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Clean Economy Rising
Georgia solar energy looks bright

Overview

Abundant solar and biomass resources, falling costs of materials, innovative research, and state policies have launched Georgia into the national spotlight as a clean energy leader. The state ranks No. 1 in the country in commercial timberland, making woody biomass a major component of its renewable energy sector. Its significant solar potential has been largely untapped until the past year. Research at state institutions and companies has led to innovation on a wide range of clean energy technologies such as offshore wind, electric vehicles, and microgrids (power generation independent of the electrical grid). This brief examines Georgia's success in deploying clean energy and its subsequent economic growth.

Clean energy policies

Georgia has prioritized clean energy because of its economic benefits and the state's population growth and significant sources of renewable energy.

Last year, the Georgia Public Service Commission directed Georgia Power, the state's largest utility, to add 525 megawatts (MW) of solar power between 2013 and 2016. This requirement prompted new initiatives to increase solar deployment in the state, positioning Georgia to become a national leader in this sector. Georgia Power has been soliciting requests for proposals for solar projects and awarding power purchase agreements—contracts in which the utility buys electricity produced from privately owned solar farms for a set period of time at a fixed rate.[1]

Although Georgia has not established a requirement for utilities to obtain a set amount of energy from renewable sources, known as a renewable portfolio standard, it does have other important clean energy policies that have spurred economic growth. The state's solar buyback program allows Georgia Power customers to purchase electricity from the utility's solar portfolio. Interconnection guidelines let residential customers who have installed clean energy systems such as wind or solar link to the main grid, and net metering laws allow them to generate electricity from these systems to offset bills from the power company.[2]

Key State Policies					
○	Renewable portfolio standard	✓	Tax incentives	○	Green power purchasing
✓	Net metering and interconnection standards	✓	Bonds/loans/rebates/other financing	○	Nonutility sales of renewable electricity allowed

Source: North Carolina State University, Database of State Incentives for Renewables and Efficiency

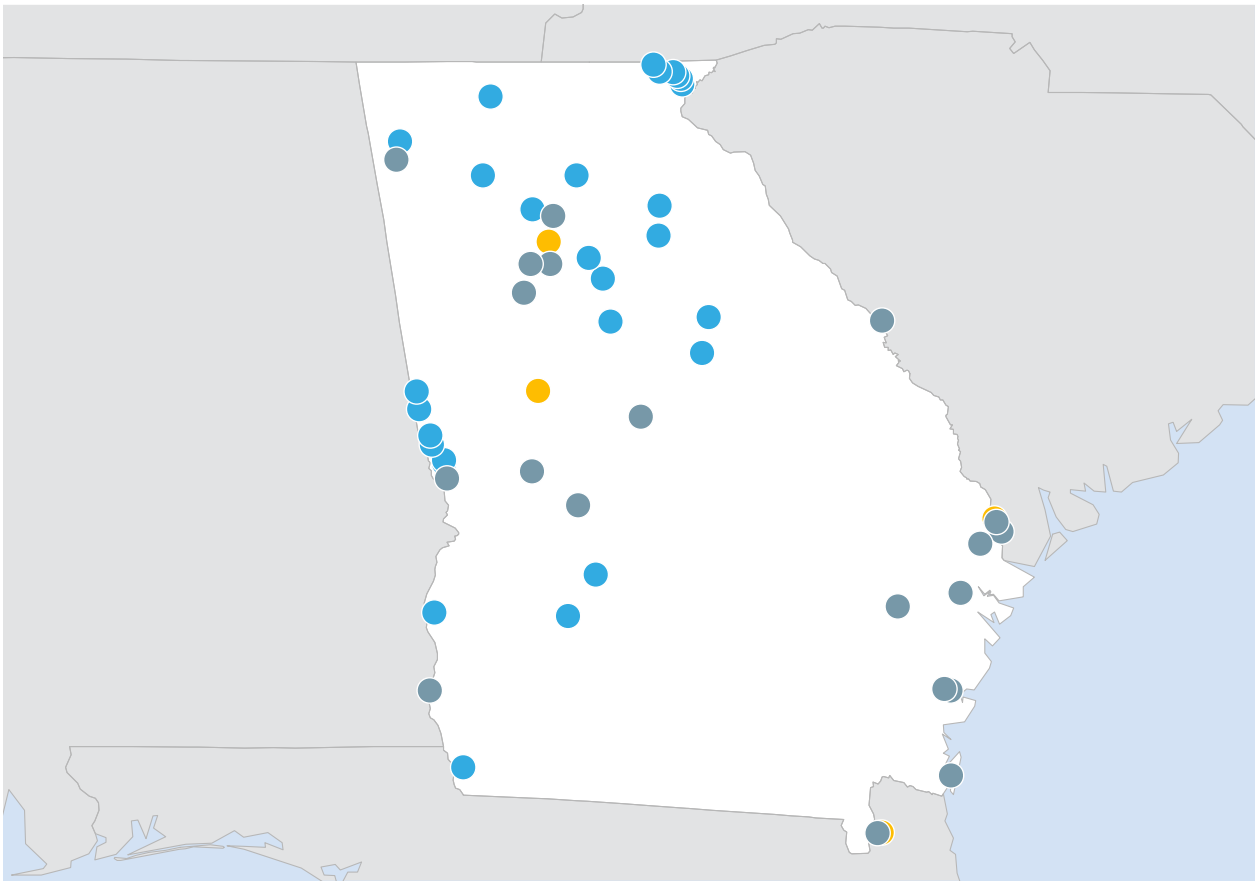
Sources of power and economic growth

The falling costs of solar installations, rising costs of electricity, and efforts by the Public Service Commission have paved the way for clean energy growth in Georgia.

In 2013, hydropower produced the most renewable energy in Georgia, with 2 gigawatts of cumulative capacity, accounting for 6 percent of the state's total power generation. Biomass came in second with 765 MW. Solar is growing rapidly, with 106 MW installed over the past five years (2009 to 2013).[3]

In 2013, the state was responsible for nearly 3 percent of new clean energy capacity installed in the United States, ranking ninth in the country. That year, private industry invested $477 million in Georgia's clean energy sector, the eighth-highest figure in the nation. This momentum continues to create jobs and support businesses in Georgia. In 2011 the Atlanta metropolitan region ranked seventh on the Brookings Institution's list of the largest clean energy metro areas, with a total of 43,060 jobs in the sector.[4]

Renewable Electricity Power Plants, >1 Megawatt Capacity



Hydro Biomass Solar

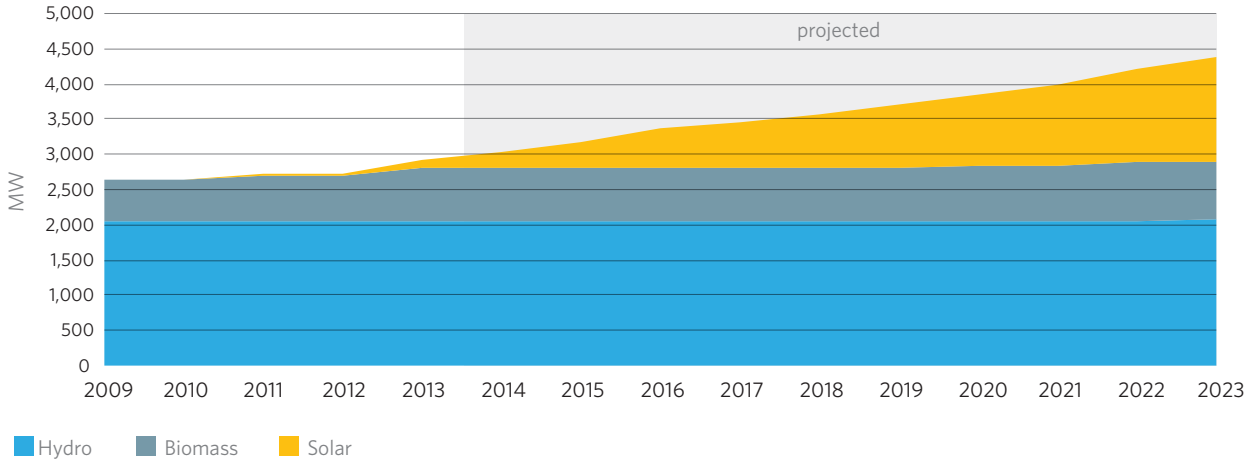
Source: Energy Information Administration

Photovoltaic panel assembly plant operated by German manufacturer MAGE SOLAR in Dublin, GA.

Snapshot: Georgia's clean energy economy

Clean Energy Capacity, by Sector and Year

Actual (2009–13) and projected (2014–23) growth in cumulative capacity

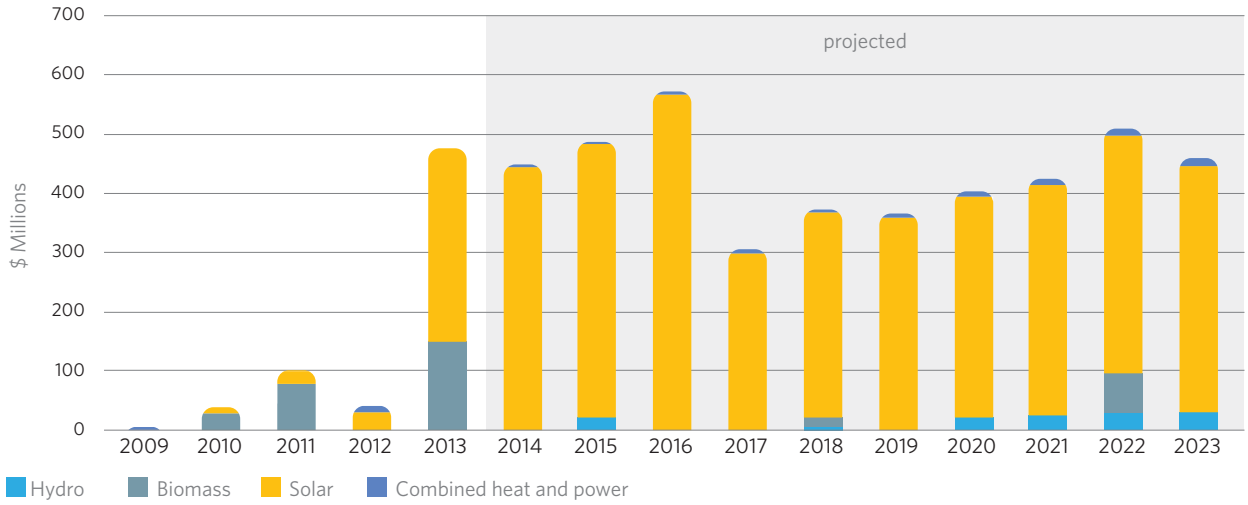


Note: Navigant Research provided data and projections of annual capacity additions from 2009 to 2023. These figures were added to baseline 2008 cumulative capacity data from the Energy Information Administration (except for wind and solar, for which cumulative data were available from Navigant Research). Navigant Research's methodology is described at the end of this brief, and that of the Energy Information Administration is available in Table 3, available at http://www.eia.gov/renewable/state/georgia/.

Sources: Navigant Research, Energy Information Administration

Clean Energy Investment, by Sector and Year

Actual (2009-13) and projected (2014-23) annual investment



Source: Navigant Research

New Clean Energy Capacity Installed in 2013 (MW)

Biomass and solar accounted for all new projects

Biomass	100.5
Solar	91
Wind	0
Combined heat and power	0
Hydro	0
Geothermal	0
Marine hydrokinetic	0
Total	191.5

Source: Navigant Research

> "This is a very dynamic time for solar energy, and it demonstrates a pent-up demand and interest in solar energy for Georgia. ... There's a great potential here for real, sustainable economic development."
>
> — Mark Bell, chair, Georgia Solar Energy Association, and president, Empower Energy Technology

National Rankings

Rank	
9th	in new renewable capacity installations, 2013 (192 MW)
10th	in private investment, 2013 ($477 million)
13th	in energy- and environment-related jobs, 2011 (64,205)

Sources: Navigant Research, Bureau of Labor Statistics

Institutional Spotlight

Georgia Institute of Technology

Georgia Tech in Atlanta stands at the forefront of research and innovation in solar and smart grid technologies.

Solar

Georgia Tech is home to one of the country's two University Centers of Excellence for Photovoltaics Research and Education, funded in part by the U.S. Department of Energy. The program gives students an understanding of the technology behind advanced photovoltaic devices, researches device performance, and provides training for those who plan to enter the field. The center also offers recommendations to the Energy Department and industry on how to lower costs and increase efficiency of photovoltaic installations, helping to make U.S. companies more competitive in the global marketplace.*

Rooftop Solar Array at Georgia Tech's Campus Recreation Center.

Continued on next page

In 2006, research by the center's founding director, Ajeet Rohatgi, Ph.D., led to the creation of Georgia's first solar manufacturing plant, operated by Suniva Inc. With $55.5 million in start-up funding, the company is working to reduce the cost per watt of solar power.[†] Its Norcross factory produces a low-cost, high-efficiency solar module with one of the largest percentages of U.S. materials on the market. Suniva has created about 200 jobs in Georgia.[‡]

Smart Grid

Georgia Tech received a grant from the Energy Department's Advanced Research Projects Agency-Energy to research smart grids, a technology that uses digital communications to help electricity providers improve reliability and efficiency by detecting and reacting to changes in usage.[§] The project lead, Santiago Grijalva, Ph.D., was named director in 2013 of the National Renewable Energy Laboratory's Power Systems Engineering Center.[**] In addition, the students who are working on the project are forming a start-up company after winning the Atlantic Coast Conference Clean Energy Challenge, a regional event hosted by the Energy Department to recognize clean energy business models led by student researchers.

Wind

The university also focuses on wind energy, and researchers are looking at methods to improve the technology used in large-scale wind farms.[††] In 2010, Georgia Tech received a $3 million research grant from the Advanced Research Projects Agency-Energy to reduce costs and increase efficiency in the manufacturing and operation of wind turbines. In coordination with PAX Streamline Inc., a California industrial product development firm, the university conducted a two-year project and found ways to reduce the complexity of the mechanical control system and improve the blade shape of turbines, thus cutting manufacturing costs and time.[‡‡]

[*] Georgia Tech, "Creating a New Energy Source for the 21st Century" (2004), http://www.ece.gatech.edu/research/UCEP.

[†] Rachel Barron, "Solar Startup Suniva Snags $50M," *Greentech Solar*, Feb. 5, 2008, http://www.greentechmedia.com/articles/read/solar-startup-suniva-snags-50m-567.

[‡] Sol Haroon, "DC Microgrids—A Solar 'Back to the Future,'" Suniva Inc. (Dec. 2012), http://solpowerpeople.com/wp-content/uploads/2012/12/122012-dc_microgrid_suniva_.pdf.

[§] University of Maryland, "$100K ACC Clean Energy Challenge," http://www.mtech.umd.edu/accnrg/.

[**] National Renewable Energy Laboratory, "NREL Names Santiago Grijalva Director for Power Systems Engineering," July 1, 2013, http://www.nrel.gov/news/press/2013/2230.html.

[††] Georgia Tech, "Unleashing Wind's Energy Potential," http://energy.gatech.edu/unleashing-winds-energy-potential.

[‡‡] Georgia Tech, "Wind Energy: ARPA-E Grant Aims to Reduce Cost and Expand Use of Wind Turbines for Generating Electricity," http://www.gtri.gatech.edu/casestudy/wind-energy-arpa-e-turbine.

Solar industry highlights

For a state with a high number of sunny days, Georgia has been slow to take advantage of its abundant solar resources. However, over the past year the state has proved its readiness to embrace this energy source: In 2013, Georgia attracted $326.2 million in private investment in the solar energy sector, a 1,025 percent increase over 2012. While industry investment expanded, the price of installing residential and commercial solar projects in the state dropped 27 percent from the previous year. Experts predict that this trend will continue, with investment and deployments poised to grow again in 2014, according to Navigant Research.

As a result, the state is now home to more than 142 solar companies. Other industries are profiting as well: The Coca-Cola Co. chose Macon, Georgia, as its first facility east of California to have solar panels installed.[5]

Solar also represents an export opportunity for Georgia, based on the state's abundance of solar resources, low cost of generation, and demand from other states. In a study by Arizona State University, Georgia ranked third among states that would benefit the most from generating solar power in-state and selling the electricity to other states.[6]

225% The increase in solar jobs in Georgia, from 800 in 2012 to 2,600 in 2013—the largest gain of any state

Source: Solar Energy Industries Association

Georgia Solar
National rankings and statistics, 2013

Rank	
7th	in new capacity (91 MW)
7th	in private investment ($326.2 million)
15th	in total capacity (129 MW)
16th	in jobs (2,600)
21st	in homes powered by solar (3,255)

Sources: Navigant Research, Solar Energy Industries Association, and Solar Foundation

Georgia is on the path toward reaching its solar potential, but implementing additional state policies such as a renewable portfolio standard could unlock even more economic benefits.

Utility Spotlight

Georgia Power's Advanced Solar Initiative

In an effort to deploy more solar power, the Georgia Public Service Commission approved Georgia Power's Advanced Solar Initiative in November 2012. Through this initiative, Georgia Power has been working to issue contracts for 210 MW of solar power by the end of 2014, using solar purchase programs—agreements to purchase power from solar installation owners at a fixed price for a set period of time.[*] The utility will buy electricity from owners and developers of large-scale solar arrays.

Customers with residential or commercial solar projects can also sell excess electricity back to the grid through Georgia Power. These programs and others are designed to help meet the state requirement of adding 525 MW of solar power by 2016. When its efforts are completed, Georgia Power will have 800 MW of solar in its energy portfolio.[†]

In September 2014, the utility proposed a change in the structure of its solar purchase programs for small to midsize projects. Currently, Georgia Power uses a lottery system to award contracts, with a fixed price based on the cost the utility would incur building new power generation on its own. Instead, it wants developers to compete to offer the lowest price. Solar companies that were counting on the fixed price have expressed concerns that changing the nascent program would create market uncertainty and discourage investment. Meanwhile, Georgia Power believes the changes would reduce rates for its customers.[‡]

Regardless of the outcome of this debate, the utility is making progress on low-cost solar power. It recently signed contracts to buy electricity from 10 new projects that will come online in 2016 at a price of less than 6.5 cents per kilowatt-hour—nearly a quarter below the cost achieved in last year's solicitation.[§]

[*] Georgia Power, "Advanced Solar Initiative," http://www.georgiapower.com/about-energy/energy-sources/solar/asi/advanced-solar-initiative.cshtml.

[†] American Council on Renewable Energy, "Renewable Energy in Georgia," updated January 2014, http://www.acore.org/files/pdfs/states/Georgia.pdf.

[‡] Ray Henry, "Georgia Power Price Plan Rattlers Solar Developers," Sept. 14, 2014, *Savannah Morning News*, www.savannahnow.com, http://savannahnow.com/news/2014-09-13/georgia-power-price-plan-rattles-solar-developers#.VBw95vldWSo.

[§] Robert Walton, "Georgia Power Inks Solar Contracts for Less Than 6.5 Cents/kWh" Oct. 16, 2014, Platts McGraw Hill Financial *Utility Drive*, http://www.utilitydive.com/news/georgia-power-inks-solar-contracts-for-less-than-65-centskwh/321898/.

Company Spotlights

Georgia's Solar Industry Spurs New Businesses

Abundant solar resources, falling prices for solar panels, declining installation costs, and a push to add 525 MW of solar to the grid are benefiting businesses across the state. Commercial interests and residential customers are reducing energy expenditures over the long term and selling back excess power, while small and medium-sized solar companies are finding new customers.

Inman Solar

Atlanta-based Inman Solar provides a wide range of solar services in the state and around the country. The company specializes in project management, engineering, incentive procurement and fulfillment, and financial analysis for solar arrays.[*] Under an agreement with Georgia Power and its solar initiative, Inman recently completed the first photovoltaic array in Effingham County, a 5-acre farm with 1 MW of capacity. After the company installed a 1-MW array at the Chattanooga Metropolitan Airport in 2011, Georgia officials selected it to complete an additional 1.2-MW project.[†]

Hannah Solar

Founded in Atlanta in 2008, Hannah Solar is a full-service solar company that offers engineering, procurement, and construction of solar arrays for residential and commercial locations.[‡] Recent projects include a 10-kilowatt solar canopy on the Valdosta State University campus, a 1-MW solar array for a Birdsong Peanuts processing facility, and two solar projects for Chase Family Farms in Oglethorpe totaling 1 MW.[§]

[*] Inman Solar, "About," http://www.inmansolar.com/about/.

[†] Inman Solar, "News," http://www.inmansolar.com/news/.

[‡] Hannah Solar, "About Us," http://www.hannahsolar.com/about-us/.

[§] Hannah Solar, "Our Work," http://www.hannahsolar.com/our-work/.

Solar array in Georgia built by Hannah Solar.

Solar array in Georgia built by Inman Solar.

Project Spotlight

Georgia 3x30 Project

Georgia Power is working with the U.S. Army Energy Initiatives Task Force to build, own, and operate 90 MW of solar power across three Army bases. Fort Stewart, Fort Benning, and Fort Gordon will each be home to 30 MW of installed solar capacity* that together will produce 18 percent of the energy the Army uses on these bases.† Slated for completion by 2016, the project would move the Army 9 percent closer to its goal of deploying 1 gigawatt of renewable energy by 2025.

> "The agreement with the U.S. Army not only marks another step for Georgia Power's solar initiatives, but also further enhances the state's position as a solar leader and will strengthen both the bases and the surrounding communities."
>
> —Norrie McKenzie, vice president of renewable development for Georgia Power

E+ via Getty Images

* Georgia Power, "Georgia 3x30 Project," http://www.georgiapower.com/about-energy/energy-sources/solar/solar-projects/3x30.cshtml.

† Army Energy Initiatives Taskforce, "U.S. Army Announces Plans to Develop Three 30 Megawatt Solar Arrays on Georgia Installations," http://www.armyeitf.com/index.php/component/content/article/67-news/24-georgia-3x30-solar.

Biomass highlights

In 2013, Georgia ranked third in the nation in total electricity generated by biomass, a fuel source that includes refuse from any biological material, such as plants, agricultural waste, or municipal solid waste.[7] In the case of woody biomass, the waste is often processed into pellets and then burned to generate steam and create electricity. When managed sustainably, biomass reduces carbon dioxide emissions and offers low operating costs.[8]

Georgia's 24 million acres of forest, the most commercial timberland of any state, has led its forestry industry to gradually shift toward biomass energy production as a new opportunity for economic growth.[9]

The agricultural industry also enjoys significant opportunities in the biomass energy sector. In 2013, the state added 100.5 MW of biomass capacity and attracted over $150 million in investment, according to Navigant Research.

Institutional Spotlight

Forestry Fueling the Future

In 1938, Georgia established the Herty Advanced Materials and Development Center in Savannah to study pulp and paper products. More than 65 years later, the center formed a powerful partnership with Georgia Southern University to promote economic development by researching and fostering a wide range of wood waste-derived products including biofuels and biomass.* Today, more than 32 bioenergy projects generate millions of dollars for local Savannah communities and employ residents.†

* Herty Advanced Materials and Development Center, "History," http://www.herty.com/?page_id=9.

† Chris Hanson, "The Root of Georgia's Pellet Boom," *Biomass Magazine*, April 2, 2013, http://biomassmagazine.com/articles/8795/the-root-of-georgiaundefineds-pellet-boom.

Emerging opportunities

In addition to solar and biomass, Georgia is exploring other clean energy technologies such as offshore wind and electric vehicles to capitalize on its robust manufacturing sector.

The U.S. Department of the Interior's Bureau of Ocean Energy Management is reviewing an application by Southern Co. (which owns Georgia Power) for a study of Georgia's offshore wind potential using meteorological towers.[10]

A generous state tax credit is also spurring ownership of electric vehicles. The Zero Emissions Vehicle tax credit is one of the strongest in the country, providing 20 percent, or up to $5,000, in credits toward the purchase of a new electric vehicle.[11] Georgia Power has also enacted a reduced electricity rate for qualified residential customers who use plug-in vehicles.[12] Furthermore, customers with lengthy commutes in the Atlanta region are purchasing these cars to avoid gasoline costs and gain access to express lanes. Today, the state ranks No. 1 in the nation for electric vehicle sales.[13]

Georgia's strong manufacturing sector represents 11.2 percent of the state's gross product, employing about 8 percent of the workforce.[14] With this manufacturing base and its rich infrastructure of university research and innovation, Georgia has the potential for growth in the production of clean energy systems and components.

Innovation Spotlight

Teaming Up to Power Up

Ford Motor Co. is teaming up with Georgia Tech's solar racing team to design, build, and race solar-powered cars.[*] The partners also designed a solar-powered concept car. The "C-Max Solar Energi" uses photovoltaic cells covering the vehicle's roof to convert a day's worth of sunlight into enough power to drive 620 miles.[†] It is able to do this with the help of a solar "concentrator," which acts like a magnifying glass over the car to maximize sunlight captured for rapid charging.[‡] Ford released a prototype vehicle at the 2014 Consumer Electronics Show.[§]

[*] Georgia Tech, "Solar Racing," http://solarracing.gatech.edu/.

[†] Ford Motor Co., "Let the Sun in: Ford C-Max Solar Energi Concept Goes off the Grid, Gives Glimpse of Clean Vehicle Future," https://media.ford.com/content/fordmedia/fna/us/en/news/2014/01/02/let-the-sun-in--ford-c-max-solar-energi-concept-goes-off-the-gri.html.

[‡] Ibid.

[§] Urvaksh Karkaria, "Ford Connects With Georgia Tech to Drive Solar-Powered Car," Atlanta Business Chronicle, Jan. 6, 2014, http://www.bizjournals.com/atlanta/blog/atlantech/2014/01/ford-teams-up-with-georgia-tech-on.html?page=all.

Conclusion

Georgia has emerged as a national leader in the clean energy sector and is poised for continued economic growth due to abundant solar and biomass resources, falling costs of technology materials, cutting-edge research, a robust manufacturing base, and policy efforts by the state's Public Service Commission. A renewable portfolio standard could further increase the economic and environmental benefits that Georgia is already experiencing from a clean energy sector on the rise.

Acknowledgments

This policy brief is one of a collection examining state clean energy economies. The states selected have demonstrated leadership in clean energy policies, installations, and economies, or are at a crossroads in their energy futures. The brief was prepared by The Pew Charitable Trusts' clean energy initiative, with Sarah Greene as lead author. This research was funded in part by The 11th Hour Project.

Unless otherwise specified, data on capacity additions and investment were provided by Navigant Research, an energy market research firm, and include solar photovoltaics, industrial sector combined heat and power, geothermal power (excluding heat pumps), biomass power (excluding landfill gas, anaerobic digesters, and biogas recovery), hydropower projects, permanently installed (not pilot) marine and hydrokinetic projects, and wind projects greater than 1 megawatt.

The Clean Energy Business Network

Pew's Clean Energy Business Network seeks to inform and engage clean energy business leaders in policy issues affecting the industry. For more information or to sign up for this free resource, visit pewtrusts.org/businessnetwork.

Endnotes

1 American Council on Renewable Energy, "Renewable Energy in Georgia," updated January 2014, http://www.acore.org/files/pdfs/states/Georgia.pdf.

2 Database of State Incentives for Renewables & Efficiency, "Georgia Financial Incentives," 2014, http://www.dsireusa.org/incentives/index.cfm?re=0&ee=0&spv=0&st=0&srp=1&state=GA.

3 Energy Information Administration, "Georgia Renewable Electricity Profile 2010" (March 8, 2012), Table 3: State Renewable Electric Power Industry Net Summer Capacity, by Energy Source, 2006-2010 (MW), http://www.eia.gov/renewable/state/georgia/. Added to more recent capacity data from Navigant Research.

4 Atlanta Business Chronicle, "Brookings: Atlanta a Top 10 Clean Economy," July 2011, http://www.bizjournals.com/atlanta/news/2011/07/13/brookings-atlanta-a-top-10-clean.html.

5 The Coca-Cola Co., "Advancing Energy Efficiency and Climate Protection," 2010, http://assets.coca-colacompany.com/48/4e/9f9f56e44bbb88a20877ff5872fa/SR09_Energy_ClimateProtct_20_23.pdf.

6 Arizona State University, "Who Would Benefit Most From Solar Energy?" Nov. 29, 2010, https://asunews.asu.edu/20101122_business_solarrankings.

7 Energy Information Administration, "Georgia Profile Overview," http://www.eia.gov/state/?sid=GA.

8 Georgia Power, "What Is Biomass Energy?" http://www.georgiapower.com/about-energy/energy-sources/biomass.cshtml.

9 Georgia Forestry Commission, "Sustainable Forest Management in Georgia" (July 2008), http://www.gfc.state.ga.us/resources/publications/SustainableForestManagementinGeorgiarev0309.pdf.

10 Georgia Coastal Resource Council, "Offshore Wind Energy: Considerations for Georgia" (August 2011), http://www.gcrc.uga.edu/PDFs/GCRC_GA_OffshoreWind.pdf.

11 Georgia Department of Natural Resources, "Alternative Fuels and Tax Credits," http://www.georgiaair.org/airpermit/html/mobilearea/engines/Alternativefuels.htm.

12 Georgia Power, "Plug-in Electric Vehicle Application," http://www.georgiapower.com/environment/electric-vehicles/plug-in-electric-vehicles.cshtml.

13 Urvaksh Karkaria, "Georgia top state in electric vehicle sales" Sept. 15, 2014, *Atlanta Business Chronicle*, http://www.bizjournals.com/atlanta/blog/atlantech/2014/09/georgia-top-state-inelectric-vehicle-sales.html?page=all.

14 National Association of Manufacturers, "Georgia Manufacturing Facts," http://www.nam.org/~/media/5931DBC877544F66A20A121F51FA6000.ashx.

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