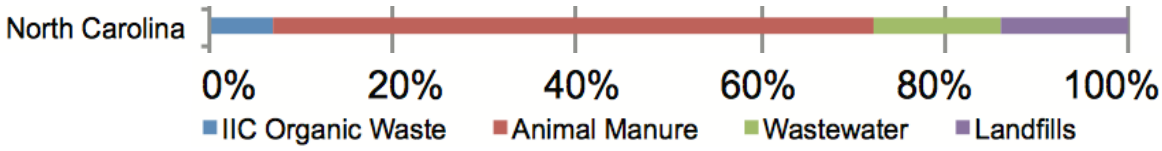
Renewable Natural Gas Fact Sheet for North Carolina

The increased production and utilization of Renewable Natural Gas (RNG) have allowed this healthy, ultra-low carbon intensity, and cost-competitive renewable fuel an unprecedented opportunity for application across the Tar Heel State. RNG, also known as biomethane, is produced from biogas released by decaying organic matter. Once conditioned, RNG is nearly identical to fossil natural gas and can be used for electricity, heat generation or transportation fuel. North Carolina has many qualities that make it well-equipped to adopt RNG in meaningful ways. These include the following:

- The environmental and health benefits of capturing biogas from waste resources are numerous. From a GHG reduction perspective, methane (CH4) has 25 times the impact of carbon dioxide (CO2) on climate change.[i] The agricultural and waste sectors are major sources of methane emissions in North Carolina. Altering manure, landfill, wastewater and food waste management strategies for production of RNG is an effective means of reducing and repurposing errant methane that would otherwise be released into the atmosphere. If the transportation sector were to use vehicular renewable compressed natural gas (R-CNG) as their chosen fuel, cars, trucks and buses on the road in North Carolina would achieve an 80-115% reduction in GHG emissions compared to diesel.[ii] All told, maximizing the potential of methane capture from waste sources in North Carolina would result in significant CO2 reductions of 1.6 million tons/yr.[iii]

- The adverse effects of air pollution on North Carolinians' health are already well known across the state. An estimated 6,000 hospital admissions for respiratory disease and 2,000 for cardiovascular disease are caused by air pollution in the state annually.[iv] Coal-fired power plants and automobiles are the two largest sources of air pollution. Natural gas (fossil and renewable) can reduce toxic pollutants such as nitrous oxides, sulfur oxides and particulate matter by as much as 80%, 99% and 92% respectively as compared to diesel.[v] There are many other significant public health incentives for capturing biogas from waste resources.



Source: NREL

- The Tar Heel State is particularly well-positioned to expand its current use of RNG based upon the abundance of methane resources. According to the EPA's NREL, the estimated methane generation potential for select biogas sources in North Carolina is the third largest in the country at almost 500,000 tons.[vi] This source of fuel is sustainable and locally produced meaning that it can help significantly reduce North Carolina's reliance on out-of-state petroleum that the state imports annually.[vii]

- The EPA's Landfill Methane Outreach Program (LMOP) lists 34 operational landfill gas projects and an additional 12 additional potential landfill projects. Landfill gas (LFG) projects have the dual benefit of reducing GHG emissions and harnessing a previously wasted energy resource.[viii] There are 26 water

resources recovery facilities which process their waste solids with anaerobic digesters and over a hundred others that could be outfitted to use their waste solids as a feedstock for production of RNG.[ix] AgSTAR lists 10 swine farms that are already equipped with anaerobic digesters operating in the state, there are an additional 175 dairy farms[x] and 529 swine farms[xi] that could deploy anaerobic digestion technology for refinement to RNG. Maximizing development of anaerobic digesters at farms, landfills and wastewater treatment facilities for biogas resources would yield the state 27.2 million dekatherm/yr of RNG.[xii]

- On March 21, 2016, Duke Energy announced that it will buy both swine and poultry waste from a facility to be built and operated in eastern North Carolina. The company will buy captured methane, treat and inject the biogas into the pipeline system to generate carbon neutral electricity at four of Duke Energy's plants. Under a 15-year term, the project developer is expected to produce more than 1 million MMBtus of pipeline-quality captured methane a year. Duke Energy should yield about 125,000 megawatt-hours of renewable energy a year – enough to power about 10,000 homes for a year.[xiii]

- North Carolina has placed a target on biofuels in the state's strategic planning for alternative fuel and advanced transportation technologies. The Clean Fuel Advanced Technology (CFAT) 2016-17 project is currently in the fourth phase of support from the N.C. Department of Transportation with $4.5 million in federal Congestion Mitigation Air Quality (CMAQ) funding. Funds are provided for transportation related emission reduction projects in 24 North Carolina counties.

- In August 2007, North Carolina became the first state in the southeast to adopt a Renewable Portfolio Standard (RPS). They are the only state to have a specific carve-out for electricity generated from animal waste as part of the clean energy law. Utilities may purchase swine or poultry Renewable Energy Certificates (RECs) or develop their own, and to comply with the law, they must secure approximately 284,000 swine RECs by 2018. In the first six years of the REPS program (2007–2012), the standard produced more than $1.7 billion in economic benefits, created or retained 4,000 jobs and 21,162 job years, and generated $1.4 billion in new investments.[xiv]

North Carolina is already becoming a leader in the promotion of generating and utilizing RNG within the state. Multiple facilities at pig farms and landfills are already producing RNG, and many more are in a position to do the same. The existing and growing use of fossil natural gas in the state's energy mix will further enhance the market for RNG, which utilizes the same infrastructure and vehicles. This puts the state in a great position to set a precedent for the rest of the country, and to substantially curb greenhouse gas emissions and reap local economic benefits in the process.

---

[i] (EPA, Overview of Greenhouse Gases: Methane, EPA estimation based on *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014 (February 2016)*)
[ii] (CARB, *Low Carbon Fuel Standard 2011 Program Review Report, 2011.*)
[iii] (American Gas Foundation, *The Potential for Renewable Gas: Biogas Derived from Biomass Feedstocks and Upgraded to Pipeline Quality,* p.60, September 2012.)
[iv] (Environment North Carolina, *Air Pollution and Public Health in North Carolina,* February 2006. Findings Based on research from University of North Carolina School of Public Health.)
[v] (NaturalGas.org, *Natural Gas and the Environment,* Sept. 2013.)
[vi] (National Renewable Energy Laboratory, *Energy Analysis: Biogas Potential in the United States,* 2013.)
[vii] (U.S. Energy Information Administration, *North Carolina State Energy Profile*, 2015.)
[viii] (EPA's Landfill Methane Outreach Program, *LFG Energy Benefits Calculator*, 2014.)
[ix] (Water Environment Federation, *Biogas Data*, 2015.)
[x] (USDA AgCensus, *North Carolina Full Report*, 2012. Potential farms for AD are farms with 500 to 999 milk cows.)
[xi] (USDA AgCensus, *North Carolina Full Report,* 2012. Potential farms for AD are farms with 5,000 or more hogs.)
[xii] (American Gas Foundation, *The Potential for Renewable Gas: Biogas Derived from Biomass Feedstocks and Upgraded to Pipeline Quality,* p.60, September 2012.)
[xiii] (Duke Energy News Center. *Pork Power gets new meaning with Duke Energy deal in N.C.,* March 2016)
[xiv] (Natural Resources Defense Council. *North Carolina's Clean Energy Future,* March 2015)