

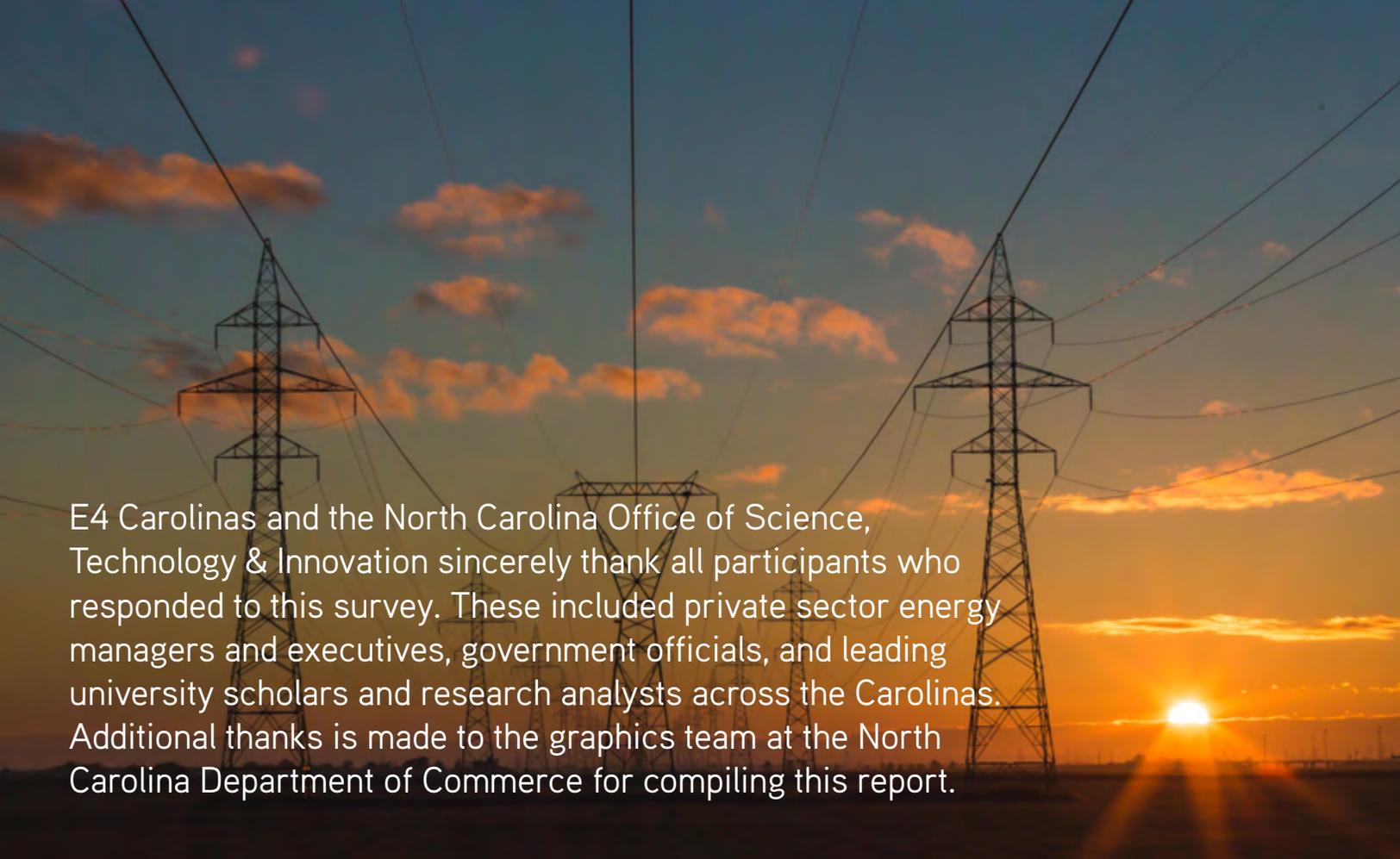
# Carolinas' Energy Economy Survey: *Findings & Recommendations*



NORTH CAROLINA  
Department of Commerce  
*Science, Technology & Innovation*



E4  
CAROLINAS<sup>®</sup>



E4 Carolinas and the North Carolina Office of Science, Technology & Innovation sincerely thank all participants who responded to this survey. These included private sector energy managers and executives, government officials, and leading university scholars and research analysts across the Carolinas. Additional thanks is made to the graphics team at the North Carolina Department of Commerce for compiling this report.

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E4 Carolinas is the trade association for Carolina energy companies and organizations, providing a platform whereby members become more valuable and successful through collaboration in the areas of Workforce Development, Economic Development, Innovation & Capital, Communications & Networking and Policy. More information about E4 Carolinas can be found at [e4carolinas.org](http://e4carolinas.org).

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# Executive Summary

In 2017, E4 Carolinas, the North Carolina Department of Commerce's Office of Science, Technology & Innovation, and other energy organizations joined together to create the Southeast's Energy Innovation Collaborative. The Carolinas and adjoining areas in the Southeast are believed to be home to the largest energy economy in the eastern United States,<sup>1</sup> and this Collaborative will give global visibility to the area's energy innovation. Collaborative activities include conducting the research, convening stakeholder meetings, and mapping the pathway necessary for increased energy employment and new companies.

An important and first step of the Southeast's Energy Innovation Collaborative was to collect information on the Carolinas' energy economy and to define the region's "energy economy" and its "energy innovation assets." To fulfill this goal, the *Defining the Carolinas' Energy Economy* survey was launched in the fall of 2017. The Collaborative "crowd sourced" these definitions through this survey targeted at private sector energy managers and executives, government officials, leading university scholars and research analysts across the Carolinas, as well as other individuals affiliated with the energy industry. The results of the survey will help the Collaborative launch several important activities that will benefit the energy sector, including:

- develop and provide facts to fuel the Southeast's Energy Innovation Collaborative's growth;
- make Carolina energy innovation assets easy to find and access;
- define how these energy assets interact and can best grow;
- reveal development opportunities in our own backyard;
- attract prospective investors and customers of energy innovation;
- supplement, enhance and facilitate the better use of existing networks, and;
- recommend and promote policies that will make the Carolinas the innovation leader of the new energy economy.

This report provides an overview and analysis of the survey. To achieve this goal, this report is divided into three sections: a description of the goals, survey and its responses; analysis and discussion; and recommendations for the future. The survey's results indicated that, while the energy economy and innovation assets are vital for development and should be included in development discussions, efforts to promote and leverage them effectively appear to be mixed. Furthermore, most respondents indicated that the Carolinas' energy innovation assets are leaders in the South currently and have strong potential to remain the leader. However, when compared to energy economies of the national market, just over half of respondents ranked the Carolinas' energy innovation assets as contributors (not leaders) currently, but with the potential to become the energy leaders.

*In sum, the "Defining the Carolinas' Energy Economy" survey highlights the importance of the region's current energy innovation leadership and its future potential, while at the same time revealing a valuable opportunity to promote and expand these assets further.*

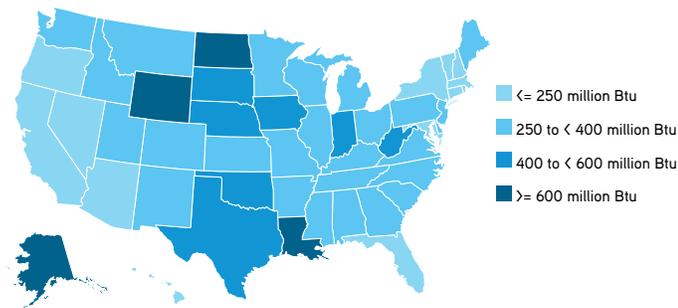


# Analysis and Discussion

The Carolinas – comprised of North Carolina and South Carolina – make up approximately 2.3% of the physical area of the United States<sup>ii</sup> and are home to over 15 million people (making the area the fifth largest in terms of population in the nation)<sup>iii</sup>. In terms of energy consumption, the Carolinas consumed between 250 million Btu and 400 million Btu in 2017 per capita (specifically, North Carolinas residents consumed approximately 251 million Btu per capita while South Carolinas residents 337 million Btu per capita, see Figure 1).

The sources of energy consumed by most Carolinians are produced from natural gas, nuclear fuel, and coal and petroleum, which are primarily used for transportation purposes. Industrial, residential, commercial consumption follow transportation in per capita consumption.<sup>iv</sup> In 2015, Carolinians spent less than \$4,000 per capita on their energy (specifically, North Carolinians spent \$3,073 per capita and South Carolinians spent \$3,763 per capita). North and South Carolinians were charged 11.20 cents/kWh and 12.79 cents/kWh, which were below the national average of 13.12 cents/kWh. Comparatively, many of the region’s cities continually rank high on indicators of economic strength and population growth,<sup>v,vi</sup> and an increased demand for energy in the Carolinas should be expected in the future.

**Figure 1: U.S. Total Energy Consumed per Capita by State, 2015 (million Btu)**



Source: U.S. States: States Profiles and Energy Estimates. United States Energy Information Administration.<sup>vii</sup>

According to the United States Energy Information Administration, to fill the growing demand for energy, the Carolinas employ a variety of methods, as well as some of the nation’s most robust technologies, for production purposes. Figure 2 presents a map of the Carolinas’ energy production facilities. And while both states share a border and cultural similarities, their electric energy production methods are quite different. With regards to North Carolina, the state was fourth in the nation in net electricity generation from nuclear power in 2016, producing five percent of the nation’s total, but coal-fired plants produce the most power for electricity at thirty-six percent total, then followed by nuclear at twenty-eight percent and natural gas-fired plants at twenty-seven percent. The state has also made significant generation in terms of renewable energy (much of which is hydroelectric energy), which provided nearly ten percent of the state’s electricity output. North Carolina was the third largest producer of

electricity generated from solar photovoltaics (PV) among all states in 2016, and almost all of the solar generation occurred at utility-scale facilities operated by independent power producers. Finally, in 2017, a wind farm with 208 megawatts of capacity came online in North Carolina, which is the largest wind farm in the Southeast United States.

**Figure 2: Map of the Carolinas’ Power Production Facilities**



Source: U.S. Energy Mapping System. United States Energy Information Administration.<sup>viii</sup>

Meanwhile, South Carolina’s primary energy provider is nuclear power, generating approximately fifty-four percent of all electricity in the state.<sup>ix</sup> Coal-fired and natural gas-fired plants provide twenty-three percent and eighteen percent respectively, of South Carolina’s energy supply. South Carolina’s system of rivers and lakes does provide hydropower, but only at three percent of the total production.<sup>x</sup> Finally, with nearly two-thirds of South Carolina forested, the wood waste from the state’s forests, lumber mills, and wood products industry yields significant amounts of biomass that mostly accounts for the remaining three percent of energy production statewide.<sup>xi</sup> Furthermore, the region’s Atlantic Outer Continental Shelf holds an estimated 4.72 billion barrels of oil,<sup>xii</sup> but accessing this oil may not be economically viable and could cause significant economic and environmental harm.<sup>xiii</sup> Comparatively, the geographic areas for generating wind energy are much larger than the anticipated oil and gas deposits along the Atlantic coast.<sup>xiv</sup> Furthermore, considering the Southeast’s advantages in lower labor

costs, manufacturing and construction, favorable business environments, major research facilities, and established transportation systems, there is great potential for the offshore wind energy industry.<sup>xv</sup> Couple this with North Carolina's projected population growth rate of eleven percent<sup>xvi</sup> and South Carolina's of nine percent,<sup>xvii</sup> and the need for new, innovative energy-producing technologies becomes apparent.

## Description of Goals, Survey and Responses

Collaboratively, E4 Carolinas and the North Carolina Office of Science, Technology & Innovation created the *Defining the Carolinas Energy Economy* survey. The survey contained fourteen total questions and was conducted through SurveyMonkey. Appendix A contains the contents of the entire survey. Questions were based around the Carolinas' 'energy economy' and 'energy innovation assets,' which were defined as the following in the survey (and stated throughout the survey):

- The Carolinas' **"Energy Economy"** includes any entity that is engaged in the production, transmission, distribution or delivery of energy in the Carolinas, or is a consequential provider of products, services, workforce, regulation, capital, or other necessity of those entities.
- An **"Energy Innovation Asset"** is anything or entity with substantive potential to foster or contribute to the creation and adoption of new products, services, and business models that promote the energy economy and may include companies, organizations, policies, research, intellectual property, prototyping, capital provision, manufacturing, technological ability, etc.

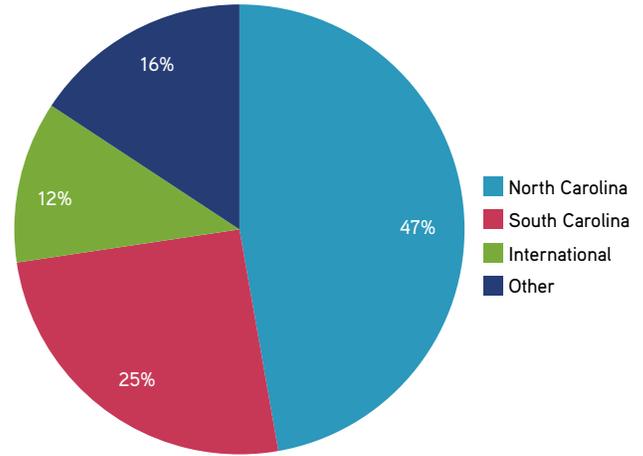
The results of the survey will eventually be used to create a directory of energy resources and policies to help make the Carolinas the leader in the future energy economy across the South, nationwide, and internationally.

The survey sample included 1,574 energy related professionals who were analysts, managers, and executives from utilities and energy-related companies, government and community leaders, energy researchers, and other senior-level professionals who support the Carolinas' energy industry. Everyone in the sample worked in either North Carolina or South Carolina (with nearly two thirds of the sample from North Carolina). Data were kept confidential on the North Carolina Department of Commerce servers and in password-protected files. The surveying period ranged for one month over September 2017. The average completion time was just over five minutes, and was accessible via respondents' laptops, tablets or smart phones. Respondents received an initial email shortly after Labor Day 2017, inviting them to complete the survey. Respondents also received up to three reminders if they did not complete the survey by the stated deadline.

A total of 236 individual unique responses were collected, resulting in a fifteen percent response rate. As illustrated in Figure 3, nearly three-fourths of surveyed professionals indicated a majority of their interest in energy were in the states of North and South Carolina. Interest in "Other" states was primarily in the Southeast and west coast regions of the US, but all other states were indicated. Only twelve percent of respondents indicated interest in international markets. Additionally, almost a third of respondents worked in energy-related businesses, and nearly a tenth each worked for a utility, an energy-related nonprofit, in educational settings, or government. Fifteen percent of respondents serve in a consulting role for the Carolinas' energy industry.

Results from the survey are described below, and corresponding data tables are presented in Appendix B.

Figure 3: Respondents' Geographic Interests in Energy Markets

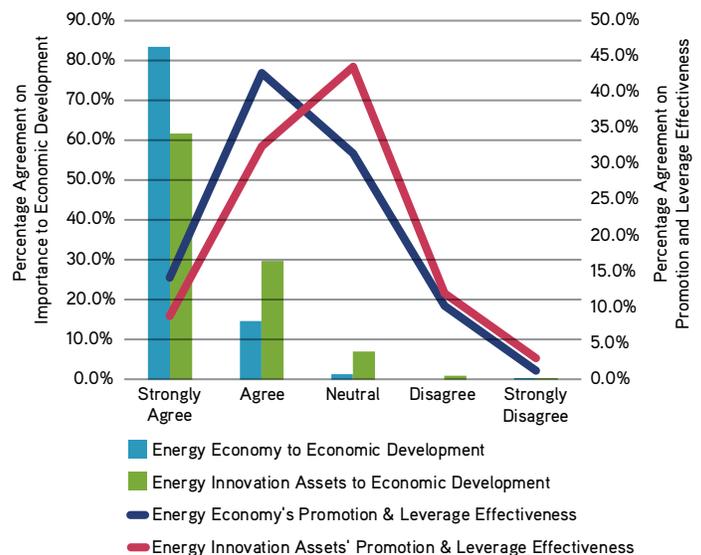


## Survey Results

The results from this survey are presented across the following three areas: 1) the importance of the Carolinas energy economy and energy innovation assets in economic development, and the extent to which they are effectively promoted and leveraged; 2) specific sector's consideration as part of the Carolinas energy economy and energy innovation assets; and 3) the assessment of the Carolinas' energy innovation assets to other areas.

Results on the importance the Carolinas energy economy and energy innovation assets in economic development, and the extent to which they are effectively promoted and leveraged are presented in Figure 4. Overwhelmingly, and as presented in the bar charts, ninety-eight percent of respondents agreed that the Carolinas' energy economy is important for economic development. Furthermore, ninety percent of respondents agreed that the Carolinas' energy innovation assets are important for economic development, suggesting that these items play a vital role in the Carolinas economy. However, just over half of respondents said the energy economy is efficiently promoted and leveraged for development and forty-one percent of respondents said that these assets are efficiently promoted and leveraged for development (as illustrated by the line charts).

Figure 4: Extent to which Respondents Agree that the Carolinas' Energy Economy and Energy Innovation Assets are Important to Economic Development and Effectively Promoted and Leveraged



These results suggest shared thinking on the importance of the energy economy and innovation assets as vital for development, but some disagreement on whether or not we are effectively promoting and leveraging them to the Carolinas' advantage. Furthermore, similar patterns of agreement were observed in the respondents who worked for utilities, in energy-related business, in nonprofits, and among consultants regarding the promotion and leveraging of the energy economy. Respondents from government and education tended to be more neutral in this area, with government workers leading in neutral responses. Regarding the efficiency in the promotion and leverage of energy innovation assets, the largest percentage of agreement came from consultants, as all other respondents employed within other sectors mostly had neutral responses.

The overall economy is made up of several different sectors that independently and jointly drive its performance, and the Carolinas' energy economy is no different. For this survey, we gauged respondents' opinions about the inclusion of specific sectors within the Carolinas' energy economy and innovation assets. These sectors were, and are defined, as follows:

- Research Centers (including universities, corporate, Federal, and non-profit research centers);
- Government (including Federal, State, and Local);
- Utilities (including investor-owned, cooperatives, municipals, and public);
- Non-profits (including trade associations and environmental/community advocacies);
- Education (including universities, community/technical, and private trainings);
- Energy companies (including biofuels, biomass, coal, geothermal, hydro/marine, hydrogen, natural gas, nuclear, petroleum, solar, waste, and wind);
- Energy Efficiency Companies (including industrial, commercial, and residential), and;
- Professional Services (including law, accounting, consulting, logistics, marketing, communications, engineering/procurement/construction, information technology, and workforce development).

As shown in Figure 5 (following page), there was overwhelming consensus that all sectors should be considered part of the Carolinas' energy economy and energy innovation assets. Of these sectors, government, nonprofits, and professional services had more neutral responses, though none were strong enough to make up more than a quarter of all respondents. These same sectors also had more responses signaling they should not be considered part of the energy economy and energy innovation assets, though these estimates were calculated to be between one and twelve percent. Similar patterns of agreement were seen across all private-, public-, and non-profit sector respondents.

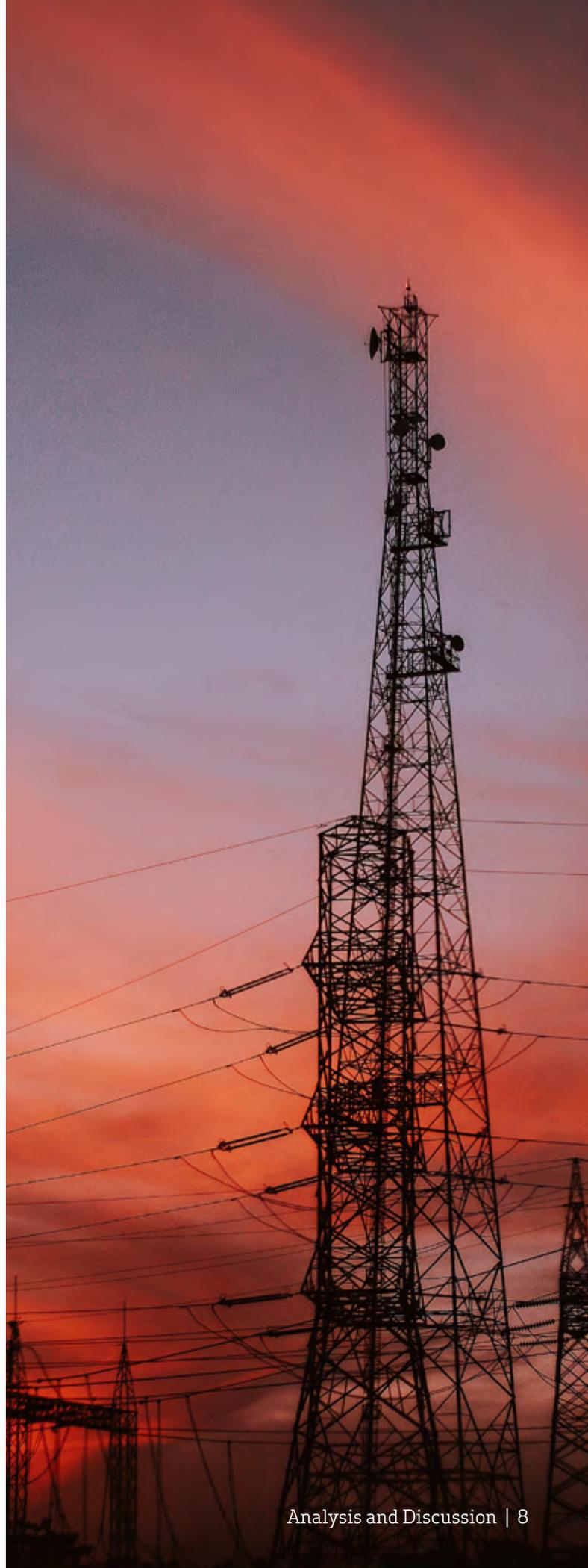


Figure 5: Sectors' Inclusion on the Carolinas' Energy Economy and as Part of the Carolinas' Energy Innovation Assets

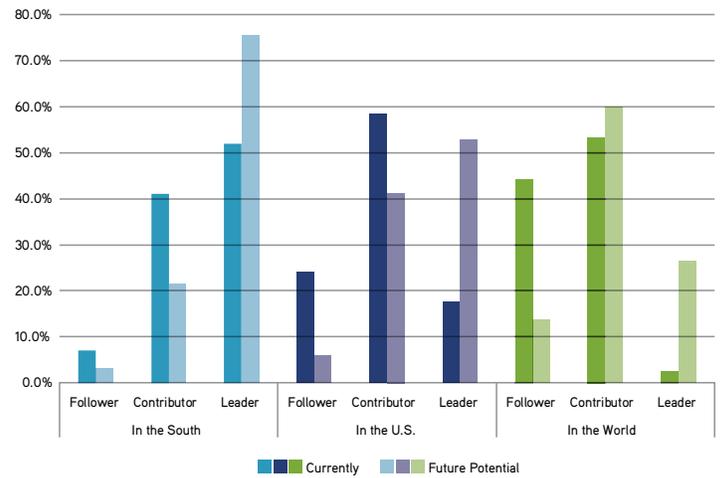


Finally, we asked respondents to rank the Carolinas' energy innovation assets in current and future potential as either leader, contributor, or follower in the southern, domestic, and international economies. These ranking results are presented in Figure 6 (following page). Overall, we saw there was an indirect relationship between confidence and the size of the market in comparison; specifically, the smaller the market, the more confidence a respondent had in the Carolinas' energy assets as leaders within this market. When compared to energy economies of the South, just over half of respondents indicated the Carolinas' energy innovation assets as the leaders in the South currently, and three quarters of respondents indicated that our assets have the potential to be or remain the leader. Respondents from government tended to rank both the current and future potential of Carolinas' energy innovation assets as contributors in the Southern energy economy, while nonprofits tended to rank the assets the highest as leaders.

When compared to energy economies of the entire US, fifty-eight percent of respondents ranked the Carolinas' energy innovation assets as contributors (not leaders) in the economy currently, and just over half of respondents indicated that our assets have the potential to become the leaders. Once again, respondents from government tended to rank both the current and future potential of Carolinas' energy innovation assets as contributors in the Southern energy economy and nonprofits tended to rank the assets the highest as leaders.

But when measured against the worldwide economy, just over a majority of respondents ranked the Carolinas' energy innovation assets as contributors (not leaders) and forty-four percent ranked them as followers (not contributors) globally. Furthermore, just over a quarter of respondents said that our assets have the potential to become the international leaders, while sixty percent ranked them as having the potential to become international contributors. Respondents who work in education were the most likely to rank the assets as followers in the international market and all sectors were most likely to agree that the assets had future potential to be classified as contributors globally.

Figure 6: Current and Future Potential Rankings of the Carolinas' Energy Innovation Assets to Other Areas



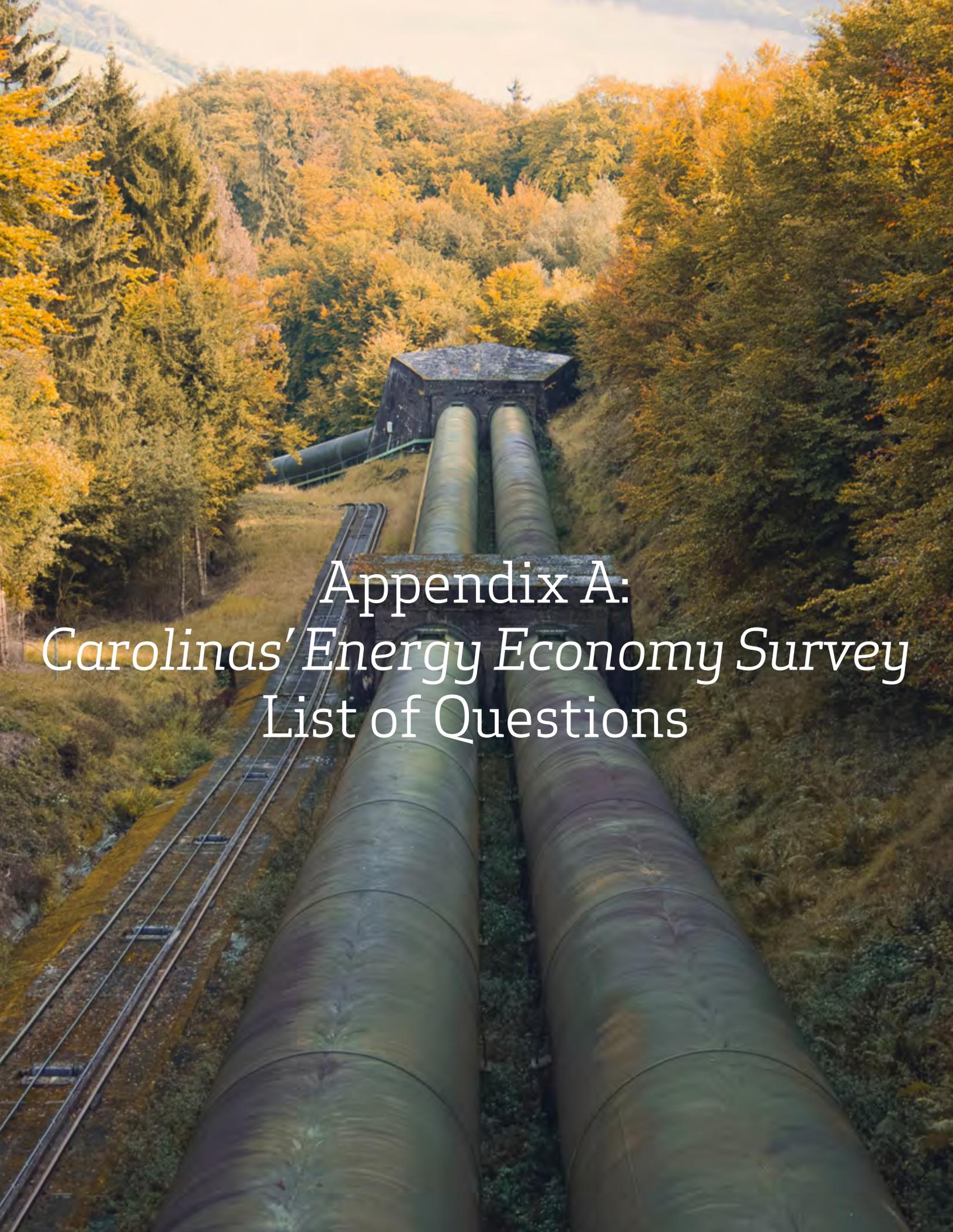


## Recommendations for the Future

The *Defining the Carolinas Energy Economy* survey is a first step by the Southeast Energy Innovation Collaborative to gain perspective on the Carolinas energy economy. The Collaborative's decision to "crowd source" the definitions of the Carolinas' energy economy and energy innovation assets has yielded several takeaways. First, the Carolinas' energy economy and innovation assets are important for economic development. And while some variation does exist among respondents by different sectors, both should be properly defined and included in energy policy discussions. Second, the energy economy and energy innovation assets may not currently be promoted and leveraged to their maximum potential. The causes and solutions to this should be explored further. Finally, the Carolinas' energy innovation assets appear to be considered the leaders in the Southern economy currently, but they also have potential to have a bigger impact in domestic and global markets. How these impacts can happen was not addressed in this survey, and thus they should be remembered for future study.

Following this survey, the Southeast Energy Innovation Collaborative will undertake a series of next steps to promote the survey results to policy makers, business leaders, and researchers; promote energy-related entrepreneurial and innovative activity within the Carolinas; and shape the region as the innovation leader in the new energy economy. These steps include:

- **Establishing a Directory of Energy Resources** – Currently, E4 Carolinas maintains a data base of Carolina energy companies and organizations which will be expanded, validated and then used to identify and connect organizations engaged in energy research, innovation, new product and service development, new venture creation and energy innovation support. The directory will provide economic, demographic and inferential information relevant for the residential, commercial, industrial, and transportation energy sectors. From this directory a roadmap and reference tool for entrepreneurs, researchers, and policy makers will be built. This will address the Collaborative's objectives to develop and provide facts to fuel the Energy Innovation Collaborative and make the Carolinas' energy assets easy to find and access.
- **Convene Stakeholder Meetings** – In 2018 the Collaborative will convene a series of stakeholder meetings to define how the Carolinas "energy innovation assets interact and can best grow" to advance the Carolinas to energy innovation leadership. This process will reveal development opportunities in our own backyard and policy recommendations will be developed.
- **Report on Stakeholder Recommendations** – The Collaborative will organize the recommendations into appropriate reports for state development, innovation, research and policy organizations, and support various organizations in initiatives to advance those recommendations. These recommendations will contain suggestions for developing policies that will advance the Carolinas' position in the new energy economy.
- **Identify/Fill Gaps in Carolinas' Energy Innovation Ecosystem** – Based on the Collaborative's survey, inventory, stakeholder recommendations and reports, potential national/global energy innovation leadership opportunities will be identified and the additional assets and actions required to attain leadership positions will be mapped and plans made.
- **Attract Investors, Practitioners and Customers** – The Collaborative's survey, inventory and development and policy initiatives will be used to attract others to invest in and join the Carolina energy economy, enhancing existing assets and filling gaps to advance the Carolinas to national/global energy innovation leadership.



Appendix A:  
*Carolinas' Energy Economy Survey*  
List of Questions

Question 1. Which state(s) and areas contain the majority of your interest in energy? Check all that apply.

- North Carolina
- South Carolina
- International
- Other state(s). Please specify.

Question 2. Which of the following categories best describes your participation in the energy economy? Check one.

- I work for a utility.
- I work in an energy-related business.
- I work in finance.
- I work for an energy-related nonprofit.
- I work in education.
- I work for the government.
- I am a consultant.
- Other. Please specify.

Question 3. To what extent do you agree that the Carolinas' Energy Economy is *important* to economic development?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Question 4. To what extent do you agree that the Carolinas' Energy Economy is effectively promoted and leveraged for economic development?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Question 5. To what extent do you agree that the Carolinas' Energy Innovation Assets are *important* to economic development?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Question 6. To what extent do you agree that the Carolinas' Energy Innovation Assets are *effectively promoted and leveraged* for economic development?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Question 7. Do you agree or disagree that each sector listed below should be considered part of the Carolinas' 1) Energy Economy and 2) Energy Innovation Assets?

Sector	Part of the Carolinas' <u>Energy Economy</u>	Part of the Carolinas' <u>Energy Innovation Assets</u>
Research Centers (including universities, corporate, Federal, and non-profit):		
Government (including Federal, State, and Local):		
Utilities (including investor-owned, cooperatives, municipals and public):		
Non-profits (including trade associations and environmental/community advocacies):		
Education (including universities, community/technical, and private trainings):		
Energy Companies (including biofuels, biomass, coal, geothermal, hydro/marine, hydrogen, natural gas, nuclear, petroleum, solar, waste, and wind):		
Energy Efficiency Companies (including industrial, commercial, and residential):		
Professional Services (including law, accounting, consulting, logistics, marketing, communications, engineering/procurement/construction, information technology, and workforce development):		

Have we forgotten anything not listed above? If so, what is it and what are your opinions on its role in the Carolinas' Energy Economy and as an Energy Innovation Asset?

Question 8. Using the scale below, how would you *currently* rank the Carolinas' Energy Innovation Assets compared to assets in other areas?

	Follower	Contributor	Leader
In the South			
In the U.S.			
In the world			

Question 9. Using the scale below, how would you rank the *future potential* of the Carolinas' Energy Innovation Assets compared to assets in other areas?

	Follower	Contributor	Leader
In the South			
In the U.S.			
In the world			

Question 10. First and Last Name

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Question 11. Title

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Question 12. Email Address

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Question 13. Organization Name

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An aerial photograph of a large-scale solar farm. The solar panels are arranged in long, parallel rows that stretch across the landscape. The panels are a deep blue color, and the ground between them is a mix of brown and green, suggesting some vegetation or bare earth. In the center of the image, there is a small, rectangular, light-colored structure, possibly a building or a water reservoir, surrounded by a small pool of water. The overall scene is a vast, organized expanse of renewable energy infrastructure.

# Appendix B: Results Tables

**Table 1: States and Areas Containing a Majority of Respondents' Energy Interests**

State	N	%
North Carolina	204	81.6%
South Carolina	110	44.0%
International	50	20.0%
Other	68	27.2%

*N=236 (multiple responses accepted)*

**Table 2: Respondents Employment within the Energy Economy**

Employment	N	%
I work for a utility.	25	10.1%
I work in an energy-related business.	77	31.0%
I work in finance.	4	1.6%
I work for an energy-related nonprofit.	25	10.1%
I work in education.	24	9.7%
I work for the government.	22	8.9%
I am a consultant.	39	15.7%
Other.	18	7.3%

*N=236*

**Table 3: Extent to which Respondents Agree that the Carolinas' Energy Economy is Important to Economic Development**

Agree/Disagree	N	%
Strongly Agree	188	83.6%
Agree	33	14.7%
Neutral	3	1.3%
Disagree	0	0.0%
Strongly Disagree	1	0.4%

*N=225*

**Table 4: Extent to which Respondents Agreed that the Carolinas' Energy Economy is Effectively Promoted and Leveraged**

Agree/Disagree	N	%
Strongly Agree	32	14.2%
Agree	96	42.7%
Neutral	71	31.6%
Disagree	23	10.2%
Strongly Disagree	3	1.3%

*N=225*

**Table 5: Extent to which Respondents Agree that the Carolinas' Energy Innovation Assets are Important to Economic Development**

Agree/Disagree	N	%
Strongly Agree	139	61.8%
Agree	67	29.8%
Neutral	16	7.1%
Disagree	2	0.9%
Strongly Disagree	1	0.4%

*N=225*

**Table 6: Extent to which Respondents Agreed that the Carolinas' Energy Innovation Assets are Effectively Promoted and Leveraged**

Agree/Disagree	N	%
Strongly Agree	20	8.9%
Agree	73	32.4%
Neutral	98	43.6%
Disagree	27	12.0%
Strongly Disagree	7	2.9%

*N=225*

Table 7: Sectors' Consideration as Part of the Carolinas' Energy Economy and Energy Innovation Assets

Sector	Agreement	Energy Economy		Energy Innovation Assets	
		N	%	N	%
Research Centers	Strongly Agree	83	41.1%	145	71.8%
	Agree	70	34.7%	50	24.8%
	Neutral	34	16.8%	7	3.5%
	Disagree	14	6.9%	0	0.0%
	Strongly Disagree	1	0.5%	0	0.0%
Government	Strongly Agree	49	24.3%	51	25.2%
	Agree	87	43.1%	84	41.6%
	Neutral	41	20.3%	50	24.8%
	Disagree	19	9.4%	13	6.4%
	Strongly Disagree	6	3.0%	4	2.0%
Utilities	Strongly Agree	150	74.3%	95	47.0%
	Agree	44	21.8%	67	33.2%
	Neutral	8	4.0%	33	16.3%
	Disagree	0	0.0%	7	3.5%
	Strongly Disagree	0	0.0%	0	0.0%
Non-Profits	Strongly Agree	39	19.3%	56	27.7%
	Agree	98	48.5%	101	50.0%
	Neutral	44	21.8%	38	18.8%
	Disagree	19	9.4%	7	3.5%
	Strongly Disagree	2	1.0%	0	0.0%
Education	Strongly Agree	80	39.6%	120	59.4%
	Agree	73	36.1%	65	32.2%
	Neutral	35	17.3%	16	7.9%
	Disagree	13	6.4%	1	0.5%
	Strongly Disagree	1	0.5%	0	0.0%
Energy Companies	Strongly Agree	150	74.3%	126	62.4%
	Agree	44	21.8%	52	25.7%
	Neutral	8	4.0%	21	10.4%
	Disagree	0	0.0%	3	1.5%
	Strongly Disagree	0	0.0%	0	0.0%
Energy Efficiency	Strongly Agree	105	52.0%	94	46.5%
	Agree	76	37.6%	83	41.1%
	Neutral	16	7.9%	23	11.4%
	Disagree	5	2.5%	2	1.0%
	Strongly Disagree	0	0.0%	0	0.0%
Professional Services	Strongly Agree	51	25.2%	52	25.7%
	Agree	96	47.5%	95	47.0%
	Neutral	43	21.3%	50	24.8%
	Disagree	12	5.9%	5	2.5%
	Strongly Disagree	0	0.0%	0	0.0%

N=202

**Table 8: Current Assessment of the Carolinas' Energy Innovation Assets to Others in the South, the United States, and Internationally**

	Ranking	N	%
In the South N=200	Follower	14	7.0%
	Contributor	82	41.0%
	Leader	104	52.0%
In the U.S. N=199	Follower	48	24.1%
	Contributor	116	58.3%
	Leader	35	17.6%
In the World N=197	Follower	87	44.2%
	Contributor	105	53.3%
	Leader	5	2.5%

**Table 9: Future Potential for the Carolinas' Energy Innovation Assets to Others in the South, the United States, and Internationally**

	Ranking	N	%
In the South N=200	Follower	6	3.0%
	Contributor	43	21.5%
	Leader	151	75.5%
In the U.S. N=199	Follower	12	6.0%
	Contributor	82	41.2%
	Leader	105	52.8%
In the World N=197	Follower	27	13.7%
	Contributor	118	59.9%
	Leader	52	26.4%



# References

- i The Carolinas a New State of Energy. E4 Carolinas website: <http://e4carolinas.org/about/the-carolinas-a-new-state-of-energy/>. Last accessed November 14, 2017.
- ii "State Area Measurements and Internal Point Coordinates." United States Census Bureau, United States Department of Commerce. [www.census.gov/geo/reference/state-area.html](http://www.census.gov/geo/reference/state-area.html). Last accessed March 7, 2018.
- iii "Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2016 (NST-EST2016-01)." United States Census Bureau, United States Department of Commerce. [www2.census.gov/programs-surveys/popest/tables/2010-2016/state/totals/nst-est2016-01.xlsx](http://www2.census.gov/programs-surveys/popest/tables/2010-2016/state/totals/nst-est2016-01.xlsx). Last accessed March 7, 2018.
- iv "U.S. States: States Profiles and Energy Estimates." United States Energy Information Administration, United States Department of Energy. [www.eia.gov/state/rankings/](http://www.eia.gov/state/rankings/). Last accessed October 30, 2017.
- v "The Best Places for Business and Careers: 2017 Ranking." Forbes. [www.forbes.com/best-places-for-business/list/#tab:overall](http://www.forbes.com/best-places-for-business/list/#tab:overall). Last accessed October 30, 2017.
- vi "Tracking Innovation: North Carolina Innovation Index." Office of Science, Technology & Innovation, North Carolina Department of Commerce. Raleigh, NC. December 2017.
- vii "U.S. States: States Profiles and Energy Estimates." United States Energy Information Administration, United States Department of Energy. [www.eia.gov/state/rankings/](http://www.eia.gov/state/rankings/). Last accessed October 30, 2017.
- viii "U.S. Energy Mapping System." United States Energy Information Administration, United States Department of Energy. [www.eia.gov/state/maps.php](http://www.eia.gov/state/maps.php). Last accessed October 30, 2017.
- ix "State Energy Production Estimates 1960 Through 2015." United States Energy Information Administration, United States Department of Energy. [www.eia.gov/state/seds/sep\\_prod/SEDS\\_Production\\_Report.pdf.pp4](http://www.eia.gov/state/seds/sep_prod/SEDS_Production_Report.pdf.pp4).
- x Wachob, Andrew, Park, A. Drenan, & Newcome, Roy. "South Carolina State Water Assessment: Second Edition." Land, Water & Conservation Division, South Carolina Department of Natural Resources. Columbia, SC. 2009, pp. 9-1-9-51. [www.dnr.sc.gov/water/hydro/HydroPubs/assessment/SC\\_Water\\_Assessment\\_2.pdf](http://www.dnr.sc.gov/water/hydro/HydroPubs/assessment/SC_Water_Assessment_2.pdf).
- xi "The State of SC's Forests, By the Numbers: 2015." South Carolina Forestry Commission. [www.state.sc.us/forest/stateofsc.pdf](http://www.state.sc.us/forest/stateofsc.pdf).
- xii Moore, Eddy. "Project Offshore Drilling." Coastal Conservation League. 2017. [www.coastalconservationleague.org/projects/offshore-drilling-2/](http://www.coastalconservationleague.org/projects/offshore-drilling-2/). Last accessed October 30, 2017.
- xiii Murawski, John & Fordham, Evie. "NC Gov. Cooper: No offshore oil drilling in the Atlantic Ocean." *News and Observer*. 20 July 2017, [www.newsobserver.com/news/politics-government/state-politics/article162639538.html](http://www.newsobserver.com/news/politics-government/state-politics/article162639538.html).
- xiv Southeastern Coastal Wind Coalition. NC Offshore Wind vs. Oil & Gas Locations. [http://www.sewind.org/images/fact\\_sheets/2012-10-04\\_NC\\_Offshore\\_Oil\\_Gas\\_vs\\_Wind\\_Locations.pdf](http://www.sewind.org/images/fact_sheets/2012-10-04_NC_Offshore_Oil_Gas_vs_Wind_Locations.pdf). Last accessed March 6, 2018.
- xv Southeastern Wind Coalition. Wind Energy Supply Chain Boost the Southeast. [http://www.sewind.org/images/fact\\_sheets/Energy\\_20170705\\_WindFactSheet\\_FINAL\\_%283%29.pdf](http://www.sewind.org/images/fact_sheets/Energy_20170705_WindFactSheet_FINAL_%283%29.pdf). Last accessed March 6, 2018.
- xvi "Projected Population Change in North Carolina Counties: 2010-2020." North Carolina Office of State Budget and Management. Raleigh, NC. [files.nc.gov/ncosbm/demog/countygrowth\\_2020.html](http://files.nc.gov/ncosbm/demog/countygrowth_2020.html). Last accessed March 7, 2018.
- xvii "Population Counts and Projections 2000-2030." Health and Demographics Section, South Carolina Department of Revenue and Fiscal Affairs. <http://abstract.sc.gov/chapter14/pop5.html>. Last accessed March 7, 2018.