ECONOMIC COMPETITIVENESS IMPACTS OF UTILITY RATES AND PROGRAMS

Rate, Incentive and Technology
Programs as Strategic Weapons

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ABSTRACT

For a utility, innovative rates and efficient technology programs represent potential tools to generate revenue and enhance the economic position of its customer base. This article discusses key factors affecting these outcomes. It describes analysis methods for examining how energy rates and customer programs can differentially raise or lower the productivity and relative cost of doing business for various types of business, affecting relative prices, capital investment and business growth. It illustrates how the economic impacts can depend on the mix and design of the utility's rate/program "portfolio," and how that portfolio can be targeted to leverage those industries where there is the most potential for local business retention and growth.

ECONOMIC COMPETITIVENESS IMPACTS OF ENERGY RATES AND PROGRAMS

As utilities move towards a more competitive environment, it will become increasingly critical to understand how their rates, programs and policies can together affect the economic competitiveness of their customer base and their own profitability. This issue is particularly important because no energy-related program or policy can affect all businesses the same. The distribution of benefits may vary among types of business activities, they may vary over time, they may differ between shrinking businesses and growing businesses, and they may differ between customers interested in new equipment investments and those not interested in them.

Differential impacts are, in fact, an intrinsic aspect of programs and policies affecting sales of any normal product or service. They occur for both unregulated and partially-regulated industries (e.g., airlines and telephone rates and services). The differential impacts may be unintentional or intentional. It is the opportunity to intentionally target the differential impacts of energy products and services that gives them strategic value.

If a goal is to encourage the economic growth of a utility's customer base and service area, then it can be important to assure that the policies and programs are instituted in ways which <u>enhance</u> rather than stifle business expansion and business growth potentials. It can be equally important to assure that they are also instituted in ways which <u>discourage</u> rather than encourage business contraction and business loss risks among that business base. To accomplish that, benefits must be targeted to those recipients for whom they will leverage positive economic results. (This issue of strategic targeting is further discussed in Weisbrod, 1994).

These positive results can be measured in several different ways. From the viewpoint of a utility, they can be measured in terms of the additional net revenue generated from an expanded customer base. From the viewpoint of a state economic development agency, they can be measured in terms of the additional jobs and net income for residents of the state.

Either way, the driving force for accomplishing these benefits is the encouragement of economic expansion in the constituent area.

Theory -- The Basis for Identifying Economic Development Benefits and Costs
Advocates for subsidizing various types of rates, programs and policies --whether they be special economic development incentives, energy conservation programs or renewable energy technologies-- often use the justification that they will ultimately be "good for the area economy." In fact, the impact of these policies and programs is complex and can be positive or negative. In general, economic development impacts occur through two types of mechanisms:

(1) **Income and Spending Pattern Shifts --** the effect (over time) of raising, lowering or otherwise shifting expenditure patterns and energy demand for various types of customers.

-- Programs can initially shift the available demand for, and supply of, various types of energy products (e.g., insulation, fluorescent lighting and ballasts, variable speed drives, geothermal heat pumps, etc.) Ultimately, shifts in income and spending patterns can affect: (1) the mix of products and services which is locally produced, (2) the mix of products and services which is provided by outside sources and (3) demand for various types of jobs in the local area.

(2) **Competitiveness Changes --** the effect (over time) of increasing or decreasing prices and costs of doing business for various types of local industries, as well as the cost of living for residents.

-- This can occur through shifts in the costs of energy inputs, equipment purchases and operating and maintenance costs of equipment used. The net result can be a shift in the competitive position of local industries relative to outside competition, which is likely to affect investment in retention or expansion of existing businesses and attraction of new businesses. Over the long run, population in/out-flows may also be affected.

Both of these types of changes can have consequences for the generation of local income, corporate profits and business activity expansion/contraction, as well as changes in energy demand. Both utility customers and the utility itself are affected. Utility profits themselves depend critically on the economic health and economic development of the customer base, as well as the cost structure for serving that base. Utility customers are affected most directly by changes in available disposable income and capital.

The ways in which special pricing incentives, energy efficiency and renewable energy programs may work is summarized in Table 1.

Table 1: Direct Economic Effects of Energy Programs

ENERGY PROGRAMS ECONOMIC EFFECTS	Pricing Incentives	Renewable Technology Promotion/ Incentives	Energy Efficiency Promotion/ Incentives
Shift/Reduce/Increase Energy Demand	–		–
Displace Existing Energy Supply		–	–
Expenditure of Utility $ on Products and Services		–	–
Shift Customer Demand (Spending) Patterns	–		–
Raise Energy Prices		–	(maybe)
Reduce Customer Energy Costs	–		–

We can illustrate how these mechanisms work to redistribute spending and income through the example of energy efficiency programs. In general, they may work in any or all of the following ways:

(1) These programs reduce demand for energy or increase the efficiency of energy use, through educational, organizational or incentive mechanisms.

(2) They effectively reduce costs of doing business for some segments of local businesses, and reduce cost of living for some segments of local residents.

(3) They may be financed by increased energy rates for a period of time, which directly or indirectly raise costs of doing business (or costs of living) for some other segments of the local customer base.

(4) To accomplish their energy efficiency goals, there is an increase in local spending on energy-saving equipment and materials, which generates short-term income for suppliers of those products and services.

(5) The long-term realization of energy-saving goals may also mean a reduction in local spending on energy and hence a reduction in revenue for its local suppliers and distributors.

(6) These changes may be offset by increased local economic growth or accentuated by additional contraction of the local economy.

In this example, the overall economic development impact may be positive or negative. There are shifts in spending patterns which make some segments of industry gain revenue while others lose revenue. There are also shifts in costs of doing business, which affect the competitive position of local areas.

The six factors, identified above, act together to determine patterns of business investment and hence the relative growth of various types of local businesses. They can also affect regional purchase patterns -- i.e., the extent of local spending which flows to local businesses. Most importantly, there is a significant time element in these patterns, in which benefits and costs occur at different times. Thus, some businesses may expand and contract at different times, which ultimately will affect personal income, corporate profits and energy demand.

Methods -- Four Steps to Assess Economic Impacts

In order to assess the full economic impacts of utility rates and customer programs, it is necessary to evaluate the direct program impacts on spending patterns and energy costs, the indirect effects on applicable regional economies and their implications for business productivity and competitiveness. Illustrative examples are presented from an economic impact study of Iowa's utilities, conducted for the Iowa Dept. of Natural Resources (Hagler Bailly Consulting, 1995). The major feature which distinguishes this approach is its focus on the measurement of customer competitiveness and impacts of shifting program mix and pricing on capital flows. The lack of price responsiveness has been a drawback to previous studies of energy program impacts. (For further reading on business impacts of utility programs and rates, see also Megdal and Rammaha, 1992; Moscovitch, 1994, Laitner et al, 1994. and Weisbrod and Ford, 1996).

Step #1: Program Cost and Benefit Profile. All rates schemes, product offerings and service offerings have differential patterns of direct spending, and they can therefore be wielded as strategic tools for targeting benefits. In order to design and evaluate those targeting benefits, the first step is to identify the distribution of program costs and benefits, by type of business and over time. This includes:

- **Participation** - the profile of customers participating in programs, and the pattern of financial incentives flowing to them;

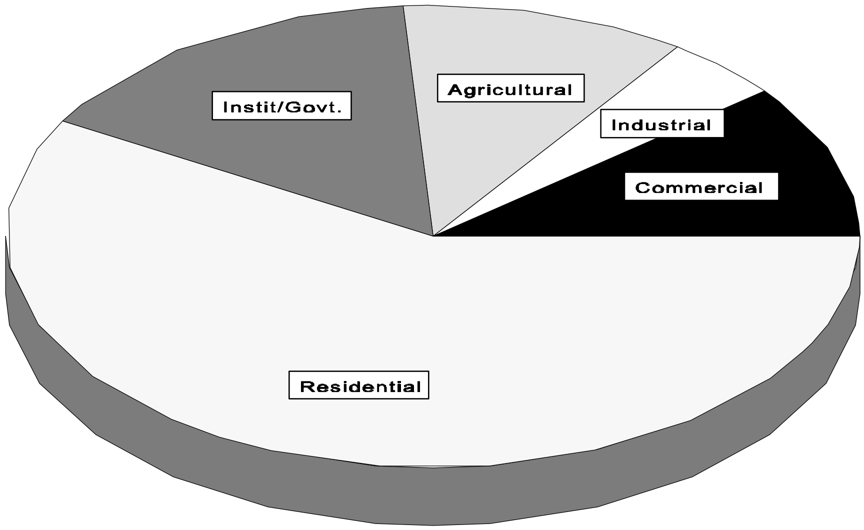
- **Cost burden** - the magnitude of program costs incurred by the utility (and by customers, through rate impacts):

- **Spending pattern** - the distribution of direct utility spending and induced customer spending on various types of services and products as a result of the program implementation, operation, participation and/or evaluation.

Such information is important because these elements of program design affect the flow of dollars and the generation of income in the economy.

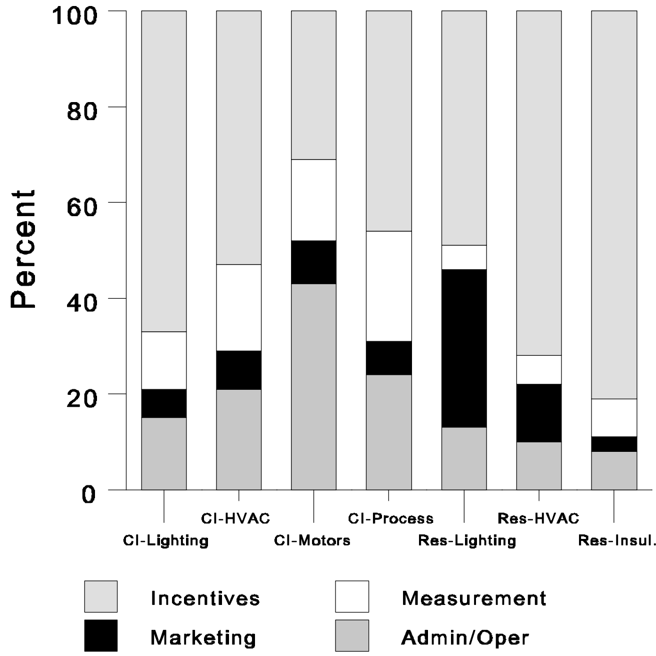
A survey of energy efficiency program expenditures, conducted as part of the Iowa statewide study, illustrates how utility spending patterns and participant benefits can be distributed among various types of firms and customers. The breakdown of program spending, summarized in Figure 1, shows that the various elements of program cost -- and hence the relative benefits to manufacturers, installation contractors, marketers and consultants -- can vary significantly in relative size among different program types. The estimated distribution of incentives from Iowa utility programs, summarized in Figure 2, indicates that some customer sectors have been receiving a particularly large share of the energy efficiency incentives paid out.

Figure 1: Components of Spending on Energy Efficiency Programs, by Program Type (Iowa, 1994)



(Source: CI - Commercial & Industrial Sector; Res - Residential Sector (Source Utility Records)

Figure 2: Distribution of Incentives for Energy Efficiency Programs, by Customer Sector (Iowa, 1994)



(Source: Utilities records)

The distribution of incentives paid to participants can be compared to the distribution of energy sales to all customers, as an indicator of the extent to which some customer segments are receiving a disproportionately high share of incentives. The information to do so is readily available. In the current regulated environment in which program costs are covered in the rate base, such comparison will raise politically volatile debate concerning equity among customer classes. In reality, the pattern of spending on incentive payments is driven by many factors which include not only the composition of the customer base, but also the mix of programs offered, the differential benefit/cost pattern associated with various types of technologies, and the differential pattern of customer responses to any given set of program offerings. As utility markets continue transitioning to a more competitive mode of operation, it will become both easier and more important for utilities to strategically target their programs to maximize customer value, growth (or retention) and profitability.

Step #2: Regional Economic Profile. The next step is to document the nature of the regional economy affected by the program-induced shift in flows of products and services. For energy efficiency and renewable energy programs, this includes:

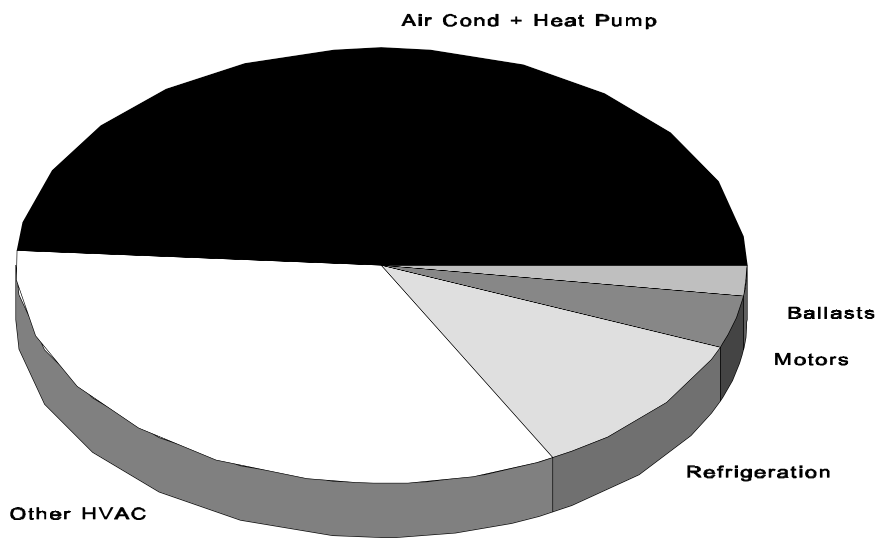
- **Supply** - the profile of businesses supplying program-related equipment and services, and the pattern of sales revenue flowing to them as a consequence of these programs;

- **Displacement** - the traditional equipment producers or energy sources which are being displaced as a result of these programs.

This information is important because these aspects of the regional economy affect the magnitude and mix of dollars flowing to various business sectors within the region and the magnitude of dollars flowing out of the region. It can vary greatly among regions of the country.

Figure 3 illustrates the results of a survey and study of Iowa firms engaged in the manufacturing and distribution of electric and gas powered products. One finding of that survey was that Iowa's manufacturing sector features a relatively high level of production of energy efficient heat pump and refrigerator products (many of which are exported out of state), and a relatively smaller level of production of energy efficient motors and controls (many of which are produced elsewhere and shipped into the state). The importance of that finding is that the economic benefit to Iowa's economy from promoting energy efficient products will differ depending on the particular end use technologies being promoted.

Figure 3: Distribution of Sales by Manufacturers of Energy Efficient Products In Iowa (1994)



Source: (Survey of Manufacturers, HBRS 1994)

Step #3: Local Business Competitiveness Assessment. In addition to the direct spending impacts discussed in Steps 1 and 2, various combinations of pricing, product and service offerings can also affect the cost competitiveness of business customers. These "competitiveness impacts" can purposefully or inadvertently affect a utility's own market growth and retention of business customers. In order to design programs which enhance the competitiveness of business customers, it is clear that utilities must understand the nature of such potential impacts, which depend on the relative strengths and weaknesses of the local economy for attracting or retaining different types of business, as well as their sensitivity to energy costs. The following factors come into play to affect business responses to energy cost changes:

• **Relative Importance of Energy Costs** - the contribution of energy costs to overall cost of operations, for each given industry;

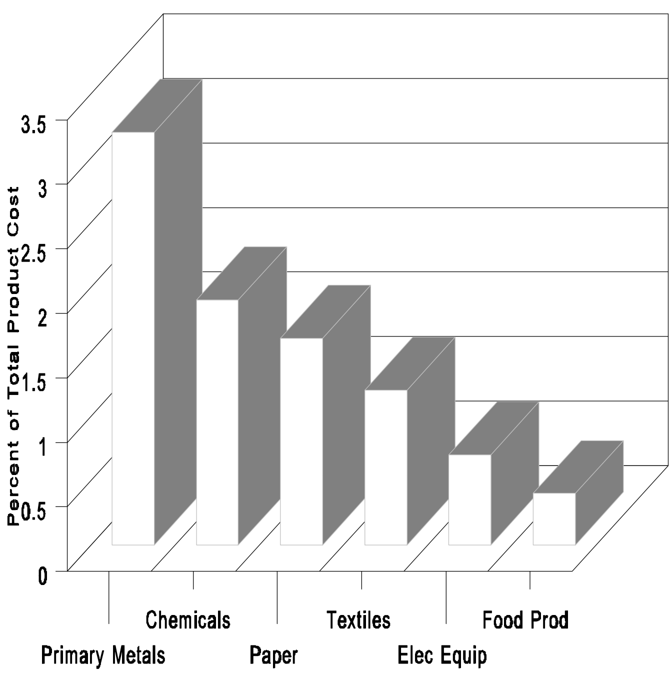
• **Cost Competitiveness** - the cost of doing business for various types of businesses in this region, relative to elsewhere;

• **Sensitivity to Cost Changes** - the relative sensitivity of business expansion and contraction in various types of industries to relative changes in business costs. (This depends on the ease of relocating the industry while serving the same market base, and prevailing profit margins in the industry.)

This analysis is critical because the same change in energy costs can have a very large or very small impact on business activity, depending on the industry, its competition and location alternatives.

The determinants of a business response to energy cost factors are complex. One factor -- but by no means the most important factor -- is the relative role of energy costs in affecting overall cost of producing a product or providing a service. Figure 4 illustrates how the relative importance of electricity costs can differ by business type. In this example, it is clear that electricity is a larger share of overall costs for "heavy industries" such as primary metals, and a lesser share of overall costs for assembly industries such as electronic products. While electricity costs are most frequently less than 5% of overall business costs, profit margins in many industries are also less than 5% of gross sales volumes, so a change in electricity cost may still make a noticeable dent in the overall profitability of a business.

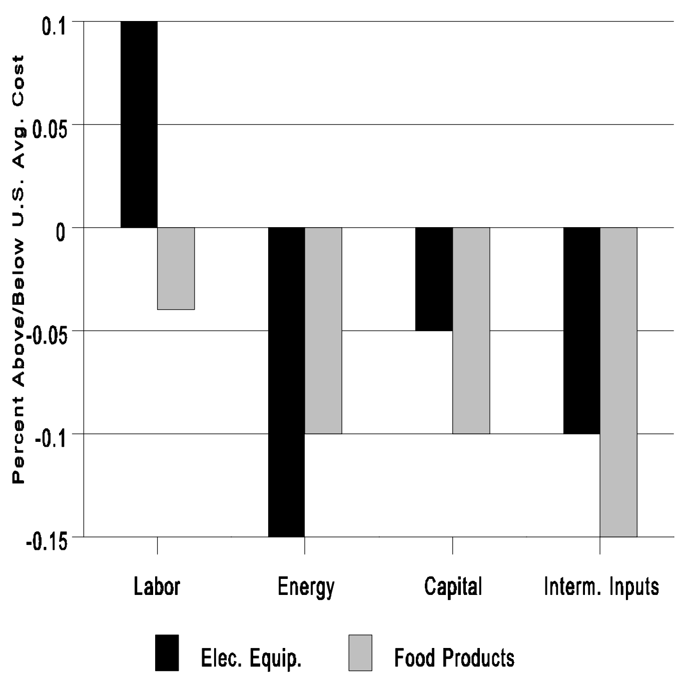
Figure 4: Electricity Costs as a Percentage of Total Product Cost
(Iowa Businesses)



Source: (US Bureau of Economic Analysis and US Energy Information Administration

Of course, energy costs are far from the only cost factor affecting business investment and location decisions. Other factors include energy, labor, capital, intermediate inputs (supplies), transportation, housing and taxes.   Figure 5 illustrates indicators of cost-competitiveness for selected industries in Iowa. It shows how the relative costs of doing business in Iowa differs from the U.S. average for the first four of the above-cited cost factors. Not only do different types of business differ in their relative reliance on these various factors, but also the costs for the individual factors themselves may vary depending on specifics of the labor skills, energy sources, capital financing requirements and intermediate supplies required. In this example, the electronics industry is found to be potentially at risk in Iowa, insofar as it has above average labor costs, compared to the rest of the U.S. despite lower than average costs for energy and other factor inputs. In contrast, the food products industry is shown to have lower than national average costs for all factor inputs.

Figure 5: Differences in Relative Cost of Doing Business, Compared to US Average (Example of Two Industries in Iowa)

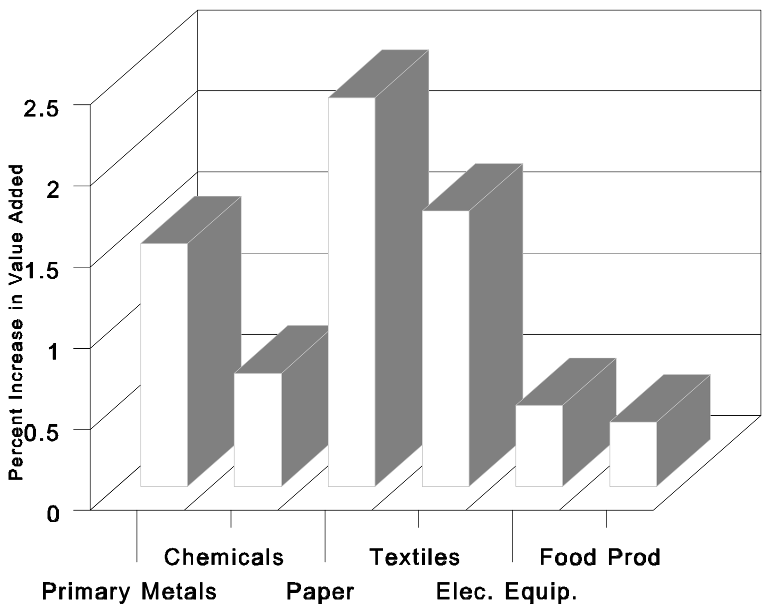


Source: Regional Economic Models, Inc., US Bureau of Labor Statistics, US Energy Information Administration, Moody's Reports and Quarterly Financial Report for Manufacturing)

To evaluate the relative sensitivity of industry growth to these various local cost factors, the REMI economic model was calibrated and applied for Iowa. This model utilized historical data for 1972 to the present on the cost competitiveness of doing business in Iowa relative to elsewhere in the U.S. (for each of 53 industries) and the growth of the Iowa economy relative to national growth (for each of those industries). The data was then used to estimate coefficients for predicting long-term (10-year) business response to shifts in various cost factors over time. (For more information on this model, see Treyz et al 1992 or Treyz 1993).

The model projections, illustrated in Figure 6, show that an across-the-board reduction in electricity costs would have very different impacts on various industries. In this example, it is notable that activity in the textiles and paper industries is shown to be more sensitive to changes in energy costs than activity in the primary metals and chemicals industries, even though the former were shown to have a lower overall dependence on energy costs (as illustrated in Figure 4). These differences demonstrate how some industries are more "footloose" or able to shift activities among locations than are others. A variety of factors, including profit margins and dependence on locational proximity to the supply sources, combine to determine which industries are particularly responsive to small changes in cost factors and which are not.

Figure 6: Long Term Impact of 20% Electricity Cost Savings on Industry Output (in Iowa)



Source: REMI Model

Several other key points need to be made in regard to these findings. First, it should be noted that a 1% increase in business value added (labor and corporate income) can represent more dollars than a 20% reduction in energy costs, for some industries. The translation of these changes in energy cost percentages into dollars differs, depending on the cost structure of the industry. Second, it should be noted that the magnitude of business impact predicted by the model is not necessarily linear. In other words, a 20% change in energy cost may translate into a larger or smaller change in business value added, depending on the industry and the extent to which it is "footloose." Finally, it should be noted that the particular findings shown here cannot necessarily be extrapolated to other regions. The particular findings shown here cannot necessarily be extrapolated to elsewhere. They are highly specific to Iowa, and are dependent on the particular regional economic mix there, the relative factor costs (illustrated in Figure 5) and the area's location relative to raw materials and markets.

Step #4: Scenarios Representing Program Mix Alternatives

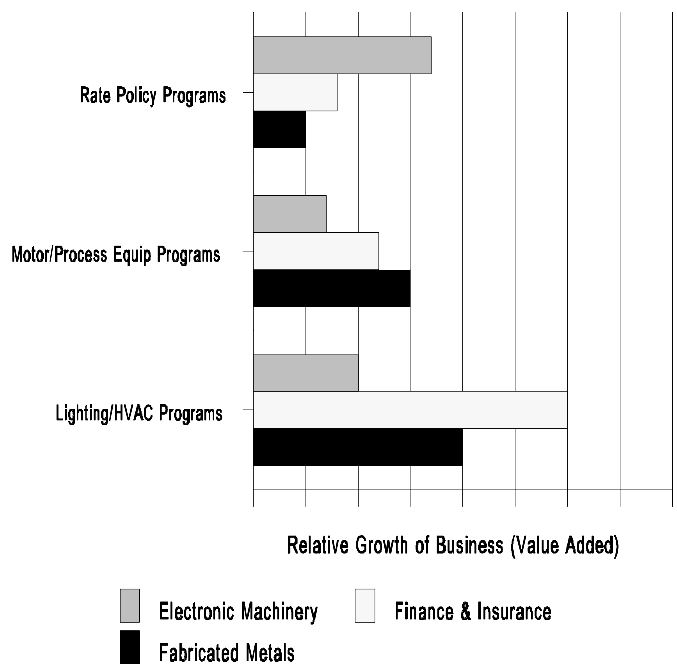
By affecting spending flows and relative costs, alternative program designs and mixes will ultimately affect the two types of results:

- **Economic Development Impacts** - effects on customer revenue and income
- **Financial Impacts** - net revenue impacts for utilities

To estimate the impacts associated with alternative program/pricing scenarios, an Economic Development Impact Analysis (EDIA) system was developed. The EDIA system is a computer analysis program which estimates --on a year by year basis -- how a given combination of utility programs will affect: (1) patterns of spending by the utility and its various types of customers, (2) energy rates and prices provided by the utility and faced by the various types of customers, (3) cumulative energy savings results of the program and its impacts on energy consumption levels for the various types of customers, (4) changes in overall costs of doing business for the various types of customers and (5) changes in business competitiveness and regional economic growth. The EDIA system is designed to be used in conjunction with the REMI model, which is the source of detailed information on how shifts in business competitiveness in a given area will affect that region's long-term employment and economic growth. This approach is intended to assist program and policy design by providing a spreadsheet-style "what if" analysis, which allows the analyst to quickly assess the implications of many alternative combinations of program size, mix, targeting and pricing. (For more information on the application of this approach for evaluating energy program impacts, see Hagler Bailly Consulting, 1995). This approach parallels methods used for assessing the business impacts of transportation system changes (see in Weisbrod 1996 or Weisbrod and Bechwith, 1992).

Figure 7 illustrates impacts on business growth which are projected to result from three different mixes of energy efficiency programs in Iowa. All three scenarios involved spending the same amount of money on utility programs, but each targeted a different set of end uses. The results illustrate how various differences in pricing and energy efficiency program mix can affect the composition of beneficiaries. In this example for the state of Iowa, the incentive rate policy caused particularly high growth for the electronics industry, while the lighting/ HVAC programs particularly benefited the finance and insurance industries and the process equipment programs particularly benefitted the fabricated metals industry. For purposes of clarity and illustration, only relative levels of impact are shown in that figure. The full model results included year-by-year estimates of impacts on industry output, and those can be directly used to project utility revenue consequences.

Figure 7: Relative Impact of Alternative Program Portfolios



Source: Hagler Bailly Consulting

This same analysis approach was also used to estimate impacts on the overall state economy resulting from shifting the technology targets of energy efficiency programs. The same amount of program incentives were assumed to be focused on either lighting, HVAC, insulation, water heating, (commercial) cooking or selected industrial processes. The resulting forecasts showed that a mix of programs focusing on building HVAC and water heating could generate 64% more business value added income in Iowa than the same level of incentives focusing on lighting and process equipment. This finding was highly specific to Iowa, since it reflected the high level of locally-produced HVAC products (and relative lack of locally-produced lighting products), as well as the relatively low level of industrialization there (which limited the level of local reinvestment from industrial process savings).

Conclusion -- Advantages of Optimizing a Program/Pricing "Portfolio"

The results shown here lead to three general conclusions:

1. Utility rates, product and service offerings and incentives can have differential impacts on both business spending patterns and business costs. The mix of these rate/product/service offerings can be targeted to affect business loss or gain.

2. Economic impact modeling techniques are available and can be used to test and evaluate alternative scenarios. The economic simulation model, used in conjunction with a program analysis system as described here, can be applicable for estimating the competitiveness and economic growth impacts of many alternative packages of rate, product and service offerings.

3. By managing a "portfolio" of rate, product and service offerings, a utility can better select the combination of rates and offerings which best enhances local economic growth and its own profits. This portfolio can include a wide variety of explicit and implicit elements, such as:

- incentives for end-use equipment upgrades or conversions
- competitive rate or load management rate designs
- rate class eligibility targeting
- marketing information and service targeting
- innovative arrangements including competitive contracts, financing and/or service offerings.

It will become increasingly critical, as full retail competition in the electricity industry emerges, to understand how various rates, product and service programs or policies will affect competitiveness for both utilities and customers. Armed with appropriate assessment tools, utilities may better target programs and policies for specific industries, in order to minimize adverse (rate) impacts and maximize valuable efficiency, competitiveness and profitability impacts.

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