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**No. 35**

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LETTER OF TRANSMITTAL

May 28, 2004

Mr. Bob Gibson  
Program Manager  
Cooperative Research Network (CRN)  
National Rural Electric Cooperative Association  
4301 Wilson Blvd.  
Arlington, VA 22203

Dear Mr. Gibson,

Please find attached a research project proposal to CRN's Marketing & Energy Services Task Force (M&ES). East Kentucky Power Cooperative (EKPC) and its Member Systems request that M&ES review and consider this proposal for funding during its next funding cycle.

EKPC and three (3) of its Member Systems are developing a pilot program for a billing service called Fixed Bill. Fixed Bill potentially offers several benefits to EKPC, Member Systems, and our member owners. Those potential benefits are indicated in the proposal. EKPC and its Member Systems believe that other cooperatives with interest in Fixed Bill could benefit from the knowledge gained by this pilot program. At the end of the pilot program, EKPC will prepare a final report and PowerPoint presentations to communicate pilot program results to CRN members. EKPC and its Member Systems are requesting funding assistance in the amount of \$112,500.

If you have questions about the proposal, please don't hesitate to call me at the telephone number listed below.

Sincerely,

Jim Lamb  
Manager of Market Research

Attachment

c: Dan Brewer, Blue Grass Energy Cooperative  
Rick Ryan, Nolin RECC  
Paul Embs, Clark Energy Cooperative  
Bill Bosta, EKPC

**PROPOSAL**

to

**CRN (Marketing & Energy Services Task Force)**

**THE DEVELOPMENT AND EVALUATION OF FIXED BILLING  
SERVICE (PILOT PROGRAM)**

*at*

**THE MEMBER COOPERATIVES OF EAST KENTUCKY  
POWER COOPERATIVE**

*Proposal by*

**East Kentucky Power Cooperative**

**Member Cooperatives of East Kentucky Power Cooperative**

**Mr. Bill Bosta  
Manager of Pricing  
East Kentucky Power Cooperative  
P.O. Box 707  
Winchester, Kentucky 40392  
Phone 859.744.4812**

**Mr. James Lamb  
Manager of Market Research  
East Kentucky Power Cooperative  
P.O. Box 707  
Winchester, Kentucky 40392  
Phone 859.744.4812**

**May 28, 2004**

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## **INTRODUCTION**

East Kentucky Power Cooperative (EKPC) and its Member Cooperatives proposes to develop a Fixed Bill pilot program for three (3) member distribution cooperatives, Inter-County Energy, Nolin RECC, and Salt River Electric. The fixed bill product offers retail residential customers an initial contract for 12 months, during which the monthly bill is a fixed, predetermined dollar amount. The actual amount of usage during the contract period is independent of the bill amount.

This program differs from budget billing in that there is no true up. Because this is risky to the cooperative and its G&T power supplier, the fixed dollar amount bill is calculated with a risk premium designed to compensate the G&T power supplier and the distribution cooperative for the risk involved. At the end of the initial one-year contract, a new annual contract is offered that reflects the changes in consumption during the first year, other than weather effects.

In order to develop the pilot program, EKPC, Inter-County Energy, Nolin RECC, and Salt River Electric will work with the consulting firm of Christensen Associates. They will assist EKPC and its distribution members by rapidly and cost effectively producing a program design and implementation plan. Their direct involvement in developing this product elsewhere will minimize the cost of the pilot program while ensuring program accuracy and fostering regulatory approval, and will accelerate product development and rollout.

The purpose of the pilot program is to evaluate whether or not the fixed bill concept should be supported by EKPC and its 16 distribution member systems on a permanent basis. The pilot experience will also allow all parties to better understand this relatively sophisticated marketing and pricing program. EKPC expects the pilot to last no longer than two (2) years.

This document contains three sections. Section 1, (Approach, Tasks, and Deliverables), presents task descriptions and lists that will be developed and delivered at EKPC and reported to CRN and its membership. Section 2 provides a timeline and budget estimate for the tasks described in Section 1. The final section presents the project team and corporate qualifications.

## **VALUE PROPOSITION**

EKPC and its member systems believe that this program is attractive to customers for several reasons. These include:

- Eliminates uncertainty
- Simple, easy to understand
- One-year obligation to try
- Optional, not mandatory
- Convenient
- Personalized

It is expected that the program will also have advantages for EKPC and its Member Systems.

These include:

- Offers choice to customers
- Potential for increased customer satisfaction
- Improved margins and stable cash flow
- Improved load factor
- Innovative pricing tool

Several investor-owned utilities have recognized the benefits of a fixed bill concept and have established successful programs. EKPC and its member systems have the opportunity to move forward at a time when many of the developmental issues have been resolved and as the product is in its initial stage of popularity.









EKPC will create a PowerPoint presentation highlighting the content of the final report. EKPC and/or Christensen Associates will provide staff to present the program results at two (2) CRN communication opportunities (i.e. NRECA Marketing Conference).

Task 5 Deliverables:

- Final Report
- PowerPoint Presentation and two (2) presentations by EKPC staff.

## 2. TIMELINE AND BUDGET

### Timeline

EKPC and its member systems would like to initiate a pilot program offering fixed billing service by January 2005, with customer recruiting beginning in the fall of 2004. EKPC expects it will need about five months from project startup until product mailings. However, this pace can be affected by several factors, including regulatory approval and other considerations regarding optimal marketing timing. EKPC anticipates that the pilot will remain in effect for no longer than two (2) years.

The timeline for support during the program operation period should include 2-3 weeks for setting up tracking capability and 4-6 weeks for response analysis and repricing. These tasks can overlap somewhat in timing, to ensure that the maximum amount of data from the first year is used in repricing for the second. For example, offers for the second program year will need to be sent out with the bill for the tenth month of the first program year, suggesting that offers be based on eight or nine months of data and that tracking computations begin no later than the seventh program month.

Exhibit A (Timeline) is the project timetable.

### Budget

EKPC presents the following budget based on Tasks as defined in this proposal. Please note that EKPC portion of the budget (staff labor and materials) is separated from the budgeted cost of support from Christensen Associates.

### Budget

#### Fixed Billing Service (Pilot Program)

Task	EKPC Expense	* External Support Expenses	Total Task Expenses
<b>A. Product Roll-out</b>			
[REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
[REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
[REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
<b>B. Post Roll-out</b>			
[REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
[REDACTED]	\$ [REDACTED]	\$ [REDACTED]	\$ [REDACTED]
<b>Total Pilot Program Cost</b>	<b>\$ [REDACTED]</b>	<b>\$ 112,500</b>	<b>\$ [REDACTED]</b>

EKPC requests CRN funding assistance of \$ 112,500

\* External Support is assistance from Christensen Associates

### 3. PROJECT STAFFING AND QUALIFICATIONS

#### The Project Team

The project team will include staff from EKPC and Christensen Associates. Mr. Bill Bosta and Mr. James Lamb of EKPC will be the Project Managers.

**Jim Lamb, MBA** (University of Kentucky, 1989; Centre College, B.S. Economics and Management, 1979) Mr. Lamb serves as the Manager of Market Research for EKPC. He is responsible for risk analysis, short, medium, and long-term price modeling and forecasting, and wholesale market analysis including sales and revenue forecast. Mr. Lamb manages the competitive intelligence process and is a member of EKPC's corporate strategic planning team. He is responsible for preparing regular risk assessments relating to EKPC power supply and demand issues. Mr. Lamb previously served as the Manager of Energy Control and as a Business Economist at EKPC.

**Bill Bosta, M.Ad.** (Lynchburg College, Industrial Management, 1984; Virginia Tech, B.A. Economics, 1974,) Mr. Bosta serves as Pricing Manager for EKPC. He is responsible for all pricing and regulatory matters at EKPC including wholesale pricing to EKPC's Member Systems, fuel adjustment clause cases, rate case management, tariff interpretation issues, transmission pricing, regulatory strategy, and retail pricing. Mr. Bosta previously served as Director of Regulatory Management for Kentucky Utilities Company and Louisville Gas and Electric and worked in the regulatory area for two American Electric Power operating companies; Indiana Michigan Power and Appalachian Power Company. Mr. Bosta is a member of the American Economic Association.

The following is a summary of the qualifications of Christensen Associates.

## **Christensen Associates Principal Analysts**

**Bruce R. Chapman, M.A.** (University of Wisconsin-Madison, 1979) is a Senior Economist. He specializes in the development of innovative electricity pricing programs that incorporate risk management features for customers in competitive markets. He has managed and participated in many such programs, with a special focus on real-time pricing and fixed bill products. He has led all phases of pricing program development: product design, implementation, and statistical evaluation of customer response. Mr. Chapman's assignments have included heading a project that evaluates competitive customer preferences for risk management products. He has also supervised the design of PC-based software required for implementation and support of innovative retail products.

**Michael T. O'Sheasy, MBA** (Georgia State University, 1974) is a Vice President. From 1980-2001, Mr. O'Sheasy directed the development and implementation of real-time pricing and other innovative rate structures at Georgia Power Company, the largest operating company in the Southern Company system. These programs are the most extensive and successful of any in the U.S. He was responsible for retail and wholesale rate filings and other regulatory requirements, and has routinely testified before various commissions on both costing and pricing. He has published numerous articles on pricing in several journals including the *TAPPI Journal*, *Public Utilities Fortnightly*, *Electric Perspectives*, *EPRI Journal*, *Energy Customer Management*, and *The Electricity Journal*. On a national media level, Mike has been interviewed in USA Today, Newsweek, and National Public Radio. He has been featured on the front page of The Wall Street Journal and has appeared live on CNN FN.

## **Christensen Associates Corporate Qualifications**

### ***General Qualifications***

Christensen Associates is a full-service consulting firm specializing in creative and timely solutions to complex business challenges. We provide the high-caliber economic analysis businesses need to prosper in today's rapidly changing marketplaces. Our multi-disciplinary team of economists, engineers, and market research specialists has been providing services to our clients for over 25 years. This team possesses institutional knowledge of numerous domestic and international industries including electric power, natural gas, health care, telecommunications, transportation, and postal services.

We provide below a description of our capabilities in two areas of importance for this project: pricing design for retail markets and software development for project support. The software development capability is important in that the computation of offers and tracking output relies on the capabilities embedded in our software designed for fixed bill support. Descriptions of recent projects in these areas follow below.

### ***Pricing Design for Retail Markets***

Christensen Associates helps utilities take a proactive approach to pricing in increasingly competitive retail markets. We strategically assess our clients' markets and their customers' competitive alternatives, and then help to design menus of pricing products targeted at various

customer segments. Our design process accounts for the risk of uncertainty in both wholesale electricity prices and customers' loads, and their correlation. It also considers customers' product and supplier preferences, and price responsiveness. We have performed original design and evaluation work in the following product areas:

- Real-time pricing programs.
- Curtailable (priority) service programs.
- Efficient time-differentiated products.
- Fixed bill products.
- Other efficient pricing structures such as products that deter uneconomic bypass.

### ***Software Development for Project Support***

Christensen Associates produces software programs that provide critical capabilities in cost estimation, and in the design, implementation, and evaluation of innovative pricing programs. We list below some examples of our software capabilities.

- Compute fixed bill contract offers for retail customers.
- Estimate the load reduction provided by interruptible and curtailable service customers.
- Assess the margin and load impacts of alternative service designs, and simulate customer acceptance to these alternatives prior to actually fielding a project.
- Assess the margin and risk implications of a potential mix of retail product offerings.
- Assess residential time-of-use rates.
- Provide billing support for real-time pricing programs.

### **Partial Listing of Recent Projects**

We offer brief descriptions of projects relevant to EKPC's fixed bill project. This experience is categorized under pricing design and software development, matching the descriptions above.

#### ***Pricing Design for Retail Markets: Fixed Billing***

***Risk Assessment of Fixed Bill Products.*** Christensen Associates undertook a quantitative assessment comparing a utility's risks from offering a fixed bill retail product to residential customers relative to the risks from standard tariffs. We used the utility's customer and weather data to assess the risks resulting from: 1) changes in customer behavior in response to the product, 2) variability in the weather, 3) modeling risk, and 4) regulation-related impacts such as changes in the cost of fuel and in standard tariff prices. This analysis provided estimates of the range of plausible markups that would be necessary for a profitable fixed bill service compared with the markup for a standard tariff. Our client used the results of this assessment, along with qualitative information on fixed bill products, to present a case before its regulator for offering a fixed bill service.

***Accuracy Test of Weather Sensitivity Algorithm.*** In response to a client's request, Christensen Associates conducted an analysis of our firm's weather sensitivity algorithms. These algorithms permit the computation of customer-specific weather sensitivity parameters using limited amounts of billing data. We estimated weather sensitivity parameters and calculated forecasted

consumption based on actual weather. The client compared these forecasts with actual consumption. This project was undertaken as a preliminary step in the utility's consideration of whether to offer fixed bill service to its customers.

***Fixed Bill Product Development for a Pilot Program.*** Christensen Associates assisted a utility in developing and pricing a fixed bill product targeted at residential customers. Issues included the degree of weather protection to offer customers, and the extent to which limitations should be placed on changes in consumption within the fixed bill contract. The project also determined the weather and other risk premiums to charge customers during the course of a pilot project.

***Scoping Study for Fixed Billing.*** A large Midwestern utility asked Christensen Associates to evaluate the potential for a fixed-bill product within the utility's service territory. Our review included a general overview of the product's capabilities plus the description of appropriate pricing methodology and ways to investigate possible customer response to and acceptance of the products.

***Fixed Bill Pricing for a Southeastern Utility.*** Christensen Associates applied its methodology for costing fixed bill products to the development of improved pricing for a very large fixed bill program. The project involved computing the components of response – both weather-related and nonweather-related – to fixed billing, and determining the risk premium necessary to cover the risk of fixed billing. The client used this information to adjust the pricing parameters of its fixed bill product to ensure cost recovery, including the incremental cost of its risk. The improved precision in costing enabled this utility to keep its risk premium low, thereby increasing the benefits available to its fixed-bill customers.

***Fixed Bill Design for a Midwestern Utility.*** Christensen Associates provided an objective evaluation of a fixed bill product design for natural gas and electricity. Following the evaluation, we supported our client in presenting the concept to regulators.

***Fixed Billing Product Enhancements.*** Christensen Associates assisted a client in extending the eligibility and features of its fixed bill product, and provided support to the client in meeting its regulatory filing obligations regarding customer response to fixed billing. This work included assistance in determining product structure and pricing. The project also involved consulting support for enhancements of other innovative retail products.

### ***Software Development for Project Support***

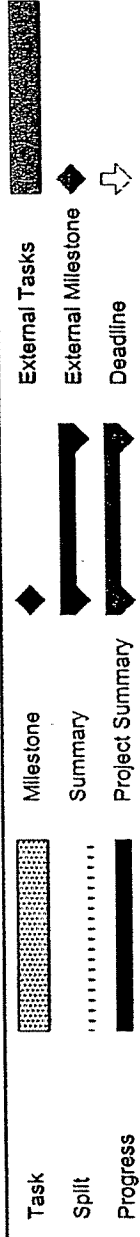
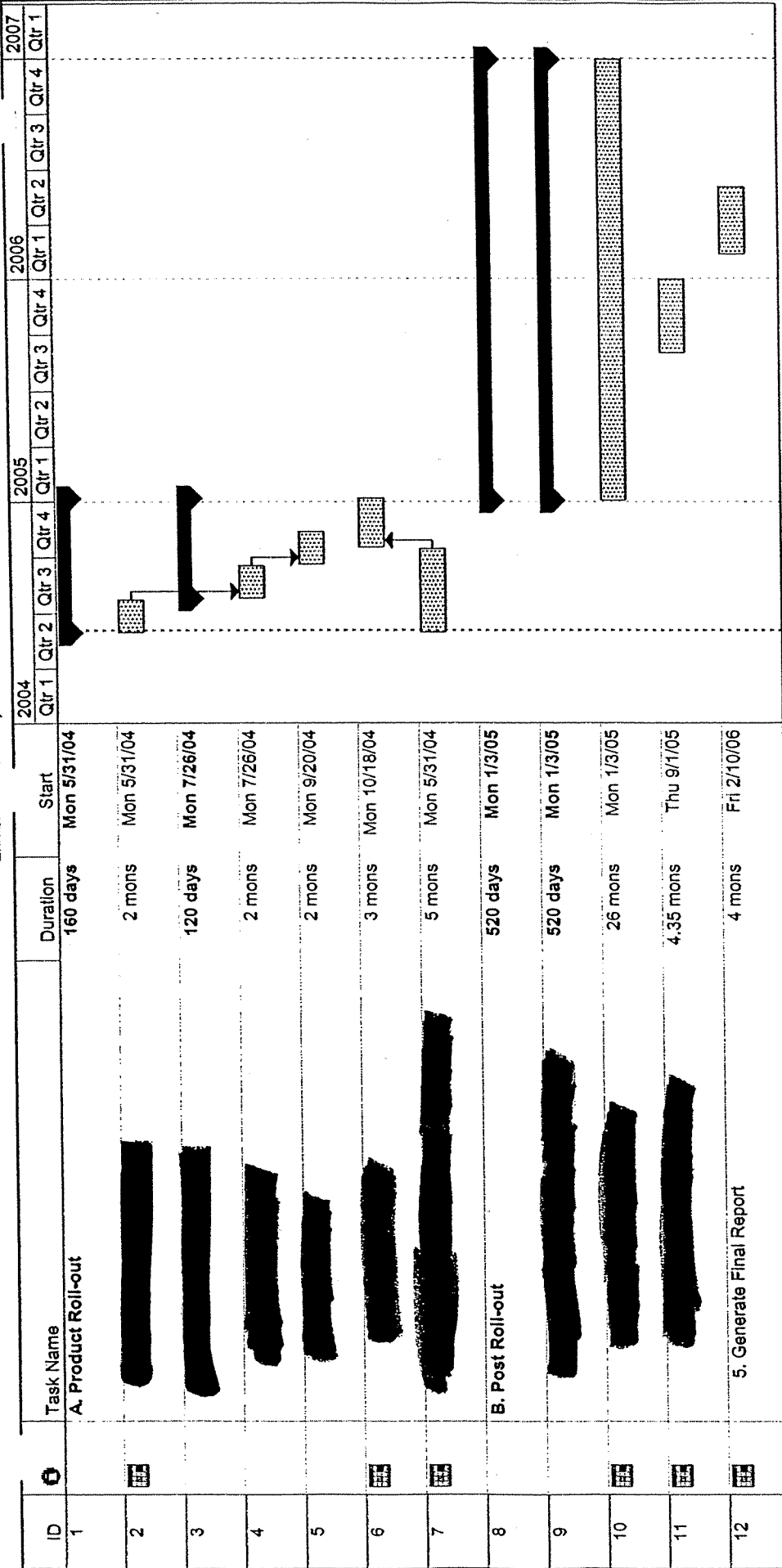
***Software to Support Fixed Bill Offers to Retail Customers.*** Christensen Associates developed software that permits a utility to calculate the offer value of a fixed bill contract for its retail electricity customers. The fixed bill offer requires weather normalization of a customer's billing history, and the computation of a constant dollar value that constitutes an offer for a monthly electricity bill to the customer regardless of consumption during the life of the contract. The software product performs these tasks on a large data base of customer information, permits regular updates of billing information and weather sensitivity calculations, and provides documented records of offers and the underlying data. This software program is installed on the utility's computers for in-house use.

***Risk Management, Profit Analysis, and Product Choice Software.*** In this project, Christensen Associates developed commercial grade software in order to evaluate and design retail gas and electric products in an uncertain environment. Price and load scenarios are constructed through a

trinomial tree structure in accordance with modern finance theory. This allows the risk profiles of hypothetical and real pricing mechanisms to be evaluated, and provides an evaluation of their implications and market acceptance. Hedging strategies may subsequently be applied on the basis of the risk measures that are model outputs. The software is designed to be used either in stand-alone fashion or integrated with the client's own systems. This software's modular, object-oriented code has allowed it to be readily adapted to specific and complex needs at individual utilities.

***Market Share Prediction Software.*** This software is a stand-alone Visual Basic program designed to predict market shares from willingness-to-pay estimates that are derived from survey data. The software handles a wide range of user-specified products and provider attributes, including price structure and value-added services (such as green power and bundled goods or services.) An intuitive and attractive interface allows the specification of customer segments with highly differentiated attributes. Reports assist the analyst in bundling products to attract specific segments. The software is especially suited for estimates obtained through mixed logit or hierarchical Bayesian procedures, which account for the diversity of willingness-to-pay in the population.





Project: Fixed Bill  
Date: Wed 6/2/04

**Jim Lamb**

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**From:** Jan Moore [jsmoore@directoptions.com]  
**Sent:** Tuesday, June 08, 2004 10:51 AM  
**To:** Jim Lamb  
**Subject:** Pilot Audience Selection Methodology

Jim:

Following up our conversation from this morning:

Our intention is to conduct what amounts to a double random sampling of EKPC's co-op customers to ensure there is no favoritism, nor selectivity associated with the pilot program. We will, however, go back after the selections are complete and verify that we've reached all customer segments so we can accurately analyze results.

In addition to receiving the sample data, we'd also like some direction from EKPC on how you prefer the pilot enrollees be distributed among the co-ops. For example, do you want one-third each, or number of enrollees based on size of co-ops or some other permutation?

Ms. Tracy Volan will be covering for me for the balance of the week (I'm traveling), and she can answer any data related questions EKPC may have.

Jan S. Moore  
Direct Options  
6511 West Chester Road  
Suite B  
West Chester, OH 45069  
513-779-4416  
513-779-4426 Fax  
513-703-0993 wireless

9/23/2004

PROPOSAL

**TO SUPPORT DEVELOPMENT OF FIXED BILLING SERVICE**

*at*

**THE MEMBER COOPERATIVES OF  
EAST KENTUCKY POWER COOPERATIVE**

*by*

**LAURITS R. CHRISTENSEN ASSOCIATES, INC.**

**4610 University Avenue, Suite 700**

**Madison, WI 53705-2164**

**Voice 608.231.2266 Fax 608.231.2108**

**June 6, 2004**

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        [REDACTED] ..... 3

        [REDACTED] ..... 4

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        [REDACTED] ..... 4

        [REDACTED] ..... 5

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## PROPOSAL

### **TO SUPPORT DEVELOPMENT OF FIXED BILLING SERVICE**

*at*

### **THE MEMBER COOPERATIVES OF EAST KENTUCKY POWER COOPERATIVE**

*by*

**LAURITS R. CHRISTENSEN ASSOCIATES, INC.**

**Madison, Wisconsin**

**June 6, 2004**

## **INTRODUCTION**

Laurits R. Christensen Associates, Inc. (Christensen Associates) proposes to assist East Kentucky Power Cooperative and its members (EKPC) in developing a fixed bill pilot program for its residential customers. The fixed bill product offers customers a contract for a limited period of time (typically one year) in which the monthly bill is a fixed dollar amount that does not change in response to changes in consumption by the customer or in the underlying cost to provide electricity. However, actual changes in consumption, other than weather effects during the contract year, are reflected in contract offers for the following year. Such a product is attractive to customers for its simplicity and stability.<sup>1</sup> It also represents an opportunity for the G&T and its members to enhance their net margins. A few utilities have already recognized this and have established fixed bill programs. EKPC has the chance to move forward at a time when many of the developmental issues have been resolved and as the product begins to gain popularity. EKPC is also in the advantageous position of being able to promote the adoption of its Touchstone Energy Program by offering an efficient fixed billing package in the future.

Our proposal outlines the ways in which Christensen Associates can assist EKPC to put a product into the field rapidly and cost effectively. We can assist EKPC with product design and implementation. Based on our experience in developing this product elsewhere, we will help to ensure bill accuracy and obtain regulatory approval, and will accelerate product development and roll-out.

This document contains three sections. Section 1, Approach, Tasks, and Deliverables, presents task descriptions and lists what we will deliver to EKPC at the end of each task in supporting EKPC's fixed bill development. Section 2 provides a timeline and our budget estimate for the tasks described in Section 1. The final section presents our project team and corporate qualifications.

## **1. APPROACH, TASKS, AND DELIVERABLES**

### **General Description of Support**

Christensen Associates will assist EKPC in the design, implementation and evaluation of its fixed billing pilot program. We offer to undertake three key support tasks during the pilot roll-out stage: 1) design and price your product; 2) compute fixed bill offers; and 3) assist in

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<sup>1</sup> Many budget billing customers will find fixed billing particularly attractive. Budget billing will continue to provide value to customers who do not select fixed billing.

program acceptance. Once your fixed bill product is in the market, we provide essential support in several additional areas: 4) measure customer response and develop new prices based on that response for the second program year; 5) generate new offers for the second year of service; and 6) measure customer response in the second program year, which yields revised prices for a subsequent year. We also provide support options for responding to regulatory discovery during the roll-out period and a customer satisfaction survey toward the end of the pilot program. The project tasks described below are designed and budgeted for a pilot program expected to attract about 1,000 residential customers at up to six cooperatives.

**A. Product Roll-Out**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] ag

[REDACTED]

[REDACTED]

[REDACTED] on

[REDACTED]

ve  
ne

**B. Basic Support After Roll-Out**

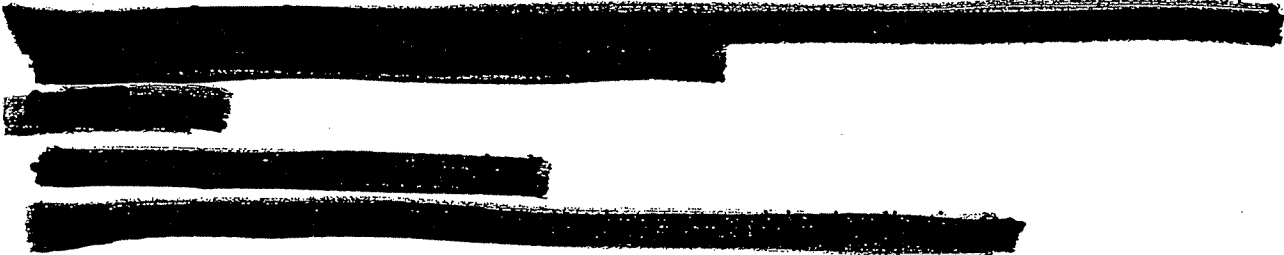
[REDACTED]



[REDACTED]

**C. Additional Optional Enhancement**

[REDACTED]



## 2. TIMELINE AND BUDGET

### Timeline

We understand that EKPC would like to initiate fixed billing service by December 2004, with recruiting beginning in the preceding October. Christensen Associates is ready to begin work at any time and recommends immediate startup for timely completion of roll-out tasks. We will be glad to tailor our support to the timeline that EKPC wishes to follow.

The timeline for support during the program operation period should include 2-3 weeks for setting up tracking capability and 4-6 weeks for response analysis and repricing. These tasks can overlap somewhat in timing, to ensure that the maximum amount of data from the first year is used in repricing for the second. For example, offers for the second program year will need to be sent out with the bill for the tenth month of the first program year, suggesting that offers be based on eight or nine months of data and that tracking computations begin no later than the seventh program month.

### Budget

We present our budget for this project in the table below.<sup>4</sup> We assume that roll-out tasks occur in 2004. Task 4, the measurement of first-year response, including tracking computations, response analysis, and price revision for the second program year, will occur in late 2005. Tasks 5 and 6 will occur in late 2006. (EKPC has made mention of possibly conducting analysis after the conclusion of the winter of 2005-06. Tasks 5 and 6 can be moved up to April or May without difficulty and will cover a shorter period of time.) These budget estimates apply through the end of June 2004 and are conditional upon a project start by July 1, 2004.

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<sup>4</sup> Note that some individual task budgets have been revised upward slightly from the original proposal to reflect the later start date than that assumed in the original version.

**Budget to Support Design and Pricing  
of a Fixed Bill Product at EKPC**

Task	Year	Amount
<b>A. ROLL-OUT</b>		
[REDACTED]	2004	[REDACTED]
[REDACTED]	2004	[REDACTED]
[REDACTED]	2004	[REDACTED]
<b>B. BASIC SUPPORT AFTER ROLLOUT</b>		
[REDACTED]	2005	[REDACTED]
[REDACTED]	2005	[REDACTED]
[REDACTED]	2006	[REDACTED]
<b>Total, Roll-out and Basic Support -- 2004-2006</b>		[REDACTED]
<b>C. ADDITIONAL OPTIONAL ENHANCEMENT</b>		
[REDACTED]	2006	[REDACTED]
<u>Options</u>		
[REDACTED]	2004	[REDACTED]
[REDACTED]	2004	[REDACTED]
[REDACTED]	2004	[REDACTED]
[REDACTED]	2004	[REDACTED]

**3. PROJECT STAFFING AND QUALIFICATIONS**

**The Project Team**

Christensen Associates will make available a team of consultants who have worked on many pricing projects and fixed billing projects in particular. Mr. Bruce Chapman will manage the project and participate in all tasks. Mr. Michael O'Sheasy will serve in a consulting role on design and risk pricing tasks. Mr. Robert Camfield, who has consulted with EKPC for some time, will assist in a consultative role as needed and will provide continuity given his understanding of EKPC's goals and procedures.

Mr. Chapman, Mr. O'Sheasy, Dr. David Glycer, and Dr. Daniel Hansen will collaborate in the determination of project design. Dr. Glycer, Dr. Hansen, and Mr. David Armstrong will work with Mr. Chapman in conducting response analysis and repricing. Mr. Chapman, Dr. Hansen, and Mr. Armstrong will perform data analysis and develop fixed bill offers. Biographical sketches of the team members appear below.

**Bruce R. Chapman, M.A.** (University of Wisconsin-Madison, 1979) is a Senior Economist. He specializes in the development of innovative electricity pricing programs that incorporate risk

management features for customers in competitive markets. He has managed and participated in many such programs, with a special focus on real-time pricing and fixed bill products. He has led all phases of pricing program development: product design, implementation, and statistical evaluation of customer response. Mr. Chapman's assignments have included heading a project that evaluates competitive customer preferences for risk management products. He has also supervised the design of PC-based software required for implementation and support of innovative retail products.

**David A. Armstrong, B.S.** (University of Wisconsin-Madison, 1992) is a Senior Economist. He specializes in supporting electricity suppliers in quantitative analyses related to designing products for competitive markets. His projects have included retail product design and evaluation, wholesale price forecasting, and customer response modeling. Mr. Armstrong has played an essential role in the development and testing of retail product design and pricing software. He is also an expert software instructor, and leads workshops, training sessions, and pricing seminars.

**Robert J. Camfield, M.A.** (Western Michigan University, 1975) is a Vice President. He has extensive experience in the electricity industry and in the economics of regulation, and has managed numerous projects involving wholesale and retail markets including a large market design project in Central Europe. Mr. Camfield is credited with several innovations including two-part pricing with location-based usage charges for transmission and self-designing web-based products for retail markets. He has developed unbundled cost allocation methods based on marginal and economic costs, and he currently serves as the Program Director of a national market design school. In addition, he has testified on numerous occasions, most recently on transmission interface congestion. Before joining Christensen Associates, he worked with several organizations within Southern Company, including Pricing and Economic Analysis, and Southern Company's Strategic Planning group. Prior to that, Mr. Camfield was chief economist for the New Hampshire Public Utilities Commission. He has published articles in *The Electricity Journal* and *IEEE Transactions on Power Systems*.

**J. David Glycer, Ph.D.** (Claremont Graduate School, 1990) is a Senior Economist. He specializes in applied microeconomics, program design, and statistics. He has managed projects on, and is an expert in, the design, modeling, and evaluation of competitive pricing products, including real-time pricing, as well as interruptible and standby services. Dr. Glycer has testified in regulatory cases in Wisconsin and Missouri. He has also developed commercial grade PC-based software that simulates customers' hourly demand, customer choice among competing products, and utility margin impacts from offering specific product lines. He has published articles in a number of journals, including in *Nature*, *The Electricity Journal*, and *Water Resources Research*, and is an author of the book *Electricity Deregulation and the Safety of U.S. Commercial Nuclear Power Plants* published in March 2003. He has held faculty appointments at Oregon State University and the University of Colorado-Denver.

**Daniel G. Hansen, Ph.D.** (Michigan State University, 1997) is a Senior Economist. Dr. Hansen specializes in the development of innovative, market-based pricing programs that are well-grounded on solid statistical techniques and fundamental economic principles. He has worked extensively with electricity suppliers who are facing competitive retail markets. As the basis for pricing recommendations, he has developed econometric estimates of customer responsiveness to retail electricity prices and of customer preferences for electricity products based on survey

data. Dr. Hansen has developed a model for pricing innovative energy derivatives, and performed valuations of existing energy derivatives in a manner consistent with Financial Accounting Standard 133. His research has been published in *Industrial and Labor Relations Review*, the *Journal of Labor Economics*, and *The Electricity Journal*.

**Michael T. O'Sheasy, MBA** (Georgia State University, 1974) is a Vice President. From 1980-2001, Mr. O'Sheasy directed the development and implementation of real-time pricing and other innovative rate structures at Georgia Power Company, the largest operating company in the Southern Company system. These programs are the most extensive and successfully of any in the U.S. He was responsible for retail and wholesale rate filings and other regulatory requirements, and has routinely testified before various commissions on both costing and pricing. He has published numerous articles on pricing in several journals including the *TAPPI Journal*, *Public Utilities Fortnightly*, *Electric Perspectives*, *EPRI Journal*, *Energy Customer Management*, and *The Electricity Journal*. On a national media level, Mike has been interviewed in USA Today, Newsweek, and National Public Radio. He has been featured on the front page of the Wall Street Journal and has appeared live on CNN FN.

## **Corporate Qualifications**

### **General Qualifications**

Christensen Associates is a full-service consulting firm specializing in creative and timely solutions to complex business challenges. We provide the high-caliber economic analysis businesses need to prosper in today's rapidly changing marketplaces. Our multi-disciplinary team of economists, engineers, and market research specialists has been providing services to our clients for over 25 years. This team possesses institutional knowledge of numerous domestic and international industries including electric power, natural gas, health care, telecommunications, transportation, and postal services.

We provide below a description of our capabilities in two areas of importance for this project: pricing design for retail markets and software development for project support. The software development capability is important in that the computation of offers and tracking output relies on the capabilities embedded in our software designed for fixed bill support. Descriptions of recent projects in these areas follow below.

### **Pricing Design for Retail Markets**

Christensen Associates helps utilities take a proactive approach to pricing in increasingly competitive retail markets. We strategically assess our clients' markets and their customers' competitive alternatives, and then help to design menus of pricing products targeted at various customer segments. Our design process accounts for the risk of uncertainty in both wholesale electricity prices and customers' loads, and their correlation. It also considers customers' product and supplier preferences, and price responsiveness. We have performed original design and evaluation work in the following product areas:

- Real-time pricing programs
- Curtailable (priority) service programs
- Efficient time-differentiated products

- Fixed bill products
- Other efficient pricing structures such as products that deter uneconomic bypass.

### ***Software Development for Project Support***

Christensen Associates produces software programs that provide critical capabilities in cost estimation, and in the design, implementation, and evaluation of innovative pricing programs. We list below some examples of our software capabilities.

- Compute fixed bill contract offers for retail customers.
- Estimate the load reduction provided by interruptible and curtailable service customers.
- Assess the margin and load impacts of alternative service designs, and simulate customer acceptance to these alternatives prior to actually fielding a project.
- Assess the margin and risk implications of a potential mix of retail product offerings.
- Assess residential time-of-use rates.
- Provide billing support for real-time pricing programs.

### **Partial Listing of Recent Projects**

We offer brief descriptions of projects relevant to FPL's fixed bill project. This experience is categorized under pricing design and software development, matching the descriptions above.

#### ***Pricing Design for Retail Markets: Fixed Billing***

***Risk Assessment of Fixed Bill Products.*** Christensen Associates undertook a quantitative assessment comparing a utility's risks from offering a fixed bill retail product to residential customers relative to the risks from standard tariffs. We used the utility's customer and weather data to assess the risks resulting from: 1) changes in customer behavior in response to the product, 2) variability in the weather, 3) modeling risk, and 4) regulation-related impacts such as changes in the cost of fuel and in standard tariff prices. This analysis provided estimates of the range of plausible markups that would be necessary for a profitable fixed bill service compared with the markup for a standard tariff. Our client used the results of this assessment, along with qualitative information on fixed bill products, to present a case before its regulator for offering a fixed bill service.

***Accuracy Test of Weather Sensitivity Algorithm.*** In response to a client's request, Christensen Associates conducted an analysis of our firm's weather sensitivity algorithms. These algorithms permit the computation of customer-specific weather sensitivity parameters using limited amounts of billing data. We estimated weather sensitivity parameters and calculated forecasted consumption based on actual weather. The client compared these forecasts with actual consumption. This project was undertaken as a preliminary step in the utility's consideration of whether to offer fixed bill service to its customers.

***Fixed Bill Product Development for a Pilot Program.*** Christensen Associates assisted a utility in developing and pricing a fixed bill product targeted at residential customers. Issues included the degree of weather protection to offer customers, and the extent to which limitations should be placed on changes in consumption within the fixed bill contract. The project also determined the weather and other risk premiums to charge customers during the course of a pilot project.

**Fixed Bill Product Scoping Study.** In a scoping study, Christensen Associates developed the economic theory underlying fixed bill products, which resulted in a set of preliminary criteria for the sustainability of fixed bill products for electricity, natural gas, and telecom in competitive markets. The study also set out a list of research questions that can be addressed in order to gain a better understanding of product viability in these markets.

**Expanded Budget Billing Program.** Christensen Associates evaluated the load impacts from the expansion of a utility's budget billing program. Past evidence suggested that customers who adopt budget billing increase their consumption. This project evaluated the degree to which this was true for our client's program and estimated the extent to which this effect persists over time. The utility used the results of this analysis to evaluate the financial implications expanding the budget billing program.

**Assist Fixed Billing Program Startup.** Christensen Associates assisted a utility in strategic decision making and the implementation of a fixed billing pilot program. We provided advice on the scope and nature of the pilot program design, the development and computation of fixed-bill offers, related information management questions, as well as customer care.

**Evaluation of Customer Response to Budget Billing.** Christen Associates evaluated load responses by customers participating in a budget billing program. The project focused on consumption differences between first-year participants and those with longer service experience. The client benefited from an improved understanding of its budget billing program and also acquired information useful in developing pricing for fixed-bill customers.

**Scoping Study for Fixed Billing.** A large Midwestern utility asked Christensen Associates to evaluate the potential for a fixed-bill product within the utility's service territory. Our review included a general overview of the product's capabilities plus the description of appropriate pricing methodology and ways to investigate possible customer response to and acceptance of the products.

**Fixed Bill Pricing for a Southeastern Utility.** Christensen Associates applied its methodology for costing fixed bill products to the development of improved pricing for a very large fixed bill program. The project involved computing the components of response – both weather-related and nonweather-related – to fixed billing, and determining the risk premium necessary to cover the risk of fixed billing. The client used this information to adjust the pricing parameters of its fixed bill product to ensure cost recovery, including the incremental cost of its risk. The improved precision in costing enabled this utility to keep its risk premium low, thereby increasing the benefits available to its fixed-bill customers.

**Fixed Bill Design for a Midwestern Utility.** Christensen Associates provided an objective evaluation of a fixed bill product design for natural gas and electricity. Following the evaluation, we supported our client in presenting the concept to regulators.

**Fixed Billing Product Enhancements.** Christensen Associates assisted a client in extending the eligibility and features of its fixed bill product, and provided support to the client in meeting its regulatory filing obligations regarding customer response to fixed billing. This work included assistance in determining product structure and pricing. The project also involved consulting support for enhancements of other innovative retail products.

**Weather Hedge Products.** Christensen Associates developed weather hedge products for the retail commercial and industrial markets served by a major electric service provider. Weather

exposes retail customers and service providers to price and quantity risks, and these risks result in uncertain retail electric bills and returns to shareholders. Because risk is costly, the mitigation of weather risks improved value to both customers and shareholders. Weather hedges can serve as very effective means to achieve these ends. Key project elements included: 1) analyzing weather, loads, and customer bills for various retail market segments; and 2) estimating customer selections of weather hedge service options.

### ***Software Development for Project Support***

***Software to Support Fixed Bill Offers to Retail Customers.*** Christensen Associates developed software that permits a utility to calculate the offer value of a fixed bill contract for its retail electricity customers. The fixed bill offer requires weather normalization of a customer's billing history, and the computation of a constant dollar value that constitutes an offer for a monthly electricity bill to the customer regardless of consumption during the life of the contract. The software product performs these tasks on a large data base of customer information, permits regular updates of billing information and weather sensitivity calculations, and provides documented records of offers and the underlying data. This software program is installed on the utility's computers for in-house use.

***Billing and Load Response Software for a Real-Time Pricing Program.*** Innovative rate designs require billing and analysis software for utilities and their customers. This project developed PC-based software products that utilities can use for billing under real-time pricing, and that customers can use to analyze the bill impacts of load responses to real-time pricing. These software packages have been successfully implemented and are used on an ongoing basis.

***Development of a Demand Simulation Model.*** Christensen Associates developed a demand simulation model as part of a long-term project to develop the theory, methods and data required by utilities to evaluate, design, and implement priority service programs. This model can simulate customer response to a wide range of priority service programs that alter either the price or availability of electricity on a short-term basis. The software is a commercial grade product and includes a three volume set User's Guide.

***Risk Management, Profit Analysis, and Product Choice Software.*** In this project, Christensen Associates developed commercial grade software in order to evaluate and design retail gas and electric products in an uncertain environment. Price and load scenarios are constructed through a trinomial tree structure in accordance with modern finance theory. This allows the risk profiles of hypothetical and real pricing mechanisms to be evaluated, and provides an evaluation of their implications and market acceptance. Hedging strategies may subsequently be applied on the basis of the risk measures that are model outputs. The software is designed to be used either in stand-alone fashion or integrated with the client's own systems. This software's modular, object-oriented code has allowed it to be readily adapted to specific and complex needs at individual utilities.

***Market Share Prediction Software.*** This software is a stand-alone Visual Basic program designed to predict market shares from willingness-to-pay estimates that are derived from survey data. The software handles a wide range of user-specified products and provider attributes, including price structure and value-added services (such as green power and bundled goods or services.) An intuitive and attractive interface allows the specification of customer segments with highly differentiated attributes. Reports assist the analyst in bundling products to attract



specific segments. The software is especially suited for estimates obtained through mixed logit or hierarchical Bayesian procedures, which account for the diversity of willingness-to-pay in the population.



Laurits R. Christensen Associates, Inc.  
4610 University Avenue, Suite 700  
Madison, Wisconsin 53705-2164

Voice 608.231.2266 Fax 608.231.1365

## MEMORANDUM

TO: Bill Bosta & Jim Lamb, East Kentucky Power Cooperative

FROM: Bruce Chapman, David Glycer & Michael O'Sheasy

DATE: June 25, 2004

SUBJECT: Fixed Bill Risk Premium

A key challenge for East Kentucky Power Cooperative (EKPC) and its members in offering fixed billing to the members' retail customers is to determine the risks associated with the program for EKPC and participating members and to select risk premium values to match the incremental risks to each party. These incremental risks depend upon the wholesale pricing arrangement to be applied to fixed billing customers.

EKPC charges its members for generation and transmission services under its Wholesale Power Rate Schedule, with Schedule E applying to the members who will be offering fixed billing. If Schedule E were to continue to apply, practically all of the incremental risks associated with fixed billing would be borne by the hosting member. EKPC and its members recognize that the entire system will eventually benefit from the fixed bill pilot program and are therefore interested in considering an alternative to Schedule E for fixed bill consumption.

The alternative under consideration presently involves a "pass-through" of EKPC's share of fixed bill revenues, based on the share of average residential customer retail bills paid currently to EKPC under Schedule E. That is, *expected* fixed bill customer consumption will be priced under Schedule E, along with a proportionate share of the risk premium. The sharing will be based on the residential class average revenue split, implying that the fixed bill customers' load factor will equal that of the class average.

EKPC and its members are interested in three issues related to this proposed pricing arrangement. It is important to investigate the following:

- What risks result from the possibility that customers who subscribe to fixed billing will have an aggregate load profile that differs from the residential class average load profile?

- What if consumption growth by fixed bill customers is not proportional across the profile? That is, the load factor or the on-peak to off-peak consumption share of these customers may change, thereby creating risk.
- Should the risk premium under this pricing plan be split proportionately according to the base revenue or according to some other criterion?

We discuss these issues below. Our investigation of them indicates the following:

- The risks of fixed bill customer load profile differing from residential class load profile are small. This is because the loads that are the basis of the fixed bill offer calculation are still billed under Schedule E's algebra for wholesale billing purposes. Prior to customer consumption response to fixed billing the proposed approach likely produces little to no revenue transfers between EKPC and the member.
- If customer response to fixed billing results in declining load factor (*i.e.* more rapid growth of peak consumption than overall consumption), then EKPC will over-collect from the member for the cost of serving the fixed bill customers. (This assumes that Schedule E accurately reflects the cost of serving customers.)
  - Incidentally, our experience in quantitatively evaluating customer response to fixed bill service, including review of interval data, indicates that load factor deterioration is unlikely. Residential customers appear not to expand disproportionately in peak hours. We believe that this is due in part to cooling systems reaching their peak capacity in such hours even in the absence of fixed billing. In such circumstances, a fixed bill customer may believe that it is now less expensive to "dial down" the thermostat but no incremental cooling can occur in response. Instead, it is the shoulder periods where greater expansion in response to fixed billing occurs.
- EKPC's candidate plan for wholesale pricing of fixed bill services assigns most risk to the G&T. We estimate that the risk cost of fixed billing for EKPC can be covered by a premium of about 1.5 percent while that of the member should be 0.5 percent. These estimates are based on our understanding of the risks associated with customer selection and behavior while on fixed billing, plus our computation of the pricing and weather risks inherent in the EKPC system.
- EKPC can modify its planned weighting of risk and reward from fixed billing if it wishes, by developing a variant of the pass-through wholesale pricing arrangement. EKPC can transfer some of the weather and price risk back to the member offering fixed billing, along with some of the risk premium, by basing expected consumption on *actual* weather (rather than *normal*) and *actual* fuel price (rather than *expected*). More generally, EKPC and its members can agree upon some combination of the actual and expected values to settle upon a sharing mechanism that suits all parties.

The remainder of this memorandum explores these issues and derives recommended risk premium values for the planned wholesale pricing arrangement.

### **Risks Associated with Fixed Bill Customer Load Profile**

In evaluating the risks associated with fixed billing, it is useful to review numerical examples of alternative outcomes to identify situations in which transfers occur and to understand their nature

and scale. Consider an example in which there are two customers – A and B – who are the same size in terms of total consumption but differ in terms of peak demand. The provider doesn't know their actual demand but assumes that they are both equal to the aggregate, which can be inferred from substation data or interval data from representative households. Let us use representative prices: wholesale energy (all-hour) of 2.5¢/kWh and demand of \$7.00/kW and retail energy of 6.5¢ (perhaps a little high, but we have omitted a customer charge and the value is useful for illustrative purposes).

The first table below illustrates the case in which fixed billing is offered with no quantity factor, a 5 percent risk premium and customers do not grow. For each customer and the total "class" there appear the actual kW, assumed kW and actual kWh, followed by the customer's retail bill, the payment that would occur to EKPC based on the assumed kW, EKPC's actual cost to serve, and the member or co-op's revenue.<sup>1</sup> The rightmost column identifies the low load factor customer as electing to participate in fixed billing. The "actual cash flow" line presents the calculation of wholesale payment that the member will need to make based on the substation data and the pass-through approach and the remaining cash for the member. The outcome shows that no transfers occur between EKPC and the member.<sup>2</sup>

If, alternatively, the high load factor Customer A joins fixed billing and Customer B does not, the result is identical. This result is important for its implications regarding the use of class average load factor to develop assumed kW values for customers. Any other load factor will set up transfers even in this rudimentary case. Thus, using a class average approach to load factor imputation both limits transfers and avoids selection issues in which fixed billing attracts high load factor customers only.

**Case 1: No Load Response by Fixed Bill Customer**

	<u>Actual</u> kW	<u>Assumed</u> kW	<u>Actual</u> kWh	<u>Retail Bill</u>	<u>Implicit</u> <u>Pmt to</u> <u>EKPC</u>	<u>EKPC</u> <u>Cost</u>	<u>Coop</u> <u>Revenue</u>	<u>Fixed Bill</u> <u>Participant</u>
Customer A	2.00	3.00	1,000	\$ 65.00	\$ 46.00	\$ 39.00	\$ 19.00	0
Customer B	4.00	3.00	1,000	\$ 68.25	\$ 48.30	\$ 53.00	\$ 19.95	1
Total	6.00	6.00	2,000	\$ 133.25	\$ 94.30	\$ 92.00	\$ 38.95	
Actual Cash Flow					\$ 94.30		\$ 38.95	
Transfer					\$ -		\$ -	
EKPC Margin Induced by Fixed Billing								\$ 2.30
Coop Margin Induced by Fixed Billing								\$ 0.95
Total Margin Induced by Fixed Billing								\$ 3.25

<sup>1</sup> The cost assumed for EKPC is based upon the Schedule E prices for actual kW and actual kWh for fixed bill participants and non-participants.

<sup>2</sup> We have abstracted from the distribution line losses; the effects of these could be captured by increasing the EKPC prices by the appropriate loss factors that make the quantities from customer meters match up with those from the substation meters.

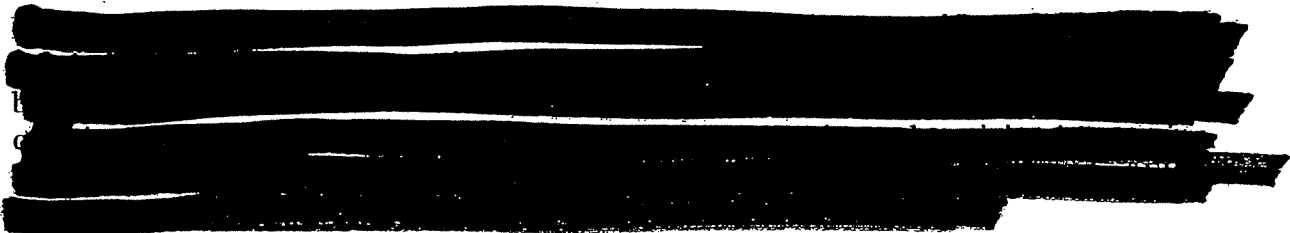
A more realistic example involves selecting a positive quantity factor for inclusion in the fixed bill offer and matching actual consumption and peak demand growth percentages. If we select all load changes for fixed bill participants to be 5 percent and retain the 5 percent risk premium, the result is as follows when customer B only joins fixed billing. In this case there is a transfer of \$.35, about 0.26 percent of the retail bill from the member to EKPC. The transfer is about 0.36 percent of the EKPC revenues but about 0.9 percent of the member revenues. If the high load factor customer joins instead, the transfer is equal in size and opposite in direction. More realistically, if 10 percent of customer load joins fixed billing and these customers are collectively very different from the class average, these percentages, especially that of the member, decline further. Thus, a realistic evaluation of the risk to both EKPC of signing unrepresentative customers is small, although it appears that the risk to the member is significantly larger than that of EKPC.

**Case 2: Load Response at Expected Level by Fixed Bill Customer**

	<u>Actual</u>	<u>Assumed</u>	<u>Actual</u>		<u>Implicit</u>		<u>Coop</u>	<u>Fixed Bill</u>
	<u>kW</u>	<u>kW</u>	<u>kWh</u>	<u>Retail Bill</u>	<u>Pmt to</u>	<u>EKPC</u>	<u>Revenue</u>	<u>Participant</u>
					<u>EKPC</u>	<u>Cost</u>		
Customer A	2.00	3.00	1,000	\$ 65.00	\$ 46.00	\$ 39.00	\$ 19.00	0
Customer B	4.20	3.15	1,050	\$ 71.66	\$ 50.72	\$ 55.65	\$ 20.95	1
Total	6.20	6.15	2,050	\$ 136.66	\$ 96.72	\$ 94.65	\$ 39.95	
Actual Cash Flow					\$ 97.07		\$ 39.60	
Transfer					\$ 0.35		\$ (0.35)	
EKPC Margin Induced by Fixed Billing								\$ 2.41
Coop Margin Induced by Fixed Billing								\$ 0.65
Total Margin Induced by Fixed Billing								\$ 3.06

**Recommended Risk Premium Values**

Christensen Associates' approach to computing a risk premium for fixed billing is based on developing an estimate of the risk exposure of the program and then using the provider's cost of money to value that exposure. We begin by estimating the parameters of the distributions of each of the sources of risk of fixed billing. We then compute the parameters of a joint distribution of these risk sources. Once this joint distribution is available, we compute the value at risk for the program (essentially the difference in margins between the expected outcome and a "worst case" outcome). We then use the provider's cost of money to establish the cost of covering this risk exposure.



We next identify the separate revenue streams of EKPC and the member and then apply this methodology to those streams. The revenue streams are based on the algebraic representation of the wholesale pricing arrangement as modified for fixed billing: the pass-through approach described above. In this case, the program risks lie preponderantly with EKPC. This arises since a member pays EKPC based on expected consumption given normal weather, the exact basis on which the customer pays the member. Both EKPC and the member still bear risk related to variation in load factor in response to fixed billing but the member's risk is confined to covering incremental distribution costs.

Under this approach, we estimate that EKPC's risk premium sufficient to cover costs should be about 1.5 percent, while the members who offer fixed billing should need a premium of 0.5 percent, where each percentage is expressed relative to the standard retail tariff applied to the expected consumption level of the customer. That is, the risk premium applied to this bill is the simple sum of the two risk premium values, or 2.0 percent.

[REDACTED] The EKPC premium is thus about 75 percent of the overall risk premium and the member's premium is about 25 percent.

The pass-through approach, in which the risk premium is the sum of risk premium values that are proportional to the shares of the base bill, results in a premium for EKPC that is about 70 percent of the sum, while the premium for the member is about 20 percent.<sup>3</sup> This result indicates that EKPC's plan to base the share of the risk premium upon the shares of each party in the base bill is fairly reasonable.

EKPC and its members may be content with this risk sharing arrangement. However, if it is concluded that this shifts too much risk and return in the direction of EKPC (and thus also in the direction of non-participating members), it is not difficult to modify this approach. If the basis for wholesale pricing for fixed bill customers is modified to reflect expected consumption given actual weather (rather than expected), EKPC can shift some weather risk back in the members' direction. Similarly, some fuel risk, which currently resides with EKPC, can be moved back in the members' direction by making the wholesale pricing of fixed billing reflect the most recent fuel cost recovery value as opposed to the value used in developing the fixed bill offer.

Christensen Associates can compute such alternatives readily and at short notice. A more general framework that should provide sufficient flexibility yet remain tractable for computation and evaluation would involve using some combination of the two different "expected" values above. (That is, consumption can be based on expected consumption given actual or normal weather or a weighted average of the two, with the weights determined by EKPC. Fuel can be treated similarly.)

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<sup>3</sup> Our estimate of this proportion is based on incomplete data. EKPC will have available better computations of the portion of the average residential retail bill that is paid to EKPC. This portion may vary across members and could conceivably result in different risk premia for each member. However, this appears to be a needless complication.

**Appendix: Derivation of Risk Premium Values**

The derivation of risk premium values for EKPC and participating members in fixed billing involves three steps: 1) derive distributional assumptions for the sources of risk; 2) derive assumptions of a joint risk distribution; and 3) estimate the risk cost associated with each provider’s distribution. This appendix outlines these steps.

**Step 1: Derive Distributional Assumptions**

Christensen Associates models the risks of fixed billing as having three sources. These are quantity risk unrelated directly to weather, quantity risk directly related to weather, and price risk. Quantity risk unrelated to weather involves the risk that the actual quantity change will differ from the change that is used to calculate an offer, due to customer selection or customer load response. Price risk in a world of stable rates is predominantly fuel risk. We assume that each of these risks can be approximated by a normal distribution.

EKPC has provided us with historical data that permits computation of weather variability and fuel price variability and their correlation. Our fixed bill experience provides us with non-weather variability information and the quantity implications of weather variability as well as information about the correlation between each of these risk factors.

We then apply our methodology to separate revenue streams for EKPC and the participating member, with revenues determined by their respective tariffs and the pass-through approach to fixed bill wholesale payments.<sup>4</sup>

**Step 2: Derive Joint Distribution**

Under our assumption of normality, a joint normal distribution can be derived, with the mean and standard deviation of this distribution being a function of the distribution parameters of the individual risk distributions. In this case, the distribution parameters for each of the parties involved appear in the table below.

[REDACTED]

	<b>Standard Deviation</b>
EKPC	15.2%
Member	5.1%
[REDACTED]	[REDACTED]

**Step 3: Compute Cost of Incremental Risk of Fixed Billing**

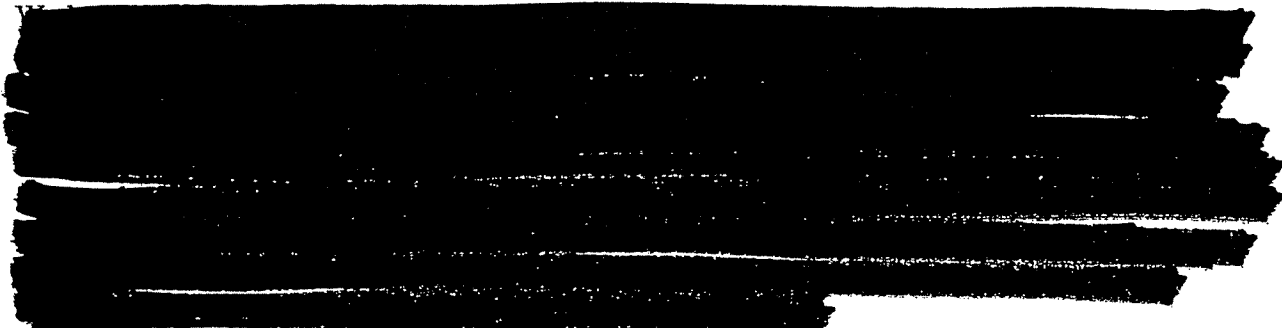
Christensen Associates values the incremental risks of fixed billing by means of the “Value at Risk” (VaR) approach familiar in financial risk estimation. The application here identifies the expected net revenue to each party from fixed billing in the current year and the net revenue that would result from a “worst case” outcome, defined as the 95<sup>th</sup> percentile (loosely, the “5<sup>th</sup> worst” outcome) and takes the difference between these two values. This is the revenue shortfall that

<sup>4</sup> A key assumption is that the expected kW is conditioned on the actual kWh, not the forecasted value; this reduces the risks arising from the kW uncertainty.

would have to be covered if the 95<sup>th</sup> percentile outcome were to occur this year. In this case, the providers (EKPC and the member) would each have to borrow this amount on a short-term basis. The borrowing cost to cover this shortfall is the cost of risk. The approach assigns this cost to participating customers in the form of the risk premium.<sup>5</sup>

To apply the approach here, we compute the VaR for each party based on our estimate of the annual revenue associated with a full-scale fixed bill program and multiply this dollar value by the cost of money. Based on estimates by Robert Camfield of 6 percent for EKPC and member Coops, we derive the following risk cost values:<sup>6</sup>

	<b>EKPC</b>	<b>Member</b>
FB Expected Base Revenue [REDACTED]	\$8,800,000	\$8,800,000
Standard Deviation	15.2%	5.1%
Scaled to 95 <sup>th</sup> percentile (St Dev x 1.645)	25.0%	8.3%
Value at Risk	\$2,200,000	\$730,000
Cost of Money	6.0%	6.0%
Risk Cost (\$)	\$132,000	\$44,000
Risk Cost (%)	1.50%	0.5%



Finally, we offer a cautionary note. The risk cost estimates presume that the expected quantity change value is selected as the quantity factor for the program. If a lower value is selected for some reason, then there will be an expected loss the first year, in addition to the cost of risk. In a pilot program this is not very important as the overall risks are small. However, when a full-scale program is offered, joint development of the quantity factor and risk premium is essential for an understanding of the true financial dimensions of fixed billing.

<sup>5</sup> This approach is not the only one that could be adopted. However, it has the advantage of having been accepted by two regulatory agencies already. One of these agencies discussed the risk calculations with the insurance division, since this calculation is inherently similar to the calculations insurance companies make to quantify the costs of risk.

<sup>6</sup> As may be evident in the table, a lower value for the opportunity cost of money results in a proportionately lower value of the risk cost (and similarly for higher values).

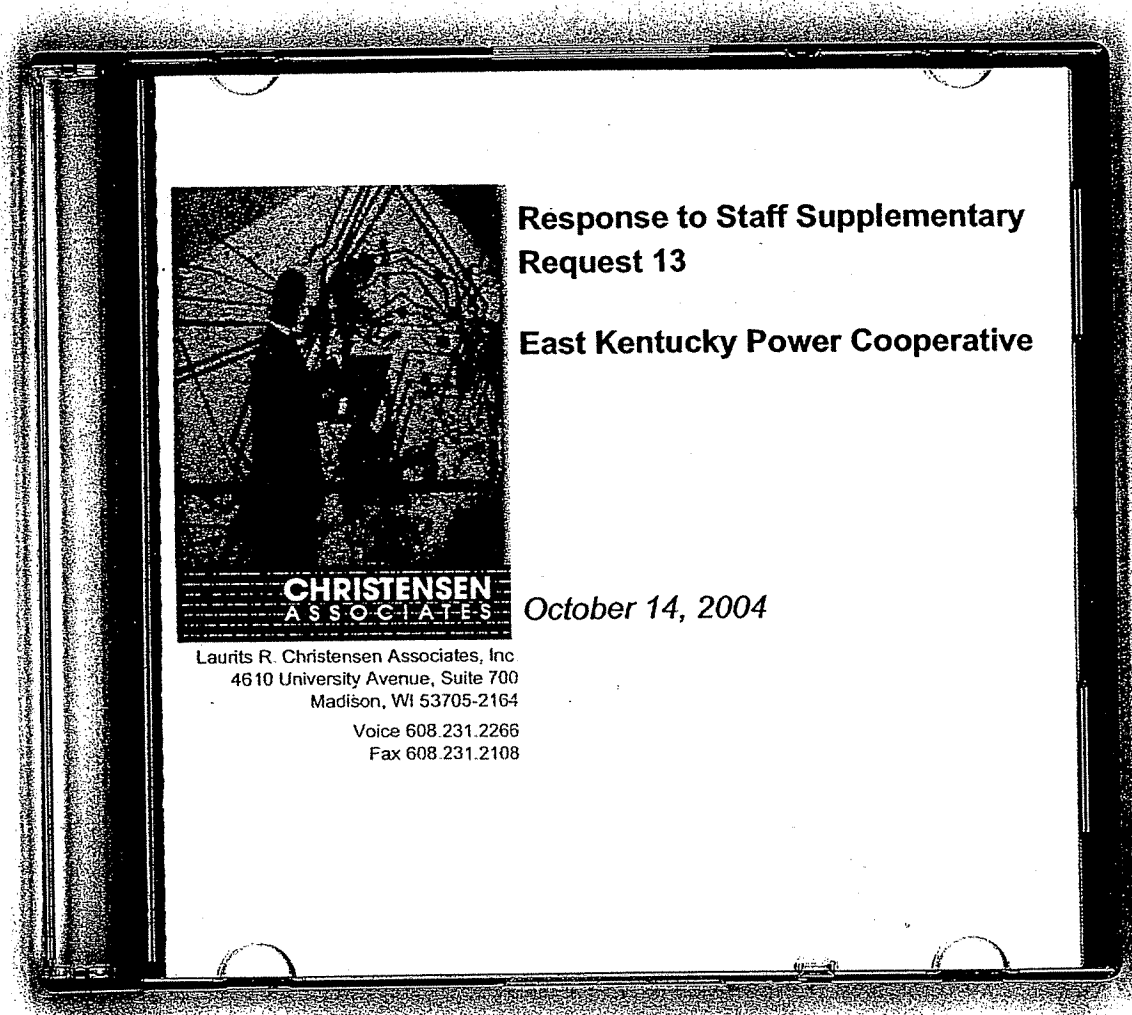


**PSC Staff**

**Supplemental Data Request**

**No. 13**

**Redacted Confidential Information**



**Response to Staff Supplementary  
Request 13**

**East Kentucky Power Cooperative**

*October 14, 2004*

Laurits R. Christensen Associates, Inc.  
4610 University Avenue, Suite 700  
Madison, WI 53705-2164  
Voice 608.231.2266  
Fax 608.231.2108

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