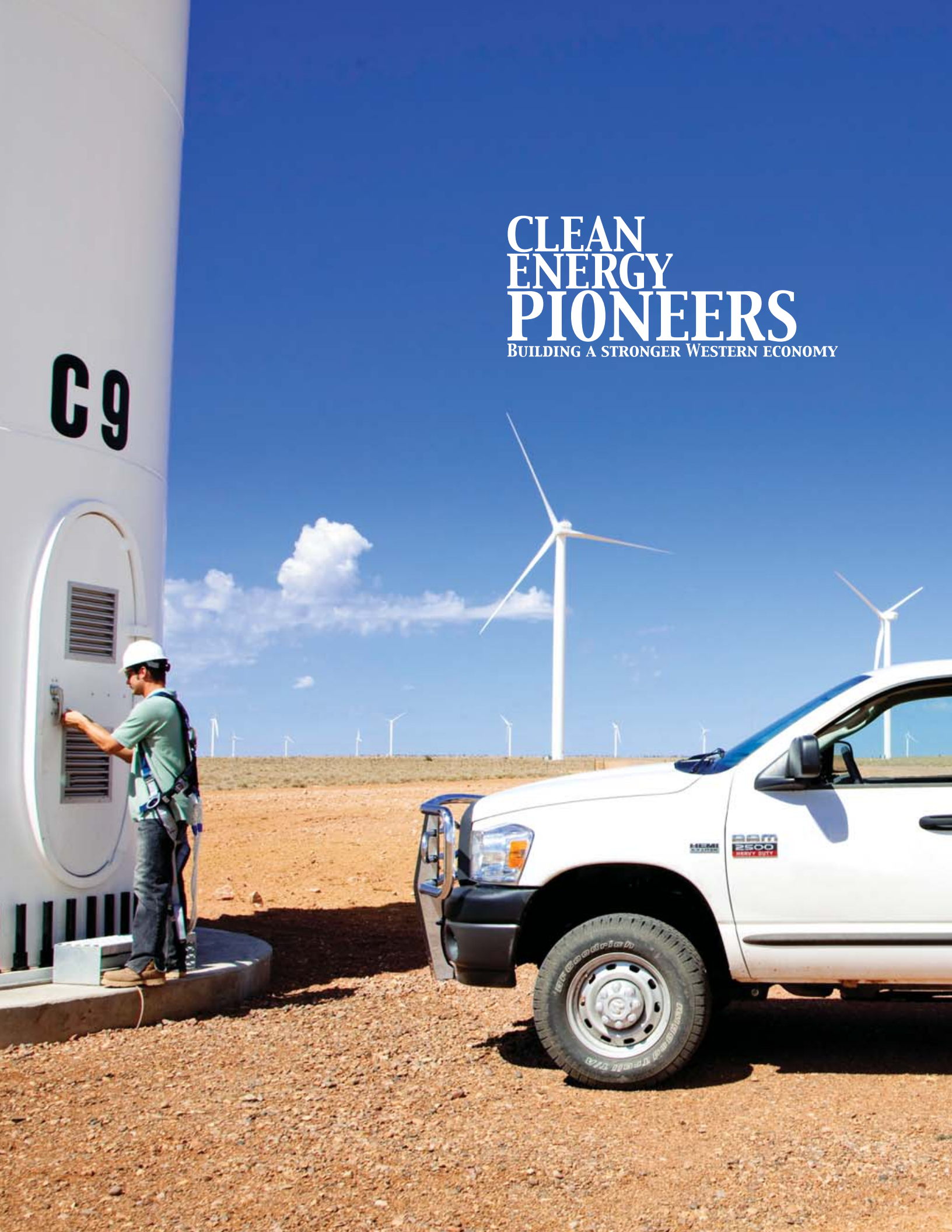


CLEAN ENERGY PIONEERS

BUILDING A STRONGER WESTERN ECONOMY



Contents

Welcome	1
Introduction	3
<hr/>	
Solar-powered job creation in Arizona	6
Colorado farmers harvest wind power	8
Clean energy economy heats up in Idaho	10
<hr/>	
Montana harnesses strong winds in the West	14
Geothermal energy: A sure bet for Nevada	16
New Mexico's economic tailwind	18
<hr/>	
Clean energy shines in Utah neighborhood	22
Wyoming explores renewable energy	24
Clean energy heats tribal homes	26
<hr/>	
Non-profit prepares low-income families for green jobs	28
Pioneer training	30
Meet the partners	32

Cover: The 63-MW Dry Lake Wind Power Project in Arizona is the first utility-scale wind project in the state. The Salt River Project is purchasing 100% of the power from the Phase I of this project for the next 20 years. The project is located just southwest of I-40 and Holbrook. PHOTO: DOE/NREL, Iberdrola Renewables



Welcome

Welcome to Montana and the Western Governors’ Association annual meeting. For the past 100 years, Westerners have come together to discuss the most pressing issues facing our region. One of today’s most critical challenges is how we will meet the West’s energy demands with reliable, affordable and clean energy.

On our farms and in our cities, Westerners are working to build a stronger clean energy economy. From wind farms in Montana to solar arrays in Arizona and geothermal heat plants in Nevada, the western states are pioneering clean energy solutions and creating expansive job opportunities. In the 10 years between 1998 and 2007, job growth in the clean energy field rose by more than 30 percent in the West, creating economic opportunity in both urban and rural communities.

Six years ago, the Western Governors’ Association undertook an extensive process to examine how the West could achieve its goal of developing 30,000 megawatts of clean energy by 2015. This monumental effort was led by the Clean and Diversified Energy Advisory Committee and included the input of more than 700 stakeholders. In 2007, we revisited these goals and determined that the West was on target to achieve—and exceed—this regional clean energy target.

A new generation is being educated to seize these economic opportunities. Clean energy programs are growing at community colleges throughout the West, with at least 20 schools offering Associates degrees in a broad array of educational and training programs.

Please join me in celebrating the clean energy pioneers highlighted in this publication. With the collaborative effort of farmers, ranchers, entrepreneurs, industry and students, we can harness the power of the West’s clean energy resources to grow our economy, strengthen our security and improve our environment.

Sincerely,

The Honorable Brian Schweitzer
Governor of Montana

Job growth in clean energy rose by more than 30 percent between 1998 and 2007.



Introduction

The pioneers who settled the West were visionaries who considered convention dispensable compared to the promise of prosperity over the horizon. Today, a new generation of pioneers trailblazes the frontier of opportunity by harnessing innovation to build a clean energy economy.

The result is a land where windmills, solar collectors and geothermal generators provide homegrown solutions to achieve energy independence, local self-reliance and job creation.

Who are these pioneers? They are farmers in Colorado who are able to keep their land with supplemental income from wind. They are roofers in Arizona and communities in Utah turning sun into electricity. They are Native American entrepreneurs who found a better way to heat and cool houses on tribal lands. They are college students in New Mexico training for work on wind turbines. They are engineers in Wyoming using infamous Teapot Dome oil fields to generate geothermal power and test innovative renewable projects. They are Denver's working mothers who are training to become solar installers and green construction workers. And they are employees helping to spread commercial geothermal energy across Idaho.

For the past year, Rocky Mountain Farmers Union, Western Resource Advocates and Environmental Defense Fund chronicled stories that reach across far-flung corners of the West under a project called "Clean Energy Pioneers: Building a Stronger Western Economy." These narratives and more appear online at CleanEnergyPioneers.com, together with interactive maps, video, podcasts and other multimedia presentations.

Across the West, individuals, schools, businesses and communities are building a clean energy economy. Please join us in celebrating their determination and innovation.

A new generation of clean energy pioneers is building a stronger western economy.

Left: Students from the Midwest School stand in front of a wind turbine at the Rocky Mountain Oilfield Testing Center (RMOTC) in Casper, Wyo. PHOTO: RMOTC



Turbines at Ponnequin Wind Facility
in Weld County, Colo. PHOTO: DOE/NREL,
Jenny Hager Photography

Wind turbines harness and convert the natural power of the wind into electricity. Wind power fits the rural West because it's inexhaustible, natural and promotes energy independence.





Solar-powered job creation

Arizona brings the heat by creating cool economic solutions

Few forces in nature equal the purity and intensity of the Arizona sun and few people have experienced it like Heath Hemauer. He works on Phoenix rooftops installing solar panels to capture the sun's energy to power homes and businesses.

The 32-year-old roofer knows well the most fearsome force in the Valley of Sun. "Once we were working on a dark brown metal roof and the temperature was 195 degrees," Hemauer said. "It's like being in a sauna, where you get that extremely relaxed feeling, it gets difficult to move. You don't want to be there as a human being, but it is a sweet spot for solar," he said.

"I'm building something that's for the future. My grandkids say you're building the future. They think that's pretty cool."

—Conrad Udave,
employee, Solon, Inc.

Sun fuels power behind homes and jobs

Soon, many Arizonans will experience sunshine in a whole new light. The solar industry is poised for radiant growth as the state moves forward with a renewable energy standard that requires 15 percent of electrical production come from renewable power by 2025.

"We've got everything here to support increased solar activity in our state, and in fact we probably have enough to export

power to other states," said William "Pat" Patton, an energy economist at the University of Arizona.

Patton authored a report last year, "Arizona Solar Energy Economic Outlook," which examined the job benefits of capital investments to build 4,340 megawatts of solar energy by 2030. Economic benefits: 32,082 construction and installation jobs; \$1.6 billion in annual wages. "Construction of solar power plants will have a significant impact on the state's economy over the next 20 years," the study finds.

Above: 2-MW PV facility at the Prescott, Arizona airport. PHOTO: DOE/NREL, Arizona Public Service

That would mark a quantum leap forward in Arizona's installed solar capacity. Solar's future in Arizona shines brightly. Arizona Public Service Company's proposed Solana Generating Station at Gila Bend will generate 280 megawatts of electricity, one of the biggest projects of its kind in the world and a foundation for future solar expansion in Arizona.

Going local, from manufacturing to installation

Some companies are surging ahead, branding their own special kind of made-in-Arizona renewable energy. For example, Solon Inc. produces solar photovoltaic arrays at a Tucson factory for use by Scottsdale-based American Solar Electric, an installation company.

Rob Wanless, business development manager for Solon, says the 140 employees at the manufacturing plant can produce enough panels to make 100 megawatts of solar power annually, or 20 percent of the corporation's worldwide production. He expects double-digit growth in the next three years.

Conrad Udave, 62, has worked on the assembly line at Solon's manufacturing plant for two years since he retired as a school janitor. "I'm building something that's for the future. It's a big thing for solar renewable

energy and I'm part of it. My grandkids say you're building the future. They think that's pretty cool," Udave said.

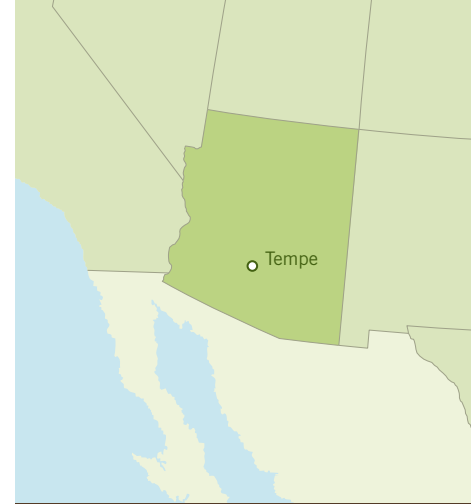
Meanwhile, the 103 employees at American Solar Electric install about two new rooftop residential solar systems per day. A typical one is six kilowatts and covers about 360 square feet. Tom Alston, manager of policy and business development for ASE, said "It's important to buy and install panels made in the U.S.A. We can visit the factory where they are made, and they know the market. Our customers care a great deal about where the panels come from."

Revenue doubles for Tempe-based solar company

Other companies leading Arizona's solar surge include Tempe-based First Solar Inc., which has increased production of thin-film photovoltaic cells 25-fold to 500 megawatts capacity annually. In March, the company's reported net income from first quarter sales was \$568 million, up 36 percent from \$418 million in the first quarter of 2009.

To attract more manufacturers, Arizona Gov. Jan Brewer signed a law granting income and property tax rebates and cash refunds to companies that provide "green jobs" that pay 25 percent more than the state's median wage.

So in the coming months, Hemauer and his rooftop installation crews plan to be busy, atop buildings by 6 a.m. and off by 2 p.m. when the heat really sizzles. To the blistering sun, they say bring it on; Arizona is ready.



Arizona clean energy facts

- From 1998 to 2007, clean energy sector jobs in Arizona grew over 20 percent.¹
- The Dry Lake Wind Power Project near Holbrook is the first utility-scale wind project in Arizona and will provide electricity to 15,000 homes.^{2,3}
- Tempe-based First Solar, Inc., one of the largest thin film solar module manufacturers in the world, saw first quarter 2010 earnings increase over 30 percent compared to 2009.⁴
- In 2009, Arizona was among the top 10 states with the most renewable electricity generation, producing over 6.5 million MWh of energy.⁵



A worker installs a rooftop solar panel in Arizona.

PHOTO: Energy Pro, Inc.

Greener pastures

Colorado farmers harvest wind power

Edward Koester, 60, knows the tough life of a farmer in Logan County, a high plains frontier in northeastern Colorado. One big hailstorm can ruin a year's crop, snow can bury a building, drought sucks life from soil and he killed eight rattlesnakes in his yard last year. About the only thing that comes easy is the wind, which heaps tumbleweeds on fences and fills pockets with money.

The region that includes Logan County is rapidly developing into one of the largest wind energy producing regions of the country. Energy companies, farmers and ranchers have partnered to capture what the National Renewable Energy Laboratory rates as some of the nation's best wind resources across southern Wyoming, western Nebraska and northeastern Colorado. The new development is creating jobs, building tax revenue and reducing global warming gases.

“Wind energy generates income for families and it grows the tax base to build roads, bridges, schools and social services.”

—Rich O’Connell, Director,
Logan County Economic
Development Corp.

Renewable energy provides security for farm families

For clean energy pioneers like Koester, renewable energy development is key to keeping the family farm. He and his wife grow millet and wheat on 320 acres his father once farmed, but it's not enough to pay the bills. So, by day he drives a road grader for the county and his wife works at the grain elevator in nearby Peetz; they farm during evenings and weekends. He wonders how long he can sustain the workload or

when he will retire. His solution: use the land to grow windmills.

“A guy called me [in 2003] and said, ‘If you put turbines on your place, we’ll pay you,’” Koester said. “It’s very trying to make a living on a farm, so you got to do something else, so we wanted to look at it. Everyone I know who has the windmills likes them because they bring in a little extra money,” he said.

He signed a long-term contract with Florida Power & Light Energy Co., to host three towering, 2.3 megawatt windmills, which





A wind energy technician trainee at Northeastern Junior College in Sterling, Colo. PHOTO: Northeastern Junior College

he estimates will pay him about \$20,000 annually. That's a decent chunk in a county where, government statistics show, the median household income is about \$38,000 and one in eight residents live below the poverty level.

Wind generates jobs and revenue in northeastern Colorado

The nearby 400-megawatt Peetz Table Wind Energy Center, built in 2007, is the cornerstone of renewable energy development in Logan County, about 120 miles east of Denver. In nearby Fleming, the Colorado Highlands Wind LLC plans to build 69 turbines. By the end of 2009, 645 wind turbines straddled the county's northern border, supplying 700 megawatts, or enough electricity for 200,000 homes, according to research by Colorado State University Extension.

"These are the largest construction projects in the history of the county," said Rich O'Connell, director of the Logan County Economic Development Corp. "Wind energy generates income for families and it grows the tax base to build roads, bridges, schools and social services," he said.

How much is wind power worth to the county today? About \$2.3 million annually in property taxes; an average of \$5,000 in

annual easement payments to landowners; and about a \$400,000 increase in tax base for every 100 megawatts produced, according to O'Connell. New projects could nearly double those figures, plus hundreds of jobs to build and maintain wind turbines and transmission lines.

Wind associations give power to rural landowners

Seizing opportunity, groups such as the Rocky Mountain Farmers Union organize ranchers and farmers into "landowner wind associations" to help Western ranchers and farmers negotiate better rates with energy companies. "It's a better model, it allows us to grow more renewable power over a wider area and, no pun intended, it's more power to us," said Bill Midcap of the Union. The organization has 23,000 members in Wyoming, New Mexico and Colorado.

Rural power associations typically reliant on fossil fuels are warming to clean power. The Highline Electric Association in nearby Phillips County, Colo., has a project to recover waste energy from two turbines that compress natural gas, generating 3.5 megawatts, or about 5 percent of the power the association provides customers, while saving up to \$500,000 per year.

Landowners like Koester focus on the bottom line.

"I'm doing it because they came along and asked me, and they are doing it because the government says we need more renewable energy," Koester said. "This is the cleanest energy you can get, it don't take one gallon of fuel, so when they (energy companies) come along and had those towers, everybody jumped on them. Nobody gripes about them at all and everybody that's got them is plum happy."



Colorado clean energy facts

- Colorado's wind energy generation grew by 25 times from 2001 to 2007.⁵
- In 2010, Governor Bill Ritter signed landmark legislation requiring Colorado's investor-owned utilities to produce 30 percent of their electricity from renewables within a decade.⁶
- From 1998 to 2007, clean energy sector jobs rose by over 15 percent.¹
- Colorado provides clean energy training and certificate programs at numerous community colleges throughout the state.

Left: The Colorado Green Wind Power Project, a 162-MW wind energy development, is among Colorado's largest wind power projects. PHOTO: Iberdrola Renewables



A geothermal economic boost

Clean energy economy heats up in Idaho

From hot springs to geysers, signs point to powerful forces churning beneath the Idaho landscape, yet all that pent up power has not translated to clean, new energy above ground in this region. Until now.

A Boise-based firm named U.S. Geothermal Inc. is making a power play by becoming the first commercial geothermal energy plant in the region. The company hopes its Raft River Valley generating station will presage many new geothermal power plants in a land dominated by big rivers churning hydroelectric power. At just 13 megawatts, the U.S. Geothermal plant is relatively small, supplying clean energy for about 10,000 homes. But it is in prime position to tap even more power from under the ground because the Raft River Valley, 200 miles southeast of Boise, is a geothermal hotspot ripe for energy expansion.

“We are looking at doing more and more of this across the Northwest,” said Doug Glaspey, the company’s chief operating officer. “We’re just seeing tremendous growth in geothermal as a clean-technology option.”

“We’re just seeing tremendous growth in geothermal as a clean-technology option.”

—Doug Glaspey, Chief Operating Officer, U.S. Geothermal Inc.

A hot economic boost from geothermal power

Companies have been using micro-scale geothermal power for years in Idaho. For example, Boise-based Flora Co., growers of ornamental flowers and fish, has for the past 11 years used 117-degree water pumped

from the earth to heat a 100,000 square foot greenhouse, offices and a pond. “It’s so much cheaper,” said Flora Co. manager Greg Vanhoover, “we save thousands of dollars every year by not running our gas heaters.”

Other Idaho sites heated by geothermal energy include government buildings in

Above: This Raft River geothermal project is located 200 miles southeast of Boise.

PHOTO: Ormat Technologies, Inc.

Boise, fish and alligator ponds near Twin Falls and the College of Southern Idaho near Twin Falls.

The U.S. Geothermal power plant, which began commercial operation in 2008 on a former Department of Energy site, is a quantum leap forward because it spreads geothermal-generated electricity over a far wider area.

“It greatly expands the market for geothermal (energy) hugely beyond what’s been done historically,” said Gerald Fleishman, senior energy specialist at the Idaho Office of Energy Resources. He said studies show that Idaho could potentially generate 700 megawatts of geothermal power.

Geothermal power yields multiple economic dividends

With the new geothermal megawatts also flows economic opportunity. In 2006, the U.S. Bureau of Land Management’s first competitive geothermal lease sale under the Energy Policy Act netted \$5.7 million in bonuses for five Idaho parcels encompassing nearly 9,000 acres in the Raft River Valley. Half the monies collected were distributed to the state, 25 percent to Cassia County and 25 percent to the BLM. In addition, about 3 percent of the gross electric sales



The Raft River Unit 1 began commercial operations in January 2008. PHOTO: Ormat Technologies, Inc.

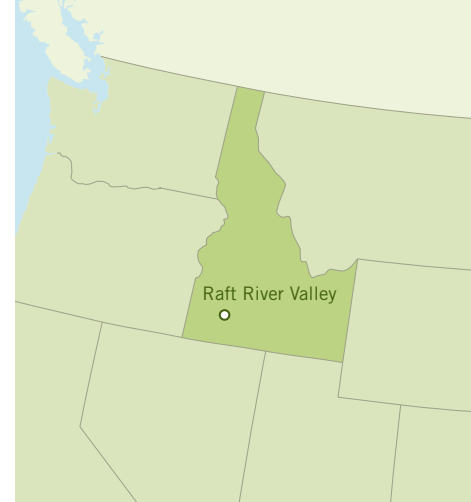
revenue from the U.S. Geothermal plant, or about \$184,000 annually, is returned to Cassia County where the U.S. Geothermal project operates, Fleishman said.

Glaspey said the generating station cost \$52 million to build, and provided jobs in construction, exploration and drilling, plus a dozen permanent jobs to operate the plant. “This is a very rural community. The only jobs out there are low-paying agriculture jobs, but these (energy) jobs are well paying jobs,” he said.

Geothermal is a winning solution

In addition, the price of geothermal power is increasingly competitive and often geothermal can be tapped directly, eliminating the need for controversial power transmission lines. Better still, geothermal energy is constant and never takes a day off providing a steady flow of electricity.

“Utilities like geothermal because it’s base load power, it operates long term and it has a 50-year history in the United States,” Glaspey said. “It’s a great technology and a great industry to be in.”



Idaho clean energy facts

- Idaho has 15 MW of geothermal power producing electricity, with an additional 400-675 MW currently in development.⁷
- The Goshen North wind project in Bonneville County will generate 124 MW of energy, employ about 250 workers during peak construction and provide revenue for rural communities.⁸
- The 2.25-MW Bettencourt Dry Creek Biofactory, one of many methane-to-energy anaerobic digesters in Idaho, powers more than 2,000 homes.⁹
- In 2007, Idaho employed over 4,500 people in the clean energy sector, an increase of over 125 percent from 1998.¹



The 1.5-MW Maricopa Solar concentrating solar power plant in Peoria, Ariz. is operated by Tessera Solar. PHOTO: Kindred Elliott

Whether captured via a photovoltaic panel or a concentrating array, solar energy is generated from the sun's powerful radiation. Because of its versatility, solar energy is a popular choice for both large utility-scale projects and small residential installations.





Bridging the gap

Montana harnesses strong winds in the West

“It brought jobs to small, poor rural towns in decline. It’s given enthusiasm and push to develop wind energy in Montana as a whole.”

—Bob Quinn, Montana organic farmer and wind energy entrepreneur

Bob Quinn, a farmer in Big Sandy, Mont., is a visionary who has successfully planted the seeds for renewable energy. Quinn’s dream germinated on a serendipitous trip to Germany a few years ago, where he learned from a relative how to sell wind energy to make money. The pair met later in Montana, explored potential sites for a wind farm, and settled on Judith Gap about 100 miles northwest of Billings.

Why Judith Gap?

Montana’s hammer-blow gusts are legendary. Rocky Mountain winds can uproot Ponderosa pines and sail them like kites. Highway signs sport wind socks, usually full, so truckers can navigate U.S. 191 between the towns of Judith Gap and Harlowton. In the Judith Gap, wind speeds average 16 to 18 mph, ranking the area as one of the windiest spots in the West, according to the Montana Department of Natural Resources and Conservation. “The last time the wind stopped blowing at our place, the buildings fell down,” Quinn said.

Some of the best wind in the nation

A Harvard study released in August 2009 found Montana tied Kansas for having the second most wind energy potential in the nation. Texas was first. The study shows Montana has the potential to produce 4,700 terawatt hours of wind electricity—370 times the state’s current total retail electricity sales. Future studies

will determine how much of that potential can be put into commercial use.

Today, about 90 turbines swirl above 8,300 acres at the Judith Gap Wind Farm, churning out 135 megawatts of electricity without air pollution. That’s enough power for about 33,750 Montanan homes or about 8 percent of the electricity NorthWestern Energy provides the state. The project is

Above: The Judith Gap Wind Farm in Judith Gap, Mont. PHOTO: Windpark Solutions America

operated by Chicago-based Invenergy LLC, which took over the project from Quinn's company, Wind Park Solutions.

As Montana's first commercial wind farm, the project represented a groundbreaking step toward meeting the state's 15 percent by 2015 renewable energy goal established by the Legislature. Since the Judith Gap project began operation in 2006, wind energy has rapidly expanded across Montana. The state generated 1 megawatt of wind power in 2003, but government estimates show that wind electrical generation jumped to over 370 megawatts by 2009. Wind farms have sprung up at Horseshoe Bend near Great Falls, Centennial wind park near Swift Current and the NaturEner project near Ethridge.

Schools benefit from windy plains

For each 1,000 megawatts of wind power Montana produces, 1.2 billion gallons of water will be saved and 2.9 million tons of carbon dioxide emissions, a greenhouse gas, will be averted annually, according to the National Renewable Energy Laboratory.

But the environment isn't the only beneficiary.

One thousand megawatts of wind power would pump \$1.2 billion into Montana's economy in construction jobs, property tax revenue, payments to landowners hosting windmills and operational jobs, NREL estimates.



Construction workers prepare the site for the Judith Gap Wind Farm. PHOTO: Windpark Solutions America

Wind projects benefit schools, too. Montana owns 5.1 million acres of "school trust lands," and energy developers who lease the lands pay a portion of electrical generation revenue to public education. Montana K-12 schools receive about \$60,000 annually from the 640 acres of trust lands at the Judith Gap Wind Farm, according to the state Department of Natural Resources and Conservation.

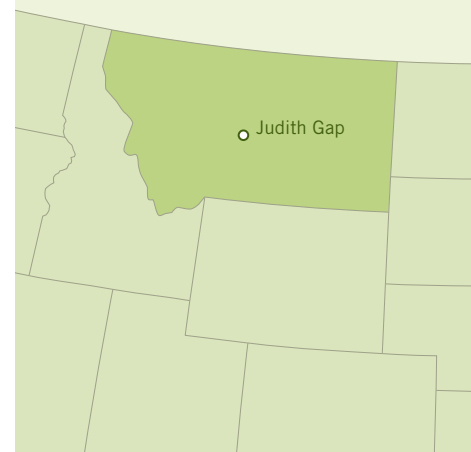
Montana State University–Great Falls College of Technology and three other campuses received a \$2 million grant from the U.S. Department of Labor to offer certificate programs in energy technology. Mel Lehman, project manager at MSU–Great Falls, said the program will train 100 students annually as wind technicians.

"The goal is to provide lots of good paying jobs. Montana has long been losing jobs and exporting students at a loss to the state economy, so the state's new energy policies are linked to economic policy," Lehman said.

Local wind resources provide rural economic development

These days, Quinn is more focused on raising an exotic strain of Egyptian wheat on his 3,400-acre farm than on wind power. He aims to power his farm completely on biofuels from feedstock he grows. Still, he marvels at how his inaugural Judith Gap project led to a proliferation of wind power across Montana.

"My grandfather told me you can't argue with success, and Judith Gap has been a great success," Quinn said. "It brought jobs to small, poor rural towns in decline. It's given enthusiasm and push to develop wind energy in Montana as a whole, and culturally it's opened an alternative besides coal as an energy option. Just watching those turbines go around, producing energy, it's a very satisfying thing to know," he said.



Montana clean energy facts

- Montana has over 370 MW of installed wind generation capacity, enough to power approximately 80,000-110,000 homes.^{10, 3}
- By 2015, Montana utilities will obtain 15 percent of their electricity sales from renewable sources.¹¹
- Montana State University recently announced that it will offer Sustainable Energy Technician degrees at four locations throughout the state.¹²
- Between 2001-2007, renewable resources grew eight-fold in Montana.⁵

A clean energy gold rush

Geothermal energy: A sure bet for Nevada

Few early prospectors who traversed the Nevada desert got rich, but had those early seekers looked deeper, they would've found real riches beneath the Great Basin's rippling mountains in the form of geothermal energy. Today, a new generation of prospectors has rediscovered Nevada and is pioneering clean energy by punching holes in the ground and bringing clean, reliable, base-load geothermal power, as well as economic opportunity, to cities and rural communities in Nevada.

“This is a new type of gold for Nevada and it’s going to be far more valuable today than silver or gold. The geothermal industries are the new prospectors.”

—Paul Thomsen, Director of Policy & Business Development, Ormat Technologies, Inc.

John Bernardy is one of the pioneers. After the Navy, he left stints on Montana fire crews and at Nevada gold mines to work as a chemical engineer at Reno-based Ormat Technologies, Inc., where he said he found steady employment and an opportunity to do good.

“Around here, there isn’t a lot for chemical engineers. I wanted to get into power production and Ormat was offering a renewable energy source that runs 24-7, so I saw it as an opportunity,” Bernardy said.

Green collar job opportunities

Ormat is in the forefront of this subterranean land rush. As the largest geothermal developer in the United States, the company mines a prolific resource along Interstate 80 near Fallon, 60 miles east of Reno, where hot magma flows near the Earth’s crust.

Ormat builds about five new power stations per year in various locations. It is

poised to develop four new power plants in Nevada creating more than 400 new jobs replacing fossil fuel with labor. Ormat has grown from 10 U.S. employees in 1995 to 500 today, including 130 in Nevada.

Some 3,000 megawatts of geothermal power could be produced in Nevada, said Paul Thomsen, Director of Policy & Business Development for Ormat. To put that number



in some perspective, 3,000 megawatts will require a \$17 billion investment with nearly 50 percent allocated to the exploration and drilling phases.

“We’ve only scratched the surface. The potential for this resource is endless,” he said.

Bernardy said he is fortunate to find work in geothermal. Jobs for people with technical skills are few in northern Nevada—one of his friends from college works as a gas attendant at Costco and the other returned to school. He said the chance to help protect the planet while earning a living wage makes geothermal jobs appealing.



Drilling exploration crew performing initial well logging tests at the Desert Peak site, Nev.
PHOTO: DOE/NREL, Pat Laney

“Being in renewable energy is a night and day (improvement) from working in a gold mine. And there are benefits for everyone because we’re working for the planet. That’s job satisfaction,” Bernardy said.

And geothermal energy is more than potential; it’s available now. For example, Ormat has seven power plants operating in the hills around Reno. Nevada is the nation’s second leading geothermal producer and has 45 new projects

underway, which will add jobs, according to the Great Basin Center for Geothermal Energy at the University of Nevada, Reno.

Clean, base-load power energizes Nevada’s economy

Geothermal power stations use heat from the Earth to drive turbines. Electricity goes to cities and the water stays behind. Geothermal power produces so-called base load power and can operate at 95 percent capacity all day, year-round. It produces almost no air pollutants or gases that contribute to global warming.

In northern Nevada, Churchill County Commissioner Norm Frey welcomes geothermal power. Five power stations near Fallon produce more electricity than the town’s 8,000 people use, so much of it is exported for use outside of town.

Geothermal energy companies pay Churchill County \$601,443 in net county tax proceeds and \$1.6 million in property taxes annually, according to officials. The revenue helps pay for schools, Frey said. The companies also provide good-paying jobs and help fill local hotels and restaurants with customers.

“We want these (geothermal) resources in our community. It’s green energy and we want to see it developed,” Frey said.

Unlike Western boom towns that came and went when precious ore ran out, today’s geothermal energy prospectors have an almost inexhaustible supply. The Western Governors’ Association estimates about 5,630 megawatts of geothermal energy are viable for commercial development in the West by 2015.

“This is a new type of gold for Nevada and it’s going to be far more valuable today than silver or gold. The geothermal industries are the new prospectors,” Ormat’s Thomsen said.



Nevada clean energy facts

- As of April 2010, there were 20 geothermal power plants in Nevada with a total operating capacity of more than 445 MW and an additional 3,300 MW in development.⁷
- In 2009, Nevada had the highest number of solar watts and solar retail sales per capita in the nation.¹³
- In 2007, Nevada had 28 percent clean energy job growth over ten years.¹
- EnergyStar certified houses built by Pulte Homes in the Las Vegas area are saving homeowners \$300 or more on their annual energy bills.¹⁴

Left: The Desert Peak Geothermal plant located 4 miles southeast of Brady’s Hot Springs near Fernley, Nev.
PHOTO: Ormat Technologies, Inc.



New Mexico's economic tailwind

Pioneering program builds power and jobs

No one knows from where the wind comes or where it goes, but folks in eastern New Mexico know when it blows.

"You can always tell it's springtime in New Mexico by the flying cinder blocks," said Lane Bradley, a lifelong resident of Tucumcari, about 70 miles east of Albuquerque.

People in this small town know which way the wind is blowing these days. It's creating a mighty economic tailwind, turning whooshing windmills into jobs. In a stroke of strategic foresight, Mesalands Community College leaders created the North American Wind Research and Training Center, positioning their small campus as one of the nation's few schools to prepare students for jobs as wind energy technicians.

"The town's people see it as a form of economic development for rural America and a way to help us become less dependent on foreign energy."

—Phillip O. Barry, President, Mesalands Community College

Small town sees jobs on the rise

For students like Bradley, the program is a godsend. His ancestors homesteaded in Tucumcari in the 1880s. He's scratched out a living here as a rodeo rider, rancher and construction worker. He says becoming a wind technician is a way to stay close to his roots while pioneering the future of the green economy.

"This is the wave of the future. I want to get in on the ground floor. This is an environmental issue, but it's also a good employment opportunity," Bradley said.

Tracy Rascoe, director of the center from 2008-2009, says new jobs in wind energy will help young people find work in rural towns instead of moving to cities. He said General Electric could provide jobs for many of the graduates for the next three years, but that's just one employment option the students will have.

Wind energy technicians can expect to earn \$45,000 to \$60,000 annually—substantially more than the median income in this part of New Mexico. Rascoe said that in a small town like Tucumcari, that's a good

Above: Mesaland's first graduating class received their degrees in May. PHOTO: Mesalands Community College

deal compared to working in fast food restaurants, ranches and retail stores.

“Finding a job for these students is not going to be a problem. The problem will be deciding where they want to work. There’s not much employment in Tucumcari, but there’s lots of wind farms,” Rascoe said.

Windsmiths of the West

In a sign of how the program is reshaping the community, a 400-foot tall windmill producing 1.5 megawatts of power dominates the campus and the town. Students use it as a hands-on classroom to study safety, electricity generation and blade maintenance. In May 2010, 23 students graduated from the two-year program, during which time they pursued courses in electrical theory, introduction to hydraulics and wind turbine operation and maintenance. According to Troy Carpenter, an instructor at the Research and Training Center, many of these recent graduates have already secured jobs as technicians, commissioners and project managers.

Wind energy is one of the fastest growing businesses in the West and demand for “windsmiths,” as the technicians are called, is growing. Some 17 wind farms generating 1,722 megawatts of power are operating or planned within 250 miles of the Mesalands campus. The American Wind Energy Association estimates wind energy will generate 170,000 jobs in the United States by 2030.

In a town with 5,000 residents, four stop-lights and more cows than people, Tucumcari needs jobs, said Mesalands Community College President Phillip O. Barry.

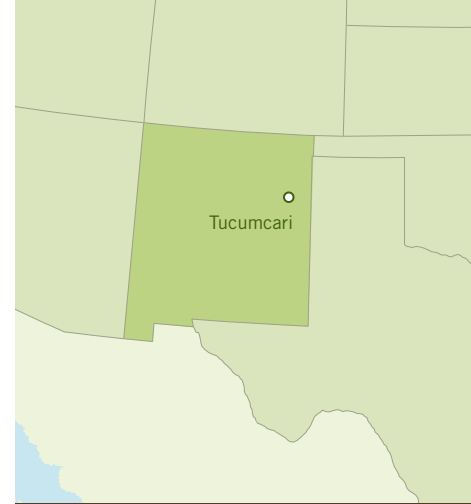
“The town’s people see it as a form of economic development for rural America and a way to help us become less dependent on foreign energy. We have a tremendous resource here that hasn’t been tapped, and that’s the wind,” Barry said.

A bipartisan clean energy future

The Research and Training Center represents a convergence of bipartisan political support with environmental goals. New Mexico officials are counting on renewable energy to give an economic jolt to small, rural towns eager for jobs.

“Typically, renewable energy generates excitement in the Legislature. This project could help raise New Mexico’s status as a leader in clean energy development,” said New Mexico state Rep. Brian K. Moore (R-Clayton).

David Griscom of the Santa Fe-based Regional Development Corp., a non-profit economic development organization, can see the direct and immediate benefits of the wind training center. “This green economy business is not hype at all. It’s happening here today and it’s happening now,” Griscom said.



New Mexico clean energy facts

- Between 1998-2007, clean energy jobs in New Mexico increased by 50 percent.¹
- New Mexico has over 490 MW of installed wind generation capacity, enough to power more than 100,000 homes.^{5, 3}
- In December 2009, Xcel Energy contracted with Sun Edison to build 50 MW of photovoltaic solar installations, which will generate enough electricity for 10,000 homes in the first year of operation.¹⁵
- New Mexico is home to a half dozen well-established renewable energy training programs at community colleges throughout the state.



Wind turbine installation in Tucumcari, N.M. PHOTO: Mesalands Community College



This geothermal project generates electricity for Nevada residents. PHOTO: Nevada Geothermal Power



Geothermal power uses heat stored deep within the Earth to drive steam-powered turbines. Geothermal power can produce reliable baseload electricity generation.



A bright future

Clean energy shines in Utah neighborhood

“We see a market for this. People want to contribute to going green and saving energy and do their part.”

—David Hansen, architect

When it came time to retire, Carl Berger had enough of chilly Michigan, so he and his wife moved to the Southwest for sunshine. But basking in southern Utah’s warm hues wasn’t enough, so they purchased power directly from the sun to heat their new home under an innovative program in St. George.

Their new town offers residential and commercial users solar energy via the city’s “SunSmart” program. Residents rent renewable power from a central 100-kilowatt photovoltaic array. For Berger, it’s a perfect way to reduce carbon emissions without ruffling his Sun River retirement community, which frowns upon rooftop solar panels.

“We’ve got 365 days of sunshine per year here in St. George, so solar makes sense,” Berger said. “We have a strong commitment to the environment, so I wanted to put my money where my mouth is. With all the concern about global warming, this was the best way to get started,” he said.

Utah community pioneers renewable energy

St. George is one of a handful of communities across the West providing renewable power options for residents. The city, 120 miles northeast of Las Vegas, installed 100 solar panels in December 2008.

“We’re seeing more use of solar, wind and other renewables due to increasing demand from homeowners and businesses to reduce monthly utility bills and receive electricity from clean sources,” said Neal Lurie, spokesman for the Colorado-based American Solar Energy Society. “There are

Above: Dangling Rope Marina, Lake Powell, Utah. PHOTO: DOE/NREL, Warren Gretz

a variety of creative approaches to reduce one's carbon footprint and increase renewable energy for personal use," he said.

Under SunSmart, residents can elect to purchase shares of the city's solar system under 19-year contracts. The city and the Dixie Escalante Electric cooperative monitors the solar system's output and discounts monthly electric bills for participants accordingly.

René Fleming, conservation coordinator for St. George, said the city launched SunSmart after residents demanded renewable energy in response to a proposed coal-fired power plant in nearby Mesquite, Nev. The program has 26 subscribers who save an average of \$10 per month on electric bills and are eligible for a \$2,500 federal tax credit. According to Fleming, the city's goal is to expand the project to 2 megawatts of power. So far, the program has already avoided roughly 340,000 pounds of greenhouse gases, the equivalent of reducing the town's gasoline consumption by 17,348 gallons.



A worker inspecting a rooftop PV panel in Zion National Park. PHOTO: DOE/NREL, Robb Williamson

Residents contribute to clean energy legacy

David Hansen, 51, has worked as an architect in St. George for 15 years. He's begun incorporating SunSmart into his remodel jobs, especially dwellings unsuitable for on-site solar panels.

"We see a market for this. People want to contribute to going green and saving energy and do their part," Hansen said.

For Berger, he says his monthly electric bills are 25 percent lower now and he expects the savings will grow.

"I try to act in the short run to benefit in the long run," Berger said. "Besides, we're going to leave our kids and grandkids with a big legacy with the environment and as senior citizens we need to support a new direction that will encourage them to think about this."



Utah clean energy facts

- In 2008, the Utah state legislature set a renewable energy goal of 20 percent for utilities by 2025.¹⁶
- ETC Group, LLC, an energy efficiency consulting company based in Salt Lake City, helped a manufacturing plant in Ogden save 2,000 MWh and \$120,000 annually, in a process that involved 6,800 worker-hours.¹⁷
- The 204-MW Milford Wind project created more than 250 development and construction jobs, and resulted in more than \$85 million in economic benefits to Utah.¹⁸
- Salt Lake City is engaging in a multi-stakeholder planning process to implement 10 MW of distributed solar generation by 2015.

A new energy convergence

Wyoming explores renewable energy

Nearly a century after one of the nation's worst political scandals at Teapot Dome, a new chapter is being written across central Wyoming. Here the petro-rich land is producing innovations that promise more responsible use of petroleum wells and renewable energy technologies for farms and towns across the West.

Now, just 35 miles north of Casper, Wyo., you can find the 10,000-acre Rocky Mountain Oilfield Testing Center, a Department of Energy alternative-energy incubator utilized by energy companies, inventors and academia.

“People produce fossil energy and people produce renewable energy, but the natural tendency is to guard their industries...we are trying to make collaborative efforts.”

—Clarke Turner, Director, Rocky Mountain Oilfield Testing Center

Past-meets-future technologies

Clarke Turner, the director at the center, relishes the convergence of two distinct energy cultures in one place. The hybridization is producing a new generation of technologies.

“People produce fossil energy and people produce renewable energy, but the natural tendency is to guard their industries and not use hybrid technologies or talk about it, but we are trying to make collaborative efforts,” Turner said. “If these two camps don't collaborate, you're missing tons of opportunities,” he said.

The industrial mutualism in the works at the center is a past-meets-future venue where clean energy breakthroughs are merged with traditional fossil fuels, potentially transforming the energy sector of the U.S. economy.

How might such a new future come about? Consider the wider applications of technologies now in use at the center. For example, researchers have developed methods to extract geothermal electric power from low-temperature wells. Oil fields extract lots of water as they age and deplete, but the water is not hot enough for conventional geothermal power plants.



To overcome this challenge, the center, in a partnership with Ormat Technologies Inc., for the first time used the 200-degree water to generate electricity and power the oil pumps. This technology saves money, prolongs the life of marginal oil fields and reduces need for imported oil. Moreover, it proves a new form of renewable energy for use in industrial and commercial applications in remote places around the West. Said Turner: “It can be a widespread technology because across the entire United States you have some sort of water sources that have low temperature (geothermal potential).”

Another experimental endeavor tests a trailer-drawn solar-powered pump, which can be transported to remote locations to power oil-well pumps. It could help reduce some of the harmful emissions associated with oil extraction and advance broader application of solar-power technologies.

A new kind of classroom

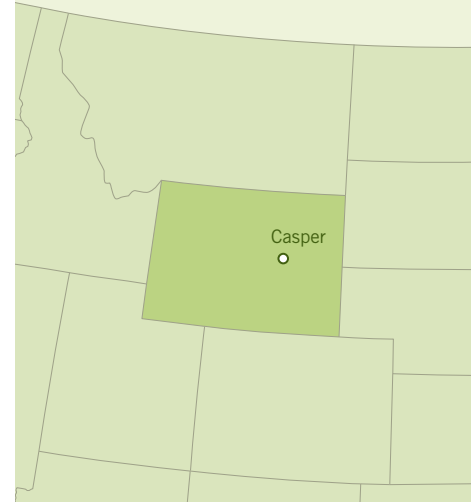
Casper College partnered with the center to host a 6 kilowatt wind turbine that students use as a classroom to practice wind turbine maintenance. It’s part of a course for a renewable energy degree

program the college offers, said Megan Graham, an instructor at the college.

“I foresee us doing more projects out there and using renewables to power light industrial applications,” Graham said. “Typically, wind and solar have been used for residential or remote applications, but for renewables to take hold they have to have proven application and one area that hasn’t been explored much is powering larger motors to power industrial or commercial operations or agricultural operations.

“If we prove this works at (the center) by powering some pumping units, that would be a way to get affordable power in Wyoming where it’s costly to run power lines to remote locations,” Graham said.

Crossing the cultural and technological divide between renewable and fossil fuel energy can be a challenge and Turner says his staff works hard to build bridges. Said Turner: “The mission is extremely rewarding. We have to work together to solve our energy and policy issues.”



Wyoming clean energy facts

- Clean energy sector jobs grew over 55 percent between 1998 and 2007.¹
- Wyoming Department of Family Services delivers energy assistance to more than 11,000 households each year, resulting in average energy savings of \$218 per household in energy efficiency improvements.¹⁹
- The McFadden and High Plains wind projects, completed in 2009 and now producing 127 MW, provided over 250 full-time jobs during peak construction.²⁰
- Wyoming realized a 19 percent growth in total renewable energy generation from 2001 to 2007.⁵



The groundbreaking of a wind turbine partnership project between the Rocky Mountain Oilfield Testing Center (RMOTC), Rocky Mountain Power and Casper College. PHOTO: RMOTC

Left: An Ormat geothermal project is housed at RMOTC. PHOTO: RMOTC



Clean energy heats tribal homes

Entrepreneur trains tribal members and cuts energy costs in half

Henry Red Cloud's journey linked him to one source of renewable power in his Native American heritage and to another in a clean-energy future. The South Dakota entrepreneur—he is a descendant of the famous Sioux chief Red Cloud—is the founder of Lakota Solar Enterprises, which manufactures residential solar heaters and alternative energy and conservation devices.

His company is one of what is believed to be a small handful of renewable energy businesses fully owned and operated by Native Americans in the United States. The products they manufacture help tribes across the West improve their standard of living while reducing energy costs and emissions.

Solar devices provide big energy savings

In the rush to develop clean jobs to lift the economy out of recession and slash greenhouse gases, the contributions of Indian tribes get overlooked by the actions of venture capitalists, scientists and government officials. Yet, from Alaska to Oklahoma, New Mexico to Minnesota, tribes are using renewable energy to grow local economies and improve housing.

In 2004, Lakota Solar Enterprises partnered with the Colorado-based non-profit group,

Trees, Water & People, to begin assembling solar heating systems for Pine Ridge, S.D., families. The devices, box-like and about the size of a sheet of plywood, capture sunshine to heat air and blow it into houses, cutting energy costs by about one-third. The devices cost about \$2,000 each and the energy savings repay the initial investment in about five years. When used in conjunction with energy conservation measures, residential energy savings can be even greater, Henry Red Cloud said. He said the 62,000 residents of Oglala Lakota Sioux tribe at Pine Ridge cut

“If I was living a couple hundred years ago, I’d be doing the same thing—bringing resources back to the family... I’m just doing my warrior deed.”

—Henry Red Cloud,
entrepreneur

Above: Henry Red Cloud in his Renewable Energy Center on the Pine Ridge Reservation in South Dakota.
PHOTO: Trees, Water & People

their annual energy bill in half, saving over \$1 million annually.

So far, Lakota Solar Enterprises has installed about 500 residential solar heaters and, working with other tribes to make the equipment, has created 72 jobs. Lakota Solar also sells solar electric devices and residential wind turbines.

Promoting economic stability within the tribe

The work has been a journey of the soul for Henry Red Cloud. Fifteen years ago, he was traveling around the nation welding girders and erecting high rises as a structural steel worker. But he said he missed his home in Pine Ridge, so he returned.

“But I couldn’t find work when I returned, so I figured I would just create work and make jobs for other people,” he said.

With help from the federal government, he opened the Red Cloud Renewable Energy Center in South Dakota to train other Indian tribes in all aspects of renewable energy development. It is part of a broader effort underway to provide training and jobs for Indian people.

Bob Gough, secretary for the Intertribal Council on Utility Policy in Rosebud, S.D., understands the importance of creating jobs within the community. He said tribes have a desperate need for housing because one-third of U.S. Indians live in trailers or



Trainees at the Red Cloud Renewable Energy Center prepare solar panels. PHOTO: Trees, Water & People

manufactured homes that are no match for frigid winters on reservations across the Plains or interior West. He said government studies show 200,000 new homes are needed on reservations and the council funds projects to help students learn to make homes of hay bales, which have twice the energy efficiency of a typical suburban house.

“For tribes, there will be lots more jobs in house construction than, say, wind turbine construction,” Gough said.

Training the next clean energy generation

In New Mexico, the Southwestern Indian Polytechnic Institute received federal funding to train students in renewable energy. The institute plans to offer certificate programs in energy auditing, wind energy and photovoltaic solar installation beginning in the fall of 2010.

Nader Vadiie, an electrical engineer who runs the institute’s Department of Advanced Technical Education, wants to train a generation of renewable energy opportunists. Meanwhile, the institute is also in the midst of generating all its electricity and heating needs from renewable energy sources.

“All our students are Native Americans, so this will directly impact tribal communities. We want to develop entrepreneurs who can make technology-based businesses on tribal lands,” Vadiie said.

Henry Red Cloud sees these efforts as a renewal of the land ethic his ancestors lived.

“Becoming sustainable is in our culture, our language, our heritage,” Henry Red Cloud said. “As native people, we have a strong connection with things like this, so it helps us get balance and create hope. It’s our new way to honor the old way,” he said.



Renewable energy challenge

In April 2010, students from the Southwestern Indian Polytechnic Institute shared a first place award in the Indian Education Renewable Energy Challenge. They won a trip to Washington, D.C. and a \$5,000 cash award. The contest encourages renewable energy development among students and teachers on tribal lands.

The Bureau of Indian Education, the Indian Affairs Office of Indian Energy and Economic Development and the U.S. Department of Energy’s Argonne National Laboratory sponsor the contest.

A teacher helps students assemble their winning portable wind turbine model. PHOTO: Southwest Indian Polytechnic Institute

A new start:

Non-profit prepares low-income families for green jobs

“I took to construction in the green energy field because it’s a growing field and I wanted to make the world better for me and my children at the same time.”

—Lesli Miller, graduate, Mi Casa Resource Center

“Go West” is advice that has inspired hope for new opportunity since Horace Greeley saw new beginnings beyond the setting sun. Lesli Miller of Denver heeded that counsel. The 31-year-old single mom with four children moved to Colorado in search of green jobs. She may not seem a typical clean energy pioneer, but Miller saw a chance to leave a troubled past and start over.

“I was working in fast-food, low-end jobs, hospitality work, dead-end jobs with no room for growth,” Miller said. “So I took to construction in the green energy field because it’s a growing field and I wanted to make the world better for me and my children at the same time,” she said.

A new start in the green economy

Her story shows that many westerners have a strong stake in the region’s clean energy economy. Environmentalists may see an opportunity for improved protection of human health and the environment. Local officials see the promise of tax revenue for schools and roads. Politicians see a way to rebuild American economic innovation. But others see clean energy jobs as hope for a decent living.

And Mi Casa Resource Center specializes in helping people like Miller get new starts. For 34 years, the Denver-based organization has helped people of color and low-income

individuals find economic hope. It teaches people basic work skills, small business development and life and family skills.

“These are folks that experience poverty,” said Meredith Roach, director of career development at Mi Casa. “It’s beyond their means to do things that lots of other people in society can do, so we help them,” she said.

Green training to expand with federal grant

Recently, Mi Casa received a \$3.6 million federal grant as part of a jobs program targeting low-income communities and used the money to create the Denver Green Jobs Initiative. The two-year project will provide job training to 500 people in energy efficient construction, renewable energy, sustainable construction practices and energy audits. Eligible participants include people with disabilities and the unemployed, including veterans, people of color, high school dropouts, the homeless and those with a criminal record.

“We are a new kind of clean energy pioneer for those who are not well educated or are below the poverty



Mi Casa trainees during a weatherization class.

PHOTO: Mi Casa Resource Center



Mi Casa trainees learn about rooftop solar installation from Simple Solar. PHOTO: Mi Casa Resource Center

line. These are not urbanites driving around in their Prius,” Roach said.

Miller heard about the program shortly after she moved to Denver last year. She said she was always good in math and figured that would be an asset working with environmental matters, plus she says she is diligent about recycling and weatherproofing her house. She figured green jobs would be a growing career path, so she enrolled.

“I see a future in this. I can prosper in this; I can start at the bottom at a company and grow with it. I can show other women that they can do it, too,” Miller said.

Hopeful outlook for clean energy jobs

Adawnous Henry, 32, also graduated from the program, one of about 20 graduates so far. He was out of work and tired of stints that included construction, warehouse jobs and dog-walking. Shortly after graduation, he got a job with Simple Solar LLC of Boulder, Colo., installing photovoltaic arrays. He said the work has helped stabilize his life and keep him out of trouble.

“I like waking up and being a part of this, a part of the future and a way to help the environment and my family,” Henry said. “How many other jobs do you have the opportunity to pull electricity out of the sky with your bare hands? It’s extremely rewarding,” he said.

So far, the couple dozen graduates of the Mi Casa green jobs program are finding mixed success in a difficult economy. As the economy slowly recovers and renewable energy expands across the West, Miller is hopeful as she continues to look for work. She’d like to help the National Renewable Energy Laboratory on a project to build a rail link to Denver International Airport.

Said Miller: “I want to help build something good and show my son that this is something his momma did with her hard work and her bare hands.”

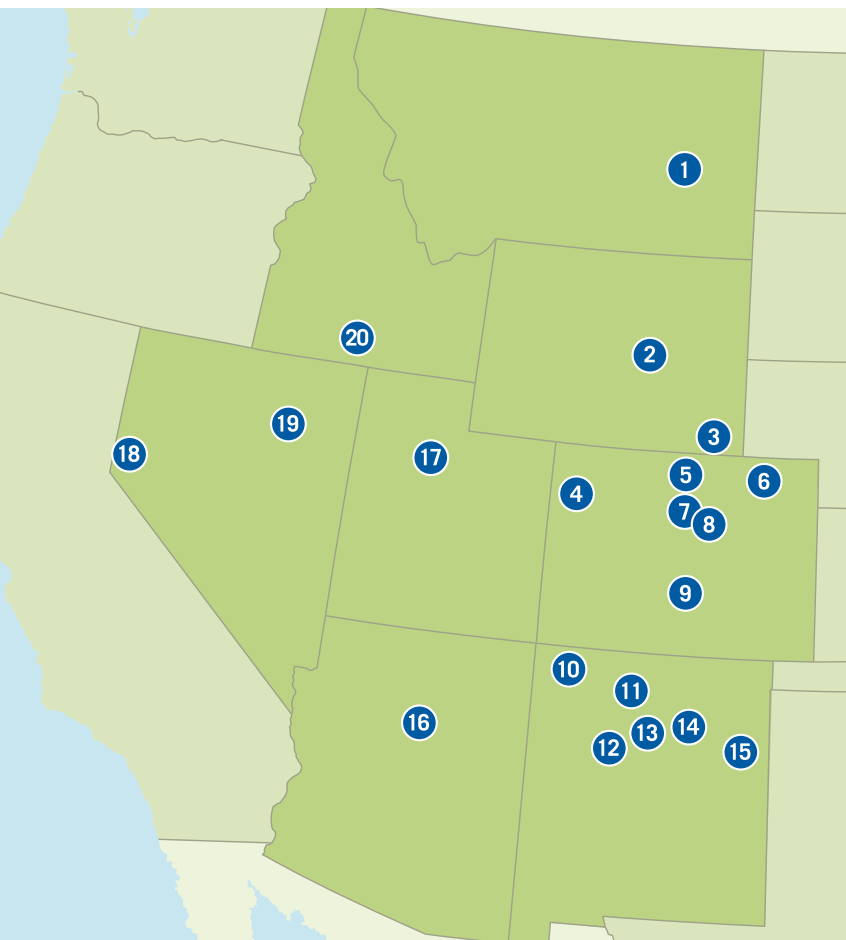
Mi Casa...teaches people basic work skills, small business development and life and family skills.

Pioneer training:

Building a stronger clean energy economy

Community colleges across the Rocky Mountain region are pioneering clean energy educational programs. Many community colleges offer hands-on training programs that prepare students for opportunities in the West's clean energy economy.

The map below highlights some of the community college clean energy programs that offer training in solar, wind, geothermal, biofuels, energy efficiency and more. There are many more programs and opportunities—at community colleges, technical schools, universities and other institutions across the region.



1. Miles Community College, Miles City, Mont.
2. Casper College, Casper, Wyo.
3. Laramie County Community College, Cheyenne, Wyo.
4. Colorado Northwestern Community College, Rangely, Colo.
5. Front Range Community College, Fort Collins, Colo.
6. Northeastern Junior College, Sterling, Colo.
7. Red Rocks Community College, Lakewood, Colo.
8. Arapahoe Community College, Littleton, Colo.
9. Pueblo Community College, Pueblo, Colo.
10. San Juan College, Farmington, N.M.
11. Northern New Mexico Community College, El Rito, N.M.
12. Southwestern Indian Polytechnic Institute, Albuquerque, N.M.
13. Santa Fe Community College, Santa Fe, N.M.
14. Luna Community College, Las Vegas, N.M.
15. Mesalands Community College, Tucumcari, N.M.
16. Cococino Community College, Flagstaff, Ariz.
17. Salt Lake Community College, Salt Lake City, Utah
18. Truckee Meadows Community College, Reno, Nev.
19. Great Basin Community College, Elko, Nev.
20. College of Southern Idaho, Twin Falls, Idaho



Left: Students during a wind technician course. **Right:** A student on top of a wind turbine near Sterling, Colo.
 PHOTOS: Northeastern Junior College

Northeastern Junior College | Sterling, Colo.

The renewable energy field is a fast growing industry. Eastern Colorado is host to one of the fastest growing sectors of renewable energy—wind energy. The Wind Energy Technician program at Northeastern Junior College is designed to prepare students for entry-level positions in the wind industry. The program covers the basic knowledge areas of electricity, electronics, fluid power, mechanics and more specific control systems of large wind turbine generator technology.

Hear what some students have to say about wind energy technician training:

Name: Tyson Ramseier

Graduation Date: May 2011

Hometown: Idalia, Colo.

I enrolled in the Wind Energy Technician program because...

Wind energy is taking off, the pay is excellent, and the job is exciting.

I think renewable energy can help rural communities because...

It will not only improve the economy by generating cleaner and cheaper electricity, but it also provides jobs as well.

After I graduate, I want to...

Work my way up in the rankings for the company I am employed with, start a family, and build a new house.

Name: Kent Greentree

Graduation Date: May 2011

Hometown: La Veta, Colo.

I enrolled in the Wind Energy Technician program because...

It is something that I can do and do well that utilizes my talents, will keep me in shape, help reduce CO₂ levels, help the economy, help with national security, and provide me with a decent income.

The coolest thing I've done in the Wind Energy Technology program is...

My test climb!

After I graduate, I want to...

Work in the field maintaining turbines.

“We had more students than slots when the fall courses started, and already have more students than openings for fall 2010.”

—Kent Wright, Department Chair of Transportation and Energy, Northeastern Junior College

Meet the partners



Rocky Mountain Farmers Union

Rocky Mountain Farmers Union is a progressive, grassroots organization dedicated to achieving profitability for family farmers and ranchers, promoting stewardship of land and water resources, delivering safe, healthy food to consumers and strengthening rural communities through education, legislation and cooperation.



Western Resource Advocates

Western Resource Advocates' mission is to protect the West's land, air and water. Our lawyers, analysts and economists work to:

1. advance clean energy to reduce pollution and the impacts of climate change;
2. promote urban water conservation and river restoration and
3. defend special public lands from inappropriate energy development and unauthorized off-road vehicle travel.

WRA recognizes that success can only come from working collaboratively with other conservation groups, hunters and fishermen, ranchers, American Indians and all those who seek a sustainable future for this remarkable part of the country.



Environmental Defense Fund

Environmental Defense Fund, a leading national nonprofit organization, represents more than 700,000 members. Since 1967, Environmental Defense Fund has linked science, economics, law and innovative private-sector partnerships to create breakthrough solutions to the most serious environmental problems.

ABOUT THE AUTHOR

The Clean Energy Pioneers are chronicled by Gary Polakovic, a Pulitzer-Prize winning journalist with over two decades of experience in policy and communications. Mr. Polakovic is president of Make Over Earth, Inc.[®], a public affairs firm specializing in environment and energy issues.



Bibliography

- ¹ "The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America," The Pew Charitable Trusts, June 2009, http://www.pewcenteronthestates.org/uploadedfiles/clean_economy_report_web.pdf
- ² "Dry Lake Wind Power Project," Salt River Project, <http://www.srpnet.com/about/stations/drylakewind.aspx>
- ³ "Wind Energy Basics," American Wind Energy Association, 2009, http://www.awea.org/faq/wwt_basics.html
- ⁴ "Fast Facts: Company Overview," First Solar, Inc, http://www.firstsolar.com/Downloads/pdf/FastFacts_PHX_NA.pdf
- ⁵ "State of the States 2009: Renewable Energy Development and the Role of Policy," Elizabeth Doris, Joyce McLaren, Victoria Healey, and Stephen Hockett, National Renewable Energy Laboratory, October 2009, <http://www.nrel.gov/docs/fy10osti/46667.pdf>
- ⁶ "New Energy Economy," Colorado Governor's Energy Office, March 2010, <http://www.colorado.gov/governor/newenergyeconomy>
- ⁷ "U.S. Geothermal Power Production and Development Update," Dan Jennejohn, Geothermal Energy Association, April 2010, http://www.geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf
- ⁸ "Site Announced for Mobilization of East Idaho Wind Farm," Idaho State Journal Online, March 16, 2010, http://www.idahostatejournal.com/news/local/article_c114a1d6-3136-11df-bc98-001cc4c002e0.html
- ⁹ "Idaho Power approves digester agreement with Cargill," TradingMarkets.com, April 7, 2010, http://www.tradingmarkets.com/news/stock-alert/idhoo_idaho-power-approves-digester-agreement-with-cargill-896733.html
- ¹⁰ Montana Energy Promotion and Development Division, Montana Department of Commerce, personal correspondence with author, June 2010
- ¹¹ "Montana: Incentives/Policies for Renewable and Efficiency," U.S. Dept. of Energy, May 11, 2010, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MT11R&state=MT&CurrentPageID=1&RE=1&EE=1
- ¹² "Sustainable Energy Technician Program Approved," Montana State University Great Falls College of Technology Press Release, May 28, 2010, http://www.msugf.edu/about/CollegeRelations/News_Details.php?Sustainable-Energy-Technician-Program-Approved-113
- ¹³ "Renewable Energy and the Environment," NV Energy, 2010, <http://www.nvenergy.com/renewablesenvironment/>
- ¹⁴ "Pulte Homes, Las Vegas Case Study," Southwest Energy Efficiency Project, 2010, <http://www.swenergy.org/publications/casestudies/nevada/pulte.htm>
- ¹⁵ "SunEdison and Xcel Energy Strike Deal for 50MW (AC) / 55MW (DC) of Solar PV Energy in New Mexico," Sun Edison Press Release, December 23, 2009, http://www.sunedison.com/press_releases.php?id=91
- ¹⁶ "S.B. 202 Energy Resource and Carbon Emissions Reduction Initiative," Utah State Legislature, February 19, 2008, <http://le.utah.gov/~2008/bills/sbillamd/sb0202.htm>
- ¹⁷ "Building the Clean Energy Economy: A Study on Jobs and Economic Development of Clean Energy in Utah," Presentation to the Utah State Legislature, Kelly Knutsen, Marshall Goldberg, and Wikstrom, Utah Chapter of the American Institute of Architects and Utah Clean Energy, February 19, 2009, http://utahcleanenergy.org/files/u1/Knutsen_final_2-19-09.pdf
- ¹⁸ "Milford Wind Corridor Project Is Completed; Largest Wind Facility in Utah and One of the Largest in the West," First Wind Milford Press Release, November 10, 2009, <http://www.milfordwind.com/milford/news.cfm?ID=44f4cd7e-6326-49fe-b2de-6ce748468ad6&test>
- ¹⁹ "Weatherization: Quick Facts," Wyoming Energy Council, June 4, 2010, <http://www.wyoec.org/weatherization.htm>
- ²⁰ "Section 109 Permit Application High Plains and McFadden Ridge Wind Energy Project," PacifiCorp Energy, July 2008, [http://deq.state.wy.us/out/downloads/High_Plains_ISA_All_Sections_\(070708\).pdf](http://deq.state.wy.us/out/downloads/High_Plains_ISA_All_Sections_(070708).pdf)

