

charlotte **CHAMBER**

CHARLOTTE'S ENERGY SECTOR: **LEADING THE CHARGE**





CAN ONE PERSON CHANGE THE WORLD?
HOW ABOUT THOUSANDS WHO COME TO WORK EVERY DAY
READY TO GIVE THEIR BEST,
GO BEYOND THE EXPECTED
AND DRIVE FOR EXCELLENCE?
THEY'RE SIMPLY UNSTOPPABLE.
THEY'RE THE HEART AND SOUL OF OUR COMPANY.
THEY CHANGE THE WORLD.

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COMPASS GROUP NORTH AMERICA
RECOGNIZED IN FORTUNE'S 50 COMPANIES THAT
CHANGE THE WORLD!**



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THE *Energy Sector* IN CHARLOTTE



From alternative energy startups and engineering firms to multinationals working on nuclear energy projects, Charlotte's energy sector represents a large cross-section of the local economy. Anchored by titans such as Duke Energy, Siemens and AREVA, the industry's success is built on a foundation of capabilities: an ample and able workforce, reliable and affordable energy resources, and a diversified supplier network.

Charlotte's energy industry remains strong because of the region's high level of specialization and focus on fostering synergy and collaboration. Charlotte's energy industry can be classified into three sectors: services and construction, manufacturing, and generation and distribution. Services and construction firms employ the majority of professionals in the energy industry followed by manufacturing and energy generation and distribution.

SECTOR	EMPLOYMENT	WAGES
Services & Construction	24,514	\$64,114
Energy Generation & Distribution	6,890	\$106,517
Energy Manufacturing	5,111	\$69,424

TOTAL: 36,515

The Energy sector has a major impact on the Charlotte region. In addition to the **36,515 PEOPLE DIRECTLY EMPLOYED** within the industry, the energy sector indirectly supports another **45,295 JOBS** in the 16-county Charlotte region.¹

81,810 TOTAL JOBS supported directly or indirectly.

\$5.2 BILLION IN WAGES and benefits generated.

\$17.8 BILLION TOTAL ECONOMIC IMPACT on the region.

Accounts for **11.7% OF THE REGION'S ECONOMY**.

¹The Charlotte Chamber uses the IMPLAN model of economic impact analysis. The IMPLAN model uses measures of direct, indirect and induced effects to calculate total economic impact. Indirect effects are those created by business-to-business purchases. Induced effects are those created by personal spending generated by wages. Total direct economic impact of energy employment is \$10.9 billion. Indirect impact is \$3.6 billion and induced impact is \$3.3 billion. Indirect employment effects account for 21,790 additional jobs; induced employment effects account for an additional 23,505 jobs.

200+ ENERGY COMPANIES
36,500 EMPLOYEES



39 POWER PLANTS
OPERATING IN THE REGION

12 SOLAR AND 5 BIOMASS
PLANTS IN CHARLOTTE REGION



2 NUCLEAR REACTORS
IN THE CAROLINAS

REGIONAL ASSETS FOR ENERGY GROWTH

2016 ENERGY OCCUPATIONS AND GROWTH RATES

OCCUPATION	CURRENT EMPLOYMENT	REGIONAL AVERAGE WAGE	10-YEAR PROJECTED GROWTH RATE
Electricians	4,184	\$42,400	27.0%
Electrical Power-Line Installers and Repairers	1,101	\$51,600	26.4%
Civil Engineers	955	\$80,800	21.7%
Electrical Engineers	640	\$104,400	10.8%
Helpers--Electricians	621	\$28,200	27.2%
Mechanical Engineers	600	\$83,300	23.0%
Operating Engineers and Other Construction Equipment Operators	543	\$36,200	43.3%
Telecommunications Line Installers and Repairers	493	\$37,700	46.7%
Architectural and Engineering Managers	380	\$134,000	15.9%
Construction Managers	356	\$97,500	26.7%
Telecommunications Equipment Installers and Repairers, <i>Except Line Installers</i>	308	\$50,800	24.3%
Electrical and Electronic Engineering Technicians	297	\$54,900	9.8%
Welders, Cutters, Solderers, and Brazers	292	\$38,300	17.9%
Plumbers, Pipefitters, and Steamfitters	271	\$39,300	37.9%
Maintenance and Repair Workers, General	268	\$39,600	11.9%
Machinists	259	\$41,500	19.6%
Industrial Engineers	257	\$80,400	9.9%
Architectural and Civil Drafters	229	\$61,000	9.8%
Civil Engineering Technicians	219	\$48,100	15.6%
Electronics Engineers, Except Computer	193	\$91,900	15.3%

Source: JobsEQ 2016.

SERVICES *and* CONSTRUCTION

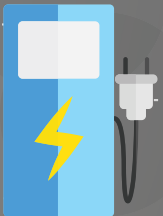
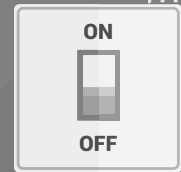
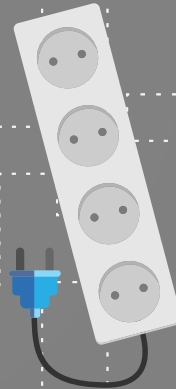
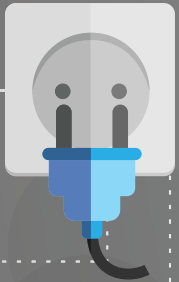




Photo by Patrick Schneider

Well over half — 67 percent — of the region's energy workers are employed in the services and construction sector, which includes engineering, electrical contracting and power structure construction. Several impressive companies within the services and construction sector have a large Charlotte presence:

AREVA

AREVA specializes in design and construction of nuclear power plants, plant modernization, maintenance and repair services, and nuclear fuel manufacturing. AREVA relocated its United States headquarters operations to Charlotte in 2013 and employs 645 people.

CB&I

CB&I provides engineering, construction, technology, fabrication, maintenance and environmental services. In the energy sector, the company focuses on up-stream oil and gas, downstream oil and gas, liquefied natural gas and the power market, including fossil fuel electric generation and nuclear, hydroelectric and wind power.

BABCOCK & WILCOX ENTERPRISES

A Fortune 1000 company with its headquarters in Charlotte, Babcock & Wilcox is leading the development of new and innovative power generation options and environmental control solutions. From zero-emissions nuclear power and near zero-emissions carbon capture technology to biomass, waste to energy and cutting-edge solar thermal, the company has a broad portfolio of clean and efficient energy technologies.

MITSUBISHI NUCLEAR ENERGY SYSTEMS (MNES)

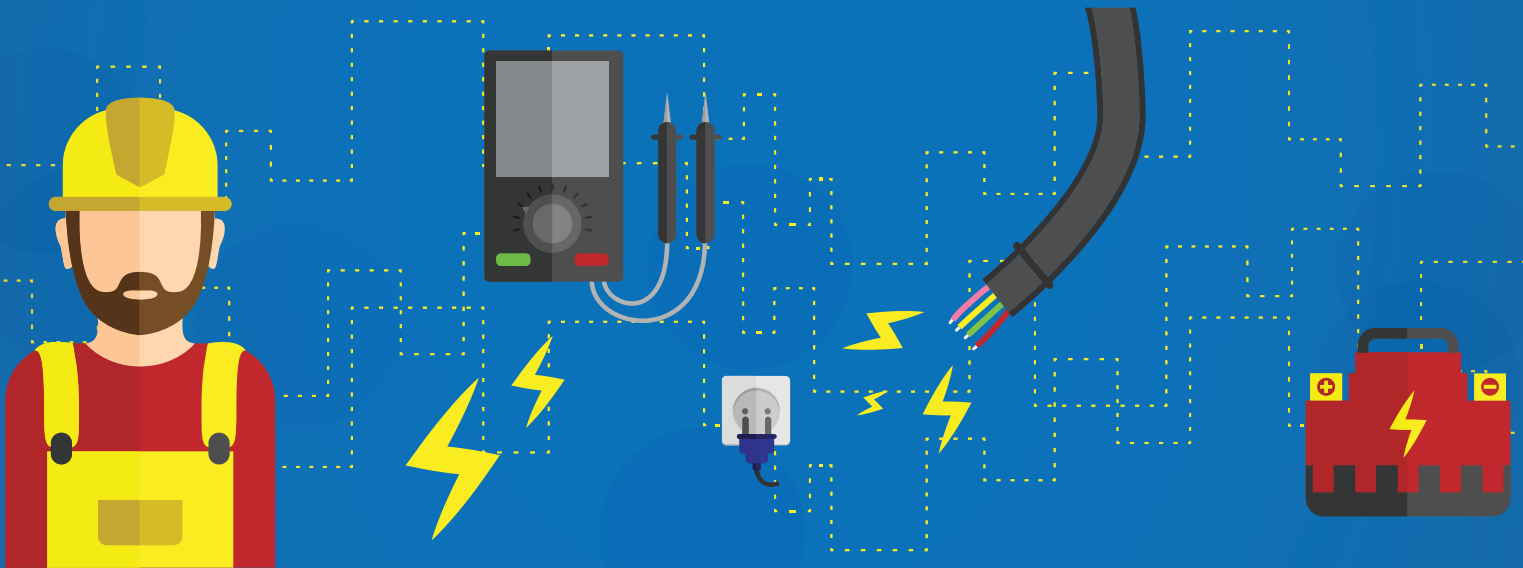
A U.S. subsidiary of Mitsubishi Heavy Industries Ltd., Mitsubishi Nuclear Energy Systems (MNES) located its main engineering center in Charlotte in 2011. The company works with partners, contractors and customers in the areas of project management, engineering and quality assurance.



SERVICES *and* CONSTRUCTION

SECTOR	EMPLOYMENT	AVG. ANNUAL WAGES
Engineering Services	6,555	\$88,652
Nonresidential Electrical Contractors	4,772	\$51,371
Residential Electrical Contractors	3,899	\$42,856
Power & Communication Line & Related Structures Construction	2,505	\$51,394
Water & Sewer Line & Related Structures Construction	2,156	\$60,331
Electrical Apparatus & Equipment, Wiring Supplies, & Related Equipment Merchant Wholesalers	1,823	\$65,182
Other Scientific & Technical Consulting Services	1,151	\$74,474
Other Electronic & Precision Equipment Repair & Maintenance	561	\$89,143
Oil & Gas Pipeline & Related Structures Construction	545	\$62,191
Testing Laboratories	525	\$56,526
Solid Waste Combustors & Incinerators	23	\$62,542

MANUFACTURING



MANUFACTURING continues to be a cornerstone of the Charlotte regional economy — Mecklenburg County is the largest manufacturing county by total employment in the state. Energy manufacturing is a substantial portion of that base. The Charlotte metro is a leading exporter of engine and power equipment, as mentioned in a 2016 Brookings Institution report. The highest concentrations of employment are in turbine generator manufacturing, primary battery manufacturing and wiring device manufacturing. Companies in this sector, including Siemens and SPX, are creating cutting-edge products used by energy cluster companies and their consumers. Battery manufacturing also has a strong hold in the Charlotte area with companies such as Alevo, Celgard, and FMC Corp.



6x NATIONAL AVERAGE EMPLOYED IN TURBINE MANUFACTURING INDUSTRY.



6x NATIONAL AVERAGE EMPLOYED IN PRIMARY BATTERY MANUFACTURING.



4x NATIONAL AVERAGE EMPLOYED IN THE MOTOR AND GENERATOR MANUFACTURING SECTOR.



3x THE AVERAGE NUMBER EMPLOYED IN THE CURRENT-CARRYING WIRING DEVICE MANUFACTURING SECTOR.

SIEMENS

Siemens, a longtime turbine manufacturing presence in Charlotte, relocated the manufacture of its 60-Hz large-scale gas turbines from Canada to Charlotte in 2010. The move allowed the company to create a U.S. manufacturing hub to take advantage of synergies in transportation, workforce, supply base, research and development of its current expandable site. The Siemens complex boasts 1 million square feet of manufacturing and office space

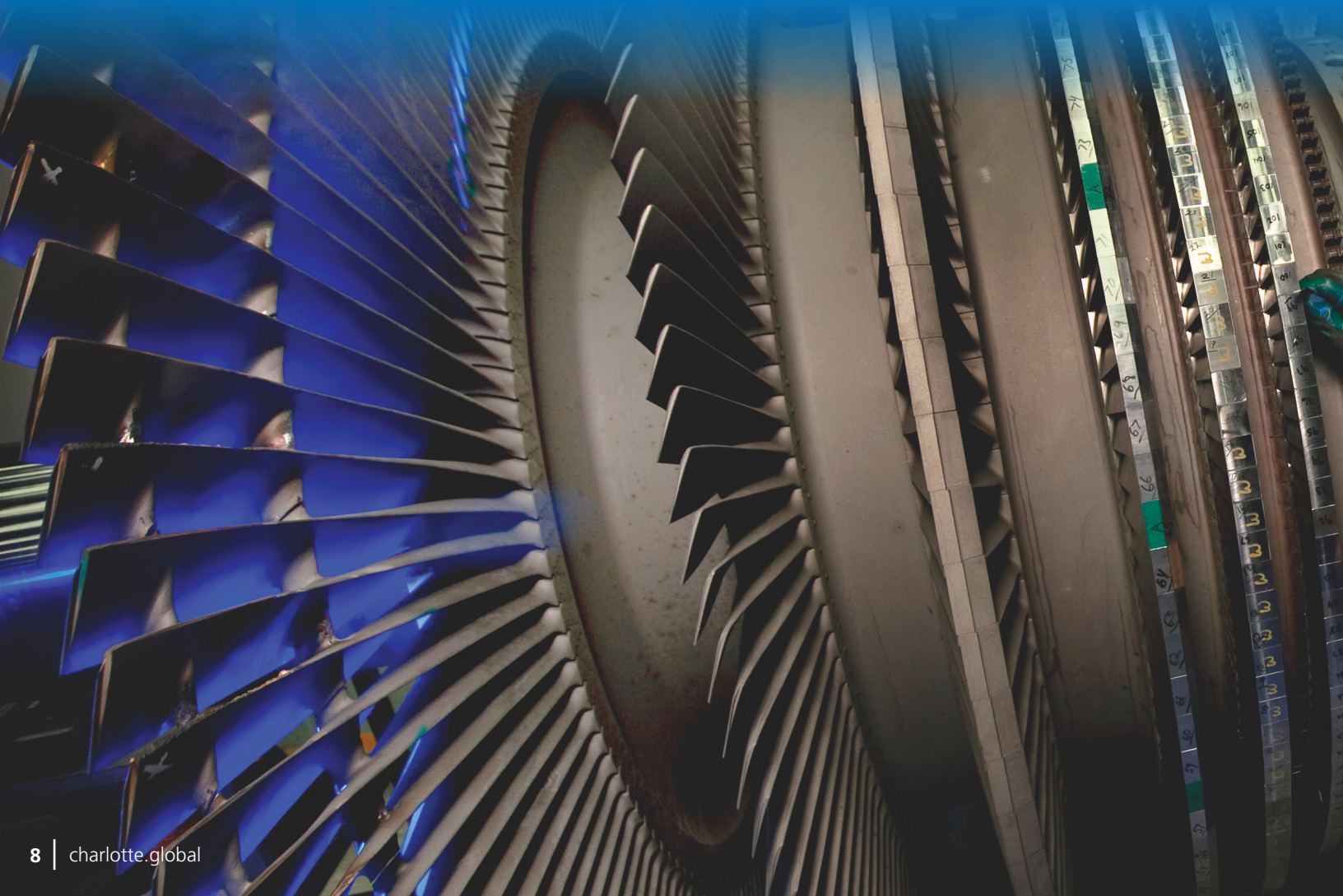
and employs around 1,600 people. It is the most modern gas turbine manufacturing facility in the world.

A separate division, the company's instrumentation and control group, relocated to Charlotte in 2010. The group performs all of Siemens' I&C work for nuclear power plants in North America.

SPX

Headquartered in Charlotte, SPX, a Fortune 1000 multi-industry manufacturer, serves a number of markets, including the global power and energy markets, with innovative technologies and products including cooling

towers, heat exchangers and a broad spectrum of processing equipment. SPX supplies components and pollution control systems critical to building new, more efficient power plants and renovating older ones.





LEADING METRO EXPORTER OF ENGINE AND POWER EQUIPMENT.

(Brookings, 2016)

CELGARD

Celgard, a wholly owned subsidiary of Polypore International, Inc., is a lithium battery component manufacturer headquartered in south Charlotte. Celgard makes a microporous film — known as a battery separator — used in batteries for portable electronics devices, such as laptop computers and mobile phones, and in emerging applications such as reserve power, grid management systems and electric drive vehicles.

FMC CORP.

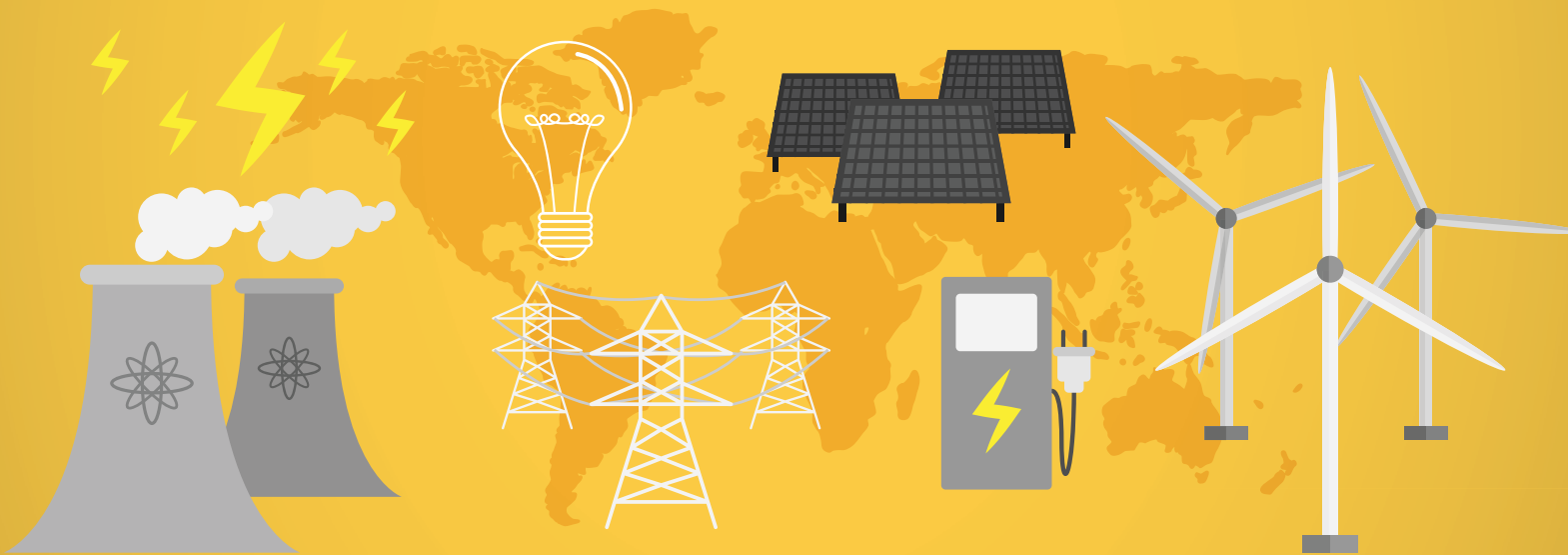
FMC Corp's lithium division is stationed in the Charlotte region. FMC's corporate offices are located in the heart of Charlotte and a lithium manufacturing facility is in neighboring Gaston County. Focused on the energy sector, the company is a global supplier of lithium for energy storage and is used in rechargeable batteries found in tablets, phones, power tools, cars, and power plants.



MANUFACTURING

SECTOR	EMPLOYMENT	AVG. ANNUAL WAGES
Turbine and Turbine Generator Set Units Manufacturing	1,544	\$100,942
Motor and Generator Manufacturing	1,422	\$49,578
Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment	1,015	\$83,593
Current-Carrying Wiring Device Manufacturing	880	\$56,740
Primary Battery Manufacturing	689	\$53,031
All Other Miscellaneous Electrical Equipment and Component Manufacturing	353	\$53,537
Switchgear and Switchboard Apparatus Manufacturing	296	\$70,653
Residential Electric Lighting Fixture Manufacturing	176	\$64,903
Other Lighting Equipment Manufacturing	166	\$44,284
Power, Distribution, and Specialty Transformer Manufacturing	126	\$61,162
Relay and Industrial Control Manufacturing	89	\$62,313
Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	86	\$77,282
Heating Equipment (except Warm Air Furnaces) Manufacturing	46	\$44,860

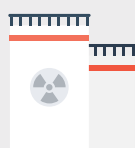
GENERATION *and* DISTRIBUTION





GENERATION AND DISTRIBUTION

round out the Charlotte region's dynamic energy cluster. The sector includes companies engaged in fossil fuel, hydroelectric and nuclear power distribution, along with natural gas distribution. Duke Energy, the country's largest electric power holding company, and Piedmont Natural Gas are two of the major players in the sector that provide critical services to a vast region.



5x THE NATIONAL AVERAGE
EMPLOYMENT IN NUCLEAR
ELECTRIC POWER GENERATION.



NORTH CAROLINA RANKS **8TH**
IN THE NATION IN TOTAL NET
ELECTRICITY GENERATION.



NORTH CAROLINA OFFERS **10TH**
LOWEST RESIDENTIAL ELECTRICITY
PRICES IN NATION.

GENERATION *and* DISTRIBUTION

SECTOR	EMPLOYMENT	AVG. ANNUAL WAGES
Nuclear Electric Power Generation	2,422	\$131,213
Electric Power Distribution	1,303	\$76,743
Natural Gas Distribution	971	\$93,779
Fossil Fuel Electric Power Generation	303	\$82,790
Hydroelectric Power Generation	52	\$85,249
Electric Bulk Power Transmission & Control	32	\$125,112
Steam & Air-Conditioning Supply	26	\$70,441



DUKE ENERGY

Duke Energy, No. 115 on the Fortune 500, is headquartered in Charlotte. The largest electric power company in the United States, Duke Energy serves 7.4 million electric customers in the Carolinas, the Midwest and Florida, and 525,000 gas customers in Ohio and Kentucky. Duke Energy Carolinas' average industrial rate of 6.08 cents per kilowatt-hour is one of the lowest rates nationwide.

The company invests heavily in alternative energy sources. Nuclear energy accounts for 34 percent of total energy generated by Duke's plants, and natural gas and fossil fuels account for 29 percent. Duke Energy owns and operates 23 wind farms and 38 commercial solar farms that generate more than 2,500 megawatts of energy across 13 states.



PIEDMONT NATURAL GAS

Piedmont Natural Gas, acquired by Duke Energy in 2016, provides natural gas to more than 1 million residential, commercial and industrial customers in North Carolina, South Carolina and Tennessee. Piedmont Natural Gas promotes the direct use of natural gas for homes, businesses and industries as the most efficient use of this valuable natural resource.

Piedmont Natural Gas is pioneering the use of compressed natural gas (CNG) as a superior alternative fuel for transportation. Piedmont is actively marketing CNG, making it more widely available across its service areas with a focus on return-to-base fleets, both large and small. As the first step in building a network of fueling stations that anyone can use, Piedmont currently has 10 public fueling stations in North Carolina, South Carolina and Tennessee.



WORLD-CLASS RESEARCH FACILITIES

The Charlotte region is at the forefront of providing highly trained and educated energy professionals. The Charlotte region's 49 colleges and universities offer dozens of programs leading to careers in energy-related occupations. More importantly, the corporate community works in partnership with the region's universities and community colleges, which offer nationally and internationally recognized programs to meet the industry's needs.



ELECTRIC POWER RESEARCH INSTITUTE (EPRI)

The Electric Power Research Institute, Inc. (EPRI) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety and the environment. EPRI also provides technology and economic analyses to drive long-range research and development planning, and supports research in emerging technologies.

EPRI's University Research Park campus includes laboratories that focus on nuclear and fossil generation, renewable energy and power delivery. With 360,000 square feet of laboratory, office and conference space on 45 acres, EPRI's Charlotte campus equips the institute to continue to expand its research, development and demonstration programs and to serve its member companies. Member companies represent 40 countries as well as more than 90 percent of the electricity generated and delivered in the United States.

ENERGY PRODUCTION AND INFRASTRUCTURE CENTER (EPIC)

The Energy Production and Infrastructure Center (EPIC) at the University of North Carolina at Charlotte is a collaborative industry/education effort to produce a high-quality engineering workforce and to become a partner in technology research for the global energy industry.

Students are hands-on in their academic careers and with prospective employers. The College of Engineering's Senior Design Program brings together students, faculty members and industry experts to tackle real-world engineering projects.

EPIC has defined key research thrusts, which include grid management; advanced sensing; manufacturing issues associated with large power generation equipment; renewable energy generation, including photovoltaics, wind, geothermal and biofuels; and environmental improvements on fossil generation. The 200,000-square-foot EPIC building comprises labs, offices and classrooms, with a 4,000-square-foot clean room, a 3,500-square-foot material growth lab and a high-bay research area.






S U S T A I N A B I L I T Y E F F O R T S

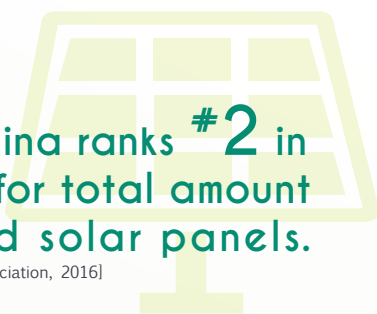
From the local government to nonprofits to the private sector, the Charlotte community is investing in initiatives to make more environmentally conscious investments. According to a 2014 report by Sustain Charlotte, the Charlotte area scores well in areas like air quality, energy use, and water use

on a local level, but is slightly behind the national average when it comes to trends including land use and transportation. As Charlotte continues to climb the ranks of sustainable cities, many businesses and nonprofits are pioneers in green practices.



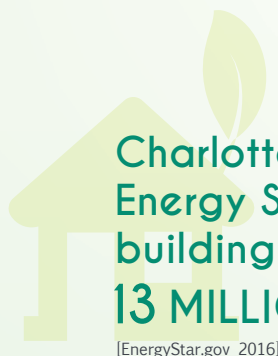
26,000
clean energy jobs
in North Carolina.

[N.C. Sustainable Energy Association]



North Carolina ranks **#2** in
the nation for total amount
of installed solar panels.

[Solar Energy Industries Association, 2016]



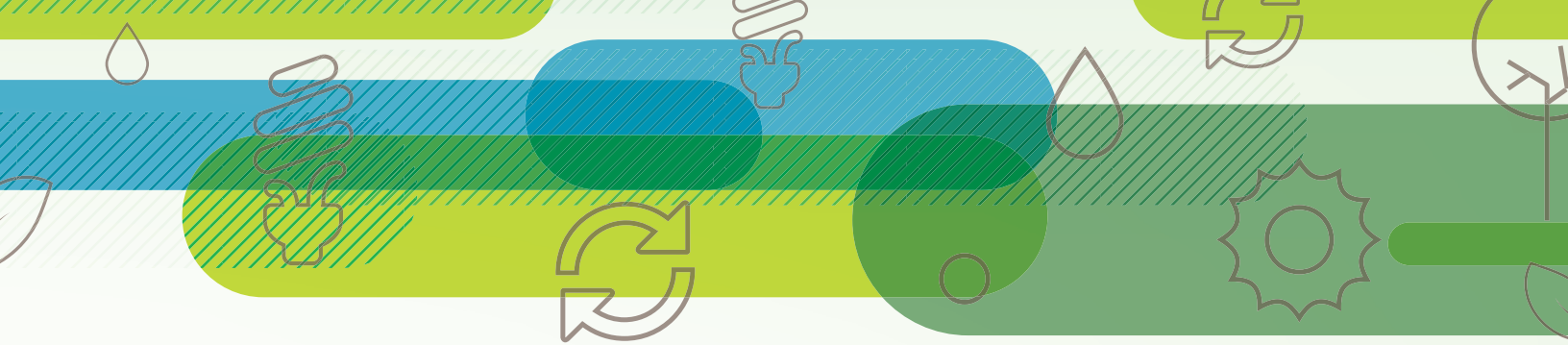
Charlotte has **71**
Energy Star-rated
buildings totaling
13 MILLION sq ft.

[EnergyStar.gov 2016]



North Carolina ranks **9th**
in the nation for number
of solar jobs.

[Solar Market Insight, 2016]



HOW CAN YOUR BUSINESS GO GREEN?

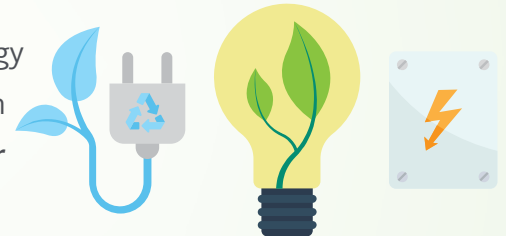


WATER CONSERVATION

Consider replacing old toilets with newer models that use less water per flush. With new equipment, **look for the WaterSense label to ensure it is energy efficient.**

WORK GREEN

Invest in heating, cooling, and lighting systems that use less energy when the office is not occupied. Use energy efficient light bulbs with compact fluorescent lights (CFLs). **Duke Energy provides these for free to qualified users.**

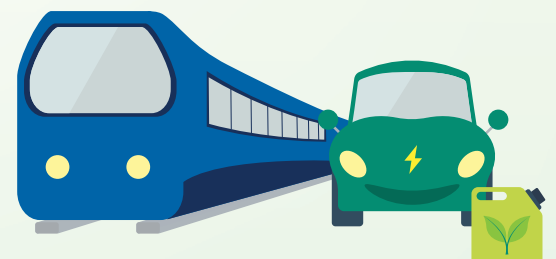


BUILD GREEN

Consider LEED-certified construction if you are building or renovating your space. You may be able to take advantage of structural, financial, and other incentives including tax credits and grants. **Check out the options at www.usgbc.org.**

COMMUTE GREEN

Encourage employees to commute using public transportation via the LYNX blue line, CATS Gold Rush, or any CATS bus routes. **If you have a vehicle fleet, consider investing in energy efficient cars or trucks.**



ENVIRONMENTAL INNOVATION

Numerous organizations in the Charlotte region are coming up with ways to save energy and implementing innovative green policies in their workplace. These organizations

range from nonprofits to corporate offices to hospitals. All of their contributions make Charlotte's energy hub even stronger.

ALL GREEN RECYCLING

Serves the corporate community by assisting with the recycling of old commercial and industrial equipment. Ensures that hazardous waste from these machines does not end up in landfills.

CENTRAL PIEDMONT COMMUNITY COLLEGE (CPCC)

The Sustainability Technologies program at CPCC offers degrees and certificates in renewable energy, environmental engineering, sustainable manufacturing and spatial analysis.

COCA-COLA BOTTLING CONSOLIDATED

The Charlotte bottling plant has its own wastewater treatment facility that allows the company to discharge water that is as clean as when the water was originally purchased.

RENEWABLE ENERGY TRANSITION INITIATIVE

This nonprofit focuses on tackling poverty in Charlotte by lowering energy costs for low-income families. Their partnerships with local libraries, recreation centers and churches help to educate Charlotteans on energy conservation methods.

UTC AEROSPACE SYSTEMS

UTC Aerospace Systems has a number of LEED-certified sites around the world, including its Charlotte headquarters, and locations in Russia, Germany, and Poland.

CLT JOULES

An incubator for startups, CLT Joules works with some of the largest energy companies in the country to create opportunities for entrepreneurs who are developing clean energy companies.



LOWE'S, INC

Lowe's is actively investing in green chemistry to become better informed and use safer chemicals in its products. Lowe's removed certain chemicals from all residential vinyl flooring products in 2015 and exclusively offer paint selections that are free of volatile organic compounds.

CATAWBA RIVER DISTRICT

This nonprofit organization provides educational programming on the watershed and sustainable development to local schools in Mecklenburg and Gaston counties.

CAROLINAS HEALTHCARE SYSTEM^(CHS)

Four of CHS's facilities have been nominated for environmental awards for its investments in green initiatives including community gardens, bicycle sharing programs, electric vehicles, and using Green Seal Certified cleaning products.

SUSTAIN CHARLOTTE

Sustain Charlotte works across the Charlotte region to promote its sustainable neighborhoods program, which empowers residents to set measurable sustainability goals for their communities.

UNC CHARLOTTE

The University, with over 28,000 students, has numerous sustainable initiatives. UNC Charlotte replaced more than 30,000 light bulbs with LED lamps in 2014. A student community garden club creates green areas around the campus.

CITY OF CHARLOTTE

The city owns and operates approximately 100 alternative fuel vehicles and has five LEED-certified buildings. More than 1,500 solar panels are installed on city-owned and managed facilities.



 *charlottechamber*

GreenWorks

The Charlotte Chamber's GreenWorks Council helps Charlotte businesses turn over a new green leaf. Council members range from those passionate about sustainability to others looking for ways to be green in their business. This council exists to provide information on environmental responsibility and sustainability to businesses and help connect like-minded members of the Charlotte Chamber.

The GreenWorks Council would like to thank Sealed Air for its Gold level sponsorship.



GreenWorks

The GreenWorks Council would like congratulate
the following for being nominated for the
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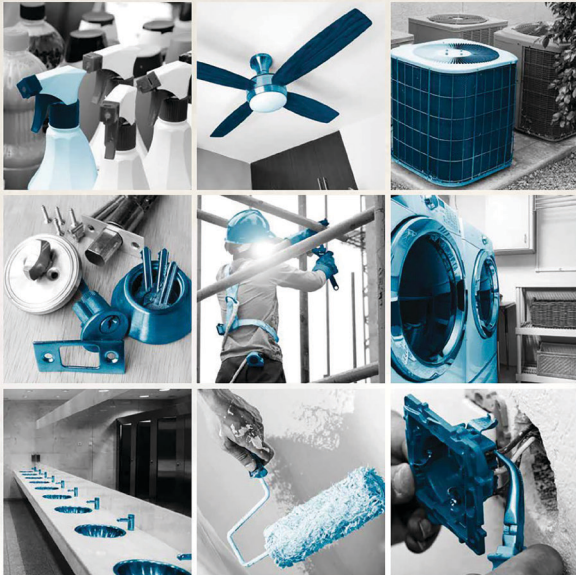
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The advertisement features a large image of a city skyline with a prominent skyscraper. Below the skyline, there are three smaller images: a warehouse interior, a parking lot with a building, and a warehouse interior with shelves.

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LIFE IMPROVEDSM

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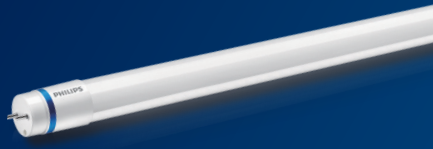
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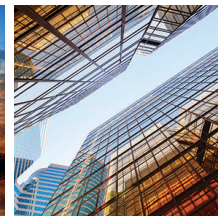
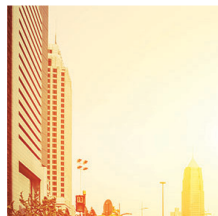
integrity

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GUIDANT GROUP **Bartech**
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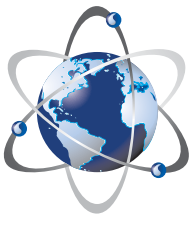
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