Docket No. 92-208-E

STATE OF SOUTH CAROLINA
BEFORE THE
SOUTH CAROLINA PUBLIC SERVICE COMMISSION

In Re:

CAROLINA POWER & LIGHT COMPANY

DIRECT TESTIMONY OF

PAUL CHERNICK
Resource Insight, Inc.

ON BEHALF OF THE

DEPARTMENT OF CONSUMER AFFAIRS

November 24, 1992

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I. QUALIFICATIONS

Q: MR. CHERNICK, PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A: My name is Paul L. Chernick. I am President of Resource Insight, Inc., 18 Tremont Street, Suite 1000, Boston, Massachusetts.

Q: MR. CHERNICK, WOULD YOU PLEASE BRIEFLY SUMMARIZE YOUR PROFESSIONAL EDUCATION AND EXPERIENCE?

A: I received an S.B. degree from the Massachusetts Institute of Technology in June, 1974 from the Civil Engineering Department, and an S.M. degree from the Massachusetts Institute of Technology in February, 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a Utility Analyst for the Massachusetts Attorney General for over three years and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options.

As a Research Associate at Analysis and Inference and in my current position, I have advised a variety of clients on utility matters. My work has considered, among other things,

prospective and retrospective review of supply planning decisions; ratemaking for excess and/or uneconomical plant entering service; conservation program design; cost recovery for utility efficiency programs; and the valuation of environmental externalities from energy production and use. My resume is attached to this testimony as Exhibit PLC-1.

Q: MR. CHERNICK, HAVE YOU TESTIFIED PREVIOUSLY IN UTILITY PROCEEDINGS?

A: Yes. I have testified approximately ninety times on utility issues before various regulatory, legislative, and judicial bodies, including the Massachusetts Department of Public Utilities, the Massachusetts Energy Facilities Siting Council, the Maine Public Utilities Commission, the Texas Public Utilities Commission, the New Mexico Public Service Commission, the District of Columbia Public Service Commission, the Vermont Public Service Board, the New Hampshire Public Utilities Commission, the Pennsylvania Public Utilities Commission, the Connecticut Department of Public Utility Control, the Michigan Public Service Commission, the Illinois Commerce Commission, the Minnesota Public Utilities Commission, the Federal Energy Regulatory Commission, and the Atomic Safety and Licensing Board of the U.S. Nuclear Regulatory Commission. Subjects on which I have testified

include (among others) long range energy and demand forecasts, utility supply planning decisions, conservation costs and potential effectiveness, conservation program design, and ratemaking for utility production investments and conservation programs to avoid their next supply commitments.

Q: HAVE YOU AUTHORED ANY PUBLICATIONS ON UTILITY PLANNING AND RATEMAKING ISSUES?

A: Yes. I have authored a number of publications on rate design, cost allocations, power plant cost recovery, conservation program design and cost-benefit analysis, and other ratemaking issues. These publications are listed in my resume.

Q: HAVE YOU BEEN INVOLVED IN LEAST-COST UTILITY RESOURCE PLANNING?

A: Yes. I have been involved in utility planning issues since 1978, including load forecasting, the economic evaluation of proposed and existing power plants, and the establishment of rate for qualifying facilities. Most recently, I assisted the South Carolina Consumer Advocate in review, negotiations, and comments on the Commission's least-cost planning procedures (Order No. 91-885, Docket No. 87-223-E, October 21, 1991). I assisted the DC PSC in drafting order 8974 in Formal Case 834 Phase II, which established least-cost planning requirements for the electric and gas utilities serving the District. In

addition, I have been a consultant to various energy conservation design collaboratives in New England, New York, and Maryland; to the Conservation Law Foundation's (CLF's) conservation design projects in Jamaica and Zimbabwe; to CLF interventions in a number of New England rulemaking and adjudicatory proceedings; to the Boston Gas Company on avoided costs and conservation program design; to the City of Chicago in reviewing the Least Cost Plan of Commonwealth Edison; to Florida environmental groups on review of utility DSM programs and proposed power plants; and to several parties on determining avoided costs and incorporating externalities in utility planning and resource acquisition.

Q: ON WHOSE BEHALF ARE YOU TESTIFYING?

A: My testimony is being sponsored by the South Carolina Department of Consumer Affairs.

II. INTRODUCTION

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A: My testimony reviews the adequacy of the 1992 Integrated Resource Plan (IRP) of Carolina Power and Light Company (CP&L), concentrating on the treatment of demand-side management (DSM).

Q: PLEASE SUMMARIZE YOUR EVALUATIONS OF CP&L'S IRP.

A: CP&L has made little, if any, progress toward developing a least-cost integrated plan. It is not committing to cost-effective conservation as a least-cost alternative to supply. Load building, load shifting, and load control remain CP&L's dominant objectives in the initiation, selection, and design of DSM programs.

Q: PLEASE SUMMARIZE YOUR RECOMMENDATIONS.

A: More direction is needed from the Commission if CP&L is to develop cost-effective DSM programs in time to affect its near term need for capacity. CP&L plans its first capacity addition for 1996. It now has fewer than four years in which to design and implement conservation programs to avoid this next supply commitment.

If South Carolina is to develop a least-cost planning process which places demand-side resources on an equal footing with supply, it is essential that the Commission require CP&L

to follow these general principles in developing least-cost integrated plans:

- develop resource plans that minimize the long-run total resource costs of providing adequate and reliable energy services to customers, to the extent feasible;
- commit to the pursuit of all cost-effective demand-side resources;
- rely on the Total Resource Cost test as the primary basis for DSM program design and selection;
- evaluate the cost-effectiveness of all programs, including load-building programs;
- develop comprehensive strategies for planning and acquiring demand-side resources;
- place a high priority on capturing lost opportunity resources;
- avoid cream skimming; and
- design DSM programs to address market barriers effectively, including direct utility financing of customer energy efficiency investments.

Q: DO YOU HAVE ANY OTHER INTRODUCTORY COMMENTS?

A: Yes. CP&L's documentation of its DSM programs is incomplete. It has not provided detailed program descriptions and important input and output data relied upon in its program evaluations. The IRP filing does not even report the projected MWh effects of CP&L's proposed DSM portfolio; it provides only the summer peak load reductions. These problems have complicated my review of the proposed DSM portfolio and

limit the extent of the Commission's oversight of the IRP.

Q: HOW HAVE YOU ORGANIZED YOUR TESTIMONY?

A: I present the remainder of my testimony in three sections. Section III identifies and explains general principles of least-cost DSM program planning and design. In Section IV, I evaluate the DSM planning of CP&L, focusing on deficiencies in the screening process for DSM programs, errors and omissions in the DSM program portfolio as well as in the design of individual programs, and inadequacies in the integration of demand resources with supply resources. Section V provides my recommendations.

III. GENERAL PRINCIPLES

A. Primary Objective of Utility Resource Planning

Q: IN ITS RULES, THE COMMISSION REQUIRES THAT THE INTEGRATED RESOURCE PLANS "SEEK TO ENSURE THAT EACH UTILITY INCORPORATES THE LOWEST COST OPTIONS FOR MEETING THE ELECTRIC NEEDS OF CONSUMERS, CONSISTENT WITH THE AVAILABILITY OF AN ADEQUATE AND RELIABLE SUPPLY OF ELECTRICITY." DO YOU AGREE WITH THIS PLANNING OBJECTIVE?

A: Yes. The primary objective of least-cost integrated resource planning should be the minimization of the long-run costs of providing adequate and reliable energy services to customers. The minimization of total costs requires that utilities choose the resources with the lowest costs first,[1] and then draw on progressively higher cost options until demand is satisfied. But much of the demand being forecast by utilities arises because most customers are unwilling to spend more than a small fraction of the price they pay for using electricity on saving it. This market failure leaves a significant but unquantified potential for economical efficiency investment available for less than the cost of utility supply.

Least-cost planning therefore requires utilities to pursue savings their customers would otherwise miss. These

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[1]This is a conceptual ordering, not a chronological one.

efficiency gains are worth pursuing to the point that any further savings would cost more than supply -- counting all costs incurred by both utilities and their customers.

Uncertainty and risk complicate this task. Future demand is unknown. This makes some resources riskier than others. In general, larger resources with longer lead times carry greater risks for the system. Once utilities gain the capability to deploy efficiency resources, they can acquire them in small increments over short lead times. Some efficiency resources, such as programs to raise new buildings' efficiency, coincide with demand growth. More efficient loads generally are more stable loads, implying lower load uncertainty.

Q: DOES LEAST-COST PLANNING OBLIGATE UTILITIES TO PURSUE ONLY THE MOST COST-EFFECTIVE DSM?

A: No. Least-cost planning requires utilities to pursue the most cost-effective <u>resource plan</u>. This goal implies that utilities should pursue <u>all</u> cost-effective DSM -- that is, all DSM available for less than the cost of supply it would avoid. Otherwise, stopping short of this goal would obligate the utility to make up for the foregone savings with more expensive supply.

B. The Total Resource Cost (TRC) Test in DSM Program Selection and Design

Q: WHAT SHOULD BE THE BASIS FOR DSM SCREENING?

A: The Company should design and select DSM programs to procure as much cost-effective DSM as feasible. Therefore, in screening supply resources and DSM measures and programs, the utility should rely primarily on the TRC. Only the TRC test will consistently reflect the true value of efficiency programs. Any measure that passes the TRC screening -- i.e., is cheaper than supply -- is worth pursuing. Least-cost planning requires that the utility attempt to realize the potential of all such measures, since failing to do so would unnecessarily lead to higher total costs.

Q: IS DSM SCREENING BASED PRIMARILY ON THE TRC TEST CONSISTENT WITH THE COMMISSION RULES?

A: Yes. Not only is primary reliance on the TRC test consistent with the Commission least-cost planning rules, it is a requirement. The utility must justify any deviation from least cost planning:

> . . . <u>The utility shall propose an IRP which minimizes total resource costs to the extent feasible</u>, giving due regard to other appropriate criteria such as system reliability, customer acceptance and rate impacts (subsection B(7))
>
> . . . The utility must justify the use of a specific test or tests employed as part of the basis for adoption of a specific resource. . .

(subsection B(6a))

(emphasis added).

Q: IS IT APPROPRIATE FOR UTILITIES TO RELY ON TESTS IN ADDITION TO THE TRC TEST IN THEIR DEVELOPMENT OF DEMAND-SIDE PROGRAMS?

A: Yes. Different types of tests produce useful information which can aid in the development of demand-side programs. It is important to establish the role that each test should have in the screening/design process and to structure each test accordingly in order to provide the needed information.

Q: WHAT ROLE SHOULD THE RATEPAYER IMPACT MEASURE (RIM) HAVE IN DETERMINING THE COST-EFFECTIVENESS OF A DEMAND-SIDE RESOURCE?

A: It should have no role in the economic screening of demand-side programs or the technologies incorporated in such programs. Use of the RIM test will lead to the rejection of economical DSM. By prohibiting a utility's rejection of cost-effective DSM options based solely on the RIM test, the Commission's rules (in particular, subsection B(6a)) explicitly recognize the conflict between use of the RIM test and the objective of minimizing total costs.

Q: HOW DOES USE OF THE RIM TEST LEAD UTILITIES TO REJECT COST-EFFECTIVE DSM?

A: DSM is cost-effective if its total benefits exceed its total costs, i.e., if it passes the total resource cost test. Under

this test, costs include outlays for energy-efficiency measures themselves, plus utility program delivery costs. Benefits include the avoided costs of utility supply, plus any non-electric savings (such as natural gas, water, labor, etc.). A DSM measure or program satisfies the total resource test if its benefits exceed its costs because it will lower the total costs of providing electric service.

The RIM test adds another dimension to the comparison: the revenue shifts caused by the sales reductions from energy conservation. These revenue losses are effectively added to the costs of DSM or subtracted from its benefits. DSM that passes the total resource cost test will usually appear less attractive under the RIM test.

Depending on the relationship between avoided costs and retail rates, the RIM test can completely rule out DSM, no matter how low its acquisition costs. For example, if retail rates exceed avoided costs, the "cost" of sales losses will exceed the benefit of avoided costs. In that case, DSM must have <u>negative</u> acquisition costs to pass the RIM test. Such an absurd result would automatically preclude demand-side resources that would lower <u>total</u> system costs.

Q: DOES PRIMARY RELIANCE ON THE TRC MEAN THAT THE RATEPAYER IMPACTS SHOULD BE IGNORED?

A: Not at all. The ratepayer impacts of the DSM portfolio should be examined to flag any equity problems or disruptive rate impacts. The RIM test, however, is not a very meaningful test of equity or rate changes. It looks at rate effects on a measure-by-measure or program-by-program basis, and measures only the average effect on non-participants of a particular utility DSM program or measure. Individual measures and programs cannot really be considered equitable or inequitable in isolation. A measure that fails the RIM test can increase the equity of the portfolio. Equity effects should be evaluated for the portfolio as a whole; the standard present-value RIM test is not useful for this purpose. It does not assess the equity effects of DSM among and within classes and it does not determine the pattern of rates and bills over time.

Q: IF THE PORTFOLIO AS A WHOLE FAILS THE RIM TEST, SHOULD THE DSM PLAN BE REJECTED?

A: No. The fact that the portfolio as a whole fails the RIM test does not imply that rate effects are distributed unfairly, or that rate increases are too large compared to bill reductions. Rate impacts should, first of all, be evaluated by class and by year to determine whether problems exist and how they can be fixed. If there are equity problems, they can be addressed

by changing cost recovery patterns, by altering the allocation of expenditures among and within rate classes, by increasing the penetration of programs to groups that would otherwise face higher bills, and possibly by changing the timing of particular programs. A DSM plan should not be rejected because it fails the RIM test.

Q: SHOULD OTHER TESTS AND FACTORS BE CONSIDERED?

A: Yes. The Utility Cost (UC) test has a largely conceptual role in fine-tuning program design. The UC test differs from the TRC test in that it excludes costs that participants bear and includes incentives paid to the participants. Since the costs that flow through utility rates are not all the costs of DSM, utility cost should not be used to determine whether actions are cost-effective.

All other things (especially total benefits) being equal, lower utility costs are preferable to higher costs. Programs should be designed to minimize the Company's share of program costs, so long as customer contributions do not significantly decrease the program's benefits, by discouraging participation and raising overhead costs per installation, or impair the program's equity by limiting the number of customers financially able to participate. The UC test can be performed on alternative program designs with equivalent TRC

net benefits, to select the one with the lowest cost to the utility.

A Participant test can be useful in gauging the need for, and determining the level and structure of, utility financial incentives to customers designed to overcome market barriers to efficiency investment. However, the test should measure, as well as feasible, the acceptability of a program to the participants, considering the characteristics of the market segment. Acceptability may be measured by payback period, years to positive cash flow, or other computations that reflect the market barriers for the particular market segment. Present-value computations will rarely be useful in Participant tests.

C. The Need for Economic Evaluation of Load-Building Programs

Q. DOES PRIMARY RELIANCE ON THE TRC TEST MEAN THAT UTILITIES SHOULD NOT PROMOTE GROWTH IN ELECTRIC ENERGY USE, OFF-PEAK OR OTHERWISE, UNDER ANY CIRCUMSTANCES?

A. No. Utilities must consider the costs and effects of such load building carefully and consistently. Programs promoting sales growth may be desirable if they can be shown to be cost-

effective.[2] This is easier for programs with only temporary effects. CP&L's heat pump promotions, on the other hand, will have long-term effects.

Q: HOW COULD STIMULATING WINTER OR OFF-PEAK SALES AFFECT COSTS?

A. Extra sales will increase loads at times that contribute to capacity need. The need for capacity is determined by peak loads throughout the year. CP&L projects that its winter peaks will be very close to its summer peaks and for some years the system will be step-peaking. (IRP, p. 3-20). Even loads outside the daily peak hour can increase loss of load probability and reduce the capacity benefits of storage hydro and pumped storage, since the same amount of water will produce less capacity over a longer high-load period. In addition, even totally off-peak load growth can necessitate tomorrow's baseload generating expansion; eventually, sustained growth in electric energy use will surpass the capability of current baseload capacity. Sales that do not change the total <u>amount</u> of generating capacity needed may

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[2]Quantifying and valuing some benefits of load-building programs may be difficult, such as the crime reduction benefit of CP&L's Safeshine program. These benefits can usually be estimated by customer surveys, focus groups, and other techniques. Increases in company revenues are not a sufficient or appropriate justification for load-building programs. Evaluation of programs should also consider costs to customers, such as reduced comfort level with heat pumps, and analyze energy-efficient alternatives, such as motion detectors on security lighting.

increase the fraction of future capacity that is expensive baseload generation.

Even in the short run, greater sales lead to greater costs for fuel, variable O&M, and environmental compliance. Unless there are clear benefits to offset these costs, the sales should not be encouraged.

The cost of operating today's coal plants does not represent the total long-term cost of serving increased sales. Such costs include the extra capital costs of new baseload facilities, the effects of increased load factor on reserve requirements, changes in transmission and distribution investments (due to higher local peaks and higher load factors), and costs associated with mitigating the environmental damage from burning coal.

Q: WILL THE PROMOTION OF HEAT PUMPS AND OTHER MARKETING PROGRAMS FOSTER LEAST-COST ENERGY SERVICE?

A: Not generally. Established electric end-uses that still require promotion are unlikely to be either cost-effective or energy-efficient.[3] In most residential and small commercial applications (and for some larger applications, as well), fossil fuels are more cost-effective and fuel-efficient than

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[3]There may be emerging cost-effective industrial technologies that do require promotion.

electricity for heating. In most cases, more fossil fuel will be used to generate electricity for providing heat at the end-use than the customer would have used to generate heat directly from fossil fuel.

Even though electric heating results in higher customer heating costs, the emphasis on first costs in construction markets makes electric heating attractive to builders because of its lower first costs. Thus, the structure of the market already over-promotes electric heating.

Q: DOES UTILITY PROMOTION OF HEAT PUMPS APPROPRIATELY ENCOURAGE INTER-FUEL COMPETITION?

A: No. The Commission should encourage alternative fuels to compete on the basis of cost and quality of service, not on marketing advantages and market imperfections. Utilities should reduce the cost of electric heating, by increasing the efficiency of equipments and buildings, and by demonstrating more efficient technologies, such as ground-coupled heat pumps. If the electric utilities can then demonstrate that the resulting electric heating system is less expensive than oil heat, over the life of the equipment, they (and the gas companies) should be encouraged to promote efficient electric heating for new construction where gas is not available and for existing oil-heated buildings. If the electric utilities

can demonstrate that efficient electric systems are less expensive than comparable gas systems, on a life-cycle basis, they should be encouraged to promote electric heat throughout their service territories. The gas companies and oil dealers should simultaneously be promoting efficiency in the use of their own products. The result of this efficiency competition would be the selection of the lowest-cost mix of heating fuels for South Carolina.

The electric companies' marketing approach builds on some important initial advantages for electric heat, exploits market barriers, and may result in the installation of uneconomical heating systems. It is relatively easy to convince developers, or cash-short customers building their own homes, to select electricity over gas, which requires additional capital for a separate hook-up, interior piping, and sometimes a line extension. The market barrier to least-cost energy selection posed by limited capital is exacerbated by utility financing of heat pumps.

D. The Need for Comprehensive Strategies in Planning and Acquiring Demand-Side Resources

Q: WHAT DO YOU MEAN BY "COMPREHENSIVE STRATEGIES IN PLANNING AND ACQUIRING DEMAND-SIDE RESOURCES?"

A: To be comprehensive, DSM programs should pursue all cost-

effective efficiency improvements, targeting all end-uses and measures, for each participant. In addition, utility programs should address all customers and all market segments.

Q: WHAT DO YOU MEAN BY A "DSM MARKET SEGMENT?"

A: A DSM market segment is a portion of the potential for improved efficiency that requires a distinct marketing and delivery approach. For example, large industrial customers, small commercial customers, and residential customers are unlikely to be successfully reached through a single program. Similarly, new construction, routine equipment replacement, and retrofit generally require programs with different incentive levels, program structures, technical assistance, and other features.

Q: HOW DOES THE STRATEGY YOU RECOMMEND DIFFER FROM OTHER APPROACHES A UTILITY MIGHT TAKE TO DEMAND-SIDE INVESTMENTS?

A: Buying efficiency savings is a markedly different proposition from selling or marketing conservation measures. The latter tends to concentrate on individual technologies. It often leads utilities to fragmented and passive efforts to convince customers to adopt individual measures that marketing research indicates they are most likely to want and accept.

Another frequent but misguided objective is to seek savings from customers as inexpensively as possible. Such a

strategy will neglect savings that cost more than the cheapest conservation (say, 4 cents/kWh rather than 2 cents/kWh), but which are available at less than utility avoided costs (say, 6 cents/kWh).

Both of these approaches, while intuitively attractive at face value, could well lead utilities to acquire more supply than least-cost planning criteria would justify.

Q: WHAT ARE THE PRACTICAL IMPLICATIONS OF THIS "EFFICIENCY-BUYING" APPROACH TO UTILITY DEMAND-SIDE INVESTMENTS?

A: Treating each customer as a reservoir of potential electricity resources leads to some important principles about the way to design and implement programs. Most importantly, successfully capturing economical energy efficiency opportunities requires that utility programs be comprehensively targeted. This means that utilities should generally address the entire efficiency potential of the customer, not just one end-use or measure. Otherwise, utilities would have to re-visit their customers many times to tap all available, cost-effective efficiency savings. In the end, less of the efficiency resource would be recovered at higher costs than if the utility extracted all the efficiency potential one customer at a time.

A clear analogy exists to the development of oil and gas resources or mining. The resource is limited, and careless

extraction of one part of the resource can interfere with development of the rest of the potential.

E. Need to Place a High Priority on Capturing Lost-Opportunity Resources

Q: WHAT DO YOU MEAN BY LOST-OPPORTUNITY RESOURCES?

A: Lost-opportunity resource programs pursue efficiency savings that otherwise might be lost because future treatment may not be possible or economic. For example, most efficiency improvements are very cost-effective if introduced when a building is being constructed or remodeled. These same improvements will be much more expensive, and with some measures no longer possible, once the building or remodeling, is completed.

Q: ARE LOST-OPPORTUNITY RESOURCES IMPORTANT?

A: Yes. The Commission's rules explicitly direct the utilities to pursue lost opportunity resources (subsection B(21)).

Q: WHY SHOULD UTILITIES PLACE A HIGH PRIORITY ON CAPTURING LOST OPPORTUNITY RESOURCES?

A: Acquiring all cost-effective lost-opportunity resources should be a utility's top demand-side priority for at least five reasons. First, the situations that create the potential for lost-opportunity resources are also the leading source of load growth, and thus actually create requirements for new

resources. Load growth is driven largely by customer decisions to add new facilities or expand existing facilities, where a "facility" may be any building, appliance, or equipment. By concentrating on these lost opportunity resources, a utility can reduce the new resources it will need to meet the new load that is generated. Second, lost-opportunity resources often represent extremely cost-effective savings, since only incremental costs are incurred to achieve higher efficiency levels. Third, acquisition of lost-opportunity resources cannot be postponed. A utility must be prepared to act quickly within a limited window of opportunity or these efficiency resources will be lost. Fourth, market barriers to customer investment in lost-opportunity resources are among the most pervasive and powerful. Fifth, lost-opportunity resources are the most flexible demand-side resources available to utilities. They tend to correlate with demand growth since rapid growth tends to correspond to construction booms and facility expansion. Unlike any other option available to utilities, the acquisition of lost-opportunity resources will parallel the utility's resource needs.

Q: WHERE ARE LOST-OPPORTUNITY RESOURCES USUALLY FOUND?

A: One-time opportunities to save energy through improved energy

efficiency arise in four market sectors:

- during the design and construction of new building space;
- when existing space undergoes remodeling or renovation;
- when existing equipment either fails unexpectedly or is approaching the end of its anticipated useful life; and
- when retrofits miss measures that would be cost-effective to install in conjunction with other measures, but that would not be economical to pursue in a subsequent visit or through a separate program.

Q: WHAT DISTINGUISHES A LOST-OPPORTUNITY MEASURE FROM OTHER DSM OPPORTUNITIES?

A: The two dominant factors that determine if a conservation measure is a lost opportunity measure are (1) the feasibility or cost premium of installing it later, and (2) the service life of the building or equipment involved. Buying efficiency is inexpensive during construction, renovation, or replacement, when higher levels can be attained through design changes and incremental investments. Once these opportunities lapse, efficiency improvements often require existing equipment to be discarded and work to be redone in a retrofit decision. In the case of new equipment such as appliances, all efficiency potential may be lost until the end of its useful life.

Q: HOW RAPIDLY ARE THESE OPPORTUNITIES LOST?

A: These opportunities represent rapidly vanishing resources because builders, businesses, and consumers are making essentially irreversible choices on a daily basis. The window of opportunity for influencing these decisions is quite short. For new commercial construction, this window may be a matter of weeks or months; for appliances, a utility's opportunity to acquire cost-effective savings may be limited to hours or at most days. The consequences of these decisions can last anywhere from a decade to a century.

F. Need to Avoid Cream-Skimming

Q: WHY IS IT NECESSARY TO AVOID CREAM-SKIMMING?

A: Cream-skimming renders otherwise cost-effective resources non-cost-effective or more difficult to obtain.

Q: WHEN CAN CREAM-SKIMMING OCCUR?

A: Cream-skimming occurs in either of the following circumstances:

(1) A program neglects measures that would be cost-effective if implemented at the same time as other planned measures. With this type of cream-skimming, the administrative, diagnostic, delivery, and other overhead and joint costs make later implementation of the neglected measures more expensive and less

cost-effective. For example, if a utility is wrapping a water heater, it could install water heater measures (low-flow showerheads, faucet aerators) and compact fluorescent bulbs in the same visit. The increase in costs for installing those measures in the initial visit is small compared to the cost of returning for a second installation.

(2) A program captures a small amount of inexpensive savings but at the same time renders a larger amount of otherwise cost-effective savings less cost-effective and more difficult, or even impossible, to obtain. Thus, the utility forgoes otherwise cost-effective conservation. For example, if a utility installs insulation with an R-value lower than the most efficient cost-effective level (e.g., R-30 instead of R-38), the incremental savings from the more efficient insulation will no longer be cost-effective.

Cream-skimming typically improves a program's benefit/cost ratio at the expense of lowering the program's total savings. However, the benefit/cost ratio may also be decreased by cream-skimming, since overhead and joint costs are supported by smaller savings.

It should be noted that the adoption of the fourth principle I discussed -- the need to develop comprehensive strategies in planning and acquiring demand-side resources -- will avoid the problem of cream skimming.

G. Need to Address Market Barriers Effectively

Q. What are some of the market barriers to customer-funded conservation?

A. Limited access to capital, institutional impediments, split incentives, risk perception, inconvenience, and information costs compound the costs and dilute the benefits of energy efficiency improvements. These factors interact to form even stronger barriers. Utilities can accelerate investment in cost-effective demand-side measures with comprehensive programs that reduce or eliminate these barriers.

Q. Should utilities fund customer energy-efficiency investments to reduce barriers to customer investment?

A. Yes. Customers typically require efficiency investments to pay for themselves in two years or less, while utilities routinely accept supply investments with payback periods extending beyond twelve years. The pervasive market barriers underlying this payback gap lead utility customers to reject substitutes for supply which, if scrutinized under utility investment criteria, would appear highly cost-effective.

Q. Are short-payback requirements confined to a few, relatively unsophisticated customers?

A. Not according to extensive research. As discussed in the handbook on least-cost utility planning prepared for the National Association of Regulatory Utility Commissioners:

> According to extensive surveys of customer choices, consumers are generally not motivated to undertake investments in end-use efficiency unless the payback time is very short, six months to three years. Moreover, this behavior is not limited to residential customers. Commercial and industrial customers implicitly require as short or even shorter payback requirements, sometimes as little as a month. This phenomenon is not only independent of the customer sector, but also is found irrespective of the particular end uses and technologies involved. ("Least-Cost Utility Planning: A Handbook for Public Utility Commissioners," Vol. 2, The Demand Side: Conceptual and Methodological Issues, December 1988, p. II-9)

Q: HOW SHOULD CUSTOMER INCENTIVE LEVELS BE DETERMINED?

A: In general, incentives should be set as high as necessary to achieve high participation and to encourage participating customers to install all cost-effective measures. It has been the experience of utilities that, for many customer segments, maximum cost-effective savings will only be realized if utilities pay all or almost all of the incremental costs of efficiency measures. For example, utilities that actively pursue DSM resources have designed incentives to:

- pay the full incremental costs in the case of lost-opportunity resources, including new construction and non-residential equipment replacement and building remodeling.

- pay the full costs of measures in direct installation programs that are targeted at hard-to-reach customers, such as low-income residential and small commercial customers.

- "buy down" large commercial/industrial retrofit costs so that the customers have a payback period of no more than 12 to 18 months.[4]

- "buy down" efficiency improvements in industrial processes to an 18-month payback in new industrial construction.

Residential lighting rebate programs have been found to be popular enough to require only 2/3 funding.

Q: DOESN'T AGGRESSIVE FUNDING OF DSM RISK PAYING TOO MUCH FOR DSM SAVINGS?

A: It is certainly possible that high penetration could be achieved in some customer segments, market types, or efficiency measures with less than full utility funding. Past utility experience supports the conclusion that setting incentives too low entails more risk than paying too much.

Higher incentives will serve only to raise customer participation and measure penetration. It is important to remember that increasing the fraction that utilities pay of

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[4] The incentive can cover 100% of measure costs when the customer commits to all cost-effective measures.

measure costs will not raise the costs of the measures and will reduce the costs per unit savings of programs under the total resource cost perspective. As long as uneconomical measures are eliminated at the screening stage of program planning and the diagnostic stage of implementation, raising utility funding of measure costs is almost certain to increase societal net benefits.

Incentives that are too low, on the other hand, discourage participation and thereby lower the cost-effectiveness of DSM programs, for at least two reasons:

- the fixed costs of marketing and administering programs will be spread over fewer savings; and
- the program will attract a higher proportion of free-riders.

Q: WHAT DO YOU MEAN BY "FREE RIDERS?"

A: Free riders are those participants that will be motivated to make efficiency improvements without utility intervention. Programs should be designed to encourage actions not otherwise taken, in other words, to maximize the percentage of non-free-rider participants. For example, rebates for efficient appliances should be offered for units that significantly exceed applicable Federal efficiency standards. Similarly, current practice should establish the base line; programs should offer incentives in new construction and routine

replacements only for efficiency levels achieved above this base line.

The lower the customer incentive, the more likely it is that the program will capture only those customers who would have made the efficiency improvements without utility intervention.

Q: HOW SHOULD INCENTIVES BE STRUCTURED?

A: Utilities should structure incentives to give greatest incentives for installation of the most efficient, cost-effective measures and to minimize free-ridership.

Q: IS THE CUSTOMER INCENTIVE LEVEL THE ONLY FACTOR INFLUENCING CUSTOMER PARTICIPATION?

A: No. Money matters a lot, but there are additional aspects of program design that affect customer participation and decisions to install cost-effective efficiency measures, including:

- comprehensive approaches to program design;
- targeting program delivery strategies and marketing approaches to the decision-makers and types of investments involved. Depending on the program, utilities should direct program incentives to utility customers, equipment dealers, architects, engineers, or building developers. Separate marketing and delivery is

needed to influence investment decisions in new construction, remodeling/renovation, replacement, and retrofit.

- direct installation of measures for the customer with a minimum of difficulty and with little cost or performance risk.

All of these factors should be considered in designing effective DSM programs.

IV. REVIEW OF THE INTEGRATED RESOURCE PLAN OF CP&L

A. Inadequacy of CP&L's Planning Objectives and Process

Q: PLEASE SUMMARIZE THE MAJOR DEFICIENCIES YOU FIND IN CP&L'S INTEGRATED RESOURCE PLAN.

A: CP&L's filing lacks essential elements of a least-cost integrated resource plan: a least-cost DSM plan and the integration of demand-side and supply-side resource planning. It is clear from its IRP that CP&L has not committed to cost-effective conservation as an alternative to supply.

Q: WHAT IS YOUR BASIS FOR STATING THAT CP&L HAS MADE VIRTUALLY NO PROGRESS IN THE DEVELOPMENT OF A LEAST-COST DSM PLAN?

A: For its 1992 IRP, CP&L is proposing merely to continue its current programs. The IRP contains no new DSM options and eliminates none of the existing programs. It lists some R&D projects and ten "future potential" options, but they are only "under investigation" or "in the development stage," and no kW and kWh effects are reflected in the resource plan.

CP&L's proposed programs and its overall DSM strategy are fundamentally flawed, in at least the following respects:

- CP&L does not adopt minimization of total resource cost as its primary objective.

- CP&L has not made a serious effort to pursue conservation resources. Its proposed DSM programs and program designs focus primarily on load building and peak clipping.

- CP&L has not even attempted to test the cost-

effectiveness of its load-building programs.

- The Company's DSM programs do not constitute active involvement in promoting conservation. With few exceptions (in particular, the promotion of heat pumps), CP&L offers no direct utility financing of customer energy efficiency investments.

These shortcomings are discussed more fully below.

Q: CP&L MAINTAINS THAT IT HAS ESTABLISHED ITSELF AS AN INDUSTRY LEADER IN DSM, PREDICTING A 2218 MW OR 17% DECREASE IN PEAK BY 2006 (IRP, P. 1-1; WILLIAMS TESTIMONY, PP. 8-9). DO YOU AGREE WITH THIS ASSESSMENT?

A: No. These peak reduction figures exaggerate CP&L's DSM efforts in at least the following ways:

- The Company has included 1318 MW of peak reductions from DSM achieved before 1991. CP&L projects an incremental peak reduction of only 900 MW, or 7.6% of the peak, in 2006.

- Approximately 60 MW of the incremental peak reductions are due to time-of-use rates. These rates are standard practice and are generally not included in utilities' calculations of DSM savings.

- At least 250 MW of the incremental peak reductions are projected to come from audit and technical support programs.[5] The Company has not demonstrated that these savings will in fact occur. If other utilities were including similar projections in their estimates of DSM peak reductions, they would be predicting even higher savings.

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[5]Technical support could produce real savings, especially if combined with cash incentives, but CP&L has not provided sufficient detail to determine whether its estimates of savings are reasonable.

- CP&L includes approximately 70 MW of savings due to cogeneration. Most utilities do not include cogeneration savings in their calculation of DSM savings. (Eric Hirst, "Electric Utility DSM Programs: 1990 Data and Forecasts to 2000," ORNL, June 1992, p. 11).

Furthermore, summer peak reduction is only one of the considerations in the evaluation of a DSM plan. The reductions in winter peak and annual sales are also important. Yet CP&L does not report these effects, even in response to discovery (IR SCDCA-1-8(m)). CP&L's load forecast does not show any incremental reductions in sales due to conservation. It projects only increases from heat pump promotions (IR SCDCA-1-9).

Although the DSM plan proposed by Duke Power Company in its 1992 IRP has some serious deficiencies,[6] it has much greater emphasis on energy efficiency. By 2006, Duke projects an incremental reduction in annual sales of 5%, even including its promotion of heat pumps.

1. Failure to Minimize Total Resource Costs and to Pursue Cost-Effective Conservation Resources.

Q: WHAT IS THE OBJECTIVE UNDERLYING CP&L'S DESIGN AND SELECTION OF DSM OPTIONS?

A: It is clear from CP&L's statement of its objectives that it

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[6] In stipulations filed in South and North Carolina, Duke has agreed to address several of these deficiencies.

does not seek to minimize total resource costs and in particular, does not intend to pursue additional conservation resources, even if they are cost-effective:

> . . . Valley filling DSM programs assist in the better utilization and increased efficiency of existing capacity, while peak clipping DSM will defer the need for peaking capacity. Given CP&L's current and forecasted needs, these are the two objectives CP&L intends to focus upon during the planning period. Full scale implementation of additional conservation programs is not currently needed and will be timed to meet the projected need for baseload capacity. To do otherwise will unnecessarily increase costs to our customers. (Williams Testimony, p. 10)

Q: DOES THE ABSENCE OF A PROJECTED NEED FOR BASELOAD CAPACITY JUSTIFY EXCLUDING CONSERVATION RESOURCES FROM THE 1992 IRP?

A: Absolutely not. Conservation is currently cost-effective. Failure to pursue DSM that can be captured at less than the cost of supply will unnecessarily increase costs to customers.

CP&L projects a need for new capacity by 1996. Whether this addition is peaking or baseload capacity is not a critical distinction. Conservation programs can defer additions of capacity, whether it is peaking or baseload. Likewise, CP&L's "valley filling" and "strategic load growth" efforts to promote increases in winter peak and sales are likely to accelerate the need for capacity investments, especially given CP&L is nearly a step-peaking system (IRP, p.

3-20).

If conservation is delayed until baseload capacity is needed, it will be too late. CP&L's neglect of lost opportunity resources now will affect its need for capacity, baseload or peaking, for decades hence.

2. Errors in CP&L's Screening of DSM

Q: ACCORDING TO THE TESTIMONY OF MR. WILLIAMS (P. 14), CP&L HAS EXPANDED THE EVALUATION OF DSM OPTIONS TO INCLUDE THE TRC TEST, INSTEAD OF SOLE RELIANCE ON THE RIM TEST. DO YOU REGARD THE INTRODUCTION OF THE TRC TEST AS A SIGNIFICANT ADVANCE IN CP&L'S PLANNING?

A: No. CP&L continues to consider the RIM test the only test appropriate for the evaluation of programs that promote "strategic load growth" or are exclusively "valley filling" (IRP, App. D).[7]

Furthermore, there is nothing in the IRP to indicate that the TRC test (or any of the test results, for that matter) had any effect on CP&L's DSM program development, design and selection decisions. CP&L does not specify a larger set of options from which it selected its proposed DSM portfolio. Two of CP&L's existing programs actually failed the tests

[7]As distinct from programs that fill valleys through load shifting.

performed, yet these programs were not eliminated from the portfolio. Therefore, as far as I can tell, the only purpose that the test evaluations served in the IRP is to support a pre-determined decision to continue existing programs.

Q: WHAT TWO PROGRAMS FAILED CP&L'S EVALUATIONS?

A: The load-building Electrotechnologies program does not even pass the RIM test (the only test performed for this program); and the EZ-$64 Program (Stand-Alone Water Heater) does not pass either the TRC, the RIM, or the UC tests. According to the Company's own calculations, this program benefits only the participant.

Q: DOES CP&L PROVIDE ANY EXPLANATION FOR CONTINUING THESE PROGRAMS?

A: No. In fact, it appears that the Company is investigating a future option, a High Efficiency Water Heater program, which would include stand-alone water heater control as a measure (IRP, App. E, p. 2). By reducing water heating loads, efficiency improvements to water heaters would make the water heater control even more uneconomic. In designing programs, CP&L should screen at the measure level and omit measures that are not cost-effective. If the water heater control measure is uneconomic, its inclusion would reduce the net benefits of a High Efficiency Water Heater program.

CP&L provided no analysis of potential benefits of the Electrotechnologies program, due to its position that the RIM test is the only test that is appropriate for evaluating load-building programs. Yet the program did not even pass the RIM test and CP&L has provided no justification for its continued implementation.

Q: WHY DOES CP&L CONTINUE TO SUPPORT SOLE (IF INCONSISTENT) RELIANCE ON THE RIM TEST FOR THE EVALUATION OF LOAD-BUILDING PROGRAMS?

A: CP&L claims that load-building programs would never pass the TRC test because "there are no benefits to balance against increased supply costs, participant costs, and utility program costs (IRP, App. D, p. 3; emphasis added)." Some programs may have benefits that are difficult to measure (for example, the crime reduction benefits of the Safeshine program). However, where the Company's DSM programs encourage fuel-switching from fossil fuels to electricity, the benefits are clear cut: the reduction in the use of the alternative fuel and equipment and non-fuel operating cost savings.

If, on the other hand, CP&L truly believes that its load-building programs have no benefits, it should terminate these programs.

Q: WHAT IS THE ROLE OF THE RIM TEST IN CP&L'S SCREENING OF

CONSERVATION PROGRAMS?

A: In Stipulation B.3 of the CP&L-Public Staff Agreement filed with the North Carolina Utilities Commission in Docket No. E-100, Sub 58, CP&L stated that a "particular program/option should not be accepted or rejected based solely on the results of any one of these tests [including the RIM test]." However, although CP&L has not rejected any program it has evaluated in the IRP based solely on the RIM test, CP&L has not actually evaluated any aggressive, comprehensive cost-effective conservation programs.

The decision to exclude aggressive, comprehensive cost-effective conservation programs is made outside the screening process. According to the testimony of Mr. Williams (pp. 6-7, 10), only DSM resources that meet CP&L's objectives, currently load building and peak clipping, reach the development and evaluation stage of CP&L's planning. Unless CP&L is committed to the comprehensive assessment, development, and pursuit of energy-efficiency resources, its agreement not to reject programs because they fail the RIM test is essentially of no value.

Q: HAS CP&L RELIED UPON THE TRC TEST IN ITS DEVELOPMENT OF PROGRAM DESIGN, IF NOT IN ITS PORTFOLIO PLANNING PROCESS?

A: Apparently not. The Company actually does screen measures and

efficiency levels for one of its programs -- the Common Sense Home program. Unfortunately, it failed to screen the measures according to the TRC test and rejected measures that are likely to be cost-effective without adequate justification. This measure screening for the Common Sense Home program will be discussed in greater detail in Section B below.

3. Failure to Take an Active Role in Promoting Conservation.

Q: DO CP&L'S PROGRAMS ADDRESS MARKET BARRIERS TO CUSTOMER INVESTMENT IN CONSERVATION?

A: No. With few exceptions, CP&L's existing programs provide no direct utility financing or direct installation to reduce barriers to customer conservation. Rather, CP&L's involvement is largely limited to:

- time-of-use rates, load curtailment and control rates, and reduced rates for large customers;
- audits and technical support; and
- education and marketing programs.

Only three of CP&L's programs offer utility funding of conservation measures: the Common Sense Home, Homeowner's Energy Loan, and the Residential High-Efficiency Heat Pump programs. However, these programs rely on loans and rate discounts, rather than direct installations or rebates. The use of a rate discount in the first two programs fails to

address market barriers and sends a contradictory message to CP&L's customers. The loan programs (the latter two programs) are not well-structured to overcome market barriers, as I will discuss more fully in Section B below.

Q: IS DIRECT UTILITY INTERVENTION A NECESSARY ELEMENT OF AN EFFECTIVE DSM PLAN FOR CP&L?

A: Yes. The Company itself recognizes that there are substantial barriers to customer investment in energy efficiency. CP&L states that it is its "best estimate and feeling that a simple payback of two years or less is required by most customers for all measures except thermal energy storage before a conservation investment would be made (IR SCDCA-1-16)."

Q: AREN'T RATE DISCOUNTS LIKELY TO BE THE MOST ECONOMICAL WAY FOR CP&L TO CAPTURE SAVINGS FROM RESIDENTIAL RETROFITS AND NEW CONSTRUCTION?

A: No. To qualify for the rate discounts, a customer must first install a number of measures (insulation and electric heat pump equipment) and then apply for the rate discount. This system requires the customer (or the developer) to pay the up-front cost of the measures. For a customer building a new home, and especially for speculative developers, every dollar of efficiency cost must usually compete with other uses (more space, better finishes). The developer either gives up the

features that make the home more saleable, or must finance any additional cost until the home sells (which is unpredictable), put more of his financial eggs in one basket, and hope that the selling price of the home covers the additional cost.

CP&L should replace the rate discount with direct services, training, and up-front cash incentives to builders and customers, sufficient to overcome the market barrier to investments in energy efficiency. This approach will be more effective in overcoming the market barrier of high up-front customer outlays.

Q: WHAT MESSAGE DO RATE DISCOUNTS SEND TO THE CUSTOMER?

A: Rate discounts provide price signals that would normally encourage customers to increase their energy use. This would result in customers on conservation rates "taking back" a portion of the savings of the conservation programs. Such "take back" decreases these programs' effects on load growth and may reduce the cost-effectiveness of the programs.

Q: HOW DOES THIS PRICE SIGNAL FIT WITHIN THE LEAST-COST PLANNING PROCESS?

A: It fits poorly. A conservation program simultaneously offering conservation measures and lower tail-block rates operates at cross purposes with itself. The price signal poses the risk that CP&L will spend money on conservation

programs only to have the programs' effects "taken back" by the customers. CP&L should not offer lower rates as an incentive in its conservation programs.

B. Deficiencies in CP&L's DSM Portfolio

Q: DOES THE COMPANY HAVE ANY PROGRAMS THAT PURSUE CONSERVATION RESOURCES?

A: Yes. The Company identifies 6 of its DSM[8] programs as "strategic conservation" programs (IRP, App. D): the Commercial Energy Efficient Design, Commercial Energy Analysis, Industrial Audit/Energy Efficient Plants, Common Sense Home, Homeowner's Energy Loan and the Residential High-Efficiency Heat Pump programs.

1. Deficiencies in Commercial and Industrial Programs

Q: WHAT IS THE MAJOR DEFICIENCY YOU SEE IN CP&L'S THREE COMMERCIAL AND INDUSTRIAL "STRATEGIC CONSERVATION" PROGRAMS?

A: The commercial and industrial programs offer no financial incentives, only information. Utility experience over the past decade has uniformly shown that information-only programs are not effective in capturing conservation resources. Every

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[8]I am not considering the Cogeneration & Hydroelectric program as a DSM program. Most utilities do not include cogeneration as a DSM resource.

utility that has made a serious effort towards DSM has rejected information-only programs as a strategy to capture conservation resources. This is particularly significant in CP&L's case, because the commercial and industrial sectors present the greatest source of conservation resources. CP&L's adoption of information-only programs for these sectors suggests to me that CP&L has no serious intention of pursuing conservation resources in these sectors.

2. Deficiencies in Residential Programs

Q: ARE CP&L'S RESIDENTIAL "STRATEGIC CONSERVATION" PROGRAMS ALSO INFORMATION-ONLY PROGRAMS?

A: No. The residential programs do provide some financial incentives; however, the design of these programs is deficient.

Q: WHAT ARE THE MAJOR DEFICIENCIES IN CP&L'S THREE RESIDENTIAL PROGRAMS?

A: The residential programs do not meet any of the important objectives that I outlined in Section II:

- They are not comprehensive, neglecting most measures and end-uses.
- They fail to pursue lost opportunity resources.
- They fail to address market barriers.
- They result in cream-skimming at best, and at worst, no improvement in energy efficiency choices

of its customers.

- They focus on load building through the promotion of heat pumps without any evaluation of its cost-effectiveness.

a. Deficiencies in the Common Sense Home Program

Q: HOW IS THE COMMON SENSE HOME PROGRAM NOT COMPREHENSIVE?

A: The Common Sense Home program targets an important lost opportunities resource - residential new construction. Unfortunately, it appears to be designed more to promote heat pumps, than to obtain all of the cost-effective efficiency opportunities available in new construction. The program overlooks numerous measures and entire end-uses, such as water heating measures (other than insulation), window measures (such as low-E windows, shading, and solar gain), infiltration limits, and high efficiency lighting.

The program does not even offer incentives for the installation of a high-efficiency central air conditioner. Even though more efficient air conditioners and higher than average levels of home insulation would reduce peak and energy use during the period CP&L considers most important, CP&L limits eligibility for the Common Sense Home program to homes with electric heat and excludes homes with central A/C but fossil-fuel heating.

In addition, the program does not seek to achieve the

highest cost-effective level of heat pump and insulation efficiency. It sets too low a minimum efficiency level for heat pumps. The eligibility threshold is only 10 SEER for split systems or 9.5 SEER for package systems. These levels are the minimum efficiencies required under the Federal appliance efficiency standards. Therefore, CP&L is rewarding customers merely for complying with the law.

The program may also set too low an eligibility threshold for insulation efficiency. CP&L's insulation standards (R-30 ceilings, R-16 walls, and R-19 floors) are virtually the same as the new South Carolina Code requirements for all houses (R-30 for most ceilings, R-13 walls, and R-19 floors), exceeding the state's standards by only an additional R-3 in wall insulation.

Q: HAS THE COMPANY EVALUATED INCREASES IN MINIMUM EFFICIENCY LEVELS AND ADDITIONAL MEASURES FOR THE COMMON SENSE HOME PROGRAM?

A: Yes, but the Company's measure screening process is fundamentally flawed.

A June 4, 1992 study prepared by the Energy Engineering Unit of the Customer Support Department, Evaluation of Requirement Changes in CP&L's Residential Common Sense House Program, evaluated higher heat pump efficiencies (SEER 11 and

SEER 12), higher insulation levels, infiltration control measures, and low-E windows (IR SCDCA-1-29). The report recommends that the ceiling insulation standard be raised to R-38. The study also found that an increase in the minimum efficiency level of heat pumps to 11 SEER and 8 HSPF and the addition of infiltration control measures were "economically justified" but not recommended.

Unfortunately, the study recommendations were not based on the cost-effectiveness of these additional measures and higher efficiency levels. Rather, they were based on estimates of the payback period for the customer under the residential rate and the 5% energy conservation rider. The study focused solely on customer acceptability of higher eligibility requirements, accepting the customer incentive level as a given.

Least-cost planning and program design requires a different analysis. In the design of DSM programs, decisions about measures and efficiency levels should be based on avoided cost, not rates. Only after the most cost-effective bundle of measures and efficiency levels is determined, should customer incentives be designed to make the most cost-effective program acceptable to customers.

Q: WHY DID ENERGY ENGINEERING NOT RECOMMEND A HIGHER MINIMUM HEAT

PUMP EFFICIENCY AND INFILTRATION CONTROL MEASURES, EVEN THOUGH THEY WERE FOUND TO BE ECONOMICALLY JUSTIFIED?

A: They found the availability of heat pumps that would meet minimum efficiency levels of 11 SEER and 8 HSPF to be too limited, and the infiltration controls too difficult to evaluate.

Q: DO YOU BELIEVE CP&L HAS A VALID REASON FOR REJECTING A HIGHER MINIMUM EFFICIENCY LEVEL FOR HEAT PUMPS?

A: No, for at least the following reasons:

- In its evaluation of the High Efficiency Heat Pump program, CP&L assumes that even more efficient heat pumps are available and, what is more, installed. CP&L predicts that the program will, on average, encourage heat pump efficiencies of SEER 11.7 and HSPF 8.7 (CP&L back-up documentation for program evaluation).

- An important objective of utility programs is to improve the marketplace by increasing the availability of more energy efficient appliances and equipment. It is not to pay customers to do the minimum they would have done anyway.

- If, contrary to CP&L's own evaluation of its High Efficiency Heat Pump program, heat pumps with 11 SEER and 8 HSPF ratings are not widely available, CP&L should have at least considered 11 SEER heat pumps with lower than 8 HSPF ratings. The report does not evaluate any other heat pump efficiencies.

Q: IS IT FEASIBLE TO INCLUDE INFILTRATION CONTROL MEASURES IN THE COMMON SENSE HOME PROGRAM?

A: Yes. The blower door test of infiltration is a standard part of many utility DSM programs.

b. Deficiencies in the Residential High-Efficiency Heat Pump Program

Q: WHAT DEFICIENCIES HAVE YOU FOUND IN THE RESIDENTIAL HIGH-EFFICIENCY HEAT PUMP PROGRAM?

A: The Residential High-Efficiency Heat Pump program excludes high efficiency central air conditioners.[9] This omission suggests that the Company is more interested in promoting electric heating sales than it is in reducing summer peak period use.

CP&L does encourage higher heat pump efficiencies by offering loans with the interest rate pegged to the efficiency level of the heat pump equipment. Notwithstanding the inefficiency of loans in removing the market barriers to conservation investment, offering a higher incentive for higher efficiency levels is a step in the right direction. It also appears that CP&L has structured the loans to cover the full incremental cost of going from SEER 10 to SEER 11. As a result, 80% of the participants have installed equipment with SEER 11 or greater (IRP, p. 2-8).

CP&L anticipates that the program will achieve

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[9]According to the description provided in response to IR SCDCA-1-8, the Residential High Efficiency Heat Pump program also targets central air conditioners. However, the only customer incentive provided, the Homeowner's Energy Loan, is offered only for the purchase of heat pumps.

significant efficiency gains and recognizes that installations of SEER 10 heat pumps are essentially free-riders. It is therefore unclear why CP&L even provides loans for heat pumps with only the minimum legal efficiency level. Inclusion of heat pumps with SEER's of less than 11, even if discouraged by the higher 12% rate of interest, gives customers an option the Company does not seem to want them to take.

c. Deficiencies in the Homeowner's Energy Loan Program

Q: WHAT ARE THE PROBLEMS WITH THE HOMEOWNER'S ENERGY LOAN PROGRAM?

A: The Homeowner's Energy Loan program provides low interest loans available to the customer to encourage upgrades of home insulation levels.

This program is not structured to encourage maximum cost-effective levels of insulation. It cream-skims by setting a cap on its low-interest loans, and that cap is only $1500. In addition, CP&L establishes maximum efficiency levels that are eligible for loans, even though higher levels may be shown to be cost effective. In fact, as noted above, the Company's own analysis recommends a minimum standard for ceiling insulation under the Common Sense Home program that exceeds the maximum that the Company has set in the Homeowner's Energy Loan

program. Finally, the program appears to set no minimum insulation levels.

d. Potential for Load building through the Promotion of Heat Pumps

Q: IS CP&L PROMOTING HEAT PUMPS TO CUSTOMERS WHO OTHERWISE WOULD HEAT WITH FOSSIL FUEL?

A: Yes. Even though CP&L has characterized the Common Sense Home program as a "strategic conservation" program exclusively, it regards the target market to be the entire new housing market (IR SCDCA-1-8). The Residential High- Efficiency Heat Pump program is intended to promote winter load growth (IRP, App. D, p.7). In its calculation of program effects, CP&L assumes that all participants would otherwise heat with a fossil fuel furnace (CP&L back-up documentation for program evaluation).

Q: IN YOUR JUDGMENT, DOES THE COMMON SENSE HOME PROGRAM HAVE THE POTENTIAL TO BUILD LOAD, RATHER THAN DECREASE IT?

A: Yes. Given the way the program is designed, the heat pump promotion is likely to result in a net increase in winter loads and no summer peak reductions.

Q: WHY DO YOU BELIEVE THAT SUMMER PEAK REDUCTIONS ARE UNLIKELY?

A: A participant has only to install a heat pump with the minimum legal efficiency to be eligible for the discounted rate. The Company's projection of summer peak reductions either assumes

that (1) participants will meet the minimum eligibility requirements, but otherwise would install illegal equipment, or (2) the Common Sense Home program will give homebuilders an incentive to install higher efficiency equipment. Neither of these assumptions are realistic. By reducing electric rates, the Common Sense Home program actually reduces the incentive to install equipment with more than the minimum efficiency.

Q: WHY DOES THE COMMON SENSE HOME PROGRAM HAVE THE POTENTIAL TO INCREASE WINTER LOADS?

A: The Common Sense Home program will have three kinds of participants: customers who would otherwise install conventional resistance heating, customers who would install heat pumps anyway, and customers who would otherwise opt for heating with fossil fuel. New customers who would install heat pumps anyway will essentially all be free riders. Given the recent changes in the South Carolina building code, CP&L's program will achieve winter kW or kWh savings for the most part only when it succeeds in encouraging the installation of heat pumps instead of conventional resistance heating. Unfortunately, the program is not designed to achieve the maximum cost-effective savings for this category of customers. Given the low minimum efficiency levels set for the heat pump, the program will have virtually no effect on the efficiency of

heat pump equipment installed in these new homes.

Therefore, winter load growth due to the promotion of electric heat among customers who would otherwise use fossil heat is likely to swamp any conservation effects this program might have.

Q: WHAT EFFECT WILL THE HIGH EFFICIENCY HEAT PUMP PROGRAM HAVE ON SALES?

A: According to CP&L's projections, this program will result in reductions in summer peak and energy, increases in winter peak and energy, and an overall increase in annual kWh (CP&L back-up documentation for program evaluation).

Q: HAS CP&L DEMONSTRATED THAT ITS LOAD-BUILDING PROGRAMS WILL FOSTER LEAST-COST ENERGY SERVICE?

A: No. The Company has simply declined to estimate the total resource cost of load-building and valley-filling programs. If it did so, the programs that promote fuel-switching (to electricity) would likely fail the TRC test. If the Company is going to pursue load building, at the very least, it should have to demonstrate that these programs are cost-effective. For example, with regard to the promotion of heat pumps to replace fossil heat, least-cost planning requires, at a minimum, a demonstration that the heat pump will have a lower cost than high efficiency central air conditioning and fossil

heat, all else equal.

C. Failure to Integrate Demand-Side and Supply-Side Planning

Q: WHY IS CP&L'S PLANNING INTEGRATION INADEQUATE?

A: There simply is no integration of demand and supply-side resource planning. The Company's analysis of the least-cost supply plan assumes a single fixed amount of DSM, and therefore does not test the economics of supply additions against increases in DSM. It does not test the effects of load building on supply costs. Nor does it test the effects of different mixes of DSM, conservation, load building, and load management on the level and types of capacity additions needed in the planning period.

Aggressive conservation programs and elimination of promotional programs could defer CP&L's 1996 capacity addition, the 225 MW Darlington CT. By failing to integrate demand-side planning and supply planning, CP&L disregards the effect of DSM on the timing of capacity additions.

V. CONCLUSIONS AND RECOMMENDATIONS

Q: WHAT ARE YOUR RECOMMENDATIONS FOR THE COMMISSION ON CP&L'S IRP?

A: I recommend that the Commission find CP&L's integrated resource planning and proposed DSM portfolio inadequate with regard to the requirements of Order No. 91-1002.[10] I recommend that the Commission order CP&L to:

1. immediately suspend the Safeshine and Electrotechnologies programs, unless it files with the Commission within 30 days justification for the programs, including all screening results;
2. immediately redesign the Residential High-Efficiency Heat Pump program to eliminate financing for split system heat pumps with efficiencies below SEER 11 and for package heat pumps with efficiencies under 10. In addition, the program should be redesigned to offer financing for central air conditioners of SEER 11 and above.
3. immediately redesign the Common Sense Home program to raise the minimum efficiency requirement for heat pumps to SEER 11 and to make the program available to

[10]I have not taken a position on the reasonableness of the special rates and rate designs proposed in CP&L's IRP filing. An IRP proceeding is not the appropriate forum for consideration of rate design issues.

homebuilders that do not choose electric heat; and

4. immediately suspend the EZ-$64 Program (Stand-Alone Water Heater) program.

In addition, I recommend that the Commission direct CP&L to prepare a comprehensive integrated resource plan that minimizes total resource costs to the extent feasible. This should include the design and implementation of efficiency programs for the residential, commercial and industrial classes that comply fully with the general principles summarized in Section II of this testimony.

The Commission should also put CP&L on notice that cost recovery for its 1996 Darlington peaker addition is at risk.

Q: DOES THIS COMPLETE YOUR TESTIMONY?

A: Yes.