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PUBLIC SERVICE
COMMISSION

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

IN RE THE MATTER OF:

JOINT APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CONSTRUCTION OF TRANSMISSION FACILITIES IN JEFFERSON, BULLITT, MEADE, AND HARDIN COUNTIES, KENTUCKY	)	CASE NO. 2005-00142

* * * * * *

INTERVENERS DENNIS AND CATHY CUNNINGHAM
DIRECT TESTIMONY OF GEOFFREY YOUNG
AND
MOTION FOR EXTENSION OF TIME WITHIN WHICH TO FILE DIRECT TESTIMONY

* * * * * *

Come the Interveners Dennis Cunningham and Cathy Cunningham, ("Cunningham"), by and through counsel, and file the Direct Testimony of Geoffrey Young as per the scheduling order in this action, and MOVE THE PUBLIC SERVICE COMMISSION FOR AN EXTENSION OF TIME within which to file additional Direct Testimony, as follows:

1. The Public Service Commission ("PSC") order setting the schedule for this application directed that Parties shall file direct testimony, if any, no later than July 15, 2005.

2. The Applicants, Louisville Gas and Electric Company and Kentucky Utilities Company ("LG&E/KU") filed

direct testimony with the application, and Cunninghams are on this date filing direct testimony of one witness.

3. LG&E/KU filed responses to the Cunningham Data Request and the PSC Staff Data Request. Cunninghams have determined that the responses by LG&E/KU appear to be either incomplete or misleading. Specifically, Cunninghams sought to require LG&E/KU identify all applications to and all federal action taken or to be taken on such applications. See Question #5, #6, #8, and #10. Cunninghams sought copies of all such applications and all supporting studies that were part of such applications. See Question #1, #2, and #9. None were produced. Subsequently, Cunninghams have received information and believe LG&E/KU has an application for a federal permit pending and as part of that application, has submitted materials to the Kentucky State Historic Preservation Officer (KY SHPO).

4. LG&E/KU concedes that they are currently in "ongoing discussions" with the Department of Defense regarding the crossing of Fort Knox Military Reservation, and provided a February 15, 2005, March 15, 2005, and March 15, 2005 letters from LG&E/KU to Fort Knox, but failed to provide any communication from the Department of Defense in

reply and failed to provide any environmental studies that are required by NEPA that must proceed federal action.

5. LG&E/KU may provide additional Direct Testimony today, as per the scheduling order. However, this motion is made whether or not additional Direct Testimony is received today.

6. Cunnighams sought to retain additional engineering and scientific review of the LG&E/KU application, but two of the engineers approached were required to decline because they had a conflict based upon other clients.

7. Cunninghams have not had sufficient time to complete their Direct Testimony by July 15, 2005. This application clearly matters to the public as witnessed by the large outpouring of public opposition in Elizabethtown, Kentucky at the July 12, 2005 Local Public Hearing. On a case with this degree of public opposition, these Interveners should be given sufficient time to prepare their case. They will not be able to complete such preparation unless they are given additional time to submit direct testimony.

8. Based upon the foregoing, Interveners Dennis Cunningham and Cathy Cunningham move the PCS to allow them until July 22, 2005 within which to file their Direct Testimony.

WHEREFORE, the Interveners, Dennis Cunningham and Cathy Cunningham MOVE THE PSC TO EXTEND THE TIME FOR THESE PARTIES TO FILE DIRECT TESTIMONY TO NOT LATER THAN JULY 22, 2005.

Respectfully submitted,

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By: ______________________
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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy has been duly served by first-class mail upon the following:

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Public Service Commission
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Hon. Greg Stumbo
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This the 15 day of July, 2005.

W. Henry Graddy, IV

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COMMONWEALTH OF KENTUCKY
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IN RE THE MATTER OF:

JOINT APPLICATION OF LOUISVILLE GAS	)	
AND ELECTRIC COMPANY AND KENTUCKY	)	
UTILITIES COMPANY FOR A CERTIFICATE OF	)	CASE NO.
PUBLIC CONVENIENCE AND NECESSITY FOR	)	2005-00142
CONSTRUCTION OF TRANSMISSION FACILITIES	)	
IN JEFFERSON, BULLITT, MEADE, AND HARDIN	)	
COUNTIES, KENTUCKY	)	

* * * * * *

PREPARED TESTIMONY OF
GEOFFREY M. YOUNG

* * * * * *

Filed July 15, 2005

Q. Please state your name and place of employment.

A. My name is Geoffrey M. Young. I work out of an office in my home, which is at 454 Kimberly Place, Lexington, KY 40503.

Q. What is your position?

A. I resigned from State Government in the fall of 2004 to start working as a private consultant on issues related to energy efficiency, renewable energy, energy policy, and utility regulation and rate structures. I have also been authorized to speak for the Kentucky Sierra Club (i.e., the Cumberland Chapter) on these issues. I am submitting the following testimony in my role as a private energy consultant and not on behalf of the Sierra Club.

Q. Please describe your education and employment experience.

A. I received a bachelor's degree in Economics from the Massachusetts Institute of Technology, a master's degree in Mechanical Engineering from the University of Massachusetts, and a master's degree in Agricultural Economics from the University of Kentucky.

From 2/78 to 8/79, I worked as a Staff Engineer at

Technology + Economics, a research consulting firm in Cambridge, Massachusetts. I analyzed the economic and energy savings resulting from energy efficiency technologies and prepared a commercialization plan for a low-cost passive solar heating and cooling system.

From 7/82 to 6/83, I was the Staff Engineer at the Small Business Development Center, administered by the University of Kentucky in Lexington. I performed cost-benefit analyses of energy efficiency and renewable energy technologies, provided technical assistance to small businesses, and maintained and updated a manual with descriptions of energy technologies.

From 4/90 to 9/91, I worked for the Kentucky Division of Waste Management in the Department for Environmental Protection as an Environmental Engineering Technologist Senior. I performed technical and administrative reviews of applications for hazardous waste facility permits. I provided technical assistance to field and enforcement personnel, conducted hazardous waste facility assessments, and provided information to the public.

From 9/91 to 11/94, I worked as an Environmentalist Principal at the Kentucky Division of Energy (KDOE). My major duty at that time was to coordinate the Alternate Energy Development Program. I administered small grants for the demonstration of renewable energy technologies, developed fact sheets and other information for the public, edited a national monthly newsletter on energy efficiency programs in the 50 states, and wrote proposals for grant funding.

I was promoted to assistant director of KDOE in November 1994. In addition to administrative duties and continuing management of the Alternate Energy Development Program, my work focused on demand-side management, energy policy issues, energy-efficient building systems, and alternative fuels for vehicles. Between 1994 and 2004, I represented KDOE on demand-side management collaboratives at Louisville Gas and Electric Company (LG&E/KU/KU), Kentucky Power Company (AEP), and Union Light, Heat and Power Company (Cinergy). I was the lead person for the Division in addressing electric industry regulatory issues before the Commission. During 2005, KDOE was shifted into the Commerce Cabinet, and is now known as the Division of Renewable Energy and Energy Efficiency.

Q. Have you participated in other cases before this Commission?

Yes. I submitted prepared testimony in the following cases:

•Case No. 98-426, Application of Louisville Gas and Electric Company for Approval of an Alternative Method of Regulation of Its Rates and Service

•Case No. 98-474, Application of Kentucky Utilities Company for Approval of an Alternative Method of Regulation of Its Rates and Service

•Case No. 2000-459, The Joint Application of the Louisville Gas and Electric Company and Kentucky Utilities Company for the Review, Modification and Continuation of DSM Programs and Cost Recovery Mechanisms

•Case No. 2001-053, the Application of East Kentucky Power Cooperative, Inc. for a Certificate of Public Convenience and Necessity, and a Certificate of Environmental Compatibility, for the Construction of a 250 MW Coal-Fired Generating Unit (With a Circulating Fluid Bed Boiler) at the Hugh L. Spurlock Power Station and Related Transmission Facilities, Located in Mason County, Kentucky, to be Constructed Only in the Event that the Kentucky Pioneer Energy Power

Purchase Agreement is Terminated

•Administrative Case No. 387, A Review of the Adequacy of Kentucky's Generation Capacity and Transmission System.

I was the lead participant and representative for KDOE in the following integrated resource planning cases:

•Kentucky Power Company (dba AEP), Cases No. 99-437 and 2002-00377

Big Rivers Electric Corporation, Cases No. 99-429 and 2002-00428

•East Kentucky Power Cooperative, Inc., Cases No. 2000-044 and 2003-00051

•Louisville Gas and Electric Company and Kentucky Utilities Company, Cases No. 99-430 and 2002-00367

•The Union Light, Heat and Power Company, Case No. 99-449.

•I prepared testimony for the Division to submit in Administrative Case No. 341, An Investigation Into the Feasibility of Implementing Demand-Side Management Cost Recovery and Incentive Mechanisms.

•I testified orally at a public hearing and submitted written follow-up comments in Administrative Case No. 2005-00090, An Assessment of Kentucky's Electrical Generation, Transmission, and Distribution Needs.

Q. This case relates to a proposal by LG&E/KU to build a new transmission line to handle the power produced by a proposed new power plant. In general, is building new power lines the only way to handle increased power flows?

A. No. According to Clark Gellings and Kurt Yeager: "We in the US cannot afford to abandon or entirely replace our power delivery system. And we don't need to. What we do need is to use advanced technology to modernize and enhance the use of the existing asset base. Computers, sensors, and computational ability have transformed every major industry in the Western world except the electric power industry… Several available or emerging technologies will help transform the grid into a smart power system capable of supporting the digital society of the 21st Century. In broad strokes, the transformed "intelligrid" will be an integrated, self-healing, electronically controlled electricity supply system of extreme resilience and responsiveness that is capable of responding in real time to the billions of decisions made by consumers and their increasingly sophisticated microprocessor agents. The transformation, we believe, will open the door to a convergence of electricity and communication that will usher in a new era of productivity and prosperity." ("Transforming the Electric Infrastructure," *Physics Today*, December 2004; web site: http://www.physicstoday.org/vol-57/iss-12/p45.html)

The authors list the following technologies that can be used to enhance the performance, reliability, resilience, economic value, and power-carrying capacity of the grid:

•"**Advanced conductors.** Various techniques can increase the amount of power carried along existing transmission corridors. Some of them, but not all, involve new materials. The methods range from reconfiguring existing lines to using new types of conductors with carbon-fiber cores. The new conductors have higher current-carrying capability, and because of their greater strength and lighter weight, they sag less at the high temperatures associated with high power-flow rates. In the future, high-temperature superconducting cables in underground systems might carry triple the current of conventional conductors, perhaps more. They may also be suitable for retrofitting in some underground and ground-based conduits.

•**Distributed energy resources.** Small generation and storage devices distributed throughout and seamlessly integrated with the power delivery system offer potential solutions to several challenges the electric power industry currently faces. Those challenges include the needs to increase the resilience and reliability of the power-delivery infrastructure, make a range of services available to consumers, and provide low-cost, digital-quality power.

•**Automation.** This is key to providing high levels of reliability and quality. To a distribution-system operator, automation may mean that in an emergency, a distribution feeder, local distributed energy resources, or both would be automatically isolated from the grid. To a power-system operator, automation could mean a self-healing, self-optimizing power-delivery system that anticipates and quickly responds to disturbances. As a result, power disruptions would be minimized or eliminated altogether.

•**Power-electronics controllers.** Based on solid-state components, these devices offer control of the power-delivery system with the speed and accuracy of a microprocessor, but at a power level 500 million times higher.

•**Computer modeling of market tools.** To accommodate changes in retail power markets worldwide, market-based mechanisms will need to offer appropriate incentives to buyers and sellers, facilitate efficient planning for the expansion of the power-delivery infrastructure, and effectively allocate risk. Computer modeling will play an important role in testing market models.

•**Communications architecture.** To realize the vision of the smart power-delivery system, standardized communications architecture must first be developed and overlaid on today's system. EPRI recommends that integrated energy and communications-system architecture be based on publicly available standards.

•**Energy portals.** Distribution systems were designed to perform one function—to distribute power to consumers. But many value-added retail services require two-way information exchange between the consumer and the marketplace. An energy portal, which would sit between a consumer's in-house communications network and a wide-area access network, would enable two-way, secure communication between a consumer's equipment and energy-service or communications providers." (Gellings and Yeager, *Ibid.*)

This list should be supplemented by including the concept of geographically-targeted demand-side management (DSM) programs that may be able to relieve transmission and distribution bottlenecks by reducing customer demands and/or shifting the time when energy is used.

In addition, time-of-use pricing is a tool that can provide many benefits to the utility. These benefits include improved load factors, reduced operating costs, reduced economic inefficiency, relieving of transmission and distribution constraints, improved grid reliability, reduced wholesale market price spikes, reduced potential for the exercise of wholesale market power, and lower customer bills. ("Demand Response: Not Just Rhetoric, It Can Truly Be the Silver Bullet," Michael O'Sheasy, *Electricity Journal*, December 2003, pp.52-53.) Mr. O'Sheasy describes and summarizes the characteristics of a set of demand-response approaches: conventional time-of-use (TOU) pricing, day-type TOU pricing, critical-period TOU pricing, occasional real-time pricing, and real-time pricing (RTP).

Q. Are these technologies available today?

A. Many of these technologies are available today and others are currently under development. For example, AEP has installed a full-scale power-electronics controller system in its transmission network. I was fortunate enough to be present at the dedication ceremony of the world's first Unified Power Flow Controller (UPFC), in Inez, Kentucky, on June 26, 1998. This advanced solid-state transmission system control technology, developed by AEP, Westinghouse Electric and the Electric Power Research Institute (EPRI), offers "a cost-effective way to increase the amount of power that can be transferred," according to a statement made that day by Karl Stahlkopf, EPRI vice president. Quoting from the AEP press statement, "The UPFC electronically alters the physical parameters that determine where and how much power flows. It can 'force' a line to carry power that would naturally flow elsewhere, thereby eliminating bottlenecks and diverting power to underutilized paths. 'The UPFC is the most advanced high-power controller ever devised,' said John Kessinger, Westinghouse general manager.

'Its possibilities are so enormous that it is causing utility operators to abandon much of what they've used as historical guidelines and embrace a new era in controlling transmission parameters.'" (Web site: http://www.companyreports.com/cgi-bin/stories.pl?ACCT=105&STORY=/www/story/06-26-1998/0000695669)

In addition to power-electronics controllers, DSM programs, and real-time pricing plans, numerous distributed energy technologies exist today and others are under development. The same is true of advanced conductors, automation technologies, and the other approaches outlined by Gellings and Yeager.

It should be noted that numerous companies, research institutions, and consortia are working to implement the vision of an intelligent electric grid for the 21st Century. One example in this country is the IntelliGrid Consortium, which was created by EPRI to help the energy industry pave the way to the power grid of the future. The current partners are EPRI, SRP, Long Island Power Authority, Alliant Energy, WE Energies, Bonneville Power Administration, PSE&G, PSE, US Department of Energy, EDF, Con Edison, New Yrok

Power Authority, TXU Electric Delivery, PSE, and ABB. Formerly known as the Consortium for Electric Infrastructure to Support a Digital Society (CEIDS), the IntelliGrid Consortium is dedicated to the development of "A new electric power delivery infrastructure that integrates advances in communications, computing and electronics to meet the energy needs of the future." (Web site: http://www.epri-intelligrid.com/intelligrid/home.jsp) It may be prudent for LG&E/KU to join this consortium or another joint research and development initiative with similar goals in order to obtain early access to advanced technologies as they are developed.

Q. Aren't technologies such as distributed generation much more costly than the conventional strategy of building more power plants and transmission lines?

A. Not necessarily. In 2002 the Rocky Mountain Institute published a revolutionary book called *Small Is Profitable*, which describes 207 ways in which the size of "electrical resources" - devices that make, save, or store electricity - affects their economic value. Primary author Amory Lovins and his co-authors found "that properly considering the economic benefits of 'distributed' (decentralized) electrical resources typically raises their value by a large factor, often approximately tenfold, by improving system planning, utility construction and operation (especially of the grid), and service quality, and by avoiding societal costs." (Web site: http://www.smallisprofitable.org/index.html)

In support of the claim that distributed resources are approximately ten times more valuable to the utility company than their purchase price would suggest, the authors present the following findings:

The most valuable distributed benefits typically flow from financial economics—the lower risk of smaller modules with shorter lead times, portability, and low or no fuel-price volatility. These benefits often raise value by most of an order of magnitude (factor of ten) for renewables, and by about 3-5-fold for nonrenewables.

Electrical-engineering benefits—lower grid costs and losses, better fault management, reactive support, etc.—usually provide another ~2-3-fold value gain, but more if the distribution grid is congested or if premium power quality or reliability are required.

Many miscellaneous benefits may together increase value by another ~2-fold—more where waste heat can be reused.

Externalities, though hard to quantify, may be politically decisive, and some are monetized.

Capturing distributed benefits requires astute business strategy and reformed public policy. (*Ibid.*, Executive Summary)

When I was employed at KDOE, I tried to bring this book and the issues it raises to the attention of planning staff at LG&E/KU, but it is unclear whether they gave these concepts serious consideration. If the thesis set forth in this book is even close to being correct, it would mean that alternative technologies and programs that have been dismissed as too costly are actually lower-cost options than the traditional centralized approach that LG&E/KU is proposing now.

Q. What are the implications of advanced technologies such as those described above?

A. It may be possible for LG&E/KU to implement one or more of these technologies and strategies during the next few years instead of building a new power line. The utility should analyze the total resource cost of meeting its projected requirements by means of the alternatives listed above, alone or in combination. The economic impacts of enhanced reliability, grid resilience, and power quality should be factored into the analysis to the extent possible. If any of the alternatives yield a lower total cost than the proposed new transmission line, the utility should select the lowest-cost option.

Q. Is it necessarily the case that LG&E/KU's proposed new power plant is the least-cost strategy to meet the utility's future electricity needs?

A. No. At the public hearing for Administrative Case No. 2005-00090, held on June 14, 2005, several energy professionals made the point that the potential for cost-effective improvements in energy efficiency throughout Kentucky's economy is very large. Dr. Stephen Roosa, for example, made the point that over the past 15 years, improved energy efficiency has been the largest energy "source" for the United States. Efficiency improvements are available throughout all sectors of the economy at a cost of two to three cents per kilowatt-hour saved.

Kentucky has not taken as much advantage of this low-cost, pollution-free energy "source" as several other states have done. The potential for improved energy efficiency in Kentucky is still largely untapped. Dr. Roosa listed several available, cost-effective technologies which exist today and simply need to be incorporated by our residents, business owners, industrial firms, and electric utilities: energy-efficient lighting, motors, drives, cogeneration, digital energy management systems, advanced glazing, air sealing, efficient chillers, and small-scale hydropower.

In my oral statement on June 14, I added the idea of whole-system design, which combines a number of technologies in clever ways to reduce the energy requirements of the system as a whole, whether it be a manufacturing process, a commercial building, or a new home. I recommended the book, *Natural Capitalism*, which provides a readable overview of the exciting possibilities that can be achieved through better design practices. The chapters on design and waste reduction are particularly relevant. (Hawken, Paul, Amory Lovins, and L. Hunter Lovins, Rocky Mountain

Institute, Snowmass, Colorado, 1999; web site: www.natcap.org)

I would like to provide one example from the book that describes the savings achievable through better design and engineering practices in the industrial sector. A major use of electricity in industry is to operate pumps for moving liquids around. The Atlanta-based carpet company, Interface, was planning to build a new factory. One of the factory's production processes required 14 pumps. A leading firm specializing in factory design did a conventional engineering analysis and sized the pumps to total 95 horsepower. An Interface engineer, Jan Schilham, however, took a fresh look and was able to come up with a different design that was not only more efficient but cost *less* to build. The first design change used larger pipes and smaller pumps, greatly reducing frictional losses. Second, Schilham laid out the pipes first and then the equipment, in the reverse order from standard practice, enabling him to use shorter and straighter pipe runs. The combination of these two approaches allowed for a system with only 7 horsepower of pumping capacity - a 92% decrease. The lower capital cost of the smaller pumps, motors, inverters, and associated electrical system more than compensated for the additional cost of larger diameter pipes. The payback period for the higher-efficiency design was instantaneous and its return on investment was infinite because it was cheaper to build than the inefficient design would have been. However, "optimization" techniques in use throughout the industrial sector routinely ignore systemic effects such as these, focusing only on single-component or partial-system optimization. (*Ibid.*, pp.116-117.)

Dr. Donald Colliver from the University of Kentucky testified on 6/14/05 that a consortium of organizations that include 145,000 design and engineering professionals is now working on methods to produce buildings which are 30%, 50% and 70% of the way toward using zero net energy. In other words, the buildings are extremely efficient and also include distributed energy generation technologies that produce as much energy as the building uses over the course of a year. One example of such a technology is solar shingles in place of the conventional shingles, but which generate electricity and feed it back into the electric grid during peak periods.

The implication of these points is that LG&E/KU may be able to meet future needs for electric services by developing and implementing a range of new DSM programs, at a lower total resource cost than building its proposed new power plant. At a minimum, the construction of a new power plant might be significantly delayed.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY
STATE AT LARGE

The undersigned, **Geoffrey M. Young**, being duly sworn hereby verifies that the statements contained hereinabove are true and correct to the best of my knowledge and belief.

____
GEOFFREY M. YOUNG

COMMONWEALTH OF KENTUCKY, STATE AT LARGE

Subscribed and sworn to before me, by Geoffrey M. Young, on this _____ day of July, 2005.

____
NOTARY PUBLIC

My Commission Expires:____________

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