

Other Southern States

Some of the other southern states have made initiatives toward the development of clean-energy industries, but the initiatives tend to be on the demand side. For example, the Commonwealth of Virginia has established an Off-Shore Wind Development Authority, and there is a large smart-grid installation project in the state, but neither is connected with a plan to develop manufacturing or software companies. Among the southern states that show some signs of developing clean-energy industries are Georgia, Kentucky, North Carolina, South Carolina, and Tennessee. With the exception of North Carolina, the five states lack renewable portfolio standards, and none of the states has a public benefits fund. In most cases they also lack specific investment funds designated for the clean-energy industries. The states have energy-efficiency goals for state buildings, but with the exception of South Carolina the goals are not at the level of LEED-silver designation. Although the states did receive ARRA funding for green jobs training, they do not have extensive training programs and state-government coordination. An exception is North Carolina, which has also emphasized sustainability in its community-college initiative, which is framed around three major educational goals: creativity, entrepreneurialism, and sustainability. Nevertheless, the five states are showing signs of emergent clean-energy industrial clusters.

Georgia

Georgia supports high-tech innovation through its Centers of Innovation program and a statewide conference of venture capitalists, but there is no dedicated green business fund. The state has focused its clean-energy development resources on bioenergy. In 2008, the state government launched the Center for Innovation of Bioenergy to provide support for the biofuels industry, and it has helped to attract manufacturers from other states and countries. The University of Georgia and Georgia Tech were named collaborators in the large cellulosic biofuels research center at Oak Ridge National Laboratory in nearby Tennessee. Georgia Tech's Advanced Technology Development Center has also helped new companies in the biofuels industry to get started, including Aska Energy, C2 Biofuels, EnerTech Environmental, and Green Cusp. Colorado-based Range Fuels also selected Georgia as the site for its commercial-scale cellulosic ethanol plant due to the state's forestry and wood waste resources. The state government also contributed a grant of \$6 million in addition to private capital funding and a \$76 million federal government grant (Sims 2008).

Georgia Tech's University Center of Excellence for Photovoltaics Research and Education is one of two such centers sponsored nationally by the U.S. Department of Education, and Suniva and LumoFlex are two examples of spin-off solar energy companies from the university. However, as of 2009 the solar industry in Georgia remains largely installation and services, and Suniva has located manufacturing outside the state.

Kentucky

Under Governor Steve Beshear, the state of Kentucky developed an energy independence plan that includes higher levels of renewable energy for electricity, biofuels development, and “clean” coal technologies (coal to liquids, coal to gas, and carbon sequestration). Kentucky has received national attention because it will host the national Battery Manufacturing Research and Development Center in Lexington. The center will involve collaboration with the Argonne National Laboratory, the University of Louisville, and the University of Kentucky. Two manufacturing plants are planned with a goal of creating 2000 new jobs. The national center will likely integrate regional businesses, including Ohio’s Proctor and Gamble (HQ in Cincinnati) and Johnson Controls in Wisconsin. The relationship with Michigan’s battery manufacturers was not yet clear in the original statements (State of Kentucky 2009).

North Carolina

North Carolina has a combined renewable energy and energy-efficiency portfolio standard of 12.5 percent by 2020 for investor-owned utilities, with a small solar set-aside. Legislation that was pending in 2010 would create a 25 percent tax credit for the construction of facilities that generate renewable energy. North Carolina also has a goal of reducing the energy consumption of government buildings by 30 percent by 2015. Legislation passed in 2007 (SB 668) and 2008 (SB 1948) added to the goal by requiring that all new state government buildings, including those of the public higher-education system, must exceed by 20 percent a state-government energy-efficiency code. Major renovations must exceed the code by 30 percent. Other directives include water conservation.

In the high-technology sector, North Carolina is known for the Research Triangle area near Duke University, North Carolina State University, and the University of North Carolina at Chapel Hill. The successful example of high-tech development was pioneered during the 1950s with strong support from the state government. However, due to the failure of the state government to attract some prominent manufacturers, which went to other southern states, the state shifted its economic development strategy back toward a more traditional recruitment approach. Still, the innovation culture developed in the Research Triangle area has been able to sustain the transition to lower levels of state-government funding, and there are some signs that the successes in the biotechnology and information-technology fields were translating into clean-technology business development as well.

To support green business development, the state launched the Green Business Fund in 2007, but the initial grants were small in comparison with investments found in other states (\$1 million per round). In 2009 the newly elected Governor Purdie announced a plan to use ARRA funds to expand the pool to \$10 million (Pearson 2009). The most likely industrial foci are biofuels and solar. In 2007 North Carolina established a strategic plan for its biofuels industry and began its implementation with the establishment of the Biofuels Center of North Carolina (State of North Carolina 2007). In 2008 the state’s biodiesel companies formed a trade association to promote the industry. The Biofuels Center lists about twenty biofuels companies

across the state, with strengths in biodiesel, and it awards grants to the industry to support research and education projects. However, only one of the companies was listed as among the 50 “hottest” bioenergy companies in *Biofuels Digest*. The total value of the grants awarded during the first years of operation was relatively modest (less than \$5 million per year) in comparison with some of the biofuels investments occurring elsewhere. One of the goals of the center is to have ten percent of the state’s liquid fuels grown within the state by 2017.

Since 1988 the state government has supported the North Carolina Solar Center at North Carolina State University. Over the years it has become a general information center for support of renewable energy industries and building efficiency. The university also is home to several research centers related to solar energy, including the Silicon Solar Consortium, an Industry/University Cooperative Research Center that is sponsored by the National Science Foundation. The University of North Carolina at Chapel Hill also hosts the Solar Energy Research Center, which has received support from the U.S. Department of Energy as an energy frontier research center. The state is home to several solar companies, including Enertia Building Systems, K-Flex, SBM Solar, Solargenix, SunQuest, and Surry Solar Services.

The FREEDM (Future Renewable Electric Energy Delivery and Management) Systems Center at North Carolina State University is an engineering research center sponsored by the National Science Foundation that links research at several universities across the country for work on green energy and smart-grid technologies. The program also offers graduate training in smart-grid technologies and renewable energy systems, and it has over 65 industrial partners (DeGraff 2008).

South Carolina

In the clean-energy field, South Carolina is best known for its efforts to develop a fuel-cell industry. In 2007 the state passed the Hydrogen Infrastructure Development Act, which allocated \$15 million over three years toward hydrogen infrastructure development. Interstate 20 between Aiken and Columbia became a “hydrogen highway” with fueling stations. The Savannah River National Laboratory (2009) claims to have the largest concentration of hydrogen experts in the country. Although known for weapons research (as in hydrogen bombs), the laboratory also conducts research on hydrogen storage and metal hydrides. Much of the research is classified, but the laboratory engages in partnerships with automobile manufacturers and local universities. In 2006 Aiken County launched Center for Hydrogen Research (subsequently the Center for Applied Research: Hydrogen) adjacent to the national laboratory to catalyze research and industry partnerships. The other pillar of hydrogen research in the state is the University of South Carolina (2009), which has conducted fuel-cell and hydrogen research since the 1980s. By 2010 the university had four research centers related to fuel-cell and hydrogen research. It received recognition as one of the 31 “energy frontier research centers” sponsored by the U.S. Department of Energy and was designated by the National Science Foundation as the Industry/University Cooperative Center for Fuel Cells. Transportation and materials science research at Clemson University and South Carolina State University also includes fuel-cell specialties, and BMW, which has a factory in South Carolina, has piloted fuel-cell vehicles. The cluster of companies in the state that are engaged in work related to the hydrogen and fuel-cell

industry includes Collexis Holdings, Dantherm, Küsters Zima, Logan Energy, Midlands Tech, and Trulite. There are more energy- and fuel-cell-related companies in the technology incubator at the University of South Carolina, which has worked in collaboration with the city of Columbia and local firms to develop the industry in the region.

South Carolina is a regional center for wind manufacturing due to General Electric's large wind turbine design and manufacturing center in Greenville and several bearing manufacturers in the state. As in the case of the Midwestern automotive industry, there is some potential for the automotive supply chain in South Carolina other neighboring states to contribute to the wind industry. In 2009 the Clemson University Restoration Institute received \$45 million from the U.S. Department of Energy, with \$53 million in matching funds, to establish a drive-train testing facility for wind turbines. There is some hope that the off-shore wind resources could enable the state to establish a wind industry cluster, but the demand side of the industrial cluster will require a commitment from the state government to develop offshore wind. Meanwhile, the testing facility has begun to attract companies, such as the German wind turbine manufacturer IMO Group.

Tennessee

Tennessee Governor Phil Bredesen has been a supporter of green jobs and clean-energy companies, and the state has made some progress in the biofuels, solar, and electric vehicle industries.

With respect to biofuels, in 2006 Governor Bredesen established the Alternative Fuels Working Group for the state, and in the following year the state's legislature allocated \$72 million to develop biofuels. In 2008 the state announced a partnership with DuPont Danisco Cellulosic Ethanol and the University of Tennessee that included a \$40 million investment from the state to develop a pilot plant for cellulosic ethanol and a research and development facility. In 2007 Oak Ridge National Laboratory was also designated as one of three national centers to receive a total of \$375 million for cellulosic ethanol research, with the University of Tennessee named as one of the collaborators (Childs 2007). Although Oak Ridge works with companies and universities as far away as Hanover, New Hampshire, its location in the state provides an important resource.

The Oak Ridge National Laboratory also has solar-energy research in its Solar Technologies Laboratory, Center for Advanced Thin-Film Solar Cells, and other research centers and facilities. To develop the state's solar industry, in 2002 the state government launched the Tennessee Million Solar Roofs program, which was funded by the U.S. Department of Energy to bring together stakeholders to reduce barriers to solar energy use. The next year the Tennessee Valley Authority launched the Green Power Switch Generation Partners program, which provided incentives and support for renewable energy installation. In 2006 the state Department of Economic and Community Development offered the Tennessee Clean Energy Technology grant program to support renewable energy installation, and the next year Knoxville was named a Solar America City. The state government also recruited solar manufacturers to locate in the state, and its economic development efforts have led to new factories owned by Sharp, Hemlock

Semiconductors, Wacher Chemie AG, and other companies. In 2009 the Volunteer State Solar Initiative was launched, which will include a solar farm and a Solar Institute sponsored by the University of Tennessee. The solar farm will include an educational facility, and the Solar Institute will provide technical assistance and installation grants. Although Tennessee has made great headway in developing a solar installation and manufacturing industry in the state, crucial elements are lacking. A representative from the Southern Alliance for Clean Energy has noted that the TVA remains focused on coal and nuclear energy, and its efforts to promote solar energy have been limited (Gomberg 2009). The capacity to move upstream from installation and manufacturing to innovation and new technology development remains unproven.

Tennessee has an advantage with its location as the site of the North American headquarters of Nissan and home to a large manufacturing facility for the company. When Nissan moved into electric vehicle production, the state seized on some opportunities in this industry. In 2008 the state government, Tennessee Valley Authority, and Nissan announced a plan to promote electric vehicles by introducing charging stations in the state. With \$5 million in matching funds from the state government, the U.S. Department of Energy selected Tennessee in 2009 as one of five states (along with Arizona, California, Oregon, and Washington) to test a release of electric vehicles (State of Tennessee 2009).

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