

Heroes of Climate Change



Local Citizens Work to Combat Global Warming

by Steve Beers

According to cliché, “everyone talks about the weather, but no one does anything about it.” That’s not so in Austin. As reported last month, the Austin City Council adopted an aggressive climate protection plan. And Austin Energy, the city-owned electric utility, leads the nation in sales of renewable energy, runs a nationally renowned Green Building Program, and initiated a nationwide push for plug-in electric hybrid vehicles.

But the city government is not the only first responder to the

emerging global climate crisis. Elsewhere around town, committed individuals and nongovernmental organizations are not just talking about the climate any more, but doing something about it.

Among them are University of Texas researchers, business owners, activists, and just plain folks who happen to be doing extraordinary things. They all have a story—how they took direct personal action to deal with a gigantic and threatening situation that seems overwhelming to most of us.

A Special Report Climate Change: Part 2

Camille Parmesan

UT Biologist Turns Climate Detective

Camille Parmesan’s climate odyssey began innocently enough due to her fascination with butterflies.

Parmesan, an associate professor of biology, says, “What happened is I’d been doing basic plant-insect interaction work for several years for my PhD. NASA came out with a call for graduate grant proposals. They were called the Mission to Planet Earth programs, that specifically asked for people working on impacts of climate change. At that time,



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there really were very few biologists working in this field at all.”

She proposed to study the Edith’s Checkerspot Butterflies that range along the

Pacific Coast of North America. “I’d been working with this butterfly and it was well known that it was sensitive to climate,” says Parmesan.

Parmesan found pristine “beautiful habitat” in Baja California, but the butterflies were notably absent. Her study concluded that the butterfly abandoned habitats in Mexico and Southern California for more northern and higher altitude locations. The findings, published in the scientific journal *Nature* in 1996, were the first solid evidence that human-caused climate change had an effect on a wild animal species.

For her trouble, “climate contrarians” (see accompanying story, “Climate Contrarians Wage ‘Info-Wars’”) disputed her findings. “Two of them attacked me.” The two critics were Pat Michaels, a research professor of environmental sciences at the University of Virginia, and talk radio host Rush Limbaugh. “Pat Michaels, the only thing he could say is, ‘This is an absolutely fantastic study but it’s just a butterfly.’ Rush Lim-

baugh’s comment was, ‘Well, you know, what this little gal from Texas is showing us is that global warming is good, and it’s fine because everything will just move northward.’ Neither of them attacked the science at all.”

Parmesan’s next step was to broaden her investigation of climate change’s effects on other butterfly species. “In the USA, I basically worked on the one (butterfly species that) we had the best data on, and it still took me four and a half years. So in the UK, Finland, Sweden and in most of Europe they had much, much better records already in their databases. So I was able to look at their records going back to 1760. So I was able to look at fifty-seven species instead of one, and in two years I was able to get enough data to document that two-thirds of the fifty-seven species were pushed northward by anywhere from fifty to two hundred kilometers.” In 1999 this seminal paper was published in *Nature*.

Parmesan began to investigate spe-

cies other than butterflies. An analysis, co-authored by Parmesan for the Pew Center on Global Climate Change, homed in on the United States and found that human-driven climate change has affected many diverse species across the country. Parmesan and her colleague found evidence of hummingbird, starfish, red foxes and several other species adapting to human-caused climate change. Sixty years of studies revealed that warmer-water species of fish and species like starfish and sea anemone now dominate the waters off Monterey, California, once known for its cold-water species.

The Pew report notes that “range-restricted species, particularly polar and mountain-top species, show more severe range contractions than other groups and have been the first groups in which whole species have gone extinct due to recent climate change. Tropical coral reefs and amphibians are the taxonomic groups most heavily impacted.”

Parmesan became a lead author of the 2001 Intergovernmental Panel on Climate Change (IPCC) publication on current and future impacts of climate change. She followed up with another paper published with a coauthor in *Nature* in 2003. This paper expanded the scope of analysis further to look at several studies of other species worldwide. This “metaanalysis” reviewed more than eight hundred studies on the effects of human-caused climate change on nearly seventeen

hundred species around the world.

“The report has been considered the strongest statistical evidence that global warming—influenced by trapped greenhouse gasses such as carbon dioxide from cars and factories—is having an impact on a wide scope of species and regions,” according to a profile of Parmesan published on a UT web site.

Parmesan says, “I think we’ve absolutely answered the question whether species are responding to climate change and overwhelmingly the answer is yes. In the paper with Gary (Yohe) we actually came up with an estimate that about fifty percent of species are responding, which is a huge number.” Continued warming could cause the extinction of a third or more of the world’s species over the next two or three generations.

Of course, the implications of climate change won’t be limited to nonhuman species. Coastal cities will have to be abandoned, more severe weather events will take human lives, timber production is declining.

“The most frustrating thing is that policymakers aren’t acting on the information. If we can work aggressively, maybe we can keep the warming down to maybe two degrees more than what we have. If we don’t do anything at all, just stick to business as usual, it will get to four degrees pretty fast. So, people need to get their act together—do something, not just talk about doing something.” **g**

Karen Hadden

From Austin Teacher to Global Activist

In her life, clean air activist Karen Hadden grew a big heart to cover a small world.

“I’ve lived in Germany, Hawaii and El Paso as an Army brat,” she says. “In Hawaii, the diversity of plant life is so astonishing. Then I studied native plants here (in Texas). I went to college in El Paso and Austin. I was already concerned with air quality in El Paso.”

“I got here (in Austin) in 1977. I was working at the Night Hawk (restaurant) and going to school. I’d walk home through the Capitol after a show at the Armadillo World Headquarters. I started following (environmental) issues locally and went to a few events. I started out in biology (getting a bachelor of arts degree in botany), then got a teaching certificate.”

By 1981 Hadden began teaching, mostly in AISD schools. She taught middle and high school for fourteen years. “The students were great, always. I felt real lucky to have the students I did. I learned a lot from it too. I taught, as best I could, dealing in the real world.”

Through those busy years of teaching, Hadden also started a family. “Garrett was born in 1985. We (Hadden and her then-husband) were together, I guess, until 1994.”

In her first intensive brush with government policy, Hadden worked for clean-up of toxic waste at the former Bergstrom Air Force Base. She says “I was on the Bergstrom Conversion Task Force (studying conversion of the former Air Force base into

Austin’s municipal airport). I was (also) on the board of the Austin Peace and Justice Coalition. There were a lot of underground plumes of jet fuel (at the Bergstrom site). It was an incredibly difficult time because the task force wouldn’t even look at the problem. They wouldn’t write even one word about environmental concerns in the final report.”

“When I was teaching, a lot of teachers were pretty conservative. There were people who knew about my involvement (in community issues) and were wary of it. The students had some great times, however. We brought a lot of speakers into the classroom. Kids were taking positions, debating on the nuclear issue. It was a wonderful experience.”

Then, “I got blacklisted. I had quit for a little while and then came back to work part time. During that time, I made the mistake of criticizing AISD for wanting to build schools on the aquifer. I felt they should be building schools in East Austin at that point in time, where better facilities were needed.” Hadden moved to El Paso for a while and continued to teach there.

While being blacklisted from teaching in Austin might have deterred some people from further pursuing such an outspoken path, Had-



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den pressed on. She got a job back in Austin with the Sustainable Energy and Economic Development (SEED) Coalition, a grass-roots lobbying group that works for alternative energy and clean air legislation. Peter Altman, who was the executive director, put her to work on mercury as an air-pollution issue.

At the time there was little public interest in mercury impacts on human health. Hadden was surprised to learn that the EPA rates mercury as the most hazardous pollutant emitted by coal plants. Six hundred thousand infants each year are at risk from high mercury blood levels. Even low levels of exposure can cause lifelong developmental disabilities. Hadden was able to convince the Texas Parks and Wildlife Department to post advisory warnings about mercury-contaminated fish for certain lakes and streams.

She later became executive director of the SEED Coalition after Altman moved on. She has tirelessly advocated ever since for clean energy sources and against polluting coal and nuclear plants.

Hadden opposes nuclear power as an answer to global warming. “We don’t need nuclear, which is deadly and dangerous.” She points out that radioactive waste has to be isolated from the environment for thousands of years and can be used to make nuclear weapons. Also, nuclear power plants make tempting terrorist targets. She believes energy efficiency and renewable energy are a better way forward.

SEED, along with Virtus Energy, helped found Solar Austin, a nonprofit advocacy group that wrested significant solar and renewable energy commitments from the Austin City Council. SEED rallied its six thousand members to pass bills in the last state legislative session that mandate greater ener-

gy efficiency in state government buildings.

Most recently, Hadden has rallied people across Texas against nineteen planned coal plants. “Back in October, we protested the governor’s executive order fast-tracking the coal plants and we followed the governor on the campaign trail to demand that he address this.” Major newspapers in Dallas, Waco and around the state editorialized against the actions of the governor and the utilities. The story received substantial and critical news coverage from the likes of *The Wall Street Journal* and *The New York Times*. Together with Public Citizen and other groups, Hadden crisscrossed the state, helping local people organize themselves to fight the coal plants. Four of these groups filed a successful lawsuit against Governor Rick Perry, which set aside the executive order.

Even though Texas is the largest emitter of carbon dioxide of any state, TXU Energy proposed eleven coal power plants that would more than double its carbon dioxide emissions to one hundred thirty-three million tons a year. Besides carbon dioxide (CO₂), mercury, soot, nitrogen oxide (NOx), and sulfur dioxide (SO₂) would foul the state’s air and imperil its citizens’ health.

However, struggle against the remaining coal plants continues. As the *Dallas Morning News* editorialized on May 14, “TXU still plans to build three plants that burn lignite, the filthiest type of coal.” Although she is not an attorney, Hadden represented SEED in hearings for seven of the coal plants. Recently, SEED fought unsuccessfully against Oak Grove, a lignite plant one hundred miles northeast of Austin. Now anti-coal forces are preparing appeals to this decision. Wherever the shifting line of battle over air quality falls, there you will find Karen Hadden. **g**

Cliff Braddock

Not Business as Usual

Dell Children’s Medical Center at the former Mueller Airport site is a high-profile project.

Less noticed, however, is this project’s approach to saving energy and reducing carbon emissions. The hospital’s success in minimizing energy use may soon be duplicated around the globe in other large institutional, office, retail and hospital projects.

Cliff Braddock of Austin Energy says that the Dell Children’s Hospital is so energy-efficient and such a model of sustainability that it is likely to get a Platinum Award for Leadership in Energy and Environmental Design, recognition given by the US Green Building Council to only the very greenest buildings in the United States.

The on-site power plant captures waste heat from the generator and uses it to run an absorption chiller for cooling. The recovered heat also supplies space heating in the winter and hot water year round. By combining different functions, a nearly unprecedented level of efficiency was achieved.

Fuel efficiency for the combined thermal and electric power plant easily exceeds the sixty percent threshold required for recognition

by the Environmental Protection Agency Energy Star program, and can at times approach eighty percent. This is far above the typical thirty-two percent for a centralized power plant. Compared to Austin Energy’s other power plants the on-site combined plant reduces carbon dioxide (CO₂) by forty percent. Other pollutants like sulfur dioxide (SO₂) and nitrogen oxide (NOx) are reduced by ninety-nine and ninety-eight percent, respectively.

In normal times, the on-site energy system feeds surplus energy to the city’s electric grid. The hospital needs to maintain mission-critical electricity and thermal energy even if regular power delivery becomes unreliable. To assure seamless delivery of healthcare services when regular power delivery is under duress, the on-site energy system will work in “island” mode. This approach for energy delivery for mission-critical facilities could be deployed for other situations that require



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AUSTIN ENERGY

high reliability. For instance, such combined heat and power plants could prevent factory outages that would otherwise cost hundreds of thousands or even millions of dollars.

Braddock says, "Dell Children's Hospital had a strong interest in doing something out of the box. I know that there are a few people in our city who say if you're still burning fossil fuels we don't want to have anything to do with you, but I'd remind those people

that you can't transition from a fossil-based system today to, in a short period of time, renewables. We need to crawl, and walk, then run as we evolve toward a renewable energy society. Then eventually we can transition. And I'm saying projects like the Children's Hospital are the transitional way to do this. Replication of such systems is a great gateway to the future while significantly reducing our carbon footprint." **g**

Bruce Melton

Tracking Polar Climate: Bruce's Excellent Adventure

Bruce Melton's approach to a huge, serious problem is to have huge, serious fun with it—and leap full-force into the unknown. "I want to be a climate superhero," he says in half-serious jest.

Melton is a civil engineer with twenty-five years experience in land development and environmental permitting. Some of his peers might focus on securing pending retirement or flailing around in mid-life crisis. But Melton is doing something entirely different. Diving headlong into extreme personal challenge—both physical and intellectual—he is preparing himself to "write the book" on climate change. And he is going to the ends of the earth to do it.

Why is he going above the Arctic Circle on his quest? "I've always been interested in weather and I'm deeply concerned about the future of the planet. I got the science background from working at LCRA (Lower Colorado River Authority). I've always enjoyed academics and science was great fun. I like understanding science, the big picture. I'm a big picture guy, you know. And there's nothing hardly in life except astronomy that's bigger than global climate."



PHOTO COURTESY
BRUCE MELTON

Melton started devouring academic papers about the topic in his spare time five years ago. He began writing a book on climate change himself about two and a half years ago.

"I'm writing for plain people, I'm writing for the masses, because that's the people that make things happen," he says. "Scientists don't use extreme language in general. They are always measured in their language... When you read these statements in academic papers in the journal *Science* and you see a scientist saying 'extreme' and 'never before encountered' it gets your attention. It's foreign in that kind of an article. So I know it's important. I know it's bigger than the media portrays and our leaders portray and the only way to do something about that is to kick some asses and back it up.

"That's why I'm writing a book for everyday people and trying to use language that is not academic."

Especially important to Melton's understanding of the climate issue was an article by Naomi Oreskes, PhD, professor of history and science studies at the University of California, San Diego. According to Melton, "She looked at almost a thousand papers between 1993 and 2004 that had the words 'global climate change' in their title or their text, and she found zero percent of these papers supported the viewpoint that climate change is not caused by man... This is virtually every scientific paper written in the last decade. Rarely have I seen such unanimity as one hundred percent."

Melton's research method is not simply to sit back in his study and read, however. "Coming out of college (Texas A&M University) I had to do hands-on stuff to really be an engineer. That's why I'm going

to the arctic. I've put in my time, I feel like I've got enough education to be knowledgeable on climatology. Now I need to go where it's happening to do the deed. I'm going to hang out with the scientists at those places on this planet where the climate is changing the most rapidly, which is at the poles... I'm going to go up there and witness this firsthand. To be a real climate authority, I've got to have both book learning and practical knowledge."

Melton's first stop is the Greenland ice cap this summer. "There's two thousand foot thick ice there. Some of those blizzards are twenty-below (zero) events. If I can get to the top of the Greenland ice cap, I'm very likely to see above-freezing temperatures (happening) for the first time in three million years.

"The other things I'm going to do are go to Alaska in September and look at permafrost. (In) the arctic taiga, the northern forest—which is where the vast majority of timber is on the planet—there's been an increase in 'drunken forest' because of permafrost melt. The root systems aren't supported by solid ice any more. They start tilting and... because the melt is nonuniform, the trees tilt in different directions. That's why it's called a drunken forest, because the trees are all tilting this way and that."

Documenting glacial retreat is another reason Melton wants to go to Alaska. A series of paired photographs shot over decades by the National Snow and Ice Data Center, based in Boulder, Colorado, dramatically establish a consistent retreat of glaciers across the earth. Melton declares, "I'm going to get a kayak and see it for myself. I'm going to camp out at the foot of a glacier for a week, have a kayak, bring my camera and sound



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recording equipment to record the glacier's noises."

Another climate change-fueled phenomenon that Melton hopes to witness up close is the decimation of northern forests by insect pests. "The last thing I'm going to look at is the Pine Bark Beetle outbreaks. PBB is a pest that infests weak pine trees, basically, pines, firs and spruces. Today the warm climate in the northern environments has led to outbreaks of PBB. Historically, outbreaks of PBB are very well correlated with warmer temperatures. Two or three weeks of thirty-below-zero temperatures kills all the Pine Bark Beetles. So that kind of cold means the severity of the environment acts to control the pine beetle in areas that are susceptible to them. So now we're seeing the largest PBB infestation ever recorded. Which has led to some of the largest fire outbreaks ever

recorded—which will only get worse as the Pine Bark Beetle infestation increases."

Melton intends to sound an alarm in as many compelling ways as he can. "We just need more people than Al Gore out there saying this. My presentation will be more of an academic book with a few more pictures, an academic book written in a more popular style. It will be not as simple as the *Complete Idiot's Guide*, but it will have more pictures." Eventually, he would like to take his show on the road with lectures, multimedia presentations, and even television appearances if possible.

Contrary to most climate models, Bruce Melton does not believe the planet will continue to warm in linear fashion. Instead, he believes there will be an abrupt reversal of trends, towards a drastic cooling. "I believe the climate will flip fairly soon—in one or

two decades. All of the trends are warmer (right now). None of the computer models show a flip. The great paradox is that all of the historic records show that when you get to the level we are now, they all flip."

He further explains, "In the last three million years, there have been forty to fifty abrupt climate changes, cycles where you go from warm to cold and back to warm. These cycles have all happened about the same time—about the time carbon dioxide (and methane) gets as high as it is, temperature gets as high as it is, and they all are rising as rapidly as they are rising (now). It's as warm as it's ever been in three million years."

He postulates that the Gulf Stream, an ocean current that carries heated water up from the tropics to the poles, is the mechanism that trips the "flip." Right now, water warmed at the equator rises up from the

bottom of the sea and moves north to the poles, because hot water flows to cold. As the ocean surface current moves north, evaporation causes the sea water to get steadily more salty. This extra briny water eventually sinks due to its higher density and cooling temperatures somewhere near Greenland, and then circulates back to the equator as a colder "return" current in the deep ocean. At the tropics, the cold deep water warms and rises towards the surface, repeating the whole cycle over again.

Melton says, "That (ocean) conveyor belt circulates heat and salt. Because of ice melt at the poles and Greenland, it isn't so salty anymore because of the input of fresh water." He believes this sudden freshening up of the far North Atlantic may stall the Gulf Stream mechanism, plunging the northern hemisphere into another glacial "ice age" period. His hypothesis explains the past pattern of abrupt change, as well as serving for a prediction of what may happen in the near future.

In spite of the grim prognosis, Melton is upbeat. "In February I spent three weeks camping in the Rockies in training for winter camping. This is a pastime, as well as a future vocation. I wouldn't be into this kind of thing if I didn't enjoy it. I really enjoy the weather, being outdoors in extreme weather, and winter camping, you don't get much more extreme than that."

Reflecting on the human condition, Melton says, "If we don't significantly alter our ecological footprint our kids, maybe even us, aren't going to be able to enjoy our current level of comfort on this planet. One of the most astounding things you see scientists saying today is that climate change used to be a problem for our future generations.

"What used to happen over hundreds of thousands of years time scale is happening in our lifetimes." g

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Mike Sloan

Austin Entrepreneurs Chase the Wind

Texas, the land of the carbon cowboys, seems an unlikely spot for a clean energy renaissance.

However, according to many knowledgeable authorities, our Lone Star State could become a Saudi Arabia of wind power. Mike Sloan, head of an Austin-based consulting firm, Virtus Energy, says “We’re doing a lot more in this area of the country than anywhere else in the United States for wind development.”

This didn’t happen accidentally or overnight. Nor was it an inevitable outcome, even given the potentially large size of the wind power resource in Texas. No, the recent rapid growth in wind power in the state has occurred because of conscious, determined, and smart advocacy efforts. Sloan is one of the prime movers who paved the way for current rapid growth in wind power generation by favorably influencing state policy.

Sloan, a mechanical engineering graduate of the University of Texas, worked for twenty years at Austin Energy, the city-owned electric utility. He’s worked since 1988 in a variety of small business, trade association and governmental bodies to promote renewable energy in Texas.

In 1999, the Texas Legislature mandated that the state’s private electric utilities buy or develop a minimum amount of renewable energy. The Renewable Portfolio Standard, or RPS, was seen as a small part of a very large electric restructuring bill designed to revolutionize the Texas utility industry.

Beginning with the private utility mandates and public power programs like Austin Energy’s GreenChoice, fledgling wind power efforts sprouted and grew. Wind turbines came to generate some of the lowest cost electricity in the state, particularly after natural gas prices nearly doubled between 1999 and 2005.

In 2006, more than one billion dollars worth of wind generators were added, a thirty-eight percent increase in wind power in a single year. The addition of nearly eight hundred megawatts made Texas the leading wind power state, vaulting ahead of California.

Still, there’s a long way to go before either wind or solar becomes a dominant part of the power mix. Currently renewables provide only about one and a half percent of Texas electric generation, although they are extremely fast growing segments at the moment.

Today, Virtus Energy manages The Wind Coalition, a nonprofit industry trade group promoting policies giving wind generators in the Southwestern United States greater access to electricity customers.

While this fuel cost advantage over natural gas proved fortuitous, there are additional economic advantages for wind power. Compared to the construction cost of a new coal plant, wind comes in cheaper—two and a half million dollars per megawatt for coal versus one and a half million dollars for



PHOTO BY BARTON WILDER
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wind. Both coal and nuclear electric plants also have longer lead times than wind plants.

The Electric Reliability Council of Texas (ERCOT), manager of the electric grid that supplies eighty-five percent of Texas electricity, studied the impact of wind power. ERCOT identified more than one hundred thirty thousand megawatts of high-quality wind sites in Texas—more than twice the amount of electricity consumed within ERCOT last year.

The generation sites themselves are mostly located in remote windy West Texas and the Panhandle regional. Development of six hundred fifty megawatts of wind power offshore of the Texas Gulf Coast is proposed as well. Denmark and Germany are precedents for Texas here. European nations currently generate nearly nine hundred megawatts of their electric power from offshore wind farms.

While there are now strong environmental and economic incentives to construct more wind generation in the state, a significant barrier to growth is the lack of transmission lines to the remote parts of the state where the best wind prospects can be found. Sloan says, “Wind can be up in a year and a half, but it can take new transmission lines five years to be built.” The Public Utility Commission is currently considering the designation of priority locations for new transmission lines to be built to avoid duplication and unnecessary costs.

There are no good wind sites within a hundred miles of Austin. Nevertheless, a lot of the business side of the action is right here in Austin. Sloan ticks off some of the recent start-ups and deals.

“Green Mountain Energy is probably the leading green power marketer in the country. They started in Vermont, but moved their national headquarters here. Airtricity is the largest global wind power company in the world out of Ireland, but they recently opened a southwest regional headquarters in Austin. They intend to invest three billion dollars in wind farms in Texas over the next ten years. Renewable Energy Systems (based in the United Kingdom), they’ve been here a while. They mainly construct wind farms, but they also develop new sites. Tierra (Energy), a wind developer, was just purchased by a large electric utility based in North Carolina, Duke Energy. Horizon (Wind Energy) was bought by Goldman Sachs (in 2005) for a little less than a billion, who then sold them to a Portuguese company for about two-point-two billion dollars.” In addition, Austin-based Cielo Wind Power has completed more than eight hundred megawatts of Wind Projects in Texas and New Mexico.

Sloan speaks of Austin’s unique positioning to assist wind power nationally. ERCOT

is legally and physically detached from the rest of the country’s grid, which has certain advantages according to Sloan. “The State Legislature is here, the Public Utility Commission and ERCOT. That’s unique in the

country—Texas is the only state that has its own power grid that’s not subject to federal regulation. So you can do things a lot faster here on electric policy than you can anywhere else in the country.” **g**

Susan Hovorka

UT Geologists Rebury the ‘Dead Dinosaurs’

Through decades of research, University of Texas geologists labored to extract fossil fuels from the earth. Now, they are partially trying to put the genie back into the ground. Research scientist Susan Hovorka, PhD, is among their ranks.

Scientists at UT’s Gulf Coast Carbon Center and Bureau of Economic Geology are experimenting with “carbon capture and sequestration.” The goal is to, first, corral the carbon dioxide (CO₂) that would otherwise escape in exhaust from coal and gas-fired electric power plants. Then, once the CO₂ gets captured, the idea is to permanently bury the climate-wrecking gas deep underground. One irony is that among the best candidate geologic formations for this purpose are depleted oil and gas fields in Texas.

Hovorka says, “We are injecting CO₂ (into the ground) in the Frio formation, which occurs all the way up and down the Texas coast. UT alumni happen to own the wells and allowed us to them to use them for the experiment.”

Hovorka notes that carbon dioxide injections are nothing new. Injection is a common technique used to increase production in older oil fields. She says, “It’s been going on for thirty-

four years in West Texas, but all of the data collection is centered on how effective it is for enhanced oil and gas production. We want to make sure that the CO₂ is staying down so that we can get the benefit to the atmosphere.”

Hovorka believes the potential for a catastrophic or hazardous release is minimal to nonexistent. “I’m willing to accept some risk, a low probability of an unfortunate event happening, for the really one hundred percent probability of otherwise suffering the effects of global warming. I like the risk of the underground injection. It looks good so far.”

She notes that the Intergovernmental Panel on Climate Change’s special report contemplates capturing and sequestering perhaps half the fossil fuel emissions in the coming decades. Depleted oil and gas fields or similar formations in Texas are a good location for this type of facility. “If Texas wanted it, we could be number one in carbon sequestration. It has the resources.” **g**



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Honor Roll

Lest we forget, there are other seminal figures who are making Austin part of the global climate solution. “Heroes of Climate Change” focuses on lesser known Austinites in academia and the private sector who labor for change—unsung heroes, if you will. But there are other “heroes”—more prominent or government employed—who deserve accolades too.

Of course, leading the pack is Austin Mayor Will Wynn, for his leadership on the Austin Climate Protection Plan (covered in the June edition).

Roger Duncan of Austin Energy helped launch many efforts for green power, rebates for energy efficiency, and a national program to create a market for plug-in hybrid vehicles.

Pliny Fisk and Gail Vittori are internationally renowned pioneer innovators in the green building movement with the Center for Maximum Potential Building.

Paul Robbins, often cited in this publication, is a researcher and advocate for a green future. He publishes the *Austin Environmental Directory*.

Shudde Fath has given thirty years of dedicated service to Austin electric ratepayers as a volunteer member of the city’s Electric Utility Commission.

The Clean Energy Incubator helps young clean energy companies succeed.

We should also recognize US Representative Lloyd Doggett (D-Austin) for introducing legislation that would provide tax credits of four thousand to six thousand dollars for buyers of plug-in electric vehicles. The legislation, incorporated into a bill to encourage conservation and use of renewable energy, was recently approved by the House Ways and Means Committee.

We’ve covered these folks before in *The Good Life*, and we will again.

—Steve Beers

Tom Romberg

Using the Earth Keeps Austin Schools Cool

It took an “old school” air conditioning business to introduce a revolutionary new energy-saving technology to schools across Austin.

Tom Romberg, president of Action Mechanical Services Inc. of Austin, says, “I’ve been in the AC business for thirty-five years. Throughout my history, I’ve been looking for higher efficiency. So when someone comes out with a new product, then I look into it. So when I noticed an advertisement somewhere about geothermal and it was supposedly very high efficiency, I investigated it, got involved with it, and did my first (installation) seventeen years ago in Spicewood, Texas, and I’ve been doing them ever since. My colleagues, there’s two or three of them in town that do this, but in general it’s an ‘I don’t understand it’ problem.”

Romberg estimates his company has installed more than one hundred and seventy-five geothermal systems in Central Texas. According to the company’s web site, “AISD has converted or built over sixty schools using the GeoExchange System and has more than six thousand loops in the ground.”

Unlike other geothermal systems, this one does not tap into underground steam or geysers to drive electrical generation turbines. This system does not generate electricity. It is strictly for climate control, to provide heating or air conditioning.

Water is pumped into the earth, which stays a relatively constant temperature a few feet below the surface—about sixty-eight degrees, “the same temperature as Barton Springs.” The GeoExchange system transfers heat to and from the earth. A hole is bored into the ground two hundred to two hundred fifty feet deep. Water is circulated through a loop, exchanging heat from the earth to the inside of the building in the winter, and from the building into the earth in the summer.

According to the 2006 *Austin Environmental Directory*, such a ground-coupled geothermal heat pump is “similar to conventional air-source heat pumps, which move heat from the air to heat or cool a building; geothermal heat pumps move hot or cold temperatures through plastic pipes buried in the earth or submerged under bodies of water such as lakes or ponds.”

The geothermal heat pump provides

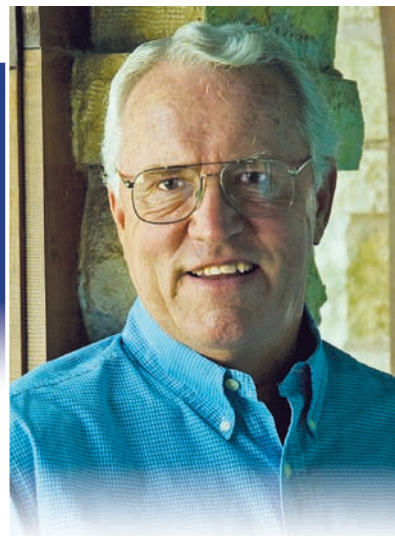


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CUSTOM IMAGES

significant savings in energy and money. Romberg says, “Typical air-to-air heat exchange, you’d spend fourteen hundred dollars a year (on electricity) and with GeoExchange, seven hundred dollars. It’s a lower carbon footprint and a safer product because you’re not burning a fuel and you don’t have anything as hot as auxiliary heat. You have less maintenance to deal with because you typically don’t have anything (like compressors sitting) outside at all.”

The *Environmental Directory* says “Public schools in North Central Texas have experienced monetary savings on energy bills of as much as sixty-two percent compared to schools with conventional HVAC (heating, ventilating and air conditioning).”

One difficulty is that, while there is a lower operating cost, there is more upfront cost to install a system. Romberg says, “Most of the air conditioning contractors (are reluctant to use the systems), since the system costs more money that makes their bid higher and all contractors are allergic to higher bids, because they think they’ll get a ‘no.’” Nevertheless, the life-cycle costs should provide a five-year payback from the savings due to installing the system, and equipment is thought to last twenty years or more. If this first cost remains a significant barrier to greater use of these systems, utility rebates or government tax breaks may help remove some of this disincentive to use the technology.

Besides this small-scale use of geothermal for building climate control, a recent study by Massachusetts Institute of Technology researchers says geothermal electric power plants could economically supply one hundred and thirty times the annual consumption of energy in the United States. Again, this is not drilling to tap into a geyser hot water source. Rather, the technology involves pumping water into the earth under pressure into hot rock formations, and then using the resulting steam to drive a turbine and generate electric power. While some areas are better than others, this source of power is potentially universal if one drills deeply enough to tap into hotter rocks. **g**

Bee Moorhead

Acting on Faith

According to the Biblical Book of Genesis, on the seventh day, God took His rest, calling His work “good.” In granting humans “dominion” over the earth with the injunction to “be fruitful and multiply,” He also put man into the Garden of Eden “to dress and to keep it.”

Bee Moorhead is finding that Texans of all faiths are taking seriously their obligation to care for God’s creation by acting on climate change. According to its web site, “Texas Interfaith Power and Light (TXIPL) is a nonprofit religious education project that helps congregations of all faiths in Texas take action to reduce global warming and air pollution through energy conservation and renewable energy strategies...TXIPL is Texas’ only statewide, interfaith environmental organization with formal ties to the state’s Christian, Jewish and Muslim denominational bodies.” TXIPL is a project of the Texas Impact Education Fund and part of a national network of congregations united to act on climate change.

Moorhead says, “I have lived in Austin for twenty-five years. I’ve been (executive) director of the (Texas Impact) organization for seven years. Before that, I worked for John Sharp in the (state) comptroller’s office. The organization is interfaith. I’m an elder in the Presbyterian church. By interfaith, we mean broadly including all the Abrahamic traditions, including the Muslim, Christian and Jewish.”

TXIPL is taking action, great and small, in support of “creation care.” In the legislative session that ended in May, the organization fought against the proposed coal plants and in favor of energy conservation legislation. Moorhead says Austin congregations are coming together in support of Austin Mayor Will Wynn’s climate initiative. “We have congregations as well as individuals that have formed a partnership to make sure every congregation in Austin participates in this effort. What we want to do is make sure climate protection does not become a boutique issue. We want to make sure that in caring for creation, we are involving all of God’s children, not just the ones that live west of I-35.”

The group wants to make sure that



PHOTO BY BARTON WILDER
CUSTOM IMAGES

“low-income housing rehabilitation projects are done in a carbon-conscious way.” On Earth Day, TXIPL helped distribute a thousand compact fluorescent light bulbs through food pantries, with the aim of both reducing carbon emissions and saving low-income families money. TXIPL also will be “promoting a variety of energy efficiency initiatives the Texas Legislature has just passed, including a new incentive for low- and middle-income families to buy energy efficient appliances.”

Moorhead says, “We are totally ecumenical—we have people that are Catholic, evangelical, orthodox Jews, Muslims with and without head scarves. It’s very broadly interfaith. Every faith tradition I’m aware of has in it a thread of an understanding that whatever we think of God and how we’re supposed to relate to each other, this always involves how we’re supposed to relate to the rest of creation.

“There’s a story that Martin Luther preached a sermon about the end of the world and later that afternoon his congregation found him in the garden planting a tree. They said, ‘If you think the end of the world is coming so quickly what are you doing out here planting a tree?’ And he said, ‘I’m doing what I think God would want me to do at the end of the world.’

“It’s probably none of your business whether it’s the end of the world or not. You’re just supposed to be following the instructions and the instructions are: you’re supposed to be taking care of all of it and love all of it, like God does.” **g**

Steve Beers says his personal plan to combat global warming is to go someplace cooler for the summer. You may e-mail Steve at sbeers@goodlifemag.com.

Resources

For additional resources, see this story on our web site, www.goodlifemag.com.

Climate Contrarians Wage 'Info-Wars'

As reported last month, the leading international network of climate scientists—the Intergovernmental Panel on Climate Change (IPCC)—on February 2 released a report that states the evidence of global warming is “unequivocal.” The report also says that human activities were “very likely” causing the warming trend through emissions of heat trapping gases like carbon dioxide, methane, nitrous oxide and water vapor. The report reflects the consensus opinion of hundreds of climate experts, and effectively closes scientific debate on human-caused climate change.

It is important to note that the scientific delegations in the IPCC followed very conservative methods to arrive at consensus. They consulted with twenty-five hundred scientists worldwide who had to agree on all the contents of the chapters before publication.

In spite of the alarmed tone of much of the report's conclusions, many participants nonetheless criticized the United States, Saudi Arabia and China's delegations for trying to soften the report's conclusions to minimize the threat of climate change.

Journalist Ross Gelbspan detailed in his book, *The Heat is On: The Climate Crisis, The Cover-up, The Prescription*, how large corporations led by Exxon secretly funded a handful of scientists to deliberately attack the mainstream climate consensus. This was a conscious public relations strategy, outlined in several memos, to delay climate regulation. The press dutifully reported for most of two decades that the state of knowledge was “uncertain.” In 2005 the Bush Administration in turn cited these “experts” as a reason to withdraw from the Kyoto Protocol that would limit carbon emissions below 1990 levels.

Climate contrarians with scientific credentials are notably fewer and quieter now than they used to be. The scientific equivalent of anecdotal evidence has now solidified into multiple verifiable trend lines. Despite the seeming avalanche of recent reports and evidence, some influential people, usually non-scientists, still question whether there really is a greenhouse effect after all.

Who are these “denialists”?

Many grass-roots conservatives and most congressional Republicans attack the climate science. Chief among them is US Senator James Inhofe (R-Oklahoma), who has branded global warming as the “greatest hoax ever perpetrated on the American people.”

However, facts of physics and chemistry are neither liberal nor conservative. President Bush, Senator John McCain (R-Arizona), even ex-congressman Newt Gingrich (R-Georgia), conservatives all, now admit the existence of this problem and say something should be done about it. McCain told journalist Elizabeth Kolbert, author of *Field Notes from a Catastrophe: Man, Nature, and Climate Change*, “We are a country that emits nearly twenty-five percent of the world's greenhouse gases. How much damage will have been done before we act?”

Some oppose all effective action because they know it must be global action. One unidentified student wearing a T-shirt saying “9-11 was an inside job” appeared at an Austin event where US Senator John Kerry (D-Massachusetts) and Teresa Heinz Kerry spoke at BookPeople on April 22. This young man told me, “Global warming is the least of our problems compared to global government and a global tax. A carbon tax is the first step to a global tax.”

In a special September 2006 issue of *Sci-*

entific American titled “Energy's Future: Beyond Carbon,” Gary Stix wrote the article, “A Climate Repair Manual.” He stated: “The slim hope for keeping atmospheric carbon below five hundred parts per million hinges on aggressive programs of energy efficiency instituted by national governments. To go beyond what climate specialists call the ‘business as usual’ scenario, the United States must follow Europe and even some of its own state governments in instituting new policies that affix a price on carbon.”

Substantial international cooperation in fact happens all the time, on matters great and small, without world government. Global commerce, travel and conflict management are ongoing and constant—much of it not organized through the United Nations or any other international institution, sinister or benign.

Sovereign states and their peoples cooperate because it is to their mutual benefit. They do not have to be coerced. There is no reason to think the richest nation on earth won't be able to guard its legitimate interests without giving up sovereignty, so long as it truly wants to work with others to solve this global problem.

Radio conspiracist Alex Jones claims global warming is “junk science.” It is tempting to dismiss all such anti-science opinions as being equivalent to crackpot “flat earth” theories. Perhaps gravity was an oppressive theory invented by the Illuminati to “keep us down.”

However absurd such objections may seem at first blush, they meld with more mainstream suspicions that global warming is just a convenient excuse for higher taxes and more intrusive government. Legitimate concerns over despotic or inefficient government could unfortunately block the effective international cooperation needed.

Scientist Tim Flannery, author of the non-fiction book *The Weather Makers: How Man is Changing the Climate and What It Means for Life on Earth*, envisions a possible global “Earth Commission for Thermostatic Control,” empowered with far-reaching dictatorial authority over intimate details of economic activity and human reproduction. His scenario is spun out of the nasty potential for war, trauma and disruption represented by the fallout from a worsening future climate crisis.

Flannery argues that it is better to avoid this fate by selective cooperation now among the great international powers, led by the United States. He draws an analogy with revolutionary-era Americans, who chose to create a central government, ceding some freedom and prerogatives away from the states to stay independent of the British Crown. “The only way to avoid both tyranny and destruction is to act as America's Founding Fathers did, by swiftly heeding the call to action and by ceding just enough power to a higher authority to combat the threat. And this will be effective only if we act now, before the crisis becomes full blown.”

A recent authoritative British government study, the Stern Review on the economics of climate change, estimates investment of one percent of global economic output per year is needed to avoid the worst impacts of global warming. The Stern Review also notes that the cost of *not* dealing with the problem is almost certain to exceed the costs of acting to limit greenhouse gas emissions.

Efforts to combat global warming could be likened to buying a relatively cheap insurance policy. The house might never burn down, but a prudent homeowner keeps coverage nonetheless. And if house *does* get torched, you can

be glad the loss is mitigated.

Even without considering global warming, there are plenty of other very good reasons to reduce fossil fuel combustion. Between gasoline price shocks, trade deficits, oil spills, cancer clusters, strip-mined mountains and ruined rivers, Middle East wars and terrorism, it is obvious that reliance on oil and coal already causes numerous costly problems. Even relatively clean-burning natural gas faces cost and safety issues (with liquified natural gas imports). Cutting fossil fuel use to counter global warming, by contrast, would be an insurance policy that actually pays dividends.

Is it too late?

There are denialists, and then there's nihilists. These opinion extremists don't bother to deny that global climate change is happening. They merely say that it's too late to do anything about it. Indeed, there is some scientific support for this stance. The most optimistic projections claim more than three degrees Fahrenheit increase is now inevitable. Given lag times in the response from the climate system, even if all greenhouse gas emissions stopped tomorrow, over thirty years we would still see a continued warming before it leveled off.

Nevertheless, activated scientists and policymakers believe meaningful action to limit climate damage is both possible and necessary. There are grave concerns that the situation could rapidly spin out of control—beyond even the anticipated consequences of the few degrees of warming predicted by the computer models. They point to unquantifiable threats from “positive feedbacks” to the climate system. These are possible natural responses to the warming that would wind up further amplifying and speeding up the warming trend in progress.

One example of already occurring feedback is the melting of frozen tundra in Siberia and Canada. Billions of tons of frozen methane and carbon dioxide—fully one-third of the Earth's stored soil carbon—turns to gas when the tundra warms up. When arctic temperatures increased by more than four degrees, this process began.

For a different example, intact ice sheets have reflectiveness, or *albedo* (Latin for white), where eighty percent of the sunlight bounces back into space. Open seawater's *albedo* is only five or ten percent. So, the warmer conditions that cause ice melt beget even more melting and warming in a vicious cycle.

With the resulting sea level rises, coastal estuaries and low-lying farmland will be flooded, causing yet more feedback. The decomposition of submerged vegetation releases methane. And methane as a greenhouse gas is twenty-three times more potent by volume than CO₂.

Yet another feedback mechanism is the evaporation of water. The capacity of air to hold water depends on temperature. More humid warm air in turn traps even more heat, with its own greenhouse effect. At the same time, drought has caused truly gigantic fires as rainforests in Southeast Asia and Latin America burn millions of acres annually. The release of stored carbon represented by this torched rainforest area represents a further acceleration of global warming trends.

Perhaps the most terrifying potential feedback process of all involves the melting of methane hydrates at the bottom of the ocean. At these great depths, pressurized frozen methane exists locked in a crystalline, ice-like atomic structure. There's ten trillion tons of frozen methane down there, with twice the warm-

ing potential of the world's entire fossil fuel reserves. A wild card possibility is that sufficient warming of the deep ocean could trigger a sudden catastrophic eruption of these gases.

It is mainly to avoid these possibilities of runaway greenhouse effects—positive feedbacks making the warming impossible to slow, halt, or reverse—that humanity must take action. It's also possible that negative feedbacks—responses that dampen rather than amplify the warming affect—could kick in as well. To some extent more water vapor, while counting in some measure as a positive feedback, may also lead to more cloud formation. More clouds can dampen the warming effect by increasing sunlight reflection or *albedo*.

While negative feedback seems the more likely of the two possibilities, that is not without risk either. The record of past climate change shows the usual onset of ice ages to be sudden, rapid and drastic. The change tends to occur over only a few decades. The climate cooling reaction is thought by paleoclimatologists to be more like a light switch thrown on or off, rather than a rheostat that is gradually turned up or down.

The trigger for new ice ages is thought to be freshwater ice melting in the northern latitudes during the warming phase. A large melt of freshwater ice from the warming dilutes cold salt water in the North Atlantic, stopping it from sinking to the bottom of the ocean.

Right now, that deep water circulation flows south to the equator, warms up there, rises to the surface, and then returns north as the warm Gulf Stream waters. The circulation of this “thermal conveyor belt” could be disrupted by the addition of the arctic ice melt. Additional negative feedback would happen if the now regionally colder Northern Europe and/or the arctic area began to freeze over with ice once the Gulf Stream stopped. Then the *albedo* effect would kick in, causing more cooling, even more spreading of ice cover, leading to still more cooling and freezing.

In this model, therefore, the consequences of the massive ice melt eventually act as the “circuit breaker” to halt the warming effect. So, while humans affected the trajectory of this climate period, the larger pattern of natural oscillation between ice ages and warmer periods will return. The normal pattern will assert itself again.

But it's entirely unknown whether this comparatively rosier scenario will in fact happen, or whether the human-caused climate forcing will instead propel us into higher carbon dioxide and warmer temperature regimes never witnessed before. The scarier of the two feedback possibilities would see the earth becoming more like planet Venus, with its ninety-seven percent carbon dioxide atmosphere and nine hundred degree surface temperatures. Some scientists even conjecture that the atmosphere could boil away if it got hot enough.

We tend to admire and even worship science when it gives us the techno-goodies—computers, cars, airplanes—but blithely ignore it when it tells us we must exercise self-restraint and humility.

The all too human reaction to bad news would be a shrug of the shoulders—“What can you do?” That would be tragic, because there are many prudent steps available that can make a difference to hold global warming under the threshold that the experts say could trigger truly dire consequences. But will we listen to them and take action?

—Steve Beers

Resources

For more background on the persons and institutions profiled, and other heroes of climate change, see the following.

We can be heroes

Go to www.safeclimate.net/calculator or www.climatecrisis.net/takeaction/carboncalculator to calculate your personal carbon footprint. Then visit www.climatecrisis.net/takeaction/whatyoucando for personal actions you can take to reduce your impact.

A good, although somewhat dated book is *Stormy Weather: 101 Solutions to Global Climate Change* by Guy Dauncey with Patrick Mazza, published in 2001. It can be ordered for \$22.95 at www.newsociety.com.

Species and climate change

(Camille Parmesan)

See www.utexas.edu/research/profiles/parmesan.html and links to related web pages.

Parmesan's major scientific papers: "Climate and species' range," on Edith's Checkerspot Butterfly in *Nature* August 29, 1996. The article can be purchased for \$30 at www.nature.com/nature/journal/v382/n6594/pdf/382765a0.pdf.

"Poleward shifts in geographical ranges of butterfly species associated with regional warming," with several coauthors, in *Nature* June 10, 1999. This reviews the record of European butterfly observations. Article abstract can be seen at www.nature.com/nature/journal/v399/n6736/abs/399579a0.html.

"Summary for Policymakers—Climate Change 2001: Impacts, Adaptation, and Vulnerability," IPCC, 2001. See www.biosci.utexas.edu/IB/faculty/parmesan/classes/WGII_spm.pdf.

"A globally coherent fingerprint of climate change impacts across natural systems," with coauthor Gary Yohe, *Nature*

January 2, 2003. www.nature.com/nature/journal/v421/n6918/abs/nature01286.html.

"Observed Impacts of Global Climate Change in the U.S.," with co-author Hector Galbraith. Prepared by the Pew Center on Global Climate Change, November 2004. www.pewclimate.org/global-warming-in-depth/all_reports/observedimpacts/index.cfm.

The Union of Concerned Scientists has a web page with many links and references on the topic of biological indicators of climate change. www.ucsusa.org/global_warming/science/early-warning-signs-of-global-warming-plant-and-animal-range-shifts.html.

Clean energy activism

(Karen Hadden)

See www.stopthecoalplant.org and www.seedcoalition.org for information on the struggle in Texas against new coal and nuclear plants and for renewable energy and energy efficiency alternatives.

For a recent review of the coal industry see the book *Big Coal: The Dirty Secret Behind America's Energy Future* (2006) by veteran journalist Jeff Goodell.

Energy efficiency and cogeneration projects

(Dell Children's Hospital)

For a review of the potential of combined heat and power cogeneration plants in Texas, see www.texaschpi.org. Also www.gulfcoastchp.org, www.eere.energy.gov/de, and www.austinenergy.com.

The 2006 *Austin Environmental Directory* provides much information on energy efficiency technologies for home and business at <http://environmentaldirectory.info/Austin>.

On the national level the Rocky Mountain Institute, led by energy guru Amory Lovins, has published many policy and technical papers on efficiency and

renewables. See www.rmi.org.

Polar climate science

(Bruce Melton)

See www.meltonengineering.com for draft chapters of Bruce's book, *Earth at Risk: Abrupt Climate Change*, 2006. While the profile covers his upcoming polar journeys, his research covers a wider range, including intensified hurricanes and other recent evidence of human-caused climate change.

The head of the American Association for the Advancement of Science, Alan Leshner, says "the poles are ideal places to study the effects of global climate change." See the March 16, 2007, special issue of *Science* magazine on polar science at www.sciencemag.org/content/vol315/issue5818/index.dtl.

Carbon sequestration projects

(Susan Hovorka)

A description of the University of Texas Bureau of Economic Geology research projects on carbon sequestration can be found at: www.beg.utexas.edu/envronqlty/co201.htm.

See also the on-line encyclopedia, www.wikipedia.org, for article entries on "carbon sequestration," "carbon capture and storage," and "carbon dioxide sink."

Geothermal power

(Tom Romberg)

See www.actionmech.biz/geo.html for an explanation of geothermal heat pumps, using Austin cost examples (albeit dated ones).

Paul Robbins published an article on geothermal heat pumps in his 2006 *Austin Environmental Directory* at <http://environmentaldirectory.info/PDFs/AustinThemePart3.pdf>. This reference includes contact information for several

geothermal contractors in the Austin area.

For more information on the Massachusetts Institute of Technology's survey of the nationwide potential to generate electricity from "hot rocks," see *Technology Review*, August 1, 2006; and *Scientific American*, April 2007.

Wind power

(Mike Sloan)

Visit www.windcoalition.org for a roundup of news, issues, and analysis in Texas and other states.

Austin Energy scored an unexpected success with wind in its GreenChoice program. See Lester R. Brown, "Wind Energy Demand Booming: Cost Dropping Below Conventional Sources Marks Key Milestone in U.S. Shift to Renewable Energy," at www.earth-policy.org/Updates/2006/Update52.htm.

Other Austin-based renewable energy projects

HelioVolt is an Austin-based startup company seeking capital for research and development of thin-film photovoltaic solar cells. Its story can be viewed at www.heliovolta.net.

The Clean Energy Incubator located in Austin is an academic, business, and governmental partnership launched in 2001 to help develop early stage clean energy companies. See www.cleanenergyincubator.org.

Creation care

(Bee Moorhead)

See <http://txipl.org> for the story of Texas Interfaith Power and Light and its religious interfaith efforts to address environmental concerns.

—Steve Beers