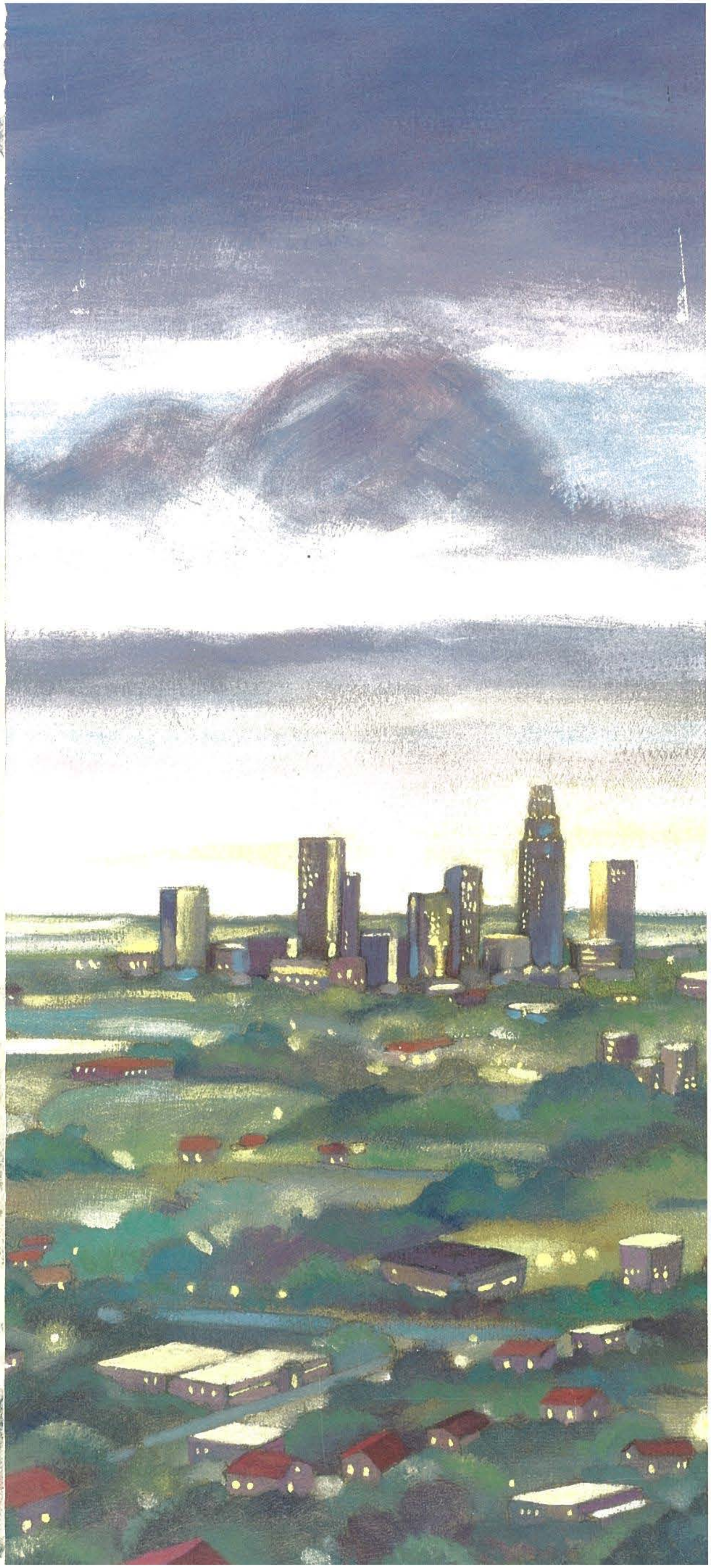

PLAN DETAILS

1995 Integrated Resource Plan

DUKE POWER

About Duke Power

Headquartered in Charlotte, N.C., Duke Power supplies electricity to more than 1.7 million residential, commercial, and industrial customers in a 20,000-square-mile service area in North Carolina and South Carolina. Founded 91 years ago, the company is one of the nation's largest investor-owned electric utilities.

Duke Power operates three nuclear generating stations, eight coal-fired stations, and 27 hydroelectric stations. Together, these units produced 85.1 billion kilowatt-hours of electricity in 1994. Total electric revenues reached $4.3 billion, with approximately 65 percent of sales in North Carolina and 35 percent in South Carolina.

This 1995 Integrated Resource Plan identifies the resources Duke will use to meet its customers' electric power needs from 1995 through 2009. It reflects decisions made during the most recent planning cycle, which occurred during the 1994 calendar year.

For further information or to request additional copies of this report or the more comprehensive *Plan Details*, write to:

IRP Regulation-EC12S
Duke Power Company
Post Office Box 1006
Charlotte, North Carolina 28201-1006

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PLAN DETAILS

1995 Integrated Resource Plan

Succeeding in an Uncertain Future

The risks imposed by an increasingly competitive utility industry demand that we select flexible generating resources that can be built or purchased quickly and modified if future events require changes. It is clear that our future resource selections are heavily dependent upon the actual business environment that unfolds. Short lead times allow us to add resources that closely match forecasted load growth. We will commit to long-term resources only to satisfy highly certain load growth. These same risks also demand that we design and implement flexible, low-cost customer options. Future demand-side options will focus on keeping electric rates low and educating customers about energy efficiency improvements. Duke Power's 1995 Integrated Resource Plan represents the best strategy for balancing the perspectives of customers, shareholders, and the public, while remaining flexible enough to withstand a wide range of uncertainties.

Succeeding in this environment will not be easy. It will require quicker planning and decision-making as well as better knowledge about our competitors and customers. We must react faster to changes. We will deal with these challenges successfully by building upon our past successes, planning wisely, and embracing change to create a stronger, more competitive, and more successful company than ever before. Because our resource strategy is flexible and our resource portfolio combines the most cost-effective supply-side, purchased, and demand-side resources, we are confident that we will be successful however the future evolves.

Planning for Other Futures

The following three planning scenarios were developed:

- Lean and Green

  In this business environment, additional environmental regulations and nuclear issues increase electric operating costs, resulting in lower-than-expected customer load growth.

- Intense Competition

  In this business environment, a highly competitive energy marketplace reduces Duke's future electric load growth while technological advances provide more individual energy choices.

- Economic Boom

  In this business environment, a growing world economy and a competitive utility market result in increased electric growth with greater financial risks.

After evaluating our plan using each of the three scenarios, we found that:

- Peaking generation is the most appropriate near-term resource for all scenarios.
- The year in which we project a need for the next peaking resource could vary significantly.
- An intermediate-type resource could satisfy our future needs.
- Base load needs could be greater than our resource integration results indicate.
- If their costs decrease significantly, new technology resources could replace conventional combustion turbine peaking resources.
- The year in which we project a need for base load resources could be delayed or advanced one to three years.

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DUKE POWER

Duke Power stands at a pivotal point in its history. The utility industry continues to change, constantly presenting our company with new challenges. Enhancing our position as an industry leader largely depends on our commitment to meeting our customers' expectations and our competitors' challenges. While our overall direction remains unchanged, we continue to establish aggressive objectives to ensure our future success.

As the utility industry changes, we must be willing to adapt and quickly change our assumptions and the plans we develop. The following offers a view of the changing utility industry and environment in which we believe Duke will operate over the next five to 10 years.

- **Changing Laws and Regulations**

  Open transmission systems at the wholesale level and increased competition are expected as a result of the Energy Policy Act of 1992. Market prices could fall as low as the marginal cost to generate electricity plus the embedded cost to transmit it to customers.

- **Technological Improvements and Innovations**

  Emerging generation technologies such as fuel cells and photovoltaics will become cost-competitive for some customers while the cost of current technologies may drop to all-time lows.

- **Intense Competition**

  Nontraditional and traditional competitors such as power marketers, gas companies, cooperatives, and municipalities will intensify their efforts to increase market share at the expense of electric utilities.

- **Slower Growth in Electricity Demand**

  Growth in demand for electric power will rise only about 2 percent a year in the United States. Our 1995 Integrated Resource Plan projects that peak demand in our service area will grow 2.1 percent annually.

- **Financial Performance**

  Investors are judging utility value by the utility's ability to maintain low rates and compete for customers. Credit ratings for utilities with higher rates have been downgraded as investor concerns rise.

Duke Power's 1995 Integrated Resource Plan (IRP) is a major component of our business planning process for the future. Driven by our corporate business plan and strategic business intents, the integrated resource planning process identifies the best resource plan for our future. The IRP is the plan which, at this time, identifies the most cost-effective resources to meet our customers' electric needs while giving us the flexibility we need to enter an increasingly competitive environment. We recognize, however, that the pace of change in our industry and in our customer markets drives us to continually adjust and refine our plan.

Donald H. Denton, Jr.
Senior Vice President and Chief Planning Officer

April 1995

Printed on recycled paper

THE PLAN

Developing the Best Plan

The risks imposed by an increasingly competitive utility industry demand that companies develop flexible, low-cost resource strategies to meet customer energy needs. Duke Power's 1995 Integrated Resource Plan represents the best strategy for balancing the perspectives of customers, shareholders, and the public while remaining flexible enough to withstand a wide range of future uncertainties.

Changes in the industry are creating opportunities for others to enter the electricity business. When customers have more energy choices, they begin looking for suppliers who can meet their needs reliably and at the lowest cost. Competition is all around us and we are ready for it. We have responded to the increased demands from customers that competition brings by developing a plan that keeps our rates competitive and offers our customers innovative and valuable ways to use electricity.

The way we did business in the past was right for that time and environment. While we have always responded quickly to the challenges we face, the current environment requires an even quicker response. We may continue to design, build, and operate our own power plants, but we have adopted a new philosophy that says: assess the market and identify the most cost-effective way to supply the needed power.

While competition presents many challenges, it also presents opportunities for growth and increased customer satisfaction. By 1996, our customers' energy needs will be met by a combination of existing generation, customer options, and the Lincoln Combustion Turbine Station now being built. Duke will meet future capacity needs by assessing the market and determining the best way to acquire the needed resources.

As we seek to be the most efficient electric company in the world, we will meet our customers' energy needs reliably and at the lowest reasonable cost. Success in a changing utility industry requires us to consider the various views of our "stakeholders"— customers, investors, regulators, the public, and Duke:

- All customers want quality power and reliable electricity at low cost. Keeping costs low without having an unacceptable impact on quality or reliability requires thorough planning.
- Shareholders require reasonable returns. When their requirements are satisfied, the utility can obtain good rates on the funds it needs to stay in business, lowering costs to customers.
- Regulators will continue requiring utilities to comply with state and federal regulations while ensuring that electricity is available and reasonably priced.
- The public wants clean, efficient, reliable, low-cost electricity to meet the growing and changing energy requirements of an expanding Carolinas economy.
- Duke is committed to identifying innovative ways to provide high-value products and services that meet customers' energy needs, in part, through prudent investment in the research and development of electric end-use technologies.

SUCCEEDING IN A CHANGING ENVIRONMENT

THE TIMES ARE CHANGING

Duke, like most electric utilities, is vertically integrated—generating, transmitting, and distributing electricity to customers within the geographic bounds of its service area. In a competitive environment, utilities cannot assume that the customers within their geographic boundaries will remain exclusively theirs. Customers in all market segments are becoming more sophisticated about energy options, more vocal about their expectations of service, and more adamant about the prices they are willing to pay.

As competition increases, other power suppliers are entering the game, taking advantage of regulatory and market changes more quickly than some established electric utilities. These changes are moving the utility industry away from vertical integration. Changing laws and regulations have paved the way for competition in the electric utility industry.

Energy Policy Act of 1992. EPACT has begun moving utilities toward a more competitive environment, introducing additional competition in generation through establishment of exempt wholesale generators. EPACT requires transmission of power for third parties to wholesale customers provided that service reliability to the utility's local customer base is protected and the local customer base does not subsidize the third-party service.

Regulatory Framework. Utilities are facing increasing pressure to offer market-based rates to retain existing customers and attract new ones. If cost-based regulation were to be discontinued in the industry and market prices for electricity were reduced to marginal production costs, some utilities might be forced to write down their assets to reflect their market values rather than their costs. Although we recognize this possibility, we cannot predict if, when, or how these competitive forces might impact our future financial position and operations. However, Duke continues to position itself to effectively meet these challenges by maintaining prices and costs that are regionally and nationally competitive.

Planning for Change

Duke has observed the changes that have taken place and is planning for the future. To help ensure our continued success in the rapidly changing industry, we decided it was critical to take a new, in-depth look at the corporate strategic planning process and the integrated resource plan growing out of it. To meet the challenges ahead, we developed a strategic plan that focuses on:

- Customer service and satisfaction
- Financial performance
- Growth and market share
- Continuous improvement
- Operating excellence

Just as our strategic planning process has broadened our focus and enabled us to deal effectively with the pace and extent of change, the integrated resource plan must also provide a flexible framework to meet these same challenges.

THE 1995 INTEGRATED RESOURCE PLAN

Competition is reshaping our business. The uncertainty brought about by the changing utility industry requires us to focus on short-term resources that satisfy immediate customer energy needs while not losing sight of long-term resources to meet future needs.

DUKE'S RESOURCE STRATEGY

Our strategy for meeting these energy needs consists of generation resources and demand-side resources. To help develop our resource portfolio—the best combination of these resources—we employ an integrated resource planning process. The goal is to provide adequate and reliable electricity in an environmentally responsible manner, acquiring resources in the most cost-effective way by building generation, purchasing power, or changing customer energy use.

Generation. The supply-side market has changed. Increased competition, decreasing costs, changing regulations, and slower growth in electricity demand make it more difficult for utilities to make long-term commitments. Flexibility in this changing environment is the key to survival and success.

To maximize flexibility and minimize costs, our generation strategy incorporates a mix of short- and long-term resources available in the open market as resource needs change. Our current plan for meeting the resource needs beyond the Lincoln Combustion Turbine Station embraces this approach. We intend to use a competitive bidding process to provide for this next increment of resources. Our plan for the future is to closely match:

- Short-term resources with uncertain load
- Long-term resources (which may be built by Duke or others) with highly certain load that will remain on the system for a long time

By remaining flexible about how the company will meet customer energy needs, we can take advantage of prevailing market prices. For example, if the market price for short-term resources is better than expected, we may decide to purchase a larger amount of short-term resources and delay long-term commitments. Competition has necessitated this new strategy, which moves away from how we have done business in the past. Instead of making long-term commitments to design, build, and operate our own generating resources, we will assess the overall market and identify the most cost-effective way to acquire resources with the needed flexibility.

Customer Options. Since the 1970s, we have been working with our customers to improve the way they use energy by offering energy efficiency, strategic sales, interruptible, and load-shift programs that encouraged the wise and efficient use of electricity. Because competition provides customers with a greater selection of energy suppliers from which to choose—potentially increasing or diminishing our customer base—we have seen a need to shift our demand-side focus. This year we initiated a fundamental change in the way we plan to influence customer energy use.

When utilities operate exclusively within the geographic boundaries of a limited service area, they respond to customer requests for lower electric bills by offering a variety of options that modify energy use and demand. While many options give participating customers an opportunity to lower their electric bills, energy efficiency options with large incentives could result in higher rates for all customers. In a competitive environment, energy efficiency options with large incentives become unsatisfactory. When competition opens up a utility's service area, the utility must focus on overall rates to keep existing customers and attract new ones.

To meet customer needs and remain a competitive energy supplier, we must implement a balanced demand-side portfolio. Based on almost 20 years of experience with demand-side options, we have decided to reduce our emphasis on energy efficiency options that offer large incentives. While we will continue many of the customer options already implemented to improve efficiency, we are changing the way we will implement other options, including some that were previously identified. In the future, we will focus on developing and implementing options that help keep electricity rates low. In response to the changing needs of customers and the increasingly competitive utility industry, we will concentrate on:

- Educating customers about the advantages of managing their energy use
- Promoting new, efficient electric technologies to give customers more energy choices

Our demand-side resource strategy will build on our already successful customer options to:

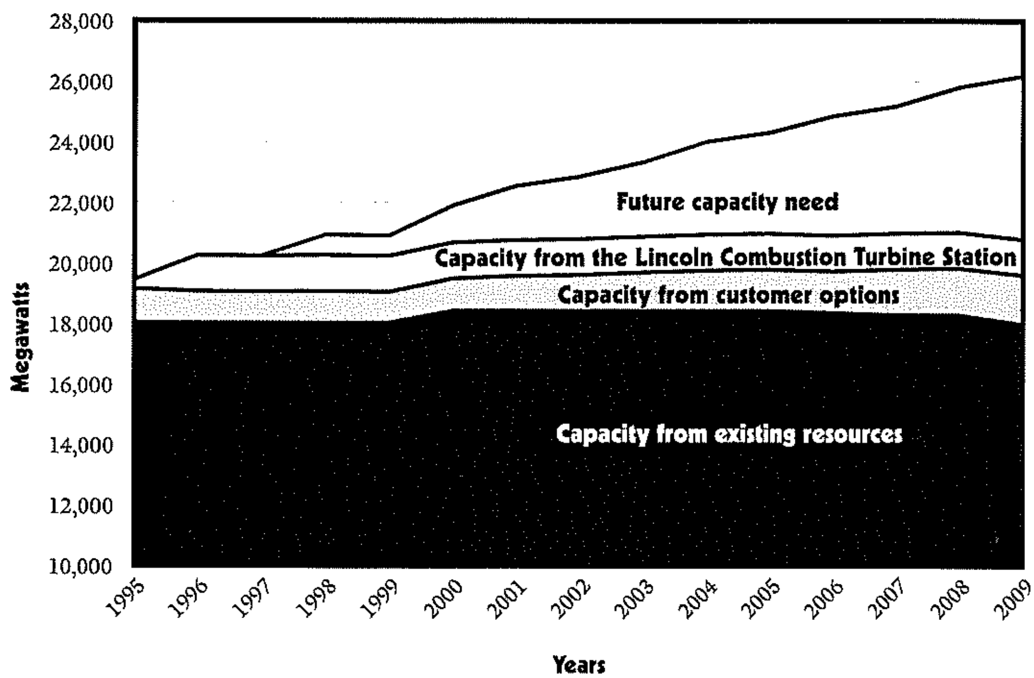
- Provide energy solutions through a wide range of options tailored to the individual customer's energy and environmental needs.
- Manage system growth in demand for electricity, allowing Duke to control the acquisition of new generation by increasing off-peak use.
- Keep electricity rates low.

Duke's 1995 Resource Plan

Our 1995 Integrated Resource Plan (Figure 1) projects a 2.1 percent annual growth in demand for electricity over the next 15 years. Existing generation stands at 17,991 megawatts in 1995 excluding Nantahala Power & Light.

A portion of this need will be satisfied by the Lincoln Combustion Turbine Station, providing approximately 1,200 megawatts of peaking capacity. Customer options, which consist of existing interruptible and new demand-side resources, will reduce the need for generation to meet peak demand by another 1,600 megawatts. The remaining 5,100 megawatts of peaking or base load capacity will be met by assessing the overall market and identifying the most cost-effective way to acquire resources with the needed flexibility.

FIGURE 1. **1995 Integrated Resource Plan**



Plan Implementation

To satisfy immediate short-term energy needs, we focused on the next three years. The uncertainty inherent in a changing industry makes short-term planning critical. The following supply-side and demand-side actions will help us begin implementing the 1995 Integrated Resource Plan.

SUPPLY-SIDE ACTIONS

Several supply-side actions are planned as a result of the current planning cycle. The most significant ones are highlighted below:

Complete the Lincoln Combustion Turbine Station. By 1996, all 16 units of the Lincoln Combustion Turbine Station will begin commercial operation, supplying 1,184 megawatts of capacity at periods of peak demand. This project is on schedule and within budget. Four of the units will be available by the summer of 1995.

Meet Capacity Needs Beyond Lincoln. By 1998, we have projected a 675-megawatt resource need beyond the Lincoln Combustion Turbine Station. We intend to acquire this next increment of resources through a competitive bidding process.

The 1995 Integrated Resource Plan also reflects the need for additional peaking resources beginning in 2000 and base load resources beginning in 2004. While no immediate action is required to secure these resources, action may be required within the three-year, short-term planning horizon. Future planning cycles may show a change in the resource need. If future plans continue to indicate a need for these resources, we will decide how best to meet the need by assessing the market and either purchasing, contracting, or building the needed resources. Future Short-Term Action Plans will provide updates on the status of resource needs for 2000 and beyond.

Comply With 1990 Clean Air Act Amendments. The 1990 Clean Air Act Amendments require electric utilities to incorporate a two-phase reduction in the aggregate annual emissions of sulfur dioxide and nitrogen oxide by the year 2000. Duke currently meets all Phase I requirements through historical initiatives, such as:

- Burning low-sulfur coal in our fossil plants
- Operating efficiently
- Using nuclear generation

We are developing a detailed compliance plan for Phase II requirements that must be filed with the Environmental Protection Agency by 1996. The strategy will incorporate developments in the emissions allowance market, future regulatory and legislative actions, and advances in clean air technology. All options within the preliminary strategy provide for full compliance with Phase II requirements by the year 2000.

Complete Preservation and Maintenance Program. We are working on the following in an effort to preserve, maintain, and improve our existing generation facilities:

- Replace nuclear steam generators affected by stress corrosion cracking.
- Renew licenses of hydroelectric stations.
- Consider extending the lives of nuclear stations.
- Evaluate turbine runner replacement at Jocassee Pumped Storage Station.
- Carry out a preservation and maintenance program for existing combustion turbines and hydroelectric stations.
- Improve the utilization of transmission and distribution facilities.

Demand-Side Actions

Several demand-side actions are planned as a result of the current planning cycle. The most significant ones are highlighted below:

Focus on Education. To help maintain competitive electricity rates, we are shifting our energy efficiency focus. We've shifted from an emphasis on large, incentive-based energy efficiency options to education-based ones when we design and implement options. Two new education-based options (previously planned as incentive-based) are High-Efficiency Motors and High-Efficiency Indoor Lighting.

Balance the Demand-Side Portfolio. We serve our customers best when we offer them a portfolio of options that promote efficient electric technologies and provide solutions to their energy, manufacturing, or quality service needs. To provide the best solutions for our customers, we continually work to develop a balanced demand-side portfolio that encompasses both energy efficiency and strategic sales options.

While both energy efficiency and strategic sales options encourage the installation of efficient electric equipment, the markets they target are different. Energy efficiency options are targeted at customers who would have selected less efficient *electric* equipment if the option were not offered. Strategic sales options are targeted at customers who would have selected *nonelectric* equipment if the option were not offered.

Energy efficiency options lower participating customers' electric bills and defer Duke's need for new supply-side resources. While strategic sales options may increase participating customers' *electric* bills, these options can lower their total *energy* bills. Additionally, strategic sales options increase customer satisfaction by improving efficiency and comfort, reducing operating costs, and increasing productivity. The additional revenues Duke gains from strategic sales options offset the revenues lost to energy efficiency options. We ensure that strategic sales options are cost-effective and have an overall downward influence on rates. A balanced portfolio promotes both strategic sales as well as conservation and efficiency to meet customer needs and keep rates low.

Offer Customer Options. To achieve our demand-side objectives, we will continue 11 existing customer options. Six of these options target the residential market. Four of them target the commercial/industrial market, and one of them targets the residential/commercial market. Some of our major initiatives are highlighted below:

- Our energy efficiency and strategic sales package targeted at the new residential market lowers customer energy bills, increases efficiency, and reduces Duke's system demand. This New Home Package combines three separate programs:
  - Duct Sealing Payment Program for New Residential Structures
  - High-Efficiency Heat Pump and Central A/C Payment Program
  - Maximum Value Home Builders Program
- One of our most effective energy efficiency programs for the commercial/industrial market is High-Efficiency Chillers Payment Program. This program represents a viable demand-side alternative because:
  - Manufacturers offer a wide range of machines with varying efficiencies.
  - Approximately 25 percent of the conditioned space in our market is served by chillers.
  - Cooling load drives our summer peak.
  - The 1990 Clean Air Act Amendments' phase out of CFC refrigerants used in chillers will require attention and response from owners.

In addition, the plan introduces 11 new customer options. Two of these options target the residential market, and nine of them target the commercial/industrial market. Some examples of these new offerings follow:

- One of our newest strategic sales options, Electrotechnology Strategy, encourages the installation of efficient electric technologies, which provide a direct customer benefit and improve the utilization of our generating system. This option will initially focus on heating and curing applications: infrared, ultraviolet, microwave, radio frequency, and membrane processing.
- By the end of 1996, the final phase of our new High-Efficiency Motors Program will be implemented as an energy efficiency option, reducing demand by approximately 3.6 megawatts.

Implement Demand-Side Competitive Bidding. Duke assessed the potential benefits of paying a third-party or customer to design and/or market demand-side resource options. A request for proposals was issued, and 16 bidders responded. As a pilot program, we entered into contracts with four of the bidders for a total projected savings of 4.7 megawatts. The bidders must complete installation of the energy efficiency measures by the first quarter of 1997.

The Right Plan for Today

In an uncertain business environment, our 1995 Integrated Resource Plan represents the best strategy to carry us forward because it:

- Keeps electricity rates low
- Incorporates marketing initiatives to protect revenues in major market segments where competitive threats exist
- Includes sales efforts to increase revenues in markets where electricity has a significant economic and/or customer-competitive advantage
- Manages short-term financial risks by taking advantage of prevailing market prices for near-term capacity
- Delays the decision for supply-side investments in large, capital-intensive projects
- Offers customers a variety of options for managing and reducing their energy costs

PLANNING FOR UNCERTAINTY

PREDICTING THE FUTURE

How certain are we that our forecasted future will become reality? Predicting the future is serious business for those charged with planning for future electricity needs.

Fifteen Years Ago. The Carolinas' economy was heavily dependent on textiles. Home mortgage interest rates were around 12 percent. Cellular car phones were a novelty. Investing in CDs required an eye for interest rates rather than an ear for music. The only BMWs in the Carolinas were imported from Germany. Professional basketball and football were a dream for Carolinians.

Fifteen Years From Now. What will life be like in 2010? The state of the economy, the life-styles of society, expanded use of electric technologies and invention of new ones—these are among the factors that determine how much electricity we will need to supply.

OBTAINING THE PUBLIC'S PERSPECTIVE

We must not only plan for the most likely future, but also be flexible enough to cope with less-likely circumstances. Because the number of possible futures is infinite, we thought it was prudent to obtain a public perspective.

The IRP Advisory Panel provides public input for the integrated resource planning process by discussing planning issues with Duke. The panel, which consists of ten members of the public, is briefed throughout the year on resource planning issues, processes, and results. The panel offers opinions and suggestions as each annual planning process evolves.

The panel recommended that Duke consider five guiding principles when developing a resource plan: flexibility, cost, equity, revenue, and risk. As a public group, the panel felt that all of these issues must be addressed and evaluated to have a plan that could withstand an uncertain future.

In the 1995 planning cycle, the panel helped develop three planning scenarios to evaluate the resource integration results. The panel's input was based on the public's expectations and perceptions of the future. The panel's work helped identify a broad array of variables and planning scenarios beyond the scope of traditional planning.

Developing the Forecast

Service Area Economic Model

The starting point for the 1994 Forecast was the Service Area Economic Model. This model is an estimate of Duke's regional economic activity and is based on Standard Industrial Classifications (SIC). Duke used Gross Regional Product (GRP) to measure regional economic activity. As the regional counterpart to Gross Domestic Product, GRP measures the production of all goods and services within Duke's service area.

Primary Indicators. The Service Area Economic Model's primary indicators—employment, personal income, and gross regional product—are used to develop the sales and peak models.

Primary Inputs. Primary inputs for the Service Area Economic Model forecasts are based on:

- Historical and forecasted national and regional economic data from Regional Financial Associates
- Service area historical data from the Bureau of Labor Statistics and the Bureau of Economic Analysis

Sources of Information. Other sources of information for the Service Area Economic Model are:

- National Association of Business Economists
- Various professional magazines and newspapers from the service area

Forecasting Methodologies

Duke relied solely on econometric forecasting methodology until 1990 when it began developing econometric and end-use forecasting methodologies for the residential class only. In 1993, Duke began using a combination of these methodologies to create the forecast for all customer classes.

Econometric Forecasting. Duke uses econometric forecasting methodologies to develop a reliable 15-year forecast by customer class. The econometric forecast assumes that the rate of change in efficiency standards and demand-side activities remains the same as has occurred historically. The econometric forecast serves as the baseline to which adjustments are made using end-use forecasting methodologies.

End-Use Forecasting. End-use forecasting methodology (forecast of usage by appliance) seeks to quantify the relationship of electricity use to specific appliances (motor drives in the industrial sector). The forecast of total usage by customer class is the total electricity use of all appliances within that particular customer class. End-use methodology allows Duke to recognize and react to changes in the marketplace, such as demand-side achievements and changes in efficiency standards that are not reflected in the econometric methodology.

By adopting end-use methodology, Duke is able to:

- Account for demand-side program potential and impacts.
- Incorporate end-use trends and factors affecting electricity use.
- Produce forecasts by end-use appliances.
- Reveal long-term trends associated with changing efficiency standards.
- Show impact of electric technologies on industrial processes and fuel usage.

Load-Shape Forecasts. Using forecasted peaks and energy by customer class, Duke has produced an 8,760-hour (365 days x 24 hours) system-level load-shape for each year of the forecast. Load-shape forecasts project the amount of hourly energy needed to meet future customer demands.

Rising Efficiency Standards

Duke employed software models and applied end-use forecasting methodology to reflect the effects of changes in efficiency standards in the forecast.

Uncertainty and Risk

To help evaluate the plan against an uncertain future, Duke creates additional high and low scenarios for peaks and energy from the base scenario. These high and low forecasts start with differing national economic scenarios. It is assumed that there is a normal statistical relationship between the high and low growth rates and the base rate from which they are derived. During the current planning cycle, the high scenario corresponds to the 80 percent probability confidence level, and the low scenario corresponds to the 20 percent level.

Critical Inputs

The service area GRP components served as critical inputs for the peak, commercial energy, and industrial energy forecasts. The service area income forecast was an input for the peak, residential energy, and commercial energy forecasts. The employment forecast served as input to the commercial energy forecast.

The peak demand and energy models also incorporated projections of the real price of electricity (produced by Duke's corporate financial model).

Peak Demand Models

Duke used the results from the Service Area Economic Model to derive both the summer and winter peak demands. Other factors used to develop the summer and winter peak demand models and resulting forecasts included:

- Air conditioning saturations
- Electric heating saturations
- Electric water heating appliance saturations
- Number of customers from the energy models
- Temperature

1: Load Forecasting

Introduction

Each spring, Duke Power begins its planning process by producing a 15-year peak demand and energy forecast. The 1994 Forecast used econometric and end-use energy forecasting methodology to project the following for the residential, commercial, and industrial customer classes:

- Annual energy needs for the service area
- Peak demand for summer and winte r

Using national and regional historical and forecasted information, Duke produced a service area economic forecast that served as a major component of the demand and energy forecast.

After using the econometric forecast to project energy and demand for each of its customer classes, Duke applied end-use methodology to divide the econometric forecast by end uses for each customer class. End-use methodology was also used to project the impact of changing efficiency standards resulting from the Energy Policy Act of 1992 (EPACT) and to adjust the econometric forecasts.

THE 1994 FORECAST

PEAK DEMAND AND ENERGY

During May 1994, Duke completed the current long-term peak demand and energy forecasts for 1994 through 2009 (Table 1). This table includes the effects of historical demand-side accomplishments; it excludes the peak demand and energy data for Nantahala Power and Light as well as the effects of Duke's demand-side resource projections.

TABLE 1: 1994 Peak Demand and Energy Forecasts

Year	Summer (MW)[a]	Winter (MW)[b]	Territorial Energy (GWH)[c]
1994	15,675	14,894	83,309
1995	16,040	14,659	85,339
1996	16,320	15,043	87,155
1997	16,763	15,521	89,357
1998	17,162	15,861	91,426
1999	17,576	16,168	93,344
2000	18,007	16,516	95,169
2001	18,491	16,933	97,224
2002	18,845	17,256	98,554
2003	19,263	17,575	100,582
2004	19,610	17,878	102,443
2005	20,007	18,209	104,377
2006	20,371	18,540	106,034
2007	20,714	18,845	107,552
2008	21,093	19,158	109,247
2009	21,490	19,485	110,818

a. Summer peak demand is for the calendar years indicated.

b. Winter peak demand is for the specified years beginning in January. 1994 value is a temperature-corrected historical point.

c. Territorial energy is the total projected energy needs of the service area, including losses and unbilled sales.

Energy Models

Certain results from the Service Area Economic Model served as inputs to the following energy models.

Residential Energy Model. The primary input for the Residential Energy Model was real disposable personal income. Other inputs included:

- Service area population
- Real mortgage interest rates
- Fuel prices
- Appliance saturations
- Temperature

This model projected energy and the number of residential customers by various types.

Commercial Energy Model. The primary inputs for the Commercial Energy Model were real total and disposable income and components of real gross regional product. Other inputs included:

- Service area population
- Certain sectors of nonmanufacturing employment
- Fuel prices
- Prime interest rate
- Temperature

This model projected energy and the number of commercial customers by various types.

Industrial Energy Model. The primary inputs for the Industrial Energy Model were manufacturing gross regional product components. Other inputs included fuel prices and temperature. This model projected energy by two-digit SIC for the manufacturing industries.

Number of Customers

The number of residential and commercial customers is forecasted primarily from the service area population. Interest rates and service area income are also used. The number of industrial customers is derived by analyzing the relationship of industrial energy to its customers.

External Evaluation

To develop the most reliable forecast possible, Duke considered various sources of external information to make sound judgments concerning the validity of the forecast and assumptions.

Peak and Energy Growth Rates/Trends

Summer and Winter Peak Growth Rates

Table 2 shows the historical and projected annual incremental and percent growth rate for the 1994 forecast of summer and winter peaks.

TABLE 2: Summer and Winter Peak Growth Rates

Season	Historical 1980-1993		Projected 1993-2009	
	MW	% per year	MW	% per year
Summer [a]	385	3.1	385	2.1
Winter [b]	327	2.7	306	1.8

a. 1993 temperature-adjusted summer peak demand was 15,337 megawatts.

b. Projected winter peak demand is for the specified years beginning January 1994.

Summer Peak. Duke expects to remain a summer peaking company. Summer peak demand is projected to increase 2.1 percent annually during the current forecast period. From 1980 through 1993, the temperature-corrected growth rate averaged a comparable 3.1 percent annually.

Winter Peak. Winter peak demand is projected to increase 1.8 percent annually during the current forecast period. From 1980 through 1993, the temperature-corrected growth rate averaged a comparable 2.7 percent annually.

Peak Demand by Customer Class

Table 3 summarizes the historical and projected annual growth in peak demand by customer class.

TABLE 3: Annual Summer Peak Demand Growth

Customer Class	Historical 1980 - 1993	Projected 1993 - 2009
Residential	2.3%	2.0%
Commercial	4.5%	2.6%
Industrial	2.1%	1.5%

Residential Trends. Average summer peak demand per residential customer will increase, yet at a slower rate compared to the past. Other trends include:

- The saturation of air conditioning is expected to continue to grow in the future, yet at a slower rate compared to recent history.
- The efficiency of air conditioning units in new homes as well as replacement systems in existing homes will continue to increase, causing a slower growth in demand for electricity by air conditioners at the summer peak hour.

Commercial Trends. The commercial class has been the fastest growing sector in Duke's service area. The lower projected growth rate is due to efficiency improvements and slower customer growth.

Industrial Trends. The projected growth rate is lower than the historical value because of slower economic growth in the manufacturing sector. Expected electrification of industrial processes will contribute to future growth; however, higher efficiency standards will slow growth.

TERRITORIAL ENERGY

Territorial energy consumption is projected to grow at 2 percent per year during the current forecast period. From 1980 through 1993, temperature-corrected sales grew at 2.9 percent annually.

ENERGY NEEDS BY CUSTOMER CLASS

Table 4 summarizes the historical and projected annual growth in energy needs by customer class.

TABLE 4: Annual Energy Growth by Customer Class

Customer Class	Historical 1979 - 1993	Projected 1993 - 2009
Residential	2.7%	0.8%
Commercial	4.4%	2.7%
Industrial	2.5%	1.6%
Textiles	1.0%	0.9%
Other	3.8%	2.0%
Regular Sales	3.1%	1.7%

Residential Trends. The historical trend in the residential class's energy consumption reflects an annual increase of 100 kilowatt-hours per customer because of increases in the size of the average dwelling unit and the increasing saturation of air conditioners. The forecast consumption increases more slowly because of higher insulation levels, higher efficiencies, and heat pump replacement for resistance heating. Annual energy sales, peak demands, and number of customers will continue to grow, yet at a slower rate compared to the past because of the following factors:

- The growth in electric heating, central air conditioning, and electric water heating is expected to be lower compared to historical growth.
- Heat pumps, central air conditioners, and refrigerators will be more efficient in the future.
- The average home will be better insulated because of higher state building code standards.
- The adult population of our service area is expected to grow at 80 percent of historical growth.

Commercial Trends. The commercial class is a highly diversified market ranging from amusement parks, to restaurants, to office towers. Offices, education, and retail are the three largest sectors, accounting for 41 percent of total commercial sales. In addition, the Duke service area is becoming more nonmanufacturing. In 1978, 65 percent of employees worked in nonmanufacturing businesses; today that figure is 73 percent. The projected growth rate for commercial energy needs is lower than the historical trend because economic and population growth rates will be lower than in the past.

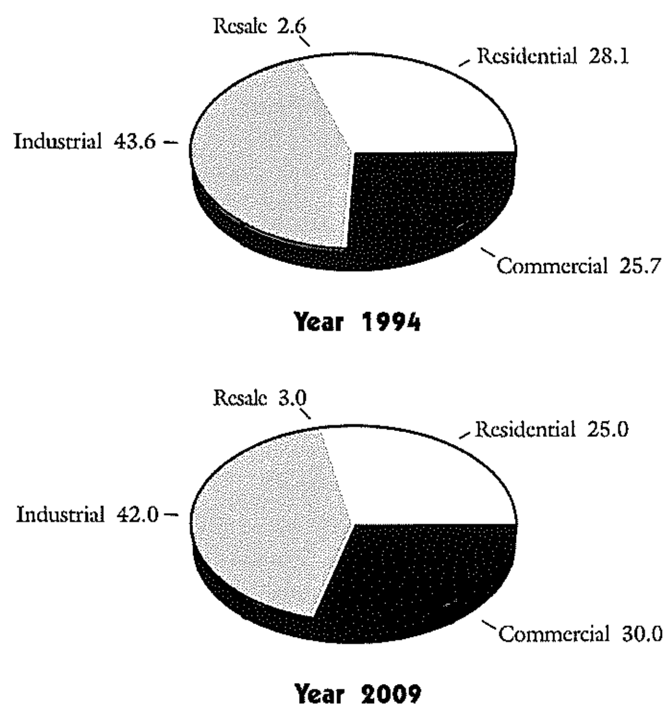
Industrial Trends. Industrial sales represent approximately 40 percent of Duke's Regular Sales. The Duke service area has an unusually large concentration of industrial activity. The decline in projected growth is due to overall slower economic growth because of decreasing migration of industry into the service area. In addition, it is estimated that efficiency standard increases mandated by EPACT will result in a lower growth of energy sales in the industrial class.

Textile energy sales presently represent a large share, 42 percent, of all industrial sales. However, its relatively low historical growth is expected to continue. Other industrial sales, such as the nondurable industries including chemicals and rubber/plastics, will contribute much more in new energy sales than the textile industry.

SALES BY CUSTOMER CLASS

Figure 2 shows the percent of sales by customer class. This comparison of 1994 and 2009 sales indicates that the commercial class is growing the fastest as a percentage of total sales.

FIGURE 2. **Percent (%) of Regular Sales by Customer Class - 1994 and 2009**



RESIDENTIAL END-USE FORECAST

DEVELOPING THE FORECAST

To develop the Residential End-Use Energy Forecast, Duke used:

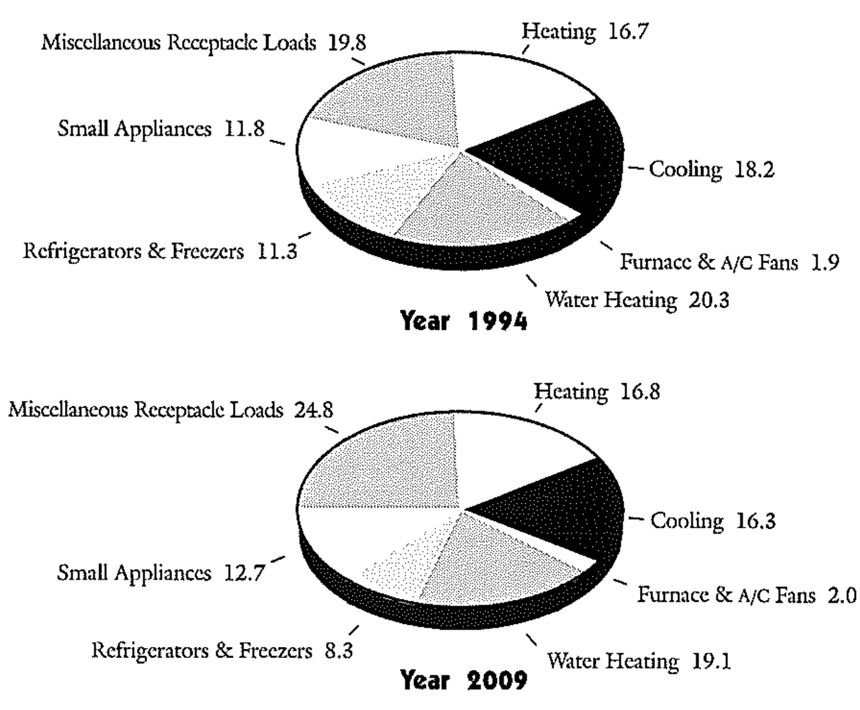
- Electric Power Research Institute's (EPRI) Residential End-Use Energy Planning System
- Coefficients that reflect monthly energy consumption (based on a conditional demand analysis of monthly data)

Residential Classifications. To reflect residential end uses accurately, Duke divides the residential customer class into five structure types:

- Single-family homes
- Duplexes
- Condominiums
- Apartments
- Manufactured housing

Figure 3 shows the forecasted share of end-use residential energy sales by broad end-use categories. This comparison of 1994 and 2009 energy sales reflects the way that rising efficiency standards may impact certain end uses, such as water heating, cooling, and refrigeration.

FIGURE 3. **Percent (%) of Residential Sales by End Use - 1994 and 2009**



COMMERCIAL END-USE FORECAST

DEVELOPING THE FORECAST

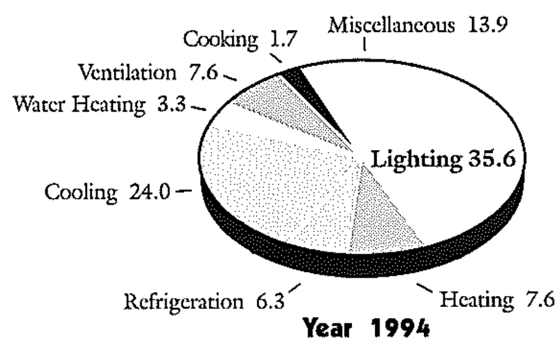
To develop the Commercial End-Use Energy Forecast, Duke used:

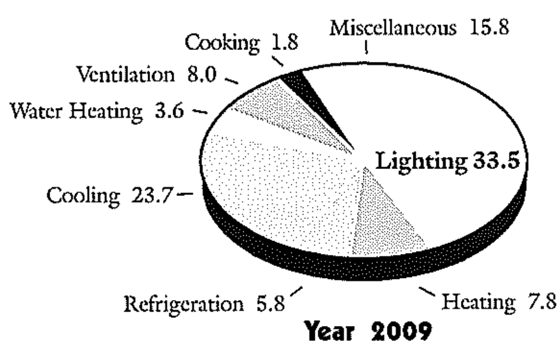
- EPRI's commercial end-use energy forecasting software, COMMEND
- Average end-use load shapes from Duke's load research and end-use metered data
- National data

Commercial Classifications. To reflect commercial end uses accurately, Duke divides the commercial customer class by building type. These categories reflect the types of business activities as well as the characteristics of the building shell.

Figure 4 shows the forecasted share of end-use commercial energy sales by broad end-use categories. This comparison of 1994 and 2009 energy sales shows that lighting will continue to be the largest end use in this class.

FIGURE 4. **Percent (%) of Commercial Sales by End Use - 1994 and 2009**





INDUSTRIAL END-USE FORECAST

DEVELOPING THE FORECAST

To develop the Industrial End-Use Energy Forecast, Duke used:

- ❖ EPRI's industrial end-use energy forecasting software, INFORM
- ❖ National data
- ❖ Motor survey of its customers

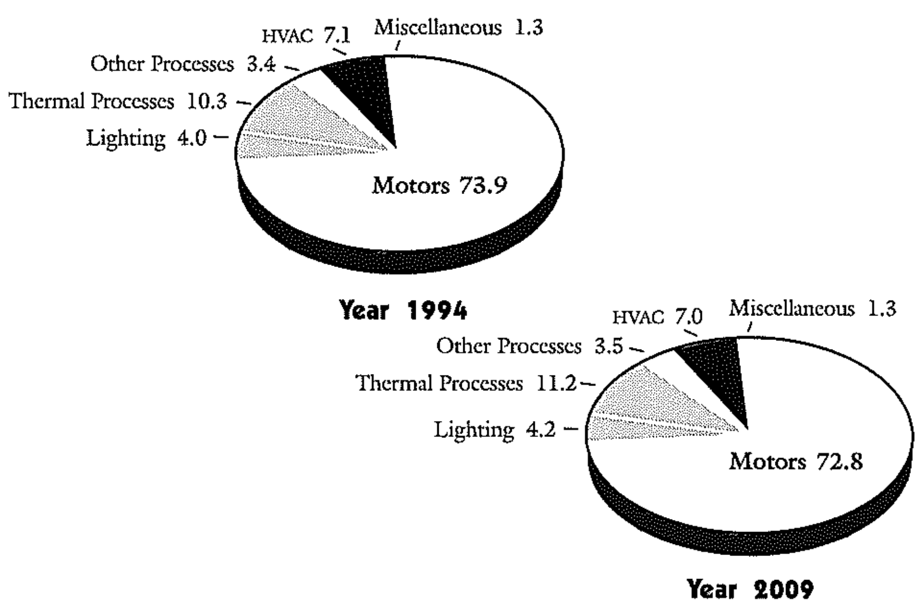
Standard Industrial Classifications. Duke divides the industrial customer class using SIC 20 through 39.

Industrial End Uses

- ❖ Motors (pumps, fans, compressors; material processing and handling)
- ❖ Thermal processes (melting, heating, drying/curing)
- ❖ Heating, Ventilation, and Air Conditioning (HVAC)
- ❖ Lighting (fluorescent, incandescent, high-intensity discharge)
- ❖ Miscellaneous

Figure 5 shows the forecasted share of end-use industrial energy sales by broad end-use categories. This comparison of 1994 and 2009 energy sales shows that motors will continue to be the largest end use in this class. However, the share from motor sales is expected to decline because of the increased efficiency standards of the Energy Policy Act of 1992. The share of electricity use for thermal processes is expected to increase as the trend toward electrification is expected to continue.

FIGURE 5. **Percent (%) of Industrial Sales by End Use - 1994 and 2009**



2: Supply-Side Resources

Introduction

Supply-side resources are viable power-generating technologies that Duke Power has available to meet its electrical needs. These resources are one component of Duke's integrated resource planning process. This chapter includes:

- Overview of supply-side resources
- Specific technologies assessed
- Brief descriptions of the technologies

Overview of Supply-Side Resources

Existing Resources

Duke's existing generation capacity (excluding Nantahala Power and Light) is currently 17,991 megawatts. Municipal and rural electric cooperative organizations in North and South Carolina own 87.5 percent of Catawba Nuclear Station. These organizations are located in Duke's service area and are partial-requirement customers of Duke. For planning purposes, their portion of Catawba is included in Duke's generating capacity.

New Resources

Each year Duke compiles a comprehensive list of supply-side technologies. The number of technologies that Duke initially considers may vary from year to year as new technologies are identified and previously considered technologies are found to be impractical. In an effort to provide safe, reliable, and economical electricity, Duke assesses each technology's current stage of development and classifies each one as either:

Conventional Technology. Well-understood, widely used technology with a long track record in the electric utility industry.

Demonstrated Technology. Technology that has been utilized, but has not achieved widespread acceptance or use within the electric utility industry.

Emerging Technology. New technology that shows promise, but is still in the developmental stage and has not been used in large-scale utility applications.

Developing Schedule, Cost, and Performance Data

For each of the technologies considered, Duke develops schedule, cost, and performance information such as:

- Licensing and construction schedule durations
- Estimated capital costs
- Estimated operation and maintenance costs
- Unit capacities and anticipated heat rates
- Schedules for maintenance/overhaul outages and the effects on unit availability

After developing schedule, cost, and performance data for each technology, Duke evaluates the technologies based on their operating characteristics. This evaluation allows Duke to compare the cost and performance parameters of technologies with similar operating characteristics and best identify the most cost-effective options. Described below are the three categories of technologies and their characteristics:

Base Load Technologies. Technologies that typically operate at or near full output 24 hours a day except during periodic outages for maintenance and repairs.

Intermediate Technologies. Technologies that typically operate according to system needs through frequent on/off cycles at full or partial output.

Peaking Technologies. Technologies that typically operate at full output for short periods during system peak-load conditions.

SUPPLY-SIDE TECHNOLOGIES ASSESSED

Table 5 shows the supply-side technologies that were studied further and considered for integration. For more information, see "Chapter 5 : Integration & Analysis."

TABLE 5: Supply-Side Technology Summary (Part 1 of 2)

Technologies	Conventional	Demonstrated	Emerging
Base Load Technologies			
Advanced Pulverized Coal With Chiyoda Flue Gas Desulfurization (FGD)			♦
Advanced Pulverized Coal With Spray Dryer FGD			♦
Conventional Advanced Light Water Reactor	♦		
Conventional Pulverized Coal	♦		
Evolutionary Advanced Light Water Reactor			♦
High Temperature Gas-Cooled Reactor			♦
Integrated Gasification Combined Cycle		♦	
Passive Advanced Light Water Reactor			♦
Intermediate Technologies			
Biomass–Fluidized Bed Combustion		♦	
Circulating Fluidized Bed Combustion	♦		
Combined Cycles (205 and 415 megawatts)	♦		
Fuel Cells			♦
Gas-Fired Boiler	♦		
Integrated Gasification and Humid Air Combustion Turbine			♦
Municipal Refuse Steam System		♦	
Oil-Fired Boiler	♦		
Pressurized Fluidized Bed Combustion		♦	

TABLE 5: Supply-Side Technology Summary (Part 2 of 2)

Technologies	Conventional	Demonstrated	Emerging
Peaking Technologies			
Advanced Battery			♦
Combustion Turbines (74 and 135 megawatts)	♦		
Combustion Turbines With Inlet Air Cooling (89 and 162 megawatts)		♦	
Compressed Air Energy Storage		♦	
Diesel Generator	♦		
Lead-Acid Battery		♦	
Pumped Storage Hydroelectric	♦		
Solar Central Receiver			♦
Solar Photovoltaic Collector			♦
Wind Power		♦	
Underground Pumped Storage Hydroelectric			♦

Note: Economical sites have not been identified on Duke's system for conventional hydroelectric and geothermal technologies. Although they were on the comprehensive list of supply-side technologies considered, they were not included in the screening process.

Phased Expansion. Phased expansion is a philosophy that provides flexibility in meeting future generation growth by incrementally adding capacity to existing generation. The phased expansion technologies considered in this year's analysis incorporate combinations of some of the technologies in Table 5. The options considered were:

- Multi-unit conventional pulverized coal
- Peaking to base load technology expansion
  - Phase I - Build Simple-Cycle Combustion Turbines for peaking duty.
  - Phase II - Convert Simple-Cycle Combustion Turbine to Conventional Combined Cycle for intermediate duty.
  - Phase III - Convert Conventional Combined Cycle to Integrated Gasification/Combined Cycle for base load duty.

Conventional Technologies

Conventional Advanced Light Water Reactor

Nuclear power generation is considered to be a viable technology for the future. New, evolutionary designs are being developed based on requirements developed by the EPRI-sponsored Advanced Light Water Reactor program. Evolutionary design features address increased safety system designs, licensing issues, operational flexibility, reduced capital and O&M costs, and financial investment protection.

These evolutionary improvements to current technology have not been proven and/or accepted. Estimates for conventional Advanced Light Water Reactor designs are based on completed projects and conventional construction schedules.

Circulating Fluidized Bed Combustion

In circulating fluidized bed combustion, an air distributor supports a bed of ash and limestone in which coal is burned. A large part of the solids suspended in combustion gases is recycled to the bed, increasing the utilization of coal and limestone particles. Low combustion temperatures reduce nitrogen oxide formation to meet emission requirements without additional nitrogen oxide controls. Directly injecting limestone into the combustion process removes 90 percent of the sulfur dioxide in the bed and yields a dry, solid by-product.

Combined Cycle

The combustion turbine combined cycle adds a heat recovery steam generator and steam turbine to the simple-cycle combustion turbine, which improves generating flexibility and increases overall generating efficiency.

The heat recovery system uses the residual hot exhaust gas from the combustion turbine to create steam that is then used to drive a secondary steam turbine generator.

Combustion Turbine

This simple-cycle technology generates electricity by:

- Compressing outside air
- Mixing fuel (oil or natural gas) with the compressed air
- Igniting the fuel/air mixture
- Expanding the resulting gas through a turbine to generate electricity

Conventional Pulverized Coal

Pulverized coal is burned in a steam generator (boiler). Water circulating in the boiler walls captures the heat released from combustion, converting it to steam. This steam is expanded through a turbine/generator while the combustion gases are expelled from the boiler through a sulfur dioxide removal module (scrubber).

DIESEL GENERATOR

Internal combustion engines are connected to electric generators and are used to meet peaking needs. Each unit evaluated during this planning cycle consists of two diesel engines powering one generator.

GAS-FIRED BOILER

A gas-fired boiler generates steam that drives a conventional turbine/generator.

OIL-FIRED BOILER

An oil-fired boiler generates steam that drives a conventional turbine/generator.

PHASED EXPANSION COMBUSTION TURBINE, COMBINED CYCLE, COAL GASIFICATION

With phased expansion, simple-cycle combustion turbines are initially designed so that other phases can be built later to expand generating capacities. The first capacity expansion upgrades the existing combustion turbines to a conventional combined cycle configuration. The second capacity expansion installs a coal gasification unit to switch the primary fuel from gas to coal.

PUMPED STORAGE HYDROELECTRIC

Water stored in a reservoir powers turbines to provide on-peak energy. During off-peak periods, the water is collected and pumped back into the reservoir to be used again. This energy storage system optimizes base load power plant operating conditions.

Demonstrated Technologies

Biomass Fluidized Bed Combustion

Biomass fluidized bed combustion plants use the fluidized bed technology to burn wood by-products such as urban wood, mill residue, in-forest wastes, and rotational wood crops. After the wood is screened and processed, a steady stream of wood fuel is delivered to the circulating fluidized bed. Because most wood fuels contain negligible sulfur and chlorine, the plant does not include a sulfur dioxide scrubber.

Combustion Turbine With Inlet Air Cooling

This technology uses a typical simple-cycle combustion turbine. However, the air entering the combustion turbine compressor is cooled as it passes over a closed-loop system of coils containing chilled water. This system increases the peak summer output of the combustion turbine.

Compressed Air Energy Storage

Compressed Air Energy Storage uses an electric, motor-driven compressor to pressurize air in an underground rock cavern during off-peak periods. When the stored energy is needed, the air is combined with fuel and ignited. Combustion gases expand and power a combustion turbine/generator. To maintain constant pressure in the underground cavern, a vertical water shaft connects the cavern to a surface water reservoir.

Integrated Gasification/ Combined Cycle

A coal gasification module is added to the combined cycle technology to use coal as the primary fuel. Finely ground coal is mixed with water to form a concentrated slurry. This mixture is pumped into the gasifier, which produces a medium Btu gas, superheated steam, and slag. The raw product gas is cooled and passed through particulate and sulfur/acid gas removal systems. The clean gas fuels a conventional combined cycle unit.

Lead-Acid Battery Storage System

Off-peak electric power is used to charge an improved lead-acid battery based on either the sodium-sulfur or zinc-chlorine system.

Municipal Refuse Steam Systems

Municipal refuse steam systems use municipal solid waste, a low-quality fuel with low heat content and high ash and moisture contents, to generate steam. This waste is assumed to be fired on a moving grate in a waterwall-lined steam generator to produce steam for electricity.

PRESSURIZED FLUIDIZED BED COMBUSTION

In Pressurized Fluidized Bed Combustion boilers, compressed air is blown from underneath the bed mixture to fluidize the bed material (fuel, coal ash, and limestone). The limestone reacts with sulfur dioxide, a by-product of burning coal, to form calcium sulfate, a dry, granular material. The calcium sulfate is then discharged from the boiler with the bed ash.

Hot combustion gases exit the boiler with combustion particles and pass through ceramic filters that remove almost all the particles. The gases are then expanded through a gas turbine that powers a compressor to charge boiler inlet air and an electric generator.

The gases exiting the turbine are cooled in a waste heat recovery step and cleaned further in an electrostatic precipitator before being discharged into the atmosphere. Steam is generated in the boiler to power a conventional steam turbine/generator.

WIND POWER

A basic wind turbine consists of rotor blades mounted at the top of a tower. The blades are connected by gears to a drive shaft that translates the rotation of the blades to a generator. Two factors influence reliable energy generation:

- Sustained wind velocity
- Rotor blade length

EMERGING TECHNOLOGIES

ADVANCED BATTERY STORAGE SYSTEM

Off-peak electric power is used to charge an advanced battery based on either the sodium-sulfur or the zinc-chlorine system.

ADVANCED PULVERIZED COAL WITH CHIYODA FLUE GAS DESULFURIZATION

The Advanced Pulverized Coal power plant represents an evolutionary extension of current technology to higher levels of thermal efficiency. The boiler and turbine are designed for sliding pressure operation with the following:

- ❖ Maximum steam conditions of 4,500 psi pressure
- ❖ Initial temperature of 1,100°F
- ❖ Two reheats to 1,100°F
- ❖ 800 megawatts of capacity

A feature of the Chiyoda Flue Gas Desulfurization System is that it yields a marketable gypsum product.

ADVANCED PULVERIZED COAL WITH SPRAY DRYER FGD

Boiler characteristics for the Advanced Pulverized Coal With Spray Dryer are the same as the Advanced Pulverized Coal With Chiyoda Flue Gas Desulfurization. The spray dry system uses lime injection followed by fabric filter particulate collector.

EVOLUTIONARY ADVANCED LIGHT WATER REACTOR

Evolutionary advanced light water reactor technology uses a conventional pressurized water reactor design. Advances in construction technology incorporate the following enhanced features:

- ❖ Gravity-fed safety systems
- ❖ Standardized designs
- ❖ One-step licensing

FUEL CELLS

Fuel cell power plants are modular units composed of three major subsystems:

- ❖ Fuel processor
- ❖ Power section
- ❖ Power conditioner

The fuel processor reforms light distillate fuel (or other liquid or gaseous fuel) into a hydrogen-rich gas. The power section (composed of fuel cell stacks) uses the oxygen from ambient air to convert the hydrogen into water and electricity by conducting the hydrogen gas through various electrolytes. The power conditioner converts DC power to AC power, which is compatible with the utility's distribution system. The three electrolytes evaluated are molten carbonate, phosphoric acid, and solid oxide.

High Temperature Gas-Cooled Reactor

High Temperature Gas-Cooled Reactor is a nuclear reactor concept that uses helium gas as the heat transfer medium instead of water. High Temperature Gas-Cooled Reactor plants are modular units that employ a phased construction approach.

Integrated Gasification and Humid Air Combustion Turbine

The humid air combustion turbine cycle is a combustion turbine-based cycle that uniquely integrates with coal gasification. The combination improves cycle efficiency and power output by reducing the large parasitic load of air compression through intercooling of combustion air and water vapor injection. Increasing the mass flow rate through the turbine in turn increases output.

Passive Advanced Light Water Reactor

The passive Advanced Light Water Reactor is a 600-megawatt nuclear power plant using safety features such as gravity and natural convection. The passive Advanced Light Water Reactor design has several potential advantages over conventional nuclear technology:

- Simplified plant in terms of the number of systems, equipment, operations, inspections, and maintenance requirements
- One-step licensing process
- Lower capital and operating costs
- Short construction schedule

Solar Central Receiver

In the solar central receiver process, a large array of two-axis tracking mirrors (heliostats) focuses solar energy onto a heat exchanger. This heat exchanger functions like a boiler in a steam turbine/generator power cycle. A combustor fires natural gas and operates in parallel with or independently of the solar facility.

Solar Photovoltaic Collector

Photovoltaic systems convert direct sunlight into DC electricity, which is fed to a power conditioning unit to be converted to AC. A tracking mechanism follows the path of the sun to achieve the highest electricity production possible.

Underground Pumped Storage Hydroelectric

Underground pumped storage hydro is similar to conventional pumped storage except that the lower reservoir is located underground.

3: Purchased Resources

Introduction

Purchased resources refer to the capacity and energy Duke Power purchases to meet its electrical demand. Duke evaluates purchased resources to determine the total net benefit to its customers by considering costs, benefits, uncertainties, and reliability.

This chapter describes purchased resources that may be available from non-utility generators (NUGs), other utilities, and power marketers.

PURCHASED POWER AGREEMENTS

Duke continually receives inquiries from NUGs, other utilities, and power marketers regarding sales of capacity and energy to Duke.

NON-UTILITY GENERATORS

Non-utility generator is the term generally used to describe all producers of electric power that are not regulated utilities generating power for use in their franchised service area. There are basically two types of NUGs:

- ❖ Cogenerators and small power producers classified as Qualifying Facilities (QFs) under the Public Utility Regulatory Policies Act of 1978 (PURPA)
- ❖ Exempt wholesale generators (EWGs) as defined in the Energy Policy Act of 1992

Qualifying Facilities Less Than Five Megawatts. The North Carolina Utilities Commission (NCUC) and the Public Service Commission of South Carolina (PSCSC) have established standard rates, contract terms, and procedures for purchases from QFs. Duke includes the capacity of QFs in its Integrated Resource Plan as firm purchases only after both of the following requirements have been fulfilled:

- ❖ Contracts terms have been executed with commission-approved standard rates.
- ❖ Firm capacity has been determined and/or demonstrated.

Qualifying Facilities From Five to Ten Megawatts. Duke currently evaluates purchased-resource proposals from QFs larger than five megawatts but smaller than 10 megawatts on a case-by-case basis to determine the benefit to its customers. Proposals from EWGs and other utilities have been deferred pending the release of Duke's request for proposal. Proposals that are viable, cost-effective, and in the best interest of Duke's customers are pursued through further negotiations, if applicable.

Inter-Utility Contracts

Duke actively reviews inter-utility purchased-power opportunities through contact with other utilities, selective solicitations for quotes of power, and evaluation of requests for proposals from other utilities. Inter-utility purchased-power opportunities are evaluated by comparing cost, availability, and reliability with that of other alternatives.

Duke continues to negotiate with neighboring utilities concerning:

- Modifications to existing interconnection agreements
- New interconnection agreements
- Other power contracts

New agreements will give Duke more flexibility to purchase and sell power. Since the last planning cycle, Duke has received Federal Energy Regulatory Commission (FERC) approval for a new contract with Oglethorpe Power Corporation. Contract modifications with Carolina Power & Light Company, South Carolina Electric & Gas Company, and South Carolina Public Service Authority have also been approved.

Power Marketers

Duke has contacted power marketers in an effort to enhance its opportunities to purchase capacity and sell bulk power. A contract has been signed with ENRON Power Marketing Company and filed with FERC for this purpose. Currently, transactions under this contract will be on an as-needed basis.

Request for Proposals

During 1995, Duke will initiate a competitive bidding process, requesting proposals from NUGs, other utilities, and power marketers. This process will help meet anticipated supply-side resource needs beginning in 1998.

Duke's request for proposal (RFP) has a minimum bid amount of 25 megawatts. Below are tentative proposals and restrictions associated with them:

- Bids from QFs five megawatts and smaller are eligible for commission-approved standard rates.
- Bids larger than five but smaller than 25 megawatts are too small to bid into the RFP and must negotiate rates with Duke.
- Bids 25 megawatts and larger must respond to an RFP to receive consideration. If the proposal is received from a QF, it may receive energy payments without bidding.

Status of Purchased Resources

Existing Purchased Capacity

Since the last planning cycle, Duke's purchased resources have decreased from 500 megawatts to 300 megawatts. This decrease is due to the termination of a purchased power contract with the Tennessee Valley Authority in December 1994. Purchased capacity now includes:

- 238 megawatts from Southeastern Power Administration
- 62 megawatts of firm capacity from various NUGs

The total firm capacity of facilities selling excess or total generator output to Duke, as incorporated in the current planning cycle, is 62 megawatts. Table 6 shows the details of this NUG capacity.

As of March 1995, 29 cogeneration and small power production facilities were being operated by Duke customers to offset power requirements that they would otherwise purchase from Duke. The generation from these facilities is considered when Duke develops its load forecasts. Generally, the output from these facilities is used entirely by the customer, but five of them also sell their excess generation to Duke.

Twenty-six other cogeneration and small power production facilities sell their total generation to Duke and are not offsetting power requirements they would otherwise purchase from Duke.

Proposed NUG Projects

Duke has also entered into new purchased-power contracts with five proposed QFs, providing a total installed capacity of approximately 84 megawatts. Four of these QFs are under contract on Duke's commission-approved standard rates. The other contract—and the largest of these proposed projects, the Cherokee County Cogeneration Project—has a nameplate capacity of 80 megawatts. Duke and Cherokee negotiated a 15-year contract at prices below the standard rates[1] for QFs classified as five megawatts and smaller.

The firm capacity of the Cherokee facility is approximately 73 megawatts. An application for a Certificate of Public Convenience and Necessity and Environmental Compatibility is pending before the PSCSC. Commercial operation of the Cherokee facility is expected in late 1996. The firm capacity of the Cherokee facility was not included in the current planning cycle because the certificate application has not yet been approved. Also, the firm capacity of the four proposed projects on standard rates was not included in the 1995 Integrated Resource Plan since their level of firm capacity can not yet be determined.

1. The 15-year standard rates were approved by the NCUC in July 1993.

TABLE 6: NUG Firm Capacity Rating[a]

	Firm Capacity	NUG	Availability
Small Power Producers	3 MW	Run-of-River Hydro (21 plants)	Monthly Total Capacity – Summer Months (available 90 percent of the time)
	1 MW	Storage Hydro (1 plant)	Monthly On-Peak Capacity – Summer Months (available 90 percent of the time)
	4 MW	**Subtotal: Small Power Producers**	
Cogeneration	45 MW	RJ Reynolds Tobaccoville Plant	Per Contract Capacity Commitment (Firm Capacity)
	2 MW	Mecklenburg County Waste-to-Energy Plant	Average Monthly On-Peak Capacity (Peak Months)
	4 MW	RJ Reynolds Whitaker Park Plant	Average Monthly On-Peak Capacity (Peak Months)
	7 MW	University of North Carolina at Chapel Hill	Average Monthly On-Peak Capacity (Peak Months)
	0 MW	Bob Jones University	Nonfirm (Excess Energy Only)
	0 MW	FMC—Lithium Corp.	Nonfirm (Excess Energy Only)
	0 MW	RJR Bailey	Nonfirm (Excess Energy Only)
	58 MW	**Subtotal: Cogeneration**	
	62 MW	**Total NUG Firm Capacity**	

a. This table does not include one Run-of-River hydro and one cogeneration facility that began selling power to Duke after the determination of NUG firm capacity for this planning cycle. The NUG firm capacity rating includes only the capacity from NUGs that are selling power to Duke. NUG capacity that is used by customers to reduce purchases from Duke is captured in Duke's load forecasts.

4 • Demand-Side Resources

Introduction

Demand-side resources represent one of the components of the Integrated Resource Plan that are considered during Duke Power's annual planning cycle. These customer options modify energy and/or demand by encouraging the wise and efficient use of electricity.

This chapter describes how these options were analyzed and modeled to operate in a competitive marketplace. Each option falls into one of the following categories:

- Energy efficiency
- Strategic sales
- Energy efficiency and strategic sales
- Interruptible
- Load-shift

This chapter also describes how some individual options were combined into packages for delivery to customers.

Analysis of Demand-Side Resources for a Competitive Marketplace

Evaluating the Available Options

The number of demand-side options Duke considers each year varies as new options are identified and previously considered options are revised or dropped from consideration. After using an initial screening to assess their cost-effectiveness, Duke identifies which options will be studied further and considered for integration.

During this year's analysis, Duke initiated a fundamental change in the way it plans to influence customer energy use. Based on almost 20 years of experience with demand-side options, Duke's strategy is to reduce its emphasis on energy efficiency options with large incentives. In response to the changing needs of customers and the increasingly competitive utility industry, Duke will concentrate on:

- Educating customers about the advantages of managing their energy use
- Promoting new, efficient electric technologies to give customers more energy choices

Considering Competition

Duke, like other utilities, is facing increasing competition from other energy suppliers such as gas companies, other electric utilities, and non-utility generators. In the future, competition will give customers a greater selection of energy suppliers from which to choose. As a result, this year's modeling and analysis reflected the increasingly competitive marketplace more strongly than past analyses. The options analyzed during this planning cycle address these uncertain, competitive times by responding to customer needs and preferences while maintaining competitive electricity rates.

Designing a Balanced Portfolio

Duke can best serve its customers by offering them a demand-side portfolio that uses efficient electric technologies and provides solutions to customer energy, manufacturing, or quality service needs. Some customer needs are best met by energy efficiency improvements; other customer needs are best met by the addition of efficient electric technologies. To provide the best solutions for its customers, Duke works to design a balanced portfolio that encompasses energy efficiency, strategic sales, interruptible, and load-shift options.

Energy Efficiency. These options encourage the installation of efficient electric equipment and are targeted at customers who would have selected less efficient electric equipment if the option were not offered.

Energy efficiency options lower participating customers' electric bills by reducing the energy needed to power their homes and businesses. These options defer Duke's need for new supply-side resources and eliminate energy production costs that would have been incurred to supply power to less efficient equipment. Because these options promote efficient equipment that uses less energy than standard equipment, they reduce Duke's kilowatt-hour sales, which lowers revenues. While these options give participating customers an opportunity to lower their electric bills, energy efficiency options with large incentives could result in higher rates for all customers. To meet customer needs and remain a competitive energy supplier, Duke has modified some of its proposed energy efficiency options to decrease option costs and rate impacts by educating customers rather than paying large incentives.

Strategic Sales. These options encourage the installation of efficient electric equipment in new or expanded applications and are targeted at customers who would have selected nonelectric equipment if the option were not offered.

Strategic sales options also improve the utilization of Duke's generating system and provide additional revenues. These options are cost-effective when the revenues gained are greater than the cost of the options plus the cost of generating the additional energy. While strategic sales options may increase participating customers' *electric* bills, these options can lower their total *energy* bills. Additionally, strategic sales options increase customer satisfaction by improving efficiency and comfort, reducing operating costs, and increasing productivity.

Energy Efficiency and Strategic Sales. While both energy efficiency and strategic sales options encourage the installation of efficient electric equipment, the markets they target are different. Some options were analyzed as both energy efficiency and strategic sales because they will influence customer selections in both markets.

The benefits of energy efficiency and strategic sales options are described above. Because the additional revenues gained from strategic sales options help offset the revenues lost to energy efficiency options, using a combination of these options helps keep rates low. A balanced portfolio promotes both strategic sales as well as conservation and efficiency to meet customer needs and help keep rates competitive.

Interruptible. These options reduce Duke's system peak demand by temporarily interrupting all or part of a participating customer's electrical service.

Participating customers receive bill credits that lower their electric bills. Interruptible programs reduce load at a cost lower than the cost to build new generating capacity and defer the need for new supply-side resources, lowering the utility's costs.

Load-Shift. These options reduce Duke's system peak demand by shifting customer energy use to off-peak times.

Customers benefit from lower electric bills, and the utility benefits from lower generating costs.

CLASSIFICATIONS

After developing cost, energy, and demand data for a wide variety of potentially viable demand-side options and evaluating each option, Duke determines which ones may be feasible. They are classified as Existing, Revised, or New.

Existing or Revised? If an option is existing or revised, it must have been available to customers and filed with and approved by the state commissions, if appropriate. Programs are options that have received commission approval.

An additional requirement for an *existing* option is that its primary characteristics—incentive amount, option cost, and projected demand and energy impacts—must remain essentially the same.

An additional requirement for a *revised* option is that one or more of the option's primary characteristics changed before it was analyzed in the current planning cycle.

What's New? To be considered new, an option must be a new technology or service that has not been approved by the state commissions or made available for system-wide implementation.

Options Considered for Integration

Table 7 lists the demand-side options Duke decided to study further and consider for integration. For more information, see "Chapter 5 : Integration & Analysis."

This year Duke has 11 existing and revised customer options. Six of these options target the residential market. Four of them target the commercial/industrial market, and one of them targets the residential/commercial market.

In addition, Duke introduces 11 new customer options. Two of these options target the residential market, and nine of them target the commercial/industrial market.

TABLE 7: Options Considered for Integration (Part 1 of 2)

	Options	Option Version: Existing	Option Version: Revised	Option Version: New
Energy Efficiency	**Residential**			
	Manufactured Housing Payment Program		♦	
	Residential HVAC Tune-Up Program	♦		
	Commercial/Industrial			
	High-Efficiency Chillers Payment Program		♦	
	High-Efficiency Compressed Air Systems			♦
	High-Efficiency Indoor Lighting			♦
	High-Efficiency Motor Replacement			♦
	High-Efficiency Motor Systems			♦
Strategic Sales	**Commercial/Industrial**			
	Electrotechnology Strategy			♦
	High-Efficiency Food Service Appliances			♦
	Outdoor Lighting	♦		
Energy Efficiency and Strategic Sales	**Residential**			
	New Home Package			
	Duct Sealing Payment Program for New Residential Structures	♦		
	High-Efficiency Heat Pump & Central A/C Payment Program	♦		
	Maximum Value Home Builders Program	♦		
	New Home Plus Package			
	Duct Sealing Payment Program for New Residential Structures	♦		
	High-Efficiency Heat Pump & Central A/C Payment Program	♦		
	Low-E Windows			♦
	Programmable Thermostat			♦
	Maximum Value Home Builders Program	♦		
	Residential/Commercial			
	High-Efficiency Heat Pump & Central A/C Payment Program	♦		
	Commercial/Industrial			
	High-Efficiency Large Unitary Equipment			♦

TABLE 7: Options Considered for Integration (Part 2 of 2)

	Options	Option Version: Existing	Revised	New
Interruptible	**Residential**			
	Residential Load Control Rider—Air Conditioning	♦		
	Commercial/Industrial			
	Interruptible Power Service Rider	♦		
	Standby Generator Control Rider	♦		
Load-Shift	**Residential**			
	Residential Water Heating—Controlled/Submetered[a]	♦		
	Commercial/Industrial			
	Cool Storage With Cold Air			♦
	Power Cool Storage			♦

a. This existing program is not currently marketed, and program attrition is anticipated.

Programs Not Analyzed During This Planning Cycle

The following programs were not analyzed during the current planning cycle:

High-Efficiency Agricultural Ventilation. This program was closed October 1, 1994, after it achieved a high penetration level in its target market and moved the market toward adoption of high-efficiency ventilation systems as standard practice.

Residential Load Control Rider—Water Heating. This existing program is closed to new installations. At the next general rate case, Duke will make a proposal to close the program completely. Analysis has shown that this interruptible program is not cost-effective. While the demand impact of existing participants was modeled through 1996 during this planning cycle, no additional accomplishments were considered.

ENERGY EFFICIENCY

MANUFACTURED HOUSING PAYMENT PROGRAM

This revised residential program promotes increased insulation levels and high-efficiency heat pumps for manufactured homes.

Target Market. Retailers selling new manufactured homes to Duke customers

Customer Incentive. The incentive structure was revised to encourage the installation of both high-efficiency heat pumps and increased insulation levels. Incentives for qualifying homes are as follows:

- $300 per single-section home
- $400 per multi-section home

To qualify for this incentive, the new manufactured home must use a heat pump with a Seasonal Energy Efficiency Rating (SEER) of 11 or greater and also meet the thermal requirements of rate schedule RE-2.

Factors Influencing Selection. The manufactured housing market is the fastest growing segment of Duke's residential customer base. This option helps reduce customer electricity costs and Duke's summer peak.

RESIDENTIAL HVAC TUNE-UP PROGRAM

This existing residential program encourages customers to improve the efficiency of their existing heating and cooling systems by having a qualified HVAC technician analyze the system to repair duct system leaks and clean coils, as needed. Dealers are encouraged to check refrigerant charges during a comprehensive tune-up, although the option does not pay additional money for it.

Target Market. Single-family homes with heat pumps or electric heating with central air conditioning

Customer Incentive. The maximum incentive that Duke will pay is $280:

- $50 toward the cost of evaluating a customer's air distribution system
- 90 percent of the completed repairs not to exceed $230

Dealers charge an evaluation fee of $100 for one-system homes and an additional $30 per system for homes with more than one system. The customer pays the balance. (For example, in a two-system home, Duke pays $50 and the customer pays the $80 balance.)

Factors Influencing Selection. This option improves the efficiency of the customer's heating and cooling system. These efficiency improvements help reduce customer operating costs and Duke's summer peak.

HIGH-EFFICIENCY CHILLERS PAYMENT PROGRAM

This revised commercial/industrial program encourages customers to use high-efficiency, water-cooled chiller equipment. This equipment reduces peak summer electrical demand and energy for space conditioning and process cooling.

Target Market. New and existing commercial/industrial customers with cooling needs in excess of 75 tons who use water-cooled chillers compatible with non-CFC refrigerants.

Customer Incentive. For customers who purchase qualifying chillers, Duke plans to raise the minimum efficiency and pay a one-time incentive of $15 to $50 per ton depending on the unit's efficiency and size. The incentive helps offset the premium cost of the high-efficiency equipment.

Factors Influencing Selection. Electric chillers are commonly used for space conditioning in larger commercial and industrial facilities. High-efficiency chillers represent a viable demand-side option for three reasons:

- A wide range of machines with varying efficiencies are available from a number of manufacturers.
- Approximately 25 percent of the conditioned space in Duke's commercial market is served by chillers.
- The 1990 Clean Air Act Amendment's phase out of CFC refrigerants, commonly used in chillers, will require attention and response from owners.

HIGH-EFFICIENCY COMPRESSED AIR SYSTEMS

This new commercial/industrial option encourages customers to evaluate their compressed air system needs and to improve efficiencies through system modifications and maintenance. Modifications may include: leakage detection and minimization, control system changes, and/or replacement of inefficient components or process equipment. Implementation was modeled to begin in 1996.

Target Market. New and existing commercial/industrial customers

Customer Incentive. Education, training, and information designed to help customers reduce their electricity costs

Factors Influencing Selection. The American Council for an Energy Efficient Economy recognizes compressed air systems as an area of potential efficiency improvement and suggests the following system optimization opportunities:

- Reducing air leakage and pressure requirements
- Improving compressor efficiency
- Increasing efficiency by installing high-efficiency compressors
- Saving energy and extending equipment life using precise speed control

High-Efficiency Indoor Lighting

This new commercial/industrial option educates customers about:

- Benefits of installing high-efficiency indoor lighting technologies
- Value of lighting upgrades to reduce customer energy consumption and lower year-round demand

Implementation was modeled to begin in 1995.

Target Market. New and existing commercial/industrial customers

Customer Incentive. Education, training, and information designed to help customers reduce their electricity costs

Factors Influencing Selection. Indoor lighting is the largest end use in the commercial market, representing 33 percent of the commercial and 8 percent of the industrial market. Installation of high-efficiency lighting systems offers significant opportunity for reducing customer energy bills and for reducing Duke's system demand and energy growth.

High-Efficiency Motor Replacement

This new commercial/industrial option promotes the benefits of installing high-efficiency motor replacements. Implementation was modeled to begin in 1995.

Target Market. New and existing commercial/industrial customers

Customer Incentive. Education, training, and information designed to help customers reduce their electricity costs

Factors Influencing Selection. Motor-driven equipment uses approximately 75 percent of the electricity sold to Duke's industrial customers and 40 to 50 percent of the electricity sold to its commercial customers. Thus, the option has the potential to significantly reduce customer electric bills and Duke's system demand and energy growth.

High-Efficiency Motor Systems

This new commercial/industrial option encourages customers to install and operate high-efficiency motor systems by showing the potential energy efficiency gains associated with options such as improved motor control technologies, proper motor sizing, and mechanical drive trains and lubrication. Implementation was modeled to begin in 1996.

Target Market. New and existing commercial/industrial customers

Customer Incentive. Education, training, and information designed to help customers reduce their electricity costs

Factors Influencing Selection. Installation of high-efficiency motor systems achieves an even greater impact than installation of high-efficiency motors alone.

STRATEGIC SALES

ELECTROTECHNOLOGY STRATEGY

This new industrial option promotes the use of high-efficiency electric heating and curing equipment in manufacturing processes. This option will initially focus on the following heating and curing applications: infrared, ultraviolet, microwave, radio frequency, and membrane processing. Implementation was modeled to begin in 1995.

Target Market. New and existing industrial customers

Customer Incentive. Education, training, and information designed to help customers reduce their manufacturing costs

Factors Influencing Selection. Electric heating and curing systems improve customer efficiency and can enhance product quality.

HIGH-EFFICIENCY FOOD SERVICE APPLIANCES

This new commercial option encourages customers to install efficient electric food preparation equipment in their commercial facilities. The option improves customers' food preparation efficiency and lowers total energy costs.

In evaluating the total effect of this equipment on the facility's energy consumption, Duke estimated that the air conditioner load would realize a peak summer demand reduction of approximately 15 percent. Implementation was modeled to begin in 1995, pending commission approval.

Target Market. New and existing commercial customers who use food service appliances. Initial efforts will focus on maximizing participation with minimal costs by targeting facilities such as chain restaurants, school systems, and multiple restaurant owners.

Customer Incentive. Within the limits established for the option based on cost-effectiveness, each purchase opportunity will be evaluated and monetary as well as nonmonetary incentives will be offered, including:

- Energy simulation analysis
- Energy audits
- Service contracts and/or extended warranties on equipment
- End-use, load-shape data
- Participant case studies

Factors Influencing Selection. Food service customers are interested in ways to lower costs, but may be hesitant to try new technologies. Promotion and incentive for the installation of new, efficient electric technologies helps customers stay competitive.

OUTDOOR LIGHTING

This existing commercial/industrial option increases customer awareness of Duke's leased outdoor lighting products.

Target Market

- ❖ Commercial/industrial customers with outdoor lighting needs
- ❖ Municipal, county, state, and federal governments

Customer Incentive. Education, training, and information designed to help customers install efficient outdoor lighting equipment

Factors Influencing Selection. This option promotes off-peak energy sales and improves system load factor while providing lighting services to customers.

ENERGY EFFICIENCY AND STRATEGIC SALES

DUCT SEALING PAYMENT PROGRAM FOR NEW RESIDENTIAL STRUCTURES

This existing residential program offers builders incentives to ensure that HVAC systems in new residential construction have minimal leaks in the duct work. It includes requirements for thermal conditioning and a high-efficiency heat pump with a SEER of 11 or more.

Target Market. New home builders in Duke's service area

Customer Incentive. Incentives for qualifying structures are as follows:

- $200 per single-family structure
- $100 per multi-family unit

Factors Influencing Selection. HVAC system inefficiencies caused by leaking duct work increase customer energy bills and Duke's system demand and energy requirements. Reduced duct leakage and improved HVAC system performance benefit both customers and Duke.

HIGH-EFFICIENCY HEAT PUMP AND CENTRAL A/C PAYMENT PROGRAM

This existing program encourages new and existing residential and commercial customers to purchase high-efficiency heat pumps and central air conditioners of less than 5.5 tons. As an *energy efficiency* option, this program is targeted at new and existing residential/commercial customers who would have chosen less efficient electric equipment.

As a *strategic sales* option, this program targets new and existing residential/ commercial customers who would have chosen fossil heating systems.

Customer Incentive. Incentive is based on a sliding scale with a minimum qualifying SEER of 11. The incentive offsets a portion of the high-efficiency equipment costs. The average incentives for a three-ton unit are:

- $165 – residential or commercial high-efficiency central A/C
- $315 – residential or commercial high-efficiency heat pump

Note: The analysis included costs and benefits associated with the Residential Comfort Machine Loan Program and the Residential Insulation Loan Program. Additional payments or services (beyond the customer incentive) are available to nonresidential building owners/developers who agree to install a minimum of ten new high-efficiency heat pumps under the Nonresidential High-Efficiency Heat Pump Development Program.

Factors Influencing Selection. The option assumes an improvement from 10 to 12 SEER. Option improvements and previous participation history indicated that on average the customer installs a 11.5 to 12 SEER heat pump because of the option. Installation of these higher efficiency units helps reduce customer operating costs and Duke's summer peak.

MAXIMUM VALUE HOME BUILDERS PROGRAM

This existing program encourages the construction of Maximum Value Homes.

Target Market

- Builders who agree to construct a minimum of 30 Maximum Value Homes on the Duke system or 10 Maximum Value Homes within a single phase of a residential development
- Developers of manufactured housing communities where a single community has at least 30 Maximum Value Homes

Customer Incentive. Duke or third parties compensated by Duke will provide participants with products or services designed to encourage and support the construction and purchase of Maximum Value Homes. Products and services may include cooperative advertising/communication and education, training, and consultation on residential building sciences such as thermal efficiency improvements, indoor air quality, mechanical system efficiency improvements, thermal imaging, and blower door testing for infiltration.

Factors Influencing Selection. The program improves customer energy efficiency and operation of Duke's generating system.

LOW-E WINDOWS

This new residential option offers an incentive to builders who install low-emissivity (low-E) windows in new, residential structures. Low-E windows have a microscopically thin, virtually invisible, weather-sensitive metallic coating that effectively blocks radiant heat through the windows.

Target Market. New home builders in Duke's service area

Customer Incentive. $150 for installation of low-E windows

Factors Influencing Selection. This option lowers customer energy bills and reduces Duke's demand and energy growth.

PROGRAMMABLE THERMOSTAT

This new residential option offers an incentive to builders who install programmable thermostats in new residential structures. Programmable thermostats are typically used during the winter to lower system temperatures at night and during summer to increase system temperatures during the afternoon.

Target Market. New home builders in Duke's service area

Customer Incentive. $40 for installation of a programmable thermostat

Factors Influencing Selection. This option lowers customer energy bills and reduces Duke's demand and energy growth.

High-Efficiency Large Unitary Equipment

As a new *energy efficiency* option, it encourages customers with nonelectric heating to install and use high-efficiency unitary air conditioners. This equipment reduces customers' space conditioning electrical demand and energy consumption for cooling.

As a new *strategic sales* option, it encourages customers to purchase and use high-efficiency unitary:

- Air conditioners with resistant strip heat
- Dual-fuel heat pumps
- All-electric heat pumps

This equipment increases customers' energy use during the heating season and reduces customers' space conditioning electrical demand and energy consumption for cooling. Implementation was modeled to begin in 1995.

Target Market. New and existing commercial/industrial customers with cooling needs served by packaged or split systems rated at greater than 5.5 tons

Customer Incentive. The incentive, which offsets a portion of the high-efficiency equipment costs, is based on the size and efficiency of the equipment.

Factors Influencing Selection. This option fills a gap in Duke's current high-efficiency offerings for the commercial/industrial HVAC markets. More than 70 percent of commercial/industrial HVAC equipment falls into the unitary category, and most of it is greater than 5.5 tons. Customers have asked for a large unitary option.

Several recent developments should enhance Duke's ability to influence this market and increase the availability of high-efficiency equipment in all sizes:

- Consistent, minimum efficiency standards for unitary equipment will be established by the High-Efficiency Commercial Air Conditioning Consortium of which Duke is a member.
- Major manufacturers have begun to introduce high-efficiency air conditioners in this size range.

PACKAGED OPTIONS

The effectiveness of demand-side resources can sometimes be improved by packaging (or "bundling") two or more options for implementation. The following packages were analyzed during the current planning cycle. As indicated, these packages were analyzed as both energy efficiency and as strategic sales, depending on the target market.

New Home Package. This residential new construction package encourages builders to construct all-electric single- and multi-family homes that meet the energy efficiency requirements of rate schedule RE-2. The package was revised to reflect current costs associated with it. The energy efficiency package contains the following individual options:

- Duct Sealing Payment Program for New Residential Structures
- High-Efficiency Heat Pump and Central A/C Payment Program

The strategic sales package contains the following individual options:

- Duct Sealing Payment Program for New Residential Structures
- High-Efficiency Heat Pump and Central A/C Payment Program
- Maximum Value Home Builders Program

New Home Plus Package. This new residential package encourages builders and developers to build single- and multi-family homes with higher energy efficiency standards than Duke's existing program. Qualifying homes meet the requirements of rate schedule RE-2. Implementation was modeled to begin in 1996. The energy efficiency package contains the following individual options:

- Duct Sealing Payment Program for New Residential Structures
- High-Efficiency Heat Pump and Central A/C Payment Program
- Low-E Windows Option
- Programmable Thermostat Option

The strategic sales package included the above options, plus the Maximum Value Home Builders Program.

INTERRUPTIBLE

RESIDENTIAL LOAD CONTROL RIDER—AIR CONDITIONING

This existing residential rider encourages customers to let Duke interrupt service to their central air conditioning systems. Load control options are currently available through rate Rider LC.

Target Market. Residential customers with central air conditioning systems

Customer Incentive. For the billing months July through October, participating customers receive a monthly $8 per residence bill credit for allowing Duke to interrupt their central air conditioning unit(s) when needed.

Factors Influencing Selection. This option reduces system capacity requirements by temporarily interrupting loads.

INTERRUPTIBLE POWER SERVICE RIDER

This existing commercial/industrial rider encourages customers to interrupt their service to a specified contract level when Duke requests. Customers are charged a penalty for not complying with the agreement. This option is available under rate Rider IS. While the demand impact of existing participants was modeled during this planning cycle, no additional accomplishments were considered.

Target Market. Commercial/industrial customers currently receiving service from Duke who can interrupt all or a part of their facility's load

While this option is still available to customers who already have contracts, new customer participation has been suspended until the integrated resource planning process shows a need for more interruptible capacity.

Customer Incentive. Monthly capacity credit of $3.50 per kilowatt of effective interruptible demand

Factors Influencing Selection. This option reduces system capacity requirements by temporarily interrupting loads.

STANDBY GENERATOR CONTROL RIDER

This existing commercial/industrial rider encourages customers to shift load from Duke's system to their standby generators upon request. This option is available under rate Rider SG.

Target Market. Commercial/industrial customers with on-site standby generation equipment currently receiving service from Duke

Customer Incentive. Monthly incentive for capacity and/or energy. Customers select Category A or Category B depending on their level of energy commitment:

Category A

- Applicable energy credit
- $10 per month

Category B

- $2.75 per kilowatt of average generation capacity provided
- Applicable energy credit
- $10 per month

To qualify for Category B:

- The customer's standby generators must generate an average of 200 kilowatts or greater for each test operation and for each emergency request.
- The customer must participate in at least 80 percent of the requested operations.

Factors Influencing Selection. This option reduces Duke's system capacity and energy requirements.

Load-Shift

Residential Water Heating—Controlled/Submetered

This existing residential program encourages customers to shift their water heating to off-peak periods as determined by Duke. Although this program is no longer actively promoted to new customers, existing participants continue to receive bill reductions. Analysis has shown that this load-shift program is not cost-effective, but no decision has been made to cancel it at this time. While the load-shift impact of existing participants was modeled during this planning cycle, no additional accomplishments were considered.

Target Market. New and existing residential customers with electric water heaters located on distribution lines served by load-control equipped substations

Customer Incentive. Customers are billed at a lower rate for all water heating energy consumption in exchange for allowing Duke to control their water heaters.

Factors Influencing Selection. This option lowers customer energy bills and reduces Duke's system peak demand.

Cool Storage With Cold Air

This new commercial/industrial option encourages customers to install cool storage systems integrated with cold air distribution systems. Cool storage systems shift load by cooling or freezing water or other liquids during off-peak hours for use during on-peak hours to cool buildings or processes. Use of cold air distribution technology is expected to reduce the customer's total system installation cost to the break-even point. Implementation was modeled to begin in 1997 following completion of the Power Cool Storage pilot.

Target Market. New construction commercial/industrial customers with relatively low load factors. The high cost of retrofitting cold air distribution systems makes this option unattractive for existing facilities.

Customer Incentive. Duke offers the system designer an incentive during the first three years of the option to offset the:

- Extra work involved to design cool storage and cold air distribution systems
- Perceived risk associated with specifying this new technology

Customer costs are expected to be no greater for this integrated system than for conventional systems. Duke anticipates market transformation will drive this technology in later years without an incentive.

Factors Influencing Selection. This option reduces summer peak demand, improves system load factor, and offers the following customer benefits over conventional systems:

- Lower cooling temperatures (as much as 15°F) and flow rates (as much as 50 percent)
- Reduced fan power requirements
- Reduced duct sizes, which can reduce building floor heights

POWER COOL STORAGE

This new commercial/industrial option encourages customers to install cool storage systems with conventional air distribution systems. Cool storage systems shift load by cooling or freezing water or other liquids during off-peak hours for use during on-peak hours to cool buildings or processes. Implementation was modeled to begin in 1997 following completion of the Power Cool Storage pilot.

Target Market. New and existing commercial/industrial customers on the OPT rate schedule (those with high off-peak, kilowatt-hour consumption)

Customer Incentive

- One-time payment of $200 per kilowatt of shifted demand to offset a portion of the system installation costs
- Additional payments to partially offset the cost of engineering analyses for system design during the first two years

Factors Influencing Selection. This option reduces summer peak demand, improves system load factor, and lowers on-peak demand for the customer.

DEMAND-SIDE ACCOMPLISHMENTS

Table 8 shows demand-side accomplishments for options in the marketplace during the 1993 calendar year. These accomplishments are based on 1993 evaluation results.

TABLE 8: 1993 Demand-Side Evaluation Results

	Options	Number of Customers	Total Impacts		Cost ($000)
			Demand (MW)	Energy (MWh)	
Residential	High-Efficiency Heat Pump Payment	12,453	(6.1)	(7,596)	$8,628
Residential	High-Efficiency Central A/C Payment	5,946	(2.85)	(1,225)	1,844
Residential	Residential Insulation Loan Program	570	(0.25)	(685)	622
Residential	Residential Water Heating–Controlled/Submetered [a]	37,888	(6.67)	0	902
Residential	Residential Load Control Rider–Air Conditioning [b c]	215,506	(390.07)	0	22,972
Residential	Residential Load Control Rider–Water Heating [a c]	102,683	(19.51)	0	4,730
	Total Residential	**375,046**	**(425.45)**	**(9,506)**	**$39,698**
Commercial/Industrial	High-Efficiency Agricultural Ventilation [d]	377	(0.58)	(832)	625
Commercial/Industrial	High-Efficiency Chillers Payment Program [d]	46	(1.17)	(4,813)	2,005
Commercial/Industrial	High-Efficiency Unitary Equipment [d]	232	(0.07)	(88)	701
Commercial/Industrial	Interruptible Power Service Rider [a c]	257	(723.09)	0	27,715
Commercial/Industrial	Standby Generator Control Rider [b]	116	(38.42)	(705)	1,829
	Total Commercial/Industrial	**1,028**	**(763.33)**	**(6,438)**	**$32,875**
	Pilots and Other				**8,866**
	Grand Total	**376,074**	**(1,188.78)**	**(15,944)**	**$81,439**

a. No change in energy expected from these options.

b. Annual energy impacts depend on the actual number of times these options are used.

c. The demand-side impacts are estimated and not observed.

d. The High-Efficiency Agricultural Ventilation option represents 2,906 fans; the High-Efficiency Chillers option represents 97 chiller units; the High-Efficiency Unitary Equipment option represents 543 pieces of equipment.

5: Integration & Analysis

Introduction

During resource integration, Duke Power uses various methods and planning models to identify the best combination of available supply-side, purchased, and demand-side resources. The resource integration results are then analyzed against an uncertain future during risk analysis.

This chapter describes the development of Duke's resource integration results and resource strategy using:

- Resource integration
- Risk analysis

Integration and Analysis Overview

Major Data Assumptions

January 1, 1995, through December 31, 2009, is the period for which the 1995 Integrated Resource Plan was prepared.

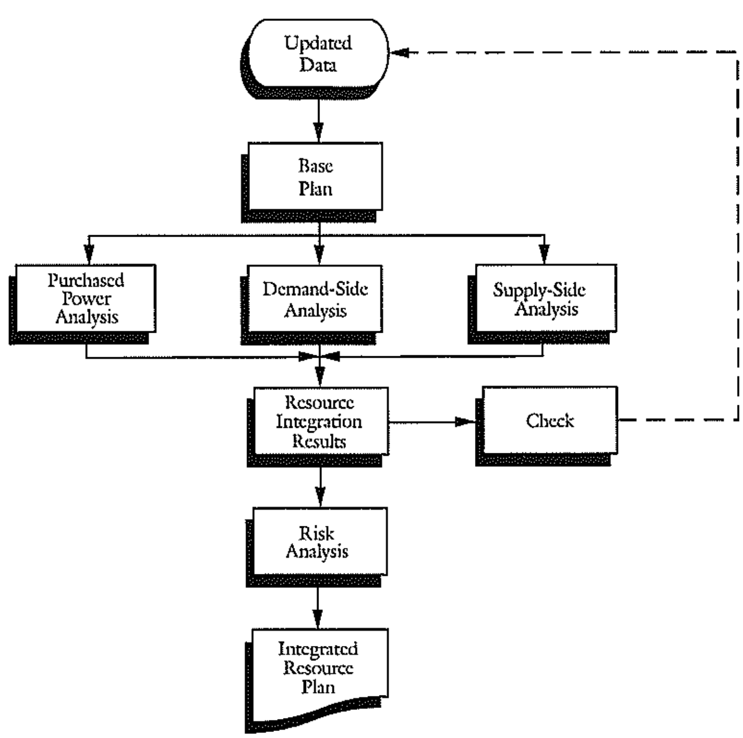
Forecast Data. The energy and demand data used during resource integration was based on the forecast in "Chapter 1: Load Forecasting."

Reserve Margin. A minimum 20 percent planning reserve margin was used in all analyses.

Process Flow

This integration and analysis process (Figure 6) starts with the development of the base plan. After establishing a base plan, Duke incorporates all potential resource options and analyzes the resource integration results against an uncertain future. The resulting analysis provided insight to help develop the resource strategy, which provides Duke with flexible, low-cost alternatives for meeting customers' energy needs. The resource integration results also undergo a check to determine whether customer rates might change. A change in rates may affect customer energy use, and a change in customer energy use may change the forecasted load.

FIGURE 6. **Integration and Analysis Process Overview**



RESOURCE INTEGRATION

ESTABLISHING THE BASE PLAN

Resource integration begins with the development of a base plan that incorporates the following updated information:

- Current peak demand and energy forecast
- Existing generation and purchased power agreements
- Supply-side technology options from the previous year's plan
- Current demand-side resource accomplishments (MNDC)[1]

The base plan establishes a starting point from which to evaluate the cost-effectiveness of new resource options (supply-side, purchased power, and incremental demand-side additions). Duke combines the final supply-side technologies from the previous year's plan with the existing demand-side MNDC values to create this base plan, which also shows how these resource options interact with Duke's existing generation system.

ANALYZING PURCHASED POWER AGREEMENTS

Analysis of purchased power agreements is an ongoing process, dependent on their availability over time. As purchased power agreements are reached, Duke may need to select different supply-side technologies or demand-side options. New purchased resources are evaluated for cost-effectiveness against the base plan in the purchased power analysis. However, if purchased power agreements are finalized outside the formal planning process, the results are incorporated during the next planning cycle.

ANALYZING SUPPLY-SIDE OPTIONS

Duke identifies potentially cost-effective technology additions by developing screening curves that compare similar technologies (e.g., base load technologies compared to other base load technologies). Screening curve analysis examines operation and cost parameters (e.g., capital, fuel, efficiency) for each generation option. The relative expense of these parameters is illustrated graphically. (For screening curves, see "Appendix.") Through comparison of graphs for several options, it is possible to identify the most cost-effective generation technologies, reducing the number of options for subsequent detailed analyses.

1. Maximum Net Dependable Capacity—Before supply-side and demand-side resources can be combined, Duke must adjust the demand-side capacity values to make them comparable to the supply-side capacity values.

The following technologies were selected as a result of this initial supply-side screening.

Base Load Technologies

- Conventional Pulverized Coal (600, 800, and 1200 megawatts)
- Conventional Pulverized Coal (two 600-megawatt units)[2]
- Evolutionary Advanced Light Water Reactor (1200 megawatts)
- Integrated Gasification Combined Cycle (500 megawatts)

Intermediate Technologies

- Circulating Fluidized Bed Combustion (200 megawatts)
- Combined Cycle (205 and 415 megawatts)
- Pressurized Fluidized Bed Combustion (340 megawatts)

Peaking Technologies

- Combustion Turbines (74 and 135 megawatts)
- Combustion Turbines With Inlet Air Cooling (89 and 162 megawatts)
- Compressed Air Energy Storage (220 megawatts)
- Lead-Acid Battery (20 megawatts)
- Phased Expansion—Combustion Turbine to Combined Cycle to Integrated Gasification Combined Cycle [2]
- Wind Power (150 megawatts)

To narrow the supply-side selection still further, Duke conducts a more detailed screening to analyze how future technologies interact with Duke's current generating system.

This detailed screening allows Duke to base its technology selection for future needs on a probable system forecast load shape (load modified by existing and projected demand-side resources). This screening includes an estimate of demand-side resources that are likely to be included in the final plan. This estimate is based on demand-side planning projections and information about the previous year's resources.

Final Supply-Side Screening Results. The final results included the following technologies, which were considered the most cost-effective of the ones analyzed. They are included as key input assumptions in the resource integration results:

- Combustion Turbine (135 megawatts)
- Conventional Pulverized Coal (600 megawatts)

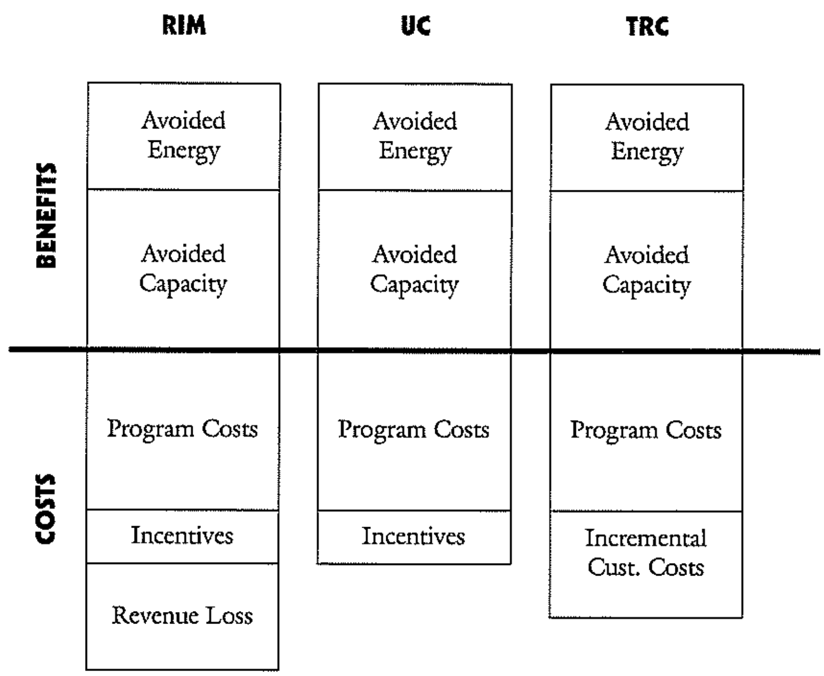
2. These technologies could not be modeled using the screening curve methodology, but were considered in the detailed screening.

Analyzing Demand-Side Options

During this analysis, Duke conducts individual and cumulative screenings of demand-side resources.

Just as supply-side resources are screened to select those that are cost-effective, demand-side resources are individually screened. During this initial screening, Duke analyzes each option against the base plan to determine its benefits and costs using the Total Resource Cost (TRC), Utility Cost (UC), and Rate Impact Measure (RIM) benefit/cost calculations. Figure 7 shows the components of the tests.

FIGURE 7. **Benefit/Cost Components**



Note: Strategic sales options undergo the RIM test only. When the RIM test is applied to strategic sales options, the "benefits" also include revenue gains and the "costs" also include additional capacity and energy costs. For applications of the benefit/cost results, see Table 10 and Table 11.

To refine the demand-side selection still further, Duke conducts a cumulative analysis of the options that made it through the initial screening. This analysis recognizes the synergy that occurs among options and the base plan when the cost-effective options are added incrementally.

Duke adds the most cost-effective energy efficiency, interruptible, and load-shift option (based on RIM) from the first screening to its base plan, which includes current participants' benefits and costs for options that were analyzed when the base plan was developed. The next most cost-effective option is analyzed against the base plan that now includes the most cost-effective option. This process continues until all cost-effective options are added and all non-cost-effective options are dropped. Next, Duke uses the same cumulative analysis to add cost-effective strategic sales options.

Duke may choose to incorporate options that are currently not cost-effective (based on strict adherence to their benefit/cost test pass/fail criteria) while seeking to improve their performance in future planning cycles. These options represent important opportunities to promote energy efficiency in new and existing markets.

PORTFOLIO RESULTS

Duke's planning goal is to develop a portfolio of energy efficiency, interruptible, load-shift, and strategic sales options that will contribute to competitive rates as measured by the RIM test. Table 9 shows the portfolio results.

TABLE 9: Demand-Side Resource Portfolio Results

Portfolio	Benefit/Cost Ratio		
	UC	TRC	RIM
Energy Efficiency, Interruptible, and Load-Shift Options	1.61	2.40	0.99
Strategic Sales Options	N/A	N/A	1.20
Demand-Side Resource Portfolio	**N/A**	**N/A**	**1.09**

These results represent the portfolio of demand-side options and are a combination of results from:

- Cumulative analysis (shown in Table 10 and Table 11)
- Base plan analysis for current participants in the Interruptible Power Service Rider, Standby Generator Control Rider, and Residential Load Control Rider–Air Conditioning options

CUMULATIVE RESULTS

Table 10 shows the benefit/cost results of analyzing energy efficiency, interruptible, and load-shift options during the cumulative analysis, which evaluated incremental benefits and costs associated with new participants in new or existing options.

TABLE 10: Benefit/Cost Results for Selected Demand-Side Options

Energy Efficiency, Interruptible, and Load-Shift Options	Benefit/Cost Ratio		
	UC	TRC	RIM
Residential Load Control Rider–Air Conditioning	1.16	1.70	1.16
Cool Storage With Cold Air	1.35	2.25	1.03
High-Efficiency Chillers Payment Program	2.69	2.64	0.76
High-Efficiency Compressed Air Systems	20.53	4.23	0.96
High-Efficiency Heat Pump & Central A/C Payment Program [a]	0.68	0.65	0.39
High-Efficiency Indoor Lighting	13.11	1.86	0.81
High-Efficiency Motor Replacement	13.52	4.56	0.88
High-Efficiency Motor Systems	26.41	5.04	0.96
High-Efficiency Large Unitary Equipment	2.42	1.17	0.95
Residential HVAC Tune-Up Program[a]	1.06	0.94	0.41
Manufactured Housing Payment Program	2.23	1.46	0.39
New Home Package [a]	0.56	0.60	0.32
New Home Plus Package [b]	0.68	0.67	0.35
Power Cool Storage [a]	1.62	0.96	0.57
Standby Generator Control Rider	1.18	3.24	1.18

IF...	THEN Duke will...
RIM result is greater than 1	Implement the option.
RIM result is less than 1 AND both TRC and UC results are greater than 1	Implement the option.
RIM result is less than 1 AND either TRC or UC result is less than 1	Modify/reanalyze, field test, or drop the option.

a. This existing option failed one or more benefit/cost tests; Duke will seek to improve its cost-effectiveness.

b. Option failed one or more benefit/cost tests. Duke will seek to improve the cost-effectiveness of this new option in future planning cycles. This option represents an important opportunity to promote energy efficiency in new markets.

Table 11 shows the benefit/cost results of analyzing strategic sales options during the cumulative analysis, which evaluated incremental benefits and costs associated with new participants in new or existing options.

TABLE 11: Benefit/Cost Results for Selected Strategic Sales Options

Strategic Sales Options	Benefit/Cost Ratio		
	UC	TRC	RIM
Electrotechnology Strategy	N/A	N/A	1.12
High-Efficiency Heat Pump & Central A/C Payment Program	N/A	N/A	1.07
High-Efficiency Food Service Appliances	N/A	N/A	1.18
High-Efficiency Large Unitary Equipment	N/A	N/A	1.46
New Home Package	N/A	N/A	1.01
New Home Plus Package[a]	N/A	N/A	0.92
Outdoor Lighting	N/A	N/A	1.37

IF...	THEN Duke will...
RIM result is greater than 1	Implement the option.
RIM result is less than 1	Modify/reanalyze, field test, or drop the option.

a. Option failed RIM. Duke will seek to improve the cost-effectiveness of this new option in future planning cycles. This option represents an important opportunity to promote energy efficiency in new markets.

Resource Integration Results

The conclusions from analyzing supply-side options, purchased power agreements, and demand-side options are then incorporated to develop resource integration results that meet Duke's 20 percent minimum planning reserve margin.

During the current planning cycle, Duke's projections indicate a need for about 6,300 megawatts of additional resources. The Lincoln Combustion Turbine Station will provide 1,184 megawatts of peaking capacity beginning in 1995 through 1996. Resource requirements in future years are expected to be met by resources with peaking as well as base load characteristics.

Table 12 shows the supply-side additions and demand-side resources represented in the resource integration results. There are no new, approved purchased power resources represented in this year's results.

TABLE 12: Resource Integration Results

Year	Supply-Side[a]		Demand-Side
	Peaking Unit(s)	Base Load Unit(s)	MNDC[b] (MW)
1995	296[c]		1127
1996	888[c]		1038
1997			1029
1998	675		1048
1999			1019
2000	540		1066
2001	270		1150
2002	270		1183
2003	405		1265
2004		600	1336
2005	270		1363
2006		600	1374
2007	270		1500
2008		600	1537
2009		600	1616

a. This capacity, other than Lincoln, will be purchased, contracted, or built by Duke.

b. Maximum Net Dependable Capacity represents the equivalent cumulative capacity for all demand-side resources.

c. Lincoln Combustion Turbine Station

Risk Analysis

Overview

The results of resource integration (Table 12 on page 75) show how much capacity is required in each of the 15 years of the plan to meet customer energy needs. In arriving at the resource integration results, Duke makes assumptions about the future (e.g., forecasted growth rate, fuel costs). However, because the future is full of uncertainties, Duke must understand and manage the risks associated with making assumptions about the future.

After developing resource integration results and determining the future uncertainties that could impact them, Duke develops its resource strategy—how Duke plans to meet customer energy needs. Part of developing this resource strategy is analyzing future risks and ensuring that the strategy is flexible enough to handle them. This risk analysis, which uses the resource integration results as a base for comparison, has two parts—sensitivity analysis and scenario analysis.

Identifying Future Uncertainties for Key Assumptions

With input from its own experts and the public IRP Advisory Panel, Duke assigned each key input assumption high and low values to cover the spectrum of possible future occurrences with reasonable confidence (Table 13).

TABLE 13: Ranges of Uncertainty for Key Input Assumptions (Part 1 of 2)

Key Inputs	High	Low
Capital Costs		
600 MW pulverized coal	+10%	-10%
600 MW nuclear	+25%	-10%
415 MW combined cycle	+10%	-10%
800 MW pumped storage	+10%	-20%
135 MW combustion turbine	+20%	-10%
Fuel Costs		
Oil price escalation rate	+70%	-50%
Gas price escalation rate	+70%	-50%
Coal price escalation rate	+50%	-65%
Environmental Regulations		
Sulfur dioxide allowance cost	+25%	-50%
Carbon tax	$100/ton	—
Air toxins	unit derates	—
Carbon dioxide emission cap	40 mil. tons	—

TABLE 13: Ranges of Uncertainty for Key Input Assumptions (Part 2 of 2)

Key Inputs	High	Low
Load Growth		
Forecast growth rate	+29%	-24%
Load factor by 2009	+8%	-8%
System Operation		
Nuclear capacity factor	+4%	-14%
"Old" fossil capacity factor [a]	—	-6%
Hydro capacity	+10%	-10%
Hydro energy	+20%	-20%
Future combustion turbine gas availability	+400%	—
Jocassee capacity increase	+80 MW	—

a. Fossil units placed in service before 1958.

SENSITIVITY ANALYSIS

Sensitivity analysis determines how a future uncertainty could change a single key input assumption and, thus, alter resource integration results. For example, how would a greater-than-expected increase in coal prices affect the assumption used to project the cost to produce electricity?

Duke determines which uncertainties have the most significant impact on individual assumptions by examining their effects on three of the critical decisions used to develop the resource strategy:

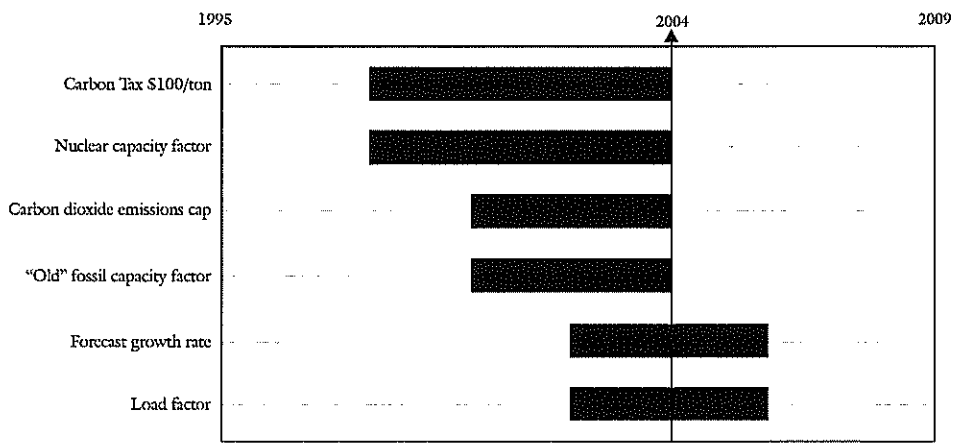
- Timing of the first base load resource
- Cost to produce electricity
- Type of technologies selected

Timing of the First Base Load Resource. First, Duke analyzed the resource integration results to assess how future uncertainties could change the individual assumptions Duke used to determine when the first base load resource was needed. Since base load resources are typically long-term commitments, this analysis enables Duke to maintain flexibility in meeting future energy needs.

Figure 8 shows the assumptions that, if changed by future uncertainties, would have the greatest impact on the timing of the first base load resource. For example, if a carbon tax of $100 per ton were imposed, Duke would need a clean, base load resource six years earlier than the resource integration results indicated. The timing of the first base load resource also depends on Duke's ability to:

- Operate existing nuclear stations at current capacity factors.
- Operate older fossil units at current capacity factors.
- Predict customers' summer peak load (forecast growth rate) and energy growth (load factor).

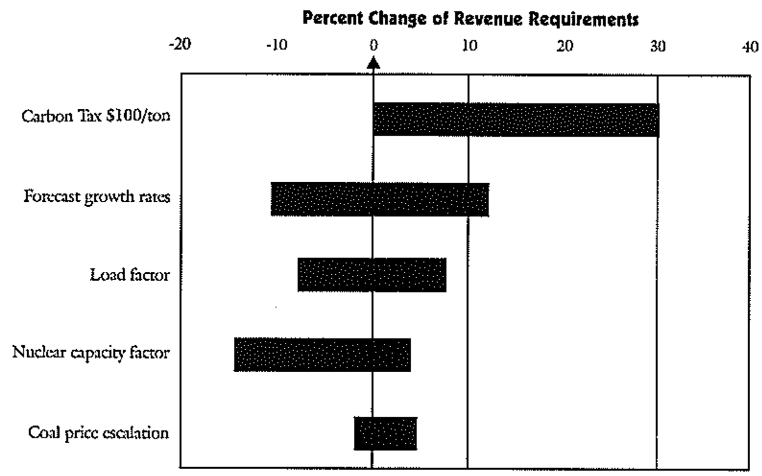
FIGURE 8. **Timing of the First Base Load Unit**



Cost to Produce Electricity. Next, Duke analyzed the resource integration results to assess how future uncertainties could change the individual assumptions Duke used to project the cost to produce electricity. This analysis helped assess Duke's ability to maintain a low-cost generating system.

Figure 9 shows the assumptions that, if changed by future uncertainties, would have the greatest impact on the cost to produce electricity. For example, if a carbon tax of $100 per ton were imposed, the cost to produce electricity would rise 30 percent over plan projections.

FIGURE 9. **Cost to Produce Electricity**



Technology Mix. Finally, Duke analyzed the resource integration results to assess how future uncertainties could change the individual assumptions Duke used to determine the type of generation technologies needed. Since the selection of generating technologies is critical to cost-effective energy production, Duke must understand the influence of future uncertainty on technology needs. Resource integration results indicate the need for both combustion turbines and conventional pulverized coal units to meet future energy requirements. For this step in the sensitivity analysis, five diverse technologies were available for selection: combustion turbine (CT), pumped storage hydro (PS), combined cycle (CC), nuclear (NC), and conventional pulverized coal (CPC).

Table 14 shows the assumptions that, if changed by future uncertainties, would have the greatest impact on the type of technology needed. For example, if a carbon tax of $100 per ton were imposed, nuclear technologies might become viable alternatives to conventional pulverized coal.

TABLE 14: Technology Mix

Sensitivity...	Technologies selected...				
	CT	PS	CC	NC	CPC
Resource integration results	◆				◆
Carbon tax ($100/ton)	◆			◆	
Carbon dioxide emissions cap	◆			◆	
Gas price escalation—low	◆		◆		◆

Scenario Analysis

The last part of risk analysis looks at the effect of having several key input assumptions change at the same time. Such changes suggest alternate business environments, or scenarios, in which Duke could find itself operating as the future unfolds. Ultimately, scenario analysis helps develop a resource strategy that is appropriate for a range of possible business futures. Because many of the assumptions are interrelated (e.g., capital costs, fuel costs), Duke must know how a change in multiple assumptions might affect the resource integration results. Scenario analysis adds flexibility to the resource strategy.

Duke collaborated with the IRP Advisory Panel to develop three scenarios that approximated simultaneous changes in multiple key input assumptions. With their experience in business, industry, environmental affairs, education, and consumer advocacy, the IRP Advisory Panel members provided valuable insight into future business environments.

Lean and Green. In this business environment, additional environmental regulations and nuclear issues increase electric operating costs, resulting in lower-than-expected customer load growth.

Intense Competition. In this business environment, a highly competitive energy marketplace reduces Duke's future electric load growth while technological advances provide more individual energy choices.

Economic Boom. In this business environment, a growing world economy and a competitive utility market result in increased electric growth with greater financial risks.

Scenario Results

To meet its customers' energy needs, Duke must have a flexible resource strategy. Scenario analysis provided insight in developing this resource strategy. The major findings from scenario analysis include:

- Peaking generation is the most appropriate near-term resource for all scenarios.
- The year in which Duke projects a need for the next peaking resource could vary significantly.
- An intermediate-type resource could satisfy Duke's future needs.
- Base load needs could be greater than Duke's resource integration results indicate.
- If their costs decrease significantly, new technology resources could replace conventional combustion turbine peaking resources.
- The year in which Duke projects a need for base load resources could be delayed or advanced one to three years.

From the risk analysis results, it is clear that Duke's future resource selections are heavily dependent upon the actual business environment that unfolds. The risks imposed by an increasingly competitive utility industry and uncertain future demand that Duke select flexible generating resources that can be built or purchased quickly and modified if future events (e.g., competition for customers, load growth, costs) require changes. Short lead times allow Duke to add resources that closely match forecasted load growth. The company will commit to long-term resources only to satisfy highly certain load growth.

6: Three-Year Outlook

Introduction

The Three-Year Outlook or Short-Term Action Plan summarizes the following actions Duke Power will take over the next three years to begin implementing the 1995 Integrated Resource Plan.

- Supply-side actions
- Purchased power actions
- Demand-side actions
- System improvement actions
- Process improvement actions

This Short-Term Action Plan also covers actions completed since the last planning cycle.

SUPPLY-SIDE ACTIONS

MEET PEAKING AND BASE LOAD RESOURCE NEEDS

The 1995 Integrated Resource Plan reflects the need for additional peaking resources beginning in 2000 and base load resources beginning in 2004. While no immediate action is required to secure these resources, action may be required within the three-year, short-term planning horizon. Future planning cycles may show a change in the resource need. If future plans continue to indicate a need for these resources, Duke will decide how best to meet the need by assessing the market and either purchasing, contracting, or building the needed resources. Future Short-Term Action Plans will provide updates on the status of resource needs for 2000 and beyond.

COMPLETE THE LINCOLN COMBUSTION TURBINE STATION

Duke is completing construction of the previously planned 16-unit combustion turbine facility in Lincoln County, North Carolina. The first four units of the Lincoln Combustion Turbine Station will begin commercial operation by June 1995 and the remaining 12 units by June 1996. Projected costs for the Lincoln station remain within the $502,355,000 estimate provided to the North Carolina Utilities Commission (NCUC) and Public Service Commission of South Carolina on October 27, 1992.

The first combustion turbine was delivered in June 1994 with deliveries of the remaining turbines continuing almost monthly. All major balance of plant equipment has been received. (For a status report on the eight major construction contracts awarded to outside construction companies, see Table 15.) Duke is the construction manager.

Federal and State Permits. Listed below are the federal and state permits required for the Lincoln Combustion Turbine Station:

Federal:

- 404 Wetlands Permit: received 8-13-92
- 404 Dredge and Fill Permit: received 10-21-91; renewed 3-5-93

State:

- 401 Water Quality Certification: received 8-13-92
- National Pollutant Discharge Elimination System Permit: received 9-1-92
- National Pollutant Discharge Elimination System—Wastewater Authorization to Construct Permit: received 2-2-93
- Solid Waste (Demolition Landfill) Permit: received 12-14-92; revised 8-10-94
- Driveway Connection Permit: received 8-12-91; revised 7-14-93
- Air Quality Permit: received 12-20-91 (currently being contested)
- Erosion and Sediment Control Permit: received 12-3-91; revised 6-23-92, 3-11-93, 7-19-93, 1-11-94, and 5-2-94
- Drinking Water Permit: not applicable

TABLE 15: Major Contracts

Contract/Status	Description
Sitework/Earthwork (Phase 1) – Complete	• Clear site. • Complete rough grading of all plant areas, roadways, and parking areas. • Install storm drainage system. • Construct dam. • Complete initial asphalt paving of main entrance road.
Sitework/Earthwork (Phase 2) – 25 to 30 percent complete	• Finish grading facilities yard and fuel tank unloading areas. • Complete site paving in facilities yard and fuel tank unloading areas.
Civil – 50 to 55 percent complete	• Complete foundation work for equipment. • Install turbine yard crane structural steel. • Construct raw-water intake structure. • Construct waste water treatment basin. • Provide conduit manholes and fuel oil test manholes. • Install precast concrete cable trenches. • Complete makeup water intake structure foundations and steel.
Mechanical – 90 to 95 percent complete	• Fabricate and install piping. • Install equipment.
Electrical – 70 to 75 percent complete	• Install the following: station ground grid, direct buried cables, embedded conduit banks, cable trays in trenches, owner-supplied electrical equipment, all outdoor lighting. • Install and test cathodic protection system. • Design, supply, and install heat tracing system.
Buildings – Complete	Erect and finish pre-engineered buildings, including the foundation, electrical, plumbing, and HVAC work within each building.
Turbine Installation – Three turbines are on site with installation in progress.	• Transport, deliver, and install GE combustion turbine units. • Install accessory equipment, cabling, and piping associated with each two-unit block.
Major Tanks – Complete	Supply and install the following: fuel oil storage tanks, demineralized water storage tanks, filtered water storage tanks.

Comply With 1990 Clean Air Act Amendments

The 1990 Clean Air Act Amendments (CAAA) primarily affect Duke's eight existing coal-fired generating stations. The following is a summary of the three key portions relevant to the company's power plant operations:

Title I. This title provides a means to help geographical areas comply and maintain compliance with the National Ambient Air Quality Standards.

Plant Allen and Riverbend Steam Station, located in Gaston County, are the only Duke fossil plants located in a nonattainment area[1]. Gaston County is designated as a nonattainment area because ozone levels exceeded the National Ambient Air Quality Standards from 1987 through 1989. While the standard has not been exceeded since 1989, a plan must be presented to the Environmental Protection Agency (EPA) assuring the standard will be maintained in the future. Since nitrogen oxide is a precursor to ozone, and coal-fired power plants are major sources of nitrogen oxide, the North Carolina Department of Environmental Management has submitted a plan to the EPA requesting an additional 10 percent nitrogen oxide reduction for Allen and Riverbend Steam Stations. This additional nitrogen oxide reduction is not expected to impact the plan results.

Title III. This title regulates 182 additional hazardous air pollutants, raising the number from seven to 189. The EPA is conducting a five-year study, scheduled to be completed in November 1995, to determine whether the level of toxic emissions from electric utility fossil generating stations needs to be regulated. Mercury emissions were addressed in a separate report that is expected to be finalized by April 1995. Duke is following the development of these studies to determine their potential impacts on its system.

Title IV. This title requires electric utilities to incorporate a two-phase reduction in the aggregate annual emissions of sulfur dioxide and nitrogen oxide by the year 2000. Starting in the year 2000, Duke will be limited to 185,500 tons of sulfur dioxide per year unless it purchases additional allowances. In addition, nitrogen oxide emissions must be reduced between 20 to 30 percent from current levels.

Duke currently meets all Phase I requirements because of historical initiatives such as burning low-sulfur coal, operating efficiently, and using nuclear generation. The sulfur dioxide provisions of the CAAA allow utilities to choose among various alternatives for compliance. Duke is currently developing a detailed compliance plan for Phase II requirements that must be filed with the Environmental Protection Agency (EPA) by 1996.

1. Nonattainment areas are regions large enough to be considered metropolitan statistical areas that fail to meet federal air quality standards applicable to a variety of pollutants.

To address these new limits, Duke is investigating the following options, which provide for full compliance with Phase II requirements by the year 2000:

Sulfur Dioxide Compliance Options:

- Retire and rebuild units.
- Use lower sulfur coal.
- Convert to natural gas as a substitute for coal.
- Use sulfur dioxide control technologies (scrubbers).
- Purchase sulfur dioxide allowances.

Duke's current sulfur dioxide compliance strategy is a combination of switching to a lower sulfur coal and purchasing allowances. The final strategy is contingent upon developments in the emissions allowance market, future regulatory and legislative actions, and advances in clean air technology. Duke is also taking advantage of a special provision in the amendments that allows for the accumulation of allowances before the year 2000. The impact of these sulfur dioxide compliance alternatives was accounted for during the planning cycle by considering the following:

- An allowance cost for sulfur dioxide along with high and low ranges
- Cost of lower sulfur coal starting in 1995

Nitrogen Oxide Control: Duke's current nitrogen oxide strategy is to modify boiler operations to lower nitrogen oxide and install low nitrogen oxide burners before 1997. The addition of low nitrogen oxide burners was not considered during the planning cycle because of its minimal system operational impact.

Develop Climate Challenge Program

In response to the Framework Convention on Climate Change, President Clinton, in April 1993, announced our nation's commitment to reducing greenhouse gas emissions to 1990 levels by the year 2000. In October 1993, President Clinton issued his Climate Change Action Plan. One of the foundation actions outlined in the plan is the Climate Challenge Program, intended to address greenhouse gas emissions from the utility industry.

Duke's generating system produces substantially less carbon dioxide per kilowatt-hour than the national utility average. Duke has worked with the Department of Energy (DOE) and others in the utility industry to develop the Climate Challenge Program. Duke is currently negotiating a Participation Accord with the DOE to voluntarily limit the growth of our greenhouse emissions by evaluating and implementing cost-effective initiatives.

PRESERVE AND MAINTAIN EXISTING COMBUSTION TURBINES

Duke currently has 24 combustion turbine units with a total capacity of 599 megawatts.[2] A 1992 system study of alternatives for this capacity indicated that the most cost-effective alternative involved a flexible near-term preservation and maintenance program followed by ongoing routine maintenance. Duke defined specific tasks, costs, and budgets for each unit. Individual unit maintenance and preservation work has begun.

REVIEW EXISTING GENERATION

Duke continues to evaluate innovative and cost-effective alternatives to improve efficiency and increase the capacity of its existing generating system. Implementation of good business alternatives will be a part of these ongoing efforts, and results will be incorporated during future planning cycles.

CONDUCT FOSSIL GENERATING FACILITIES STUDIES

As plant retirement decision dates approach, aging fossil plants will be evaluated to determine whether to continue to operate, retire, refurbish, or repower each plant. Results of these studies will be incorporated during future planning cycles. Key issues in this evaluation include:

- Life-cycle generation costs
- Potential regulatory and environmental issues
- Capital expenditures
- Plant performance
- Uncertainty and risk factors

RELICENSE HYDROELECTRIC FACILITIES

Duke is currently in the process of relicensing the leased Buzzard Roost project and the following five hydroelectric projects:

- Ninety-Nine Islands
- Gaston Shoals
- Saluda
- Holliday's Bridge
- Spencer Mountain

As Duke proceeds through this relicensing process, new licenses may affect these facilities' firm capacity and the Integrated Resource Plan. Mitigation requirements could potentially affect a station's economic viability. Duke anticipates that it will have more definitive expectations outlined by the end of 1995. These results will be incorporated during future planning cycles.

2. On December 8, 1994, Duke sold its 15-megawatt Urquhart Combustion Turbine unit to South Carolina Electric & Gas Company. The unit is included in Duke's final plan; however, future analyses will reflect the removal of this capacity from Duke's system.

Upgrade Turbine Runners at Jocassee

Duke is currently evaluating an option to replace the turbine runners at its Jocassee Pumped Storage Station. Replacing these runners may lower the operating and maintenance costs and increase the efficiency and capacity of these units.

Consider Extending the Life of Nuclear Plants

Duke operates 7,054 megawatts of nuclear capacity. Extending the life of existing nuclear units may offer the company and other owners of the Catawba Nuclear Station a more economical means for meeting future generation needs. Duke is studying the possibility of extending the life of its nuclear plants. Technical, licensing, and economic issues are being evaluated to determine the feasibility of life extension.

Replace Nuclear Steam Generators

Stress corrosion cracking (SCC) has occurred in the steam generators at McGuire Nuclear Station Units 1 and 2 and Catawba Nuclear Station Unit 1. Catawba Unit 2, which has certain design differences and came into service at a later date, has not yet shown the degree of SCC that has occurred in McGuire Units 1 and 2 and Catawba Unit 1.

Although Duke has taken steps to mitigate effects of SCC, the inherent potential for future SCC in the McGuire and Catawba steam generators still exists. Duke is planning for the replacement of the steam generators at the three units that have experienced SCC. The replacement schedule[3] below was used in the current analysis:

- McGuire Unit 1 – November 1995
- Catawba Unit 1 – June 1996
- McGuire Unit 2 – September 1997

As a maintenance issue, SCC is monitored very closely, and the steam generator replacement sequence may change based on the performance of existing steam generators and the overall performance of the three units. To minimize downtime, replacement/maintenance outages will take place during scheduled refueling outages. The estimated outage time for the replacement, expected to take approximately four months for each unit, was considered during the planning cycle.

3. The schedule was modified after the analysis began. The new replacement schedule is: Catawba Unit 1 – June 1996; McGuire Unit 1 – January 1997; McGuire Unit 2 – July 1997. These changes will be reflected in future planning cycles.

Purchased Power Actions

Procure Capacity by Competitive Bidding

To help meet future capacity needs, Duke intends to use a competitive bidding process, which includes a solicitation and evaluation of capacity offered by:

- Qualifying facilities (QFs)
- Exempt wholesale generators
- Other utilities

To maximize the benefits and preserve the integrity of the competitive bidding process, unsolicited proposals from non-utility generators (NUGs) were generally deferred until the release of the request for proposals. NUG proposals or other opportunities that offer unique benefits or substantial savings to Duke customers may, under limited circumstances, be evaluated and selected outside the competitive bidding process.

Duke will continue to accept and evaluate proposals from QFs that meet the availability criteria for commission-approved standard rates and contracts as required under Public Utility Regulatory Policies Act and commission rules. Proposals from QFs for energy-only sales will also continue to be accepted and evaluated.

Negotiate and Revise Contracts

Duke continues to revise existing agreements while negotiating new agreements with other utilities as well as power marketers. These agreements include enhancements that will provide more flexibility in the overall resource plan and in the daily operations with utility neighbors.

DEMAND-SIDE ACTIONS

PURSUE DEMAND-SIDE OPTIONS

To meet customer needs and remain a competitive energy supplier, Duke will develop and implement a balanced demand-side portfolio. Based on almost 20 years of experience with demand-side options, Duke has decided to reduce its emphasis on energy efficiency options that offer large incentives. While Duke will continue many of the customer options already implemented to improve efficiency, it is changing the way it will implement other options, including some that were previously identified. In the future, Duke will focus on developing and implementing options that help keep electricity rates low. In response to the changing needs of customers and the increasingly competitive utility industry, Duke will concentrate on:

- Educating customers about the advantages of managing their energy use
- Promoting new, efficient electric technologies to give customers more energy choices

Table 16 summarizes projected demand and energy reductions as well as related expenditures for each category of demand-side options selected during the current planning process. For specific projections, see Table 17 on page 93.

TABLE 16: Demand-Side Resource Projection Summary[a]

Year		Energy Efficiency	Interruptible	Load-Shift	Strategic Sales	Grand Totals
1995	Demand (MW)	(6.38)	(1,085.27)	0.47	6.98	(1,084.67)
1995	Energy (MWh)	(22,723)	0	0	97,265	74,542
1995	Direct Costs ($000s)	16,940	36,827	0	24,070	77,837
1996	Demand (MW)	(22.65)	(1,013.11)	0.47	23.51	(1,012.25)
1996	Energy (MWh)	(85,988)	0	0	316,883	230,895
1996	Direct Costs ($000s)	18,913	37,402	11	26,132	82,458
1997	Demand (MW)	(44.78)	(1,023.78)	(0.17)	42.64	(1,026.56)
1997	Energy (MWh)	(173,130)	0	28	574,406	401,304
1997	Direct Costs ($000s)	20,682	36,748	1,399	27,817	86,646

a. Megawatts (MW) represent diversified customer load at Duke's system peak including transmission and distribution (T&D) line losses. Megawatt values for each year are cumulative, not incremental. Megawatt-hours (MWh) represent annual values based on total accomplishments and include T&D line losses. All values in parentheses are reductions. Direct expenditures will be incurred in each of the subject years shown.

Continue Power Cool Storage Pilot

This commercial/industrial pilot is helping Duke evaluate the application of thermal energy storage systems in Duke's service area. Targeted at reducing summer peak demand, cool storage systems shift load by cooling or freezing water or other liquids during off-peak hours for use during peak hours to cool buildings or processes. The pilot has been expanded and extended until December 31, 1996, to:

- Allow more project lead time.
- Anticipate technology cost reductions.
- Investigate rate and/or rider options for non-OPT customers.
- Serve customers with additional options to minimize their cooling costs.

Implementation is expected to begin in 1997 following pilot completion.

Conduct Demand-Side Program Evaluation

Duke conducts a comprehensive periodic evaluation of active energy efficiency, interruptible, and load-shift options when there is a business need for current performance information. Refinements recommended as a result of evaluations are considered in subsequent planning cycles. The demand-side evaluation is designed to:

- Measure actual marketplace performance.
- Provide information that can be used to improve the design, delivery, and cost-effectiveness of active options.
- Continually improve the overall cost-effectiveness of the company's demand-side portfolio.

Assess Demand-Side Competitive Bidding

Duke assessed the potential benefits of paying a third-party or customer to design and/or market demand-side options. A request for proposals was issued in 1992, and 16 bidders responded. Duke entered into contracts with four of the bidders for a total savings of 4.7 megawatts. Two of the contracts are with industrial customer bidders; the other two are with energy services company bidders. The bidders must complete installation of the energy efficiency measures by the first quarter of 1997. When Duke receives satisfactory post-implementation reports from the bidders, they begin receiving payments.

Demand-Side Resource Projections for 1995-1997

In Table 17, all values in parentheses are reductions. Annual energy impacts for interruptible options depend on actual number of times programs are used.

Demand (MW). These megawatts represent diversified customer load at Duke's system peak including transmission and distribution line losses. Megawatt values for each year are based on total program accomplishments to date.

Energy (MWh). These megawatt-hours represent annual values based on total program accomplishments to date, including transmission and distribution line losses.

Direct Costs. Direct expenditures will be incurred in each of the subject years shown.

TABLE 17: Demand-Side Resource Projections

Programs	Demand [MW]			Energy [MWh]			Direct Costs [$000s]		
	1995	1996	1997	1995	1996	1997	1995	1996	1997
Energy Efficiency									
Residential HVAC Tune-Up Program	(1.11)	(3.69)	(7.14)	(3,986)	(13,285)	(25,684)	4,129	5,230	5,996
Manufactured Housing Payment Program	(0.40)	(1.22)	(2.04)	(5,351)	(16,118)	(26,983)	1,705	1,504	1,540
New Home Package	(0.17)	(0.51)	(0.88)	(405)	(1,228)	(2,117)	983	755	841
New Home Plus Package	0	(0.06)	(0.20)	0	(147)	(496)	0	219	341
HE Chillers Payment Program	(0.94)	(2.72)	(4.34)	(3,830)	(11,142)	(17,757)	1,168	1,019	917
HE Compressed Air Systems	0	(0.96)	(2.89)	0	(5,826)	(17,479)	0	232	223
HE Indoor Lighting	(0.26)	(1.04)	(2.61)	(1,506)	(6,025)	(15,062)	496	259	301
HE Motor Replacement	(0.48)	(1.43)	(2.39)	(3,153)	(9,458)	(15,763)	193	156	120
HE Motor Systems	0	(1.28)	(3.85)	0	(8,470)	(25,411)	0	232	223
HE Large Unitary Equipment	(0.35)	(1.53)	(4.19)	(385)	(1,669)	(4,563)	407	616	1,426
HE Heat Pump & Central A/C Payment Program	(2.67)	(8.21)	(14.25)	(4,107)	(12,620)	(21,815)	7,859	8,691	8,754
Interruptible									
Residential Load Control Rider–A/C	(402.57)	(352.56)	(358.14)	0	0	0	9,761	10,134	9,273
Interruptible Power Service Rider	(639.42)	(612.18)	(612.18)	0	0	0	25,195	25,204	25,214
Standby Generator Control Rider	(43.28)	(43.37)	(53.46)	0	0	0	1,871	2,064	2,261
Load-Shift									
Residential Water Heating–Controlled/ Submetered	0.47	0.47	0.47	0	0	0	0	0	0
Cool Storage With Cold Air	0	0	(0.24)	0	0	0	0	0	569
Power Cool Storage	0	0	(0.40)	0	0	28	0	11	830
Strategic Sales									
New Home Package	(1.42)	(4.00)	(6.38)	14,724	41,484	66,152	7,323	5,972	6,120
New Home Plus Package	0	(0.52)	(1.57)	0	2,864	8,739	0	2,037	2,202
Electrotechnology Strategy	8.99	30.20	55.30	61,363	205,024	374,603	2,861	3,109	2,953
HE Food Service Appliances	0.40	1.37	2.91	1,926	6,597	13,964	442	435	498
HE Large Unitary Equipment	(0.47)	(1.95)	(4.87)	2,404	10,256	26,039	906	1,293	1,977
Outdoor Lighting	0	0	0	12,055	35,974	59,666	10,121	10,844	11,548
HE Heat Pump & Central A/C Payment Program	(0.52)	(1.59)	(2.75)	4,793	14,684	25,243	2,417	2,442	2,519

Overall Improvement Actions

Improve Efficiency of Company Facilities

Duke actively continues to investigate opportunities to improve efficiency in all of the company's facilities. Duke considers the value of efficiency improvements when addressing the need for transmission and distribution (T&D) system changes. The company pursues economical and efficient T&D designs by considering:

- Losses associated with equipment and conductors while ensuring service reliability
- Operational flexibility needed when making T&D system changes

Duke has developed a comprehensive, integrated method to evaluate the cost of both capacity and energy losses associated with a T&D facility over its operating life. The capacity and energy loss evaluation for a given T&D project is an integral part of the overall economic evaluation of project alternatives. Capacity and energy values are assigned for system losses using the same principles applied to demand-side resource evaluations. Considerations for improving efficiency in T&D include:

- Purchasing transformers
- Reconductoring lines
- Converting voltage

Add Transmission Facilities

Table 18 lists the major transmission additions and increases over the next five years. Additional projects are planned after the five-year window; however, their schedules are not firm.

TABLE 18: Scheduled Transmission Additions and Increases

Transmission Facility	Location	Addition/ Increase	Timeframe	Description
Surry Line (230 kV)	Rural Hall, NC	805 MVA per circuit	Fall 1995	Bundled existing circuit and added second circuit.
Antioch Tie Station (500-230 kV)	North Wilkesboro, NC	1500 MVA	Fall 1995	Added 500-230 kV tie station.
Carolina Power & Light (CP&L) 230 kV inter-connection at East Durham tie	Durham, NC	—	Spring 1996	CP&L will fold in its Method to Roxboro Line and Durham to Roxboro Line.

Conduct Research and Development

To maintain a competitive advantage in the evolving electric utility industry, Research and Development (R&D) seeks opportunities to design cost-effective, customer-driven, and environmentally-sound technologies. Through partnerships with Electric Power Research Institute (EPRI) and several universities, R&D is focusing on many projects to help manufacturers, customers, and employees incorporate new technologies. Four of the projects are discussed below:

Electric Vehicle Research. By demonstrating dramatic reduction in emissions and costs, R&D's Electric Vehicle project is paving the way for electric transportation. As a sponsor of the electric shuttle bus service, Duke purchased and donated two of the four electric buses serving uptown Charlotte. Introducing electric transportation through the shuttle service will increase customer awareness of this budding market.

Microwave Clothes Dryer. In the area of appliance R&D, the microwave clothes dryer is a feasible alternative for those using conventional gas and electric energy. Microwave dryers can dry woolens and delicate fabrics that would ordinarily have to be dry cleaned and are about 20 percent more efficient than conventional dryers.

Performance Coal Sampling. Duke's coal-fired stations use coal sampling to calculate station performance. There are concerns regarding the consistency and accuracy of manual versus mechanical sampling techniques. In the worst case, inconsistencies could negatively affect the plant's heat rate and operating costs. This project is helping R&D determine whether investments in approved mechanical sampling equipment are justified.

Solar Demonstrations. Photovoltaic applications in remote areas are a cost-effective way to serve remote customers. Cedar Rock base camp in the Pisgah National Forest is the test site for a remote photovoltaic installation. Electrical energy produced by the solar panels during sunny daylight hours is stored in a battery bank. Backup power is provided from the grid. A data collection and monitoring system, powered by a separate photovoltaic panel, tracks system performance.

Completed Actions

Plant Modernization Program

Over the past several years, Duke has had a Plant Modernization Program (PMP) at 15 of its 30 coal-fired units. PMP increased the reliability and availability of selected older units, thus reducing Duke's need to construct additional resources. Duke has just completed the final stages of this program.

- Cliffside Unit 1 was returned to service in June 1994.
- Buck Unit 3 was returned to service in July 1994.

  Modernizing this unit regained five megawatts that had been lost because of old, inefficient equipment and returned the unit's capacity to its original 75 megawatts. Because this change was not incorporated during the current planning cycle, the capacity assumed was 70 megawatts.
- Buck Unit 4 was returned to service in January 1995.

Purchased Power Agreements

Duke received FERC approval for a new contract with Oglethorpe Power Corporation. Contract modifications with Carolina Power & Light Company, South Carolina Electric & Gas Company, and South Carolina Public Service Authority have also been approved.

A contract has been signed with ENRON Power Marketing Company and filed with FERC to purchase capacity on an as-needed basis.

Demand-Side Resource Assessment

Completed in 1994, the Demand-Side Resource Assessment study provided marketplace information to help identify demand-side opportunities in Duke's service area. This comprehensive resource assessment evaluated the total technical potential of a mix of demand-side options in both new and existing markets. This total represented the available energy and demand savings that could be expected from feasible options. Duke used these results to improve demand-side planning.

For example, in the residential sector, assessment results identified three additional measures that could provide cost-effective demand-side resources. Two of these three measures—low-E windows and programmable thermostats—were included during the planning cycle under an enhanced new residential construction market option. In the commercial and industrial sectors, assessment of high-efficiency indoor lighting savings potential provided key input to estimating the potential impact of the education-based indoor lighting option. The resource assessment is available for use in future planning cycles as well.

DEMAND-SIDE PILOTS

High-Efficiency Indoor Lighting. This commercial/industrial pilot was conducted to determine the feasibility of a full-scale indoor lighting option that would promote the installation of high-efficiency lighting technology. The operational phase of the pilot was completed in mid-1994. An evaluation of the pilot results is nearing completion.

The pilot was designed in 1992 to gather data on a number of issues associated with an incentive-based, high-efficiency lighting option. Because Duke has decided to develop and implement an education-based lighting option, many of the pilot results will not be as directly applicable to this design effort. Some insights from the pilot such as the average impact and incremental cost of high-efficiency installations are being used.

High-Efficiency Boarding. This industrial pilot helped Duke gain experience and determine the most cost-effective option design for encouraging manufacturers of half hosiery (socks) to convert to high-efficiency equipment for boarding (ironing).

In addition to helping customers offset the cost of purchasing new high-efficiency equipment rather than repairing or purchasing inefficient boarding equipment, the pilot was intended to demonstrate electric technologies that would:

- Improve product quality and productivity.
- Reduce customer operating and energy costs.
- Increase energy efficiency.
- Reduce need for new generation capacity.

The pilot, continued until December 31, 1994, was successful in moving this market sector toward adoptions of more efficient boarding technology. Two equipment manufacturers redesigned their equipment to meet the pilot's higher efficiency standards. Based on pilot achievements, Duke determined that a full-scale boarding option was not warranted.

PROGRAM CLOSED AFTER ACHIEVING OBJECTIVES

High-Efficiency Agricultural Ventilation. This program was closed October 1, 1994, after it achieved a high penetration level in its target market and moved the market toward adoption of high-efficiency ventilation systems as standard practice.

1994 HEAT PUMP LOAN PROGRAM

Per the NCUC order dated December 16, 1992, in Docket E-7, Sub. 456, Duke will report on the status of its Heat Pump Loan Program in each year's short-term action plan. In 1994, Duke completed 7,894 heat pump loans with an annual interest rate of 6 percent.

Demand-Side Program Evaluation Results

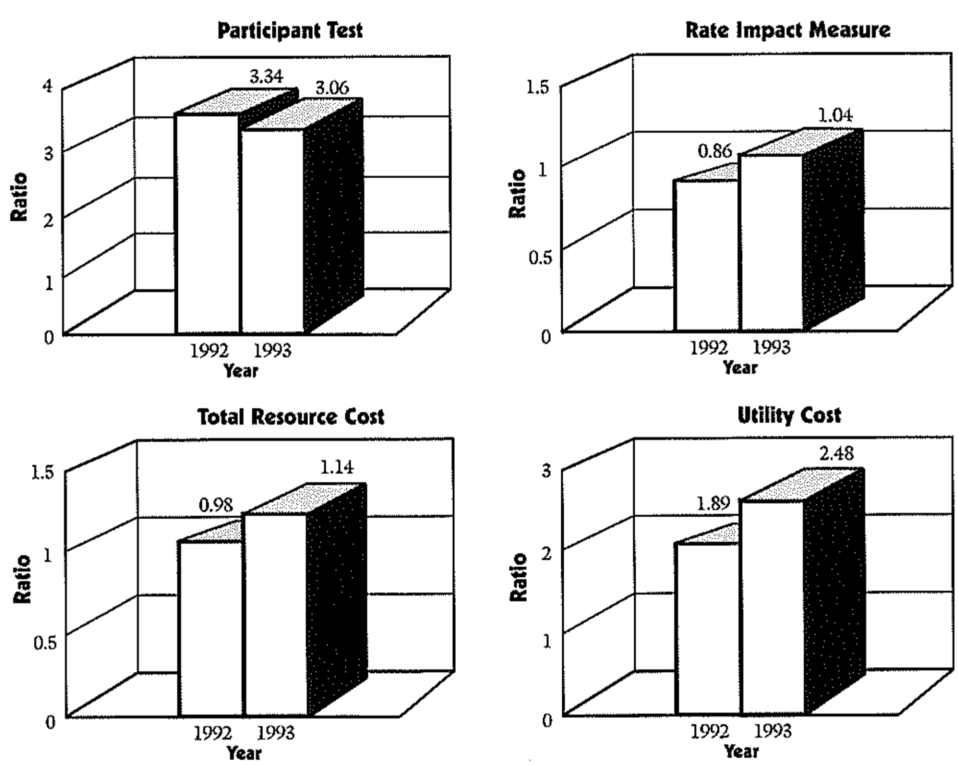
An integral part of the overall planning cycle is the periodic evaluation of Duke's active demand-side programs.

Program Evaluation History. Duke began program evaluation in 1991 and has gained a considerable amount of information in recent years from its periodic evaluation efforts. Until program impacts are thoroughly understood, Duke believes that periodic impact evaluations are critical to demand-side program success.

Periodic process and market activities will continue to be evaluated, usually every two to three years, unless significant changes to the programs require more frequent analyses. While impact evaluations were conducted on all 11 1993 programs, only three of the 11 required process and market evaluations since this type of evaluation was performed on the other eight programs in earlier evaluation studies.

Benefit/Cost Test Results. Duke uses multiple benefit/cost tests to determine the cost-effectiveness of demand-side resource portfolios. Figure 10 shows a comparison of 1992 and 1993 data for each of the benefit/cost tests used to evaluate the options.

FIGURE 10. **Benefit/Cost Tests**



APPENDIX

INTRODUCTION

The Appendix contains the following:

- Supply-side screening curves
- Demand-side resource projections
- Load, capacity, and reserves table

It also contains the status of stipulations with the North Carolina Utilities Commission (NCUC) Public Staff.

SUPPLY-SIDE SCREENING CURVES

SCREENING CURVES

Figure 11 through Figure 13 show the most cost-effective supply-side technologies and their relative cost differences. The resources are grouped according to their operating characteristics. For example, base load units typically operate from 40 to 80 percent capacity factor; intermediate units typically operate from 20 to 60 percent capacity factor, and peaking units from 0 to 40 percent capacity factor. All costs in these figures reflect year 2000 dollars.

FIGURE 11. **Top Five Base Load Technologies From First-Level Screening**

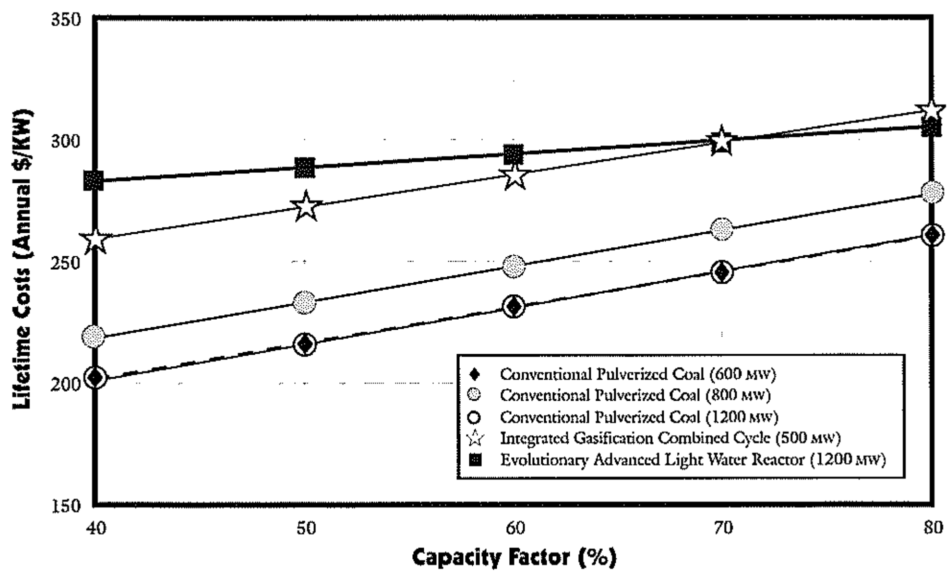


FIGURE 12. **Top Four Intermediate Technologies From First-Level Screening**

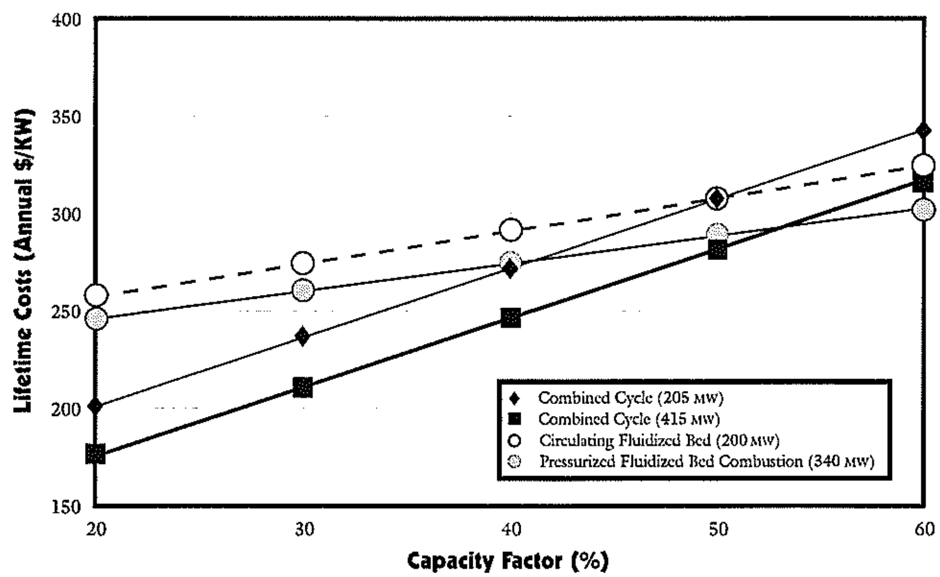
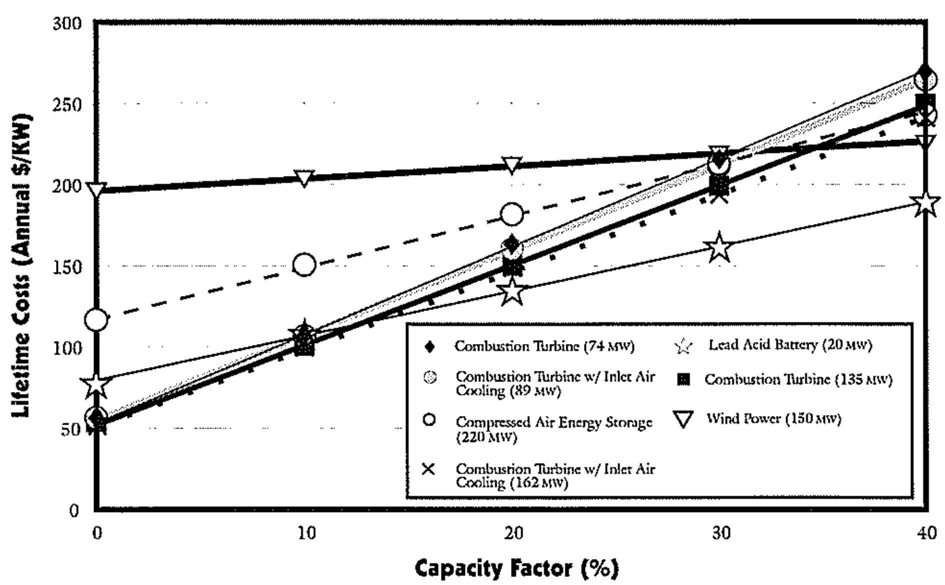


FIGURE 13. **Top Seven Peaking Technologies From First-Level Screening**



Demand-Side Resource Projections

TABLE 19: Demand (MW) Projection Summary—1995 Through 2002 [a]

Demand-Side Options	1995	1996	1997	1998	1999	2000	2001	2002
Energy Efficiency								
Res. HVAC Tune-Up Program	(1.11)	(3.69)	(7.14)	(11.32)	(16.00)	(21.17)	(26.83)	(32.92)
Manufactured Housing Payment Program	(0.40)	(1.22)	(2.04)	(2.86)	(3.70)	(4.55)	(5.40)	(6.27)
New Home Package	(0.17)	(0.51)	(0.88)	(1.30)	(1.76)	(2.24)	(2.72)	(3.22)
New Home Plus Package	0	(0.06)	(0.20)	(0.38)	(0.59)	(0.83)	(1.09)	(1.37)
HE Chillers Payment Program	(0.94)	(2.72)	(4.34)	(5.87)	(7.32)	(8.68)	(10.04)	(11.40)
HE Compressed Air Systems	0	(0.96)	(2.89)	(4.82)	(6.75)	(8.68)	(10.61)	(11.57)
HE Indoor Lighting	(0.26)	(1.04)	(2.61)	(5.21)	(8.60)	(12.51)	(16.16)	(18.76)
HE Motor Replacement	(0.48)	(1.43)	(2.39)	(2.87)	(2.87)	(2.87)	(2.87)	(2.87)
HE Motor Systems	0	(1.28)	(3.85)	(6.42)	(8.99)	(11.56)	(14.12)	(16.69)
HE Large Unitary Equipment	(0.35)	(1.53)	(4.19)	(9.16)	(17.60)	(29.62)	(43.17)	(56.05)
HE Heat Pump & Central A/C Payment Program	(2.67)	(8.21)	(14.25)	(20.92)	(28.21)	(35.98)	(44.20)	(52.93)
Energy Efficiency Totals	(6.38)	(22.65)	(44.78)	(71.13)	(102.39)	(138.69)	(177.21)	(214.05)
Interruptible								
Res. Load Control Rider–A/C	(402.57)	(352.56)	(358.14)	(363.71)	(370.49)	(380.81)	(395.89)	(415.81)
Interruptible Power Service Rider	(639.42)	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)
Standby Generator Control Rider	(43.28)	(48.37)	(53.46)	(58.55)	(63.64)	(68.74)	(73.83)	(78.92)
Interruptible Totals	(1085.27)	(1013.11)	(1023.78)	(1034.44)	(1046.31)	(1061.73)	(1081.90)	(1106.91)
Load-Shift								
Residential Water Heating–Controlled/Submetered	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Cool Storage With Cold Air	0	0	(0.24)	(0.95)	(2.14)	(3.81)	(5.95)	(8.33)
Power Cool Storage	0	0	(0.40)	(1.59)	(3.59)	(6.34)	(9.91)	(13.88)
Load-Shift Totals	0.47	0.47	(0.17)	(2.07)	(5.26)	(9.68)	(15.39)	(21.74)
Strategic Sales								
New Home Package	(1.42)	(4.00)	(6.38)	(8.88)	(11.50)	(14.26)	(17.15)	(20.19)
New Home Plus Package	0.00	(0.52)	(1.57)	(2.68)	(3.85)	(5.07)	(6.36)	(7.71)
Electrotechnology Strategy	8.99	30.20	55.30	90.28	138.52	164.67	164.67	164.67
HE Food Service Appliances	0.40	1.37	2.91	5.67	10.39	13.32	13.32	13.32
HE Large Unitary Equipment	(0.47)	(1.95)	(4.87)	(9.63)	(17.27)	(28.16)	(40.42)	(52.09)
Outdoor Lighting	0	0	0	0	0	0	0	0
HE Heat Pump & Central A/C Payment Program	(0.52)	(1.59)	(2.75)	(4.01)	(5.39)	(6.89)	(8.54)	(10.33)
Strategic Sales Totals	6.98	23.51	42.64	70.75	110.90	123.61	105.52	87.67
Grand Totals	(1084.20)	(1011.78)	(1026.09)	(1037.39)	(1043.06)	(1086.49)	(1168.98)	(1255.03)

a. MWs represent diversified customer load at Duke's system peak including transmission and distribution line losses. Values for each year are cumulative, not incremental. Values in parentheses are reductions.

TABLE 20: Demand (MW) Projection Summary—2003 Through 2009 [a]

Demand-Side Options	2003	2004	2005	2006	2007	2008	2009
Energy Efficiency							
Res. HVAC Tune-Up Program	(36.06)	(36.06)	(36.06)	(36.06)	(36.06)	(36.06)	(36.06)
Manufactured Housing Payment Program	(6.70)	(6.70)	(6.70)	(6.70)	(6.70)	(6.70)	(6.70)
New Home Package	(3.46)	(3.46)	(3.46)	(3.46)	(3.46)	(3.46)	(3.46)
New Home Plus Package	(1.51)	(1.51)	(1.51)	(1.51)	(1.51)	(1.51)	(1.51)
HE Chillers Payment Program	(12.76)	(14.04)	(15.06)	(15.83)	(16.51)	(17.19)	(17.87)
HE Compressed Air Systems	(11.57)	(11.57)	(11.57)	(11.57)	(11.57)	(11.57)	(11.57)
HE Indoor Lighting	(20.85)	(22.93)	(24.75)	(26.06)	(26.84)	(27.26)	(27.52)
HE Motor Replacement	(2.87)	(2.87)	(2.87)	(2.87)	(2.87)	(2.87)	(2.87)
HE Motor Systems	(19.26)	(21.83)	(24.40)	(26.97)	(28.25)	(28.25)	(28.25)
HE Large Unitary Equipment	(67.03)	(75.75)	(82.72)	(88.68)	(94.16)	(99.34)	(104.18)
HE Heat Pump & Central A/C Payment Program	(57.42)	(57.42)	(57.42)	(57.42)	(57.42)	(57.42)	(57.42)
Energy Efficiency Totals	(239.49)	(254.14)	(266.52)	(277.13)	(285.35)	(291.63)	(297.41)
Interruptible							
Residential Load Control Rider–A/C	(436.01)	(452.04)	(468.10)	(484.20)	(500.33)	(516.50)	(532.71)
Interruptible Power Service Rider	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)	(612.18)
Standby Generator Control Rider	(84.01)	(89.10)	(94.19)	(99.29)	(104.38)	(106.92)	(106.92)
Interruptible Totals	(1132.20)	(1153.32)	(1174.47)	(1195.67)	(1216.89)	(1235.60)	(1251.81)
Load-Shift							
Residential Water Heating–Controlled/ Submetered	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Cool Storage With Cold Air	(10.70)	(13.08)	(15.46)	(17.84)	(19.03)	(19.03)	(19.03)
Power Cool Storage	(17.84)	(21.80)	(25.77)	(29.73)	(31.71)	(31.71)	(31.71)
Load-Shift Totals	(28.07)	(34.41)	(40.76)	(45.10)	(50.27)	(50.27)	(50.27)
Strategic Sales							
New Home Package	(21.74)	(21.74)	(21.74)	(21.74)	(21.74)	(21.74)	(21.74)
New Home Plus Package	(8.40)	(8.40)	(8.40)	(8.40)	(8.40)	(8.40)	(8.40)
Electrotechnology Strategy	164.67	164.67	164.67	146.68	122.26	96.48	52.31
HE Food Service Appliances	13.32	13.32	13.32	13.32	13.32	13.32	13.32
HE Large Unitary Equipment	(62.04)	(69.94)	(76.25)	(81.65)	(86.62)	(91.31)	(95.69)
Outdoor Lighting	0	0	0	0	0	0	0
HE Heat Pump & Central A/C Payment Prog	(11.27)	(11.27)	(11.27)	(11.27)	(11.27)	(11.27)	(11.27)
Strategic Sales Totals	74.54	66.64	60.33	36.94	7.55	(22.92)	(71.47)
Grand Totals	(1325.22)	(1375.23)	(1421.42)	(1480.96)	(1544.96)	(1600.42)	(1670.96)

a. MWs represent diversified customer load at Duke's system peak including transmission and distribution line losses. Values for each year are cumulative, not incremental. Values in parentheses are reductions.

TABLE 21: Energy (MWh) Projection Summary—1995 Through 2002 [a]

Demand-Side Options	1995	1996	1997	1998	1999	2000	2001	2002
Energy Efficiency								
Res. HVAC Tune-Up Program	(3,986)	(13,285)	(25,684)	(40,741)	(57,568)	(76,167)	(96,538)	(118,458)
Manufactured Housing Payment Program	(5,351)	(16,118)	(26,983)	(37,932)	(49,018)	(60,227)	(71,542)	(82,966)
New Home Package	(405)	(1,228)	(2,117)	(3,125)	(4,227)	(5,378)	(6,553)	(7,735)
New Home Plus Package	0	(147)	(496)	(947)	(1,479)	(2,087)	(2,751)	(3,445)
HE Chillers Payment Program	(3,830)	(11,142)	(17,757)	(24,025)	(29,944)	(35,515)	(41,086)	(46,657)
HE Compressed Air Systems	0	(5,826)	(17,479)	(29,132)	(40,785)	(52,437)	(64,090)	(69,916)
HE Indoor Lighting	(1,506)	(6,025)	(15,062)	(30,124)	(49,704)	(72,297)	(93,383)	(108,445)
HE Motor Replacement	(3,153)	(9,458)	(15,763)	(18,915)	(18,915)	(18,915)	(18,915)	(18,915)
HE Motor Systems	0	(8,470)	(25,411)	(42,351)	(59,292)	(76,233)	(93, 173)	(110,114)
HE Large Unitary Equipment	(385)	(1,669)	(4,563)	(9,968)	(19,136)	(32,213)	(46,942)	(60,956)
HE Heat Pump & Central A/C Payment Prog	(4,107)	(12,620)	(21,815)	(31,875)	(42,685)	(53,926)	(65,524)	(77,503)
Energy Efficiency Totals	(22,723)	(85,988)	(173,130)	(269,135)	(372,753)	(485,395)	(600,497)	(705,110)
Interruptible[b]								
Residential Load Control Rider–A/C	0	0	0	0	0	0	0	0
Interruptible Power Service Rider	0	0	0	0	0	0	0	0
Standby Generator Control Rider	0	0	0	0	0	0	0	0
Interruptible Totals	0	0	0	0	0	0	0	0
Load-Shift								
Residential Water Heating–Controlled/ Submetered	0	0	0	0	0	0	0	0
Cool Storage With Cold Air	0	0	0	0	0	0	0	0
Power Cool Storage	0	0	28	113	255	453	708	991
Load-Shift Totals	0	0	28	113	255	453	708	991
Strategic Sales								
New Home Package	14,724	41,484	66,152	92,047	119,239	147,798	177,795	209,287
New Home Plus Package	0	2,864	8,739	14,911	21,389	28,192	35,332	42,836
Electrotechnology Strategy	61,363	205,024	374,603	612,848	942,982	1,122,152	1,122,152	1,122,152
HE Food Service Appliances	1,926	6,597	13,964	27,205	49,883	63,943	63,943	63,943
HE Large Unitary Equipment	2,404	10,256	26,039	51,707	92,970	151,815	218,061	281,113
Outdoor Lighting	12,055	35,974	59,666	83,126	106,790	130,871	154,983	179,155
HE Heat Pump & Central A/C Payment Prog	4,793	14,684	25,243	36,555	48,697	61,766	75,841	90,951
Strategic Sales Totals	97,265	316,883	574,406	918,402	1,381,950	1,706,537	1,848,107	1,989,437
Grand Totals	74,542	230,895	401,304	649,380	1,009,452	1,221,595	1,248,318	1,285,318

a. MWh represent annual values based on total program accomplishments and include transmission and distribution line losses. Values in parentheses are reductions.

b. Annual energy impacts depend on the actual number of times these programs are used.

TABLE 22: Energy (MWh) Projection Summary—2003 Through 2009 [a]

Demand-Side Options	2003	2004	2005	2006	2007	2008	2009
Energy Efficiency							
Res. HVAC Tune-Up Program	(129,750)	(129,750)	(129,750)	(129,750)	(129,750)	(129,750)	(129,750)
Manufactured Housing Payment Program	(88,701)	(88,701)	(88,701)	(88,701)	(88,701)	(88,701)	(88,701)
New Home Package	(8,328)	(8,328)	(8,328)	(8,328)	(8,328)	(8,328)	(8,328)
New Home Plus Package	(3,799)	(3,799)	(3,799)	(3,799)	(3,799)	(3,799)	(3,799)
HE Chillers Payment Program	(52,228)	(57,451)	(61,629)	(64,762)	(67,548)	(70,333)	(73,119)
HE Compressed Air Systems	(69,916)	(69,916)	(69,916)	(69,916)	(69,916)	(69,916)	(69,916)
HE Indoor Lighting	(120,495)	(132,544)	(143,087)	(150,618)	(155,137)	(157,547)	(159,053)
HE Motor Replacement	(18,915)	(18,915)	(18,915)	(18,915)	(18,915)	(18,915)	(18,915)
HE Motor Systems	(127,054)	(143,995)	(160,935)	(177,876)	(186,346)	(186,346)	(186,346)
HE Large Unitary Equipment	(72,893)	(82,371)	(89,949)	(96,437)	(102,396)	(108,026)	(113,284)
HE Heat Pump & Central A/C Payment Program	(83,587)	(83,587)	(83,587)	(83,587)	(83,587)	(83,587)	(83,587)
Energy Efficiency Totals	(775,666)	(819,357)	(858,596)	(892,689)	(914,423)	(925,248)	(934,798)
Interruptible [b]							
Residential Load Control Rider–A/C	0	0	0	0	0	0	0
Interruptible Power Service Rider	0	0	0	0	0	0	0
Standby Generator Control Rider	0	0	0	0	0	0	0
Interruptible Totals	0	0	0	0	0	0	0
Load-Shift							
Residential Water Heating–Controlled/Submetered	0	0	0	0	0	0	0
Cool Storage With Cold Air	0	0	0	0	0	0	0
Power Cool Storage	1,275	1,558	1,841	2,124	2,266	2,266	2,266
Load-Shift Totals	1,275	1,558	1,841	2,124	2,266	2,266	2,266
Strategic Sales							
New Home Package	225,413	225,413	225,413	225,413	225,413	225,413	225,413
New Home Plus Package	46,687	46,687	46,687	46,687	46,687	46,687	46,687
Electrotechnology Strategy	1,122,152	1,122,152	1,122,152	999,427	834,829	660,269	358,340
HE Food Service Appliances	63,943	63,943	63,943	63,943	63,943	63,943	63,943
HE Large Unitary Equipment	334,849	377,500	411,581	440,776	467,608	492,936	516,574
Outdoor Lighting	203,703	228,479	253,399	278,510	303,500	328,283	352,760
HE Heat Pump & Central A/C Payment Program	98,765	98,765	98,765	98,765	98,765	98,765	98,765
Strategic Sales Totals	2,095,512	2,162,939	2,221,940	2,153,521	2,040,745	1,916,296	1,662,482
Grand Totals	1,321,121	1,345,140	1,365,185	1,262,956	1,128,588	993,314	729,950

a. MWh represent annual values based on total program accomplishments and include transmission and distribution line losses. Values in parentheses are reductions.

b. Annual energy impacts depend on the actual number of times these programs are used.

TABLE 23: Direct Cost ($000s) Projection Summary—1995 Through 2002 [a]

Demand-Side Options	1995	1996	1997	1998	1999	2000	2001	2002
Energy Efficiency								
Res. HVAC Tune-Up Program	4,129	5,230	5,996	6,836	7,745	8,739	9,790	10,686
Manufactured Housing Payment Program	1,705	1,504	1,540	1,598	1,665	1,724	1,793	1,857
New Home Package	983	755	841	943	1,005	1,062	1,099	1,136
New Home Plus Package	0	219	341	394	443	500	532	565
HE Chillers Payment Program	1,168	1,019	917	944	886	912	940	968
HE Compressed Air Systems	0	232	223	247	237	262	252	0
HE Indoor Lighting	496	259	301	344	372	401	377	350
HE Motor Replacement	193	156	120	79	0	0	0	0
HE Motor Systems	0	232	223	247	237	262	252	278
HE Large Unitary Equipment	407	616	1,426	2,455	3,591	4,658	4,858	4,476
HE Heat Pump & Central A/C Payment Program	7,859	8,691	8,754	9,870	10,705	11,377	12,144	12,927
Energy Efficiency Totals	16,940	18,913	20,682	23,957	26,887	29,897	32,037	33,243
Interruptible								
Residential Load Control Rider–A/C	9,761	10,134	9,273	9,626	10,123	11,150	12,131	13,518
Interruptible Power Service Rider	25,195	25,204	25,214	25,224	25,235	25,246	25,258	25,269
Standby Generator Control Rider	1,871	2,064	2,261	2,460	2,662	2,867	3,075	3,284
Interruptible Totals	36,827	37,402	36,748	37,310	38,020	39,263	40,464	42,071
Load-Shift								
Residential Water Heating–Controlled/ Submetered	0	0	0	0	0	0	0	0
Cool Storage With Cold Air	0	0	569	951	435	486	550	624
Power Cool Storage	0	11	830	966	912	1,119	1,337	1,377
Load-Shift Totals	0	11	1,399	1,917	1,347	1,605	1,887	2,001
Strategic Sales								
New Home Package	7,323	5,972	6,120	6,589	7,097	7,647	8,243	8,873
New Home Plus Package	0	2,037	2,202	2,259	2,431	2,619	2,816	3,043
Electrotechnology Strategy	2,861	3,109	2,953	3,043	3,136	0	0	0
HE Food Service Appliances	442	435	498	701	976	0	0	0
HE Large Unitary Equipment	906	1,293	1,977	2,813	4,590	5,878	6,126	5,678
Outdoor Lighting	10,121	10,844	11,548	12,246	13,099	13,961	14,835	15,745
HE Heat Pump & Central A/C Payment Program	2,417	2,442	2,519	2,795	3,119	3,496	3,925	4,370
Strategic Sales Totals	24,070	26,132	27,817	30,446	34,448	33,601	35,945	37,709
Grand Totals	77,837	82,458	86,646	93,630	100,702	104,366	110,333	115,024

a. Direct expenditures will be incurred in each of the years shown.

TABLE 24: Direct Cost ($000s) Projection Summary—2003 Through 2009 [a]

Demand-Side Options	2003	2004	2005	2006	2007	2008	2009
Energy Efficiency							
Res. HVAC Tune-Up Program	0	0	0	0	0	0	0
Manufactured Housing Payment Program	0	0	0	0	0	0	0
New Home Package	0	0	0	0	0	0	0
New Home Plus Package	0	0	0	0	0	0	0
HE Chillers Payment Program	997	927	747	663	683	704	725
HE Compressed Air Systems	0	0	0	0	0	0	0
HE Indoor Lighting	361	372	363	353	342	344	350
HE Motor Replacement	0	0	0	0	0	0	0
HE Motor Systems	267	295	283	314	0	0	0
HE Large Unitary Equipment	3,756	3,046	2,628	2,431	2,389	2,324	2,237
HE Heat Pump & Central A/C Payment Program	0	0	0	0	0	0	0
Energy Efficiency Totals	5,381	4,640	4,021	3,761	3,414	3,372	3,312
Interruptible							
Residential Load Control Rider–A/C	14,245	15,260	16,061	17,169	18,052	19,261	20,233
Interruptible Power Service Rider	25,281	25,294	25,307	25,320	25,334	25,348	25,363
Standby Generator Control Rider	3,498	3,714	3,933	4,155	4,380	4,185	4,219
Interruptible Totals	43,024	44,268	45,301	46,644	47,766	48,794	49,815
Load-Shift							
Residential Water Heating–Controlled/Submetered	0	0	0	0	0	0	0
Cool Storage With Cold Air	701	783	869	960	529	545	561
Power Cool Storage	1,419	1,462	1,506	1,551	0	0	0
Load-Shift Totals	2,120	2,245	2,375	2,511	529	545	561
Strategic Sales							
New Home Package	0	0	0	0	0	0	0
New Home Plus Package	0	0	0	0	0	0	0
Electrotechnology Strategy	0	0	0	0	0	0	0
HE Food Service Appliances	0	0	0	0	0	0	0
HE Large Unitary Equipment	4,823	3,972	3,483	3,256	3,219	3,142	3,053
Outdoor Lighting	16,736	17,665	18,732	19,821	20,913	22,078	23,293
HE Heat Pump & Central A/C Payment Program	0	0	0	0	0	0	0
Strategic Sales Totals	21,559	21,637	22,215	23,077	24,132	25,220	26,346
Grand Totals	72,084	72,790	73,912	75,993	75,841	77,931	80,034

a. Direct expenditures will be incurred in each of the years shown.

LOAD, CAPACITY, AND RESERVES TABLE

Table 25 shows the detail of the resource integration results for the 15-year planning horizon.

TABLE 25: Load, Capacity, and Reserves Projections: 1995 Integrated Resource Plan (Part 1 of 2)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Duke System Forecast Peak	16,040	16,320	16,763	17,162	17,576	18,007	18,491	18,845	19,263	19,610	20,007	20,371	20,714	21,093	21,490
NP&L System Forecast Peak	163	168	173	178	183	188	193	198	203	208	213	218	223	228	232
Coincident Duke/NP&L Peak [a]	16,200	16,485	16,902	17,337	17,756	18,192	18,681	19,040	19,420	19,815	20,217	20,586	20,934	21,317	21,718
Cumulative System Generating Capacity															
Duke Capacity	17,991	18,325	19,213	19,213	19,213	19,213	19,213	19,213	19,213	19,213	19,213	19,213	19,146	19,079	19,079
NP&L Capacity	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Annual Capacity Adjustments															
PMP Returns	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scheduled Additions [b]	296	888	0	0	0	0	0	0	0	0	0	0	0	0	0
Capacity Retirements [c]	0	0	0	0	0	0	0	0	0	0	0	(67)	(67)	0	(307)
Cumulative Generating Capacity	18,425	19,313	19,313	19,313	19,313	19,313	19,313	19,313	19,313	19,313	19,313	19,246	19,179	19,179	18,872
Cumulative Purchases [d]	300	300	300	300	300	300	600	600	600	600	600	600	600	600	600
Cumulative Sales [e]	(400)	(400)	(400)	(400)	(400)	0	0	0	0	0	0	0	0	0	0
Annual Unscheduled Additions [f]															
Peaking/Intermediate	0	0	0	675	0	540	270	270	405	0	270	0	270	0	0
Base Load	0	0	0	0	0	0	0	0	0	600	0	600	0	600	600
Cumulative Production Capacity	18,325	19,213	19,213	19,888	19,888	20,828	21,398	21,668	22,073	22,673	22,943	23,476	23,679	24,279	24,572
Generating Reserves (MW)	2,125	2,728	2,311	2,551	2,132	2,636	2,717	2,628	2,653	2,858	2,726	2,890	2,745	2,962	2,854
% Generating Reserve Margin [g]	13.12	16.55	13.67	14.71	12.01	14.49	14.54	13.80	13.66	14.42	13.48	14.04	13.11	13.90	13.14
% Generating Capacity Margin	11.60	14.20	12.03	12.83	10.72	12.66	12.70	12.13	12.02	12.61	11.88	12.31	11.59	12.20	11.61

TABLE 25: Load, Capacity, and Reserves Projections: 1995 Integrated Resource Plan (Part 2 of 2)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cumulative Demand-Side Capacity [h]	1,127	1,038	1,029	1,048	1,019	1,066	1,150	1,183	1,265	1,336	1,363	1,374	1,500	1,537	1,616
Cumulative Equivalent Capacity	19,452	20,251	20,242	20,936	20,907	21,894	22,548	22,851	23,338	24,009	24,306	24,850	25,179	25,816	26,188
Equivalent Reserves (MW)	3,252	3,766	3,340	3,599	3,151	3,702	3,867	3,811	3,918	4,194	4,089	4,264	4,245	4,499	4,470
% Reserve Margin [i]	20.07	22.85	19.76 [j]	20.76	17.74 [k]	20.35	20.70	20.02	20.18	21.17	20.22	20.71	20.28	21.10	20.58
% Capacity Margin [i]	16.72	18.60	16.50	17.19	15.07	16.91	17.15	16.68	16.79	17.47	16.82	17.16	16.86	17.43	17.07

a. Planning is for coincident peak demand for the Duke and NP&L systems. The forecast peaks for the individual systems are shown for reference only.

b. The scheduled additions are units of the Lincoln Combustion Turbine Station. The first four units will begin commercial operation by June 1995 and the remaining 12 units by June 1996.

c. The 67 MW capacity retirement in 2006 represents a decision date for the retirement of Dan River 2. The 67 MW capacity retirement in 2007 represents the retirement decision date for Dan River 1. The 307 MW capacity retirement in 2009 represents the retirement decision date for Dan River 3 (142 MW) and Allen 2 (165 MW). These dates may change if future analyses indicate it is beneficial.

d. Purchases have several components. All years include the following: purchases of 238 MWs from Southeastern Power Administration (SEPA) and 62 MWs from Cogeneration (COGEN) and Small Power Producers (SPP) for total firm purchases of 300 MWs. A 300 MW load reduction beginning in 2001 is due to NCEMC's declared intent to build a combined cycle unit in Duke's service territory.

e. Represents sales to Carolina Power & Light (CP&L).

f. Uncommitted capacity represents new capacity resources or capability increases that are being considered. Neither the operation date, the resource type, or the size is firm. All capacity additions after the Lincoln Combustion Turbine Station are shown as uncommitted and represent capacity required to maintain the 20 percent minimum planning reserve margin as determined in the integrated resource planning process. CTs are added in 135 MW units after Lincoln. The 600 MW unit additions are equivalent to coal units.

g. Generating reserve margin is shown for reference.

h. Cumulative demand-side capacity represents the demand-side resource contribution used to meet the load. The demand-side resources reflected in these numbers include interruptible, energy efficiency, load-shift, and strategic sales options.

i. Generating capacity margin is the industry standard term; a 16.67 percent capacity margin equals a 20 percent reserve margin.

j. The 19.76 percent reserve margin in 1997 is due to the delay of one CT until 1998. Duke plans to meet this need with limited-term purchases.

k. The 17.74 percent reserve margin in 1999 is based on the assumption that any off-system sales that have not concluded by June 1 are included in the peak for that year. The actual projected peak for 1999 falls in July not in June. Because the CP&L sale concludes at the end of June 1999, the peak projected reserve margin for July is 20 percent.

Stipulation Progress Report

Overview

On November 6, 1992, Duke and the NCUC Public Staff entered into joint stipulations regarding the ongoing development of the integrated resource planning process. On June 29, 1993, the NCUC approved the joint stipulation in Docket No. E-100, Sub. 64.

This section is a progress report on achieving the objectives of those joint stipulations as specified in the NCUC order. Other joint stipulations related to integrated resource planning issues have been negotiated between Duke and the NCUC Public Staff, the Southern Environmental Law Center, Public Service Commission of South Carolina (PSCSC) Staff, and the South Carolina Department of Consumer Affairs.

A. Load Forecasting

Recommendation A1. Adopt end-use forecasting models for energy and peak forecasting.

Objective:

- Take advantage of both end-use and econometric forecasting techniques in meeting the needs of the integrated resource planning process.
- Incorporate these techniques in the next integrated resource plan filing.

Status: End-use forecasting techniques for energy were fully integrated in the 1993 and 1994 forecasts for the three customer classes. End-use load shape information is provided as needed to assist in the design of demand-side options. Duke is continuing to utilize end-use forecasting techniques along with econometric methods.

Recommendation A2. Conduct periodic end-use customer surveys to collect necessary benchmark data to operate end-use models.

Objective: To initiate the collection of the necessary data to support end-use models.

Status: Duke has performed end-use surveys among all customer classes to replace national default data with service area specific data in its end-use models. The industrial motors end-use survey was conducted in 1992. Commercial building customers were surveyed in 1990. The residential end-use data was collected in 1988 and was updated in 1994. Additional end-use surveys have been conducted among residential and commercial customers; this information is used to check the end-use models and update selected parts of the model.

Recommendation A3. Abandon point forecasts and implement a range-of-forecasts approach.

Objective: Evaluate the:

- ❖ Appropriateness of utilizing multiple forecasts to explore a wide range of possible outcomes
- ❖ Associated risk and costs in meeting those outcomes

Status: Duke continues to consider impacts of high- and low-growth forecasts on the resource plan. The range of growth rates is reviewed annually during the Integration and Analysis process. For the *1995 Integrated Resource Plan*, Duke used a range of +29 percent and -24 percent.

B. DSM Assessment

Recommendation B1. Implement the supply curve approach for demand-side management (DSM).

Objective: To conduct a comprehensive assessment of DSM potential and to clearly communicate the results in a format with a common basis for all demand-side options (similar to screening curves used for supply-side options).

Status: The comprehensive DSM resource assessment has been completed. The assessment considered more than 250 measures among all customer classes. Using data from the resource assessment, supply curves were developed for residential new construction measures. Duke used the curves to screen measures for the residential new construction option. (See recommendation D3.) Generation and use of the DSM supply curves demonstrated that, while the curves can be used to display the results of the resource assessment, they are not a useful communication tool.

Recommendation B2. Conduct comprehensive assessment of DSM potential, including energy efficiency measures both for conservation and for peak reduction.

Objective: To support the assessments described in recommendation B1.

Status: See status of recommendation B1.

Recommendation B3. Modify demand-side screening methods to reflect the dynamic nature of avoided costs.

Objective: To examine methodologies consistent with the supply curve methodology that reflect the dynamic nature of avoided costs.

Status: Duke's integrated resource planning methodology reflects the dynamic nature of avoided costs for demand-side options through the cumulative option analysis. The avoided production costs change as each demand-side option is added to the resource mix.

Recommendation B4. Pilot demand-side options specifically to improve planning data.

Objective: To conduct demand-side pilots to improve planning data.

Status: Duke continues to use demand-side pilots to improve planning data.

C. Integration

Recommendation C1. Incorporate DSM supply curves and multiple forecasts into resource integration methodology.

Objective: To use a planning process that competitively selects supply and demand resources to meet multiple alternative forecasts.

Status: Duke has developed DSM supply curves for the residential new construction market but has determined that the curves could not be effectively incorporated into Duke's integration methodology. Given Duke's current reliability equalization methodology and dynamic analysis of demand-side options, Duke sees no apparent value to applying supply curves during the resource integration process.

Recommendations C2-C4.

- Expand uncertainty analyses to consider greater extremes.
- Examine plant-life assumptions.
- Enhance consideration of environmental effects beyond current regulations.

Objective: To ensure that a broad range of future conditions and uncertainties, including plant-life assumptions and environmental effects beyond current regulations, are examined.

Status: In the last three planning cycles, Duke sought input from the IRP Advisory Panel for the Integration and Analysis process. The input reflected a broad range of uncertainties, which were incorporated into the IRP risk analysis. The three scenarios used in the 1995 scenario analysis were developed in collaboration with the panel.

D. DSM Implementation and Evaluation

Recommendation D1. Conduct a comprehensive review of other utilities' energy efficiency, interruptible, and load-shift options, especially energy efficiency options using significant incentives.

Objective: To conduct a comprehensive review of other utilities' energy efficiency, interruptible, and load-shift options with relatively high impacts and significant incentives.

Status: In its development of demand-side options, Duke routinely contacts utilities offering similar options.

Recommendation D2. Distinguish between demand-side resource options and other marketing and customer service programs that use demand-side management.

Objective: The objectives of this recommendation are to:

- Distinguish between costs associated with demand-side resource options and other marketing and customer service programs that use demand-side management.
- Identify the types of options that are subject to Duke's proposed rewards mechanism.

Status: Duke tracks costs related to demand-side resource options. The NCUC-approved DSM reward mechanism identifies requirements for qualification.

Recommendation D3. Initiate aggressive options to improve energy efficiency among new customers.

Objective: The objective of the recommendation is to initiate options that improve the energy efficiency of new customers.

Status: Duke began developing a high-efficiency single-family residential demand-side option that considers comprehensive energy efficiency measures to:

- Evaluate the practical use of energy efficiency options targeted exclusively at new customers.
- Examine the practical use of DSM supply curves referenced in recommendation B1.

Duke's comprehensive resource assessment was used to identify potential DSM measures; supply curves were developed to screen the measures. The option was included in Duke's 1995 planning cycle for implementation in 1996. The option was not cost-effective in the 1995 IRP analysis, but may be considered in the 1996 analysis if new information is available.

Recommendation D4. Develop and implement a comprehensive schedule for demand-side resource evaluation.

Objective: To initiate comprehensive evaluation plans for all demand-side options.

Status: Duke has completed a comprehensive evaluation of 1992 and 1993 demand-side options. A comprehensive evaluation of 1994 demand-side options is underway.

Recommendation D5. Use DSM resource assessments and evaluations to "close the loop" between forecasting, demand-side planning, and demand-side resource performance.

Objective: To utilize the results of DSM resource assessment and evaluation in forecasting and demand-side option design.

Status: DSM resource assessment and evaluation results were provided to enhance design of demand-side options.

Recommendation D6. Develop tools and audit procedures, and establish a forum to refine demand-side implementation with the objective of implementing a "dipstick" approach.

Objective: To reduce, where appropriate, the data collected to implement demand-side options as confidence is gained through DSM resource assessment and evaluation.

Status: Duke continues to monitor data collection requirements to utilize existing data and minimize data needs.

E. Short-Term Action Plans

Recommendation E1. Increase the level of detail in Short-Term Action Plans and include problems and issues as well as accomplishments.

Objective: To expand the Short-Term Action Plans to provide greater detail.

Status: After filing the *1993 Short-Term Action Plan*, Duke surveyed the NCUC Staff and Public Staff, PSCSC Staff, and the South Carolina Department of Consumer Affairs to determine the plan's effectiveness and to solicit recommendations for improvement. The level of detail was generally considered to be appropriate. Additional detail and information was also provided in the *1994 Short-Term Action Plan*.

F. Public Involvement

Recommendation F1. Increase public involvement in the integrated resource planning process and plan development.

Objective: To provide opportunities for the public to participate in the integrated resource planning process.

Status: Duke established the IRP Advisory Panel in 1991 for this purpose. Duke involves the panel in its integrated resource planning process and continues to expand the panel's role.

Recommendation F2. Improve the comprehensiveness and accessibility of integrated resource plans.

Objective: To ensure that Duke's integrated resource plans are comprehensive and informative.

Status: An objective of Duke's 1995 IRP is to develop a comprehensive and informative plan.

G. Coordination Among Utilities

Recommendations G1-G3.

- Initiate DSM data and tool development collaboration.
- Jointly review and adapt end-use forecasting models.
- Jointly develop DSM supply curves.

Objective: To explore the potential benefits of collaborative efforts, including the information sharing.

Status: Duke is an active participant in the AEC IRP Issues Committee and related AEC committees to share information.

GLOSSARY

A

A/C. Air Conditioning.

AC. Alternating Current. An electric current that reverses its direction of flow periodically as contrasted to direct current.

ALWR. Advanced Light Water Reactor.

avoided capacity. Capacity that is deferred because of the introduction of demand-side options.

avoided energy. Energy production that is not needed because of the introduction of demand-side options.

B

base load technologies. Technologies that are typically operated at or near full output 24 hours a day except during periodic outages for maintenance and repairs.

base plan. A model of the total existing system capabilities. The base plan establishes the cost-effectiveness of new resource options and determines how they will interact with Duke's existing generating system.

B/C. Benefit/Cost test ratio.

boarding. Textile industry term for ironing hosiery.

Btu. British Thermal Unit. The standard unit for measuring quantity of heat energy, such as the heat content of fuel. It is the amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit.

bulk power arrangements. An exchange of power between utilities owning their own generating resources for resale to the ultimate customer.

C

CAAA. Clean Air Act Amendments.

CAES. Compressed Air Energy Storage.

capacity. Maximum load measured by watts.

capacity factor. Total energy output over a period of hours divided by the product of the period hours and unit capacity.

carbon dioxide (CO_2). A colorless, odorless, nonpoisonous gas normally part of ambient air; fossil fuel combustion produces significant quantities of carbon dioxide.

CFC. Chlorofluorocarbons.

COGEN. Cogeneration. The simultaneous production of electric energy and useful thermal energy for industrial, commercial, heating, or cooling purposes.

cogeneration facility. A facility that produces electric energy and useful thermal energy for industrial, commercial, heating, or cooling purposes.

COMMEND. EPRI's commercial end-use energy forecasting software.

competitive bidding. A competitive procurement process for selecting some portion of future electric generating capacity, electric energy, and/or demand-side products and services.

conditional demand analysis. Statistical technique that separates energy consumption by end uses.

CP&L. Carolina Power & Light.

CT. Combustion Turbine. An electric generating unit in which the prime mover is a gas turbine engine.

D

DC. Direct Current. Electricity that flows continuously in one direction as contrasted with alternating current.

demand-side resources. Customer options that modify energy and/or demand by encouraging the wise and efficient use of electricity.

DRI. Data Resources, Inc.

DSM. Demand-Side Management. The planning, implementation, and monitoring of utility activities designed to influence customer use of electricity in ways that will produce desired changes in a utility's load shape (changes in the time pattern and magnitude of a utility's load). *See also* demand-side resources.

E

econometrics. The application of statistical techniques to economics.

EEI. Edison Electric Institute. The association of electric companies. EEI provides a principal forum where electric utility staff exchange information on developments in their business and maintain liaison between the industry and the federal government.

EER. Energy Efficiency Ratio. A figure of merit for air conditioning or refrigeration performance. The relative efficiency of an appliance in converting primary energy (e.g., electricity) to useful work (such as for cooling in the case of air conditioners) at the rated condition. EER (Btu/kWh) is the Btu per hour output provided by the unit, divided by the watts of electrical power input.

electric technologies. Efficient technologies used in new and expanded applications.

end use. Any electric appliance, instrument, or machinery used by customers (e.g., TVs, hair dryers, refrigeration).

energy. Usable heat or electric power.

energy efficiency. Reduced energy consumption to produce a given product or output.

energy efficiency options. Options that encourage the installation of efficient electric equipment and are targeted at customers who would have selected less efficient electric equipment if the option were not offered.

EPA. Environmental Protection Agency. A federal agency created in 1970 to permit governmental action for protection of the environment through systematic reduction and control of pollution by integrating research monitoring, standard setting, and enforcement activities.

EPRI. Electric Power Research Institute. Founded in 1972 by the nation's electric utilities to develop and manage a technology program for improving electric power production, distribution, and utilization.

EWG. Exempt Wholesale Generator. Facilities, wherever located, that are exempted from PUHCA and are owned or leased for generation of electric energy for wholesale sales.

F

FERC. Federal Energy Regulatory Commission. An independent agency created within the Department of Energy (October 1, 1977), FERC is vested with broad regulatory authority over electric and natural gas industries.

FGD. Flue Gas Desulfurization.

firm power. Power and power-producing capacity intended to be available at all times during the period covered by a commitment, even under adverse conditions.

forecasting. Projections about the:

- Annual energy for the service area by residential, commercial, and industrial customer classes
- Peak demand for summer and winter

G

GWH. Gigawatt-hour (a measurement of energy); One gigawatt-hour equals one billion watt-hours.

H

HE. High-Efficiency; more efficient than established standards.

HELM-PC. Hourly Energy Load Model. EPRI's load shape forecasting software product for all customer classes.

HVAC. Heating, Ventilation, and Air Conditioning.

I

incremental customer costs. The additional out-of-pocket expenses paid by customers who participate in demand-side options.

INFORM. EPRI's industrial end-use energy forecasting software.

intermediate technologies. Technologies that typically operate according to system needs through frequent on/off cycles at full or partial output.

interruptible options. Options that reduce Duke's system peak demand by temporarily interrupting all or part of a participating customer's electrical service.

IRP. Integrated Resource Plan.

IS. Interruptible Service (an interruptible demand-side option).

K

KW. Kilowatts (a measure of electrical demand or capacity) One kilowatt equals 1,000 watts.

kWh. Kilowatt-hour (a measure of energy). The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour. One kilowatt-hour equals 1,000 watt-hours.

L

load factor. Ratio of the actual energy consumed during a designated period to the energy that would have been consumed if the peak load were to exist throughout the designated period.

load shape. A curve that shows the use of KW or kWh over a defined period, such as a day, month, or year.

load-shift options. Options that reduce Duke's system peak demand by shifting customer energy use to off-peak times.

low-e. Low emissivity, as in low emissivity glass used in high-efficiency windows.

LWR. Light Water Reactor (nuclear).

M

MBh. 1000 British Thermal Units per hour.

MMBtu. Millions of British Thermal Units.

MNDC. Maximum Net Dependable Capacity. Before supply-side and demand-side resources can be combined, Duke must adjust the demand-side capacity values to make them comparable to the supply-side capacity values. The adjusted demand-side capacity values represent Maximum Net Dependable Capacity.

MW. Megawatt (a measure of electrical demand or capacity).

MWh. Megawatt-hour (a measure of energy).

N

NAAQS. National Ambient Air Quality Standards.

nameplate rating. The full-load continuous rating of a generator, prime mover, or other electrical equipment under specified conditions as designated by the manufacturers. It is usually indicated on a nameplate attached mechanically to the individual machine or device.

NCUC. North Carolina Utilities Commission.

nitrogen oxides (NOx). Gases formed in great part from atmospheric nitrogen and oxygen when combustion takes place under conditions of high temperature and high pressure.

nonattainment areas. Regions large enough to be considered metropolitan statistical areas that fail to meet federal air quality standards applicable to a variety of pollutants.

nonfirm power. Power or power-producing capacity supplied or available under an arrangement that does not have the guaranteed continuous availability feature of firm power.

nonresidential. Commercial and/or industrial applications.

NP&L. Nantahala Power & Light

NRC. Nuclear Regulatory Commission. The federal agency responsible for the regulation and inspection of nuclear power plants to ensure safety.

NUG. Non-Utility Generator. Producers of electric power that are not regulated utilities generating power in their franchised service area.

O

off-peak energy. Energy supplied during periods of relatively low system demands as specified by the supplier.

OL. Outdoor Lighting service.

O&M costs. Operating and maintenance costs.

OPT. Optional power service (e.g., Time of Use).

P

package. Combination of demand-side options.

participant test. Test to determine whether customers would be likely to participate in a demand-side program given the savings they could expect compared to the investment required.

peak demand. Level of capacity needed to meet customer energy needs.

peaking technologies. Technologies that typically operate at full output for short periods during system peak-load conditions.

photovoltaics. The process of converting light directly into electricity.

pilot. Limited field test of a demand-side option.

PMP. Plant Modernization Program.

power marketer. As a result of the Energy Policy Act of 1992, FERC has given authority to entities (power marketers) to buy and sell power at market-based rates.

program. Demand-side option that has received commission approval.

PSCSC. Public Service Commission of South Carolina.

PUHCA. Public Utility Holding Company Act. Enacted in 1935, the Public Utility Holding Company Act regulates the corporate structure, secures issuances of electric utilities, and places limitations on utilities that are structured as holding companies.

purchased resources. Energy purchased from sources outside of Duke (QFs, EWGs, other utilities, power marketers).

PURPA. Public Utility Regulatory Policies Act. One of five bills signed into law on November 8, 1978, as the National Energy Act. It sets forth procedures and requirements applicable to state utility commissions, electric and natural gas utilities, and certain federal regulatory agencies.

PWRR. Present Worth of Revenue Requirements.

Q

QF. Qualifying Facility. An individual (or corporation) who owns and/or operates a generating facility, but is not primarily engaged in the generation or sale of electric power. QFs are either small power producers or cogeneration facilities that qualify under Section 201 of PURPA.

R

RDF. Refuse Derived Fuel.

REEPS. EPRI's Residential End-Use Energy Planning System used in forecasting.

refurbish. Maintaining and updating a power plant unit in "like kind" without significantly changing the unit's operating characteristics (e.g., heat rate, emissions, availability).

regular sales. Sales to Duke's retail and resale classes.

repower. Updating a power plant unit with modern technology that significantly changes the unit's operating characteristics (e.g., heat rate, emissions, availability).

resale. Energy sales to electric companies and non-Catawba municipalities less their SEPA allocation.

resale classes. Electric companies and non-Catawba municipalities.

reserve margin. The difference between net system capability and system maximum load requirements (peak load). It is the margin of capability available to provide for scheduled maintenance, emergency, outages, system operating requirements, and unforeseen loads.

resource. Method or technology used to supply, reduce, or displace some customer demand and energy.

resource integration results. The amount of capacity required in each of the 15 years of the plan to meet customer energy needs.

retail classes. Residential, commercial, industrial, municipal street lighting, and interdepartmental (e.g., railroad crossings, telephone booths).

rider IS. Rate document used to administer Interruptible Power Service Rider.

rider LC. Rate document used to administer load control programs.

rider SG: Rate document used to administer Standby Generator Control Rider.

RIM. Rate Impact Measure. Test to measure the rate impacts associated with making investments in demand-side options as compared to investments in an equivalent amount of alternative generation.

RS. Residential Service. A customer, sales, and revenue classification covering electric energy supplied for residential (household) purposes.

S

SCC. Stress Corrosion Cracking. Spontaneous cracking produced by the combined action of corrosion and static stress (residual or applied).

SEER. Seasonal Energy Efficiency Rating. Standard measurement of the overall efficiency of a heat pump or air conditioner during the cooling season. It is the total season heat removed (Btu) divided by the total electrical energy input (watt-hours) during the same period.

SEPA. Southeastern Power Administration.

SG. Standby Generator. A service generator not normally used, but which is available through a permanent connection in lieu of, or as a supplement to, the usual source of supply.

SIC. Standard Industrial Classification. A system used to classify establishments by type of activity.

STAP. Short-Term Action Plan.

strategic sales options. Options that encourage the installation of efficient electric equipment in new or expanded applications and are targeted at customers who would have selected nonelectric equipment if the option were not offered.

sulfur dioxide (SO_2). A colorless gas of compounds sulfur and oxygen produced primarily by the combustion of fossil fuel.

supply-side resources. Viable power-generating technologies.

T

T&D. Transmission and Distribution.

technologies. Generation sources, end-uses, etc. that are potential demand-side or supply-side options.

temperature-corrected. Relating to the actual sales or peaks that have been adjusted to a level that would have occurred if the actual temperature patterns had been equal to normal; an average of past temperatures.

TRC. Total Resource Cost. Test to measure whether the investments in demand-side options made by both participants and the utility are more beneficial than the utility's investment in an equivalent amount of alternative generation.

TVA. Tennessee Valley Authority.

U

UC. Utility Cost. Test to measure whether the utility's total investment cost in a demand-side option is more beneficial than an investment in an equivalent amount of alternative generation.

unbilled sales. Accounting term used to identify energy that customers have consumed, but for which they have not yet been billed.

W

wheeling. The use of the transmission/distribution facilities of one system to transmit power and energy by agreement of, and for, another system with a corresponding wheeling charge.

Five Critical Success Factors

To ensure our continued success in the rapidly changing electric utility industry and to meet the challenges ahead, we will focus on:

Customer Service and Satisfaction. Customers are our focus. Duke will meet their requirements by providing competitive pricing structures and levels of service that exceed their expectations.

Financial Performance. Duke will increase shareholder value, earn returns greater than the cost of capital and become a positive cash generator. Duke will maintain strong financial performance.

Growth and Market Share. To grow its business, Duke will retain existing markets and increase its share of selected markets. By the year 2000, the company will also expand its customer base through acquisition of electric properties in the United States where it can earn a return greater than the cost of capital and where there is an opportunity to enhance shareholder value.

Continuous Improvement. Duke will continue its pursuit of excellence in all it does by setting challenging standards and goals and by documenting measurable improvement in operating efficiency.

Operating Excellence. Duke will operate its electric facilities safely, reliably and cost-effectively. Nuclear operations will be among the best in the United States nuclear industry.

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