#93

Docket No. 91-216-E

STATE OF SOUTH CAROLINA
BEFORE THE
SOUTH CAROLINA PUBLIC SERVICE COMMISSION

In Re:

DUKE POWER COMPANY

DIRECT TESTIMONY OF

PAUL CHERNICK
Resource Insight, Inc.

ON BEHALF OF THE

DEPARTMENT OF CONSUMER AFFAIRS

Re:

Demand-Side Management

September 13, 1991

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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, the need for, cost of, and cost-effectiveness of prospective new generation plants and transmission lines; retrospective review of generation planning decisions; ratemaking for plant under construction; 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 Attachment 1.

Q: Mr. Chernick, have you testified previously in utility proceedings?

A: Yes. I have testified approximately eighty 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 nuclear power plant construction costs and schedules, nuclear power plant operating costs, power plant phase-in procedures, the funding of nuclear decommissioning, cost allocation, rate design, long range energy and demand forecasts, utility supply planning decisions, conservation costs and potential effectiveness, fuel efficiency standards, and ratemaking for utility production investments and conservation programs.

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.

II. INTRODUCTION

Q: What is the purpose of your testimony?

A: I intend to discuss issues relating to demand-side management raised in this rate case by Duke Power Company (the "Company") and the status of least-cost planning efforts at Duke. The central issue is Duke's request to recover $6,475,000 in incremental DSM expenditures.

Q: Please summarize your testimony.

A: Because Duke's Integrated Resource Plan (IRP) has not been reviewed and approved by the Public Service Commission of South Carolina (the "Commission"), and has not otherwise been subject to review, I conclude that evaluation of the prudence of the expenditures being used to expand the Company's Demand-Side Management (DSM) programs is not yet possible. To date, the Company has not demonstrated that these costs can be expected to benefit its ratepayers and should be recovered. Therefore, the $6,475,000 of incremental DSM expenditures Duke is seeking to recover should not be allowed at this time.

If the Company can demonstrate in this proceeding that certain of these expenditures have been prudently committed and are consistent with the recently approved IRP procedures, then those particular costs may be approved for recovery through expensing, rate basing, or deferrals.

For DSM costs that cannot be supported in this case, Duke may later file the programs for the Commission review. At that time, the prudent costs can be deferred and included in rates (or approved for inclusion with the next rate case) and imprudent costs can be disallowed. Review of the programs and the cost recovery mechanism can be resolved under the IRP procedures. Duke should be able to proceed with programs it believes to be cost-effective, confident that prudent costs will be recovered.

Q: In the absence of an IRP which has passed regulatory review, or of sufficient other information submitted by the Company in this case, is there reason to believe that some portion of the incremental DSM expenses the Company seeks to recover in this case has not been prudently incurred?

A: Yes, there is evidence that a significant portion of the incremental DSM expenses for which the Company is seeking recovery has not been prudently incurred. However, I will not attempt to prove this is the case: the absence to date of regulatory review of the IRP and of adequate justification of the DSM expenditures in this proceeding makes that task impossible.

Although it is up to the Company to prove its case for expense recovery, I will discuss four issues arising from Duke's conservation programs, including "strategic" sales programs,[1] Duke's failure to address all lost-opportunity DSM resources, cream-skimming, and counter-productive conservation

[1]Duke does not define the characteristics that make load-building "strategic." I have been unable to identify any strategic basis for Duke's load-building efforts.

rate incentives. The problems with the current and proposed programs strongly suggest that much of the Company's activities are inconsistent with least-cost integrated planning principles. For the Company to recover or get deferral of DSM costs in this docket, it must address at least those problems in order to meet its burden of proof. I will also discuss other particular aspects of these problems.

Normally, a commission's review of an IRP provides a forum for evaluating the appropriateness of DSM programs. This review may also be specific to DSM programs, in the context of load forecasts and committed and contingent supply resources identified in other proceedings. Several regulatory bodies have used the collaborative DSM design process to simplify their review of collaboratively-designed programs. Load-building programs and any rate designs related to DSM implementation and incentives would also be evaluated in the same forum.

Q: Please expand on your areas of concern.

A: Four principal areas cause concern. These areas are:

(1) Both conservation programs and load-building programs are included in the Company's portfolio of Least-cost Integrated Resource Plan (LCIRP) demand-side programs. Some of the programs Duke refers to as "conservation" programs are primarily promotional. The Company's sales programs more than offset the effects of its conservation programs on

summer peak, and add to the winter peak growth induced by the "conservation" programs. (see: Duke Power Company, Least-cost Integrated Resource Planning 1991, Short Term Action Plan (LCIRP 1991 STAP), Exhibit 4-4: Demand-Side Programs Projected Peak Load Impacts, reproduced here as Exhibit PC-1). Duke does not provide the energy effects of the program, but these are also likely to represent an increase in sales.

Duke's load-building programs are unlikely to be cost-effective in light of overall long-term resource plans. Load building is likely to advance the need for new generation, transmission, and distribution capacity, result in higher fuel usage, and result in higher revenue requirements and total costs over the long term than would have otherwise been the case.

(2) Duke's conservation programs clearly fail to capture as much cost-effective savings as possible from lost-opportunity resources, even though some of Duke's programs address less urgent discretionary (non-lost-opportunity) resources. Many decisions affecting energy efficiency are irreversible over the lifetime of the building or equipment to which they apply. Losing these opportunities has such

long-term consequences that future capacity requirements will undoubtedly be increased.

(3) Several of the Company's conservation program designs are deficient in that they can be expected to result in "cream-skimming". Cream-skimming is the acquisition of easily available inexpensive conservation resources in a manner that renders otherwise cost-effective resources non-cost-effective or more difficult to obtain. There is reason to believe that some of the Company's programs may actually reduce the availability of cost-effective conservation resources.

(4) Certain of the Company's rate designs encourage participants in conservation programs to "take back" the benefits of improved energy efficiency by increasing energy use. Such "take back" decreases these programs' effects on load growth and may reduce the cost-effectiveness of the programs.

III. LOAD BUILDING PROGRAMS

Q: Does Duke include strategic sales programs in its DSM portfolio?

A: Yes. Strategic sales programs are an important part of Duke's DSM portfolio, both in terms of the resources dedicated to these programs and of their contribution to load. In 1991 Duke will spend $25,672,950 on its acknowledged strategic sales programs (see LCIRP, Exhibit 4-6, reproduced here as Exhibit PC-2). These programs are expected to result in 10.6 additional megawatts (MW) of load in 1991 (LCIRP, exhibit 4-4, reproduced here as Exhibit PC-1).

Q: How does this compare to Duke's conservation programs?

A: In 1991, Duke will spend $5,017,936 on efforts it classifies as conservation programs, from which it expects a 10.1 MW load reduction in 1991. In effect, for every dollar Duke spends to reduce its load, it spends 5 to increase its load.

Q: Do any of the programs Duke lists as "conservation" actually build load rather than reduce it?

A: Yes. The residential heat pump sales component of the Residential MAX program encourages the adoption of heat pumps: inefficient heat pumps, at that. Duke acknowledges the program increases winter load by nearly as much as it decreases summer load (LCIRP Exhibit 4-4, reproduced here as

Exhibit PC-1). It also increases energy usage, as does the related Dual Fuel Heat Pump program.[2]

Further, the summer savings from the Residential MAX heat pumps, as well as from the Dual Fuel Heat Pump program, are suspect. It is not clear that the inefficient heat pumps promoted by these program will produce any efficiency gain over existing or alternative air conditioners. If the alternative air conditioning is limited to partial room air conditioning, summer usage may increase due to the heat pump. All else being equal, a heat pump would be expected to be less efficient than a comparable central air conditioner. It is unlikely that the program will lead to the savings Duke claims, or any other savings. If Duke encouraged high-efficiency heat pumps in new homes not on gas lines and existing homes with resistance heat and heat pumps, the Residential MAX and Dual Fuel Heat Pump programs might produce cost-effective savings. As it stands, the programs appear primarily designed to build load.

Q: Does the LCIRP take into account the energy savings and increases due to its conservation and load-building programs?

A: The LCIRP does not discuss the energy effects of Duke's programs. More gravely, it provides no evidence that Duke has integrated these energy savings into its resource planning: it appears that Duke has evaluated programs and measures

[2]The MAX program appears to be strongly oriented to the promotion of heat-pump energy use, rather than efficiency.

solely on the basis of avoided capacity (kW) costs without considering energy (kWh) costs. Yet energy costs are an integral part of avoided costs. They become even more important when externalities are valued. If indeed Duke is not including energy in its avoided costs, then it is not screening measures and programs in a least-cost manner. The Company obviously acknowledges the important role of energy costs in <u>supply</u> planning: considering only capacity costs, Duke would never build any power plants other than inexpensive peakers. Duke should also consider energy costs for demand planning.

Q: How well is Duke coordinating its efforts on the demand side with its resource needs?

A: Duke's sales programs are not geared to its resource needs and, in fact, may undermine the Company's stated intent to "defer much of the uncommitted generating capacity identified and scheduled in [the Short Term Action] Plan." (LCIRP 1991 STAP at 6, reproduced here as Exhibit PC-3.) The Company's sales programs are intended to increase peak load and energy consumption, thereby exacerbating the need for new peaking capacity and more expensive base-load and intermediate capacity.

Q: Please explain how Duke's load-building programs operate at cross purposes with its conservation programs.

A: The Company's load-building programs are designed to increase sales in order to spread fixed costs over additional unit sales (LCIRP 1991 STAP at 6, reproduced here as Exhibit PC-3). The Company's conservation programs are intended "to defer much of the uncommitted generating capacity identified and scheduled in this plan."[3] (Id.) These can be opposing goals. Duke is promoting higher sales, including sales in peak periods, which will accelerate the need for investments in generating capacity, while it also claims to be attempting to defer the same capacity. This is a real programmatic tightrope requiring careful analysis of long-term program impacts.

Sales-building programs should be undertaken only if they are cost-effective from the societal perspective.[4] Any resulting increases in peak load and energy requirements must be justified by the benefits of the load, evaluated in accordance with a fully documented least-cost integrated resource plan. Not only does Duke lack a least-cost integrated resource plan that has undergone regulatory review, but Duke has not submitted any other documentation of the economic validity of this combination of conservation and sales-building programs.

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[3]This statement appears to assume that Duke is uninterested in deferring the need for the 1165 MW of Lincoln CT capacity now scheduled for 1994-5. These costs should still be treated as avoidable, and Duke should work to avoid them.

[4]Even if a load-building program is societally cost-effective, Duke should determine the rate effect of the program in the long term before it commits to the program. Duke has a least-cost obligation to minimize the total costs of the services Duke provides; it is not clear it has any similar obligation to minimize costs of services not currently or normally provided by Duke.

Q. How should Duke re-align its demand-side efforts to be consistent with its anticipated supply needs in a least-cost planning context?

A. To consider conservation and load management properly in its resource planning, Duke must consider the following four matters:

1. Valley-filling programs can raise future baseload generating requirements, increasing both fuel and capital costs, even if they do not increase peak load.
2. Peak-shifting can increase baseload generating requirements and increase reserve requirements while decreasing peaking capacity requirements.
3. Promoting general load growth will raise the need for both baseload and peaking capacity.
4. Unlike other demand-side management strategies, improving energy efficiency can offset the need for both peaking and baseload facilities. Even by saving electric energy without reducing peak demand, efficiency improvements can reduce the need for new baseload capacity.

Q. How could stimulating baseload energy sales increase costs?

A. In the short run, greater energy sales may, indeed, reduce average fixed costs and raise revenues, resulting in lower rates. This can appear especially attractive now if the Company has substantial amounts of excess baseload generating capacity with low operating costs. But today's off-peak power promotion can necessitate tomorrow's baseload generating expansion; eventually, sustained growth in electric energy use will surpass the capability of Duke's current baseload capacity. Without raising the total amount of generating capacity needed, Duke may unwittingly change the type of generation it needs. This should cause serious concern for the Company and the Commission, since adding baseload capacity probably means building expensive new coal plants, which may cause a variety of problems.

In addition, loads in non-peak hours can increase requirements for total installed capacity by reducing the capacity benefits of storage hydro and pumped storage, reducing maintenance opportunities, and increasing loss of load probability. Even in the short run, greater sales lead to greater costs for fuel, O&M, and environmental compliance. Unless there are clear benefits to offset these costs, the sales should not be encouraged.

Q. Does the fact that peak-shifting increases some types of cost imply that peak-shifting is not a worthwhile demand-side strategy?

A. No. Cost-effective opportunities may exist for Duke to reduce growth in peak load. Some of these strategies may be cost-effective. Duke should count the full incremental costs of baseload energy, not just the currently low operating costs of today's baseload facilities, to determine the true costs of such programs.

Peak-clipping strategies, which reduce peak load without increasing off-peak loads, do not accelerate the need for additional base-load capacity and tend to be more attractive than load-shifting.

Q. Do you suggest that under no circumstances should Duke promote growth in electric energy use, off-peak or otherwise?

A. No. The Company should encourage such sales increases or shifts only if they are cost-effective. Duke needs to consider the costs and effects of such load building carefully and consistently. To begin with, the cost of <u>operating</u> today's coal plants does not represent the total long-term cost of serving such load. 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, and costs associated with mitigating the environmental damage from burning coal.

As the NARUC least-cost planning handbook observes:

> ... utility load-building programs are not sufficiently integrated in overall long-term resource plans to prevent such load-building from increasing long-term capacity requirements. They are thus likely to advance the need for new, more expensive capacity, which would force a greater increase in revenue requirements over the longer-term than would have been the case without load building. On a net present value basis, these cost increases in the longer-term could be far greater than short-term savings. (NARUC,

Least-Cost Utility Planning: A handbook for Public Utility Commissioners, Vol 2 at IV-10)

Programs promoting sales growth may be advisable if they can be shown to be cost-effective. This is easier for programs with only temporary effects. The Idaho PUC recently recognized this relationship in a ruling that requires utilities to phase out load-building rates once new facilities will become necessary.[5]

Q. Will load-building programs foster least-cost energy service?

A. Not generally. Electric end-uses requiring promotion are unlikely to be either cost-effective or energy-efficient. For example, Duke is promoting electricity use for heating. Typically, in residential buildings subject to normal use and built to building-industry standard practice, fossil fuels are more cost-effective and fuel-efficient than electricity for heating. 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. It is to be expected that 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. The Company does not appear to include the higher costs

[5]See "Load-Building Rate Discounts Must Anticipate Energy Shortages," Public Utilities Fortnightly, July 6, 1989, p. 47, citing Re "Quid Pro Quo" Demanded for Special Electric Rate Contracts, Case No. IPC-E-89-5, Order No. 22489, May 24, 1989.

of electric space or water heating to customers in evaluating the economic merits of its strategic load growth program.

The Dual Fuel Heat Pump program has a special cost-effectiveness problem. When applied on gas-heated homes on mildly cold days, it would shift relatively inexpensive gas to electricity but would leave the expensive on-peak energy to be served by the gas utility. The participant may receive a substantially lower gas bill because of the inability of the gas company to set its prices according to outside temperature. Since the real savings to South Carolina are small but the bill savings are high, the Dual Fuel Heat Pump program may successfully encourage customers to make wasteful investments and use a mix of energy sources that is far from least-cost.

Q. Should Duke be ordered to terminate all strategic load growth programs?

A. Not necessarily. The Company should promote electricity only in circumstances where it is clearly the cost-effective alternative. Otherwise, Duke will be promoting an uneconomical use of its ratepayers' resources while increasing its costs.

Most of the space-heating programs are likely to fail cost-effectiveness tests. The same is true for water heating, especially where gas is available. Electricity may, in fact, be cost effective in some of Duke's load-building applications in which electricity's specialized abilities are well-used, such as in heat recovery, induction, and microwave heating.

Q: Are there any significant financial consequences to the Company that might result from a portfolio of load building and conservation programs?

A: Yes. Duke's short-run internal marginal cost of electric supply is probably lower than its rates, which are based on the average cost of service, including costs that do not vary much in the short term. Thus, in the absence of an adjustment mechanism such as California's Electric Revenue Adjustment Mechanism (ERAM) or New York's Revenue Decoupling Mechanism (RDM), any load building that occurs will result in increased earnings for Duke shareholders, at least until the next rate case. This will occur at the same time that the Company seeks recovery of its conservation expenditures. In short, the Company will be profiting from increased sales and charging customers for conservation expenditures -- activities that may be operating at cross purposes.

Q: Does this affect the need for cost recovery for load-building programs?

A: Yes. It is not clear why Duke needs any explicit cost recovery for load building, since it will profit from the load growth induced by the programs. Duke does not appear to request any cost recovery for its formal load-building programs. The same reasoning applies to the $6.6 million ($1.8 million for S.C. retail) budgeted for the heat pump promotional programs (MAX and Dual Fuel) listed as conservation programs in the LCIRP STAP Exhibit 4-4, reproduced here as Exhibit PC-1.

IV. FAILURE TO ADDRESS ALL LOST-OPPORTUNITY RESOURCES

Q. What are lost-opportunity resources?

A. The Northwest Power Planning Council defines lost-opportunity resources as those "which, because of physical or institutional characteristics, may lose their cost-effectiveness unless actions are taken to develop these resources or to hold them for future use."[6] On the demand-side, lost-opportunity resource programs pursue efficiency savings that otherwise might be lost because of economic or physical barriers to their later acquisition.[7]

Q. Where are lost-opportunity resources usually found?

A. Opportunities to secure inexpensive efficiency savings present themselves when new residential and commercial buildings are designed and constructed. Similar one-time opportunities also arise when households and businesses add or replace appliances and equipment. Once foregone, these "resources" will have to be replaced in the future either with alternative supply or more costly conservation (e.g., as retrofits to the newly built facilities). In the case of new equipment such as appliances, all efficiency potential may be lost until the end of its useful life. (Id. at 9.)

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[6] Northwest Power Planning Council, 1986 Northwest Conservation and Electric Power Plan, Vol. 1, p. Glossary-3.

[7] "Five Years of Conservation Costs and Benefits: A Review of Experience Under the Northwest Power Act," at 7.

Q. Why should Duke be particularly diligent in pursuing lost-opportunity resources now?

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 days. The consequences of these decisions can last anywhere from a decade to a century.

On the other hand, if a discretionary retrofit is not undertaken this year, or next, it can still be installed in 1993 and still reduce the need for the last of the Lincoln CTs in 1995 or the next Duke capacity additions, planned for 1997. Hence, if Duke cannot manage all cost-effective DSM programs today, the retrofit programs should be deferred, not the lost-opportunity programs.

Moreover, lost-opportunity resources are the most flexible demand-side resources available to Duke. They tend to correlate with demand growth since rapid demand tends to correspond to construction booms and facility expansion. More so than any other resource available to Duke, the acquisition of lost-opportunity resources will parallel the utility's resource needs.

Q. What types of programs should Duke pursue to capture opportunities which would otherwise be lost?

A. Duke should concentrate on programs aimed at new construction and renovation in the commercial and residential sectors and equipment replacement and plant expansion in the industrial sector. Appliance efficiency standards also present opportunities in the commercial and residential sectors. Where standards exist, as for some HVAC and refrigeration equipment, Duke can implement programs that aim to "beat the standards."

Q. Have other utilities or regulators recognized the imperatives of capability-building and lost-opportunities?

A. Yes. The Northwest Power Planning Council first urged Bonneville Power Administration and the region's utilities and regulators to pursue lost opportunities in its 1983 Plan. Its 1986 plan reaffirmed this recommendation, in spite of a large capacity surplus.[8] In Vermont, the Public Service Board and the utilities it regulates are making capability-building and lost-opportunity resources their top priorities.[9] The Idaho Public Utilities Commission recently ordered utilities under its jurisdiction to submit a "Lost Opportunities Plan" and a "Capability-building Plan."[10] The Wisconsin PSC also declared

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[8] 1986 Northwest Plan, op. cit., at 9-28 through 9-30.

[9] Docket 5270, Vol. III, at 58-59, 92-102.

[10] See Order No. 22299, Case No. U-1500-165, January 27, 1989.

that utilities should not let such valuable yet transitory efficiency opportunities escape:

> The importance of improving the energy efficiency of commercial buildings as soon as possible must be emphasized. These buildings represent long-term investments (up to 70 years) which will significantly affect the use of energy once they are constructed. Retrofitting to achieve energy efficiency, as experience has shown, is usually expensive, if possible at all. Therefore the commission is not willing to allow these 'lost opportunities' for energy efficiency to continue unabated." (Fifth Advance Plan Order, op. cit., at 33-34)

Northeast Utilities has adopted this same perspective in its demand-side programs, which it developed under an unprecedented collaborative design process spearheaded by the Conservation Law Foundation. Utilities in Massachusetts and Vermont are re-orienting their current demand-side strategies toward capability-building and lost-opportunity resources.

Q: Does Duke have programs that target lost opportunities?

A: Yes. The Residential MAX Package and the High Efficiency Refrigerator and Freezer programs capture lost opportunities. However, the MAX Package is inadequate because it fails to attempt to capture all the cost-effective opportunities present in residential new construction projects which participate in the program.[11] I describe this subject further in the next section. Only the High Efficiency Refrigerator

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[11]Both the MAX package and the residential conservation rate allow for insulation, window efficiency, and heat pump efficiencies lower than those selected by Potomac Electric Power (PEPCo) for its cooler service territory. Given the higher cooling loads, cost-effective efficiency levels may be much higher in Duke's territory.

and Freezer program appears to be a true least-cost lost-opportunity program.[12]

Q: Please point out lost-opportunity resources Duke is not pursuing.

A: Duke has ignored lost-opportunity resources in three areas. First, Duke forgoes the most important lost-opportunity resource, non-residential new construction and renovation. Duke does not have a program targeting this large source of cost-effective energy and capacity savings. This failure has load-growth consequences that will last for over 40 years.

Second, Duke conservation programs also fail to capture the savings offered by non-residential equipment replacement. There is no program to encourage the selection of high-efficiency replacement motors, chillers, compressors, and other long-lived equipment.

Third, although Duke offers a residential refrigerator and freezer program, it ignores lost opportunities in other residential equipment and appliances such as air conditioners and water heaters. Residential end-uses other than heating are also neglected in the new construction program.

Q: What price do Duke's ratepayers pay as a result of the neglect of these lost-opportunity resources?

A: By foregoing these resources, Duke is denying its ratepayers significant cost-effective energy and capacity savings. It

[12]This program offers incentives only for the top 15% most energy-efficient models. Incentives approximate incremental costs.

will be far more expensive, and in some cases, impossible, for Duke to reap savings from these resources once the window of opportunity (e.g., the construction process or the equipment purchase) has closed.

Q: Do these omissions imply that Duke's existing programs are not prudent?

A: Not necessarily. However, it is worth noting that while Duke is ignoring certain lost-opportunity sectors, it is targeting discretionary DSM resources such as existing residential insulation upgrades. These discretionary resources are not as time-sensitive as lost-opportunity resources; they can be postponed without significant loss of savings potential. Duke's decision to run discretionary programs while it has failed to address lost-opportunity sectors comprehensively calls into question the "least-cost" nature of Duke's allocation of planning resources. Ideally, Duke should run all cost-effective programs, covering all cost-effective measures. If some programs must wait because of resource constraints, the discretionary programs should be delayed.

V. CREAM-SKIMMING

Q: What is cream-skimming?

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. In 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.

Q: Which of Duke's programs show evidence of cream-skimming?

A: The Residential MAX Package, the Dual Fuel Heat Pump program, the Residential Insulation - Existing Market program, the Residential Air Conditioner Load Control program, and the Residential Water Heater Control program all show signs of cream-skimming.

Q: How is Duke likely to be cream-skimming in the Residential MAX Package?

A: The Residential MAX Package, Duke's residential new construction program, consists of higher than average levels of insulation, a heat pump with a minimum seasonal energy efficiency ratio (SEER) of 9, and pre-wiring for Duke's load control/off-peak water heating program. This program cream-skims in both of the ways discussed above.

First, the company does not attempt to obtain all cost-effective measures from residential new construction. The program ignores sources of savings such as improved thermal performance from windows (above double glazing), and improved efficiency from lighting and water heating. Duke should be taking advantage of a construction project's participation in the program to promote use of all cost-effective energy conservation related building techniques, including but not limited to: compact fluorescent lighting, high thermal performance glazing (e.g., reflective glass), high efficiency water heaters, and low-flow showerheads and faucet aerators.

Second, the program sets too low an eligibility threshold for heat pump efficiency. Most least-cost reviews find that SEERs of 12 or 13 are cost-effective. The "higher-than-average" level of insulation does not appear to represent the least-cost level, and may not even represent standard practice. For example, wall insulation of R-19 may have a zero or negative net installation cost, compared to the R-12 Duke specifies, since the use of 2x6 framing on 24" centers uses less labor than traditional 2x4 framing on 16" centers.

Q: Why is the eligibility threshold Duke sets for heat pumps too low?

A: Heat pumps with a SEER of 9 qualify for the <u>Residential MAX</u> program, the <u>Dual-Fuel Heat-Pump</u> program, and the Conservation Rate. Federally mandated national appliance efficiency standards, effective January 1992, will require a minimum SEER of 10 for all new heat pumps (See 10 CFR CH. II (1-1-91 edition), Part 430, Subpart C, §430:32). Exhibit 4-4 of the LCIRP 1991 STAP (reproduced here as Exhibit PC-1) indicates that Duke plans to offer this program through 1993. Thus beginning in January 1992, a heat pump with the minimum legal SEER (i.e., 10), would qualify for Duke's programs. Indeed, even non-complying units would be eligible.[13] The programs in no way encourage the customer to install a high-efficiency heat pump; almost all participants can be expected to be "free-riders".[14] In effect, Duke is giving customers money for merely complying with the law. Not only is Duke getting "nothing for something," but if Duke is allowed to recover these expenditures, Duke's customers will be unnecessarily bearing the burden of these imprudent expenditures.

Duke could avoid cream-skimming by simply raising the qualifying heat pump SEER. The programs now are inconsistent with least-cost planning principles.[15]

Q: What signs of cream-skimming approaches are evident in the Residential Insulation - Existing Market program?

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[13]This is a particularly egregious problem for the Dual-Fuel program, which promotes the retrofit installation of heat pumps. To the extent that Duke is encouraging the installation of inefficient heat pumps before the effects of the Federal standards are fully reflected in distributors' inventory, it may be decreasing efficiency and raising peak loads under the guise of conservation.

[14]EPPCo found that an SEER of 12 was cost-effective. (PEPCo Collaborative Program Filing, 8/7/91)

[15]The heat pump programs are considerably less attractive than the pilot residential air conditioning/heat pump program Duke recently completed. Unlike the pilot, the actual programs give incentives for electric heat by limiting incentives for efficient cooling to customers with heat pumps. The pilot also required a minimum SEER of 10 (which is too low, since this will soon be the legal minimum) and provided increased incentives for higher SEERs. Replacing the SEER 9 requirement and the heat pump requirement with the pilot program's structure would greatly increase the quality of the proposed programs.

A: The Residential Insulation - Existing Market program encourages the upgrades of insulation levels in the residential market by making low interest loans available to the customer. Like the Residential Max Package program, this program ignores cost-effective measures such as other thermal integrity improvements (including window upgrades), high efficiency lighting, and water heating measures.

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. The caps limit the amount of cost-effective savings Duke can obtain by artificially limiting the participation of the individual program participant. The cap can prevent some participants from installing the most efficient (highest R-value) cost-effective insulation.

Q: Does the Residential Air Conditioner Load Control program show signs of cream-skimming?

A: Yes. The program may be cream-skimming by reducing the Company's ability to capture a block of otherwise cost-effective efficiency improvements. In other words, by implementing inexpensive load control, Duke may be losing cost-effective opportunities to install high-efficiency equipment. Because load control equipment shifts loads off-peak, peak savings attributable to the installation of more efficient equipment may be reduced and the cost-effectiveness of such efficiency improvements may be impaired. The fact that a load control program can produce some savings inexpensively does not mean it would be a part of a least-cost integrated resource plan. To determine if the load control is cost-effective, Duke should compare control to conservation and to combinations of control and conservation.

Q: Is there cream-skimming in Duke's two water heater programs?

A: The Residential Water Heating Load Control and Residential Controlled Off-peak Water Heating programs both show the same weakness. They do not offer any other water heater efficiency measures in tandem with the load-control measures although it might be cost-effective to do so. If Duke's programs offered low-cost energy-saving measures such as water heater wraps, faucet aerators, and low-flow showerheads, more cost-effective savings would be captured. Also, high levels of conservation, such as that offered by a high-efficiency heat pump, may provide hot water at lower costs than does load control.

Q: Given the potential for cream-skimming in Duke's programs, is it likely that these programs fit within an acceptable least-cost planning framework?

A: No. The cream-skimming potential in the Residential MAX Package, the Dual Fuel Heat Pump program, the Residential Insulation - Existing Market program, the Residential Air Conditioner Load Control program, and the Residential Water Heater Control program, suggests that some or all of these programs would be modified or eliminated in a least-cost plan. The Commission should not approve the recovery of the costs associated with these programs until the Company demonstrates the validity of these program designs.

VI. INAPPROPRIATE CONSERVATION RATE DESIGNS

Q: What inappropriate conservation rate designs does Duke offer its customers?

A: Two of Duke's rate designs send confusing price signals to the customer. These are Duke's Conservation Rate (Schedule RC), and the 2% bill discount offered as a customer incentive in the Residential MAX Package. Each of these rate designs offers the customer lower rates as an incentive to participate in Duke's conservation programs.

Q: What message do these rates send to the customer?

A: These rates are 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.

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 Duke will spend money on conservation programs only to have the programs' effects "taken back" by the customers. Duke should not offer lower rates as an incentive in its conservation programs. Instead, Duke should offer participating customers an up-front monetary incentive sufficient to overcome the market barrier to the efficiency investment. This approach is an incentive to customer participation that does not send the wrong price signal and that will be more effective in overcoming the market barrier of high up-front customer outlays.

VII. PILOT PROGRAMS

Q: Why do you recommend that Duke should not recover the $699,000 that it plans to spend on pilot programs?

A: Duke has dedicated $699,000 to pilot programs. However, the Company has not demonstrated that its pilot programs are appropriate to an acceptable Integrated Resource Plan. Pilot programs may be justified to test innovative program designs and build the capability to produce program results. Pilot programs are not necessary for well-established approaches that have been tested elsewhere. Without an accepted IRP, there is no way to know if the Company's pilot programs are appropriate.

Furthermore, as demonstrated above in the case of the heat pump programs, Duke does not appear to have used past pilots to improve its program designs. The proposed programs are markedly inferior to the completed pilot. Duke should be granted cost recovery only for pilot programs necessary for transition to full-scale programs, and for which Duke is committed to using the program results. Past Duke pilot programs may have satisfied the intellectual curiosity of its staff, but they do not appear to have positively affected the design of full-scale programs.

The incentives for the programs have not been described in enough detail to determine whether the programs are likely to produce useful information about the acceptability of the technology to customers. This is especially true for the otherwise fairly clearly described Ground-Coupled Heat Pump program and the Dust Collection program, both of which appear to be promising applications.

One pilot "program," the Commercial Efficient Lighting pilot is not a program, but a review of available literature and data. Duke appears to be seeking cost recovery for incentives it has no plans to pay, or even offer.

VIII. EVALUATION PLAN

Q: Why do you recommend that Duke should not currently recover the funds it has budgeted for evaluation?

A: Duke has projected $1,220,000 for evaluation and metering. However, The Company has not submitted its evaluation plans to regulatory review to demonstrate they are sound. There is no way to know if the Company's evaluation will provide necessary or useful information. It is not even clear what is to be evaluated, or how it will be evaluated. At this time, I recommend the Commission deny Duke's recovery of the $1,220,000 it plans to spend on evaluation.

IX. CONCLUSIONS

Q: Please summarize your conclusions on Duke's resource planning and the prudence of the Company's expenditures to expand its demand-side management programs.

A: As Duke has not submitted its Integrated Resource Plan for regulatory review, it has failed to establish that the plan is truly least-cost. The Company has provided no sound basis for the evaluation of its demand-side program expenditures. A number of features of the Company's DSM programs suggest that its IRP is inconsistent with least-cost principles. The Company's load-building programs and conservation programs appear to work at cross purposes and the cost-effectiveness of the sales programs have not been demonstrated. The Company's conservation programs address discretionary resources without first fully addressing lost-opportunity resources. The Company's load management programs and conservation programs offer high potential for "cream-skimming." The Company's rate designs send the wrong price signals to its DSM program participants.

It is thus impossible to conclude that the Company should be permitted recovery of its DSM expenditures through rates. Even the Company's request to recover expenditures for evaluation and metering is insufficiently supported in the absence of a detailed evaluation plan. The Company should not be permitted cost recovery of its DSM program expenditures at this time.

If the Company can demonstrate in this proceeding that certain of these expenditures have been prudently committed and are consistent with the recently approved IRP procedures, then those particular costs may be approved for recovery, through expensing, rate basing, or deferrals. The only programs that appear likely to pass this test are the <u>Interruptible Service</u>, <u>Standby Generator</u>, and <u>High-Efficiency Refrigerator/Freezer</u> programs. The <u>Residential Insulation New</u> component of the <u>MAX</u> program may also be better than nothing, since it captures some lost opportunities, even though it is not very good.

I suggest that any DSM programs that cannot be adequately reviewed in this case be refiled for Commission review of their prudence. At that time, the prudent costs can be deferred, included in rates, or approved for inclusion with the next rate case. Imprudent costs can be disallowed. Review of the programs and of the cost recovery mechanism can be resolved under the IRP procedures, without exposing Duke to any under-recovery of prudent costs.

Q: Does this conclude your testimony?

A: Yes.

ATTACHMENT 1

Exhibit PC-1

Exhibit 4-4: DEMAND-SIDE PROGRAMS
PROJECTED PEAK LOAD IMPACTS
(Incremental MW by Year)

	1991		1992		1993	
	S	W	S	W	S	W
INTERRUPTIBLE						
Residential W/H Load Control	(1.6)	(5.2)	(1.6)	(5.1)	(1.6)	(5.2)
Residential A/C Load Control	(75.1)	0.0	(74.0)	0.0	(75.1)	0.0
Interruptible Service	(38.2)	(38.2)	(38.2)	(38.2)	(38.2)	(38.2)
Standy Generator w/o Backfeed	(8.8)	(8.8)	(8.8)	(8.8)	(8.8)	(8.8)
SUBTOTAL	(123.7)	(52.2)	(122.6)	(52.1)	(123.7)	(52.2)
LOAD SHIFT						
Residential Controlled Off-Peak W/H	(1.1)	(1.2)	(1.1)	(1.2)	(1.1)	(1.2)
SUBTOTAL	(1.1)	(1.2)	(1.1)	(1.2)	(1.1)	(1.2)
CONSERVATION						
Residential Dual Fuel Heat Pump	(0.9)	0.0	(5.3)	0.0	(8.0)	0.[illegible]
Residential High Efficiency Freezer	(0.0)	(0.0)	(0.1)	(0.1)	(0.1)	([illegible]
Residential High Efficency Refrigerator	(0.1)	(0.0)	(0.2)	(0.1)	(0.2)	
Residential Insulation - Existing Market	(0.3)	(2.6)	(0.3)	(2.6)	(0.3)	
Residential Heat Pump Sales	(8.7)	8.3	(9.3)	8.8	(9.8)	9.3
Residential Insulation - New Market	(0.1)	(1.3)	(0.2)	(1.5)	(0.2)	(1.6)
SUBTOTAL	(10.1)	4.3	(15.3)	4.6	(18.6)	4.9

Max package

see next p.

Exhibit 4-4: DEMAND-SIDE PROGRAMS
PROJECTED PEAK LOAD IMPACTS (cont)
(Incremental MW by Year)

	1991		1992		1993	
	S	W	S	W	S	W
STRATEGIC SALES						
Apartment Heating	0.0	2.1	0.0	4.1	0.0	4.1
Mobile Home Heating	0.0	4.4	0.0	7.9	0.0	7.9
Facade Lighting	0.0	0.0	0.0	0.0	0.0	0.0
Flood Lighting	0.0	0.0	0.0	0.0	0.0	0.0
Decorative Lighting	0.0	0.0	0.0	0.0	0.0	0.0
Safelights	0.0	0.0	0.0	0.0	0.0	0.0
Street Lighting	0.0	0.0	0.0	0.0	0.0	0.0
Industrial Heat Recovery (HERO)	2.4	2.4	3.6	3.6	5.5	5.5
Commercial/Industrial Space Heating	1.8	37.2	1.9	40.0	2.1	43
Industrial Process Heating	1.4	1.9	3.0	4.0	6.2	7
Commercial Food Service	2.5	1.8	3.0	2.1	3.4	2.4
Residential Electric Water Heating	2.5	13.4	2.4	13.2	2.3	12.8
SUBTOTAL unpersal 'conserv'	10.6	63.1	14.0	75.0	19.6	83.3
TOTAL	(124.3)	14.0	(125.0)	26.2	(123.7)	34.8

Note:
These values are nameplate MW.

Exhibit PC-2

Exhibit 4-6: DEMAND-SIDE PROGRAM PROJECTED COSTS
(Annual Incremental Dollars by Year)

	1991	1992	1993
INTERRUPTIBLE			
Residential W/H Load Control	$ 1,410,941	$ 1,641,058	$ 1,905,070
Residential A/C Load Control	$ 5,628,641	$ 7,411,143	$ 9,307,484
Interruptible Service	$ 1,866,873	$ 3,585,442	$ 5,366,397
Standby Generator w/o Backfeed	$ 579,604	$ 906,767	$ 1,246,246
SUBTOTAL	$ 9,486,059	$13,544,410	$17,825,197
LOAD SHIFT			
Residential Controlled Off-Peak W/H	$ 1,623,806	$ 2,102,053	$ 2,615,134
SUBTOTAL	$ 1,623,806	$ 2,102,053	$ 2,615,134
CONSERVATION			
Residential Dual Fuel Heat Pump	$ 446,770	$ 2,731,188	$ 4,169,631
Residential High Efficiency Freezer	$ 130,083	$ 177,689	$ 215,576
Residential High Efficiency Refrigerator	$ 231,178	$ 466,137	$ 516,170
Residential Insulation - Existing Market	$ 374,739	$ 554,261	$ 775,257
Residential Heat Pump Sales	$ 3,736,244	$ 3,946,729	$ 4,190,381
Residential Insulation - New Market	$ 98,922	$ 186,557	$ 282,907
SUBTOTAL	$ 5,017,936	$ 8,062,561	$10,149,922

See hearing

Exhibit 4-6: DEMAND-SIDE PROGRAM PROJECTED COSTS (cont)
(Annual Incremental Dollars by Year)

	1991	1992	1993
STRATEGIC SALES			
Apartment Heating	$ 180,985	$ 236,828	$ 246,064
Mobile Home Heating	$ 349,839	$ 526,886	$ 547,434
Facade Lighting	$ 303,917	$ 324,381	$ 305,040
Flood Lighting	$ 2,897,122	$ 3,161,902	$ 3,444,934
Decorative Lighting	$ 2,685,883	$ 2,925,896	$ 3,182,060
Safelights	$13,901,820	$14,626,646	$12,331,144
Street Lighting	$ 2,006,619	$ 2,151,159	$ 2,303,922
Industrial Heat Recovery (HERO)	$ 709,765	$ 737,446	$ 766,206
Commercial/Industrial Space Heating	$ 1,261,196	$ 1,310,383	$ 1,361
Industrial Process Heating	$ 525,228	$ 646,849	$ 768,
Commercial Food Service	$ 261,047	$ 271,227	$ 281,[illegible]
Residential Electric Water Heating	$ 589,529	$ 612,520	$ 636,4
SUBTOTAL	$25,672,950	$27,532,123	$26,175,043
TOTAL	$41,800,751	$51,241,147	$56,765,296

Note:
For further description of exhibit reference section 4.2 (page 10)

Exhibit PC-3

4.0 DEMAND-SIDE

4.1 DEMAND-SIDE OPTION IDENTIFICATION

The identification, analysis and development of demand-side options is essential to the least cost planning process. Accomplishments from the demand-side programs identified in the last Short-Term Action Plan (1990) continue to increase and are presented in Exhibit 4-1.

Exhibit 4-1: 1990 SHORT TERM ACTION PLAN - DEMAND-SIDE PROGRAMS
(Cumulative Peak MW Accomplishments through 1990)

	Summer	Winter
Residential Air Conditioning Load Control	484.4	0.0
Residential Water Heating Load Control	41.2	114.5
Standby Generator without Backfeed	20.3	20.3
Interruptible Service	177.2	177.2
Residential High Efficiency Heat Pump	4.2	1.7
Total	727.3	313.7

Note:
These values are nameplate MW. ?

All types of demand-side management (DSM) resources are required to satisfy customers' needs and requirements and to meet Duke's system load objectives. Peak demand reductions are accomplished using interruptable service to specific customer end-uses or processes. Load shift programs incorporate technologies such as thermal storage to reduce system peak demands. Conservation or efficiency programs encompass a wide selection of technologies including insulation upgrades, high efficiency appliances, and customer energy reduction control technologies. Strategic sales programs provide a direct benefit to customers by providing products of immediate value and by helping to reduce the growth rates by spreading fixed costs over additional unit sales. Strategic sales also improve the operational efficiency of the existing generation system.

?

Duke intends to defer much of the uncommitted generating capacity identified and scheduled in this plan. To do this, Duke will significantly expand efficiency, conservation and interruptible programs. The plan now under development will reflect this change in emphasis.

Fifty-four initial demand-side options were developed for this plan. These options are presented in Exhibit 4-2 (page 8).