NC WARN

On the Backs of Families and Small Businesses

Duke Energy Carolinas Justifies New Power Plants by Giving Breaks to the World's Richest Corporations

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NC WARN, *the Waste Awareness & Reduction Network, 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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Duke Energy Carolinas Justifies New Power Plants by Giving Breaks to the World's Richest Corporations

Summary

Duke Energy Carolinas is aggressively recruiting huge electricity users, with rock-bottom rates and special deals, which are fueling demand for new "baseload" power plants and causing the rates of captive small business and residential customers to keep soaring for years to come.

Duke Energy's 215,000 small business customers in North Carolina pay more than three times as much per kilowatt hour of electricity as data storage and processing centers, also called server farms, operated by the world's richest corporations – Apple, Google and Facebook (after accounting for fuel charges, which are essentially equal for all users).

During 2010, Duke Energy's average data center customer used almost 3,200 times as much electricity as the average small business customer. Since that time additional, larger data centers are being built, creating even greater demand for electricity that residential and small business customers are subsidizing.

Duke sets its highest rates for small businesses and homes – and lowest rates for the biggest users – by designing its cost-of-service "study" to assign most costs to the smaller users.

It does this by using a "Summer Coincident Peak" method to allocate all costs related to generation of power based only on the *single hottest hour of the year*, when households and small businesses are relying on maximum air conditioning.

On cue from Duke Energy, most big customers reduce their electric load during that hottest hour – for example, with back-up generators – avoiding paying their fair share of electricity costs and shifting even more costs to homes and small businesses.

Also, Duke Energy allocates many distribution and corporate overhead costs by the mere number of customers in a rate class, regardless of how much electricity they used. So Google pays the same dollar amount of those costs as does a retired apartment renter or small retailer.

By excluding consideration of average electricity use, Duke Energy protects data centers from paying rates proportionate to the costs needed to provide the voluminous electricity they use year-round. Those costs are shifted to others.

North Carolina law strictly prohibits discriminatory rate structures.

In fact, the N.C. Utilities Commission twice rejected the method Duke Energy is using – in rulings standing for 20 years. The other two North Carolina utilities, Progress Energy and Dominion Power, do not use the Summer Peak rate making because the Commission has said it is unfair and unreasonable.

… And the Commission's consumer-protecting Public Staff argues that Duke Energy should allocate part of its production costs based on customers' average usage year-round.

… And NC Attorney General Roy Cooper's expert witness testified in 2009 that Duke Energy's method *"does not consider, in any way, the extent to which customers use these facilities during the other 8,759 hours of the year … "*

But Duke Energy continues using the Summer Peak method because its rate cases in 2009 and 2011 were settled with the Commission's Public Staff prior to evidentiary hearings, thus the Commission did not revisit its 20-year rejection of Summer Peak.

The unfairness is getting much worse.

Duke Energy's Summer Peak method will impose most of the costs of building $20 billion-plus for new power plants on Duke's captive residential and small business customers, whose needs could be met more cheaply with energy efficiency, cogeneration and renewable energy.

As long as Duke Energy can recover its variable costs from data centers and other large-volume customers, while forcing smaller, captive customers to pay most of its fixed costs, the utility will profit by building more – and increasingly more expensive – nuclear and fossil-fuel plants.

The rapidly expanding data center sector provides Duke an excuse to build financially risky nuclear plants – and burn its giant coal-fired units for decades – even though some industry analysts believe long-term U.S. electricity demand could decrease due to higher prices and advances in efficiency and decentralized renewables.

Increasingly extreme summer temperatures exacerbate the unfairness of Duke's method.

Falling prices for photovoltaic solar power are leading high-load electricity customers to install large solar arrays, causing more "peak shaving" – shifting usage away from the hottest hours.

Duke Energy is promising more peak shaving options and special deals for large customers, shifting more and more costs to residential and small business ratepayers.

On top of rate inequity, Duke Energy, along with the state and local governments, offer data centers millions in other subsidy dollars just to come into North Carolina – although some of the largest server farms produce as few as 10 jobs per average work shift.

The N.C. Utilities Commission must act.

With three imminent big-utility rate cases, and Duke Energy seeking to add expensive and financially risky nuclear plants, it is urgent for the Commission to firmly abolish the Summer Peak allocation method and require the biggest customers to pay their fair share for new power plants built primarily to serve them.

Electricity is a miserable economic development tool. With Apple, Google and Facebook not paying their fair share, rising electricity rates for smaller customers is harming the North Carolina economy by raising prices on virtually all electricity-related goods and services.

Introduction: Energy Gobbling Data Centers Pay Rock-Bottom Prices

Duke Energy Carolinas President Brett Carter recently testified that Duke Energy is attracting new businesses to North Carolina because Duke Energy is the "lowest cost provider" of electricity for businesses in the 16 South Atlantic states. Duke Energy can offer rock-bottom rates to data centers by shifting much of the cost they place on Duke Energy's system onto residential and small business customers.

Analysis of data from Duke Energy's 2011 rate case shows that in 2010, Duke Energy's lowest-paying customer class was comprised of data processing and storage centers, which use the largest amount of electricity per customer. Also called "server farms," the data centers paid only 4.84 cents per kilowatt hour (kWh) on average, and far less in off-peak hours, while the residential classes paid an average of 9.13 cents/kWh, and the small business class paid 10.03 cents/kWh.[1]

Therefore, in the struggling economy, small businesses pay Duke Energy more than twice as much per kWh as Apple, the world's richest corporation, does as its new data processing center opening this year in Maiden, N.C.

But that's only part of the picture. Looking at total amounts per kWh does not adequately capture how unfairly Duke Energy's rates are biased in favor of high-load customers.

To more fully demonstrate the rate inequity, it helps to consider the portion of each class's payments to Duke Energy for fuel that class actually consumed, and the portion for all the remaining costs of Duke Energy's system.

Due to Duke Carolinas' monopoly status, the N.C. Utilities Commission permits guaranteed fuel cost recovery by which Duke Energy's fuel costs are collected from ratepayers on a dollar-for-dollar basis. By subtracting each customer class's actual fuel and fuel-related costs, approximately 2.39 cents/kWh in 2010,[2] from what that class paid, it is possible to calculate how much each class paid for all the other costs of Duke Energy's system – generation, transmission, and distribution system capital costs, along with operating and maintenance expenses that include salaries, pensions, materials, repairs, advertising, marketing, community relations, taxes, etc.

Duke Energy's 215,000 small business customers pay over three times as much per kWh as Google, Apple and Facebook pay, excluding fuel costs.

For the privilege of using Duke Energy's system and to cover all the non-fuel costs Duke imposed on ratepayers in 2010, data

[1] Total revenue divided by kWh multiplied by 100. See the Appendix: Methodology for more complete calculations. 2011. Duke Energy Carolinas, LLC. Docket E-7, Sub 989, Form E-1 Data Request, part 5.

[2] McManeus, Jane. North Carolina Utilities Commission supplemental testimony of Jane L. McManeus for Duke Energy Carolinas, LLC in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, pp. 2-3. 6 October 2011. 6 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=QAAAAA68111B&parm3=000135371.

centers paid only 2.45 cents/kWh. Residential customers paid 6.74 cents/kWh and small businesses paid 7.64 cents/kWh in non-fuel costs.

Customer Class	Non-fuel Rate (cents/kWh)
Data Centers*	2.45
High-load Industrial and Commercial (not including data centers)**	3.26
Residential**	6.74
Small Businesses***	7.64

* Customer class 'Optional Service Time of Use - High Load Factor'
** Several tariffs are included within the high-load and residential categories.
*** Customer class 'Small General Service'

Therefore, Duke Energy's 215,000 small business customers pay over three times as much per kWh as data centers pay (beyond actual fuel and fuel-related costs).

To illustrate the unfairness another way, the chart below shows the percentages certain customer groups paid in non-fuel related rates during 2010 compared with their energy consumed as a percentage of total energy produced:

Customer Class	2010 Energy Consumed	Non-fuel Revenue Contributed
Data Centers*	0.95%	0.45%
High-load Industrial and Commercial (not including data centers)**	40.28%	25.44%
Residential**	40.51%	52.82%
Small Businesses***	7.62%	11.26%

* Customer class 'Optional Service Time of Use - High Load Factor'
** Several tariffs are included within the high-load and residential categories.
*** Customer class 'Small General Service'

Thus the high-load classes (approximately 17,000 customers) consumed about the same electricity as the entire residential class (approximately 1,600,000 customers) but paid less than half of what the residential class paid towards the costs of Duke Energy's N.C. retail operation, above actual fuel costs, for 2010.

The high-load classes, including data centers, used 41.23% of the electricity and paid only 25.89% of the allocated costs (excluding fuel), while all other customers, combined, comprised 58.77% of Duke Energy's N.C. retail electricity sales but paid 74.11% of the costs.

The data center class (just 8 customers during the full year) used 0.95% of the electricity but paid only 0.45% of the non-fuel costs – and that was before Apple, Facebook and several other large data centers became operational during 2011-12. The numbers reported by Duke Energy appear to reflect actual revenues, but exact figures are difficult to obtain as the data centers have confidential contracts with Duke Energy and they will not report their own energy use.

Are Rates Rigged Against Homes And Small Businesses?

Duke Energy justifies its highest rates for residential and small business customers – and low rates for the biggest customers – by designing its cost-of-service "study" to allocate most of its costs to homes and small businesses.

As a monopoly corporate utility, Duke Energy Carolinas is allowed to recover its entire "revenue requirement" – the amount required to pay expenses and earn a fair return for investors – from its customers. The cost-of-service study determines how much of that revenue requirement is collected from each customer class.

Theoretically, such studies show how much of the utility's costs each class causes the utility to incur and thus should pay. The utility collects whatever a particular class costs the utility by setting what regulators determine to be an appropriate rate for that class.

Unfortunately, these cost-of-service studies can produce virtually any result the analyst chooses.

The word "study" suggests scientific or measurable standards, but it is impossible to determine which customers are using electricity from which power plants at any given time, so there is no way to know how much any given customer group actually "costs" Duke Energy. Therefore a cost-of-service study reflects numerous discretionary and subjective decisions about how to "assign" costs to various customer groups, thus determining what portion of the utility's costs each customer group will pay.

> ***The North Carolina Utilities Commission has recognized that a class's energy use year-round, not just its contribution to one hour of peak demand, should be considered in allocating production costs.***

Using broad discretion, Duke Energy's own analysts create formulas, or allocators, based on data and criteria of their choosing, which reflect what percentages of various cost categories they determine to be caused by each customer class, and then use those allocators to calculate Duke Energy's purported "cost to serve" the various classes. Then they embody those "costs to serve" in the rates. Allocating very few costs to a class makes it appear that the class costs very little to serve, thus keeping that class's rates low.

Most of Duke Energy's costs are attributable to the construction and operation of its power plants, so the formulas used to allocate those costs are the most important. Duke Energy, like other electric utilities, builds and operates three main types of power plants, in terms of function:

- Baseload – plants that are designed to run most of the time in order to meet around-the-clock demand for electricity (traditionally nuclear and coal, but recently including natural gas combined cycle units)
- Intermediate – plants that might run for several hours on particular days to meet demand beyond what the baseload plant can provide (coal, natural gas and hydro)
- Peaking – plants that can be quickly turned on or off to cover brief spikes in demand (natural gas and hydro)

In determining what kind of plants to build, the company must consider how it will supply energy to customers year-round, including how to meet demand during the relatively small number of hours when system usage hits its "peak." Duke Energy deals with a cost trade-off in determining which type of plant to build. For example, baseload plants such as nuclear are very expensive to build but the fuel is relatively cheap, largely because much of the fuel-related costs are externalized to the public. Peaking plants, by contrast, are relatively cheap to build, but historically their fuel and operations have been expensive.

Through its cost-of-service study, Duke Energy shifts costs away from the biggest customers – and onto small ones – with three main strategies:

1. allocating production costs based on the single hottest hour of the year
2. alerting the largest customers to minimize electricity use during that hour
3. basing many costs on the number of customers in a class – regardless of energy used

A Very Costly Hour

Duke Energy uses what is known in the industry as the Summer Coincident Peak ("Summer Peak") method to allocate all costs of production and all related costs. Because the production, or generation, of electricity accounts for most of Duke Energy's costs, the allocation method used to assign production-related costs is critical.

To allocate all costs of electricity production, Duke Energy looks at the single hour on a very hot summer afternoon when Duke Energy's electric load hits its "peak" for the year. Most residential and small business customers are running air conditioning full blast at that time.

But those customers tend to use much less electricity at other times of the day and year. In contrast, many high-load commercial and industrial customers use enormous volumes all day every day, including data centers. In determining what proportion of costs to allocate to each class, the Summer Peak method looks *only* at the one single "peak" hour and ignores all of the other hours in the year.

For instance, if the residential class used an average 30% of Duke Energy's electricity for 8,759 hours but 60% for the one peak hour, households would get stuck paying for 60% of Duke Energy's total production costs. If the high-load classes used an average of 30% of Duke Energy's electricity for 8,759 hours but just 20% during the one peak hour, they would pay for only 20% of Duke Energy's total production costs.

As the N.C. Utilities Commission Public Staff has argued for years, the Summer Peak method unfairly allocates most of Duke Energy's costs based upon a customer class's electricity use during *one single hour* in the year, ignoring usage or demand placed on Duke Energy's resources during the rest of the year.

To better understand how it works, consider the extreme scenario: Suppose a customer class demands and consumes vast amounts of electricity for every hour of the year – except for one hour during the year when the Duke Energy Carolinas system peaks. And suppose that during this one single hour of the year, that customer class turns off its electricity completely. Under Duke Energy's allocation approach, that customer class would not be responsible for a single penny of the billions of dollars of Duke Energy's generation-related costs. All other classes would pick up the entire bill for those costs, and the customer class which turned off its electricity for one hour would enjoy a totally free ride.

Duke Energy's deal for data centers and other high-load users is not a total free ride, but the inequity does not stop with the unfair allocation of production-related costs.

Under Duke Energy's approach, a customer class's percentage of the single annual peak hour is used to allocate not just the costs of building the power plants – including roads, trestles, bridges, cranes, etc. – but also dozens of other "demand-related" costs such as depreciation, property taxes, scrubbers, purchased power, and so on.

Furthermore, because of the complex mathematical calculations embedded in the cost allocation models, each customer class's Summer Peak percentage also affects many other "allocators" and thus disproportionately imposes on small customers millions of dollars annually in other costs, including certain corporate overhead and other operating and maintenance expenses such as employee salaries and benefits.

Unlike Duke Energy's Summer Peak method, most cost allocation methodologies include a component for a customer class's annual electricity use or otherwise take into account usage at times other than a single summer hour. By excluding consideration of average electricity use, Duke Energy protects its high-load customers from paying rates proportionate to the costs Duke Energy actually incurs to provide the voluminous electricity they use year-round. Those costs are shifted to others.

N.C. and National Regulators Reject Duke Energy's Method

The National Association of Regulatory Commissioners' Cost Allocation Manual dated 1992 (which has not since been revised) stated: "In the past, utility analysts thought that production plant costs were driven only by system maximum peak demands." The clear implication – 20 years ago – was that analysts had realized that production costs are *not* driven only by peak demand. Yet Duke Energy continues using an allocation method that considers *only* peak demand.

In cases involving Carolina Power & Light (now Progress Energy) and North Carolina Power (now Dominion Power), the N.C. Utilities Commission has recognized that a class's energy use year-round, not just its contribution to one hour of peak demand, should be considered in allocating production costs.

In 1988, Carolina Power & Light and its industrial customers asked the N.C. Commission to switch to a peak-only method, but the Commission refused, stating:

> Without baseload plants, CP&L would simply not be able to serve its high load factor customers**. It is only appropriate that high load factor customers pay their share of the cost of the base load plants built primarily to serve them.**[3] (emphasis added)

Similarly, in 1990, the N.C. Commission required Dominion Power to retain the "summer winter peak average" allocation method because "the method also recognizes that not all production plant fixed costs are demand-related, and it recognizes that energy-related production plant fixed cost should be allocated by kWh energy." [4] Both Dominion Power and Progress Energy still use the Summer Winter Peak Average allocation method, which considers not just summer and winter peaks but also customers' average usage year-round.

During the past 20 years, the N.C. Utilities Commission has not made a single ruling that either moderates or nullifies its own rejection of the Summer Peak method.

In addition to the N.C. Commission's opposition to Summer Peak cost allocation, for over 20 years the Commission's Public Staff – whose job it is to represent the "using and consuming public" – has advocated requiring Duke Energy to allocate part of its production costs based on customers' average use year-round.[5]

In Duke Energy's 2009 rate case, Public Staff witness James McLawhorn, the head of the Staff's electric utility division, advocated requiring Duke Energy to use a methodology that "accurately reflects electric utility system planning" because utilities build power plants for their system's needs year-round, not just for one hour. In 2011, Public Staff witness Jack Floyd recommended requiring Duke Energy to use a methodology that appropriately "recognizes that a portion of plant costs, particularly for base load generation, is incurred to meet annual energy requirements and not solely to meet peak demand."[6]

In 2009, the N.C. Attorney General's expert economist, Glenn Watkins, captured the unfairness of Duke Energy's Summer Peak method:

> … the sole criterion for assigning one hundred percent of fixed capacity costs is the classes' relative contributions to load during a single hour of the year. **This method ignores and does not consider, in any way, the extent to which customers use these facilities during the other 8,759 hours of the year, nor does it consider the bases or reasons that the plant investment was incurred; i.e., why the generation mix of plants were placed into service.** (emphasis added)[7]

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[3] Docket E-2, Sub 537, Order Granting Partial Increase in Rates and Charges, p. 130

[4] Docket E-22, Sub 314, Order Approving Partial Rate Increase, p. 17.

[5] See, e.g., Dockets E-7 Sub 487, E-7 Sub 828, and E-7 Sub 909.

[6] Floyd, Jack L. North Carolina Utilities Commission testimony of Jack L. Floyd for The Public Staff of The North Carolina Utilities Commission in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 4. 1 November 2011. 27 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=2AAAAA50311B&parm3=000135371.

[7] Watkins, Glenn A. North Carolina Utilities Commission direct testimony of Glenn A. Watkins for North Carolina Attorney General's Office in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 909, p. 10. 2 October 2009. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-

He further explained the importance ….

> This may have severe consequences because a utility's planning decisions regarding the amount and type of generation capacity to build and install is predicated not only on the maximum system load, but also on how customers demand electricity throughout the year, i.e., load duration. To illustrate, if a utility such as Duke, had a peak load of 20,000 MW [megawatts] and its actual optimal generation mix included an assortment of nuclear, coal, hydro, combined cycle and combustion turbine units, the total actual cost of capacity would be significantly higher than if the utility only had to consider meeting 20,000 MW for 1 hour of the year. This is because the utility would install the cheapest type of plant, (i.e., peaker units) if it only had to consider one hour a year.[8]

Because Duke Energy's 2009 and 2011 rate cases were settled with the Public Staff prior to full-blown evidentiary hearings, the Commission was not given the opportunity to confirm its 20-year rejection of the Summer Peak allocation method.

Helping Big Users Avoid That One Crucial Hour

Reducing or eliminating their electric load during the single peak hour enables big customers to shift even more costs to residential and small-business ratepayers.

Not only does the Summer Peak methodology ignore how electricity is used 8,759 hours of the year and how Duke Energy's production facilities are planned and utilized, it also gives large customers a wide-open opportunity for "gaming" the system to shift even more costs onto the backs of residential and small business ratepayers. As spelled out by the Public Staff's Jack Floyd:

> As some customers can interrupt significant portions of their load during the summer coincident peak hour, use of the [Summer Peak] would reduce the allocation of production plant costs for that class, despite having significant energy requirements from the utility's generating plants for the remainder of the year. These cost burdens are then shifted to other customer classes.[9]

Individual customers that shave peak load can benefit directly by avoiding "peak" prices and by getting interruption credits on their bills; and their entire customer class benefits from reducing the class's share of peak production and thus its electric rates. As a matter of standard practice, Duke Energy notifies large commercial and industrial customers in advance when the summer "peak" is likely to occur, so the customers can temporarily

During the past 20 years, the N.C. Utilities Commission has not made a single ruling that either moderates or nullifies its own rejection of the Summer Peak method.

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bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=OBAAAA57290B&parm3=000130688.

[8] Ibid.

[9] Floyd, Jack L. North Carolina Utilities Commission testimony of Jack L. Floyd for The Public Staff of the North Carolina Utilities Commission in the Matter of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 16.

Duke Energy's notification to selected customers that it is time to "peak shave" helps keep their rates low and the rates of smaller customers growing higher.

switch to diesel generators or otherwise reduce their usage of Duke Energy's electricity, thus "shaving" off their percentage of peak demand. Mr. Rosa, a witness for Food Lion in 2011, said, "Our current utility load profile will allow us to decrease peak demand on call from the utility by either shedding kW load during the peak hours or providing onsite power generation."[10] Mr. Chriss testified that Walmart "has the ability to reduce peak demand through peak-shaving distributed generation systems at a number of our facilities"[11]

This peak shaving on call from the utility exacerbates the free ride problem inherent in the Summer Peak allocation method.[12] Customers that can switch to generators or even "disengage from the utility grid" during that single summer peak hour can dramatically reduce their class's obligation to pay for power plants and transmission facilities they use 8,759 hours of the year. They get a free ride or, at least, a very cheap ride.

In Duke Energy's 2009 case, Public Staff witness McLawhorn described how peak-shaving works:

> For example, under the [Summer Peak] cost allocation methodology, if a customer class with a load of 2,000 MW [megawatts] could reduce its class load by 300 MW at the time of the one-hour system peak, it would then be allocated production plant based on the contribution of the remaining 1,700 MW of load to the one-hour system peak. Yet the 300 MW of curtailed load may be present the remaining 8,759 hours (or a substantial portion thereof) of the year using energy produced by plants to which it has been assigned no costs.[13]

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[10] Rosa, Wayne. North Carolina Utilities Commission direct testimony of Steve W. Chriss and Wayne Rosa for the Commercial Group in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 13. 31 October 2011. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=VAAAAA50311B&parm3=000135371.

[11] Chriss, Steven W. North Carolina Utilities Commission direct testimony of Steve W. Chriss and Wayne Rosa for the Commercial Group in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 13. 31 October 2011. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=VAAAAA50311B&parm3=000135371.

[12] Watkins, p. 11, Docket E-7, Sub 909

[13] McLawhorn, James S. North Carolina Utilities Commission testimony of James S. McLawhorn for The Public Staff of the North Carolina Utilities Commission in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 909, p. 9. 2 October 2009. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=MBAAAA57290B&parm3=000130688.

Additionally, customers that allow Duke Energy to interrupt their service at peak times receive credits on their electric bills. Duke Energy allocates the cost of those "interruptible credits" *to all customers* using the Summer Peak method, thus shifting the cost of the credits primarily to residential and small business customers.

Duke Energy's notice to its biggest customers to shed peak load is arguably pursuant to N.C.G.S. 62-155(b), which provides as follows:

> If the Utilities Commission after study determines that conservation of electricity and economy of operation for the public utility will be furthered thereby, it shall direct each electric public utility to notify its customers by the most economical means available of the anticipated periods in the near future when its generating capacity is likely to be near peak demand and urge its customers to refrain from using electricity at these peak times of the day.

The statute does not, however, authorize utilities to notify only *certain* customers (who use the special notice to shift large portions of their costs onto other customers). There is apparently no regulation or directive authorizing utilities to notify a select group of customers of the approaching peak.

Under Duke Energy's current practices, peak shaving's bigger – and unfair – consequence is to enable huge users to potentially shift the cost of all new generation facilities, including much more expensive baseload coal and nuclear plants, onto residential and small business customers.

Demand-side management (DSM) programs have electronic means of communicating directly between utility and customer, or direct email/phone calls (i.e., there is a direct link between system operator and DSM resource). For large commercial and industrial customers in general outside of a DSM program, account managers in Duke Energy calls or emails these customers about the approaching peak.

By briefly shaving or completely curtailing their use of Duke Energy's electricity during the only hour that counts for rate allocation, big industrial and commercial ratepayers can avoid paying their fair share of expensive coal and nuclear plants, including the cost of scrubbers. Duke Energy's notification to selected customers that it is time to "peak shave" helps keep their rates low and the rates of smaller customers growing higher.

To be clear, peak shaving benefits all customers to some extent by helping Duke Energy avoid building more peaking gas-fired power plants. But that desirable consequence has a small impact because peaking plants are relatively cheap to build compared to baseload coal and nuclear units.

Duke Energy's own witness Bailey testified in 2011, when large-volume customers sought higher compensation for curtailing their service at peak, that reducing peak loads does not save Duke Energy (or its captive small-volume ratepayers) much money because the avoided natural gas plants would be inexpensive to build.[14] Under Duke Energy's current practices, peak

[14] Bailey, Jeffrey R. North Carolina Utilities Commission direct testimony of Jeffrey R. Bailey for The Duke Energy Carolinas, LLC in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of

shaving's bigger – and unfair – consequence is to enable huge users to potentially shift the cost of *all* new generation facilities, including much more expensive baseload coal and nuclear plants, onto residential and small business customers.

Duke Energy's under-construction Cliffside coal-fired plant is expected to cost $2.4 billion, and many analysts predict that new nuclear reactors will cost over $10 billion each if they can ever be completed. Thus, the small amount residential and small business customers save from avoiding a new peaking plant is far outweighed by paying more than their fair share for much costlier coal and nuclear plants. The only reason new plants are needed at all is the demand created by new data centers in North Carolina – overall demand for the rest of Duke Energy's service area has been flat or declining.

Yet Another Insult to Smaller Customers

Duke Energy Carolinas allocates many distribution and corporate overhead costs by the mere number of customers in a class, regardless of how much electricity is used, leaving huge customers such as Apple, Google and Facebook paying the same dollar amount of those costs as a low-income apartment dweller or a small store.

In the cost-of-service spreadsheet submitted with its 2011 rate case, Duke Energy's allocated cost for "Customer Service and Information" (including salaries) was $33,264,000. Of that, the residential class was allocated $28,701,000 (86%) and all of the high-load classes combined, which used more electricity than the entire residential class, were allocated only $308,000 (0.9%).[15] These figures represent revenue if Duke Energy had received its full requested rate increase. Since they only received a portion of that request actual amounts will differ, but are unavailable.

Customer Class	Cost for Customer Service and Information
All Classes Combined	$33,264,000
Residential	$28,701,000
High-load Industrial and Commercial (including data centers)	$308,000

Although their numbers are not shown separately on Duke Energy's spreadsheet, the entire data center class was apparently allocated about $151.20 under this line item – approximately $18 each for each data center. Those three corporate giants likely have their own Duke Energy "major account representatives" providing each of them with substantially more than $18 worth of "customer service."

Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 9. 1 July 2011. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=IAAAAA28111B&parm3=000135371.

[15] Duke Energy Carolinas, LLC. Docket E-7, Sub 989. Cost of Service Study for the Test Year Ended December 21, 2010. Book Revenue – Summer CP. Rows 554 and 570, columns F, G and AD.

The costs allocated by number of customers, while not involving nearly as many dollars as generation costs, vividly illustrate the arbitrary – even fictional – nature of cost "causation."
For instance, current customers are paying for costs Duke Energy has already incurred for recruiting data centers and developing commercial parks for them. These data centers enjoy incentives once they are here, such as discounted electricity rates for years, state and local economic incentives, enormous amounts of water, exemption from paying taxes on electricity purchases, etc.

If Duke Energy is going to spend huge sums for new baseload plants, the biggest customers driving most of the baseload demand should pay their fair share of the costs.

Poised For Even Greater Unfairness

The unfairness of Duke Energy Carolinas' cost allocation and rates are about to get much worse, if the giant utility has its way.

New Baseload Plants Under the Guise of Peaking Needs?

The Summer Peak allocation method will impose most of the costs of building new baseload power plants – and scrubbing or rebuilding old coal plants – on Duke Energy's captive residential and small-business customers, whose needs could be met more cheaply with energy efficiency, cogeneration and renewable energy.

The new Cliffside coal plant is being built – and new nuclear plants are being proposed – not to provide electricity during that very brief window of time when Duke Energy's system uses the most electricity. They are baseload plants meant to provide energy to all of Duke Energy's customers year-round, and they are very costly to build.

Attorney General expert Watkins noted in 2009: "approximately 88% of Duke Energy's total annual energy is generated from [its] baseload units." By using the Summer Peak method to ignore big customers' year-round constant use of its coal and nuclear plants, Duke Energy enables its largest customers to avoid paying their fair share for the expensive baseload coal and nuclear facilities they depend on more than any other class of customers.

Jack Floyd of the NCUC Public Staff explained why it would be unfair to use Summer Peak methodology to burden residential ratepayers – and other small users – further with most of the costs of Cliffside and new nuclear plants:

> Cliffside is certainly not being built solely to meet peak demand. Also, the proposed need for new nuclear units in the last few [Integrated Resource Plans] is not being driven by peak demand, but by energy needs.[16]

Mr. Floyd also testified: "My review of Duke's latest IRP reveals that Duke's assertion that its selection of production resources is based solely on meeting the summer peak clearly is not the case, both in terms of Duke's current and planned mix of generation resources…. Peaking

[16] Floyd, Jack L. North Carolina Utilities Commission testimony of Jack L. Floyd for The Public Staff of the North Carolina Utilities Commission in the Matter of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 9.

resources actually represent approximately 25% of Duke's generation system capacity."[17] Most of Duke Energy's electricity comes from expensive-to-build coal and nuclear plants, not its much cheaper peaking plants**. If Duke Energy is going to spend huge sums for new baseload plants, the biggest customers driving most of the baseload demand should pay their fair share of the costs.**

Undercharging the biggest customers with the most political and economic clout would understandably facilitate Duke Energy's expansion plans. The 1993 National Association of Regulatory Utility Commissioners report on Cost Allocation for Electric Utility Conservation and Load Management Programs foresaw this problem:

> [E]xisting regulation may be providing an incentive to promote uneconomic load growth….To the extent there is a reasonable expectation of being able to increase rates to recover the cost of capacity additions, utilities may find it profitable to focus on short-run considerations and expand sales at prices which are below the full long-run marginal cost of the energy sold, but above the utility's short-run marginal production cost.[18]

As long as Duke Energy can recover its variable costs from the data centers and other large-volume customers and force smaller, captive customers to pay most of its fixed costs, Duke Energy will continue to profit by building more – and more expensive – centralized power plants.

The rapidly expanding data centers provide an excuse to build expensive nuclear plants in a time when some industry analysts believe long-term U.S. electricity demand could decrease due to advances in efficiency and distributed renewables. But Duke Energy's residential and small business customer classes will be stuck with continuing "rate shock" from the new baseload coal plant at Cliffside, from any new nuclear plants, and from additional investments in Duke Energy's large fleet of coal-burning plants, which the utility plans to use for decades, according to its 2010 and 2011 Integrated Resource Plans.

During 2010, Duke Energy's average data center customer used almost 3,200 times as much electricity as the average small business customer.

Plummeting Solar Prices = More Peak Shaving

Falling prices for photovoltaic solar power is leading more high-load electricity customers to install large solar power arrays. While this has some benefit, it also facilitates more peak shaving because solar is most effective on hot summer days.

For example, Apple is building a 20 MW solar farm, which could shave huge amounts from Apple's peak load, helping keep data center rates low while increasing the burden on the residential and small business classes. (Apple is already set to shave its peak load with "a chilled water storage system to improve chiller efficiency by transferring 10,400 kWh of electricity consumption from peak to off-peak hours each day."[19] Other data centers are likely using such systems to reduce their peak loads.

[17] Ibid, p. 8.
[18] 1993, National Association of Regulatory Utility Commissioners. *Cost Allocation for Electric Utility Conservation and Load Management Programs.*
[19] Apple, Inc. "Environmental Progress." *Apple and the Environment.* 30 April 2012. http://www.apple.com/environment/progress/.

Duke Energy contends its customers' electricity consumption is "confidential," so the ratepayers to whom costs are being shifted have no way of knowing exactly how much cost-shifting is happening. But this much is clear: If all the big data centers work as hard as Apple to shift or shave peak load, that customer class could avoid paying any significant portion of the cost of new coal and nuclear plants despite using huge volumes of electricity from those plants. Having their own separate, small class – just 8 full customers during 2010 – helps data centers reap the benefits of peak-shaving, whereas a residential customer's refusal to use air conditioning – thus shaving peak usage – does not really impact his or her rates because that class contains 1,600,000 members.

Additionally, if solar prices continue to plummet – and especially if battery storage technologies develop as predicted – many customers from all rate classes may simply go off the grid to a large degree, thus leaving the costs of new power plants to be borne by customers who are unable to install solar power.

Data Monsters Keep Growing – but Create Few Jobs

As data centers that use as much electricity as 40,000 – 80,000 homes consume higher percentages of Duke Energy's "production," it will become increasingly less rational to allocate the costs of production – and all related costs – by a method that ignores data centers' monstrous energy usage all day, every day.

For the past few years, Duke Energy has been aggressively recruiting huge information technology companies like Apple, Google, and Facebook to come to North Carolina. Duke Energy says it recruits data centers **"because they run full-out, 24-7, with no shifts and no seasonality…. It's the type of customer where the meter spins and spins at an exponential pace. It may be the most ideal customer we could have."**[20]

In Duke Energy's 2011 rate case, Gary Cook of Greenpeace International summarized the electricity use and projected growth of data centers:

> Data centers … currently consume 1.5-2% of all global electricity, and are growing at a rate of 12% per year globally…. Data centers' electricity use grew nearly 60% globally from 2007 to 2010 in a horrible economy (40% in the U.S. alone), with estimates it will grow 3-4 fold by 2020…
>
> Electricity demand from data centers is the fastest growing source of IT energy use. Utility-scale data centers continue to grow even larger in scale and store larger amounts of data … The nearly completed Apple iDataCenter in Maiden, N.C., is one of the largest, with maximum estimated electricity demand conservatively estimated at 100MW, exceeding the equivalent of 80,000 U.S. homes.[21]

[20] Gillespy, Clark. Duke Energy. *Apple Sweetens N.C. Economic Picture; Duke Helped Make the Deal.* 30 April 2012. http://www.wired.com/wiredenterprise/wp-content/uploads//2012/04/ctc-apple-duke.pdf.
[21] Cook, Gary. North Carolina Utilities Commission direct testimony of Gary Cook for The Public NC WARN, NC Justice Center, and NC Housing Coalition in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, pp. 2-3. 31 October 2011. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-

As the big customers get better rates, credits, and discounts, smaller business and residential customers must make up the difference.

During 2010, Duke Energy's average data center customer used almost 3,200 times as much electricity as the average small business customer. Since that time additional, larger data centers are being built, for example, a huge AT&T data center in Cleveland County.[22]
This is driving even greater demand for electricity that residential and small business customers are subsidizing.

For all this "cheap" electricity – and the damage it does to our air and water – data centers create very few jobs. They are basically huge warehouses filled with stacks of computer servers. Contrary to claims of great economic benefits they bring with them, these data centers are doing very little to strengthen the jobs situation in the state. As noted in a news report, "Facebook has begun construction on a second huge data center in Forest City, North Carolina, even as it prepares to bring its first facility online." However, a total of only 40 staff will operate the two 300,000 square foot structures – an average of 10 workers per shift.[23]

Worsening Summer Peaks and Unfairness

Increasingly extreme temperatures will exacerbate the unfairness of the Summer Peak allocation method.

Scientific evidence shows our weather is getting more extreme and "peakier," as documented by NASA researchers.[24]

As extreme heat waves become more common, allocating costs on the basis of a single summer peak will become even more arbitrary. The summer peak on one 108-degree day could shift Duke Energy's costs even more overwhelmingly onto the residential and small business classes – who will be using their air conditioners full blast while large electricity users will be able to offset their peak demand as mentioned earlier.

In Duke Energy's latest rate case, the expert witness for the Carolina Industrial Group for Fair Utility Rates testified that 2010 was an "anomalous" year that produced extreme results: "the peak load data is not normal." The summer peak load was extremely high because that one peak day was extremely hot (and the winter peak load was "abnormally" high because that one peak day was extremely cold).[25]

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bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=UAAAAA50311B&parm3=000135371.

[22] Bethea, April. "AT&T to build data center in Kings Mountain." *The Charlotte Observer.* 22 February 2012. 30 April 2012. http://www.charlotteobserver.com/2012/02/22/3035357/gov-bev-perdue-to-make-jobs-announcement.html#storylink=misearch.

[23] Miller, Rich. "Data Center Knowledge." *Facebook to build second data center in N.C.* 4 October 2011. 23 April 2012. http://www.datacenterknowledge.com/archives/2011/10/04/facebook-to-build-second-data-center-in-nc/.

[24] For example, see NASA climatologist James Hansen's recent paper about the new "climate dice": http://www.columbia.edu/~jeh1/mailings/2011/20111110_NewClimateDice.pdf

[25] Phillps Jr., Nicholas. North Carolina Utilities Commission direct testimony of Nicholas Phillips Jr. for Carolina Industrial Group for Fair Utility Rates in the Matter of Application of Duke Energy Carolinas, LLC for Adjustment of Rates and Charges Applicable to Electric Service in North Carolina. Docket E-7 Sub 989, p. 7. 31 October 2011. 30 April 2012. http://ncuc.commerce.state.nc.us/cgi-

Scientists increasingly predict that old weather data regarding temperature extremes, "hundred-year" floods, and the like are not meaningful anymore. The climate is changing so rapidly – and influencing the weather so dramatically – that we can expect many years to be "anomalous." There is no longer any "normal" with regard to weather patterns.

More Deals Ahead For Data Centers

As rates rise, both "peak shaving" and special rates and discounts for large commercial and industrial customers are increasing, shifting more and more costs to residential and small business ratepayers.

The settlement agreement in Duke Energy's 2011 rate case requires the parties to "continue to investigate the feasibility of dynamic pricing rate structures, including but not limited to critical peak pricing and time-of-use rate structures…." The big industrial and commercial groups, Food Lion, and Walmart all sought more lucrative benefits for peak shaving, such as an increase in interruption credits (costs of which would be borne mostly by residential and small business customers).

Duke Energy's witness Bailey assured the big customers that Duke Energy plans to file enhancements to its Power Share program – credits for curtailment – in 2012. New benefits for big customers also included a "Transformation Discount," cheaper hourly rates, and lowering the high-load commercial rate. As the big customers get better rates, credits, and discounts, smaller business and residential customers must make up the difference.

Fairer Cost Allocation

For years, the N.C. Utility Commission's Public Staff has recommended a less biased cost allocation method known as the Summer/Winter Peak Average (SWPA) method, as used by Progress Energy and Dominion Power. And for years the Commission has required Duke Energy to perform two cost-of-service studies, one using Summer Peak allocation and another using SWPA. But for the 2010 test year, SWPA also produced skewed results because the winter peak was as cold as the summer peak was hot.

To avoid unfairness caused by considering only "atypical" very hot and very cold peaks, some states average several years of peaks. The Federal Energy Regulatory Commission recommends averaging the peaks in all 12 months.

Even better, in Duke Energy's 2009 rate case, N.C. Attorney General Roy Cooper's expert economist recommended the "baseload, intermediate, peak" method, which bases rates on actual examination of what type of power plants various customer groups use.

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bin/webview/senddoc.pgm?dispfmt=&itype=Q&authorization=&parm2=ZAAAAA50311B&parm3=000135371.

Conclusion

Setting electric rates based on a single, hot summer hour is demonstrably unwise and unfair.

Offering cheap electricity is a lousy economic development tool. Because policy-makers consider it appropriate to let Apple, Google and Facebook avoid paying their fair share, the resulting increases of electricity rates for smaller customers threatens the entire North Carolina economy by raising prices on virtually all electricity-related goods and services, thus reducing the buying power of every resident.

With utility-scale data centers flocking to North Carolina for cheap electricity, it is becoming more and more unfair for Duke Energy to allocate its production (and "production-related") costs using a method that does not take average energy use into account.

With Duke Energy seeking to add expensive baseload plants to its rate base, and with Progress Energy and Dominion Power indicating interest in switching to Duke Energy's biased Summer Coincident Peak methodology in imminent rate cases, it is urgent for the N.C. Utilities Commission to require Duke Energy to adopt a more fair, less arbitrary methodology for setting rates.

APPENDIX: Methodology

Data Source

Data used for calculations in this report are primarily from Duke Energy Carolinas Docket E-7 Sub 989, E-1 Item 42C, pages 1-16. The figure used for Duke's fuel costs for 2010 is found in the testimony of Duke Energy's witness McManeus as cited in the report.

Pages 1-16 of E-1 Item 42C contain exhibits for the following rate schedules:

- Residential Service (RS),
- Residential Service Energy Start Standard (ES),
- Residential Service – Electric Water Heating and Space Conditioning (RE),
- Residential Service – Energy Star All Electric (ESA),
- Residential Service – Time of Use (RT),
- Residential Service – Time of Use (WC),
- Building Construction Service (BC),
- Small General Service (SGS),
- Large General Service (LGS),
- Optional Service Time of Use – Commercial Customer (OPTG),
- Optional Service Time of Use – Energy Only (PILOT) (OPTE),
- Optional Service Time of Use – High Load Factor (OPTH),
- Optional Power Service Time of Use Industrial Customers (OPT),
- Industrial Service (I),
- Parallel Generation Customers (PG), and
- Traffic Signal Service (TS).

Total kWh is the quantity listed in each rate schedule row "Total kWh" and under the column "Test Year Billing Units."

Reported Rate Revenue is the quantity listed in each rate schedule row "Equals reported rate revenue (base rates)" and under the column "Present Revenue".

On the rate schedule on p. 10 (Optional Service Time of Use – Commercial Customers) and rate schedules p. 13-16 (Optional Power Service Time of Use Industrial Customers, Industrial Service, and Parallel Generation Customers), there is no row listing "Equals reported rate revenue (base rates)." Instead, the last listed reported booked revenue quantity under the column "Present Revenue" is the *Adjusted Reported Rate Revenue or Reported Rate Revenue*.

Test Year Billing Units is the quantity listed in each rate schedule row "Basic Facilities Charge" and under the column "Test Year Billing Units".
The rate schedules were divided into groups based on customer class.

The Residential category contained the rate schedules for Residential Service (RS), Residential Service Energy Star Standard (ES), Residential Service – Electric Water Heating and Space Conditioning (RE), Residential Service – Energy Star All Electric (ESA), Residential Service – Time of Use (RT), and Residential Service – Time of Use (BC).

The Small Business customer category as used in the report refers only to customers billed under the rate schedule for Small General Service (SGS). (Some customers billed under other schedules might also consider themselves small business, most small business that do not use huge volumes of electricity are apparently billed under the SGS tariff.)

The High-load industrial and commercial category includes customers billed under the rate schedules for Optional Service Time of Use – Commercial Customers (OPTG), Optional Service Time of Use – Energy Only (PILOT) (OPTE), Optional Power Service Time of Use Industrial Customers (OPT), and Optional Service Time of Use – High Load Factor (OPTH).

For the purpose of the report, some calculations were also made that separated the customer class for Data Centers, Optional Service Time of Use – High Load Factor (OPTH), from the rest of the High-Load Customer classes.

The remaining rate schedules were not used for any calculations other than Total Rate Revenue, Total kWh and Total Revenue without Fuel Costs because they are not part of the primary customer classes that are being addressed in the report. These rate schedules include Building Construction Service (BC), Large General Service (LGS), Industrial Service (I), Parallel Generation Customers (PG), and Traffic Signal Service (TS).

Price of Electricity

For each rate schedule, the Price for Electricity (in cents/kWh) was determined by dividing the *Reported Rate Revenue* by the *Total kWh* and multiplying by 100.

$$\frac{\textit{Reported Rate Revenue}}{\textit{Total KWH}} \times 100 = \text{Price for Electricity (cents/kWh)}$$

For each rate schedule, the price for electricity without fuel cost was determined by subtracting 2.39 from the Price for Electricity (cents/kWh). This amount (2.39) is the price of fuel per kWh as quoted from the testimony of Duke Energy's witness McManeus cited in this report's introduction. Because Duke Energy fuel costs vary during a given year and by customer class, this number cannot be precise but is a close approximation of how much of each customer class's cost per kWh is for fuel that class actually consumes.

$$\text{Price for Electricity (cents/kWh)} - 2.39 = \text{Non-Fuel Price (cents/kWh)}$$

For each rate schedule, the Non-Fuel Price was multiplied by the *Total kWh* and then divided by 100 to get Revenue without Fuel Costs in dollars.

$$\frac{\text{Non-Fuel Price (cents/kWh) x } \textit{Total kWh}}{100} = \text{Revenue without Fuel Costs (dollars)}$$

The Price for Electricity (in cents/kWh) for the Residential customer class was determined by finding the sum of the *Reported Rate Revenue* for all rate schedules in the Residential Customer Class, dividing it by the sum of the *Total kWh* for all rate schedules in the same class, and then multiplying by 100.

$$\frac{\text{Sum (Res. Reported Rate Revenues)}}{\text{Sum (Res. Total KWH)}} \times 100 = \text{Res. Customer Class Price (cents/kWh)}$$

The same process was repeated with data from the High Load Customer Class and High Load Customer Class excluding data centers to find The Price for Electricity (in cents/kWh) for those customer classes. This price includes the utility's price for fuel, which is very close to the same for all customer classes.

For Residential, High Load, and High Load without Data Center customer classes, the aggregate price for electricity without the cost of fuel was determined by subtracting 2.39 (fuel price in cents/kWh) from the Customer Class' Price for Electricity (cents/kWh).

$$\text{Class Price for Electricity (cents/kWh)} - 2.39 = \text{Class Non-Fuel Price (cents/kWh)}$$

For Residential, High Load, and High Load without Data Center customer classes, the aggregate Non-Fuel Revenue was determined by multiplying the Class Non-Fuel Price (cents/kWh) by the Total kWh of that class divided by 100.

$$\frac{\text{Class Non - Fuel Price (cents/kWh) x Sum (Class Total kWh)}}{100} = \text{Class Non - Fuel Revenue (dollars)}$$

The above two calculations were not performed for Small Business and Data Center Only Classes because they only contain one rate schedule, and therefore the non-fuel revenue calculations for those classes do not need to be aggregated.

Percentage of Energy Consumed and Percentage of Revenues

The percentage that each class contributes to the total kWh used by all customers was determined by dividing the Total kWh of each class by the Total kWh of All Schedules and then multiplying by 100.

$$\frac{\text{Sum (Class Total KWH)}}{\text{Sum (Total KWH All Schedules)}} \text{ x } 100 = \text{Class Percent of Total kWh}$$

The percentage that each class contributes to the total Non-Fuel Revenue produced by all customers was determined by dividing the Non-Fuel Revenue produced by each class by the Total Non-Fuel Revenue of all the schedules and then multiplying by 100.

$$\frac{\text{Sum (Class Non - Fuel Rev.)}}{\text{Sum (Non - Fuel Rev. All Schedules)}} \text{ x } 100 = \text{Class Percent of Total Non-Fuel Rev.}$$

Number of Customers

In order to cite information about the relative size of each customer class within the body of the report, the number of customers assigned to each class was determined by finding the sum of the *Test Year Billing Units* from all rate schedules in a class and dividing by 12 (because billing units are produced for each customer monthly and test data is for the period of one year).

$$\frac{\text{Sum (Class Test Year Billing Units)}}{12} = \text{Number of Customers in Class}$$