentucky's high school students today will be the future leaders of our state tomorrow. In their lifetimes, they are going to see dramatic changes in our energy infrastructure. It is critically important to engage these future engineers, politicians, designers, inventors and regulators in these energy issues today.

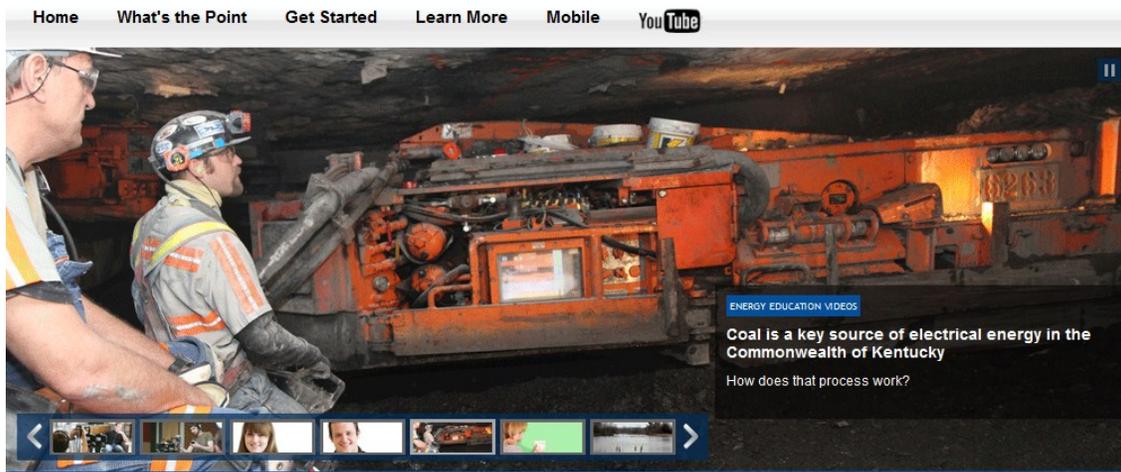
Through seven modules, the center has brought together the key areas of energy through short videos, teaching points and additional resources. By providing these teaching resources to high school student's the center hopes to see Kentucky's students learn about the challenges and opportunities of energy and its sources.

This project provides a summary or "talking points" document for each video in the hope this will be useful in the classroom and in discussions dealing with energy issues.

The modules include the following subjects.

- Energy 101
- Energy Sources
- Rock to Electron
- Energy Use and Conservation
- Water and Energy
- Carbon Capture and Storage
- Coal Products

To learn more about the project visit: <http://www.powerupky.org>



DEDI Partnership Activities



Residential

Throughout 2012, DEDI managed energy efficient residential programs that helped Kentucky homeowners save energy and lower the cost of their utility bills. These comprehensive programs provide a mix of education and incentives to help homeowners overcome the barriers of making their homes more comfortable and affordable.

Experience shows that when it comes to home improvements homeowners are in a quandary. They don't know what to do... whom to contact ... how to finance the home improvement without going to a bank... or know how to be assured the work is done correctly. In response to these consumer needs, the University of Kentucky Cooperative Extension Service (UKCES) provides much needed and easy-to-understand information on home efficiency options through its traveling educational exhibits, county extension agent training, and its presence at the Kentucky State Fair each year. Kentucky Home Performance provides a comprehensive program that also addresses consumer needs.

DEDI has also partnered with the Department of Housing, Buildings and Construction to improve the training of builders on new energy codes and increase the number of HVAC inspectors. To further educate the housing industry on energy efficiency, DEDI and the Lexington Home



KHP home inspector finding home energy efficiency savings.



Builders Association teamed together to sponsor the annual Midwest Regional ENERGY STAR Conference.

Kentucky Home Performance (KHP)

The KHP program continued through 2012, providing cost effective and properly installed home energy efficiency improvements. KHP is administered by DEDI's partner, the Kentucky Housing Corporation, an agency that is part of the Kentucky Finance and Administration Cabinet. Initial support for KHP was provided by DEDI through AR-RA funding.

The KHP program earned national recognition by the US Department of Energy as an ENERGY STAR Partner of the Year for 2012 for its successful Home Performance with Energy STAR program. This statewide initiative has successfully created a new energy efficiency home performance contracting industry for Kentucky.

When KHP was launched in January 2010, there were only 10 certified building evaluators available throughout the state. Today there is a network of more than 200 contractors and evaluators who have earned Building Performance Institute (BPI), Building Analyst (BA) certification. These certified evaluators and approved contractors have completed work in 70 of Kentucky's 120 counties.

KHP has developed special program integration with three distinct energy programs operating in the state: Greater Cincinnati Energy Alliance (GCEA), Mountain Association for Community and Economic Development (MACED), and the Tennessee Valley Authority (TVA). In

DEDI Partnership Activities



Residential

each case KHP has built an integrated system that adapts to the sister program to add benefits and opportunity to the overlapping program territories. These program partnerships have allowed customers to participate in multiple financial incentives (GCEA and TVA) and the state's only on-bill finance pilot, HowSmartKY, with MACED.

To assist contractors wishing to join the program, KHP provided rebates for BPI BA training, purchase of home diagnostic equipment, as well as equipment loan centers in three locations around the state. KHP also provided extensive professional training and support for program software, job financing, and best practice standards for energy retrofits.

KHP has provided incentives to homeowners for whole-house energy evaluations as well as a cash rebate or subsidized loan for approved energy efficiency improvements. The evaluation rebate of \$150 was designed to partially cover a BPI standard, blower-door, whole house evaluation that generally costs between \$300-\$450. The energy retrofit incentive provided an option for homeowners: 20 percent cash rebate of up to \$2000 or a loan of up to \$20,000 at a fixed rate below-market for up to 10-years. All retrofit incentives require a home to meet or exceed minimum standards for air-sealing and insulation levels of the building envelope as well as HVAC duct performance.

Accomplishments to date include:

- 1,071 completed and funded jobs
- 1409 completed whole house energy evaluations plus an additional 300+ with TVA Distributors
- 72 percent conversion from evaluation to finished jobs statewide
- 140 contractors/firms in the program certified to work for KHP
- 1500 employees with participating professionals/firms
- Total investment of the completed jobs is \$10,817,929 million

- Total ARRA funds invested in customer subsidies and rebates = \$1,535,315
- The leverage of private investment to public incentives is 7:1
- The average home shows a performance efficiency improvement of 26 percent
- Over 25 participating state utility partners including 5 TVA Power Distributors
- Projected energy savings to date 62,193 MMBtu / year
- Greenhouse gases reduced = 17,151 metric tons

The program received an award from the TVA settlement grant that will enable KHP to continue to provide outstanding service to homeowners over the next several years.

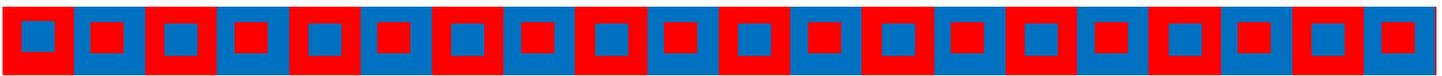
UK Cooperative Extension Service

UKCES and DEDI began a partnership in 2002 to provide energy efficiency and renewable energy education to Kentucky's consumers. Through a grant provided by DEDI, the UKCES provides ENERGY STAR information statewide through its network of county extension agents. DEDI funding also helps UKCES support the Kentucky State Fair



UKCES/ DEDI State Fair Exhibit –2012

DEDI Partnership Activities



Residential

ENERGY STAR exhibit, training Cooperative Extension staff about the display and taking the display to other events across the state throughout the year.

The Kentucky State Fair is the highlight of the UKCES annual exhibit schedule. The exhibit included 3,000 sq. ft. of hands-on materials and it played center stage in the South Wing “Main Street” pavilion. This year’s exhibit highlighted information to help homeowners assess their homes. It also included information on the Kentucky Housing Corporation’s KY Home Performance Program, which offers state funded incentives to those wishing to improve energy efficiency. Extension staff designed the exhibit as a self-guided tour for visitors. Hands-on stations took people from envelope infiltration reduction to insulation upgrade to HVAC options. Each year a library of fact sheets and publications are available to the public. Extension agents, on site at the fair exhibit, are also able to provide private consultations with homeowners and contractors. After years of interaction with the Extension resources, many homeowners have developed an allegiance to this nonprofit, non-marketing, unbiased clearinghouse of information and quality coaching.

During the fair, the ENERGY STAR exhibit was viewed by more than 67 percent, or about 425,000 of the 630,000, state fair attendees. In 2012, the exhibit was taken to 42 events across the state, such as home shows, conferences and area fairs. An estimated 2,257 technical assistance contacts were made throughout the year with homeowners, contractors, and others about specific issues of home energy efficiency, and exposed to a total audience of 480,140 considering all events.

Energy Efficiency Awareness and Action (EEAA)

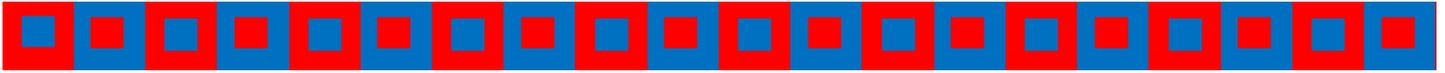
The EEAA program is a newly funded project with \$242,905 in U.S. Department of Energy grant dollars. EEAA is an out-growth of a long-standing, successful partnership between DEDI and the UK Cooperative Extension Service (UKCES). The primary objective of this project is

to train Kentucky Extension Agents to deliver energy efficiency information and solutions, locally. The focus is on fostering the adoption of energy efficiency in the residential and commercial building sectors. Through a four-phase approach, the goal of EEAA is to expand the network of Extension Agents engaged in energy-efficiency actions within the Commonwealth. It will also deepen their technical expertise to meet what is expected to be a rising demand for information on managing energy bills in both the residential and commercial sectors. Further, it will introduce a significant number of 4-H youth to energy efficiency and equip them with the right tools to assist their households improve their environment.

Initial start-up of the project required detailed, careful planning first to introduce the project to district directors and to strategically schedule training sessions for local county extension offices in 120 Kentucky counties. Simultaneously, UK CES staff developed curriculum materials specific to each sector—residential, commercial and 4-H youth. The training provided step-by-step instructions to measure energy efficiency, review utility bills, and to benchmark a building or home’s energy performance. The training enabled the foundation to conduct outreach and education and to foster participation in the program by UKCES agents, 4-H youth, and other community members.

As the EEAA program rolls out in 2013, Extension agents, as well as 4-H youth in all 120 counties in the state, will be trained to use an energy-consumption analysis tool on their home. Extension agents will be trained to use the KY Home Performance Self-Evaluation tool and the ENERGY STAR Portfolio Manager to assess the energy efficiency of their homes and offices, respectively. Opportunities for friendly competition and recognition among the Extension offices will be provided. Integral to these trainings, agents and 4-H youth will also be directed to additional technical expertise and incentives to assist in making energy efficiency improvements.

DEDI Partnership Activities



Residential

Extension agents and 4-H members will then use the knowledge gained from their own experiences to disseminate the EEAA services within their local community. This will include both marketing presentations to the general public, homeowners, youth, landowners, small business, agricultural producers, local government, communities, schools, and community leaders on the benefits of energy efficiency; and trainings offered to these groups on the use of energy consumption analysis tools.

Finally, UKCES will compile the lessons learned from EEAA program implementation and articulate this model program to a national audience with the assistance of and coordination by DOE.

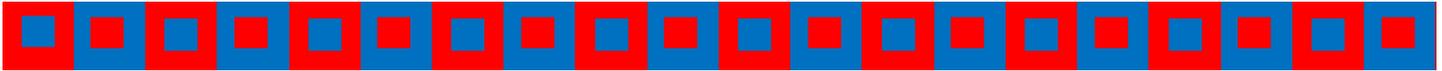
Once this project is completed, there will be a statewide network of Extension Agents with the capacity to help people answer basic energy questions, evaluate their energy efficiency, access energy management tools and incentives, and locate additional resources within the state, as well as a national model that can be replicated.

Kentucky Department of Housing Buildings and Construction (DHBC) Training

The DHBC partnered with the DEDI to deliver effective energy conservation training programs and resources throughout the Commonwealth. The series of training workshops were designed to expose the building industry to the latest requirements, techniques, and best practices required by the state-adopted codes, specifically the recently adopted 2009 International Energy Conservation Code (IECC). These workshops made residential and commercial energy training available to the Commonwealth's construction industry including contractors, code officials, builders, and design professionals. Training venues offered through the program are highlighted below.

- Energy Codes 2011 Conference, Salt Lake City, Utah: Five DHBC staff attended this program to gain understanding of adoption and implementation of the energy conservation provisions of 2009 IECC.
- Manual J Training: This training covered software instruction to approximately 25 percent of the Commonwealth's 2,500 Master HVAC contractors at nearly 30 workshops offered around the state. The training and materials were free. Given that the IECC and KRC requires that each residential building's HVAC system's design be based on the Manual J load calculations, the training was offered with the goal of increasing contractors' proficiency in the use of a form of Manual J software. Proper sizing of HVAC equipment has an enormous impact on the use of energy in residential buildings. This program was highly successful and it would have been expanded to accommodate demand had more funding and time allowed. All attendees received a free copy of the Manual J software.
- Energy Plan Review Workshop, Dale Hollow State Resort Park: The workshop included 60 plus individuals, including all DHBC plan reviewers and a few individuals from the building industry. This workshop was designed to help staff provide better and more consistent plan reviews for permit approvals.
- Ten, one-day Residential Energy Seminars: This series of full one-day workshops were held throughout the state and covered all aspects of the recently adopted residential energy code. Nearly 500 builders and designers in attendance were issued code books and other educational materials for future reference.
- ICC Certification program: Building officials across the state were provided energy code training and certification testing. One of the primary goals was to pro-

DEDI Partnership Activities



Residential

mote a greater competency in the enforcement of the energy code by Kentucky building codes officials. About 150 code officials have completed the exams.

Department of Housing Building Code Inspection

The 2007 State Senate mandated a statewide permitting and inspections program for all new heating, ventilation and air-conditioning (HVAC) construction projects. The legislation was designed to achieve compliance with the adopted energy codes affecting HVAC and building energy systems in new construction across the Commonwealth. Additionally, Kentucky adopted the new 2009 International Energy Conservation Code affecting all new homes construction. To provide personnel for compliance inspections, the agency created 15 permanent full-time positions, including inspectors and administrators. All new hires received rigorous commercial and residential energy training. While Recovery Act funds were used to support the new staff initially, the revenue generated by inspection fees provided ongoing funds to support these positions. As of the spring of 2012, all staff had been fully transitioned from Recovery Act funds and are 100 percent funded by state inspection fee revenue.

ity providers from Kentucky, Tennessee, Ohio, Indiana, Missouri, North Carolina, and Georgia were educated and exchanged information on the energy efficiency home industry. The Home Builders Association of Lexington was once again host to national energy efficiency experts, offering courses on building science, new products and services, and new construction and energy efficient retrofit techniques. The conference showcased cutting-edge energy-efficiency innovations through a vendor trade show and offered participants in-service credits for various certifications.

Mountain Association for Community Economic Development (MACED) - How\$mart Kentucky

DEDI provided \$300,000 to support MACED's administrative startup costs and partnership with KY Home Performance for a new pilot program called, **How\$martKY**. This program addresses the primary barrier households and small businesses face when they want to save energy and save money — finding the upfront cash to pay for improvements such as insulation, air-sealing and HVAC upgrades. MACED teamed up with four, rural utility cooperatives in Eastern Kentucky: Big Sandy RECC, Fleming-Mason RECC, Grayson RECC, and Jackson Energy, to provide energy retrofits as part of utility service.

The program is not a loan or a subsidy, but an extension of the utility services that households or businesses are already receiving. After completing an energy assessment of the property and estimating the potential savings, the utility oversees the contractor in installing the energy efficiency upgrades and provides assurance that the improvements have been performed correctly.

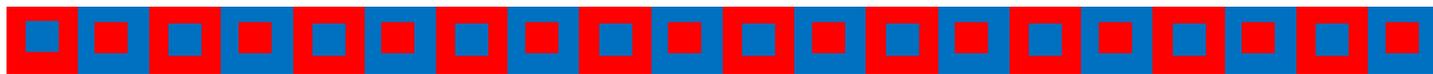
After installation, the program allows customers to make installment payments as part of their monthly utility bills, gradually paying for the efficiency upgrades by using part of the energy savings generated by the retrofit. Immediately, customers will see savings on their typical utility bill. Because the charges remain with the property and not the



Midwest Regional ENERGY STAR Conference

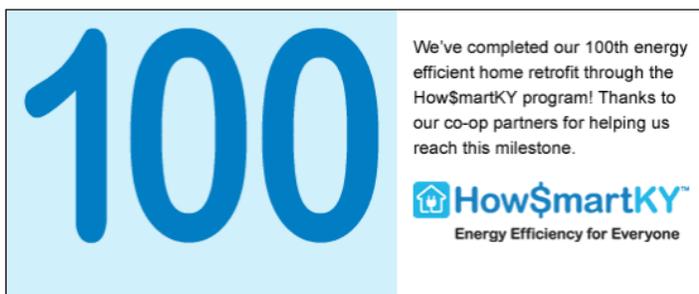
Building on the momentum and success of last year's event, the fourth annual Midwest Regional ENERGY STAR Conference returned to a packed house at the Lexington Convention Center in March 2012. More than 320 energy evaluators, contractors, design professional and util-

DEDI Partnership Activities



Residential

customer, this approach works for all classes of utility customers — renters, homeowners or business owners. To date, MACED has completed 123 on-bill retrofits and 201 assessments (62 percent conversion rate).



Accomplishments of the program to date:

- Total Capital Deployed (Less Rebates and other Incentives): \$551,388
- Total Dollars Invested in Retrofits (includes Rebates and other incentives): \$761,698
- Average Projected Annual Energy Savings in kWh: 5437 (estimated 17 percent reduction)
- Average Projected Monthly Savings: \$51.47
- HowSmart KY Average Charge (amount customer pays on their utility bill): \$39.26

Through KY Home Performance, MACED also received \$6,081 in home energy diagnostic equipment available to professionals for performing energy audits. MACED received an award from the TVA settlement grant to continue and expand the on-bill finance program to other service areas throughout Kentucky.

Houseboats to Energy Efficiency Residences (HBEER)

HBEER is a multi-year project started in 2009 when Monticello and Whitley County, in conjunction with the Kentucky Highlands Investment Corporation (KHIC), applied for funding under the Energy Efficiency and Conservation Block Grant (EECBG) program through the Department for Local Government (DLG). Together, these entities

envisioned the revitalization of the region's houseboat manufacturing industry through the construction of energy efficient modular homes. Their goal for each home was to keep the total cost less than \$100,000, operating on an average of \$1.65 per day.

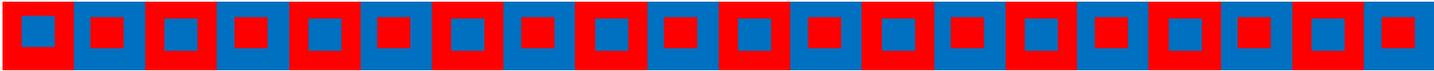
The prototypes developed for the project were a result of a partnership between KHIC, the University of Kentucky (UK) College of Design, and the UK Center for Applied Energy Research (CAER). HBEER was designed not only to create jobs for the area and to utilize materials made in Kentucky, but also to promote energy-efficient homes that would replace energy-inefficient mobile homes in southeastern Kentucky.

The ribbon cutting ceremony on the first house in Monticello was held in January 2012 and for the second house, located in Whitley County, was held mid-April. Loan closing packages for the two homes came later in the year. The homes were constructed with two bedrooms, one bathroom, laundry, living space and a kitchen. These homes come complete with built-in cabinetry, with the first two prototypes including GE ENERGY STAR appliances and ENERGY STAR windows. The average electric use for



Completed HBEER home in Whitley County.

DEDI Partnership Activities

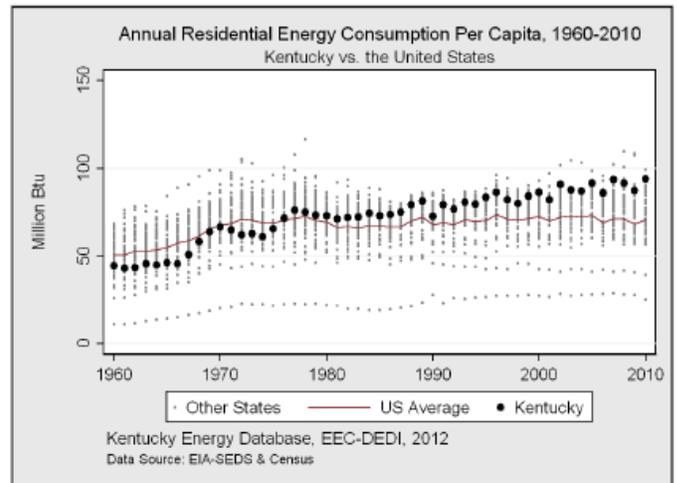


Residential

each of these homes is approximately \$35 per month for each.

Additional work is being done through KHIC and the University of Kentucky to lower the production costs of the homes to make them more affordable and ensure the goal of keeping total costs less than \$100,000. Accompanying research is being done to alter the basic design to produce larger single family homes and multi-family units. Portable classrooms are also being designed for use in school districts with overcrowding or constructing new facilities, all with the ultimate goals of improving energy efficiency in buildings and producing jobs in rural Kentucky.

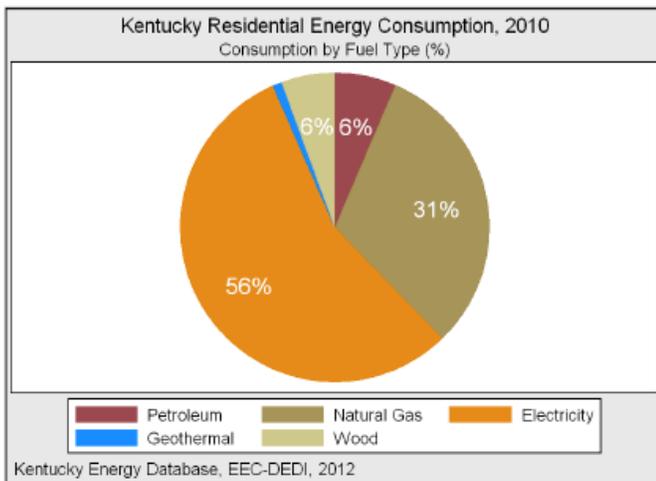
This project was recognized in 2012 at a White House ceremony in Washington D.C., along with 71 other organizations, all of whom are working to foster partnerships and create manufacturing jobs in rural areas of the nation.



State	MMBtu per Capita	Rank
North Dakota	99.1	1st
Kentucky	93.8	3rd
Hawaii	24	50th

In 2010, Kentucky ranked 3rd in terms of residential energy consumption per capita. Residential energy consumption per capita increased by 8% compared with 2009.

Kentucky Energy Profile - 2012



Fuel Type	Billion BTU	Percentage
Total Net*	178,972	100%
Electricity	99,414	56%
Natural Gas	56,060	31%
Petroleum	11,488	6%
Wood	9,967	6%
Geothermal	1,790	1%

Kentucky Energy Profile - 2012

DEDI Partnership Activities



Industrial & Commercial

Starting in 2010, DEDI began working with its partners to create programs that helped companies cut energy consumption and reduce greenhouse gas emissions in the industrial and commercial sectors. Partnering with the University of Louisville's Kentucky Pollution Prevention Center (KPPC), DEDI was able to support the Kentucky Save Energy Now (KY SEN) and the Kentucky Industrial Commercial Sustainability Program (KICSP). Funding for KY SEN continued throughout the year while KICSP funding ended in April 2012 with completion of ARRA support. Both programs provided services that promoted, implemented, and enhanced environmental sustainability and energy efficiency for industrial and commercial customers.



KY SEN enables energy-intensive industrial/ commercial/ institutional facilities to establish self-sustaining energy-saving programs using the ENERGY STAR Seven-Step Energy Management Process. A participant pledges annual reduction of energy intensity by at least 2.5 percent for 10 years and within 12 months identifies an energy-use baseline, energy management plan, an energy leader/manager, steps toward reduction of energy intensity and carbon emissions, and annually reports energy management data and achievements to the Kentucky Pollution Prevention Center (KPPC) of the University of Louisville.

Additional ARRA funding provided support for energy analyses and energy efficiency workshops under KY SEN through April 2012. The number of participants grew from six in 2011 to 30 in 2012, and the program evaluated 157 facilities, while conducting 67 on-site assessments, covering more than 9.9 million square feet of spaces with potential annual energy savings of 583,374 MMBtus.

Additionally, KPPC provided training for manufacturers and vendors to exchange information and share best practices. In June 2012, the KPPC participated as a planning committee member and helped the Kentucky Association of Manufacturers (KAM) organize its annual Energy Conference in Louisville. For the more than 70 attendees, the training session focused on, "Getting Started with the ENERGY STAR Seven-Step Energy Management Process." KPPC also hosted two meetings of the Kentucky Energy Alliance (KEA) in 2012. Industry representatives attended the April KEA meeting and toured the East Kentucky Power Cooperative's Pearl Hollow Landfill Generating Station in Elizabethtown. The August KEA meeting drew 30 participants to the Kindred Healthcare headquarters facility in Louisville. The meetings featured companies that have worked with the KPPC through the KY SEN initiative, highlighting the companies' successes.



KY SEN strives to recognize clients based on their level of excellence. A five-level program is used to recognize progress through the ENERGY STAR energy management process. In 2012 nine participants gained 14 stars. Also, six KY SEN companies with success in cost savings and energy reductions agreed to mentor other participants in their efforts to produce positive organizational changes. All companies are listed in the new KY SEN Mentor Directory that can be found at <https://louisville.edu/kppc/es/ky-sen>.

Carbon Management Research Group (CMRG)

CMRG is a public-private partnership consisting primarily of the Commonwealth's electric generating utilities, the Electric Power Research Institute, the Center for Applied Energy Research (CAER), and DEDI. The utilities participating in the partnership include Louisville Gas & Electric, Kentucky Utilities, East Kentucky Power Cooperative, Duke Energy Kentucky and Kentucky Power (AEP).

DEDI Partnership Activities



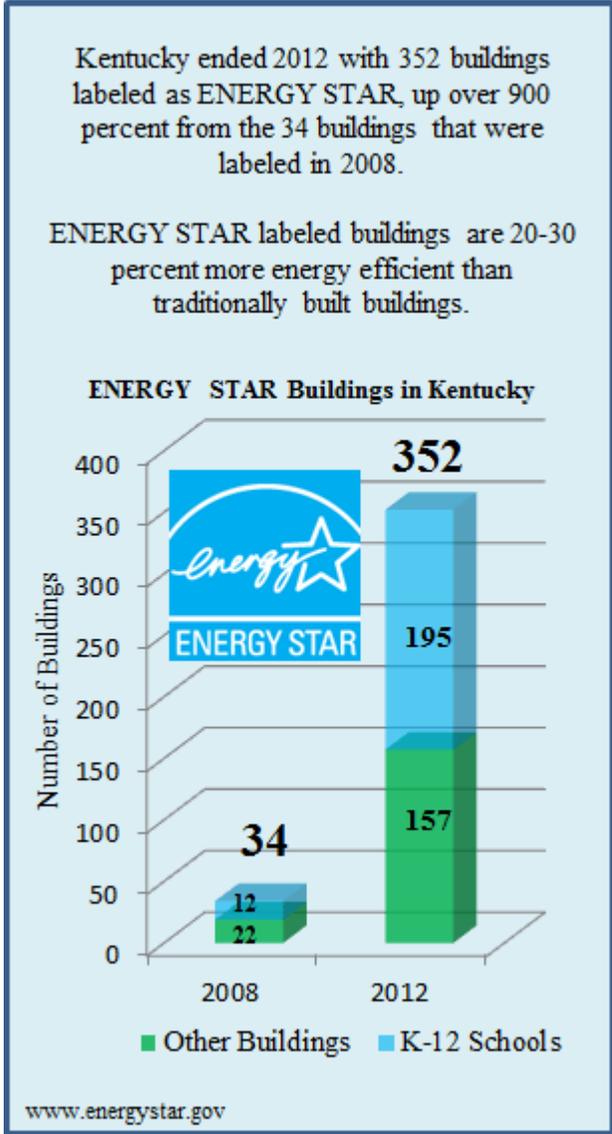
Industrial & Commercial

CMRG's purpose is to carry out a \$24million ten-year program of research to develop and demonstrate cost-effective and practical technologies for reducing and managing carbon dioxide (CO₂) in existing coal-fired electric power plants.

In 2011, CAER received a \$14.5 million competitive grant award from the U. S. Department of Energy (DOE) for "Application of a Heat Integrated Post-combustion CO₂ Capture System with Hitachi Advanced Solvent into Existing Coal-fired Power Plant." This project involves the design, fabrication, installation, testing and analysis of a slip-stream facility to be located at E.W. Brown Generating Station to demonstrate an innovative carbon capture system that utilizes heat integration with the main power plant. The project is scheduled to run through 2016. The DOE grant also involves a cooperative agreement between the parties of the CMRG to also contribute funds toward the project.

The CMRG meets biannually to review progress across a variety of research areas including pilot plant and slip-stream research, process separations, chemical looping, catalysis and solvent research. With encouragement from the CMRG, the CAER research team is in the process of solving both practical and theoretical problems to implement the successful capture and sequestration of CO₂ in an efficient, safe and environmentally friendly manner. The research team is combining hard scientific / engineering research with real world practicality. As such, CAER scientists are striving to balance the twin goals of implementing an effective carbon capture system with market viability.

The Commonwealth supports the CMRG program through an annual one million dollar budget bill appropriation that DEDI manages.



DEDI Partnership Activities



State and Local Government

Small Cities and Counties Initiative

The partnership between DEDI and the Department of Local Government (DLG) allowed 58 communities to initiate efficiency and renewable energy projects that helped reduce their energy use and lower their utility bills.

The local government grant project, funded through the Energy Efficiency and Conservation Block Grant (EECBG), provided \$6.2 million to help local communities identify and implement projects to reduce energy usage or invest in renewable energy.

Local	Amount	Project	Local	Amount	Project
Ballard County	\$125,000	HVAC/water/lights	Hickman City	\$50,000	HVAC/windows
Bardwell	\$35,000	HVAC/windows	Hickman County	\$125,000	audits
Berea	\$125,000	solar/lighting	Jackson	\$125,000	HVAC & lighting
Boyle County	\$125,000	lighting/vehicles	Jeffersonton	\$125,000	audit & lighting
Butler County	\$108,688	lighting/Windows	LaRue County	\$68,000	windows/doors
Caldwell County	\$125,000	HVAC	Lincoln County	\$125,000	windows/doors/HVAC
Calloway County	\$45,675	road dept bldg upg	Livingston County	\$125,000	geothermal
Calvert City (1)	\$27,000	municipal lighting/	Lynch	\$110,000	audits & energy upgrades
Calvert City (2)	\$98,000	sr housing HVAC	Madisonville	\$125,000	HVAC/ traffic lights
Carlisle County	\$101,210	HVAC /lighting	Madison County	\$125,000	windows
Carroll County	\$75,000	HVAC	Marshall County	\$125,000	lighting/exhaust
Central City	\$72,126	EE Roof	Mayfield	\$125,000	windows & roof
Clark County	\$125,000	windows	McLean County	\$83,602	windows /lighting
Crofton	\$47,450	HVAC & doors	Monticello	\$125,000	revolving Loan
Cynthiana	\$125,000	windows/doors/HVAC	Mount Washington	\$125,000	streetlights/audits
Danville	\$125,000	audits & loan fund	Muhlenberg County	\$125,000	courthouse retrofit
Daviess County	\$58,800	HVAC & lighting	Murray	\$125,000	sidewalk
Elizabethtown	\$125,000	audits & Lighting	Olive Hill	\$125,000	efficiency retrofits
Estill County	\$125,000	HVAC	Paducah	\$50,000	recycling
Franklin County	\$125,000	energy study	Pendleton County	\$123,350	courthouse efficiency
Fulton	\$99,044	doors & windows	Rowan County	\$125,000	geothermal
Fulton County	\$65,155	lighting/windows	Todd County	\$35,000	HVAC & windows
Gallatin County	\$125,000	HVAC & lighting	Trigg County	\$125,000	roof replacement
Garrard County	\$37,000	insulation & doors	Warren County	\$41,494	windows
Greenup County	\$125,000	windows & ee roof	Warsaw	\$75,000	HVAC & lighting
Greenville	\$125,000	electrical upgrades	Wayne County	\$35,200	recycling
Guthrie	\$65,650	windows & doors	Whitesville	\$75,600	GRADD Bldg upgrades
Harlan City	\$125,000	renewable Energy	Whitley County	\$125,000	revolving loan
Hart County	\$125,000	boiler & lighting	Winchester	\$56,802	ee upgrade
Henderson County	\$125,000	lighting/windows			
Knott County/ Pippa Passes/Hindman	\$375,000	HVAC/windows	Leitchfield/ Grayson County	\$250,000	renewable energy

DEDI Partnership Activities



State and Local Government

Under rules outlined by EECBG, local governments could receive up to \$125,000 per community to invest in strategies to reduce fossil fuel emissions, total energy usage, improve transportation efficiencies, buildings, or to invest in renewable energy. The projects varied widely from community to community.

Only local governments were eligible to apply for the funds, however, they could apply on behalf of local non-profit entities in their communities. One example of this was the City of Jackson, who applied on behalf of Kentucky River Community Care, a regional mental health services provider. The non-profit organization replaced four HVAC units (electric cool, resistance heat) with heat pumps along with programmable thermostats and 180 T-12 four-bulb lighting fixtures were replaced with 143 T-8 three-tube fixtures. These retrofits are estimated to reduce electric consumption by 40 percent.

At the end of the EECBG grant period, remaining funds were rolled over into a revolving loan fund that DLG will use to help other communities lower their energy usage. DLG was also a grantee from the TVA Settlement and will use this funding to strengthen this initiative for the coming year.



Clark County, Winchester, used an award to install historically approved energy efficient storm windows on their courthouse.

Local Government Energy Retrofit Program (LGERP)

Under a competitive award through U.S. DOE, Kentucky will be implementing a three-year pilot project to assist local governments with the energy savings performance contract (ESPC) process. In a partnership between the Department for Local Government (DLG) and DEDI, LGERP will implement strategies to promote a comprehensive whole-building approach to energy efficiency and conservation retrofits and upgrades, through the use of ESPCs.

ESPCs are utilized in Kentucky extensively by the state government, the state's universities, and some of the larger municipal jurisdictions, such as Louisville, Lexington, and Covington; however, only rarely do local governments use or even understand what ESPCs are all about. This is particularly true for the smaller cities and counties.

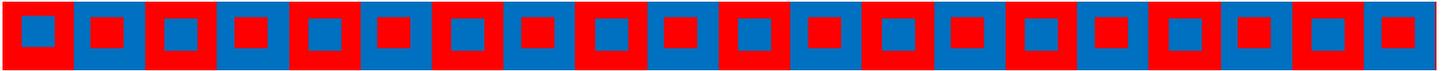
The LGERP project will partner with existing organizations – including the Kentucky League of Cities (KLC), the Kentucky Association of Counties (KACo), area development districts, Kentucky Infrastructure Authority (KIA), and DLG – to leverage existing bond pools (already used to a small degree for ESPCs) as a means of funding efficiency projects; to provide communications and training networks to local governments on ESPCs; and provide legal and technical support to local governments in the entire ESPC process.

The project is designed to:

- provide education at the local level to help local government officials understand the value and benefits of energy efficiency and ESPCs, as well as resources available to help them navigate the process;
- provide assistance in legal issues associated with ESPCs, including understanding procurement, financing, and contract review and approval;
- provide engineering support when evaluating energy assessments and recommended efficiency measures, to offer third party verification of contract documentation, and assistance with the measurement and verification process.

This project has the potential to help local governments tap into huge energy savings across the state by providing heretofore unavailable, unbiased assistance. The LGERP project will be launched early in 2013.

DEDI Partnership Activities



State and Local Government

Green Bank of Kentucky

The Green Bank of Kentucky program was created by an administrative order of Finance and Administration Cabinet (FAC) in July 2009, and was initially funded by \$14.4 million in ARRA funds. Green Bank is administered by FAC through a partnership with DEDI. The mission of the Green Bank of Kentucky is to promote energy efficiency in state buildings through competition for low interest loans to reduce operating costs, energy use, protect the environment, save taxpayer dollars, promote economic development, and create new “green collar” jobs by means of education, engineering analyses and building improvements.

The Green Bank offers supplementary financing to traditional sources of funds to make a project economically viable. Initially, the minimum amount that may be borrowed is \$50,000. An Executive Advisory Loan Committee, reviews loan applications, approves or denies applications for loans, and approves issuance of loan proceeds.



Thomas-Hood Veteran Center, Wilmore

Energy loans, including secondary loans, may be used for construction, upgrades or retrofits that are intended to result in reduced energy usage and costs. Loans may also be used to pay for certain administrative costs associated with an energy project. Projects may involve one or more measures for individual or multiple sites.

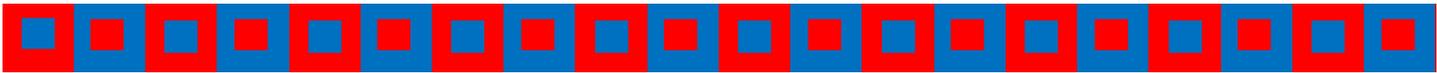
The Green Bank is a revolving loan fund for energy savings performance contracts (ESPC) on state-owned facilities. Since its creation, Green Bank has financed nine projects for a total of \$14.4 million. With the initial balance of funds loaned out, hereafter funds repaid into the Green Bank will be ‘rolled over’ to finance future energy-efficient improvements in other state buildings on an on-going basis.

To date, the Green Bank has accumulated over \$1.2 million in repaid principle and interest to fund additional projects.

Kentucky Green Bank loans given to date:

- KY Department of Education - \$1.3M ESPC loan at 3.25 percent for 14 years
 - Kentucky School for the Blind, Louisville
 - Kentucky School for the Deaf, Danville
- Future Farmers of America Training Camp, Hardinsburg
- Kentucky Educational Television – \$1.8M ESPC loan at 3.25 percent for 14 years
 - Kentucky Educational Television Network Center, Lexington
- Department for Veterans’ Affairs - \$2.2million ESPC loan at 2.25 percent for 15 years
 - East Kentucky Veterans Center, Hazard
 - Western Kentucky Veterans Center, Han-son
 - Thomson-Hood Veterans Center, Wilmore
- Kentucky Office of the Blind – \$599,785 ESPC loan at 1.5 percent for 14 years
 - Charles W. McDowell Rehabilitation Center, Louisville
- Cabinet for Health and Family Services – \$1.16 million loan at 1.5 percent fixed for 14 years
 - Outwood and Caney Creek Hospital
- Kentucky Department of Corrections – \$4.4 million ESPC loan at 1.5 percent for 14 years
 - Big Sandy, Bell County, and Eastern Kentucky correction facilities
- KY Finance and Administration Cabinet - \$2.8M
 - \$171,000 eSELF at 3.25 percent for 10 years
 - 701 Holmes Street paint shop and office
 - Fleet Administration and Garage, Frankfort
 - \$114,000 eSELF loan at 3.25 percent for 3 years
 - Old Capitol Campus, Frankfort

DEDI Partnership Activities



State and Local Government

- \$2.6M loan at 2.25 percent for 14 years
 - Capital Plaza Hotel Parking Garage
 - Capital Tower Parking Garage
 - Frankfort Convention Center
 - Kentucky History Center
 - Bush Building
 - Library and Archives
 - Public Service Commission
 - Surplus Property

Control System (CEMCS), was introduced by the FAC through their department for facilities and support services using a \$3.65 million energy management ARRA grant. This project has established a blueprint for all state agencies to fully manage and track energy consumption of government.

Using award-winning, nationally recognized software that creates data-driven analysis and helps implement low-cost building operation adjustments, Kentucky can save more than \$600,000 annually from the pilot of 43 buildings at 23 sites across the state. This software tracks energy usage in state buildings, maintains and monitors building systems, provides electronic audits of current and historical utility bills and generates alerts if usage exceeds parameters for determined energy usage. It even allows for electronic bill payments by the agencies.

To date, there are 24 buildings, over two million square feet, and 7,100 occupants included in the system. Energy savings are 12.8 percent when compared to a 2009 base-

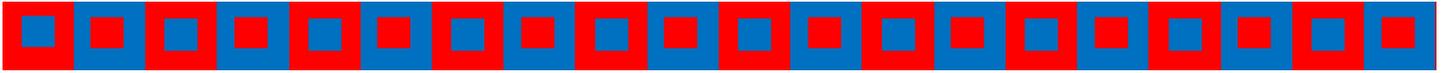
Commonwealth Energy Management and Control System (CEMCS)

The Governor's energy plan has established a goal of reducing energy consumption in state buildings 15 percent by the year 2015 and 25 percent by the year 2025 with the goal of "leading by example." and the Kentucky Finance and Administration Cabinet (FAC), in partnership with DEDI, is working to achieve this goal.

In order to meet the goals set forth in the plan, a pilot project entitled, Commonwealth Energy Management and



DEDI Partnership Activities



State and Local Government

line, or 11.9 GWh in electricity and 42,100 mcf of natural gas – on track to reach the 2025 Governor’s goal. These energy savings translates into \$1,557,545 in utility bills savings. Rate structure analyses account for approximately \$255,000 of the total savings; the balance is operational savings.

CEMCS provides an opportunity to look at utility usage and billing for each facility and sets a baseline for normal use and operating costs. It also provides the means to rank all buildings based on energy use per square foot and to allow for further investigation of facilities that are deemed energy inefficient, thus helping prioritize energy-efficiency retrofit projects and expenditures. It will also allow facility managers to make informed decisions about HVAC and light operations, providing the ability to turn off systems when appropriate.

In June 2012, the National Association of State Facilities Administrators (NASFA) awarded FAC their 2012 Innovation Award for CEMCS. NASFA is a professional organization whose mission is to provide leadership in the development and implementation of state facility administration practices.

Upon completion of the pilot project, FAC plans to integrate CEMCS into all state government facilities. Visit <http://kyenergydashboard.ky.gov/> to view current information on the status of energy and costs savings of this project.

ENERGY STAR Awards for 2012

Each year, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) honor organizations that have made outstanding contributions to protecting the environment through energy efficiency. This year, three Kentucky state government programs - the Commonwealth of Kentucky, Kentucky Housing Corporation and Kentucky Pollution Prevention Center - were selected for the ENERGY STAR Partner of the Year Award. This was the first time an entire state government has been recognized in this award category.

Additionally, three private sector companies from Kentucky- GE Appliances and Lighting, Louisville Gas and Electric and Kentucky Utilities, and Toyota Motor Engineering and Manufacturing North America Inc. were also

recognized nationally. Awards were presented on March 15, 2012, in Washington, D.C. Energy and Environment Cabinet Secretary Len Peters, along with other officials, attended the ceremony.



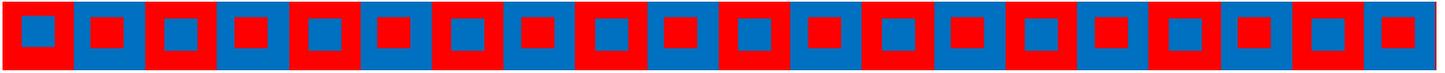
Commonwealth of Kentucky, Kentucky Housing Corporation and the Kentucky Pollution Prevention Center received ENERGY STAR recognition from EPA—2012.

Commonwealth of Kentucky, Kentucky Housing Corporation (KHC) and Kentucky Pollution Prevention Center (KPPC) received ENERGY STAR recognition for their delivery of exceptional efficiency-related programming that is helping Kentucky residents, schools, businesses, agriculture, industries and other sectors save energy. Commonwealth of Kentucky facilitates energy efficiency programs utilizing the ENERGY STAR brand. KHC launched a statewide Home Performance with ENERGY STAR (HPwES) program. KPPC is a non-regulatory environmental technical assistance resource center helping businesses and organizations stay environmentally sustainable.

ENERGY STAR is a key element of Governor Beshear's comprehensive energy plan by creating efficient, sustainable energy solutions and strategies. Kentucky sets an example with ENERGY STAR through active public-private partnerships that help create jobs, improve the environment and lessen our energy dependence. Key accomplishments that resulted in the award for Kentucky included:

- Making strategic energy management a priority at Kentucky schools with the Kentucky Energy Efficiency Program (KEEPS). KEEPS provides

DEDI Partnership Activities



State and Local Government

assistance and partners with the School Energy Manager Project, which results in reductions in operational costs and improved energy performance.

- Partnering with the Kentucky League of Cities and the Kentucky Association of Counties to reach out to local governments with a toolkit that highlights ways to reduce costs through energy efficiency and other green practices.
- Expanding access to building science training for Kentucky Home Performance evaluators that helped increase the number of Building Performance Institute Building Analyst certified professionals from 10 in 2010 to more than 200 in 2011.
- Completing over 500 Kentucky Home Performance installations, which represents a 66 percent conversion rate, and a total homeowner investment of over \$6.8 million.
- Partnering with 25 Kentucky utilities to augment Home Performance With Energy Star marketing and consumer outreach.
- Conducting 169 onsite energy efficiency assessments through KPPC's Environmental Sustainability Program, which identified more than 424,000 MMBtu in potential energy savings, with a projected annual cost savings of more than \$6 million.
- Engaging the governor, businesses, communities, and citizens to embrace energy efficiency in their daily lives using the ENERGY STAR brand.
- Developing more than 200 online resources to guide the schools participating in KPPC's KEEPS through the Seven-Step ENERGY STAR Guidelines for Energy Management. Of Kentucky's 174 school districts, 123 (70 percent) are ENERGY STAR partners, the highest percentage of any state in the nation

Energy Assurance Planning

The ability to manage a crisis and restore power systems to normal operation is a critical component of any energy management system. DEDI, in cooperation with the Public Service Commission and the Kentucky Division of Emergency Management, are accountable for the design, implementation and operation of the processes responsible for

monitoring, evaluating, and responding to energy disruptions in the Commonwealth.

The basic structure for emergency response efforts in Kentucky is categorized as Emergency Support Functions (ESF). The support function specific to energy systems is ESF#12. This framework remains constant throughout all levels of government providing for uniformity of information transfer and the orderly structuring of responsibilities.

Using funds provided by ARRA, DEDI developed an Energy Assurance Plan to strengthen and enhance energy emergency response efforts. The plan greatly expands the basic emergency response framework outlined in ESF #12. It closely examines the production, generation, transmission and distribution systems for electricity and for liquid fuels in Kentucky. The plan provides a profile of each particular energy commodity describing the production, consumption, and delivery systems for each commodity. Within each commodity classification, it includes information regarding various private businesses, organizations and government agencies, each of whom will have a role to play in restoring operations and services following an energy emergency.

Several initiatives have been completed during the course of the year. The Commonwealth Energy Assurance Plan was finalized and submitted to the U. S. Department of Energy in August 2012. The Kentucky Energy Profile has been updated, included in the Energy Assurance Plan, and posted on DEDI's website. Also, DEDI experienced staff turnover during the year and, as such, new staff has been attending energy assurance and related training courses. Most recently, staff attended a two day PJM training course regarding electric grid restoration from a black start situation.

Finally, Hurricane Sandy emphasized the need for continual planning, evaluation and preparedness. Since the Plan is intended to be a guide and resource during an energy emergency, staff is reevaluating and reviewing information contained in the Plan for accuracy and updating as needed. Contacts between DEDI and the various energy commodity groups are also being renewed and the emergency processes are being reviewed and strengthened.

DEDI Partnership Activities



Agriculture

On-Farm Energy Efficiency & Production Assistance Program

The Governor’s Office of Agricultural Policy (GOAP) collaborated with the Kentucky Agricultural Development Board (KADB) and the Kentucky Agricultural Finance Corporation (KAFC) to develop programs and funding opportunities focused on energy savings. The Kentucky Agricultural Development Fund (KADF) served as a catalyst in spurring new investments and developments in this area. The KADF enabled GOAP to partner with DEDI to utilize \$2 million of ARRA funding to create new opportunities for Kentucky farmers by implementing the On-Farm Energy Efficiency & Production Assistance Program.

The program allowed producers to receive a 25 percent reimbursement (up to \$10,000) on projects that yielded energy savings for their farm operations. The same funding was allowed for projects that established, generated, or harvested renewable energy sources from their farms, with an allowance to hire technical expertise to accomplish these tasks.

Enterprise	2009-April 2012 Projects
Grain	78
Poultry	55
Dairy	17
Other	14
Total	164

This program had three funding cycles and awarded approximately \$1.3 million to 164 farmers, allowing them to cut costs and save energy in their operations. Grain producers were the early adopters, but, as the popularity of the grant grew, poultry, dairy, farm shops, and greenhouses applied for and received funding. These grant recipients are already seeing significant energy savings and considerable energy reduction and as of April 2012, GOAP reported a

projected cumulative savings of 243 billion btu’s which is the equivalent energy of 1.9 million gallons of gasoline.

Summary	Total
Grant Awards	\$1,343,709
Project Costs	16,953,546
Energy Savings	\$1,761,273
Billion Btu Savings	243

KADB recognized the need to continue this program by approving the use of Kentucky Agricultural Development Funds to implement a similar grant program. This new state program, modeled after the original ARRA “on-farm” funded program, will also offer grants to farmers to improve energy efficiency and renewable energy in their agricultural operations.

In December of 2011, \$2 million was unanimously approved by the KADB to help Kentucky’s farmers continue to become more energy efficient and provide a legacy of efficiency for generations to come. During 2012, GOAP approved funding for 128 farms under this program. This funding will be leveraged with a \$750,000 TVA settlement grant that will provide additional energy opportunities to Kentucky’s farmers.

Multi-County Collaborative Agricultural Energy Initiative

This initiative began in 2009 and concluded in 2012 with the goal to support and accelerate implementation of Governor Beshear’s Intelligent Energy Choices for Kentucky’s Future initiative, the 25 x ’25 Roadmap and the Pathway for Kentucky’s Agriculture and its Rural Communities: 2007-2012 Strategic Plan. It was designed to encourage regional collaboration by providing a 1:1 match with ARRA funds and state Agricultural Development Funds for agriculturally-related renewable energy projects. Projects resulting from this program involved cooperative efforts

DEDI Partnership Activities



Agriculture

among a variety of entities including, farmers, higher education, groups and associations, and the private sector. The program provided financial incentives that encouraged energy efficiency and renewable energy projects to agricultural producers. Funding was used to supplement tobacco settlement funds for grants to a multi-county collaborative enabling enhancement, as well as, the advancement of renewable energy production at the farm level. The ultimate goals of the program were to expand acreage of energy generating crops through demonstration projects such as that of Kentucky Forage and Grassland Council; improve production techniques like those implemented by Commonwealth Agri-Energy; accomplish growth of marketing channels for these commodities, as Western Regional Center for Emerging Technology did by developing a farm-based Agri-energy infrastructure and projects within the Murray State University region that provided assistance for producers and small businesses applying for state and federal energy efficiency grants. The table below shows the funding breakdown to support these projects.

Applicant Name	ARRA Funding
Kentucky Forage & Grasslands Council	\$100,000
South Kentucky Rural Electric Cooperative	\$10,150
Mammoth Cave RC&D	\$10,000
Western Regional Center for Emerging Technologies	\$25,000
Commonwealth Agri-Energy, LLC	\$100,000
Total	\$245,150.00

Kentucky Forage and Grasslands Council project looked to expand opportunities for biomass and hay production in NE Kentucky by providing a renewable fuel alternative that worked well with existing hay production systems and equipment. A total of 500 acres of switchgrass were planted within an 80 mile radius of Maysville encompassing 12 counties. Two mobile pellet mills were purchased that were transported across the region to convert baled switchgrass into a usable and easily transported product.

Project managers worked with UK Biosystems and Agricultural Engineering, local agricultural and natural resources extension agents and participating farmers to en-



Kentucky Forage and Grasslands Council Biomass Briquette System

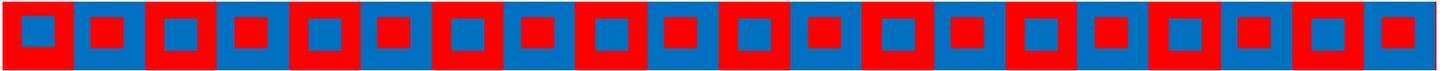
sure management, harvesting, and delivery of the product. All farmers involved in the program were required to apply for cost-share funding through the NRCS EQIP program in which the farmers received cost-share dollars that covered the majority of the cost for establishment.

South Kentucky Rural Electric Cooperative Corporation conducted a feasibility study to determine the potential for biomass production in southern Kentucky counties. The project determined the viability of constructing a biomass facility in the Lake Cumberland region, evaluated the local primary feedstocks and analyzed any negative impacts that bio-mass utilization may have to existing businesses and industries in the region.

Mammoth Cave Council assisted 20 farmers by applying for energy efficiency grants that fostered advances in communication, collaboration, innovation, investment, productivity, and profitability between agriculture, education, and industry renewable energy. Studies were conducted similar to the one completed by South Kentucky RECC that determined the advantages and disadvantages of biomass energy production in their service area.

Western Regional Center for Emerging Technology, Inc. encouraged private industry to partner with Kentucky's

DEDI Partnership Activities

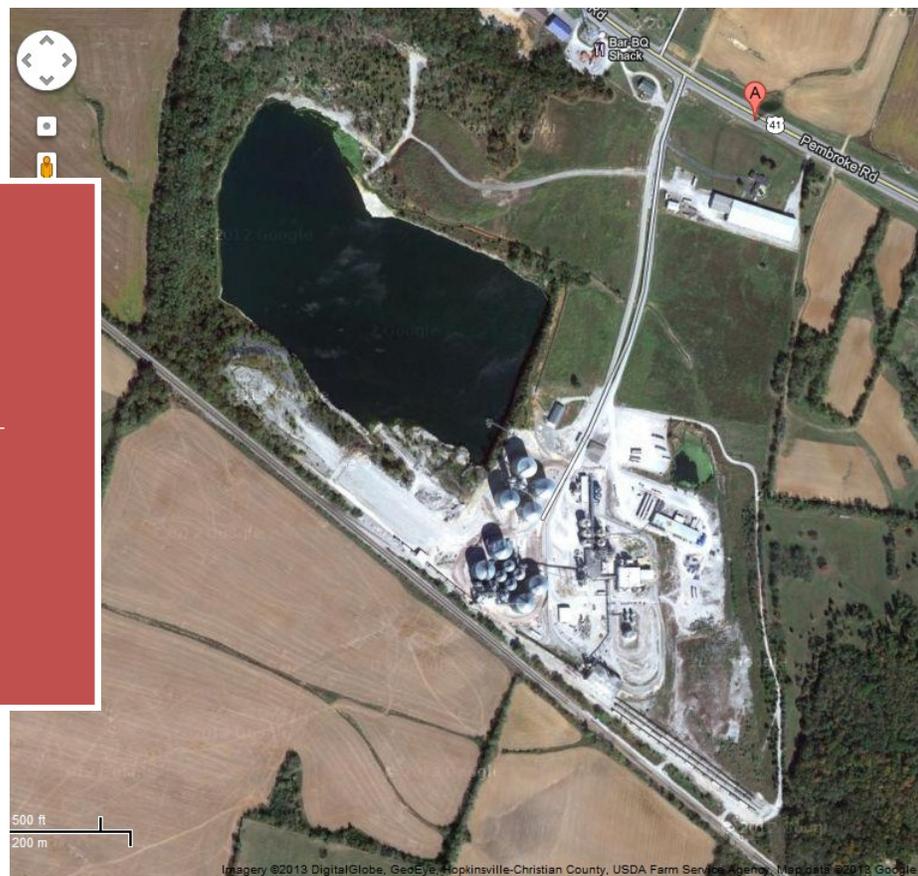


Agriculture

higher education community and farmers to advance the opportunities for agriculture by developing a farm-based agri-energy infrastructure. The project objective was to develop, commercialize, and network new energy crops in western Kentucky with a focus of stimulating industry investment in biofuels/biopower.

The Commonwealth Agri-Energy (CAE) Quarry Lake project included installation of a 5,000 gallon-per-minute pump, along with sufficient pipeline, to bring 50-degree water from an onsite quarry lake into the ethanol production facility. This low horsepower and less expensive lake-cooling process replaced the more expensive cooling tower process previously used to produce the ethanol. The water is pumped back into the lake where it is cooled and returns to its original temperature. Energy savings during the first year of use were significant allowing CAE to save \$177,000 annually on energy costs.

Aerial view of
Commonwealth Agri-
Energy Ethanol Plant,
Hopkinsville



Kentucky Grants



Public Education on Coal Issues

Kentucky Revised Statute 132.020(5) authorizes funding to the Energy and Environment Cabinet from the unmined minerals tax collected each year for the purpose of public education of coal related issues. DEDI has the responsibility to solicit proposals each year from non-profit agencies having the experience and expertise to successfully conduct programs or activities. The department selected seven projects for 2012, which are highlighted in the table below.

Awardee	Amount	Project Description	Start Date	End Date
Southeast Education Foundation	\$88,700	SKCTC will manage the Coal Museum and Portal 31 to inform visitors and students about the history of coal mining and life in the coal fields.	July 1, 2012	June 30, 2013
Coal Education Development and Resource (CEDAR)- East	\$85,000	CEDAR will use its grant to develop coal educational materials and sponsor a coal fair for K-12 students in 12 eastern Kentucky counties.	July 1, 2012	June 30, 2013
Coal Education Development and Resource (CEDAR)- West	\$50,000	CEDAR will use its grant to develop coal educational materials and sponsor a coal fair for K-12 students in 6 western Kentucky counties.	July 1, 2012	June 30, 2013
Kentucky Geological Survey (KGS)	\$39,300	KGS will create a new Internet mapping service that places Kentucky coal resource information in a geographical visualization environment.	July 1, 2012	June 30, 2013
Bluegrass PRIDE	\$55,000	PRIDE will sponsor coal education programs for K-12 students in central Kentucky counties that include teacher curriculum materials and an Energy Tour.	July 1, 2012	June 30, 2013
KY National Energy Education Project (NEED)	\$80,500	NEED will bring coal and energy education to more than 100 of Kentucky's K-12 educators and approximately 9,600 Kentucky students from across the state while hosting four one-day workshops and hosting the Kentucky Energy Tour.	October 1, 2012	June 30, 2013
University of Kentucky Center for Applied Energy Research (CAER)	\$39,000	CAER will continue the development of the energy education club at the University of Kentucky and charter clubs at other interested Kentucky colleges and universities.	November 1, 2012	June 30, 2013

Kentucky Grants



Energy Research

Under the enacted biennial budget, DEDI received appropriated funding from the General Assembly to support research projects relating to clean coal, new combustion technologies; thin-seam coal extraction; safety, tracking and communication devices, coal slurry disposal and synthetic natural gas produced from coal through gasification processes, and the development of alternative fuels produced by processes that convert coal or biomass resources or extract oil from oil shale and other coal research. These research dollars are used to provide benefits to Kentucky's Local Government Development Fund eligible counties. The supported projects are explained in the table below.

Awardee	Amount	Project Description	Start Date	End Date
Advanced Particle Separation Technology, LLC	\$254,268	APST will research the development and assessment of innovative cyclone separation technology for high efficiency coal cleaning.	February 1, 2013	June 30, 2014
University of Kentucky Center for Applied Energy Research (UK CAER)	\$61,355	CAER will research a project to remediate coal slurry impoundment liquids using a multi-stage constructed treatment wetland system.	February 1, 2013	June 30, 2014
University of Kentucky Dept of Mining Engineering (UK DME)	\$364,011	CME will develop and evaluate modern rock dust to mitigate the threat from coal mine fire or explosion.	February 1, 2013	June 30, 2014
UK CAER	\$203,344	CAER will research efficiency improvement in CO2 capture solvent regeneration using a load-leveling electricity-to-thermal energy absorption system.	February 1, 2013	June 30, 2014
Eastern Kentucky University	\$123,662	EKY will research low-cost biomass saccharification process for producing biofuels.	February 1, 2013	June 30, 2014
UK CAER	\$163,565	CAER will research a low-cost approach to anode-grade coke from coal by solvent extraction.	February 1, 2013	June 30, 2014
UK CAER	\$2,650,000 <small>Includes carry forward</small>	CAER continues Carbon Management Research Group	July 1, 2012	June 30, 2014
UK CAER	\$531,409	CAER research and development of algae for CO2 mitigation.	November 15, 2012	December 31, 2013
UK DME	\$350,000	Design and feasibility study of an underground coal laboratory	July 1, 2012	June 30, 2017

Kentucky Grants



Tennessee Valley Authority (TVA) Settlement

In late December, Governor Beshear announced that 13 organizations received grant funding under the 2011 settlement agreement between the U.S. Environmental Protection Agency and the Tennessee Valley Authority (TVA). The recipients include education, housing, agricultural and economic development organizations and projects.

The settlement is a result from alleged violations of the Clean Air Act that requires TVA to invest in new and upgraded state-of-the-art pollution controls that will reduce pollution, save energy and protect public health and the environment. More information on the settlement can be found at <http://www.epa.gov>.

As part of the settlement, Kentucky will receive \$11.2 million over a five-year period to implement environmental mitigation projects. DEDI will manage the grants for EEC as many of these programs and projects help sustain AR-RA initiatives as well as implement recommendations stemming from Stimulating Energy Efficiency in Kentucky program.

The organizations and projects or programs that have received grants are:

- Kentucky School Boards Association (KSBA): KSBA is awarded \$700,000 to support the School Energy Managers Project in school districts in and adjacent to the TVA service counties. Based on actual progress of the program to date, the project expects to produce \$2.4 million in annual energy cost avoidance by FY 2016.
- Pennyriple RECC: Pennyriple RECC is awarded \$3.1 million to support construction of a 5MW solar photovoltaic project at Fort Campbell in Christian County. The grant is leveraged with more than \$15 million in financing support from Fort Campbell. The completed system will generate more than 6,651 mWh/year of electricity, enough to power 463 homes, while avoiding 4.7 million tons per year of CO2 emission.
- Lord Corporation, Bowling Green: Lord Corporation, manufacturer of adhesive, coating and motion management technologies, is awarded \$504,000 to facilitate improvements to the site's chilled water and boiler plants. Savings achieved from the project comprise more than 1,256 mWh/year of electricity and more than 113,000 therms/year of natural gas. Lord is leveraging the grant dollar-for-dollar.
- Kentucky Housing Corporation (KHC), Frankfort: KHC is awarded \$3 million to support the ongoing KY Home Performance Program. The grant will fund three years of program operations during which at least 611 additional energy efficient units will be completed. The program will focus primarily on owner-occupied, single-family energy efficiency loans ranging from \$1,000-\$25,000 per home.
- Governor's Office of Agricultural Policy (GOAP): GOAP is awarded \$750,000 to support the KY On-Farm Efficiency and Production project. This is a statewide loan program that offers farmers up to \$15,000 to adopt new technologies, renovate existing facilities, produce energy related crops and invest in other energy efficient measures. GOAP will invest half of the program loan funds in TVA service area counties.
- Murray State University: Murray State University is awarded \$309,000 to install, test and demonstrate a biomass heating system at the MSU Equine Center. The Bio Burner Units will offset fossil fuel energy with renewable energy at a rate of 40 mWh per year of electricity. One of the units will be portable in order to demonstrate a biomass-to-energy model to area farmers, industry and others.

Kentucky Grants



Tennessee Valley Authority (TVA) Settlement

- Fayette County Public Schools: Fayette County Public Schools is awarded \$335,000 to support completion of the integrated live energy metering project. The project comprises live energy monitoring equipment, live data analysis software, and a district-wide public-facing energy and sustainability education portal. The completed project will save more than \$1.1 million a year in energy costs and reduce CO2 emissions by more than 11,000 tons per year.
- Perdue Farms Incorporated, Beaver Dam: Perdue Farms is awarded \$145,000 to support a project to divert poultry waste from the landfill to an anaerobic digestion and generator system. The result of the project will be the removal of 1,500 tons per year of organic waste from the county landfill and the subsequent generation of 620 mWh/year of electricity. Egg shell solids separated from the organic waste will provide additional beneficial uses currently lost to the landfill.
- Bowling Green Independent Schools: Bowling Green Independent Schools is awarded \$34,000 to purchase and install a solar thermal domestic hot water system for the school kitchen as well as a solar photovoltaic system to offset a portion of the total building energy. In addition to saving over 140 Mbtu/year of fossil fuel heating, the systems will be incorporated into the school's science curriculum as teaching tools.
- Southern Tier Housing Corporation, London: Southern Tier Housing Corporation is awarded \$504,000 to support energy modeling and design research to develop more cost effective and energy efficient Houseboats to Energy Efficient Residences (HBEER) factory-built structures. The project will include construction of four new energy efficient, factory-built structures equipped with photovoltaic generation systems to be installed in the Kentucky TVA service area.
- Hickman-Fulton Counties RECC: Hickman-Fulton RECC is awarded \$316,000 to support a project to replace inefficient outdoor lighting fixtures with energy efficient, long-life bulbs. The project will save more than 600 mWh/year of electricity and reduce CO2 emission by more than 440 tons/year. The project is leveraged dollar-for-dollar by HFCRECC.
- Mountain Association for Community Economic Development (MACED), Berea: MACED is awarded \$300,000 to support the On-Bill Financing Residential Energy Efficiency Retrofit Program. Under the grant funding the program will perform 150 energy efficient retrofits in area residences. The retrofits will save approximately 825 mWh/year of electricity representing more than \$90,000 a year of savings on participating customers' utility bills.
- Department for Local Government (DLG): DLG is awarded \$1.2 million to support continuation of the Energy Efficiency and Conservation Block Grant (EECBG) program. The EECBG program provides grants to local governments for programs that reduce energy consumption, greenhouse gas emissions, and utility costs for local governments.

Kentucky Energy Database and Analysis



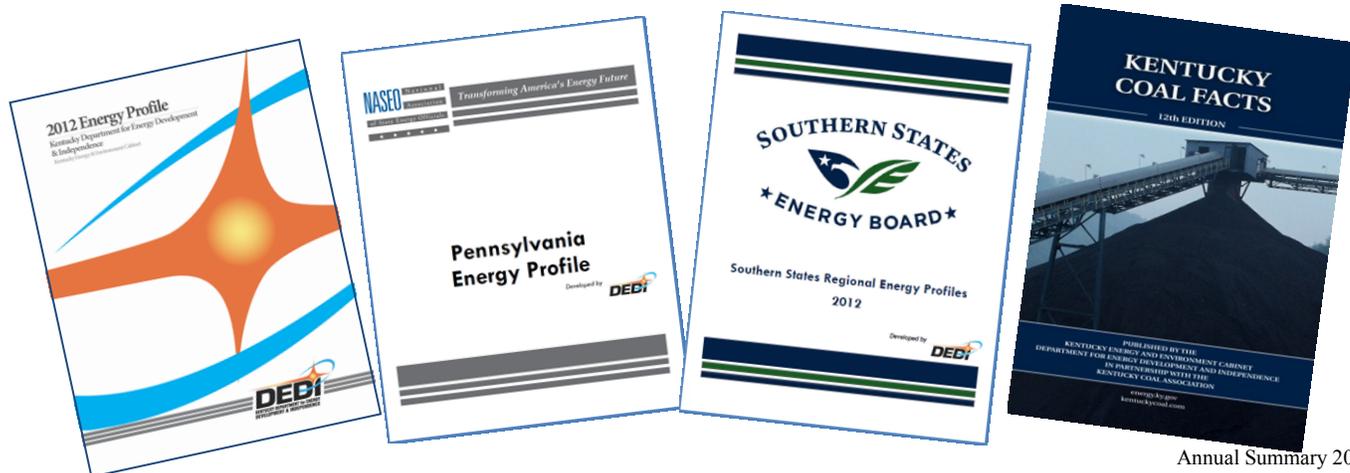
Data Products and Publications

DEDI continued to increase its data and analytical capabilities in 2012, while expanding the number of informational products offered to policy-makers and the public. Since 2009, DEDI has focused on improving internal data capabilities and data awareness so as to provide interested parties in government and the public with timely updates on the trends and contexts of energy within the economy of the Commonwealth. The combination of on-going research efforts and existing DEDI energy databases enabled the department to enhance the quality and content of publications specific to Kentucky, but also successfully design and market energy data products for state governments and regional organizations during 2012.

The third edition of the *Kentucky Energy Profile* was published by DEDI in 2012 to provide an updated annual snapshot of energy requirements and relationships that describe the Kentucky economy. The profile supplies data on the dynamics of energy expenditures, energy consumption, energy production, and electricity generation in Kentucky as a whole, and the new edition offers a national context for Kentucky's per capita energy use, energy intensity of production, and demand for electricity across economic sectors. Highlights from the third edition of the *Kentucky Energy Profile* include: Kentucky remains a net exporter of energy supplies, Kentucky was the nation's third largest coal producer in 2012, Kentucky's electricity prices were fourth lowest in the country, and Kentucky is home to the most electricity-intensive economy in the United States.

DEDI also embarked on a program to update and expand the 12th Edition of *Kentucky Coal Facts*. Focusing on Kentucky's most well-known energy industry and largest source of energy production, *Coal Facts* presents an annual summary of coal production, employment, and market demand for the coal industry in Kentucky. This well-established document serves as a reference point for information on coal in Kentucky, and the new edition now supplies county-level data profiling mining output, employment, and key coal customers for each coal-producing county in Kentucky.

Additionally, through contracts with the National Association for State Energy Officials (NASEO) and the Southern States Energy Board (SSEB), DEDI was able to design customized energy publications and data products for interested inter-governmental agencies, state energy offices, and regional organizations. During 2012, DEDI successfully consulted for energy offices in Alabama, Illinois, Maine, Minnesota, Missouri, Pennsylvania, and Tennessee to provide these offices with specialized, state-specific energy profiles and energy databases. DEDI was also able to partner with the Southern States Energy Board in 2012 to provide a comparative overview of energy in each of the board's 16 member-states (within the continental United States). Desirably, these collaborative projects help established a platform for future data services targeted towards other state agencies and energy policy organizations.



Kentucky Energy Database and Analysis

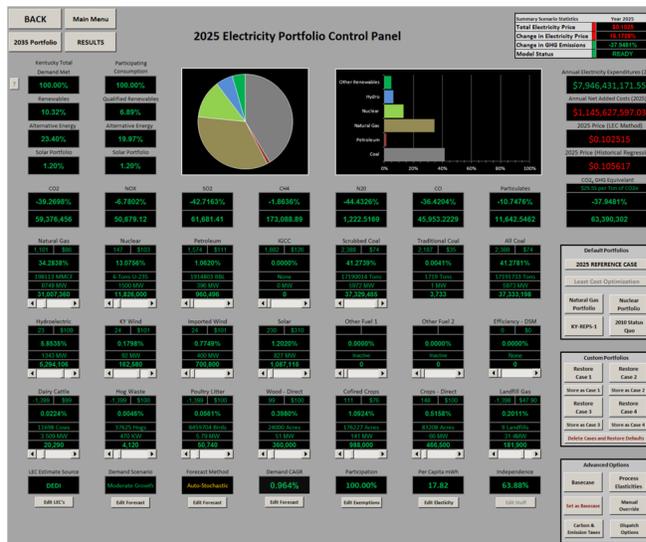


Kentucky Electricity Portfolio Model

DEDI leveraged its national database of energy, environmental, and related socioeconomic factors to build and calibrate numerous predictive energy models customized for Kentucky to help the public and policy makers make informed decisions and plan for the future. One example, Kentucky Electricity Portfolio Model, is an interactive computer program designed to simulate the macro level implications of changing the Commonwealth's electricity generating portfolio under a variety of future conditions.

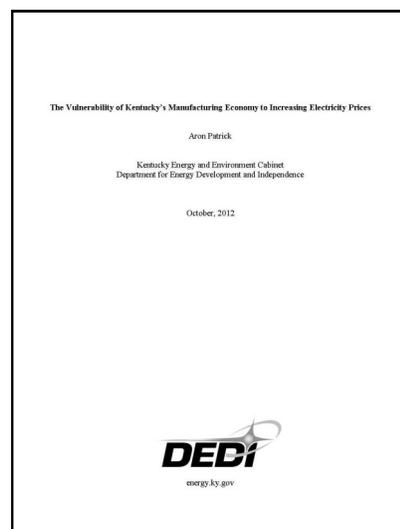
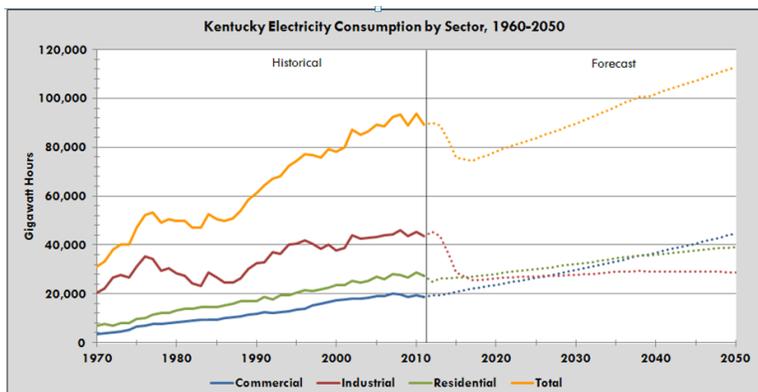
From the model's control panel users can interact with Kentucky's 2025 electricity generating portfolio by moving toggles that reallocate the proportion of electricity being produced from different generating technologies and resources. The model provides the user with instant visual feedback on the changes in airborne emissions, including criteria pollutants as well greenhouse gases, costs, fuel consumption and other physical requirements, such as land area requirements, associated with the modifications they have made. The model processes user changes to the generating portfolio and other assumptions to forecast emissions, electricity consumption, electricity price and price volatility, as well as generation capacity requirements, fuel consumption from the year 2013 to 2050 for the Commonwealth as a whole.

While the model is intended for policy analysis, it has also been valuable for educational purposes in various public events and university classrooms where people have been invited to interact with Kentucky's simulated electricity portfolio. During these opportunities users dis-



cover that preconceived solutions may not always be the best or cost effective solution.

In 2012, DEDI used the model to estimate the potential implications of significant electricity price increases on employment opportunities in Kentucky. The report, entitled "The Vulnerability of Kentucky's Manufacturing Economy to Increasing Electricity Prices" found that given a 25 percent increase in electricity prices alone, and holding everything else constant, Kentucky could expect to lose approximately 30,000 jobs and primarily in the most-electricity intensive manufacturing sectors over the long-term.





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