



Annual Summary

December, 2009

Foreword

In November 2008 Governor Steve Beshear unveiled his comprehensive energy plan for Kentucky, *"Intelligent Energy Choices for Kentucky's Future."* The plan is designed 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.

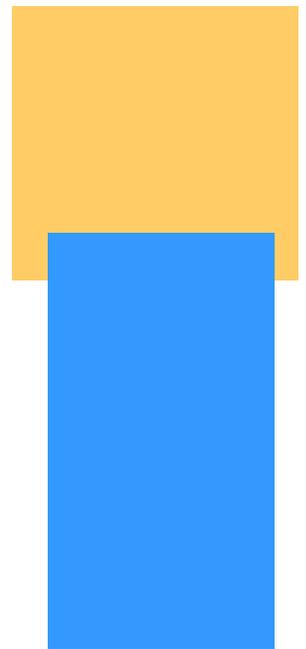
The Governor's plan incorporates recommendations to improve energy efficiency for Kentucky's homes, businesses and transportation fleet. It provides a framework from which we can begin to increase our use of renewable energy sources. It discusses the potential for biofuels as well as coal-to-liquids and coal-to-gas technologies. It recommends the initiation of an aggressive carbon capture/sequestration program for coal-generated electricity. It provides a discussion of how Kentucky could initiate and grow safe and reliable nuclear power for electricity generation.

By refining and adopting this energy plan, Kentucky can establish leadership in the United States for innovating and creating efficient, sound and environmentally compatible energy solutions and strategies. The energy plan serves as a roadmap toward energy independence that is designed to accomplish six important things:

- Conserve and use energy more efficiently.
- Achieve energy independence for transportation fuels.
- Use coal more cleanly and efficiently.
- Diversify electricity generation to optimize use of renewable and alternative fuels, in addition to coal, Kentucky's leading fossil fuel, and nuclear.
- Mitigate carbon dioxide emissions, reducing our carbon footprint.
- Establish Kentucky state government as a leader in green practices.

Over the course of the past twelve months the Energy and Environment Cabinet and the Department for Energy Development and Independence (DEDI) have worked diligently to implement the Governor's energy plan on a broad array of fronts. The journey to transform Governor Beshear's energy vision into a reality has begun and this annual summary provides a brief overview of those activities that are driving results.

More information about the Governor's energy plan and DEDI's activities to implement the plan can be found at www.energy.ky.gov.



Letter from Dr. Len Peters

Fellow Kentuckians -

Throughout the year I have had discussions with many of you about Governor Beshear's energy plan and our efforts to implement that plan. While highly desirable, it has not been humanly possible for me to connect with each of you and share our progress. For this reason I wanted to capture in an annual summary our more significant activities that are helping Kentucky become a national energy leader.

During this past year we've realigned the Department for Energy Development and Independence's organizational structure to better address the Governor's energy plan, received unprecedented amounts of funding for statewide energy efficiency and renewable energy initiatives from the American Recovery and Reinvestment Act, cosponsored the Governor's Biomass and Biofuels Task Force to assess agriculture's vital role with regards to Kentucky's energy future, and invested in fossil energy research and development to discover solutions that will help strengthen Kentucky's economy in a carbon constrained environment. Details on these activities as well as many others are presented in this annual summary.

These are interesting times for the world of energy and I know that you are concerned about rising energy costs, job opportunities, and healthy communities. Governor Beshear and I share these concerns and that is one reason why we have been so focused on developing and implementing a comprehensive energy plan for the commonwealth. As you review the plan you will see that it recognizes Kentucky's unique energy challenges—we are a major coal-producing state and we rely on coal to generate more than 92 percent of our electricity. This becomes a formidable challenge especially as the nation and the world work toward a low-carbon emissions standard. It is a challenge that will require our best efforts and collective solutions to solve as we work to improve Kentucky's economy.

Our work has only just begun and I seek your continued support and engagement to help us shape Kentucky's energy future. I hope that you will find this annual summary useful in understanding Kentucky's opportunities and challenges for meeting our energy demands.

Respectfully,



Len Peters, Secretary

Energy and Environment Cabinet



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Governor Beshear's Energy Plan

Intelligent Energy Choices for Kentucky's Future

Our Challenges

KENTUCKY'S CHALLENGE for the 21st century is to develop clean, reliable, affordable energy sources that help us improve our energy security, reduce our carbon dioxide emissions, and provide economic prosperity. Kentucky can be – and in fact must be – a leader in this energy revolution.

Energy independence is a top challenge to the state and the nation in the 21st century, a challenge that has been made at once more urgent and more complex by the equally pressing issue of global climate change. For a major coal-producing state that also relies on coal to generate more than 90 percent of its electricity, addressing these two issues – energy security and climate change – is especially problematic. As a state, it is imperative that we have policies and programs in place that allow us to shape our own energy future by making sure we utilize our energy resources in an environmentally sound manner. The Governor's strategic action plan, *Intelligent Energy Choices for Kentucky's Future*, is intended to place Kentucky on such a path.

STRATEGIES

Strategy 1: Improve the energy efficiency of Kentucky's homes, buildings, industries and transportation fleet.

Goal: Energy efficiency will offset at least 18 percent of Kentucky's projected 2025 energy demand.

Strategy 2: Increase Kentucky's use of renewable energy.

Goal: By 2025, Kentucky's renewable energy generation will triple to provide the equivalent of 1,000 megawatts of clean energy while continuing to produce safe, abundant and affordable food, feed and fiber.

Strategy 3: Sustainably grow Kentucky's production of biofuels.

Goal: By 2025, Kentucky will derive from biofuels 12 percent of its motor fuels demand, while continuing to produce safe, abundant and affordable food, feed and fiber.

Strategy 4: Develop a coal-to-liquids industry in Kentucky to replace petroleum-based liquids.

Goal: Kentucky will develop a coal-to-liquids industry that will use 50 million tons of coal per year to produce four billion gallons of liquid fuel per year by 2025.

Strategy 5: Implement a major and comprehensive effort to increase gas supplies, including coal-to-gas in Kentucky.

Goal: Kentucky will produce the equivalent of 100 percent of our annual natural gas requirement by 2025 by augmenting in-state natural gas production with synthetic natural gas from coal-to-gas processing.

Strategy 6: Initiate aggressive carbon capture/sequestration projects for coal-generated electricity in Kentucky.

Goal: By 2025, Kentucky will have evaluated and deployed technologies for carbon management, with use in 50 percent of our coal-based energy applications.

Strategy 7: Examine the use of nuclear power for electricity generation in Kentucky.

Goal: Nuclear power will be an important and growing component of the nation's energy mix and Kentucky must decide whether nuclear power will become a significant part of meeting the state's energy needs by 2025.



The Center for Applied Energy Research has teamed with Kentucky's major power companies, and Energy and Environment Cabinet to conduct carbon capture re-

REPS and ATFS

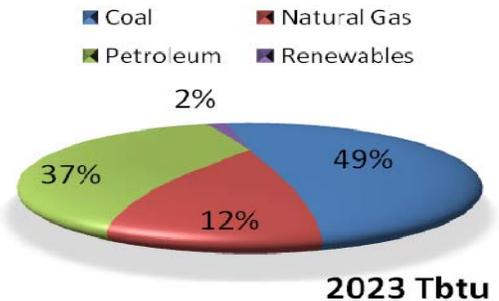
Strategies 1, 2 & 3 are designed to help the commonwealth achieve a proposed **Renewable and Efficiency Portfolio Standard (REPS)**, whereby 25 percent of Kentucky's energy needs in 2025 will be met by reductions through energy efficiency and conservation and through the use of renewable resources.

Strategies 1, 3 & 4 create an **Alternative Transportation Fuel Standard (ATFS)** intended to help transition Kentucky away from foreign oil by using fuels derived from biomass and coal, plug-in hybrid vehicles and compressed natural gas.

Kentucky's Energy Snapshot

In 2007 Kentucky consumed 2,023 trillion btu's placing the commonwealth 7th nationally in total energy consumption per capita (477.5 million btu per person). Kentucky ranked 6th for total energy consumption per capita in 2006 (468.7 million btu per person). Of that total consumption 49 percent was coal, 37 percent was petroleum, 12 percent was natural gas and 2 percent was renewable energy. These percentages have remained relatively stable for the past decade.

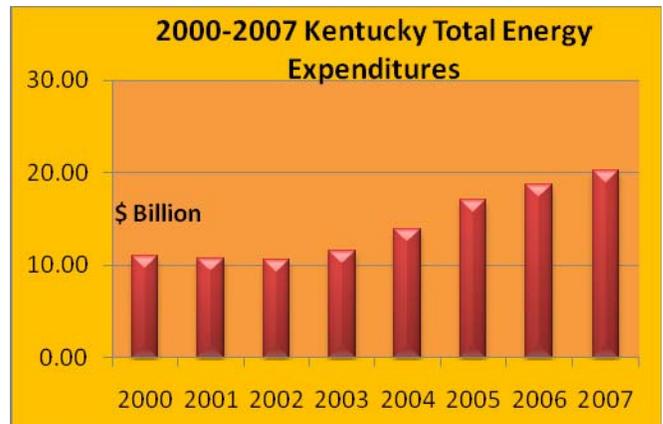
2007 Kentucky Total Energy Consumption



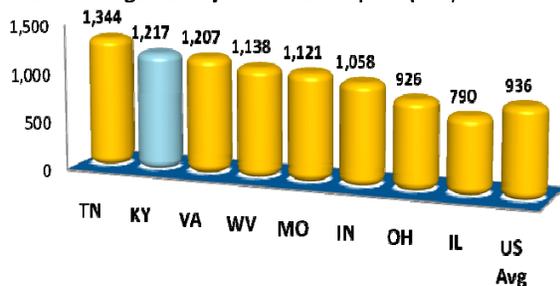
2007 Total Consumption per Capita		
Rank	State	Million Btu
1	Alaska	1,062.3
2	Wyoming	948.6
3	Louisiana	861.2
4	North Dakota	671.1
5	Texas	496.3
6	Montana	483.1
7	Kentucky	477.5
8	West Virginia	469.9

Kentucky's low electric rates have discouraged efficiency practices and resulted in higher than average energy bills. In 2007 the average monthly residential electric bill for Kentucky was \$89.35, ranking Kentucky 26th in the nation for the highest monthly electric bill.

In 2007 Kentucky ranked fifth lowest in the nation for residential electrical rates (7.34 cents per kwh). However, Kentucky's average monthly residential electricity consumption for 2007 was 1,217 kwh, which was 20 percent higher than the national average. Kentucky ranks second in monthly residential electricity consumption when compared to its bordering states.



2007 Average Monthly Electric Consumption (kwh)



Kentucky spent more than \$20.3 billion for energy in 2007, up 8.6 percent from the previous year and up 85 percent from 2000. This expenditure represents approximately \$4,446 per person. These increased expenditures were driven, in part, by higher coal costs. Petroleum and natural gas costs were strong during the year, however, they were still lower than the price spikes experienced in 2008.

Source: U.S. DOE Energy Information Administration 2007, State Energy Update, August 2009

Department for Energy Development and Independence Realignment

Shortly after Governor Beshear's release of his energy plan, a critical review of DEDI organizational structure was conducted. The review evaluated the department's capacity to maximize implementation of the Governor's plan and to position Kentucky as a nationally recognized energy leader. As a result there was a major departmental realignment that established six divisions to specifically address the seven strategies in the plan. The department now includes the Division of Efficiency and Conservation; the Division of Renewable Energy; the Division of Biofuels; the Division of Energy Generation Transmission and Distribution; the Division of Carbon Management; and the Division of Fossil Energy Development. Additionally, the Office of the Commissioner of DEDI was developed. Total recommended staffing for the department is 34 full-time employees. The new organizational structure was officially recognized in June 2009 when the Governor issued executive order 2009-0538.

The department'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 carbon dioxide emissions, and provide economic prosperity. Additionally, the department supports and encourages energy-related research and development that will benefit Kentuckians. A brief overview of each DEDI division follows.

The Division of Efficiency and Conservation provides leadership to maximize the benefits of energy efficiency and conservation through awareness, technology development, and partnerships. It is charged with implementing Strategy 1 (efficiency) and to achieve the goal of offsetting at least 18 percent of Kentucky's projected 2025 energy demand through energy efficiency. Additionally, the division is responsible for managing more than \$68 million in American Recovery and Reinvestment Act of 2009 (ARRA) funds that are programmed for energy efficiency and renewable energy. The division has added eight new federally full-time limited positions to support the ARRA mission.

The charge to **the Division of Renewable Energy** is to



Secretary Len Peters and County Judge Executive Wayne Rutherford at the 33rd Governor's Conference on Energy and Environment.

provide leadership to maximize the benefits of renewable energy through awareness, technology development, and partnerships. The division has oversight in implementing Strategy 2 (renewables) of Kentucky's comprehensive energy strategy. The division works with the Division of Efficiency and Conservation in the management of ARRA funds for renewable energy projects.

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 (biofuels) with the goal that Kentucky will derive 12 percent of its 2025 fuel demand from biofuels.

The Division of Energy Generation, Transmission and Distribution was created to analyze and develop policies that will ensure the generation, transmission, and distribution of adequate, affordable, and clean energy within the commonwealth; to understand the reliability and economic trade-offs for baseload electricity generation; to develop policies that will ensure adequate transmission of energy resources; and to promote alternative and renewable sources for electricity generation. The division also has responsibility for initiating discussion and gathering information in nuclear energy as a base-load source of power in Kentucky's Future -- Strategy 7. Additionally, the division is implementing the ARRA State Government Energy Assurance and Smart Grid Resiliency Program.

DEDI Realignment

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

The Division of Fossil Energy Development has the mission to maximize the benefits of Kentucky's 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).

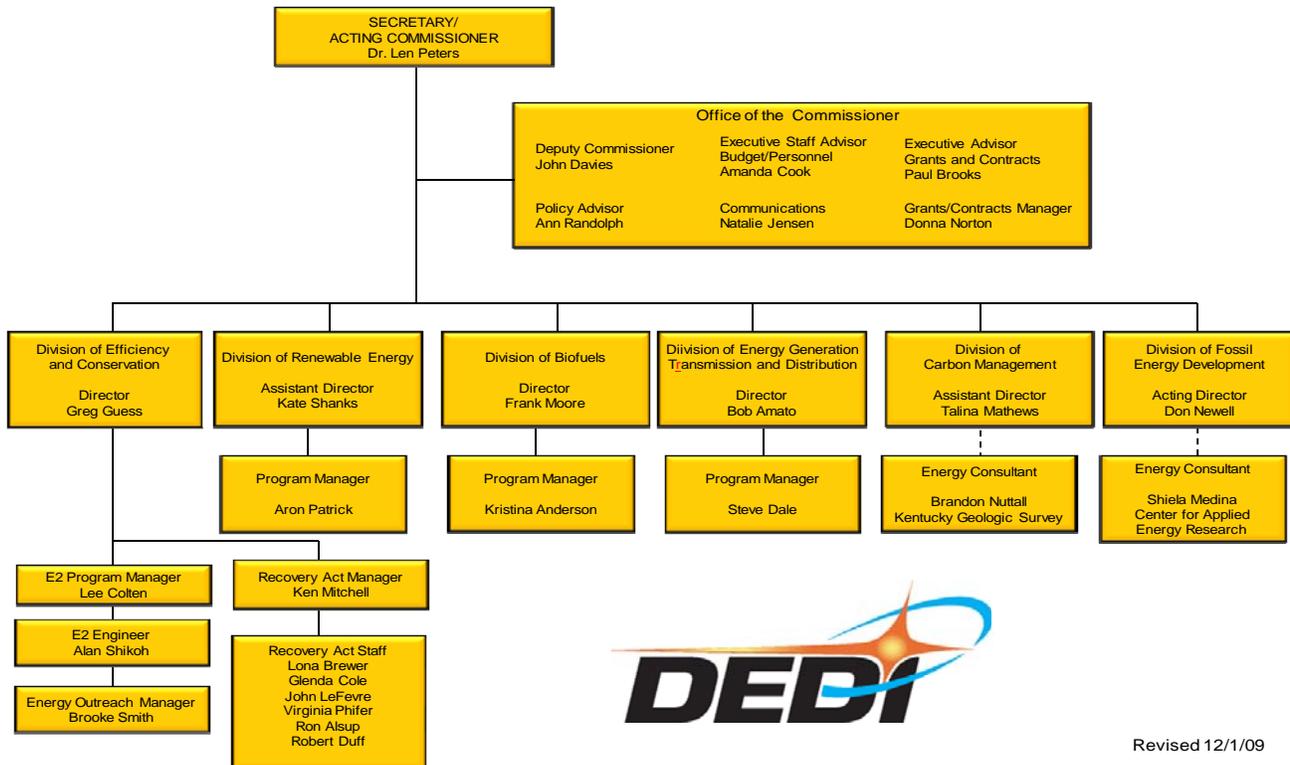
The Commissioner's Office provides direction, administrative support, energy workforce development, and grant and contract management for the department's six divisions.

Energy Workforce Development: A Collaborative Effort

DEDI provided leadership in a collaborative energy education task force to hone an Energy Career Pathways curriculum for grades 9-12 through two-year post-secondary certificate programs, allowing for three different career pathways post certificate. DEDI is currently meeting with the Kentucky Department of Education, which must approve the curriculum. In 2010, the task force will engage Kentucky's four-year universities, and the Council on Post-Secondary Education. Additionally, DEDI worked with the Kentucky Community and Technical College System and National Energy Education Development to develop an *Introduction to Energy* course.

DEDI has worked with the Economic Development, Education, Finance, and Labor Cabinets in selecting three Kentucky regional grants for a total of \$4.6 million from the U.S. Department of Labor (DOL) that were submitted in October 2009. Also, DEDI supported the Office of Employment and Training to apply for a \$1.2 million Labor Market Information (LMI) grant to formally survey Kentucky energy jobs and training programs, as well as enhance Kentucky's Job Bank. The LMI was awarded in November 2009. DEDI is currently organizing a Center for Energy Workforce Development State Consortium.

DEPARTMENT FOR ENERGY DEVELOPMENT AND INDEPENDENCE



DEDI Activities

To implement Governor Beshear's energy plan, DEDI has initiated and accomplished many activities throughout the year. These activities connect with Kentucky's economic sectors to help create jobs, save energy, increase the production of alternative energy, and improve the environment. The chronological list that follows highlights DEDI's more significant activities for the year.

January - DEDI collaborated with Kentucky Housing Manufactured Institute during their annual meeting to educate retailers and manufacturers on ENERGY STAR manufactured homes.

February - DEDI along with the Kentucky Pollution Prevention Center(KPPC), National Energy Education Development (NEED) and KY School Plant Management Association hosted two Kentucky Energy Efficiency Programs for Schools (KEEPS) Energy Management Workshops training for more than 260 superintendents, facility managers, teachers and financial officers that represented 72 Kentucky school districts.

Governor Beshear and ENERGY STAR recognized Casey County School Board for outstanding energy efficiency in the new Walnut Ridge Elementary School.

March – DEDI, the Governor's Office, and Kentucky State University hosted Southern Growth's Kentucky Energy forum which engaged more than 100 Kentucky energy leaders in a discussion about Kentucky's new comprehensive energy plan, *Intelligent Energy Choices for Kentucky's Future*, and energy public policy for the South.

DEDI helped sponsor the Midwest Regional ENERGY STAR Conference where more than 300 architects, builders, realtors, appraisers, HVAC contractors, insulation and other energy-efficient product vendors learned about energy-efficient homes and green building programs.

April – Governor Beshear announced a partnership with the University of Kentucky, University of Louisville, and Argonne National Laboratory to establish a National Battery Manufacturing Research and Development Center in Kentucky.

DEDI recognized 17 buildings and three businesses in Kentucky for their energy efficiency accomplishments. Schools and commercial buildings were recognized on Earth Day for receiving the ENERGY STAR.

ENERGY STAR Commercial Buildings and Homes

In 2009 Kentucky saw strong gains in the number of ENERGY STAR commercial buildings and homes. As of December 87 commercial buildings in Kentucky had received the ENERGY STAR with 47 of those buildings being K-12 schools. This represents a 160 percent gain for the year. The number of ENERGY STAR new homes built in Kentucky during the year increased by 1,098 homes for a total of 5,417 new energy efficient homes.

To earn the ENERGY STAR, a home must meet strict guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes are at least 15 percent more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30 percent more efficient than standard homes.

To earn the ENERGY STAR, the energy performance of a commercial building is scored on a 1-100 scale and those facilities that score a 75 or better are eligible for the ENERGY STAR, indicating that the building is among the top 25 percent of similar facilities in the country for energy performance.

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping to protect the environment through superior energy efficiency.



This ENERGY STAR/ Green Build Kentucky Certified Home is located in Independence, KY.

DEDI Activities

DEDI received a \$52.5 million ARRA grant award for the State Energy Program.

DEDI hosted the Kentucky Smart Grid Working Group consisting of E.ON US, Duke Energy, KY Power, East Kentucky Power Company, Big Rivers Electric Corp., Tennessee Valley Authority, Kentucky Public Service Commission, and Pacific Northwest National Lab, to facilitate a discussion of the development of the electric transmission and distribution system in Kentucky into a smart-grid.

May – DEDI, the University of Kentucky Cooperative Extension Service and the Kentucky Community and Technical College System (KCTCS) completed a 40-hour training program for residential building energy efficiency technology in Kentucky.

DEDI hosted Kentucky's first Energy Crop mini-Summit to develop an organized strategy for communicating and implementing the biomass and biofuels components of the Governor's energy plan.

Governor Beshear, Sec. Len Peters, Rep. Rocky Adkins, and Rep. Tanya Pullin along with Midwest Biofuels helped launch a new energy crop (miscanthus grass) in South Shore, Kentucky.

DEDI, the City of Frankfort and the Kentucky Solar Partnership of Appalachia - Science in the Public Interest completed the installation of two solar water heaters with monitoring equipment at two city fire stations.



Both Vice Admiral John Grossenbacher, Director of Idaho National Laboratory (above) and Dan Arvizu, Director of National Renewable Energy Laboratory spoke at the Governor's Conference on energy issues.



Governor's Energy and Environment Conference

Beginning in January 2009, DEDI began meeting to develop a comprehensive agenda for the 33rd Governor's Conference on Energy and the Environment. With guidance from Secretary Peters, the planning committee decided the conference must highlight the Governor's energy initiatives and bring about an open discussion on the future of Kentucky's energy needs.

The conference, "Empowering Our Future," focused on energy and was held September 30 through October 1 in Lexington, Kentucky. With a full agenda, the conference drew more than 500 people and more than 40 vendors to the Lexington Convention Center. Additionally, 26 students, teachers, and representatives from the non-profit sector were awarded scholarships. The sharing of information and frank discussions about our energy future were prime results of this highly successful conference.

The conference was memorably kicked off with Governor Beshear's discussion of Kentucky's energy plan, *Intelligent Energy Choices for Kentucky's Future*, and his assessment of Kentucky's energy challenges and opportunities.

Energy and environmental leaders from Kentucky and around the nation were invited to initiate open and candid discussions on topics related to Kentucky's seven energy strategies, including renewable energy, nuclear energy, carbon management, biofuels and biomass, coal to liquids and synthetic and natural gas, and energy efficiency and conservation.

A highlight of these discussions was the cogent evaluation of nuclear energy by Vice Admiral John Grossenbacher (ret.), director of the Idaho National Laboratory. The Vice Admiral presented the risks and benefits of nuclear energy, recognizing that it is an excellent baseload power source and will almost inevitably be a major solution to carbon mitigation and low-cost power generation amortized over time, in spite of its very large upfront costs.

In the afternoon breakout sessions attendees were able to further discuss the risks and benefits with other principals in the nuclear sector, which was one of multiple breakouts on topics specific to Kentucky's energy sector.

DEDI Activities

June – DEDI sponsored NEED’s Energy Conference for Educators that supports teachers to tour Kentucky energy sites and learn about opportunities that will allow them to connect energy education with the classroom.

DEDI awarded the University of Kentucky Cooperative Extension Service a \$100,000 grant to support an ENERGY STAR circuit rider to promote energy efficiency at public events.

July – DEDI awarded five new commercialization grants to support research projects on coal, biofuels and other alternative fuels.

August – DEDI awarded eight new grants to support public education on coal issues in accordance with KRS 132.020(5).

DEDI, along with the University of Kentucky Center for Applied Energy Research, hosted the first Ohio Valley Algae Symposium in Henderson, Kentucky. Approximately 90 business leaders, researchers, government representatives and citizens attended to learn about algae opportunities for biofuels and carbon sequestration.

DEDI received a \$591,715 ARRA award for Enhancing State Government Energy Assurance Capabilities and Planning for Smart Grid Resiliency .

DEDI received a \$4.09 million ARRA award for the Kentucky Energy Efficient Appliance Rebate Program.

September – Governor Beshear appointed an Executive Task Force on Biomass and Biofuels to validate Kentucky’s biomass production capabilities within a sustainable environment.

UK and DEDI’s ENERGY STAR display at the Kentucky State Fair.



Battery Manufacturing Research and Development Center

In April 2009, Governor Beshear announced a partnership with the University of Kentucky, University of Louisville, and Argonne National Laboratory to establish a National Battery Manufacturing Research and Development Center in Kentucky. The center will help develop and deploy a domestic supply of advanced battery technologies for vehicle applications that will aid in securing U.S. energy independence, reduce greenhouse gas emissions and help strengthen the economy. The creation of the battery research and development center aligns with the Governor’s energy strategy and supports Kentucky’s aim to become a national energy leader. The Energy and Environment Cabinet and DEDI, along with the Economic Development Cabinet, played an important role in negotiating this partnership and bringing the research and development center to Kentucky.

Argonne, a U.S. Department of Energy National Energy Laboratory, will commit scientists and engineers to the battery research center in order to perform activities such as evaluating battery components, conducting research to scale-up production of advanced materials, develop recycling technologies for battery materials, and expand testing capabilities to support U.S. battery manufacturing. These advanced batteries will play a significant role in our future energy and economic security.

The initial focus of the center is the manufacturing research and development of lithium-ion batteries. However, the long-term goal of the center would help in the development of technologies that would enable a significant increase in energy densities, including lithium-air and zinc-air systems for vehicle applications and advanced batteries for cost-efficient and long-life grid power storage applications.

Additionally, by having the battery research center located in Kentucky, both the University of Kentucky and the University of Louisville will gain additional experience from working with a national laboratory.

DEDI Activities

Twenty-five states rely on coal for more than 50 percent of their electricity generation (28 states, more than 45 percent; ten states rely on coal for more than 70 percent of their electricity). Kentucky and four other states rely on coal for more than 90 percent of their electricity generation.

Electricity Generation from Coal by State

State	Coal Generation	Rank
West Virginia	97.8%	1
Wyoming	94.5%	2
Indiana	94.0%	3
North Dakota	93.4%	4
Kentucky	93.1%	5
Ohio	85.8%	6
Missouri	82.4%	7
Utah	81.9%	8
New Mexico	76.7%	9
Iowa	76.3%	10
Kansas	72.3%	11
Colorado	66.7%	12
Delaware	65.9%	13
Montana	63.4%	14
Tennessee	63.3%	15
Wisconsin	63.1%	16
Georgia	62.2%	17
North Carolina	61.5%	18
Nebraska	60.5%	19
Michigan	59.4%	20
Maryland	59.2%	21
Minnesota	59.1%	22
Pennsylvania	54.3%	23
Alabama	54.2%	24
Illinois	47.6%	25
Oklahoma	47.3%	26
Arkansas	47.2%	27
Virginia	45.2%	28
South Dakota	43.3%	29
South Carolina	40.2%	30

Source: Energy Information Administration, State Electricity Generation by Source, 2008



DEDI, KPPC, NEED and the KY School Plant Management Association train superintendents, facility managers, teachers and financial offices on energy management in Georgetown, KY.

Governor Beshear addressed the 33rd Annual Governor's Conference on Energy and the Environment. The conference, "Empowering Our Future," focused on energy and drew more than 500 people and more than 40 vendors to the Lexington Convention Center.

DEDI received a \$10.4 million ARRA award for the Energy Efficiency Conservation Block Grant.

DEDI along with KPPC, NEED and KY School Plant Management Association hosted another set of Energy Management Workshops in Western Kentucky.

DEDI awarded the Kentucky Finance and Administration Cabinet (FAC) a \$1.1 million ARRA grant for high performance state government building staffing that will enable FAC to enhance their energy savings performance contract management capacity.

October – DEDI awarded the Kentucky Environmental Education Council a \$214,800 ARRA grant for the Kentucky Green and Healthy Schools (GHS) Program that works to improve the knowledge base about energy and related environmental topics for students, teachers and administrators in all Kentucky schools.

DEDI helped sponsor the Bluegrass Green Expo held in Lexington, Kentucky.

DEDI awarded the Kentucky National Energy Education Development Project a \$1.0 million ARRA grant to expand its existing K-12 energy education program in Kentucky.

DEDI Activities

DEDI awarded the Governor's Office of Agricultural Policy (GOAP) a \$1.0 million ARRA grant for an On-Farm Energy Efficiency and Production Program that will increase energy efficiency and opportunities for renewable energy improvements at Kentucky's farms and farming communities.

DEDI awarded Kentucky Department for Housing, Buildings and Construction a \$1.19 million ARRA grant to inspect residential housing and commercial properties for compliance with energy efficiency standards set by the HBC Board through the adoption of the 2009 International Energy Conservation Code (IECC).

DEDI awarded the Kentucky Department for Housing, Buildings and Construction (KDHBC) a \$457,153 ARRA grant for education and training to local and state code enforcement officials responsible for residential and commercial building energy codes.

November – First Lady Jane Beshear presented ENERGY STAR certificates to Southern Elementary, Eastern Elementary, and Royal Spring Middle schools in Scott County.

DEDI and the University of Kentucky sponsored "Coal in Kentucky", the first forum on coal hosted by the University of Kentucky. Multiple speakers from various points of view engaged a crowd of 200 people or more at the day-long conference.

DEDI hosted the first meeting of the Center for Renewable Energy Research and Environmental Stewardship Board as required by KRS 152.713.



Representatives from Anderson County School District receive Governor Beshear's ENERGY STAR recognition from Sec Peters.



Governor Beshear announces the ARRA Kentucky On-Farm Energy Efficiency and Production program on Kentucky Farmer of the Year Doug Langley's Shelby County farm.

DEDI received a \$350,000 ARRA award for the U.S. Department of Energy Save Energy Now grant.

DEDI awarded Kentucky Department of Local Government a \$6.6 million ARRA grant for a competitive Energy Efficiency and Conservation Block Grant (EECBG) program for Kentucky's smaller cities and counties.

DEDI awarded the Finance and Administration Cabinet (FAC) a \$3.4 million ARRA grant for energy management software and controls in state buildings.

DEDI awarded Finance and Administration Cabinet a \$14.17 million ARRA grant for the "Green Bank" of Kentucky to support the establishment of a state agency revolving loan fund that will finance energy efficiency upgrades in government buildings.

December - The Governor's Executive Task Force on Biomass and Biofuels finalized its report and delivered its recommendations to the Governor.

DEDI awarded KPPC, University of Louisville, a \$4.7 million ARRA grant for the Kentucky Energy Efficiency Program for Kentucky Schools (KEEPS).

DEDI awarded the Governor's Office of Agricultural Policy (GOAP) a \$1.0 million ARRA grant for a multi-county collaborative agricultural energy initiatives program.

Governor Beshear's Executive Task Force on Biomass and Biofuels

Governor Beshear's energy plan, *Intelligent Energy Choices for Kentucky's Future*, calls for 12 percent of Kentucky's motor fuels demand to be provided by biofuels by 2025. Additionally, the plan establishes the goal that Kentucky's renewable energy generation will triple by 2025 while continuing to produce safe, abundant and affordable food, feed and fiber. To help achieve these targets, Governor Beshear announced the creation of an Executive Task Force on Biomass and Biofuels Development in early September. The purpose of the task force is to validate Kentucky's biomass production capabilities within a sustainable environment; evaluate the status of energy crop and forestry biotechnology and genetics, and recommend a plan of action; validate Kentucky's potential biomass demand; evaluate transportation, logistics, and available business structures in Kentucky; facilitate economic impact analysis; and recommend legislative action to support the development of this industry. The task force is supported by the Kentucky Division of Biofuels, Kentucky Division of Forestry, both within the Energy and Environment Cabinet, and by the the Governor's Office of Agricultural Policy.

Dr. Len Peters, Secretary of the Energy and Environment Cabinet, and Roger Thomas, Executive Director of the Governor's Office of Agriculture Policy serve as co-chairs on the task force. Other members of the task force include Larry Hayes, Secretary of Economic Development Cabinet; Sen. David Givens; Sen. Joey Pendleton; Sen. Kenneth Winters; Rep. Dwight Butler; Rep. Thomas Mckee; Rep. Tanya Pullin; Richie Farmer, Commissioner of Agriculture; and other leaders from the agriculture and academic communities.

Members of the Governor's Biomass Task Force listen to testimony on the final report.



Governor Beshear, Secretary Len Peters, state Rep. Tanya Pullin and state Rep. Rocky Adkins aboard a burley tobacco setter planted miscanthus seedlings at a dedication ceremony for a new energy crop.

The task force concluded if improvements in productivity were realized that Kentucky could produce 25 millions tons of biomass per year in a sustainable manner by 2025. A bioenergy industry would have significant impacts on Kentucky's economy, especially in rural areas. It is estimated that biomass production and processing can generate up to \$3.4 billion of net output annually along with 10,000 jobs, many of which will be concentrated within rural communities statewide.

The Task Force identified that the development of a biomass-based biofuels industry would require approximately 10 million tons of biomass to produce 700 million gallons of renewable biofuels and Kentucky could use an additional 15 million tons of biomass for co-firing to meet a 12 percent federally mandated renewable portfolio standard.

The Task Force finished its work in early December and presented the following recommendations to the Governor in their final report.

- The Division of Biofuels within the Energy and Environment Cabinet serve as a single agency point to coordinate and facilitate biomass and biofuels development statewide.

Governor Beshear's Executive Task Force on Biomass and Biofuels



Biomass pellets made up of miscanthus and sawdust are about the size of a soup can and can be co-fired with coal in electric power plants to help reduce emissions.

- A Kentucky-specific Renewable and Efficiency Portfolio Standard be mandated which will provide significant opportunities for biomass and job development in Kentucky.
- The Division of Biofuels publish analyses and summary findings identifying current biomass development and technology within the Commonwealth, along with demand projected from developing technologies and mandates.
- The Board of Directors of the Kentucky Center for Agriculture and Rural Development (KCARD) realign its objectives to include the education of producers and forest owners on the benefits and availability of closed cooperative business structures for value-added processing, and that KCARD serve as facilitator in the implementation of this business structure for biomass development.
- The Division of Biofuels in collaboration with stakeholder groups facilitate development of a Kentucky Standard for Biomass Sustainability.
- The Governor's Office of Agricultural Policy and the Energy and Environment Cabinet assess public opinion of funding mechanisms that foster the development of biomass production and that stimulate the development of a biomass-based liquid fuel and power industry.

Power Generation Capacity and Capacity Factor

Capacity represents the amount of power a facility such as a coal-fired power plant can produce under peak conditions. For example a 1000 MW coal-fired power plant will produce 1000 MW of electricity at its maximum heat input. Similarly, a 1000 MW wind farm is capable of producing 1000 MW electricity so long as the wind is blowing at rated speeds. However, any power plant must be shut down for both scheduled and unscheduled repairs and the wind does not consistently blow at or above the speed that a wind turbine requires for maximum generation. Therefore, it is important to understand capacity factors, the ratio of the actual amount of electrical energy produced over a period of time and its output if it had operated at full capacity, and how they influence generation. Electrical energy (expressed by kilowatt—hours or megawatt-hours) is what powers our homes and businesses and capacity factors influence how much electricity is generated.

Capacity factors vary widely. For example a coal-fired power plant that is used to meet base load electricity demands can operate at 90 percent whereas the capacity factor of a wind farm is approximately 30 percent (east of the Mississippi). Understanding how a capacity factor influences generation is simple. A 1000 MW coal-fired power plant, if operated 24 hours a day for 30 days, will generate 720,000 megawatt-hours of electricity. However, based on a 90 percent capacity factor the plant will actually generate 648,000 megawatt-hours of electricity. A 1000 MW wind farm, if operated at rated wind speeds consistently for 24 hours a day for 30 days, would generate the same amount of electricity—720,000 megawatt-hours. However when you apply a capacity factor of 30 percent the actual electricity output is 216,000 megawatt-hours.

Understanding capacity factors is crucial to properly comparing sources of electricity and to determining how much capacity must be built to meet electricity demands. To achieve an equivalent 648,000 megawatt-hours of electricity generated by a coal-fired power plant, using wind with a 30 percent capacity factor, you would need to install an additional 2,000 MW of capacity or 1,000 additional 2 MW wind turbines.

In early 2009, President Barack Obama signed the American Recovery and Reinvestment Act of 2009 (ARRA) to stimulate the nation's economy. Congress appropriated \$787 billion for ARRA and Kentucky is projected to receive \$3 billion of ARRA funding, of this total approximately \$68 million is specifically designated for energy efficiency and renewable energy projects. The department has oversight and coordination responsibilities for five ARRA-funded grant programs with approximately 22 individual projects (including program management). ARRA funds provide Kentucky with the unique opportunity to jump start Strategy 1 (efficiency) and make significant progress toward reducing Kentucky's energy demand through efficiency and conservation.

Under the ARRA State Energy Program Kentucky received \$52,533,000. To qualify for these funds the DEDI recommended programs that will reduce energy use, create jobs, increase the generation of renewable energy and reduce carbon emissions. These programs have created partnerships with the Finance and Administration Cabinet, the Cabinet for Economic Development, the Kentucky Pollution Prevention Center at the University of Louisville, the Kentucky Environmental Education Council, the Kentucky National Energy Education Development program, the Governor's Office of Agricultural Policy, Kentucky Housing Corporation, the Department for Housing, Buildings and Construction, and the Kentucky Department for Local Government. These resources will touch all economic sectors within Kentucky helping to use our energy resources in a more efficient and effective manner. The programs supported with ARRA State Energy Program funds are highlighted on the next few pages.

KENTUCKY



AT WORK

- The Kentucky Energy Efficiency Program for Schools (KEEPS) program will expand to help Kentucky school districts reduce energy consumption and facility expenses through training and improved operational procedures. The program is administered by the Kentucky Pollution Prevention Center (KPPC), University of Louisville, which is expanding its capacity to support all of Kentucky's 174 school districts.
- Kentucky Energy Efficiency Program for Schools (KEEPS) Energy Managers initiative will support the expansion of KEEPS by providing support for energy managers at the school district level. The initiative will help KPPC promote and achieve KEEPS goals and objectives.



Alvaton Elementary School, Alvaton, KY, ENERGY STAR labeled.

American Recovery and Reinvestment Act of 2009



Glenn Marshall Elementary School, Richmond, Kentucky was recognized for joining the KY Green & Healthy Schools program and working on projects in the Green Spaces, Energy and Instructional Leadership categories .

- The Kentucky Green and Healthy Schools (GHS) Program improves the knowledge base about energy and related environmental topics for students, teachers and administrators in all Kentucky schools and is sponsored by the Kentucky Environmental Education Council (KEEC), Kentucky Education and Workforce Development Cabinet. ARRA funds will help KEEC expand its capacity to deliver GHS program across the commonwealth.
- Kentucky National Energy Education Development (NEED) Project will expand its coverage of objective, grade-appropriate information about conventional and emerging energy sources—their use and impact on the environment, economy, and society. NEED will hire regional coordinators, purchase additional classroom energy kits and secure NEED training materials to support Kentucky’s school districts.
- Green Bank of Kentucky will support the establishment of a state agency revolving loan fund that will finance energy efficiency upgrades in government buildings. The Green Bank will be administered by the Kentucky Finance and Administration Cabinet (FAC) and will allow public agencies to compete for low- or no-interest loans for worthy energy efficiency projects.
- Energy Management Software and Controls for State Buildings will aid in purchasing energy management software and controls. This will permit state agencies to take a critically important step toward reducing energy use by giving state facility managers an enhanced capability to monitor and manage their buildings.
- High Performance State Government Building Staffing initiative will enable Finance and Administration Cabinet to hire staff that will provide enhanced performance contract management and technical services and will allow the commonwealth to greatly expand its efforts to reduce energy consumption by its facilities.



The Green Bank of Kentucky will help the state improve the energy efficiency of its buildings.

American Recovery and Reinvestment Act of 2009

- Kentucky Farm Energy Efficiency and Renewable Energy Partnership will support the Governor's Office of Agricultural Policy to implement an On-Farm Energy Efficiency and Production Program that will increase energy efficiency and opportunities for renewable energy improvements on Kentucky's farms and in farming communities. Funding will supplement tobacco settlement funds to provide grants to farmers for energy assessments and on-farm energy efficiency and renewable energy improvements.
- Kentucky Home Performance with ENERGY STAR (HPwES) will produce an economically sustainable model for stimulating the residential home improvement market to make whole-house energy efficiency and renewable energy improvements. Working with Kentucky Housing Corporation (KHC), a comprehensive program will serve to launch a statewide approach to HPwES with coordinated marketing, training, and quality assurance.
- Industrial/Commercial Sustainability Program, whose program is modeled after the U.S. Department of Energy's Industrial Assessment Centers (IAC), will increase funding for KPPC, University of Louisville, to perform energy analyses at industrial, commercial and institutional firms or organizations. The program will also conduct energy efficiency workshops for target groups.
- Industrial Facility Retrofit Showcase is a new program that will support energy efficiency and renewable energy grants to industries locating or expanding operations in Kentucky that create or retain "green jobs," save energy and reduce carbon emissions. Administrative support for the program will be provided by the Kentucky Cabinet for Economic Development (CED).
- Utility Smart Grid Initiative is a project that supports the integration of "smart grid" strategies and technologies into Kentucky's electric utility infrastructure. The goal of the grant program is to encourage electric utilities to accelerate the modernization of energy delivery in Kentucky with the potential to result in significant energy and cost savings for Kentucky ratepayers.
- Commercial Office Building Retrofit Showcase will provide funding will for the purchase and installation of commercially available energy efficiency or renewable energy equipment and materials for the retrofit of a state government building to deliver a state-of-the-art Advanced Battery Strategic Planning facility. The facility will serve as a commercial building model with respect to energy efficiency and renewable energy for Kentucky as well as the nation.



Toyota Manufacturing plants in Georgetown, Kentucky are ENERGY STAR labeled.

American Recovery and Reinvestment Act of 2009

The department was awarded \$10,427,000 from the Energy Efficiency and Conservation Block Grant (EECBG) program and is partnering with the Department for Local Government (DLG). DLG will receive approximately 60 percent of the funds to competitively award among Kentucky's smaller cities and counties. Remaining funds from the block grant will support two other initiatives, Kentucky Net-Zero Energy Schools and state building codes training. The Kentucky Net-Zero Energy Schools initiative will provide partial match for one or more schools to fund solar photovoltaic systems sufficient to bring the school to net-zero or near-net-zero energy use. The Kentucky Department for Housing, Buildings and Construction (KDHBC) will provide education and training to local and state code enforcement officials responsible for residential and commercial building energy codes. Additionally KDHBC will work on updating Kentucky building codes and providing for 90 percent compliance with those codes within eight years.

The department received grant funding to develop an Energy Efficient Appliance Rebate Program. The total grant award was over \$4 million and these ARRA funds will support a program that offers rebates to Kentucky residential consumers who buy eligible ENERGY STAR appliances. DEDI is finalizing the program with US DOE and will be launched early in 2010.



DEDI is encouraging all Kentuckians to recycle their old appliances as they take advantage of the Kentucky Appliance Rebate Program.



Caywood Elementary, Crestview Hills, KY, ENERGY STAR labeled.

Through a partnership with KPPC at the University of Louisville, the department received \$349,000 in ARRA funding to launch Kentucky Save Energy Now (KY SEN), an industrial energy efficiency program, to assist industrial facilities in Kentucky to obtain, achieve, and sustain an annual reduction in energy intensity. This grant will help businesses, industries and other organizations develop environmentally sustainable, cost-saving solutions for improved efficiency.

Enhancing State Government Energy Assurance Capabilities and Planning for Smart Grid Resiliency is another grant being awarded to Kentucky and the department. The purpose of the \$591,000 ARRA grant is to strengthen and enhance state and local government energy assurance planning and energy system resiliency by building upon existing energy assurance plans. It will also assist by incorporating Smart Grid applications that will allow Kentucky to better prepare and respond to energy disruptions.

These programs will gain momentum and achieve results that will save energy, create jobs and reduce greenhouse gas emissions in the coming year.

Public Education on Coal Issues

Public Education on Coal Issues

Kentucky Revised Statute 132.020(5) authorizes funding to the Energy and Environment Cabinet from the un-mined minerals tax collected each year for the purposes 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 for the purpose of public education on coal related issues. In 2009, the Coal Education Grants program was fully subscribed by receiving 14 well crafted proposals requesting more than \$1.9 million. An overwhelming demand for grant dollars balanced against a limited availability of funding required the department to make hard decisions regarding which projects could be supported.

The department selected eight projects for 2009, which are highlighted in the table below.

Awardees	Amount	Project Description	Start Date	End Date
Coal Education Development and Resource (CEDAR West) , Inc.	\$50,000	This program will provide facts, figures, classroom speakers and mine tours for participating schools. In addition, teachers participating in the grant program will have access to <i>Intelligent Energy Choice for Kentucky's Future</i> through classroom speakers, visits, and tours. Teachers, students and parents will be advised and informed on how Kentucky's energy resources are responsibly managed through the state and federal permitting and reclamation laws.	8/15/2009	6/30/2010
East Kentucky PRIDE	\$100,00	East Kentucky PRIDE will work with the Kentucky Science Teachers Association to promote the curriculum of coal education within the schools. The curriculum will also include the seven strategies of Kentucky's new energy plan, <i>Intelligent Energy Choices for Kentucky's Future</i> . Components of the curriculum will include student materials, informational sheets, a PowerPoint presentation, an informational documentary video that will be useful in other outlets as well, field trips coordinated with coal companies, and guest lecturers. Evaluations will take place at the end of the year.	8/15/2009	6/30/2010

Public Education on Coal Issues

Awardees	Amount	Project Description	Start Date	End Date
University of Kentucky, Kentucky Geological Survey	\$87,047	Web Based Coal Industry Maps of Kentucky will develop up-to-date maps of Kentucky coal resources and mining operations in a web format for future updating and distribution.	8/1/2009	6/30/2010
University of Kentucky Visualization Center	\$145,171 (matched with \$41,538)	UK will provide a one hour HD documentary, along with a companion website and nine short videos on the impact coal has on Kentucky's past, present and future.	8/1/2009	6/30/2010
Kentucky Foundation, Inc.	\$5,000	Provide graphics for next edition of Kentucky Coal Facts pamphlet.	9/30/2009	6/30/2010
National Energy Education Development (NEED)	\$50,000	NEED will provide energy education curriculum, training programs, and state programming strategies for K-12 public education of coal-related issues.	8/15/2009	6/30/2010
Coal Education Development and Resource (CEDAR), Inc.	\$50,000	CEDAR, INC. will update their coal education program in eastern Kentucky to include coal education materials, stipends and materials for teachers, as well as workshops and field trips to CEDAR's annual Coal Fair where 3,000 to 4,000 students participate each year. CEDAR, Inc., will also distribute a copy of Kentucky's new energy plan, <i>Intelligent Energy Choices for Kentucky's Future</i> , to all students and teachers, and emphasize strategies which concern new technologies for cleaner coal.	8/15/2009	6/30/2010

Public Education on Coal Issues

Awardees	Amount	Project Description	Start Date	End Date
Bluegrass PRIDE	\$50,000	Bluegrass PRIDE will build upon last year's program to teach educators and students in Central Kentucky about coal energy and various alternatives. This program will have three stages. First, PRIDE will provide professional development opportunities for 15 teachers in its 18-county service area. Second, PRIDE will help those teachers use hands-on activities to teach about energy conservation, origination, and alternatives. Finally, PRIDE will organize field trips for teachers and students focused on coal and energy in Kentucky.	8/15/2009	6/30/2010



CEDAR representatives conducting coal tours in eastern Kentucky.



The coal exhibit at the Mountain Arts Center in Prestonsburg, Kentucky



Teachers visited a coal scoop on the annual energy tour sponsored by NEED.

Energy Commercialization and Research Grants

Energy Commercialization and Research Grants

Under the enacted biennial budget, DEDI is appropriated funding 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. In 2009, DEDI received 43 proposals requesting more than \$23.6 million. Five new projects were selected to receive funding and several projects begun in 2008 were funded through 2009-10. The supported projects are explained in the table below.

Awardees	Amount	Project Description	Start Date	End Date
Smith Management Group	\$10,000	Site Bank III, Extension. Evaluate the Paducah Gaseous Diffusion Facility and adjacent property as a potential site for future energy development projects under the Site Bank criteria.	7/1/2009	12/31/2009
EnviRes	\$650,000 (matched with \$850,000)	HyMelt Plant in South Shore. Commercialize the trademarked HyMelt gasification technology which utilizes molten iron as a reaction medium. The goal is to develop a commercial HyMelt facility to be constructed in Kentucky within the next three years.	10/1/2009	6/30/2010
Paducah Uranium Plant Asset Utilization Task Force	\$215,501	Global Nuclear Energy Partnership. Develop and support the Paducah Uranium Plant for possible new missions including interim storage and battery and fuel rod projects based on the DOE Energy Park Initiative.	2/23/2007	1/31/2010
University of Kentucky College of Engineering	\$81,236	Separation and Recovery of High-Value Pentose Derivatives. Develop advanced ceramic materials suitable for the selective separation and recovery of desired pentose saccharides from pretreated cellulosic biomass. This work will facilitate the development of integrated biorefineries to generate a range of commercially valuable chemical products.	7/1/2008	6/30/2010

Energy Commercialization and Research Grants

Awardees	Amount	Project Description	Start Date	End Date
Cash Creek Generation	\$200,000	Siting Board Application for Coal-to-Gas Plant in Western Kentucky. The Cash Creek Project is a state-of-the-art coal gasification to natural gas facility. The facility will be Kentucky's first "Energy Farm," capable of producing multiple forms of energy products. The project is expected to begin construction in 2010 and will involve an investment of more than \$2.0 billion, provide 1,500 construction jobs, and create 250 permanent operations and maintenance positions.	7/1/2009	6/30/2010
Western Kentucky University	\$225,000	Coal-based Chemical Looping Combustion Process. Develop this novel process that utilizes oxygen carriers to indirectly combust fossil fuel with simultaneous production of high-concentration CO2 without energy penalty and with enhanced combustion efficiency.	7/1/2009	6/30/2010
ADICA Consulting	\$200,000	Electric Power Modeling and Systems Planning and Analysis. Purchase, learn, and employ proprietary economic models for evaluating power generation, distribution, and costs under various economic scenarios in a low-carbon future world.	7/1/2009	6/30/2010
Center for Climate Strategies	\$200,000 (matched with \$20,000)	Kentucky Climate Action Plan. Building on Kentucky's Seven Point Strategy for Energy Independence the Climate Action Plan will identify opportunities for Kentucky to respond to the challenge of global climate change while becoming more energy efficient, more energy independent, and spurring economic growth.	7/1/2009	6/30/2010
Icon Construction	\$100,000 (matched with \$100,000)	Coal Synthetics – Coal to Fertilizer Plant in Western Kentucky (Year 2). Develop a gasification facility that will utilize two million tons annually of Western Kentucky coal to produce ammonia and urea for domestic fertilizers. Additionally, excess hydrogen from the process may be sold for industrial applications or alternative transportation fuel.	7/1/2009	6/30/2010

Energy Commercialization and Research Grants

Awardees	Amount	Project Description	Start Date	End Date
Western Kentucky University	\$96,079 (matched with \$648,355)	Mercury Re-emission Demonstration (Year 2). Study the effects of gas composition, various differential configurations and operating conditions, as well as various additives for Hg ²⁺ capture and Hg ⁰ re-emission in coal-fired utility flue gas. The mercury mass balance will be analyzed across the Flue Gas Desulfurization system.	10/1/2008	6/30/2010
University of Kentucky Center for Applied Energy Research	\$895,750 (matched with \$453,158)	Algae Study (Year 2). Evaluate and develop processes for growth and propagation of algae strains as scrubbers of CO ₂ from flue gas and as sources of alternative liquid fuel.	9/16/2008	6/30/2010
University of Kentucky Center for Applied Energy Research	\$100,000	CAER Regional Representatives. CAER representatives in eastern and western Kentucky communicate energy research developments, support local and regional initiatives, and propose new research ideas derived from local and regional	7/1/2009	6/30/2010
University of Kentucky Center for Applied Energy Research	\$165,735 (matched with \$1,325,875)	Strategic Liquid Transportation Fuels Derived from Coal. Advance the design and construction of a Coal/Biomass-to-Liquids Process Development Unit (PDU) at the CAER. The PDU will focus research on: Coal and Biomass Gasification, Gas Cleanup/Conditioning, Gas Conversion by FT Synthesis, and other pertinent issues.	7/1/2009	6/30/2010
University of Kentucky Center for Applied Energy Research	\$114,248 (matched with \$913,985)	Coal Derived Low Energy Materials for Sustainable Construction. Create a center to support the development of new products and industries that manufacture materials from coal combustion by-products.	7/1/2009	6/30/2010
University of Kentucky Center for Applied Energy Research	\$1,000,000 (matched with \$1,000,000)	Carbon Management Research Group (Year 2). The consortium of utility companies and DEDI that funds and oversees the research and development of CO ₂ capture processes at CAER. The goal of research and development is to commercialize a process with high CO ₂ capture efficiency, low capital and operating cost, and low energy penalty. Research and development findings are directly applicable to Kentucky utility plants.	3/1/2009	6/30/2009

DEDI Partnerships

To better coordinate energy initiatives among interested stakeholders, DEDI works to build partnerships across Kentucky and the nation. These partnerships help to leverage scarce resources and pool intellectual capacity to achieve results. Two such DEDI partnerships that are having success are with the UK Center of Allied Energy Research (CAER) and the Kentucky Geological Survey (KGS). This partnership is helping to develop solutions for carbon capture and storage for Kentucky's electric power plants.

DEDI is supporting a project with CAER that seeks to investigate and demonstrate the potential of using waste CO₂ and heat from coal-fired power plants to cultivate algae. CAER researchers are using algae to mitigate CO₂ emissions from coal-fired power plants and determining an economically favorable strategy for the production of biofuels or bioproducts. More information about the project can be found at <http://www.caer.uky.edu/greenhouse/home.shtml>.



A photobioreactor after inoculation with algae seed culture.



A view of the Hancock County site where carbon dioxide was injected into the deep test well in August 2009.

DEDI is also partnering with the KGS and its industry partners to test the technical feasibility of sequestering carbon dioxide in deep underground rock formations in western Kentucky.

In 2009 the partnership successfully completed the injection of carbon dioxide (CO₂) into an 8,126-foot deep well at a test site in Hancock County, Kentucky. A total of 323 tons of CO₂ were injected into the well.

The ability of these deep rock formations to accept and permanently store CO₂ is an essential element of carbon capture and storage. This project was mandated by House Bill 1 in the 2007 special session of the Kentucky General Assembly. More information about the well can be found at <http://www.uky.edu/KGS/kyccs/>.



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