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## OPERATIONS

Excel in Safety,  
Operational  
Performance and  
Environmental  
Stewardship

### 2017 Highlights

- Maintained industry leading safety performance with a Total Incident Case Rate (TICR) of 0.36, the best ever for Duke Energy.
- Reduced the annual number of reportable environmental events for the third year in a row.
- For the second straight year, achieved a nuclear capacity factor above 95 percent – nearly setting a company record.
- Since 2005, decreased carbon dioxide emissions by 31 percent, sulfur dioxide emissions by 96 percent and nitrogen oxides emissions by 75 percent.
- Announced dual-fuel projects at three existing coal-fired power plants, which will allow them to use either coal and/or natural gas to produce electricity.
- Received approval from the Federal Energy Regulatory Commission to amend the license for the Catawba-Wateree Hydroelectric Project to raise summer target lake levels. This will extend the water yield of the lake system one decade beyond current conditions.
- Recycled 80 percent of our solid waste, achieving our 2018 goal a year early. This enabled the company to divert 87,200 tons of solid waste from landfills.

### 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 during 2017-2026.
- Continue to move to a lower-carbon future by reducing our carbon dioxide emissions by 40 percent from the 2005 level by 2030.



Environmental protection is “part of our internal cultural and corporate DNA,” says Duke Energy’s Pat McCabe, Environmental Projects and Programs Director.

## Environmental Protection: A Top Priority Every Day

Duke Energy makes environmental protection a top priority every day.

That strong commitment, coupled with Duke Energy’s comprehensive [environmental management system](#), continues to drive down the annual number of reportable environmental events at the company’s numerous power plants and other facilities in multiple states for the third consecutive year.

Reportable environmental events are defined as events – resulting from Duke Energy operations – that require notification to, or enforcement action by, a county, state or federal environmental regulatory agency.

“We build a margin of safety into our work plans to ensure projects are conducted in an event-free way. This helps us reduce risk and prevent accidents,” says Jeff Hatch, a Duke Energy Project Manager.

Hatch oversaw a successful and environmentally sensitive job that required replacement of oil-filled transformers within 120 feet of the Catawba River at one of the company’s

power plants in Belmont, N.C., in 2017.

“We hold both our employee and contractor teammates to a high standard – and we aren’t afraid to stop work if we see something that isn’t right,” Hatch says.

Duke Energy’s environmental management system outlines the role that each employee and contractor plays in continuously improving and strengthening environmental protection.

Elements include comprehensive planning, hazard and risk assessment, thorough checklists, continuous monitoring, regular inspections and in-depth audits.

Duke Energy empowers and encourages every employee and contractor to proactively identify and immediately address any potential environmental risk or hazard – no matter how small.

“Environmental protection and stewardship together represent critically important cornerstones of our daily operations at Duke Energy,” says Pat McCabe, Environmental Projects and Programs Director. “They’re part of our internal cultural and corporate DNA.”



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Duke Energy is the first U.S. windpower operator to commercially deploy a new technology designed to prevent eagle collisions with rotating wind turbine blades.

## Protecting Eagles While Generating Carbon-Free Energy

Duke Energy is installing new eagle protection technology at its Top of the World Windpower Project in Wyoming to detect in-flight eagles and prevent their collision with rotating wind turbine blades.

Duke Energy is the first windpower operator in the U.S. to commercially deploy the new system, called IdentiFlight, which uses artificial intelligence and high-precision optical technology to ensure the successful coexistence of wind energy and eagles.

The system, designed by IdentiFlight International, LLC, will quickly detect an eagle flying within a one-kilometer hemisphere of any one of 24 IdentiFlight monitoring units being installed at the site.

If an eagle's speed and flight path indicate a potential risk of collision with a wind turbine, the monitoring

unit will send an automatic alert to the facility's operators. The operators then can immediately shut down the specific wind turbine in the eagle's flight path, reducing the risk of collision.

"Duke Energy understands the importance of balancing the need to generate clean, carbon-free, renewable energy with the equally important need to protect wildlife, including the iconic bald and golden eagles," says Tim Hayes, Duke Energy Renewables environmental director.

Adds IdentiFlight president Tom Hiester: "Duke Energy has been an amazing partner throughout the testing and development of the IdentiFlight technology, and has proven to be at the forefront of the industry in addressing this critical issue."

More information and photos – <https://illumination.duke-energy.com/articles/wind-farm-tests-technology-to-protect-eagles>.



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

	2014	2015	2016	2017
<b>Employee and contractor work-related fatalities</b>	4	5	0	<b>2</b>
<b>Employee Total Incident Case Rate (TICR)<sup>2,3</sup></b>	0.58	0.41	0.40	<b>0.36</b>
<b>Employee Lost Workday Case Rate (LWCR)<sup>2,4</sup></b>	0.17	0.18	0.15	<b>0.15</b>
<b>Contractor Total Incident Case Rate (TICR)<sup>3</sup></b>	1.05	1.18	0.87 <sup>5</sup>	<b>0.80<sup>5</sup></b>
<b>Contractor Lost Workday Case Rate (LWCR)<sup>4</sup></b>	0.28	0.21	0.15 <sup>5</sup>	<b>0.10<sup>5</sup></b>

1 Does not include Piedmont Natural Gas results, which are tracked separately.

2 Includes both employees and workforce augmentation contractors.

3 Number of recordable incidents per 100 workers (based on OSHA criteria). Top decile in 2016 for employee TICR was 0.47 (based on latest data available from the Edison Electric Institute for companies with more than 7,000 employees).

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.

## Leading the Way on Safety

Ensuring the health and safety of Duke Energy employees, contractors and communities is an integral part of what we do. The company is always striving for an injury and illness-free workplace.

In 2017, Duke Energy's safety performance was strong, with an employee Total Incident Case Rate (TICR) of 0.36 – the best ever for Duke Energy and one of the best in the industry.

Piedmont Natural Gas employees also made significant progress in safety performance. Under the leadership of a safety improvement team that worked to adopt Duke Energy's safety programs and processes, Piedmont finished the year with a TICR of 1.65 – not as positive as the Duke Energy mark, but much better than the previous year. In this metric, the lower the score, the better.

Duke Energy successfully implemented a summer safety campaign, which educated workers about heat-related illnesses and other warm-weather hazards, and a program to effectively address minor injuries through a team of on-site nurses. The company will build on those successes in 2018 with initiatives focusing on hazards, ergonomics and safe driving.

Although pleased with the company's overall performance, two work-related fatalities and three life-altering injuries mean there is still work to do. Reducing the number of serious injuries will be a focus for Duke Energy in 2018 as the company strives to have the safest workplace in the industry.

## On the Path to a Lower-Carbon Future

Duke Energy is excited about the transformation underway in the industry and is committed to meeting the expectations of our customers – now and into the future.

For more than 10 years, Duke Energy has been planning for a lower-carbon future, investing in innovative technologies to modernize and diversify our system, and executing on our strategy to deliver greater value and cleaner energy for customers.

Back in 2005, coal accounted for 58 percent of the power the company produced. Fast forward to 2017, coal was only 33 percent of the total generation and over 38 percent of the power produced was from zero carbon sources.

Carbon dioxide (CO<sub>2</sub>) emissions are down 31 percent since 2005, and the company has set our sights on even greater progress. By 2030, only one-fifth of the power Duke Energy produces will be from coal, and 80 percent of the energy produced will be from zero- and lower-CO<sub>2</sub> emissions sources.

Duke Energy has set an ambitious goal to reduce total CO<sub>2</sub> emissions 40 percent by 2030, compared to 2005 levels, which is consistent with a pathway to achieve a science-based climate target.

Reducing reliance on coal, leveraging cleaner natural gas energy and expanding renewables on our system is part of our long-term investment strategy to continue to drive carbon out of our system. As we have done

# Coal Plant Retirements

for over a decade, we'll consider CO<sub>2</sub> emissions in our investment planning and focus on finding ways to quickly deploy emerging technologies into our portfolio.

You can read more in the company's [Climate Report](#).

## Gas Co-Firing Offers Many Positive Benefits

In the energy industry, the more options the better.

That's part of Duke Energy's effort to allow dual-fuel optionality at some of its coal-fired power plants in North Carolina.

What is dual-fuel optionality? It allows certain generating units to produce electricity using either coal and/or natural gas – sometimes referred to as gas co-firing.

Co-firing provides a number of benefits to the company, customers and the environment. By using natural gas instead of coal, the company can lower its overall carbon dioxide emissions.

It also allows the company to take advantage of the price difference between coal and natural gas. Customers save when the company can lower its overall fuel costs.

At the Rogers Energy Complex, the company is pursuing co-firing up to 40 percent natural gas at unit 5; and 100 percent at unit 6.

At the Belews Creek Station, the company is looking at co-firing up to 50 percent natural gas at both of the coal units. The company will also invest

## 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
Miami Fort Station	Ohio	6	163	Converted to natural gas 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	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.

more than \$200 million to begin co-firing at all four coal units at the Marshall Steam Station.

Co-firing also enables Duke Energy to make the best use of its existing power plants and still take advantage of attractive natural gas pricing.

The flexibility and cost savings gained by operating existing coal units on gas are achieved at a much lower capital investment than building a new combined cycle power plant. Gas retrofits cost about 10 percent of the cost of a new combined-cycle unit.

## Collaboration Helps Preserve Shared Water Supply

Stakeholder engagement and collaboration are key to Duke Energy's success as a strong community partner and environmental steward.

The Catawba-Wateree River Basin, with 11 interconnected reservoirs and 13 hydropower stations managed by Duke Energy, provides water for nearly 2 million people and enough electricity to power about 3.7 million homes.

The most densely populated river basin in North Carolina is facing long-term challenges, with the overall water demand expected to more than double by 2065.

In response, the Catawba-Wateree Water Management Group developed a water supply master plan in 2014 to protect and extend the available water supply of the Catawba-Wateree River and its reservoirs by 50 additional years, to support economic growth into the next century.

Created in 2007 during the stakeholder process to relicense the Catawba-Wateree Hydroelectric Project, the nonprofit corporation includes Duke Energy and 18 public water utilities in North Carolina and South Carolina.

In May 2017, Duke Energy asked the Federal Energy Regulatory Commission (FERC) to amend the license for the Catawba-Wateree Hydroelectric Project to include several key provisions of the new water supply master plan. These include raising summer normal target elevations by 6 inches on three of the largest storage reservoirs – Lake James, Lake Norman and Lake Wylie – and revising the basin's drought response protocol to allow Duke Energy's hydro system to respond more quickly to changing drought conditions. The FERC approved the license amendment on January 22, 2018.

Raising the summer target lake levels, to be implemented following enhancements to Wateree Dam, will increase overall available storage by about 8 billion gallons, extending the water yield of the Catawba-Wateree lake system by one decade beyond current conditions.

Water is a limited and shared resource. This collaboration between Duke Energy and its regional stakeholders places the river basin's shared water supply on a stronger foundation for decades to come.

## Keeping Our Infrastructure and Information Secure

The headlines on cyberattacks can be alarming, but protecting the nation's energy grid to ensure a reliable supply is of paramount importance to the electric industry.

Duke Energy builds layers of security to provide rapid detection and response to possible cyberattacks. The company also focuses on properly isolating any impacted devices or systems. For example, in 2017 the company received 2.2 billion emails to our system. More than 94 percent of those did not meet our security criteria and were blocked by our controls.



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# Reliable Power

The company maintains an around-the-clock incident response team of highly skilled cybersecurity professionals devoted to this topic. Duke Energy also coordinates with national labs, government agencies and law enforcement officials to best protect our energy grid and technology systems, share information and develop protective standards. Working with industry partners and vendors, the company ensures it's taking steps to protect systems and data.

Duke Energy has detailed cybersecurity reporting requirements and strong partnerships to prevent and respond to threats. The company's businesses have mandatory and enforceable cybersecurity standards to protect critical infrastructure. These extensive measures help keep networks safe and prevent those wanting to do harm.

Duke Energy is also a member of the Electricity Subsector Coordination Council. Similar to other industry organizations, this group provides a forum to collaborate and coordinate with energy companies, government agencies and security organizations.

This association focuses on reducing threats through preparation, prevention, response and recovery, and supports initiatives and policies that improve the security of the industry and nation.

With ever-increasing threats, Duke Energy is committed to the safety and security of our energy grid, and business-related networks and information. Cybersecurity is a critical element of that effort.

Reliable power is one of Duke Energy's core commitments to the more than 24 million people we serve. Each year the company sets power delivery reliability targets for the number and duration of power outages, and generation fleet performance targets.

## Power Delivery

Weather was 40 percent worse (more storms) during the first half of 2017 compared to the previous year, resulting in an increase to Duke Energy's average time without power of 10 minutes. During the second half of 2017, weather returned to a normal pattern (except for Hurricane Irma), improving average time without power by 3 minutes. The average number of outages remained relatively stable.

## Outage Statistics

	2014	2015	2016	2017	2017 Target
<b>Average number of outages<sup>1,2</sup></b> (occurrences)	1.13	1.16	1.17	<b>1.18</b>	1.18
<b>Average time without power<sup>1,2</sup></b> (minutes)	122	131	144	<b>151</b>	135

1 Outages with a duration greater than 5 minutes; statistics are reported per customer, excluding major storms.

2 Lower numbers indicate better performance.

## Generation

Duke Energy's diverse generation fleet includes carbon-free nuclear, hydro, wind and solar; lower-carbon natural gas; and higher-carbon coal. This fleet reliably met customer demand and recorded another year of great performance during 2017.

Nuclear fleet capacity factor, which is a measure of generation reliability, exceeded 90 percent for the 19th consecutive year, decreasing slightly from 95.7 percent in 2016 to 95.6 percent in 2017. The fossil fleet's commercial availability increased from 84.7 percent in 2016 to 88 percent in 2017. The commercial renewables fleet's renewables availability increased from 94.2 percent in 2016 to 94.6 percent in 2017.

## Generation Reliability

	2014	2015	2016	2017	2017 Target
<b>Nuclear capacity factor</b>	93.2%	94.2%	95.7%	<b>95.6%</b>	94%
<b>Fossil commercial availability<sup>3</sup></b>	85.9%	87.4%	84.7%	<b>88.0%</b>	87%
<b>Renewables commercial availability<sup>3</sup></b>	96%	93.3%	94.2%	<b>94.6%</b>	94.5%

3 Based on units operated by Duke Energy and ownership share.



Debbie Hauliska / José Estela / Investigators for the Piedmont Natural Gas Anti-Theft Team

## Gas Anti-Theft Team Makes a Difference

Curbing natural gas theft is a full-time job for Debbie Hauliska and José Estela – both of whom are investigators for the Piedmont Natural Gas anti-theft team.

Their targets are people who steal or tamper with natural gas meters, and their efforts have cut thefts by 75 percent in five years, with the number of cases dropping from 2,214 in 2012, to just 557 at the end of 2017.

Using cutting-edge technology and relationships they've formed with local law enforcement, Hauliska and Estela canvass areas of Charlotte, N.C. looking for signs of natural gas theft. Signs include covered or altered natural gas meters, missing meters, and meters with hoses or other tubing used to bypass or otherwise alter the flow of natural gas.

Tampering with natural gas meters can be extremely dangerous, so theft detection serves to remove safety hazards. This is also an important task since the cost of stolen natural gas is shared among all customers. But Hauliska and Estela's work is having a quieter, more far-reaching positive effect –

it's identifying people who need help. When the team locates a site where natural gas is being stolen or used illegally, they are obligated to remove the meter and cut off the flow of natural gas. But this team recognizes that some people steal natural gas because they simply can't afford to pay for it.

"I carry a card with the number for Crisis Assistance on it," Estela said. "I don't know what's on the other side of that door. I'll work with you. It's rough out there."

Crisis Assistance Ministry is an agency in Mecklenburg County, N.C., providing the working poor with emergency rent and utility assistance, clothing, household goods and furniture. Piedmont Natural Gas supports Crisis Assistance Ministry through its Share the Warmth program – an optional program that rounds up a Piedmont customer's bill to the nearest dollar and then donates all the proceeds to help people in need pay their utility bills, regardless of which utility they use.

Hauliska estimates that since 2012, she and Estela have referred at least 250 families to Crisis Assistance for help.



Hauliska and Estela's work is also having a quieter, more far-reaching positive effect – it's identifying people who need help.

## Predicting Breakdowns Before They Happen

Breakdowns happen to mechanical and electrical equipment – including Duke Energy power plants. Imagine the benefits if the equipment could tell us when a breakdown is about to occur.

Duke Energy has an effort underway to increase the use of predictive maintenance using various sensor devices, which is moving the company in the right direction.

Right now, more than 30,000 sensors are in place on critical company machinery at several coal and gas-fired power plants. Among other things, a breakdown at these plants could mean less efficient plants would be brought online to take their place. A negative both financially and environmentally.

Predictive maintenance examines data gathered from sensors on large pieces of equipment – like transformers at a power plant. Company experts can sort through the data to find irregularities that suggest a breakdown is likely.

From there, company technicians can apply analytical tools or physically examine the equipment to gather additional data to see if any action is needed.

An example at the Sutton Power Plant in North Carolina illustrates how the process works:

Data gathered by the sensors indicated a breakdown might occur at a main transformer at the plant. An in-person inspection confirmed the finding.

But there was one problem: The weather was extremely cold during that time, and the plant was needed to meet the critically high demand for electricity.

In the end, the transformer was closely monitored for a short time

until the extreme cold subsided and the transformer was fixed before any breakdown occurred.

Duke Energy's team has dozens of such examples where data gathered from sensors helped solve a potential problem.

In the future, Duke Energy will continue to use new technologies to maintain reliability at its power plants – making sure the cleanest and most cost-effective plants are running to meet the needs of its customers.

## Coal Ash Basin Work Progressing Well

Work at coal ash basins across the states Duke Energy serves was bustling in 2017 as the company continued excavating at some sites and preparing other basins for safe closure.

The company has proposed a combination of excavating some basins and capping others in place with a synthetic barrier based on site-specific engineering and scientific studies.

All closure plans will be designed to protect the environment and communities we serve. In addition to meeting state and federal requirements, these closure plans help manage costs for customers, minimize community disruption and mirror how most utilities across the nation will close basins.

To date, the company has safely excavated and relocated nearly 17 million tons of ash systemwide, with 7.2 million tons removed in 2017.

At operating coal plants, the company is investing in the technology needed to take ash basins out of service. This includes constructing new, lined retention basins for wastewater management, installing state-of-the-art treatment systems and adding new equipment to manage bottom ash in a



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Duke Energy continues to look for innovative ways to recycle and reuse coal ash. Overall, Duke Energy successfully recycled about 70 percent of the coal ash produced at its operating power plants in 2017.

dry form. These plants have been managing fly ash in lined landfills for a number of years.

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A valuable construction material, ash makes concrete products stronger and more durable. The company has announced ash reprocessing units at three sites in North Carolina that will make nearly 1 million additional tons of ash suitable for the concrete industry. This will enhance the company's ability to recycle basin ash that typically can't be used for concrete without additional processing.

## Carbon-Free Nuclear Yields Another Stellar Year

As Duke Energy's largest carbon-free energy resource, operating an efficient nuclear fleet is critical to customers and the environment.

Duke Energy's 11 nuclear generating units posted a strong operating performance in 2017, providing North Carolina and South Carolina with nearly 90 billion kilowatt-hours of clean electricity – more than 50 percent of the electricity generation in those two states and about one-third of the company's entire generation output.

Nuclear generation avoided the release of 82 million metric tons of carbon dioxide in 2017 – as much as is released from more than 17 million passenger vehicles during a year.

A few highlights:

- The company's fleet achieved a combined capacity factor of more than 95 percent, which is above the national average. It was the 19th consecutive year the fleet capacity factor exceeded 90 percent.
- Both Catawba Nuclear Station and Harris Nuclear Plant set records for the amount of energy produced in a 12-month period.
- Both units at McGuire Nuclear Station posted their shortest ever refueling outages, thus maximizing their availability for generation.
- A unit at Brunswick Nuclear Plant achieved a record operating run of almost 712 consecutive days.
- A unit at Oconee Nuclear Station accomplished a record operating run of more than 715 consecutive days, which is also a new company record.
- The Robinson Nuclear Plant team completed the station's 30th refueling outage, which included a main generator stator replacement, well ahead of schedule.

The company is currently evaluating the possibility of seeking additional license extensions from the Nuclear Regulatory Commission for its currently operating nuclear plants. This would allow the generating units to operate up to 80 years if it makes economic sense and provides benefits to customers.

As for building new nuclear plants, Duke Energy notified the Nuclear Regulatory Commission that it does not intend to build previously planned units in Levy County, Florida. Duke Energy maintains its licenses for two new nuclear units near Gaffney, S.C., as an option for future generation.