

Colorado's New Energy Economy

A Ross Research White Paper
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OVERVIEW

Concerns over global warming, dependence on foreign oil, the inevitable advent of peak oil production and the unprecedented spike in gasoline prices have spurred national interest in renewable, domestically available energy. The most common sources are:

- Biomass (organic material), which can be burned as fuel or converted to other usable energy sources, such as methane gas, ethanol and biodiesel.
- Water, one of the oldest sources of energy. Its use has progressed from simple paddle wheels to hydropowered electric facilities that currently provide 7 percent of the nation's electricity.
- Wind, another ancient, elemental energy source, used for thousands of years to sail ships and harness energy from windmills. Today, wind farms employ clusters of wind machines, or turbines, to generate 1 percent of the country's electricity.
- Solar energy, which is naturally converted to thermal energy that can heat water and structures. The sun's energy also can be converted to electricity by photovoltaic (PV) cells or by solar power plants.
- Geothermal energy, generated in the earth's core, and in locations rich in geothermal reservoirs; can be tapped to produce electricity.

ECONOMIC IMPACT

Locally, the announcement that ConocoPhillips will develop a best-of-class renewable energy research center at the recently-acquired StorageTek campus in Louisville has focused attention on the renewable energy industry and the future of the US 36 corridor as a renewable energy hub. However, while the ConocoPhillips research center will be a major catalyst for renewable energy development growth, the industry is already well-established in the Denver/Boulder/Northern Colorado area:

- The nine-county region, comprised of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer and Weld Counties, ranked sixth among the 50 largest metro areas in renewable energy and energy research employment in 2007, with 13,940 workers directly employed at an average annual salary of \$79,570.
- Approximately 3,000 "green collar" jobs were created this year in Colorado. In Weld County alone, more than 40 renewable energy firms have opened their doors in recent years, adding more than 1,300 jobs.
- Renewable Energy Systems Americas recently relocated its headquarters from Austin to Broomfield. Seventy employees moved from Texas, and the wind energy firm plans to hire an additional 70 employees over the next year.
- In March 2008, Vestas Wind Systems, a Danish firm, opened a wind-blade manufacturing facility in the city of Windsor, in Weld County. The plant employs 650 workers.

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The region's major renewable energy firms, the majority of which are currently small (80 percent have fewer than 10 employees) entrepreneurial endeavors, include:

Company	Location	Products & Services	Number of Employees	Annual Sales (\$ million)
Idalex Technologies	Arvada	R&D	9	0.9
Cool Energy	Boulder	Prototype thermal-electric systems for homes	10	0.9
VAIREX Corporation	Boulder	Manufacturer of air management systems for diesel emission control & fuel cell industries	10	0.8
Sunflower Solar- now Standard Renewable Energy	Boulder	Solar energy	not available	not available
Renewable Energy Systems Americas	Broomfield	Wind power	70 (plans to hire 70 more)	not available
Rentech	Commerce City	Synthetic fuels R&D	120	25.5
Evergreen Energy	Denver	Coal-based platform to produce energy efficient, low emission fuels	216	48.7
BioEnergy of Colorado	Denver	Biodiesel	not available	not available
Woodward Governor Company	Fort Collins	Energy control & optimization systems for aircraft & industrial engines and electrical power equipment	4,248 (all locations)	1,042.3
AVA Solar	Fort Collins	PV manufacturing	25	2.0
Envirofit International	Fort Collins	Development & dissemination of products & services addressing environmental problems in developing nations	4	0.2
CoorsTek	Golden	R&D	2,900	145.0 (est.)
BlueSun Biodiesel	Golden	Biofuels	15	6.0
Industrial Solar Technology Corp.	Golden	Solar energy R&D, installation	12	1.2
Ambient Energy	Golden	Consulting-sustainable design, energy modeling, renewable energy	6	0.3
Community Power Corporation	Littleton	Development & sales of biopower systems	23	3.0
Versa Power Systems	Littleton	Solid oxide fuel cells	3	0.2
Bella Energy	Louisville	Solar energy	25	1.0
Vestas Wind Systems A/S	Windsor	Wind power	11, 334 (worldwide)	5,085.0

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REAL ESTATE IMPACT

The typical renewable energy company is a small R&D/flex or manufacturing space tenant, located in the Northwest Denver submarket or Weld County. Since many are startups or emerging, these firms are poised to expand, and this will drive demand for quality space in these locations. In keeping with their missions, LEED-certified space will likely be a requirement. Developers holding parcels in these areas are taking notice of the opportunity to fill the increasing demand.

Renewable energy firms currently occupy nearly 1 million square feet of commercial space in Colorado's Front Range; however, large projects planned by ConocoPhillips and Vestas, organic growth among small local companies and new firms attracted to the region's growing renewable energy hub will drive occupancy to 3.5 to 4 million square feet within 5 years.

OUTLOOK

The region offers an attractive location for renewable energy companies:

- Colorado's eastern plains are located in the heart of the relatively narrow "wind corridor" that ranges from Texas to North Dakota in the US:
 - Colorado ranks 6th nationally in wind capacity and was second to Texas in new wind power installed in 2007.
 - Colorado has the wind potential to supply 9 percent of the nation's demand for electricity.
- With an average of 300 days of full sun per year, Colorado ranks 4th in the nation for solar potential.
- Colorado is ranked 4th among Western states for geothermal development site potential.
- Colorado is located at the headwaters of five major rivers and currently has 62 hydropower facilities.
- Colorado is one of 22 states with a renewable energy portfolio standard (RPS). Though as of 2005, only 2.68 percent of Colorado's energy was the product of renewable sources, Amendment 37, which was passed in 2004, requires the state to achieve an RPS of 10 percent by 2015. House Bill 1281, passed in 2007, further requires an RPS of 20 percent by 2020 for investor-owned utilities.
- Colorado ranks 4th in the nation in renewable energy and energy research.
- Unparalleled intellectual capital provides highly-educated professionals and world-class research, from such leading institutions as:
 - The University of Colorado (Boulder/Denver/Aurora).
 - Colorado State University (Fort Collins).
 - Colorado School of Mines (Golden).
 - National Renewable Energy Laboratory (NREL) (Golden).
 - These four institutions have partnered to form the Colorado Renewable Energy Collaboratory. The CREC recently launched its first research center, The Colorado Center for Biorefining and Biofuels, which also has private support, including ConocoPhillips.

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Thus, the stage is set for Colorado, and in particular the Denver's Northwest sector, to emerge as a world-class center for renewable energy research, development and generation, carrying with it a significant economic impact over the next two decades:

- ConocoPhillips' Global Technology Center, scheduled to open in 2012, is expected to generate 7,000 jobs, equating to a \$400-to-\$500 million annual payroll and over \$1 billion in total economic impact, over the next 20 years. The facility will attract like and ancillary companies.
- The Metro Denver Economic Development Council and City of Louisville have experienced an unprecedented spike in calls from international companies requesting information about establishing Colorado locations, reportedly seven in June alone.
- This summer, Vestas Wind Systems announced plans for two new plants in unincorporated Brighton — a blade manufacturing plant and turbine housing unit manufacturing (nacelle) plant — as well as an additional wind tower plant in Pueblo, which will be largest such facility in the world. These three new factories, combined with Vestas' existing blade manufacturing plant in Windsor, represent a \$700,000,000 capital investment in Colorado and will result in the creation of 2,500 direct jobs and a substantial number of ancillary jobs.
- Fort Collins-based AVA Solar will open a PV production plant in southwest Weld County, just outside of Longmont. The firm's thin-film PV module technology was developed and incubated at Colorado State University in conjunction with NREL, and full-scale production of low-cost solar panels is slated to begin in early 2009.
- In early September 2008, SunEdison opened an operations center for regulatory affairs and solar system delivery in Westminster. The firm currently operates an 8.2-megawatt PV solar system in Alamosa, which sells power and renewable energy credits to Xcel.
- Governor Bill Ritter announced, also in September 2008, that the Governor's Energy Office will receive a \$397,700 grant from the US Department of Energy. The grant will be used to develop technical, financial and policy frameworks to advance production of an additional 1,000 megawatts of renewable capacity to augment the state's electricity grid.

The New Energy Economy is clearly the wave of the future, but great challenges (and corresponding opportunities) remain:

- While solar and wind energy technologies are firmly established and poised to grow exponentially, inexpensive, sustainable alternatives to liquid fossil fuels still prove elusive.
- Wind turbines, iconic and starkly beautiful, have become a common sight on either coast and in the mountain states, but currently generate only 1 percent of the nation's electricity. Development of the windiest, and most remote, sites is on hold because the nation's antiquated power grid is not adequate to transmit the amount of wind power needed to boost the industry's share to 20 percent or more.
- The cost of retrofitting a residence or commercial building with PV panels is prohibitive to many, even after rebates and tax incentives.

Colorado's New Energy Economy was spotlighted in Denver during the recent Democratic National Convention, which included roundtable discussions led by state and local officials, Sunfest 2008 (a symposium on energy and climate change) and a renewable technologies showcase, which was highlighted by the arrival of a 131-foot turbine blade manufactured at Vestas' Windsor plant. In this election year, renewable energy will be a pivotal issue and Colorado, with its abundant wind and solar potential, intellectual capital, and entrepreneurial tradition, will certainly be on the leading edge.

