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## OPERATIONS

Excel in Safety,  
Operational  
Performance and  
Environmental  
Stewardship

### 2016 Highlights

- Maintained industry leading safety performance with a Total Incident Case Rate (TICR) of 0.40.
- Set a new fleet record of 95.7 percent for nuclear capacity factor; the 18th consecutive year of attaining a 90-plus percent capacity factor.
- Since 2005, decreased carbon dioxide emissions by 29 percent, sulfur dioxide emissions by 94 percent and nitrogen oxides emissions by 70 percent.
- Received a new operating license for the Keowee-Toxaway Hydroelectric Project from the Federal Energy Regulatory Commission.
- Remained on track to increase the amount of solid waste that is recycled from 69 percent in 2013 to 80 percent in 2018.

### Challenges and Opportunities

- Maintain top-decile safety performance in TICR and continue to focus on the prevention of serious injuries to our employees and contractors.
- Continue to demonstrate our commitment to operational excellence, which is a foundation to any success we achieve.
- Significantly decrease outage frequency and duration for our customers through our grid modernization programs.
- Invest \$11 billion in cleaner generation over the next 10 years.
- Continue to move to a lower-carbon future by reducing our carbon dioxide emissions by 40 percent from the 2005 level by 2030.



Davis Montgomery / Government and Community Relations Manager   Adam Fischer / Greensboro Department of Transportation Director

## Investing in Electric Vehicle Infrastructure

For the past decade, Duke Energy has been active in building hundreds of public charging stations at parking decks, libraries and shopping areas. That infrastructure is needed as electric vehicles (EV) become a growing part of the nation's auto fleet.

That effort will continue in 2017 as more than 200 public EV charging stations are being installed under Duke Energy's \$1.5 million "EV Charging Infrastructure Project" in North Carolina.

Stations are planned in almost 50 counties around the state. The project received overwhelming interest, with more than 500 charging stations requested.

Recipients have the ability to put the charging stations in a location of their choice – and operate them how they see fit.

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Also part of the project, a \$450,000 grant from Duke Energy will help Greensboro's Department of Transportation install an electric charging station for a future influx of all-electric buses. The rapid-charging station can replenish a bus battery array in seven to 10 minutes.

The Greensboro Transportation Authority is transitioning its fleet of 47 diesel buses to all-electric vehicles. Over the next 10 years, the city plans to pair \$4.5 million in voter-approved bonds with federal funds to replace diesel buses that have met or exceeded their useful life.

Electric buses have no tailpipe emissions and are up to four times as economical to operate as conventional buses. Greensboro could have its first two or three electric buses on the streets by 2018.

Both programs were part of a 2015 settlement with the U.S. Environmental Protection Agency and various environmental groups.



Aleksandar Vukojevic / Technology Development Manager    Rodney James / Technology Development Manager

## Drones: From Testing to Real-Life Applications

A few years ago, Duke Energy was among a handful of utilities testing what unmanned aerial vehicles (better known as drones) could do for its business.

Through the company's Emerging Technology Office, Duke Energy looks at budding technologies that may be useful in three to 15 years. It investigates a number of possible scenarios to see if these new technologies can lower costs and allow us to work better and safer.

Many rounds of testing has led the company to believe drones have a future at Duke Energy. Today, drone work is being performed under the company's Aviation Department, and is proving to be a valuable resource to Duke Energy's renewable energy program – especially solar power.

*Duke Energy looks at budding technologies that may be useful in three to 15 years.*

Carrying an infrared camera, drones can spot nonworking solar panels at the company's facilities, eliminating time-consuming manual examination and leading to speedier repairs.

About 20 Duke Energy employees are now certified to fly drones for the company, which is exploring additional uses for the devices. These include power line inspections, outage restoration and work inside and outside of large power plants.

Keeping up with technology is a challenge for any company. At Duke Energy, careful testing and investigation has the company on top of promising technologies. In the end, it is all about improving safety and operations, and lowering costs.



Cynthia Embach / Lead Environmental Health and Safety Professional    Brian Powers / Crystal River North Station Manager

## Protecting Florida's Precious Water Resources

Making better use of municipal reclaimed water – or treated wastewater – is a useful and popular sustainability success story.

A great example is Duke Energy's Crystal River coal-fired units 4 and 5 on Florida's Gulf Coast. The units receive between 750,000 and 800,000 gallons of treated wastewater a day from the city of Crystal River.

Instead of releasing reclaimed water over the city's wastewater spray field, underground infrastructure transports the water to the power plant to support the energy generating process.

- It reduces by nearly one-third the amount of fresh water drawn from existing wells to support the on-site pollution control equipment.
- It eliminates wastewater discharges over the city's spray field and reduces the amount of nutrients, such as nitrogen and phosphorus, entering the Crystal River/Kings Bay springshed.

The project is a public-private partnership among the city of Crystal River, Duke Energy, Florida Department of Environmental Protection and Southwest Florida Water Management District.

*During the next several years, as the city of Crystal River upgrades its sewer systems, Duke Energy expects to increase the amount of reclaimed water received to 1.5 million gallons a day.*

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In addition to Crystal River, three other Duke Energy plants in Florida – the Hines Energy Complex, the Intercession City Plant and the Osprey Energy Center – are using reclaimed water in energy generation, further reducing our water footprint.

# Safety Performance Metrics<sup>1</sup>

	2013	2014	2015	2016
Employee and contractor work-related fatalities	3	4	5	0
Employee Total Incident Case Rate (TICR) <sup>2,3</sup>	0.62	0.58	0.41	0.40
Employee Lost Workday Case Rate (LWCR) <sup>2,4</sup>	0.20	0.17	0.18	0.15
Contractor Total Incident Case Rate (TICR) <sup>3</sup>	1.27	1.05	1.18	0.87 <sup>5</sup>
Contractor Lost Workday Case Rate (LWCR) <sup>4</sup>	0.28	0.28	0.21	0.15 <sup>5</sup>

1 Does not include Piedmont Natural Gas.

2 Includes both employees and workforce augmentation contractors.

3 Number of recordable incidents per 100 workers (based on OSHA criteria). Top decile in 2015 for employee TICR was 0.56 (based on latest data available from the Edison Electric Institute).

4 Number of lost workdays per 100 workers.

5 We have a systematic process in place for collecting productive work hours for the majority of the contractor fleet.

## It's All About Safety

At Duke Energy, the safety of our employees, contractors and communities is always our top priority. We strive for zero injuries but recognize that safety is more than a lack of incidents; it's a culture where workers actively care about themselves and the well-being of others.

In 2016, the company launched a five-year plan to focus on event-free operations and each business unit established new safety goals to build on previous successes. Our renewed focus led to important improvements in our safety performance.

Duke Energy had zero work-related fatalities in 2016. Although we had one life-altering injury, we decreased significant injuries from 16 in 2015 to five in 2016, a two-thirds reduction. We also achieved an employee Total Incident Case Rate (TICR) of 0.40, one of the best in our industry.

We are pleased with our continued improvements, but know we still have work to do. In 2017, we plan to integrate Piedmont Natural Gas into Duke Energy's safety processes and programs. We will also continue to focus on prevention of the most serious injuries to our employees and contractors to create an even safer place to work.

## Reaffirming Our Commitment Toward a Lower-Carbon Future

Providing safe, reliable and affordable energy has been at the heart of Duke Energy's mission for more than 100 years. Duke Energy began by harnessing rivers to generate electric power. Today, we use a balanced energy mix including nuclear, natural gas, coal, wind and solar to power the lives of our customers. As we continue to modernize our system and deliver increasingly clean energy, reducing emissions cost-effectively remains an important tenet of our investment strategy.

Reducing greenhouse gas emissions is a global issue and a shared responsibility. For more than a decade, Duke Energy has been planning for an energy future that includes a constraint on carbon dioxide (CO<sub>2</sub>) emissions to address climate change concerns. We established voluntary CO<sub>2</sub> reduction goals in 2010 to benchmark our progress in reducing emissions.

Through our modernization efforts and the retirement of older coal units, we have reduced fleetwide CO<sub>2</sub> emissions by 29 percent since 2005.

Duke Energy has also reduced the CO<sub>2</sub> intensity of our electric generating fleet by 25 percent since 2005, meaning we are producing more electricity with fewer CO<sub>2</sub> emissions.

Looking ahead, we are reaffirming our commitment to a lower-carbon future by updating our goal to reduce CO<sub>2</sub> by 40 percent from the 2005 level by 2030. We will continue to advance promising solutions that modernize our energy system, strengthen our economy, protect our environment and leverage innovative technologies. ([See related article on page 27: “Tomorrow: Investing in a Changing Energy Future.”](#))

## New Hydroelectric License to Benefit Region for Decades

Maintaining and enhancing the quality of the Carolinas’ lakes and rivers has been a Duke Energy tradition for more than a century.

In 2016, the Federal Energy Regulatory Commission issued a new 30-year operating license for Duke Energy’s Keowee-Toxaway Hydroelectric Project, which allows the company to continue operating the Jocassee Pumped Storage Hydro Station, Keowee Hydro Station and associated lakes in North Carolina and South Carolina.

The project was originally licensed in 1966 for 50 years. The new license includes conditions of a relicensing agreement signed by Duke Energy and 16 other stakeholder organizations, following nearly a decade of collaboration. It allows the company to make enhancements to public recreational areas on Lake Jocassee and Lake Keowee.

Proposals in the Recreation Management Plan include adding diver access, a new courtesy dock, a new boat and trailer docking area, access for nonmotorized boating, and bank fishing signs at Devil’s Fork State Park. Duke Energy will also add about 25 acres to Double Springs Campground, build new restrooms and add 12 new campsites.

## Coal Plant Retirements

### Retired Coal Units<sup>1</sup>

	Location	Units	Total capacity (megawatts)	Actual retirement date
Cliffside Steam Station	N.C.	1, 2, 3, 4	198	2011
Buck Steam Station	N.C.	3, 4	113	2011
Edwardsport Generating Station	Ind.	6, 7, 8	160	2011
W.H. Weatherspoon Plant	N.C.	1, 2, 3	177	2011
Gallagher Generating Station	Ind.	1, 3 <sup>2</sup>	280	2012
Cape Fear Plant	N.C.	5, 6	316	2012
Beckjord Station	Ohio	1	94	2012
Dan River Steam Station	N.C.	1, 2, 3	276	2012
H.F. Lee Plant	N.C.	1, 2, 3	382	2012
Robinson Plant	S.C.	1	177	2012
Buck Steam Station	N.C.	5, 6	256	2013
Riverbend Steam Station	N.C.	4, 5, 6, 7	454	2013
Sutton Plant	N.C.	1, 2, 3	575	2013
Beckjord Station	Ohio	2, 3	222	2013
Beckjord Station	Ohio	4, 5, 6	543	2014
W.S. Lee Steam Station	S.C.	1, 2	200	2014
W.S. Lee Steam Station	S.C.	3	170	2015 Converted to natural gas
Miami Fort Station	Ohio	6	163	2015
Wabash River Generating Station	Ind.	2, 3, 4, 5, 6	668	2016
<b>Total</b>			<b>5,424</b>	

### Planned Coal Unit Retirements

	Location	Units	Total capacity (megawatts)	Planned retirement date
Crystal River Energy Center	Fla.	1, 2	766	2018
Asheville Station	N.C.	1, 2	378	2019
Gallagher	Ind.	2, 4	280	Potentially retire or cease burning coal by 2022
Allen Steam Station	N.C.	1, 2, 3	582	2024
<b>Total</b>			<b>2,006</b>	

**TOTAL ACTUAL/PLANNED RETIREMENTS 7,430**

<sup>1</sup> In addition to coal unit retirements, a number of older oil/natural gas generation units have been or will be retired.  
<sup>2</sup> Per a 2009 settlement agreement with the U.S. Environmental Protection Agency.

At Lake Keowee, the company will build new parking areas at three recreation sites, create new trails, add bank fishing signs and develop new campsites, fishing stations and 10 cabins at Mile Creek County Park. The company also will build a canoe/kayak launch, fishing pier and portage at 15-Acre Lake, a recreation site at Keowee-Toxaway State Park.

The company also plans to implement a Habitat Enhancement Program in the watershed and conserve about 2,900 acres of property adjoining the lakes to preserve and protect ecologically and culturally significant resources.

## Water Resources Fund Provides \$5 Million for Waterways

Healthy waterways are vital to the communities Duke Energy serves. But we can't do it alone.

Over the past two years, Duke Energy's Water Resources Fund has helped fund 59 projects by organizations across the Carolinas and Virginia, providing support for the good work done by others.

The fund helps support projects that strengthen water quality, reinforce the importance of conservation, and expand public access to waterways for citizens and visitors across the region.

At the end of 2016, the fund had awarded more than \$5 million – more than halfway to its \$10 million multiyear commitment from Duke Energy. Recipients are selected by an independent body that includes five environmental experts and two Duke Energy employees.

Among the allocations was a \$15,000 grant to Clemson University in South Carolina to sponsor a graduate-level course for K-12 teachers that explores the interrelationship of energy production, water and the environment. This course is taught by Clemson University faculty members, a S.C. Department of Natural Resources wildlife biologist and Duke Energy scientists.

Also, the Conservation Fund received \$100,000 to protect critical acreage that contains the headwaters of the French Broad River in the Headwaters State Forest in North Carolina.

## Putting Rights of Way to Work for Wildlife

Duke Energy manages the land over which more than 30,000 miles of transmission lines traverse – that's more than enough to circle the globe.

With that much property to manage, the company has focused on how to put it to work for imperiled wildlife. Utility rights of way can serve as valuable corridors for threatened wildlife.

To bolster these efforts, the Duke Energy Foundation will provide \$500,000 over the next five years to the National Wild Turkey Federation's (NWTF) Energy for Wildlife program to conserve or enhance more than 6,000 acres of critical habitat across Florida, the Carolinas and Indiana. The project is designed to benefit imperiled pollinators and birds, as well as numerous other wildlife species.

*Duke Energy manages the land over which more than 30,000 miles of transmission lines traverse – that's more than enough to circle the globe.*

Conservation efforts will focus on establishing or enhancing habitat on public lands, such as state or national forests, and nearby areas where Duke Energy's transmission rights of way cross large areas of forested habitat. The enhanced habitat conditions will provide cover and a sustainable food source, while serving as a protective travel corridor for wildlife species that need it most.

Beyond the new collaboration with NWTF, Duke Energy implemented many programs in 2016 with natural resource protection in mind. For instance, in Florida the company piloted a power line design that minimizes risks to birds. The redesigned elements will help prevent birds from getting in between lines and from perching and building nests on electrical lines and poles.

In North Carolina, the company is supporting the Carolina Raptor Center's bald eagle conservation efforts, as well as the development of a new raptor trail and high-tech amphitheater to enhance educational programming for children.

## Crafting Permanent Coal Ash Solutions

Duke Energy is actively working to close its 60 coal ash basins to protect the environment, the public and the costs customers pay.

In 2016, the company announced it would excavate 34 basins and safely cap another 18 basins across its fleet. The company is still finalizing details on the remaining sites.

Flexible ash basin closure options not only ensure Duke Energy can select the right closure options for each site, but also help keep costs lower for customers compared to a one-size-fits-all approach.

The U.S. Environmental Protection Agency (EPA) recognizes that excavation or capping basins, combined with long-term monitoring, can be equally protective of the environment. The EPA also acknowledges that the vast majority of ash in the nation will be safely stored by capping basins in place. Consistent with the industry, Duke Energy plans to safely dispose of almost 70 percent of its ash by capping in place.

*Duke Energy is actively working to close its 60 coal ash basins to protect the environment, the public and the costs customers pay.*

As part of the company's ongoing commitment to its customers, it is closing older, less-efficient coal plants and ash basins, responsibly managing waste, and exploring new opportunities to expand the reuse of coal ash for beneficial purposes.

Duke Energy currently recycles nearly two-thirds of all ash produced and has announced plans to install three reprocessing units to transform even more of this material into useful products.

## Delivering Reliability

Customers expect highly reliable electric service, and Duke Energy delivers. Each year we set power delivery reliability targets for the number and duration of power outages, and generation fleet performance targets.

### Power Delivery

Mid-size storm activity in the Carolinas during July and August (a 1-in-100 year event) caused us to miss our targets for outage frequency and duration. Despite the results in 2016, our long-term trend in outage frequency continues to improve while our long-term trend in outage duration remains stable.

### Outage Statistics

	2013	2014	2015	2016	2016 Target
<b>Average number of outages<sup>1,2</sup> (occurrences)</b>	1.14	1.13	1.16	<b>1.17</b>	1.14
<b>Average time without power<sup>1,2</sup> (minutes)</b>	120	122	131	<b>144</b>	126

<sup>1</sup> Outages with a duration greater than 5 minutes; statistics are reported per customer.

<sup>2</sup> Lower numbers indicate better performance.

### Generation

Our diverse generation fleet including fossil, nuclear, hydro, wind and solar resources reliably met challenging demands, despite a summertime record for usage in the Carolinas.

Nuclear fleet capacity factor, which is a measure of generation reliability, exceeded 90 percent for the 18th consecutive year, and improved from 94.2 percent in 2015 to 95.7 percent in 2016. The fossil fleet's commercial availability declined from 87.4 percent in 2015 to 84.7 percent in 2016. The commercial renewables fleet's commercial availability increased from 93.3 percent in 2015 to 94.2 percent in 2016 because of reduced unscheduled maintenance activities.

### Generation Reliability

	2013	2014	2015	2016	2016 Target
<b>Nuclear capacity factor</b>	92.8%	93.2%	94.2%	<b>95.7%</b>	94.1%
<b>Fossil commercial availability<sup>3</sup></b>	85.7%	85.9%	87.4%	<b>84.7%</b>	86.9%
<b>Renewables commercial availability<sup>3</sup></b>	94.2%	96.0%	93.3%	<b>94.2%</b>	96.0%

<sup>3</sup> Based on units operated by Duke Energy and ownership share.



In 2016, Duke Energy's 11 nuclear generating stations – at six sites in the Carolinas – set a new overall capacity factor of 95.72 percent.

Since the 2014 Dan River coal ash release in North Carolina, Duke Energy has been mindful of any impact coal ash has on the environment and the community.

A two-year study conducted by N.C. State University along a 57-mile stretch of the Dan River showed no impacts of the coal ash release on agricultural crops in the area. The study joins a growing list of scientific data that demonstrate the river is doing well and wildlife is thriving.

In addition, scientific data continue to show ash basins are not impacting neighbors' wells or drinking water supplies near Duke Energy plant sites. This includes a Duke University study that confirmed hexavalent chromium is naturally occurring in drinking water wells across the region and is not originating from ash basins.

## Nuclear Fleet Establishing New Records

Duke Energy has operated nuclear power plants since the early 1970s. And the company's fleet keeps setting new records.

In 2016, Duke Energy's 11 generating stations – at six sites in the Carolinas – set a new overall capacity factor of 95.72 percent. That marks the 18th consecutive year of attaining a 90-plus percent capacity factor. The plants produced 90 billion kilowatt-hours (kWh) of carbon-free electricity.

### Here are some of the highlights:

- The two-unit Brunswick Nuclear Plant generated a record of more than 15 billion kWh over the 12-month period. Brunswick also completed its shortest refueling outage ever.
- Catawba Nuclear Station Unit 1 set a 12-month record, cranking out more than 10 billion kWh of electricity, and Catawba Unit 2 had its longest continuous operating run.
- McGuire Nuclear Station's two units established a station-best 12-month generation record of nearly 20 billion kWh.
- Oconee Nuclear Station Unit 2 provided a record of more than 7 billion kWh of electricity over the last 12 months, and units 1 and 3 completed their shortest refueling outages ever. Over the years, the efficiencies gained in planning and implementing shorter refueling outages have increased the fleet's availability to produce electricity.
- Harris and Robinson nuclear plants each achieved record six-month generation during 2016 – producing more power over that time period than ever before.

As for constructing nuclear plants, the company received licenses from the Nuclear Regulatory Commission for new reactors in South Carolina and Florida. No decisions have been made on proceeding with these projects.