# PACIFIC POWER'S LEAST COST PLANNING PROCESS

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Pacific Power has completed an integrated utility planning process. The planning process utilized public involvement and produced a useful compromise to reconcile social and corporate perspectives. A series of spreadsheets on standard commercial software were developed to estimate conservation supply curves. Supply curves are not very useful for program planning--for this purpose, target area maps were developed. The process of designing programs for integrated planning is discussed. Finally, demonstration of value within the company is discussed.

## PLANNING METHODOLOGY

Pacific Power has completed an integrated utility planning process (Pacific Power, November 1989). Important regional planning has taken place under the auspices of the Northwest Power Planning Council (Northwest Power Planning Council 1986 and 1989) Pacific has borrowed heavily from their pioneering work. The planning process at Pacific has emphasized practicality. Pacific intentionally avoided complex integrated planning models with elaborate theoretical development. Instead, the planning process is dispersed in a number of small modules. These modules were created using relatively simple computer tools, such as spreadsheets. Each module is the charge of different sections within the company. This division of labor encourages cross-communication within the company and a feeling of shared ownership. A flow chart of the process is shown in Figure 1.

The Forecast is used to predict growth in the number of customers and the amount of building stock. That information is combined with end-use models to estimate the Load Forecast. The Supply Side resources are based on the company's traditional generation alternatives with the significant addition of new independent and small renewable resources. The Demand Side model relies on assembling end-use models of the various customer segments. The Integration portion of the plan is the process of choosing the least-cost set of resources, taking into account timing and implementation considerations. This process is explored with a series of scenario examples. The final outcome is a company resource plan consisting of detailed near-term actions to build capability for long-term flexibility. During the planning process, Pacific consulted with an Advisory Group whose members represented customer groups, citizen groups, government agencies and planning professionals from other utilities. The goal of the integrated planning process is to prepare a least cost utility plan.

## PLANNING PERSPECTIVE

Least Cost Planning presents a fundamental dilemma for planners. Fiscal responsibility dictates that the utility must plan on a basis that recognizes the cost of doing business and of capital limitations. At the same time, Least Cost Planning expects the utility to make decisions based on societal cost including externalities. Inclusion of externalities was ordered by the Oregon Public Utility Commission and represents a significant addition to the requirements of other state agencies (OPUC 1989). It is possible that choices between demand-side and supply-side resources can be affected by this difference in perspective.

How are these perspectives to be reconciled? Based on Pacific's experience, a two-tiered cost effectiveness determination is proposed. General resource

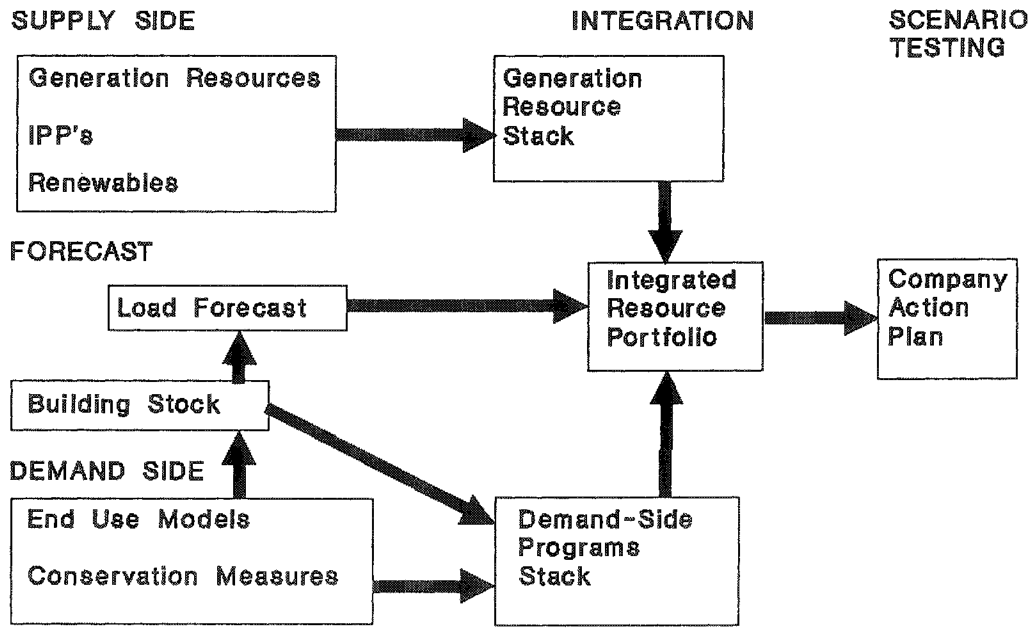


*Figure 1. Least Cost Planning Process*

choices can be selected from a society viewpoint but with the amount of the utility investment constrained by the utility's financial alternatives.

Inclusion of externality costs may require a somewhat different nomenclature. Standard economic tests required in California specify the Total Resource Cost (TRC) as a proxy for Societal cost (CPUC and CEC 1987). TRC is defined as the sum of utility and consumer costs, including quantifiable externalities. It differs from full societal cost in leaving out those externalities difficult to quantify, for example, the cost due to global warming. A broader definition of TRC could include estimates for such external costs.

In the first part of the test, supply-side and demand-side programs compete with each other on the basis of their average TRC cost. The programs are integrated into a utility action plan which draws the least cost program from the resource supply curves. However, this determination can be awkward for the utility. What if consideration of externalities leads to deferring a supply-side resource with low utility costs due to potentially large externalities? How can the utility justify its responsibility for prudent financial management with the requirement to consider externalities? Discussions with Pacific's Advisory Group produced one compromise suggestion--develop a cost or savings sharing formula so that utility costs are no worse than under the supply-side option. This represents the second tier of the test.

As an example, consider the comparison of residential retrofit weatherization program against a new coal-fired generation plant. A mine-mouth coal plant could be inexpensive, say 4 cents per kWh real levelized cost. It would, however, have the potential for large TRC due to externality costs such as global warming. Residential weatherization is one of the more expensive conservation programs, perhaps 4.5 cents per kWh real levelized TRC. On the basis of full society cost, the conservation program would be selected. However, the utility could operate the program with cost recovery from the participants sufficient to maintain the equivalent utility cost of 4 cents per kWh. Implicit in the use of utility cost is the understanding that lost revenue will not be considered in resource selection.

The participant's contribution could take the form of either shared cost or shared savings. To ensure full participation, the shared savings approach was given preference in Pacific's program design. Cost recovery from the participant produces a secondary benefit in promoting rate equity. Revenue recovered from participants operates to minimize rate impact on non-participants. In effect, the utility program provides a means to redistribute benefits broadly to all customers. In the nomenclature of the standard cost effectiveness tests, the programs demonstrate an improvement in both Utility Cost and Rate Impact Measure (RIM).

The advantage of the two-tiered process is that both societal and utility perspectives can be considered, even with different discount rates if desired. A potential drawback is that the process will not apply to a choice of two supply-side options since it relies on passing through costs to the participants. The issue of passing through costs was difficult for public members of the Advisory Group to accept--there has been an expectation that the utility should pay all costs if necessary. At the same time, members accepted the concepts that conservation has value and that value should be equitably distributed. Based on the argument of rate equity, public members will wait to see what results from Pacific's pilot programs testing the shared savings concept.

## CONSERVATION SUPPLY CURVES -- TECHNICAL POTENTIAL

As part of the planning methodology, Pacific developed a series of supply curve spreadsheets. Conservation supply curves are a required input to integrated planning procedures. In many cases, utilities have relied on outside expertise to produce conservation supply curves. The problem is that there is then little in-house knowledge how the supply curves were developed. Utility staff have little understanding of the various assumptions incorporated into the curves. There is little ability to conduct "what-if" analysis wherein modification of those assumptions can be examined.

The approach at Pacific was to develop a set of PC spreadsheets. These spreadsheets operate with ordinary commercial software, are transparent to the user and allow easy updating or "what if" analysis. The spreadsheets consist of linked modules operating together through a series of menu-driven macros. The modular nature has proved to be an advantage, since changes in assumptions could be easily implemented without forcing a massive recalculation.

The conservation potential is often described with a supply curve--that is, a function describing how much conservation is available as the price increases. An example of the resulting supply curve for the company is shown in Figure 2. Pacific has a technical potential for conservation of about 600 MWa based on a medium forecast and a ceiling of 5.5 cents/KWh.

## PROGRAMMATIC SUPPLY CURVES

Although supply curves are frequently the format for presenting the technical potential, we found another format to be more useful. The problem with supply curves is that individual conservation measures have been dispersed and can no longer be distinguished. A measure to insulate ceilings may be at the lower part of the curve; a measure for storm windows may be at the upper part. It is difficult to determine what a weatherization program, consisting of bundles of these measures, would do.

For program planning purposes, it is helpful to have a chart which identified the magnitude and average cost of savings targets. A two-dimensional map as shown in Figure 3 is a useful graphic tool. Here the potential has been divided into areas corresponding to market segment and end use applications. The area of each block indicates the amount of potential. Average cost of all the measures is indicated within each block. The shaded areas represent expensive measures currently not practical which will be watched for technology improvements. It is easy to identify which areas should be program targets. For example, office lighting is a large inexpensive resource.

The technical potential is only the first step in developing demand-side programs. The potential shows where programs should be targeted for maximum effect. Now the applicable conservation measures must be combined into workable programs. This process is more an art than a science. When developing program concepts, the following criteria applied:

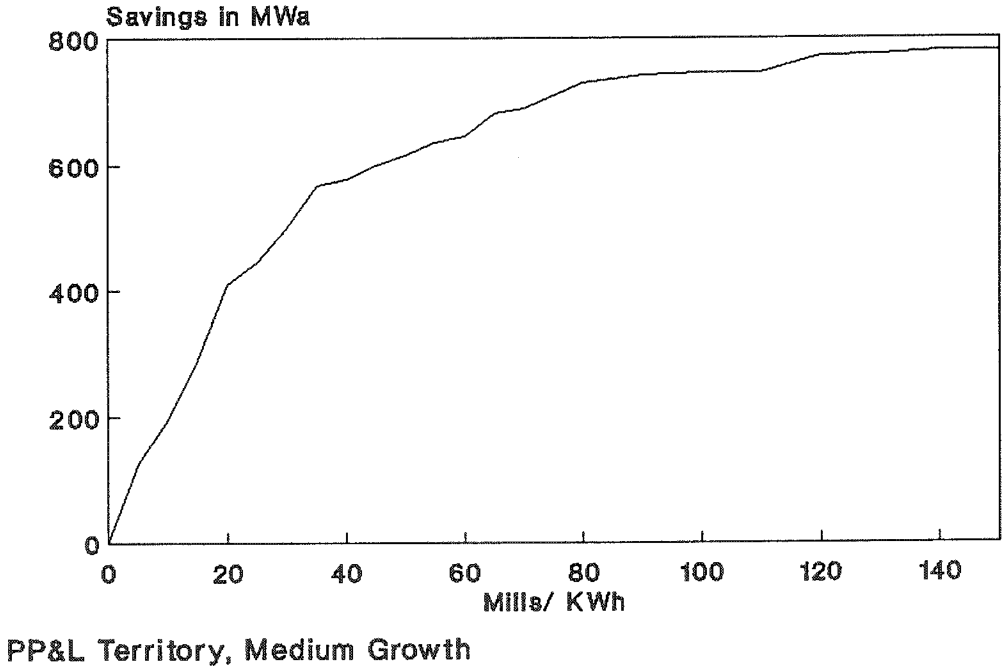


*Figure 2. Conservation Supply Curve--Year 2010*

**Significant Delivery Capability**

To present conservation as a creditable resource, a broad front of reliable programs is required. These programs must be capable of capturing a major conservation resource within a short enough timeframe to defer a supply-side resource. For this planning process, it was specified that an acquisition program must deliver at least 65% of the technical potential in seven years.

From a traditional marketing standpoint, this is an ambitious objective. Typical marketing objectives are to increase market penetration by a few percent in a year. By contrast, the goals of effective resource acquisition programs will be up to 20% market penetration *PER YEAR*. This is fast track marketing. Such penetration levels involve substantial innovation, sustained incentive levels, high public exposure for the company, and personal contact with most of the customers to optimize company activity. The overall market for energy efficiency products and services is expected to reach $500 million in Pacific's sales territory alone.

**Minimize Lost Opportunities**

Lost opportunity resources are those which, while not cost-effective at current prices, will be cost-effective over their lifetime. The important point about lost opportunities is that they do not fit into the least-cost planning approach for timing programs. Normally, one would simply choose the least-cost resource first and more expensive programs would be operated later. However, lost opportunities are outside this decision rule. They need to be captured when the opportunity exists, if it is expected that the need will occur later and that they will be cost-effective within their lifetime.

**Incorporate Proper Program Planning and Timing**

Conservation programs are often thought to be short lead time, able to be started and stopped as desired. In fact, there are constraints. Conservation is dependent on the perspectives of consumers, equipment suppliers and others. The programs will not succeed if programs are changed too often.

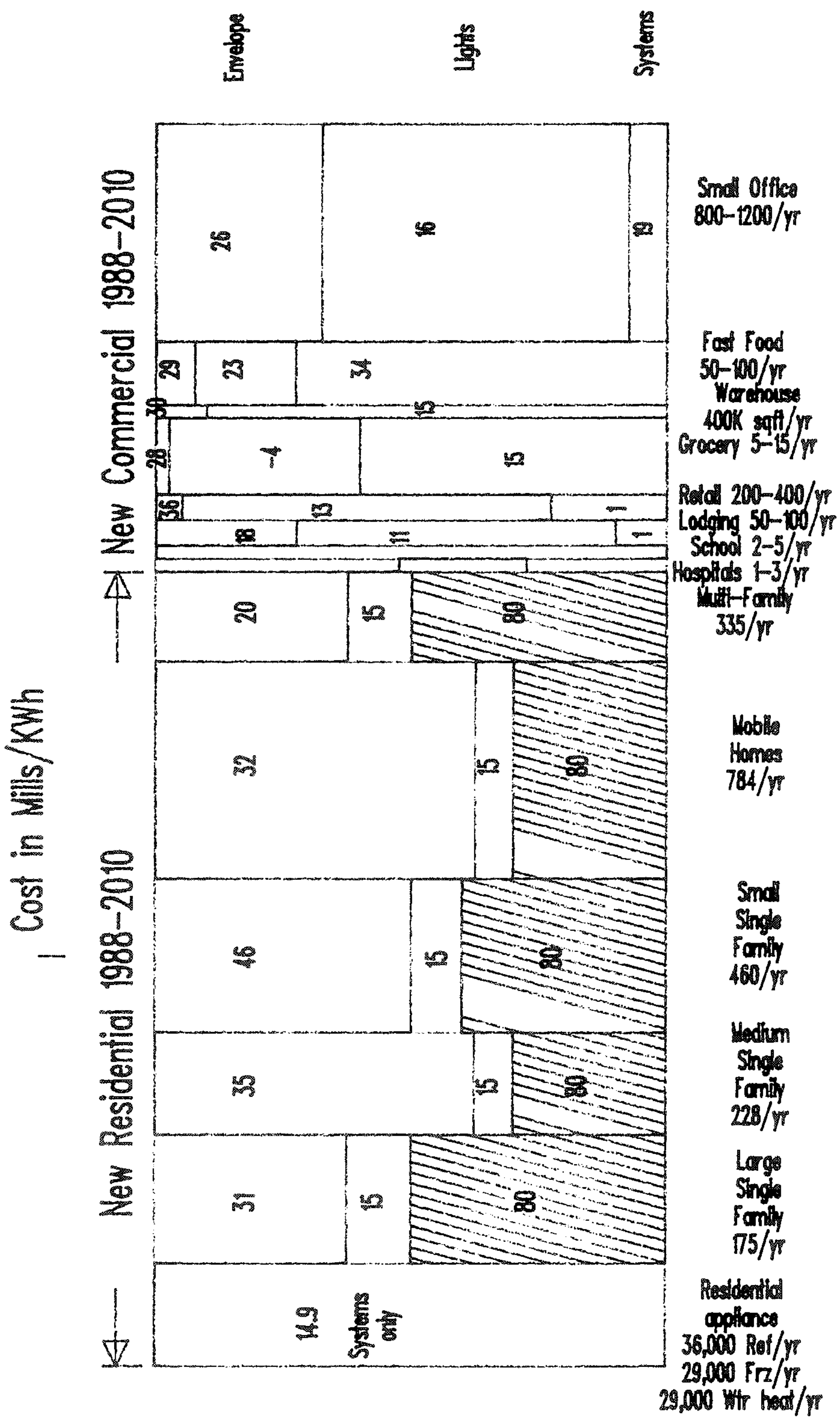


*Figure 3. Technical Potential - Residential and Commercial Sector*

Thus, there are minimum viable levels necessary to maintain programs in an operational mode.

There are also limitations to the rate at which programs can be created or ramped up. Even at the maximum rate, it takes years to complete full acquisition. Much of the work during the first five years can be done in advance and then banked for a later decision on exactly when to implement. Additional flexibility can come through spreading the major acquisition phase over longer or shorter time periods.

Proper timing will minimize redundancy and maximize helpful program interactions. We expect pilot and ramp-up requirements of about 5 years for most programs.

### Include Cost Control and Quality Assurance Components

A large demand-side program will involve hundreds of thousands of small transactions. There is potential for significant cost savings through economies of scale. On the other hand, there is potential for cost overruns through inadequate program oversight or planning. A primary cost control check lies in explicit evaluation and project tracking. Evaluation tracks cost-effectiveness and actively guides the evolution of improved effectiveness. Cost control issues include selection of eligible measures, verifying energy savings, improving synergy between programs, and evolving learning curve improvements to program operations.

### Encourage Market Transformation

The concept of market transformation deserves some explanation. All programs operate in an environment that is changing. This environment consists of several major infrastructures: program participants, contractors, suppliers, government and designers. When all the infrastructures have integrated the program then the market has been successfully transformed. The utility program is no longer necessary. A new construction code is an example of a mandated market transformation. Once the code goes into effect, the utility reaps savings benefits with no cost. A sufficiently aggressive program now can eliminate the need for utility expenditures in the future.

### Rate Equity

The challenge for demand-side programs is to identify a mechanism to ensure the benefits of utility finance, while preserving rate equity. Even when the conservation is least-cost, consumers may find that rates must increase to pay for the conservation. Rates must cover the new investment as well as any lost revenues. Participants receive the benefits since their savings exceed any rate increase. However, non-participants face the rate increase without any benefits. There may be public pressure to insist that benefits be shared.

Utilities have experimented with both cost-sharing and shared-savings programs. Experience has generally indicated that cost-sharing handicaps market penetration. Instead, Pacific has suggested a novel shared savings program as one program component. The customers will participate with no up-front cost, but will instead reimburse the utility out of their savings. The reimbursement will take the form of an additional service charge attached to the billing meter. That is, the attached service charge continues even if the property changes ownership. This design will minimize administrative costs. The service charge would remain in place, regardless of who owns the house or business until a specified amount of the credit is repaid.

The concept of charging for "saved energy" as well as consumed energy has recently been raised (Chiccetti and Hogan 1989). An energy service charge has been previously discussed in Northwest planning circles (AEDC 1979) and in Pacific's preliminary planning reports (Pacific, January 1989).

The range of possible program options can be mapped on a graph of Total Resource Cost versus utility cost in Figure 4. The utility would not operate programs within shaded areas. If the utility pays the entire cost, the program will lie on a 45-degree line. The Water Heater Wrap program is an example. To the extent that the utility can induce cost sharing, the programs will lie below the 45 degree line. For example, MCS building codes operate with little cost to the utility. It is even possible to have conservation programs with a negative cost, that is, they make profit for the utility. An example is the Water Heater Insurance

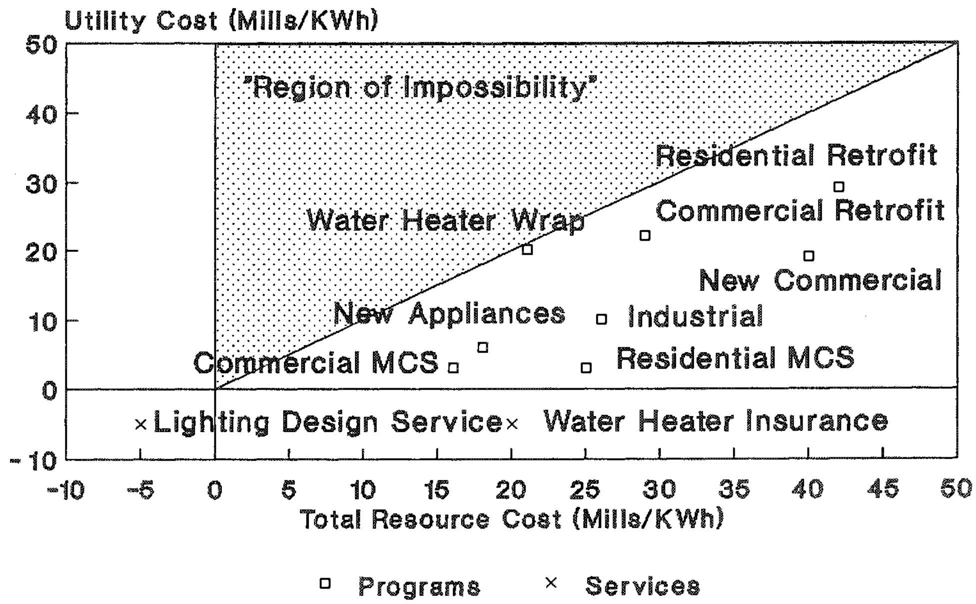


*Figure 4. Price Impact Map*

program where customers pay for the added value of an insurance service. The revenue is more than enough to pay for installation of an efficient water heater.

The final result of program planning is a set of demand-side programs that can be compared to supply-side resources. That set is presented as a programmatic supply curve in Figure 5. This presentation does not indicate the critical issues of timing and ramping. For example, ranking by cost would suggest that New Commercial programs be operated after retrofit of existing buildings. That is incorrect because the new building program is a lost opportunity which must be captured immediately. Thus, timing considerations, not merely cost, dictate program priorities.

## PROGRAM PLANNING -- AN EXAMPLE

The previous discussion of the program planning process would be better understood by considering as an example the design of a conservation program for retrofit of commercial building stock. First, such a program will be operated as a resource acquisition, not as a lost opportunity. This means full deployment will be deferred until around 1995. Pilot tests and capability building will occupy the early ramping stages. At its peak, the program will need to involve about 4000 buildings per year. At completion, the program will have reached 65% of the technical potential.

From these considerations, it seems the program should rely on a "community blitz" strategy as was applied successfully during the Hood River Conservation Project. The goal will be to involve virtually all the consumers in the community, then move on to the next community. Such a program achieves high penetration rates due to widespread involvement by the entire population and the simultaneous operation of programs in other sectors.

A budget is designed for the program, with the expectation of considerable front-end development and evaluation cost. The sum of program costs over the entire program life is used to estimate the levelized cost of the program. On the basis of TRC, the program is estimated at 2.5 cents per kWh. This is competitive with other resource options. However, the issue of rate equity can still be treated as a management option. A partial shared-savings program design is used to mitigate rate impact on non-participants. The final program design calls for about 50% of measure cost to be recovered through

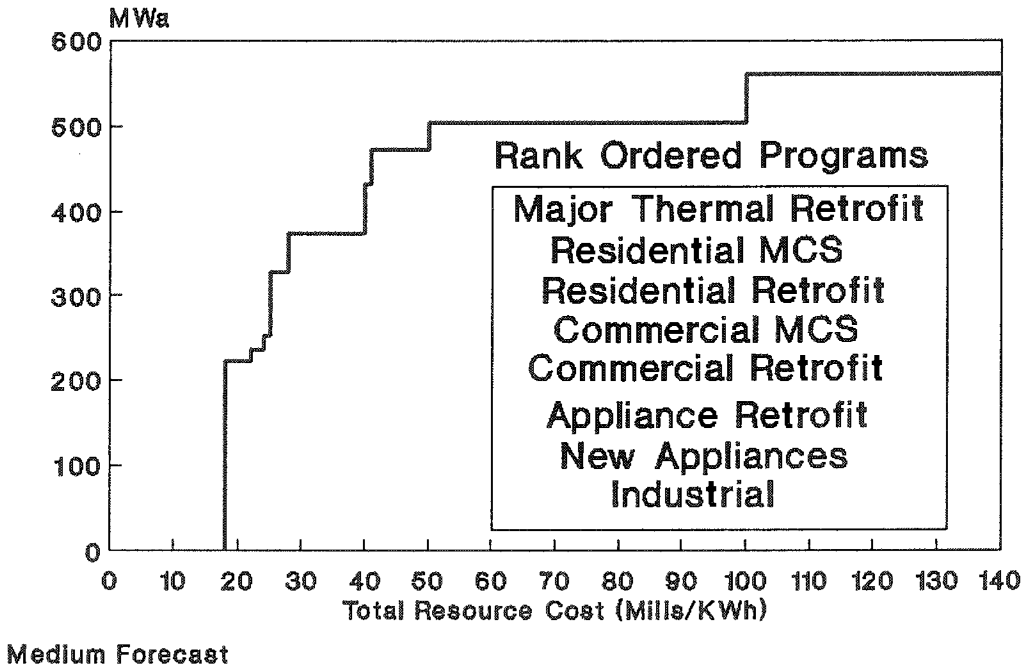


*Figure 5. Demand-Side Program Stack*

an Energy Service Charge. Preliminary market research indicates that the service charge approach does not limit participant acceptance.

## RELATION TO THE COMPANY'S BUSINESS PLAN

Once the demand-side programs have been designed, there remains the problem of selling their benefits within the company. A number of considerations carried weight with Pacific executives. Ratebasing conservation will benefit utility earnings. Because conservation is capital-intensive, it will tend to shift revenues from fuel expenses into shareholder earnings. This investment opportunity is attractive to utilities whose ratebase has been decreasing through depreciation without new construction additions.

Demand-side programs conflict with the traditional marketing policy. One of the problems for internal management is to redirect goals from marketing into energy services. It is expected that the transition will require clear direction from upper management. The issue of competitive marketing is important to Pacific's managers. Development of the Energy Service Charge assists by minimizing rate impacts. Recovery of a new revenue stream from shared savings allows the programs to proceed without harming the utility's market position.

Another benefit is the company's involvement in customer service. To be effective, the conservation program will put utility representatives in direct contact with virtually every single customer. This is an important opportunity for the utility to familiarize itself with the customer's needs and perceptions. A utility in transition from the older mentality of commodity sales to a newer one of customer service will welcome the opportunity for market involvement.

## CONCLUSION

Traditional conservation supply curves are only the beginning for least cost planning. The important step is taking the body of conservation opportunities and developing program designs. The considerations used by Pacific have been discussed. An critical point in the planning process is the need to reconcile corporate and societal perspectives. Pacific has suggested an shared-savings approach to reduce the rate impact of conservation programs on non-participants.

## ACKNOWLEDGMENT

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