Forecasts of the Effect for Mississippi of Retail Competition in the Electric Industry

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on behalf of

Energy Consumers for Choice in Mississippi

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I. INTRODUCTION

I am a Professor of Economics at Clemson University. I was born and raised in Jackson, Mississippi. I hold a Ph.D. in economics from LSU. I have done extensive research and consulting in the electric power industry, especially in analyzing the benefits, effects, and issues surrounding restructuring the industry toward competition. I am speaking on behalf of ECCM to give you some estimates of the potential benefits that will result if competition is allowed in the electric industry in Mississippi.

In 1996, two colleagues and I published a study in which we made forecasts of what the electricity market would look like if retail competition were allowed. In that study we forecast savings of between 13 and 42 percent across all classes of customers. The midpoint estimate was a 25 percent reduction in price. For Mississippi in particular we estimated that residential customers would save around $20 per month on their electricity bill.

That study was based on a simple supply and demand analysis recognizing that there are substantial levels of idle generation resources in the country right now and that the true cost of generation from new facilities has declined precipitously. In the time since we published our study much has been learned about the competitive electric market, all of which confirms our predictions.

The wholesale electricity market is already competitive. The problem is that end-users cannot buy power in the wholesale market. Wholesale power can only be bought and sold by utilities. Even so, the competitive prices that we observe in the wholesale market give us an idea about what we can expect to happen to retail prices when the market is opened up.

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2 Customer Choice, Consumer Value, An Analysis of Retail Competition in America’s Electric Industry, M.T. Maloney, R.E. McCormick & R.D. Sauer, (Washington D.C.: Citizens for a Sound Economy), 1996. The information contained in this presentation to the Mississippi Senate represents results that are the product of joint work with colleagues at Clemson, other universities, and other institutions. Even so, I am solely responsible for the information presented here.
Wholesale electric prices are low, lower even than we estimated that they would be in our 1996 study. For instance, in 1996 Mississippi Power purchased about 20 percent of its electricity on the wholesale market. It paid 2.3 cents per kwh for this. If we compare this to the 5 cents per kwh for generated power on the Entergy Mississippi system, we get a sense of the what competition is doing in the wholesale market and what it will do to retail prices.

One reason that wholesale prices are so low is because the cost of generating power has fallen dramatically. New gas-fired generators using the most advanced turbine technologies deliver power at about 2.5 cents/kwh. This is the full cost including both capital and operating expenses. It represents the true economic cost of electricity and, hence, the competitive market cannot veer far away from this for very long. It is true that this cost figure is based on the current price of natural gas as well as the engineering efficiencies of the newest technologies. The price of natural gas may fluctuate, but we can only expect that efficiencies in turbines will continue to improve. Technology is driving the cost of electricity down, down, down. The only thing that is holding price up is regulation.

Based on what we know now, I forecast that competition in the retail market will cause electricity prices in Mississippi on average and across all customer classes to fall by 40 percent in the Entergy territory and 18 percent in the Mississippi Power area. This forecast is based on an analysis presented in section II below.

Lower electricity prices will cause an increase in economic well-being. We have attempted to quantify this effect. Using analysis similar to that presented in our national study and other work, I anticipate that the decline in electricity prices will increase manufacturing output in the State of Mississippi by nearly $300 million and increase state income by over $500 million. A discussion of these conclusions is presented in section III.

II. ESTIMATING COMPETITIVE PRICES BY UNBUNDLING COSTS

One way that we can forecast the price of electricity in a fully competitive electric market is by projecting how the wholesale price of power will determine competitive retail rates. In other words, the wholesale electricity market is now competitive. Hence, we have a good idea of what competition is doing to wholesale prices. However, because retail service is still regulated, these competitive wholesale prices are not passed along to retail customers except in a few cases. Even so, based on the regulated utilities’ cost of service we can forecast competitive retail electricity prices.

This process is called unbundling. In a competitive retail electric market, the public service commission will force existing utilities to open their lines to any bona fide energy service provider. These open-access energy service providers will be required to pay the utility a fee for the use of the wires based on the cost that the utility has incurred in providing these facilities. Utilities are already forced to report their costs broken down into functional categories of generation,

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3 Such as municipal power authorities that are not tied to long term power contracts. There are several of these in Mississippi and they offer insight into the effect competition will have on prices.
transmission, and distribution for the purposes of regulated rate making. Under open access competition, the public service commission will set a wires charge based on the cost of transmission and distribution only. Competition will determine the generation cost and, hence, the price to the consumer.

We can use the data currently provided by the utilities to estimate the cost of transmission and distribution. This coupled with the competitive wholesale price of generation gives a good estimate of the competitive retail price. This analysis for the two investor-owned utilities in Mississippi is shown in Table 1. Generation costs are estimated to be 2.5 cents/kwh. This is based on a survey of wholesale prices. Granted wholesale prices in a fully competitive electric market could be higher, but they could also be lower. Transmission and distribution costs are estimated from data provided to the Federal Energy Regulatory Commission by the utilities.

The costs of generation, transmission, and distribution vary across customer classes. This is true for many reasons. For instance, industrial customers usually do not use the distribution system. They take power directly from the high voltage transmission lines. Similarly, residential customers incur more distribution costs on average than do commercial customers. The cost of supplying generation is also affected. Consumers who use a lot of power during peak times incur higher costs than customers who have a flatter load profile. Generally speaking, industrial users have flatter load profiles than residential and commercial customers. These factors are built into our forecasts.  

Also, the estimates are based on the assumption that the whole is equal to the sum of the parts. That is, I assume that the cost incurred by the utility for distribution and the cost of customer service incurred by the competitive energy service providers will be approximately equal to what the utility is now spending on those two functions. The only thing that competition will do is force energy service providers to pass along competitive wholesale prices to retail customers.

**Competitive Price Reductions**

Table 1 shows the forecast competitive retail prices of electricity for residential, commercial, and industrial customers in the Entergy and Mississippi Power service territories. The savings for each class of customer are also shown.

In the Entergy service territory, savings are forecast to be 40 percent. Savings in the Mississippi Power territory are somewhat less. Prices should fall by around 18 percent. Prices are predicted to fall more in the Entergy service territory because regulated prices there are more out of line with the true economic cost of generation.

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4 When the public service commission gets around to setting the wires charge it must do a cost of service study to answer these questions.

5 This assumes that the public service commission determines the wires charge based on the true cost of providing distribution and excludes costs that are truly associated with energy supply. See our article for more discussion, “The Wires Charge: Risk and Rates for the Regulated Distributor,” with R. E. McCormick and C.B. Tyler, *Public Utilities Fortnightly*, September 1, 1997, 26-33. Some will argue that competitive energy providers will have to spend more than the utility is currently spending to provide energy and customer service. Others feel that competition will cut fat out of the system in ways that regulation cannot.
Even though there is a disparity in the amount of savings that competition will bring to customers in the two different service territories, competition will lower prices in both regions. Moreover the forecast of competitive prices indicate that price reductions can be expected across all customer classes. While it is true that prices are expected to fall the most for industrial customers, the savings to other consumers are substantial. Importantly, residential customers in both areas are projected to see falling prices—15 percent price reductions among Mississippi power households and 34 percent for Entergy residential customers. In total, the savings for Mississippi consumers in these two service territories will be nearly $400 million per year.

III. ESTIMATING THE MACRO ECONOMIC EFFECTS OF COMPETITION IN MISSISSIPPI

Lower electricity prices will mean more economic activity in Mississippi. If full retail competition comes to Mississippi, then lower electricity prices will be enjoyed by all customers. This will cause economic spillover effects that will increase production, incomes, and employment.

The Nature of the Economic Effects of Lower Electricity Prices

Competition will lower electricity prices. This will increase electricity consumption and spur economic growth in the region. A decline in electricity prices in Mississippi relative to other states increases the likelihood that industrial and commercial enterprises will choose to build new facilities and expand existing facilities in Mississippi over alternative locations.6

Moreover, the increase in output and employment leads to an increase in output and employment in support industries and services via multiplier effects.7 Multiplier effects result from the increased income of newly employed persons that lead to increased spending by them. This round of spending represents income for its recipients; hence, a multiple increase in income, greater than the income earned by the newly employed persons, will be created.

For example, suppose that lower electricity prices encourage a manufacturer of circuit boards to build a new plant in Mississippi rather than in South Carolina. The people making circuit boards are paid for their work. They then go to local stores and spend some of this income. This increase in spending represents an increase in income for its recipients, and on average their spending will increase also. Adding up all of the gains in income induced by the initial increase leads to a total growth that is a multiple of the initial increase in income.

Evidence of the Effect of Electricity Prices on Location

There is tangible evidence that businesses are concerned with electricity costs when deciding where to locate their operations. Companies with relatively large electricity requirements can and do exercise choice by locating in regions where electricity prices are low. The following chart

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6 Or close down plants elsewhere instead of Mississippi.
7 The multiplier effect is a phrase which refers to the process where an initial increase in income leads to a total increase in income which is a multiple of the initial increase.
illustrates that industries that use electricity intensively locate where electricity prices are lower. Intensity of electricity use is measured by the ratio of expenditures on electricity to the total value of production by the industry.\(^8\) The chart clearly shows that industries that use electricity more intensively pay lower electricity prices.

![Graph: Electricity Expense as a Share of Value of Shipments and Electricity Prices](image)

Second, a recent survey of economic development executives by Conway Data\(^9\) found that the cost and reliability of electric power and natural gas was an important factor in business location decisions. Approximately 1 in 5 of the executives surveyed ranked the cost and reliability of power in the top five factors driving site selection of businesses.

This effect of electricity prices on economic activity has been quantified several times. One of note concerns the State of New Mexico, a state that is similar to Mississippi in per capita income. In 1987, the University of New Mexico’s Bureau of Business and Economic Research used its model of the New Mexico economy (FOR-UNM) to estimate the effect of a 15 percent decline in the price of electricity. Their conclusion was that a rate decrease of this magnitude would (1) create 2,600 new manufacturing jobs, (2) increase total state employment by 5,100, and (3) increase personal income in New Mexico by $125 million.

The direct and obvious policy implication is that if the price of electricity in Mississippi falls relative to other states, more businesses will locate and expand their operations in the state. These business location decisions will increase employment and income in the Mississippi economy.

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\(^8\) All data are for manufacturing industries at the 2 digit SIC level. Electricity expenditures are taken from the Manufacturing Energy Consumption Survey, U.S. Department of Energy. The value of production is from the 1990 Annual Survey of Manufactures, U.S. Census.

\(^9\) Site Selection, p. 436, April 1996.
Effects of Increased Electricity Use on Gross State Product

Productivity Growth and Electricity Use

The positive economic effects which stem from the increased availability of energy supplies are well documented. Moreover, the special role played by the flexibility of energy in the form of electricity has also received substantial attention in the economic and historical literature. As the 20th century has progressed, the inherent advantages of electricity have caused it to be substituted for other forms of energy. Electricity has both substituted for other energy inputs in existing techniques and made possible new methods of production. Modern technologies and modes of production are inherently based upon the spatial flexibility and reliability of electricity relative to other forms of energy. 10

These concepts are manifested in the fact that electricity use in manufacturing grew at a rate of 8 percent per year over the past century, more than twice the rate of growth of manufacturing output (3 percent). 11 For each of the sub-periods 1899-1920, 1920-1948, and 1948-1985, electricity use in manufacturing increased at substantially greater rates than the use of capital and labor inputs. The relative growth rates of inputs in manufacturing is further evidence of the increasing importance of electricity as a factor of production. These basic historical trends highlight the fact that abundant supplies of electricity are essential to production and economic growth. Electricity supply is a key component of the infrastructure necessary for productive economy. A cramped supply of electricity inherently entails a cramped ability to produce.

Statistical Evidence on Electricity Intensity and Productivity

Quantitative evidence on the effects of electricity on productivity growth further substantiates the record, and can be used to assess the effects of increased availability of electricity on the economy. In a detailed study of productivity at the level of individual industries, Dale Jorgensen found that the productivity increased with the utilization of electricity stimulated by lower electricity prices. Specifically, Jorgensen found that increased use of electricity "stimulates technical change" in 23 of the 35 industries studied. 12

At the aggregate level, John Moroney documented that labor productivity was positively related to the intensity of energy use in the economy. 13 Moroney's study found that output per worker was significantly higher in economies that use energy more intensively. In addition, numerous demand studies document that the industrial and manufacturing sectors make more intensive use of electricity when its price is lower. Moroney's evidence squares with the widely held view that

energy price increases during the 1973-1980 period are responsible for the slower rates of
economic growth realized in the last 25 years in the United States.\textsuperscript{14}

In specific terms, Moroney estimated that the elasticity of output per worker with respect to
energy intensity was 0.17. This figure implies that a 10 percent increase in energy intensity is
associated with a 1.7 percent increase in labor productivity. We can use this evidence as a
benchmark from which to estimate the effects of an increase in the availability and use of electric
energy in the Mississippi economy.

In addition to applying Moroney’s estimated effect of electricity to forecast the effect of an
increased supply of electricity, we have estimated our own model. Our model replicates and
confirms Moroney's findings by examining productivity in manufacturing in a cross section of the
50 states of the U.S. Our study measures the influence of electricity intensity on output per
worker in manufacturing among the 50 states. A brief discussion of this analysis is presented in
the appendix.

\textit{Projections of Increased Electricity Consumption}

In order to apply these models which capture the effect of lower electricity prices as a result of
competition, it is necessary to forecast how much more electricity will be consumed as a result of
lower prices. In other work that we have done, we have focused on this question. In general,
there is little doubt that lower prices encourage additional consumption in electricity just as they
did the consumption of all items. In electricity, we have found that the overall price
responsiveness is around 1 for 1. That is, for every percentage decline in price, there is a
percentage increase in electricity usage. This means that if competition causes price to fall by 25
percent, then consumption is expected to increase by 25 percent as well.

This is a long term phenomenon. It is likely that the short term effect of lower electricity prices
will result in a more muted price responsiveness. However, we are interested in the long term
economic effects of a move to competition. It is also notable that the price responsiveness of
various customer classes is different. Industrial customers seem to be the most responsive while
commercial customers are the least, and industrial customers are very likely to be the first to make
capital changes that will affect electricity consumption. Finally, one of the things that we are most
sure about in a competitive market environment is that products and services will change
dramatically. One of the big things that we think will be spurred on by competition is an increased
use of thermal energy storage devices. These are devices that use electric energy at night to heat
or cool solutions that are then used for air conditioning during the day. Competitive prices will
make devices such as these, which use more electricity, very economical.

\textsuperscript{14} Throughout this period the U.S. continued to accumulate capital, labor, and raw material resources at historical rates.
Output has not kept pace however due to slower rates of growth in productivity. Many economists trace the origins of
the productivity slowdown to the energy price increases in the 1970s. That energy price increases have ceased to
increase in recent years, with productivity growth recovering is evidence supporting this view.
Projections of Increased Output and Income

The Moroney model as well as our own can be used to estimate the effects of a competitive electricity market on the economic well-being of Mississippi. Since our model is based on Gross State Product data from 1994 (the most recent available), the projections presented here will be based on data from that same period. To estimate these effects, we use the estimated multipliers presented above to project increases in average productivity per worker that follow from increased intensity of electricity use. The percentage increase in productivity is then multiplied by existing levels of production to obtain an increase in total state output.

To apply the Moroney model, the increased quantity of electricity used as a result of the move of competition is converted to an increase in total energy used throughout the Mississippi economy. If the service territories of Entergy and Mississippi Power are opened to competition, we project that electricity consumption will increase by 5.8 million MWh. This represents a 14.8 percent increase in total electricity consumption in Mississippi. Electricity's share of total energy use is 36.3 percent. Hence, the 14.8 percent increase in total electricity consumption results in a 5.4 percent increase in total energy use. Multiplied by the output elasticity estimate of 0.17, this yields an increase in total output of 0.9 percent, or a total of $537 million based on 1994 Gross State Product (GSP).

Our economic impact model focuses exclusively on manufacturing output and electricity use. Hence, we look only at the effect of competition on industrial electricity usage. Competition in the Entergy and Mississippi Power service territories is expected to increase industrial electricity consumption by 2.3 million MWh, which is a 14.4 percent increase for the whole state. Multiplying the increase in industrial electricity use by the our model’s estimated elasticity of 0.168 yields a projected percentage increase in manufacturing output of 2.4 percent. The 1994 level of manufacturing output in Mississippi was $11.85 billion. An increase of 2.4 percent from that level translates to a total increase in manufacturing output of $287 million.

IV. SUMMARY

The bottom line is that if retail competition comes to Mississippi, consumers in the service territories of Entergy and Mississippi Power can expect to save $394 million annually compared to their 1996 power bills. These savings will translate into a $287 million increase in annual manufacturing output and a $537 million increase in annual state income. Benefits this large can significantly improve living conditions in the state.

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15 This is the nation-wide percent which we assume is similar to Mississippi.
16 In 1994 dollars.
Table 1
Unbundled Fees for Generation, Transmission & Distribution, and Forecast of Competitive Price

<table>
<thead>
<tr>
<th>Unbundled Costs</th>
<th>Entergy Mississippi, Inc.</th>
<th>Mississippi Power Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast Competitive Price of Generation</td>
<td>2.66</td>
<td>2.61</td>
</tr>
<tr>
<td>Fully Allocated Cost of Transmission</td>
<td>0.42</td>
<td>0.28</td>
</tr>
<tr>
<td>Fully Allocated Cost of Distribution (Residential and Commercial Customers)</td>
<td>1.77</td>
<td>2.03</td>
</tr>
</tbody>
</table>

Price Forecasts

RESIDENTIAL CUSTOMERS
- Current Price: 8.23, 6.59
- Forecast Competitive Price: 5.43, 5.59
- Savings: 34%, 15%

COMMERCIAL CUSTOMERS
- Current Price: 8.03, 5.69
- Forecast Competitive Price: 4.76, 4.93
- Savings: 41%, 13%

INDUSTRIAL CUSTOMERS
- Current Price: 6.05, 3.57
- Forecast Competitive Price: 3.16, 2.80
- Savings: 48%, 21%

Total Dollars per year

AGGREGATE SAVINGS $325,130,160 $68,684,033

Prepared by M.T. Maloney, Clemson University, August 1998

Notes:
- Data taken from 1996 FERC Form 1.
- Competitive generation cost taken from wholesale price in the region.
- Competitive generation cost includes system line losses.
- Allocation of generation, transmission, and distribution costs across customer classes based on relative line losses and load factors.
Biography

Michael T. Maloney

Michael T. Maloney is a Professor of Economics at Clemson University, a position he has held since 1984. He was Department Head for eight years. In addition to Clemson, Maloney held a faculty position at Emory University and was a senior financial economist at the U.S. Securities and Exchange Commission.

Born in Jackson, Mississippi, Maloney is married and has two children. He received is B.A. at Lewis College in 1970, an M.A. from Western Illinois University, and his Ph.D. from Louisiana State University, 1978.

Maloney has published in numerous scholarly journals and is associate editor of the Journal of Corporate Finance and Studies in Economics and Finance. Fields of interest include financial economics, industrial organization, and government regulation and deregulation.

Recent research on electricity deregulation includes:


APPENDIX

The electricity-productivity model that we developed is a regression estimation of the output per worker as a function of electricity usage and the various components of public capital per worker including all infrastructure such as water and sewer facilities, roads, and investments in education.\(^{17}\) The estimation procedure also controls for the idiosyncrasies of the various economic regions of the country. The form of the estimating equation is:

\[
\text{Output per Worker} = \beta_0 + \beta_1 \text{Electricity Intensity} + \beta_2 \text{Public Capital} + \beta_3 \text{Regional Effects}
\]

The estimates are summarized in Table A1.

![Table A1](image)

The coefficient on electricity intensity is the elasticity of manufacturing output per worker with respect to industrial use of electricity. The value of 0.168 indicates that an increase in the use of industrial electricity of 10 percent, ceteris paribus, is associated with an increase in manufacturing output of 1.68 percent. This elasticity coefficient is estimated with reasonable precision, and is statistically significant at the 0.05 level.\(^{18}\)

\(^{17}\) Capital measures were obtained from Douglas Holtz-Eakin, "State Specific Estimates of State and Local Government Capital," *Regional Science and Urban Economics*, April 1993. The output measure is manufacturing's contribution to 1994 Gross State Product, which are the most recent figures available from the Bureau of Economic Analysis, Department of Commerce (Survey of Current Business, June 1997). Data on total employment and employment in manufacturing by state is from the Bureau of Labor Statistics. Industrial electricity use is from the DOE-EIA file.

\(^{18}\) The effects of state capital stocks are not estimated precisely, although capital investments in education are positively related to manufacturing productivity per worker. The lack of a strong positive relation between public capital stocks in various forms of infrastructure has been noted by other authors (see Holtz-Eakin, 1993).