A Responsible Energy Future for North Carolina

An Alternative to the Duke Energy-Progress Energy Plans for the Crucial Years 2013–2032

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Prepared for NC WARN

NC WARN

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This report extends previous analyses for NC WARN by the late **Dr. John Blackburn**. For more on Dr. Blackburn's invaluable contributions, see www.ncwarn.org.

NC WARN is a member-based nonprofit tackling the accelerating crisis posed by climate change — along with the various risks of nuclear power — by watch-dogging utility practices and working for a swift North Carolina transition to energy efficiency and clean power generation. In partnership with other citizen groups, NC WARN uses sound scientific research to inform and involve the public in key decisions regarding their wellbeing.

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NC WARN

A Responsible Energy Future for North Carolina:

An Alternative to the Duke Energy–Progress Energy Plans for the Crucial Years 2013–2032

"With great power there must also come — great responsibility!"[1]

SUMMARY

Each year, the North Carolina Utilities Commission (NCUC) reviews the annual Integrated Resource Plans filed by the electric utilities. In their IRPs, Duke Energy and subsidiary Progress project how they would deal with supply and demand of electricity for the next 20 and 15 years, respectively.

By law, the NCUC's standard is to find the "least cost mix of generation and demand-reduction measures which is achievable." The IRPs submitted by the now-merged Duke Energy Carolinas and Progress Energy Carolinas fall far short of that standard. NC WARN is presenting the NCUC with an alternative that is far less expensive and takes a huge step forward in addressing the critical issue of climate change.

Under the Duke and Progress plans, North Carolina would still be deriving large amounts of energy from coal, natural gas and nuclear power indefinitely. The utilities plan only minimal amounts of renewable energy or energy efficiency. Their substitution of natural gas for coal would lock in a losing path for global warming, since the methane released by fracking is an even more potent greenhouse gas than the carbon dioxide emitted by coal-fired power plants. Both utilities plan to add new nuclear units despite severe problems with other utilities' nuclear construction projects underway in the southeastern United States and elsewhere around the world.

These plans are grossly irresponsible both economically and in terms of climate impact.

In NC WARN's Responsible Energy Future, we describe a combination of cleaner, lower-cost alternatives that are available to meet North Carolina's energy needs. The utilities are using their monopoly status in our state to suppress these alternatives even as they insist on continuing to build polluting fossil fuel plants and extremely costly nuclear plants — and raising our rates repeatedly to do so.

Our plan would allow for the phasing out of all coal-fired plants in the Carolinas by the mid-2020s if not sooner, building no additional natural gas or nuclear plants, and reducing the amount of generation from existing natural gas-burning plants. Instead, we advocate an aggressive but achievable increase in energy efficiency and truly renewable energies.

Weatherization and other energy-saving programs can create thousands of jobs statewide while reducing energy demand up to 30% over the planning period. Efficiency measures, which reduce the need to generate electricity in the first place, are cheaper than any other means of meeting our energy needs. Efficiency programs that have proven successful in other states could eliminate the need for costly new power plants, leaving customers with more money in their pockets.

Solar and coastal wind energy are abundant in North Carolina and can provide large amounts of electricity with no fuel costs. Solar photovoltaic is already cheaper than new nuclear power could ever be, and will soon be cheaper than the average kilowatt now coming from the grid. Just a fraction of the wind energy off our coast would help the state meet 20% of its electricity needs and could generate up to 20,000 manufacturing jobs.

Combined heat and power (CHP), also known as cogeneration, is a well-developed and economic way to capture and use large amounts of energy that are otherwise simply emitted as waste heat from industrial, commercial and institutional facilities. On average, CHP electricity is less expensive than current grid power. This is a tremendous untapped resource that could allow thousands of facilities such as manufacturing plants, schools, hospitals and hotels to decrease their annual energy bills by 30% or more. North Carolina's technical CHP capacity is the equivalent of around ten nuclear power plants — or more than 40% of all electricity requirements.

Each of those four technologies, individually, could replace the need for at least several large power plants. Together, they would lead to a decentralized electricity grid less controlled by the Duke-Progress monopoly and less subject to outages.

Energy storage is another grossly underutilized resource. Duke Energy owns two very large pumped-storage hydro plants in South Carolina. These plants operate as enormous batteries to capture the over-generation of nuclear power that occurs on most nights in the Duke-Progress system. They would be ideal for helping to smooth out the variability of widespread solar and wind power.

At a minimum, Duke Energy's business plan will cause rates to double from 2009 levels by 2019, with increases of another 50% in the subsequent decade. Instead of spending tens of billions of dollars for highly questionable nuclear construction projects, we propose spending a fraction of that sum on energy efficiency, solar, wind and CHP. This would be far less expensive for North Carolina ratepayers, would create thousands of jobs and could fuel a rapid transition to a climate-protecting energy mix.

The Responsible Energy Future would result in 2032 CO_2 emissions 86% lower than the energy mix proposed by Duke Energy's IRP and 2027 emissions 83% lower than the mix proposed by Progress.

We as a state should no longer have to bear the economic, environmental and health costs of generating fossil fuel-based electricity, and we certainly do not need the crippling expense and near-permanent hazards of new nuclear plants.

We can no longer allow the electric utilities and overly cooperative regulators to control our energy and economic future.

In order for North Carolina to do its part to prevent climate change from reaching global tipping points, we must be engaged and insistent that the time has come to aggressively replace hazardous electricity generation with proven — and economically superior — clean-energy technologies.

INTRODUCTION

In 2013, the now-merged Duke Energy Carolinas and Progress Energy Carolinas will generate almost 95% of the electricity consumed in North Carolina, and its top priority will be to make a strong profit for corporate shareholders while doing so.[2] It would be irresponsible for the rest of us to surrender our energy, economic and environmental future to the priorities and plans of this monopoly corporation.

In February 2013, as they do every year, the North Carolina Utilities Commission (NCUC) will begin review of the annual Integrated Resource Plans (IRPs) filed by the electric utilities.[3] The NCUC's basic standard for review is to find the "least cost mix of generation and demand reduction measures which is achievable."[4] This review includes the consideration of appropriate rewards to utilities for efficiency and conservation programs that decrease utility bills — to the extent that utilities develop such programs.

Both Duke Energy and Progress Energy base their long-range plans on vigorous growth in demand for electricity, 1.2–1.6% each year, even though actual growth in electricity demand has been far lower than that for more than a decade. The forecasts are based in large part on the rosy assumptions of full economic recovery, and projections of population growth. Another problem is that the utilities plan to meet new growth in electricity demand by building polluting fossil fuel plants and extremely costly nuclear plants — while suppressing energy-saving programs and advances in solar and wind power — and raising rates repeatedly to do so.

We cannot allow the electric utilities and overly cooperative regulators to control our energy future. That is something for which the people of North Carolina need to take responsibility. We need to be responsible for the wise use of our money and the future of our state's economy. We need to be ultimately responsible for the health and welfare of present and future generations of North Carolinians, and responsible for the impacts fossil fuels have on our climate. In a state "of, by and for" its citizens, we are ultimately responsible for our own future.

The Duke Energy and Progress Energy plans are *simply irresponsible*. Building expensive power plants diverts precious resources from weatherization and other energy-saving projects that can create thousands of jobs statewide — beginning almost immediately — and lower our electricity *bills* even if our *rates* might rise modestly. The same is true for renewable energy (RE) sources, such as solar and wind, which are abundant in North Carolina and have the ability to provide reliable electricity throughout the year with no fuel costs. Customer CHP (combined heat and power, or cogeneration) is a well-developed and economic way to capture and use large amounts of energy that are otherwise simply wasted. Energy efficiency (EE), solar, wind and CHP can help to dramatically reduce fossil-fuel pollution statewide.

We cannot allow the electric utilities and overly cooperative regulators to control our energy future.

Each of those four technologies, individually, could displace the need for several large power plants. However, by using their monopoly control over state ratepayers, Duke Energy and Progress Energy are impeding all of those clean-energy advances because allowing them to grow would further destroy the case for building more high-profit fossil- and nuclear-fueled plants.

New and existing coal and natural gas plants discharge large amounts of pollution that damages our health and climate, and extraction of those fuels destroys ecosystems — including entire mountains — and communities.

NC WARN's analysis shows that, even using the utilities' ambitious growth projections, all coal-fired plants in the Carolinas can be phased out by the mid-2020s without building more natural gas and nuclear plants. Instead of new fossil fuel units, we propose an aggressive but achievable increase in the use of proven efficiency programs, a more rapid development of solar and wind power and facilitation of customer CHP. Duke Energy's two large energy storage facilities in South Carolina can help smooth out the variability of solar and wind while putting to use the near-daily over-generation of nuclear power in the Duke-Progress system.

NC WARN's analysis shows that, even using the utilities' ambitious growth projections, all coal-fired plants in the Carolinas can be phased out by the mid-2020s without building more natural gas and nuclear plants.

This approach would also provide a critically important hedge against rising prices of natural gas, against nuclear construction cost overruns and failures and against the increasing droughts that could render water-hungry coal and nuclear plants unable to deliver power.

When growth forecasts are too high, the utility monopoly invests our money in unneeded plants. For many low- and fixed-income families, raising power bills to pay for those plants forces harsh choices between basic needs: electricity versus food and medicine.

That is why we cannot allow the utilities to determine our energy future. To cede such decisions to Duke and Progress, and to regulators who are subject to corporate pressure, would be tragically irresponsible on our part.

Our primary goal is to find a realistic energy future that does away with all coal plants,

Duke and Progress plan to continue burning large amounts of coal throughout their long-term planning period.

reduces the amount of generation from existing natural gas plants and requires no new gas or nuclear plants. This report lays out one such future, and does so using a conservative approach that retains many of the questionable capacity and energy projections used by Duke Energy and Progress Energy in their IRPs.

In a future that is both economically and environmentally sustainable, our energy mix would be one of widely distributed generation — including rooftop systems — that would leave communities unburdened by large, centralized coal, natural gas and nuclear plants, and we would use all energy as efficiently and wisely as possible. We will continue to refine and advocate for our Responsible Energy Future proposal so as to realize this vision to the greatest extent possible.

THE FUTURE UNDER DUKE ENERGY AND PROGRESS ENERGY

The utilities' forecasts of generation and sales are summarized in Figure 1 (page 12) for Duke Energy and Figure 2 (page 13) for Progress Energy, with more details in

Appendix A. In both cases, projections of generation, in total and by fuel source, are taken from the IRPs as submitted to the NCUC in the fall of 2012.

Despite over a decade of very little growth in demand, and U.S. industry-wide expectations for slow demand for many years to come, Duke Energy projects a robust growth rate of 1.4% annually. In its forecast for 2032, Duke includes the impacts of energy efficiency (EE) and demand-side management (DSM) and treats them as additional sources to meet its expected generation needs.[5] Progress Energy projects a growth in demand of 1.6% annually, and then, unlike Duke, lowers its forecast to 1.2% annually to accommodate its expected EE/DSM programs.

As a result of these ambitious growth predictions, Duke Energy projects an increase of 30% in electricity sales over the 2013–2032 period — from 92,210 gigawatt hours (GWh) in sales to 133,453 GWh — in its North and South Carolina markets.[6] We believe it is clear that Duke Energy plans to continue efforts to sell electricity outside of its service area (as it attempted with Orangeburg, SC) and throughout its six-state market in the Southeast and Midwest.

Progress Energy's projections are slightly lower, with a forecasted increase of 15% over the 2013–2027 period, and sales rising from 66,066 GWh to 76,025 GWh.[7]

Duke Energy projects it will need to add 6,365 MW of new generation (the equivalent of six large nuclear reactors) during its 20-year planning period, while Progress Energy projects 4,722 MW (equivalent to five reactors) during its 15-year planning period.[8]

In the IRPs and other recent filings at the NCUC, each utility has announced plans to close many of its small, unscrubbed coal plants and older combustion turbines fueled by natural gas. Duke Energy has listed 20 combustion turbines and nine coal plants that it expects to close by 2015.[9] The expected retirement dates for the 1,080 MW in coal plants have moved up considerably when compared to the projections in past IRPs. Even though most of these units have been used very little in recent years, Duke's willingness to retire them earlier than previously planned raises questions about Duke's need for new generation.

On the other hand, Duke Energy also added the 822 MW Cliffside 6 coal-fired unit to its generation fleet in late 2012, a major step backwards in terms of carbon emissions.

Progress Energy has listed 15 small coal- and oil-fired units that it will close in the next several years, with a summer capacity totaling 1,548 MW.[10] In its IRP, Progress Energy plans to replace some of its coal units with natural gas units. However, according to former CEO Bill Johnson, Progress plans to retain its large coal units as a hedge against rising natural gas prices — which means customers would pay for a large amount of redundant generation capacity.[11]

Each of the utilities continues to retain a substantial reserve margin, in the 14–16% range, in case one or more of its other plants is not on line when needed. Neither Duke nor Progress relies on purchases from other utilities, although competitive markets, such as the PJM in Virginia and the Atlantic states, are nearby.[12]

Each of the utilities plans to add nuclear power to its generation mix in the planning period, although operational dates for the two units proposed by Duke Energy at its Lee Nuclear Station site in Gaffney, South Carolina,

New nuclear plants would cost ratepayers tens of billions of dollars.

have been repeatedly delayed in each of the past few IRPs. The delays reflect slow long-term demand, the low price of natural gas and severe problems with other utilities' nuclear construction projects underway in the southeastern United States and elsewhere around the world.[13]

The two nuclear units previously proposed by Progress Energy at its Shearon Harris site near Raleigh are no longer on the planning horizon even though millions of dollars have been invested in licensing efforts.[14] Instead, Progress Energy is now presenting its preferred plan as one including 55 MW of new "regional" nuclear in 2017, 55 MW in 2019, 221 MW in 2021 and an additional 221 MW in 2023.[15] The two smaller additions of nuclear power assume a 5% purchase of two units at SCANA's V.C. Summer plant in South Carolina, which are in early stages of construction, while the larger additions reflect a major 20% buy-in of Duke Energy's Lee Station.[16]

However, all nuclear licensing is currently delayed while the U.S. Nuclear Regulatory Commission decides what to do with the used, highly irradiated reactor fuel.[17] The only two reactors licensed in 30 years — Vogtle in Georgia and Summer in South Carolina — are experiencing additional, long construction delays and rapidly escalating costs, and their completion is far from certain.[18]

A full look at new nuclear plants is critical in a responsible energy future because they are by far the most costly — and the most risky — of all generating and energy-saving options. The cost estimate for constructing two units at Duke's Lee Nuclear Station in Gaffney, SC, exceeds $24 billion — assuming costs do not increase and schedules do not slip.[19] A 2012 study conducted by Synapse Energy Economics on behalf of Consumers Against Rate Hikes showed that the addition of the Lee Station alone, without the other plants Duke Energy is planning, could raise rates by 40% or more.[20]

Both utilities plan to add more natural gas generation because gas prices are presently very low, while new coal and nuclear plants are becoming increasingly cost-prohibitive. In its IRP, Duke Energy expects to add natural gas capacity in both conventional combustion turbines (170 MW in 2017, 800 MW in 2019, 800 MW in 2030 and 150 MW in 2032) and combined cycle units (700 MW in 2016, 700 MW in 2018, 700 MW in 2028).

Progress Energy expects to add combustion turbines (126 MW in 2016, 370 MW in 2018, 185 MW in 2019, 185 MW in 2026, 185 MW in 2027) and combined cycle (1545 MW in 2013, 787 MW in 2020, and 787 MW in 2022) which would bring its electricity from natural gas plants up to 41.7% of its total generation.[21]

Present practices, along with the size of the combined cycle additions in both IRPs, indicate that the utilities are now considering natural gas to be an around-the-clock baseload resource, and they plan to continue using combustion turbines for peak periods.

There are two disadvantages of reliance on natural gas. One is the externalized costs — such as damage to the environment and our health — of fracking, refining, transport and combustion. The other is the emission of methane. Despite claims to the contrary, the increased reliance on natural gas by Duke and Progress does very little to reduce the emission of greenhouse gases. Though *burning* natural gas emits less carbon dioxide (CO_2) than coal, various stages of

Methane emitted during fracking of natural gas is an even more potent greenhouse gas than carbon dioxide. *AP/David Zalubowski*

the natural gas fracking process leak methane, which is much more potent than CO_2 in terms of the greenhouse effect, particularly over the all-important near term.[22] Therefore, substituting natural gas for coal is not an effective means of reducing the magnitude of global warming.[23]

As part of the review of the utilities' IRPs, the NCUC needs to assess the emission of CO_2 and other greenhouse gases. Just from the burning of natural gas and coal, Duke Energy's plan for 2032 results in annual CO_2 emissions in the 81 billion pound range (with Cliffside alone adding 12 billion pounds annually), while the Responsible Energy Future proposal reduces this by 87% to 10 billion pounds. Progress Energy's plan for 2027 results in annual CO_2 emissions in the 52 billion pound range, while the Responsible Energy Future reduces this by 83% to 8 billion pounds.[24]

Substituting natural gas for coal is not an effective means of reducing the magnitude of global warming.

By greatly reducing the amount of natural gas in the mix, the Responsible Energy Future proposal also prevents large amounts of methane from entering the atmosphere.

WHAT DOES THIS MEAN FOR NORTH CAROLINA?

At a minimum, Duke Energy's business plan (based on the proposed power plant construction in the IRP) will cause rates to double from 2009 levels by 2019, with increases of another 50% in the subsequent decade.[25] This does not include any additional costs from inflation, new and upgraded transmission lines, increases in fuel prices or controls on the production of carbon and other greenhouse gases. Both Duke Energy and Progress Energy are currently seeking large rate hikes.

Duke Energy and Progress Energy both plan to use very minimal amounts of energy efficiency and minimal solar, wind and other RE sources — basically only what is required of them through 2021 under the state's Renewable Energy and Energy Efficiency Portfolio Standard (REPS).[26] Under the REPS, all electric power suppliers in North Carolina must meet an increasing amount of their retail customers' electricity needs by a combination of RE resources (defined under the bill as solar, wind, hydropower, geothermal and biomass) and reduced energy consumption. The REPS requirement on the electrical utilities begins at 3% of retail electricity sales in 2012, gradually increasing to 12.5% of 2020 retail sales and remaining at that level.[27] Energy efficiency measures can account for up to 25% of the requirement and thus are capped at a little more than 3% of 2020 retail sales, a truly insignificant portion of what is possible.

In addition, demand is likely to grow more slowly than the two utilities project. Carrying out the construction programs in the IRP filings would necessarily raise rates to customers, thus causing consumers, especially commercial and industrial customers who have other options, to use less and less electricity as prices increase. Such response to higher rates is what industry economists call "demand destruction." This is an important but under-considered factor for energy planning in North Carolina.

Duke Energy's business plan will cause rates to double from 2009 levels by 2019.

As rates increase, residential and small business customers would face increasing financial burdens, especially if the utilities can pressure the General Assembly into passing "annual rate hike" legislation.[28] Duke CEO Jim Rogers has testified to the NCUC that such a bill is essential to build new nuclear plants. This would allow the utilities to pass billions of

dollars for those plants on to customers while the plant is being built, even if the costs escalated or the plant is delayed or abandoned. Even without such legislation, the tens of billions needed for the nuclear plants would be highly detrimental to the North Carolina economy. We strongly believe the tens of billions in costs for the Lee Station and Progress's buy-in at the Summer Plant are very poor investments. A fraction of that sum spent on energy efficiency, solar, wind and CHP would produce far more benefit to North Carolina ratepayers.

In all, the IRPs of Duke Energy and Progress Energy are irresponsible — in terms of cost to consumers, in terms of diversifying our energy mix, and in terms of negative impacts on our state's economy, public health and the environment. The only potential beneficiaries of these *status quo* plans are utility executives and shareholders. Ironically, they too could become losers if Duke-Progress assumes that its monopoly control over its customers is invincible, and if it locks its six-state corporate future into a nuclear construction gamble while ignoring the rapid transition to clean energy in surrounding states.

WHAT WOULD A RESPONSIBLE ENERGY FUTURE LOOK LIKE?

Our analysis and projection of a responsible energy future is based on fairly conservative assumptions. For example, we have projected a very modest growth of CHP. Also, we believe the utilities' projected growth in demand for electricity to be substantially overstated as the growth rate for the past decade has been relatively flat, yet we have accepted those projections. An economic recovery does not necessarily mean an increase in electricity use; industry analysts and economists anticipate that customers will increasingly choose to use electricity more wisely, with more reliance on efficiency measures and renewable sources.

If demand fails to grow at the utilities' optimistic levels, the phase-out of fossil fuel plants could occur even more rapidly than we project. Efficiency programs that have proven successful in other states could, alone, more than accommodate any new demand and could eliminate the need for costly new power plants, leaving customers with more money in their pockets, leading to a stronger economy and more jobs.

Solar, off-shore wind and CHP are energy sources with enormous potential in North Carolina.

As noted earlier, Appendix A compares the existing generation capacity and sales of Duke Energy Carolinas and Progress Energy in 2013 with their projections for 2032 and 2027, respectively.[29] We shall now compare these to the Responsible Energy Future proposal. Pie charts comparing our plan with the future projections of Duke and Progress can be found in Figures 1 and 2 on the following pages and in Appendix A.

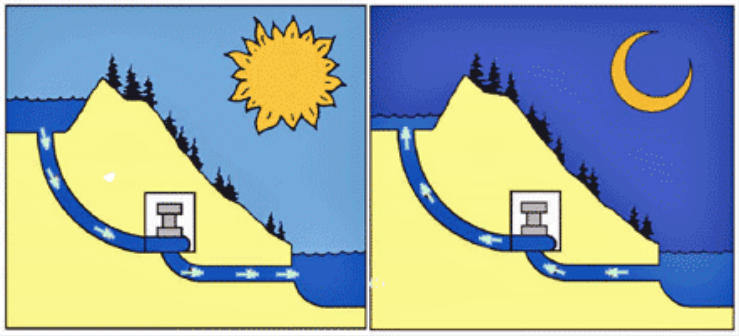
The core features of the Responsible Energy Future are:

- phasing out existing coal plants by the mid-2020s;
- eliminating the need for new natural gas plants, and phasing out several existing ones; and
- eliminating the need for new nuclear plants.

Duke's Amazing Secret: Massive Energy Storage Capacity

In northwestern South Carolina, Duke Energy operates two unusual hydro-power stations that completely disprove the widespread belief that energy cannot be stored—the key argument that old-school utilities such as Duke and Progress use to criticize solar and wind power for their variability.

Those energy storage facilities hold a key to moving the Carolinas into the age of renewable energy. Not only are they perfectly suited to smooth out variability of solar and wind power, they are valuable for storing the over-generation of Duke's nuclear capacity.



Duke Energy has two pumped storage facilities in South Carolina that could smooth out the variability of wind and solar power.

The reservoirs are massive, with a combined storage capacity of approximately 2000 MW, equal to two nuclear reactors, with critical quick-response capability. The technology used at both the Jocassee and Bad Creek pumped storage stations is well-established, though not widely used in the U.S. Here's how the *Charlotte Business Journal* explained it:

> They use excess power produced by baseload plants when demand is relatively low — usually at night — to pump water through the turbines from one lake up to a higher one to store potential hydropower. During higher-demand times, the water is run back through the turbines to produce electricity.
>
> Jocassee and Bad Creek were built to help Duke balance power production and load when Duke built its major nuclear plants. [Duke's area supervisor for the region, Reggie] King sees a good opportunity for more pump storage in Duke's future.
>
> *But King says the real impetus could come with increased use of solar and wind power. Those sources run intermittently — when the sun shines and the wind blows — and not always when the power is needed. Pairing pump storage with those renewable resources — wind power, in particular — could help reduce the disadvantage of [those] forms of energy in comparison to traditional power plants.* (emphasis added)
>
> [John Downey, "Duke Energy spending $15 million on its hydro plant upgrades," *Charlotte Business Journal*, September 17, 2010]

So it is clear that this resource is well-suited for advancing a renewable energy future, especially since Duke is considering adding even more pumped storage capacity. But Duke still resists using the pumped storage to facilitate a broad adoption of renewable energy.

This can be done through incremental programs to:

- increase energy efficiency and conservation at customer locations;
- increase solar and wind to account for 24% of total electricity sales, including both retail and wholesale sales in North Carolina; and
- develop substantial CHP (combined heat and power) facilities, also called cogeneration, for commercial, industrial and institutional customers.

Duke owns massive energy storage capacity that is perfectly suited to back up solar and wind power when needed.

Solar, coastal-area wind and CHP are abundant and available resources that can provide reliable electricity when we need it. Reliance on pumped storage[30] with limited backup from natural gas plants for peak periods cuts down on the need for more new generating plants. New storage options are being investigated globally.

An added benefit of increasing distributed power sources, as opposed to large, centralized power stations, is to reduce the large amount of electricity lost constantly through the present transmission system.

Purchases from other utilities can be planned for, and providing even 4% of total energy demand with such purchases, made when most needed, would lessen the need for costly new power plants and associated rate hikes.

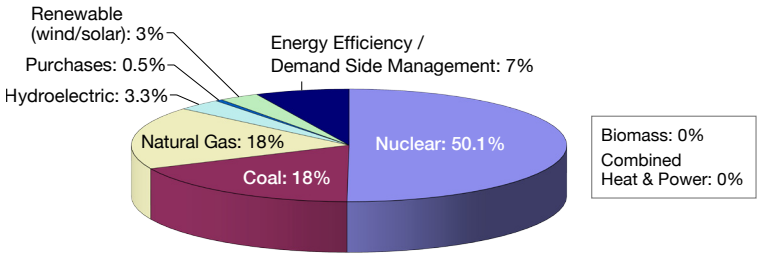
Energy Efficiency

The energy efficiency calculations in the Responsible Energy Future proposal are based on achieving gains of 2.0% annually, accumulating over the planning period. The American Council for Energy Efficiency (ACEEE) has recommended statewide efficiency standards with annual gains reaching 1.5% in 2016, rising to 2.0% by 2020.[31] The most recent of many national and state studies, a report from the National Academy of Sciences, affirms that savings of 25–31% can be accomplished by 2030. Wisconsin is now planning annual cumulative gains of 2%, and a similar rate has been proposed in Maryland's energy planning.

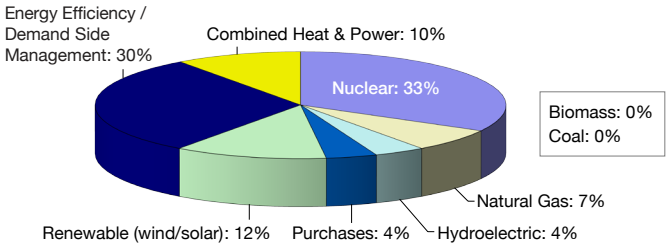
North Carolina should certainly be able to join the national trend for the responsible use of electricity. Because steady increases of 1.5% or more have been achieved in states all over the country, our goal of reductions, over the planning period, of 30% for Duke Energy and 22% for Progress Energy is reasonable.

Duke Energy Carolinas accepted the principle of a 1% annual gain in its Save-a-Watt program, starting in 2012 after a lengthy ramp-up process.[32] Duke Energy's 2008 Forefront study showed that an 18% load reduction due to energy efficiency was

Figure 1: 2032 Projected Energy Sales (Duke)



Duke Energy IRP



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cost-effective, and this was before nuclear construction cost estimates had begun to soar.[33] Energy-saving remains an abundant and clean resource that North Carolina has barely even attempted to cultivate. We think it is time to exploit energy efficiency in earnest and do so system-wide — not only because it is the law, but because it is cheaper than every alternative, and because developing EE is far wiser than trying to build costly and high-risk power plants.

Consumers at all levels are learning to use electricity in smarter ways, buying more efficient light bulbs and appliances, replacing old water heaters and HVAC systems with new ones and weatherizing their homes. New building codes in North Carolina will make all new homes more efficient.[34]

Wind and Solar

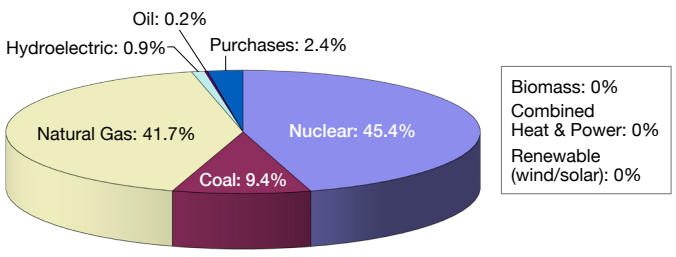
The second major contribution to the Responsible Energy Future which would contribute toward phasing out nearly all fossil fuel generation over the IRP planning horizons, while eliminating the need for new nuclear units, is a much more rapid development of renewable energy than the utilities reflect in their long-term plans. The amounts we project for wind and solar — 16 billion kWh for Duke Energy in 2032 and 10 billion kWh for Progress Energy in 2027—go well beyond present REPS requirements.[35]

Nationally in 2012, electricity from new renewable energy sources matched the generation from new conventional power plants.[36] We expect future electricity from wind and solar to far outpace all other sources in North Carolina — if Duke-Progress barriers are removed. Falling prices for solar PV equipment make it possible to install several thousand megawatts of power by the end of this decade, a vision bolstered by near-weekly news stories about additional solar installations across North Carolina that are happening despite Duke-Progress barriers. A recent study showed that *unsubsidized* commercial rooftop solar in North Carolina has the potential capacity of 3,500 MW by 2022, and *unsubsidized* residential solar has an even larger potential.[37] Together, unsubsidized residential and commercial solar could provide 9% of North Carolina's total electricity by 2022.

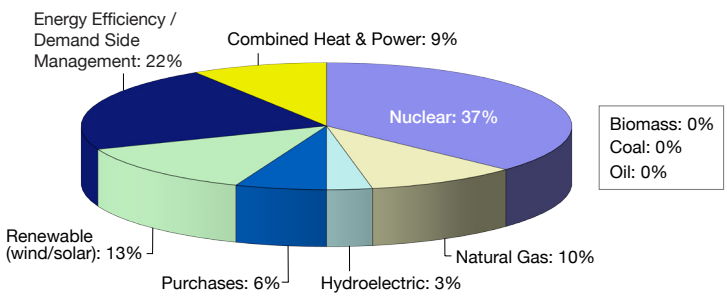
We expect future electricity from wind and solar to far outpace all other sources in North Carolina — if Duke-Progress barriers are removed.

To achieve the Responsible Energy Future, the development of coastal-area wind generation in North Carolina will be necessary. It is encouraging to note that Duke Energy recognizes the cost-effectiveness of wind power and since 2007 has invested more

Figure 2: 2027 Projected Energy Sales (Progress)



*Progress Energy IRP **



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* Progress Energy does not provide details in its IRP of plans for Demand Side Management and Energy Efficiency but adjusts its projected annual energy demand growth from 1.6% to 1.2% to accommodate potential DSM or EE programs.

than $2.5 billion to build its wind and solar power businesses in the unregulated parts of its territory (the de-monopolized markets where competition exists), building a portfolio of more than 1000 MW in wind projects.[38] The importation of wind energy from Texas and the Plains states to North Carolina should remain under consideration since it may well be cheaper, even with transmission costs, than electricity from new power plants.

Just a fraction of the wind energy resources off our coast would help the state meet 20% of its electricity needs.

Of course, the greatest reserve of wind is offshore; North Carolina has more wind off its shores than any other state on the Atlantic coast.[39] There is the marketable potential for 5,000 to 10,000 MW by 2030, with a much greater long-term potential. Just a fraction of the wind energy resources off our coast would help the state meet 20% of its electricity needs. As an added bonus, according to the U.S. Department of Energy, North Carolina has the potential to gain 10,000-20,000 manufacturing jobs to support new offshore wind — a benefit that will be hindered if this state chooses not to develop wind power.[40]

Combined Heat and Power (Cogeneration)

Another large and readily available source of energy to help replace coal is the use of customer combined heat and power (CHP, also called cogeneration). CHP technology combines the on-site processes of electricity generation and heating or cooling in order to allow a wide range of facilities to use energy far more efficiently — by capturing and putting to work large amounts of thermal energy that is otherwise simply wasted into the environment.

Combined heat and power represents a tremendous untapped source of energy — and a timely opportunity to dramatically reduce carbon emissions while avoiding soaring electricity rates in the Carolinas.

Thousands of facilities in North Carolina — including industrial plants, schools, hospitals, prisons, health clubs and hotels — could decrease their annual energy bills by 30% or more by adding CHP to their current heating or electric generation systems. North Carolina's CHP technical capacity is the equivalent of around ten large power plants — or more than 40% of all electricity requirements.[41]

But despite the presence of this vast resource, North Carolina has very little CHP in place — 1,530 total MW of capacity with only about 18 MW being installed in the past 7 years.[42]

There are thousands of facilities around North Carolina with a combined CHP potential that could be equivalent to around ten large power plants.

The greatest barriers to the expansion of CHP in North Carolina are the lack of education about technology advances, and resistance by the state's electric utilities to adopt CHP-friendly policies.

DOES A RESPONSIBLE ENERGY FUTURE MAKE FINANCIAL SENSE?

Instead of expensive new power plants, we propose to strengthen efficiency programs, more rapidly develop wind and solar and foster customer CHP.

The $26 billion needed for nuclear units in the IRPs could surely be better spent. Our proposal eliminates the need to build expensive and risky nuclear plants, along with the great uncertainty about whether they could be completed. North Carolina would be spared the 18–21 cents per kWh cost of nuclear electricity and would avoid yet

more nuclear waste, for which there is no disposal plan and which will keep costing ratepayers for generations to come.

It must also be noted that in monopoly-free Ohio, Duke Energy actually *reduced* rates by up to 17% in 2011 — while presumably maintaining adequate returns for shareholders. The corporation *raised* rates in its monopoly-protected Carolinas territory by about 7% in both 2010 and 2012, mainly due to construction of power plants in spite of flat demand growth.[43]

Our plan to avoid new conventional power plants and phase out fossil fuel plants entails additional costs, although the average cost of energy efficiency is approximately 4–5 cents per kWh in the recommendations outlined below. This is substantially lower than conventional electricity generation from coal plants and much lower than new nuclear. What our state needs is a new "least cost" energy policy that puts energy efficiency first before all forms of generation.

One way to achieve this is to amend the Senate Bill 3 REPS to establish an Energy Efficiency Portfolio Standard for all customers. We recommend a 1.5–2.0% annual increase in energy savings to reach our energy efficiency goals with the following criteria:

- systematic and comprehensive EE programs that maximize the energy savings;
- appropriate performance incentives (and penalties) for Duke Energy and Progress Energy that provide a fair rate of return relative to risk;
- a strong education and outreach component that will appeal to all customers;
- economic incentives to appeal to all customers; and
- the use of best EE practices across all Duke Energy operating companies.

One of the most essential EE measures is the creation of an independently administered "Public Benefits Fund" to concentrate on low-income and fixed-income customers. These are the families that most often cannot afford EE measures. A potential administrator of the fund is the NC Housing Finance Agency (NCHFA), a quasi-state agency that is funded by a variety of sources, including allocations from the NC Housing Trust Fund.

What our state needs is a new "least cost" energy policy that puts energy efficiency first before all forms of generation.

NCHFA already has an infrastructure in place and has contracts in place with local governments, community action agencies, community development corporations and nongovernmental organizations, such as Urban Ministries, in each of the 100 counties in North Carolina. The goal is to supplement existing programs with EE programs, such as weatherization, insulation, new appliances and new HVAC systems. With energy savings and widespread job creation, and by helping avoid rate hikes from new power plants for all customers, this fund would be a win-win situation.

Photovoltaic (PV) solar is already cheaper than new nuclear, even when the various subsidies to both technologies are considered.[44] At the same time, nuclear costs are rapidly rising and uncertain, while PV costs continue to fall steadily. Recent studies show that new unsubsidized solar will be at grid parity within the next decade, i.e., solar will be as inexpensive as any existing energy source.[45] North Carolina has barely begun to realize the potential for solar energy, and it will be tragic if Duke-Progress is allowed to continue hampering the advance of rooftop and larger-scale projects.

Even Duke Energy is already generating on-shore wind power far more cheaply, per kilowatt hour, than any electricity that could

ever be generated by new nuclear plants.[46] Off-shore wind, while proving successful in other countries, is still immature in the U.S., so prices are uncertain but are believed likely to come in at the 20 cents per kWh range initially — comparable or better than new nuclear — and to decrease as the U.S. industry develops.

We need to encourage customer CHP, possibly administered by the utilities, as its average costs are approximately 6–7 cents per kWh, and paybacks for retrofit systems can be as low as 2–3 years.[47]

For planning purposes, solar and wind, efficiency and CHP represent a critical hedge against soaring nuclear capital costs and the market price of natural gas, which has suffered a three-decade history of extreme volatility.

Similarly, the NCUC must begin factoring drought and heat waves into future planning that relies on nuclear and coal plants, both of which are dependent on enormous amounts of cool water. EE and RE are a critical hedge against a drier, hotter Southeast.

We as a state should no longer have to bear the economic, environmental and health costs of generating fossil fuel-based electricity, and we certainly do not need the crippling expense and near-permanent hazards of new nuclear plants. The bottom line is that our proposed approach can provide an annual savings for North Carolina electricity customers. Many energy efficiency measures are less expensive than the rates we are paying now; solar and wind are cheaper than new nuclear and could soon be at grid parity; CHP is less expensive than new plants, especially if natural gas prices increase. Compared to the Duke-Progress scenario, our plan would create more jobs spread more evenly across the state. There are already contractors who are well positioned to advance all these clean energy fields. The final, crucially important advantage of our plan is that it would be a major step in controlling climate change.

Our proposal comes much closer than the utilities' IRPs to being the "least cost mix of generation and demand-reduction measures" required by the law. Our Responsible Energy Future promotes a good economy and jobs, provides us all a healthier place to live and gives us a means to do our share in implementing solutions to global warming. In order for North Carolina to do its part to forestall global climate tipping points, we must be engaged and insistent that the time has come to aggressively replace hazardous electricity generation with proven clean-energy technologies. Reaching the critical carbon-reduction goals that science is demanding is an urgent challenge to which North Carolina must rise with vigor. There really is no time to lose.

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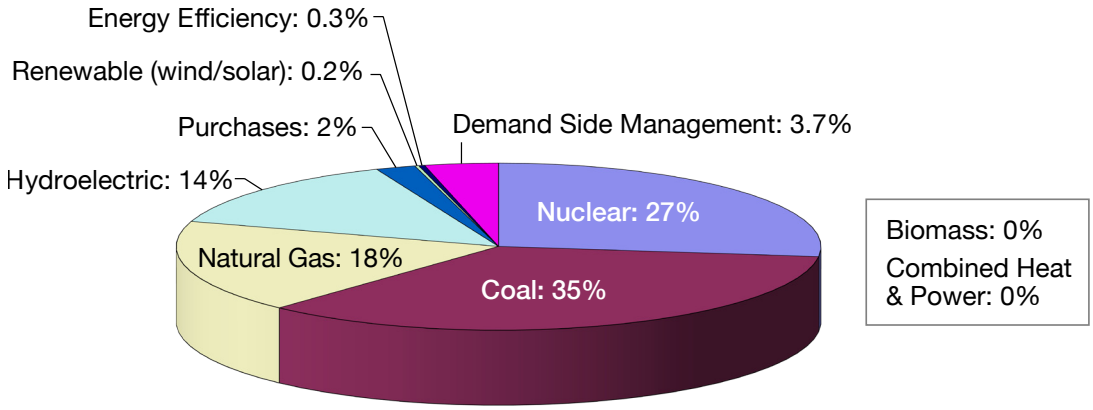
APPENDIX A: COMPARING NC WARN'S RESPONSIBLE ENERGY FUTURE TO THE LONG-TERM PLANS OF DUKE AND PROGRESS

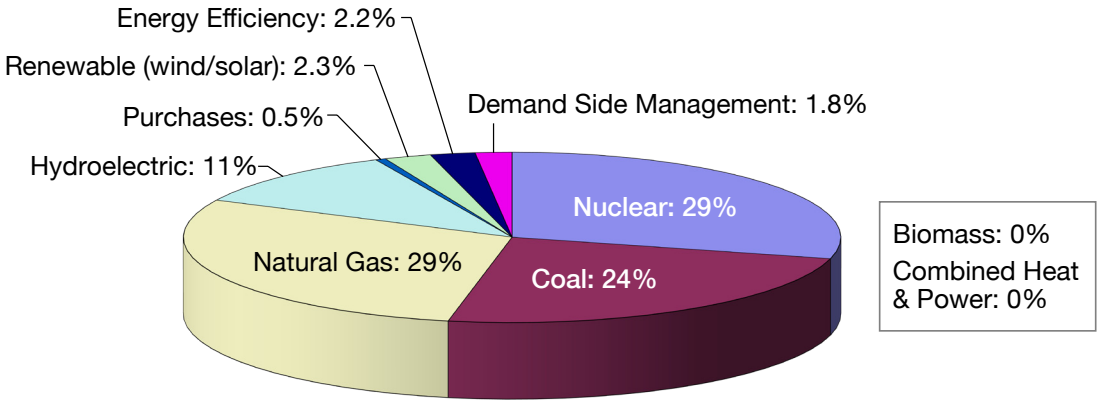
The pie charts on the following pages represent the percentages of total capacity and energy (sales) accounted for by the various energy sources in the Duke IRP, Progress IRP and Responsible Energy Future proposal. The data are for all of the utilities' service areas across both North and South Carolina. Table 1 below shows the utilities' total predictions for capacity (in megawatts) and for energy (in gigawatt hours), demonstrating how much each company intends to grow in the next two decades.

Table 1. Utility capacity and energy predictions

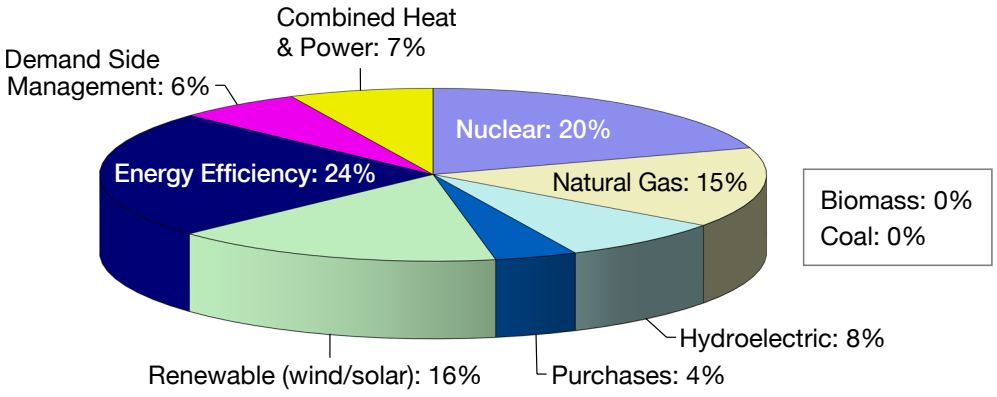
	Capacity	Energy
Duke 2013	18,107 MW	92,210 GWH
Duke 2032 (from IRP)	25,905 MW	133,453 GWH
Progress 2013	12,400 MW	66,066 GWH
Progress 2027 (from IRP)	14,600 MW	76,035 GWH



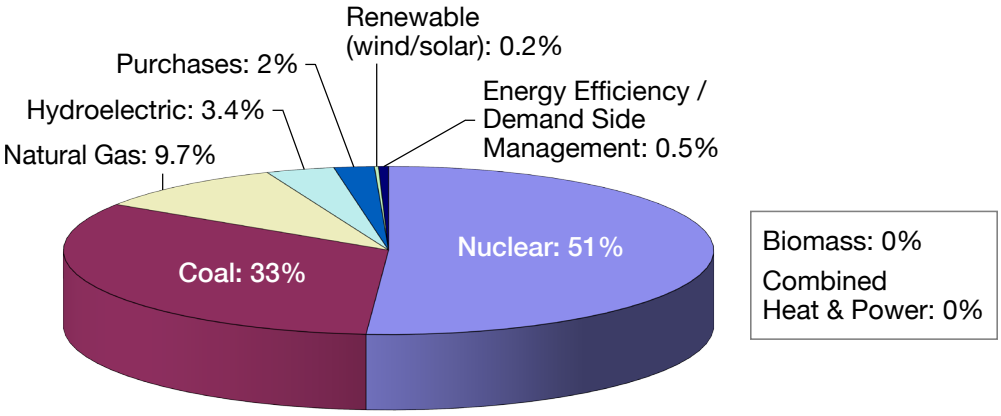
Duke Energy 2013 Capacity



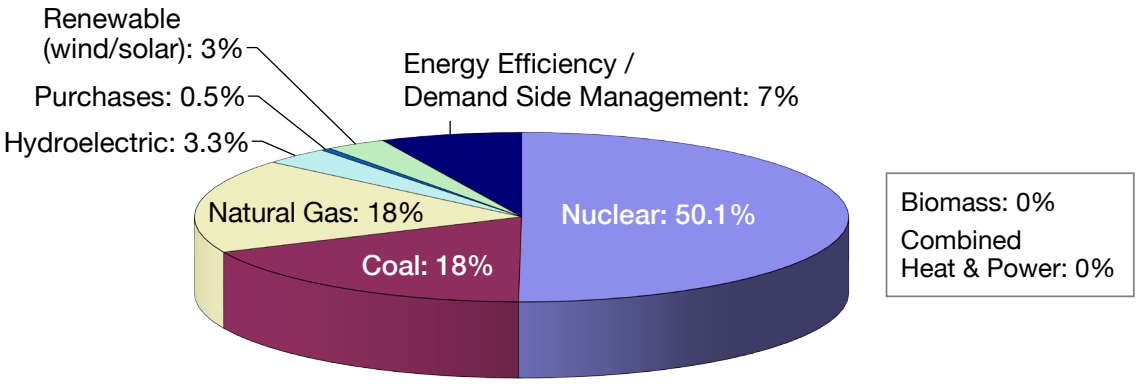
Duke Energy IRP: 2032 Capacity



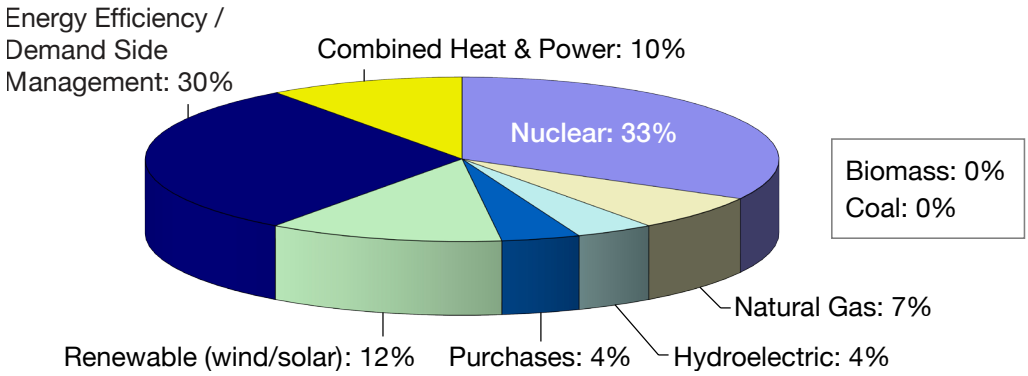
Responsible Energy Future: Duke Energy 2032 Capacity



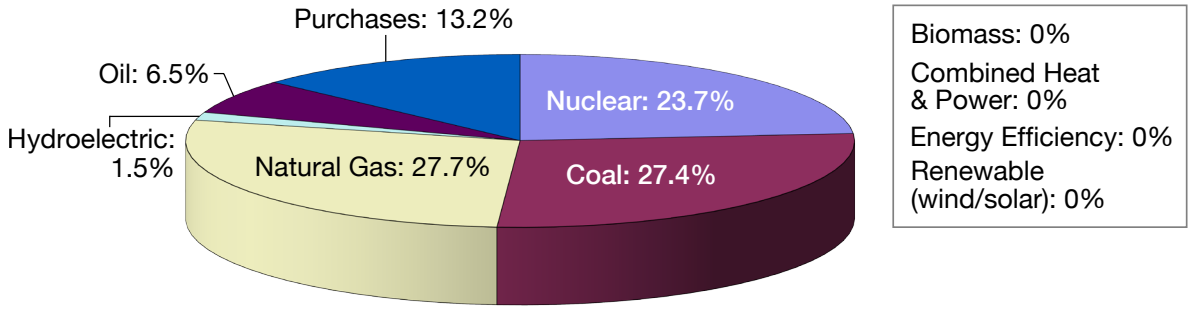
Duke Energy 2013 Energy



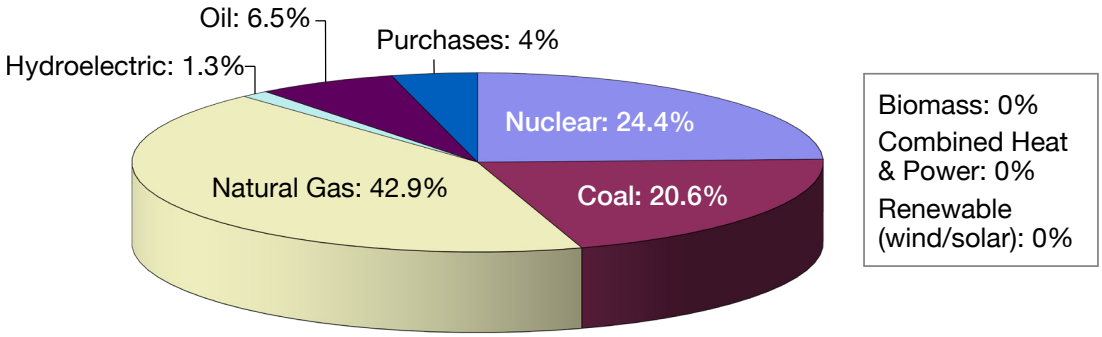
Duke Energy IRP: 2032 Energy



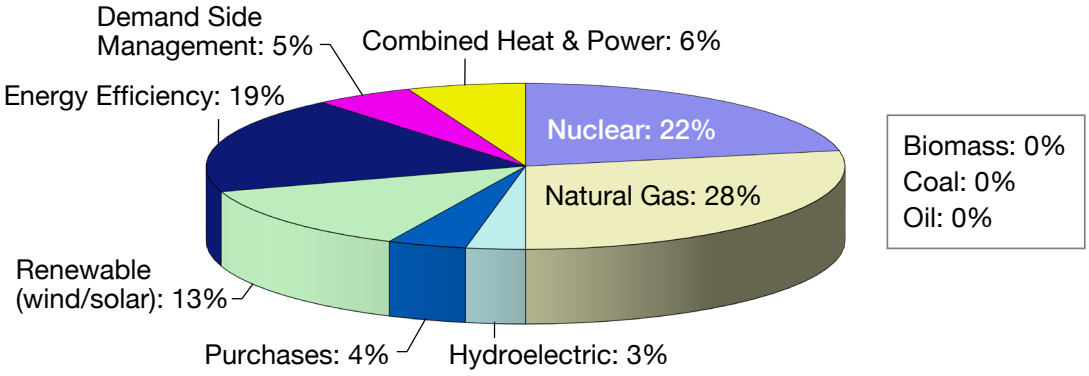
Responsible Energy Future: Duke Energy 2032 Energy



Progress Energy 2013 Capacity

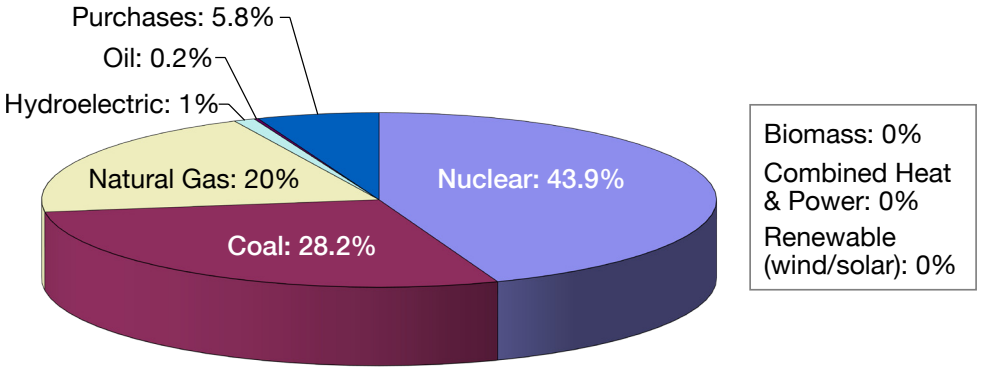


Progress Energy IRP: 2027 Capacity

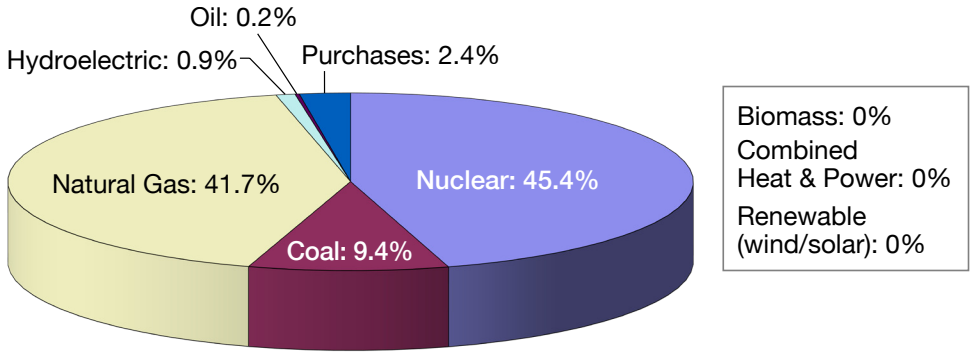


Responsible Energy Future: Progress Energy 2027 Capacity

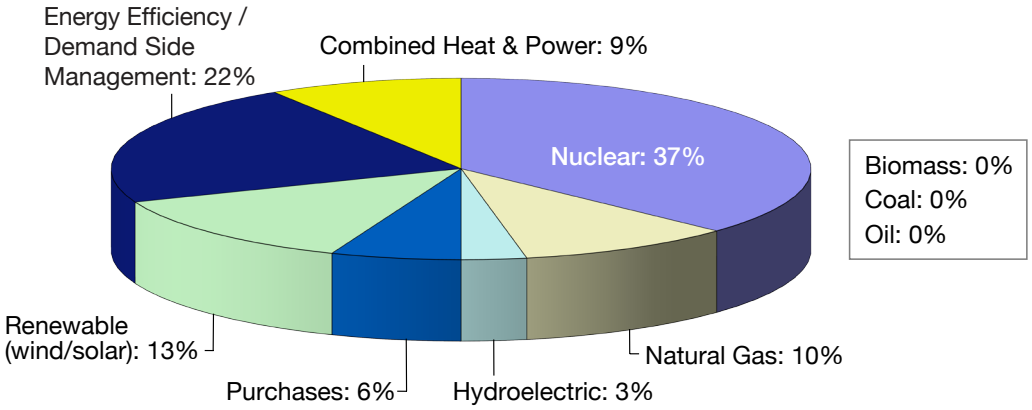
Note: Progress Energy does not provide details in its IRP of plans for Demand Side Management and Energy Efficiency but adjusts its projected annual energy demand growth from 1.6% to 1.2% to accommodate potential DSM or EE programs.



Progress Energy 2013 Energy



Progress Energy IRP: 2027 Energy



Responsible Energy Future: Progress Energy 2027 Energy

Note: Progress Energy does not provide details in its IRP of plans for Demand Side Management and Energy Efficiency but adjusts its projected annual energy demand growth from 1.6% to 1.2% to accommodate potential DSM or EE programs.

APPENDIX B: METHOD FOR DERIVING CO_2 EMISSIONS FIGURES ON PAGE 9

Based on the energy generation predicted by Duke Energy Carolinas and Progress Energy Carolinas in 2032 and 2027, respectively, and the proposed energy mix laid out in the utilities' IRPs and NC WARN's Responsible Energy Future, we calculated the amount of electricity, in megawatt hours, that would be supplied by each fossil fuel source.

Duke Energy IRP 2032 energy plan

24,021,540 MWh coal (18% of 133,453,000 MWh)
24,021,540 MWh natural gas (18% of 133,453,000 MWh)

Progress Energy IRP 2027 energy plan

7,146,350 MWh coal (9.4% of 76,025,000 MWh)
31,702,425 MWh natural gas (41.7% of 76,025,000 MWh)

Responsible Energy Future 2032 energy plan for Duke Energy

0 MWh coal (0% of 133,453,000 MWh)
9,341,710 MWh natural gas (7% of 133,453,000 MWh)

Responsible Energy Future 2027 energy plan for Progress Energy

0 MWh coal (0% of 76,025,000 MWh)
7,602,500 MWh natural gas (10% of 76,025,000 MWh)

Based on the Environmental Protection Agency's (EPA) average air emissions data, we calculated the pounds of CO_2 produced in each energy plan. The EPA estimates that the average emissions of a coal-fired power plant are 2,249 lbs/MWh of CO_2 and the average emissions of a natural gas plant are 1,135/MWh of CO_2.[48]

Duke Energy IRP 2032 estimated air emissions (in lbs of CO_2)

54,024,443,460 from coal (2,249 x 24,021,540 MWh)
27,264,447,900 from natural gas (1,135 x 24,021,540 MWh)

81,288,891,360 lbs CO_2 total

Progress Energy IRP 2027 estimated air emissions (in lbs of CO_2)

16,072,141,150 from coal (2,249 x 7,146,350 MWh)
35,982,252,375 from natural gas (1,135 x 31,702,425 MWh)

52,054,393,525 lbs CO_2 total

Responsible Energy Future 2032 estimated air emissions for Duke Energy (in lbs of CO_2)

0 from coal (2,249 x 0 MWh)
10,602,840,850 from natural gas (1,135 x 9,341,710 MWh)

10,602,840,850 lbs CO_2 total

Responsible Energy Future 2032 estimated air emissions for Progress Energy (in lbs of CO_2)

0 from coal (2,249 x 0 MWh)
8,628,837,500 from natural gas (1,135 x 7,602,500 MWh)

8,628,837,500 lbs CO_2 total

Based on the calculations above, the Responsible Energy Future proposed for Duke Energy would result in 2032 CO_2 emissions 86% lower than the energy mix proposed by Duke Energy's IRP. The Responsible Energy Future proposed for Progress Energy would result in 2027 CO_2 emissions 83% lower than the energy mix proposed by Progress Energy's IRP.

NOTES

1. Attributed to Voltaire and others.
2. The only other electricity suppliers are Dominion Power in the Northeast and TVA in western North Carolina. Even though Duke Energy and Progress Energy have merged at the holding company level, they plan to manage separate operating companies in the Carolinas for several years. In addition to their own service areas, they supply electricity to the membership cooperatives and the ElectriCities. It should also be noted that NC WARN and at least one other party, the City of Orangeburg, SC, have appealed the merger in court.
3. The IRPs are filed in NCUC Docket E-100, Sub 137 (available at http://www.ncuc.net, "Docket Information," "Docket Search").
4. North Carolina General Statutes 62-2(3a).
5. EE measures reduce the amount of energy required to provide products and services, either through conservation or by using less energy to get the same job done. DSM is the effort to change the patterns of how and when customers use electricity, such as shut-off measures during peak periods.
6. Duke Energy IRP, p. 93.
7. Progress Energy IRP, pp. 29–31.
8. Duke Energy IRP, pp.16 and 93; Progress Energy IRP, p. 25.
9. Duke Energy IRP, p. 55.
10. Progress Energy IRP, p. B-6. Some of Progress Energy's plants on the retirement list may be converted to natural gas plants.
11. John Murawski, "Progress Energy phases in natural gas," *The News and Observer*, 3 August 2011. http://www.newsobserver.com/2011/08/03/1386815/progress-phases-in-natural-gas.html.
12. It is interesting to note that one of the Federal Energy Regulatory Commission's requirements for accepting the merger between the two utilities was that major transmission lines would be constructed connecting to the PJM network. Order Accepting Revised Compliance Filing, as Modified, and Power Sales Agreements; 139 FERC ¶ 61,194 (June 8, 2012).
13. Peter Detwiler, "New Centralized Nuclear Plants: Still an Investment Worth Making?" *FORBES*, 15 January 2013 http://www.forbes.com/sites/peterdetwiler/2013/01/15/new-centralized-nuclear-plants-still-an-investment-worth-making/.
14. Progress Energy, Updated Schedule for Transmittal of Information Supporting the Environmental Review, to the Nuclear Regulatory Commission, November 14, 2012; NRC ADAMS Accession No. ML12321A039.
15. Progress Energy IRP, p. 25.
16. Progress Energy IRP, pp. 4–5.
17. NRC, Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation, 77 Federal Register 277, p. 65137; *New York v. NRC*, 681 F.3d 471 (D.C. Cir 2012).
18. Summary of Dr. William Jacobs, nuclear monitor, testimony to Georgia Public Service Commission, 12 December 2012, available at http://www.ncwarn.org/2012/12/nuclear-construction-project-in-free-fall-duke-at-risk-too-news-release-from-nc-warn/.
19. One of the best estimates for the price of new nuclear plants is from the Levy nuclear project proposed by Duke-Progress in Florida, a state that requires periodic cost updates. The project has quadrupled from initial estimates, with the price of each of two nuclear units now exceeding $12 billion, for a total of $24.1 billion, although a license to construct is still years away. See Florida Public Service Commission recommendations, 7 November 2012. http://www.floridapsc.com/agendas/archive/121126cc/121126.html.
20. Synapse Energy Economics, *Risk to Ratepayers: An Examination of the Proposed William States Lee III Nuclear Generation Station, and the Implications of "Early Cost Recovery" Legislation*, December 10, 2012; see summary at http://www.consumersagainstratehikes.org/consumer-alliance-warns-of-a-doubling-of-electricity-rates-under-duke-energys-business-plan/.
21. Progress Energy IRP, pp. 25 and 28. As a result Progress Energy expects its energy to be generated 87% by nuclear and natural gas in 2027, raising questions of sustainability and fluctuating fuel prices.
22. According to a recent Cornell Study, methane pound for pound could have an impact on climate change that is 105 times greater than CO_2. Robert W. Howarth,et al., "Methane and the greenhouse-gas footprint of natural gas from shale formations," *Climatic Change*, 106, no. 4 (2011): 679-90. Available at http://www.sustainablefuture.cornell.edu/news/attachments/Howarth-EtAl-2011.pdf.
23. Jeff Tollefson, "Methane leaks erode green credentials of natural gas: Losses of up to 9% show need for broader data on US gas industry's environmental impact", *Nature* 493, no. 7430 (January 2, 2013). References data from National Oceanic and Atmospheric Administration (NOAA) researchers. Available at http://www.nature.com/news/methane-leaks-erode-green-credentials-of-natural-gas-1.12123.
24. Figures derived using EPA data on average CO_2 emissions from burning coal and natural gas. See Appendix B for details

25. This estimate is based in large part on the findings in the report by Synapse Energy Economics (see footnote 20 above). The timing of the cost impacts for nuclear construction depends on whether Duke Energy can obtain authorization of tracking construction work in progress (CWIP), the annual rate hike bill, from the N.C. legislature, which would move the risks of construction cost overruns, and project cancellation, to the ratepayers. Other variables in the estimate of rate increases include whether the Lee Station stays on-time and on-budget. Because of the way Duke is allowed to allocate costs, most of the rate increases would be borne by residential customers and small businesses if the project proceeds.
26. The REPS was established in 2007 in the comprehensive rewrite of utility law known as Senate Bill 3, passed as NC Session Law 2007-397.
27. NC Utilities Commission, *Annual Report Regarding Renewable Energy and Energy Efficiency Portfolio Standard in North Carolina*, 27 September 2012, available at http://www.ncuc.commerce.state.nc.us/reports/repsreport2012.pdf.
28. See http://www.consumersagainstratehikes.org/ for information on the Annual Rate Hike Bill and its consequences.
29. These data are for all sales of the two utilities in North Carolina and in South Carolina, because each utility system, which has sales and generation in both states, is run as a unit and not as separate systems in each state. The merged Duke Energy and Progress Energy are likely to more closely integrate their operations over the next five years, including transmission and distribution, which would allow sharing the benefits of storage options.
30. Duke Energy's pumped storage facilities at Jocassee and Bad Creek have a combined capacity of 1,765 MW with plans to add an additional 300 MW by 2019. At the plants, water is pumped from one reservoir to a higher one, usually in the night, to store potential hydropower to use during intermediate and peak periods. For more information, see http://www.duke-energy.com/power-plants/pumped-storage-hydro.asp. See also Downey, John. "Duke Energy spending $15 million on its hydro plant upgrades," *Charlotte Business Journal*, 17 September 2010. Available at http://www.bizjournals.com/charlotte/stories/2010/09/20/story13.html?b=12849552005E3956051.
31. ACEEE, *North Carolina's Energy Future: Electricity, Water, and Transportation Efficiency*, Report No. E-102, March 2010, http://www.aceee.org/sites/default/files/publications/researchreports/E102.pdf.
32. NCUC Docket E-7, Sub 831 (available at http://www.ncuc.net/, "Docket Information," "Docket Search").
33. Forefront Economics, Inc., *Duke Energy Carolinas DSM Action Plan: North Carolina Report*, August 2007. Available in NCUC Docket No. E-7, Sub 831(Save-a-Watt), Exhibit 1 to Testimony of Duke witness Stevie, filed April 4, 2008 (available at http://www.ncuc.net, "Docket Information," "Docket Search").
34. http://www.energycodes.gov/adoption/states/north-carolina.
35. This level of renewable energy is at the same level proposed by NC WARN in its previous comments on the 2010 and 2011 IRPs, filed on February 11, 2011 and October 7, 2011 in NCUC Docket E-100, Sub 128 (available at http://ncuc.net, "Docket Information," "Docket Search").
36. According to the Federal Energy Regulatory Commission's *Energy Infrastructure Update*, renewable energy projects — including solar, wind, hydroelectric, geothermal and biomass — made up almost half of all new power generation installations in the U.S. in the first 10 months of 2012. http://www.kcet.org/news/rewire/government/the-renewable-revolution-in-american-energy.html.
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40. U.S. Department of Energy, *20% Wind Energy by 2030*, July 2008, http://www.nrel.gov/docs/fy08osti/41869.pdf.
41. ACEEE, *Coal Retirements and the CHP Investment Opportunity*, 19 September 2012, http://www.aceee.org/research-report/ie123; Maggie Eldridge, R. Neal Elliott, and Shruti Vaidyanathan, American Council for an Energy-Efficient Economy (ACEEE), *North Carolina's Energy Future: Electricity, Water, and Transportation Efficiency*, March 2010, http://aceee.org/research-report/e102.
42. Pew Environment Group, Combined Heat and Power: Energy Efficiency to Repower U.S. Manufacturing, May 2011, http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Fact_Sheet/CHP_NORTH_CAROLINA_HI-RES_5.10.11.pdf.
43. Restructuring Today, "PUC Oks results of first Duke Energy Ohio auction settling future rates," 16 December 2011, http://www.restructuringtoday.com/public/10286.cfm.
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45. Farrell, see note 37.

46. John Downey, “Duke Energy Renewables completes major wind projects,” *Charlotte Business Journal*, 14 January 2013, http://www.bizjournals.com/charlotte/blog/power_city/2013/01/duke-energy-renewables-completes-major.html.

47. Anna Moorefield and Jim Warren, *Combined Heat and Power in North Carolina: Replacing Large Power Plants by Putting Wasted Energy to Work*, NC WARN, February 2013.

48. Environmental Protection Agency (EPA), “Air Emissions,” 17 October 2012, http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

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