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The Texas Solar Energy Society (TXSES) was founded in 1976 and is a non-profit educational organization formed to increase the awareness of the potential of solar and other renewable energy applications and to promote the wise use of these sustainable and non-polluting resources.

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The SOLAR REFLECTOR

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SUMMER 2009

The SOLAR REFLECTOR

promoting the wise use of sustainable and non-polluting resources

The 10th Annual Renewable Energy Roundup 3-Day Fair with 3 speakers you don't want to miss.

Photo by Kiel Hemenway

On Friday, September 25th from 5:00–6:00 pm, Toby Hemenway, author of *Gaia's Garden*, will be a featured keynote speaker. Toby's talk is titled, "Eating the Planet or How Permaculture Can Save Humanity and the Earth, but not Civilization," and will explain what permaculture is and how it can help us to live sustainably.

Pulitzer-prize winning author Jared Diamond calls it the "worst mistake in the history of the human race." Founder of permaculture Bill Mollison says it can "destroy whole landscapes." Are they describing nuclear energy? Suburbia? Coal mining? No. They are talking about agriculture. It's not just that farming in its current industrial manifestation is destroying topsoil and biodiversity—agriculture in any form is inherently unsustainable. At its doorstep can also be laid our culture's split between people and nature, much disease and poor health, and the origins of class inequality and police states.

Those are big claims and this lecture will explore them, showing that new fuels and high technology are not the way out of the dilemma that agriculture has gotten us into. However, there are ways to live sustainably on the Earth without going back to the Stone Age. Many societies have lived in harmony with other species and yet have developed art, music, philosophy, medicine, and the other hallmarks of a rich culture. What many of them have in common looks like what today is known as permaculture, an ecological design approach based on knowledge gained from nature. Toby's lecture will show us what makes agriculture and the industrial society that relies on it, fundamentally unsustainable and how permaculture offers us a better way.

For more info see the Roundup ad on page 4

Saturday, September 26th, from 1:00–2:00 pm, will feature keynote speaker, Karl Rabago, Vice President of Distributed Energy Services at Austin Energy. Karl brings more than 15 years experience in guiding electricity policy and regulation, emerging energy markets development, and implementation of sustainability principles across a wide range of markets and sectors. In this talk, he will discuss the Net Energy Market and the role of utilities and consumers in the future.

The utility industry is rapidly moving toward integration of three new "smart" technology platforms: the "smart" grid, the "smart" home/building, and the "smart" car. With these dramatically new infrastructure platforms in place, the opportunity will arise for the emergence of a new kind of energy market—the Net Energy Market. The Net Energy Market is a market in which all customers are empowered and enabled to choose their appropriate mix of supply, demand, and energy management products and services to suit their budget and lifestyle. The utility, in turn, will take on the role of network integrator, reliability manager, and facilitator of a vast array of transactions and actions that will comprise a market of markets—the Net Energy Market.

Nothing is written in stone, but done right, the new Net Energy Market can be the realization of a cleaner, more efficient and more equitable energy services market. What is critical at this stage is our joining in support of a common vision of the future in which we want to live. One thing is certain, if we don't start thinking now about where we want to go with the future of electric utility services, the onslaught of new technologies, regulations, and market forces will cast our future for us. As we have learned from deregulation and some technological transformation events in the past, that might not be something that benefits all of us. Karl Rabago will lay out his vision of the opportunity of the Net Energy Market and what it will take to get us there.

The final keynote speaker will be Bob Dixson, the Mayor of Greensburg, Kansas who will present from noon to 1:00 pm on Sunday, September 27th. In this talk on "Pioneers of the 21st Century," you will hear the extraordinary story of how the town of Greensburg, Kansas came to be an example for sustainability and community commitment.

On the night of May 4th, 2007, Greensburg, Kansas was hit by a devastating EF5 tornado which leveled 95% of the town. In the wake of this terrible event, rather than leave their town, the brave residents chose to use this unique opportunity to rebuild a smarter, stronger, and sustainable community. As visionaries and new pioneers of the 21st century, the town has developed a Long Term Recovery Plan and a Sustainable Master Plan for the rebuilding of the community, with sustainability and green building practices as the cornerstones of these plans.

In the two years following the tornado, Greensburg is once again in the national spotlight, now with attention focused on its commitment to sustainable building, renewable energy generation and use. City resolutions, implemented by Mayor Dixson, have laid the groundwork to transfer the town to 100 % wind power and bring all government buildings to a LEED platinum standard. Greensburg now has four LEED (Leadership in Energy and Environmental Design) Platinum buildings with three more under construction. About 45% of the homes have been rebuilt and are 30–60% more energy efficient than building codes require. Despite challenges along the way, Greensburg continues to rebuild better, stronger, and greener. Greensburg has become a living laboratory for green building products and energy efficient design, as well as an inspiration for communities across the nation.

Laura Rice is owner of Success By Design and also the Roundup Coordinator for TXSES.

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Visit our web site for a calendar of events:
www.txses.org

Chairman's Corner

with John Gardner

Wow, the summer is half over! Time flies when the sun is shining. However, I am getting pretty tired of 103°F every day. The only advantage to all this heat is the wind has been blowing pretty steadily all summer at my house, near Houston. My wind turbine is normally a roost for the birds this time of the year.

The Cool House Tour was a tremendous success this year. The variety of homes was outstanding. The architects, builders and especially the homeowners deserve congratulations for showing us the path to greener pastures. The TXSES staff and all the volunteers made this the best year ever - thank you – and, thank you to Natalie and Lucy for their guiding light.

The economy seems to be showing small signs of improvement. There is a lot of activity in the solar industry. The interest in residential and commercial PV systems is more than I have ever seen before. The energy efficiency programs required by the Department of Energy and the Department of Defense have finally started to surface. These programs include weatherization, energy reduction and many solar PV systems. These projects affect thousands of installations around the country; many here in Texas. I hope all of our installation companies are getting some of this business.

For those of us closer to home, solar panel prices have never been lower. If you have been interested in putting a system on your home and it was just too expensive, check again. The panel price is the largest portion of the installed cost, so the economics certainly look better now than they did even a few months ago.

Don't forget these upcoming events! The annual RoundUp will be September 25th – 27th in Fredericksburg. Plan to attend the discussions and witness as the passion is instilled into the enthusiastic crowd.

The Houston and San Antonio Solar Tours are gaining steam (generated by the sun of course) and will be on October 3rd this year.

Have a sunny summer!

John Gardner is an energy-efficiency professional who's home is outfitted with a hybrid solar-PV and wind system.

A Glimpse at the Texas Solar Design and Installation Industry 2009

On the heels of the 2009 Texas legislative session, the Texas solar energy market exists in a state of flux and anticipation. Solar design and installation companies are operating in a highly dynamic business environment. These conditions are characterized in part by governmental policy wrangling, a patchwork of federal, state and local incentives, evolving solar technologies and prices, turf wars with trade unions, and a fledgling solar workforce.

As government tax and rebate incentives attempt to spur the industry, established solar installation companies are striving to adapt their business models to achieve a wise and profitable market position. This article presents perspectives on the current state of the industry by several well-established Texas solar design and installation companies.

Mark Rangel with Texas Solar Power Company (TXSPC) in Austin, is optimistic about solar in Texas. He points out that though most solar legislation failed to pass this session, it was the first time a statewide rebate plan had been considered. Based on how close legislation came to passing this year, he speculates that solar incentives may finally overcome political hurdles in the 2011 legislative session.

With several years of sustained growth, TXSPC has experienced an increase this year in larger scale (10kW+) residential solar installations. Rangel attributes the increase in part to Austin Energy raising the cap on residential solar rebates from $13,000 to $50,000.

When sustained solar business finally does accelerate on a wide scale, as most expect it will do, businesses will likely expand their operations. But with expansion comes new challenges. Rangel describes a large construction project recently underway that included a substantial solar component. Due to the economic down-turn, the project was halted midstream because of lack of continued bank credit. Had the solar installation company considering a contract for the project ramped up funding, equipment and labor, it would probably have found itself financially overextended.

The lesson, according to Rangel, is for a company to have a clear understanding of its resource capabilities and goals, and to gauge those carefully against a potentially lucrative opportunity. When a company does grow, it will probably find itself asking whether it should seek investors or go public. Though TXSPC has drawn the attention of potential investors, Rangel points out that they enjoy their current level of business and are not currently interested in relinquishing control of the company to outside influence.

Photo by Lighthouse Solar

In conjunction with typical installations, *Lighthouse Solar takes pride in creating spaces and welcomes challenges to discover and take advantage of opportunities that would otherwise go unnoticed.*

Another question solar companies may encounter is whether to diversify their services beyond PV. These include solar water heating, wind power, or providing energy audits as now mandated for homes older than 10 years in Austin Energy's territory. Other solar installation companies are shaping themselves to become what Quentin Keith of Lighthouse Solar in Austin refers to as full service renewable energy providers. Whereas other companies focus strictly on PV design and installation, Keith and Stan Pipkin at Lighthouse Solar have entered into business alliances with Green Zone Home, ATX Spray Foam, QLS HVAC, and the Lightbulb Shop. Through these collaborations, Lighthouse Solar plans to provide customers with comprehensive energy audit and consultation services. Before sizing the solar system, an energy audit of the residence or business will be conducted and recommendations for energy efficiency and conservation will be presented. According to Keith, the goal is to "tighten up the envelope" of the structure and then size the system. Theoretically, this will reduce the power requirement of the installation and save the customer money while helping reduce power plant emissions.

Photo by Meridian Solar

Meridian Solar was able to overcome a design and installation challenge *of building a system on a curved roof. The 24.5 kW installation was completed in April 2009 using Enphase micro inverters and Sharp Solar modules.*

Andrew McCalla, CEO of Meridian Solar, also in Austin, maintains a steady focus solely on the design and installation of distributed solar photovoltaic (PV) systems. A man clearly on a mission, McCalla enjoys the solar energy business as Meridian is about to celebrate 10 years in the industry. McCalla believes that existing federal, state and local incentives will continue to fuel steady growth for the company in the coming years. Highlighting these incentives, McCalla states that Meridian is preparing to launch federal stimulus—funded solar projects.

Photo by Jody Horton

Pearl Brewery has one of the largest solar installations in Texas *with a system power rating of 200 kW. Pearl Brewery use to be a distribution center which has been converted to a mix use green building. The system was completed by Meridian in December 2008.*

Contributing further to McCalla's optimism is the passage of Texas House Bill 1937, based on the "Berkeley, CA." and "Boulder, CO" renewable energy financing plans. This new Texas law authorizes municipalities to set up financing districts for customers who install solar, other renewables, and implement efficiency measures. Lending programs will allow customers to avoid the high up-front costs by paying for the systems over time through their property taxes. David Power at Public Citizen of Texas is developing a statewide municipal awareness campaign to promote this program.

Still, like most in the Texas solar industry, McCalla was disappointed in the failure of the legislature to pass statewide solar incentives. "Texas can either be a leader or a laggard in the solar industry, and with this past session the legislature chose to be a laggard," states McCalla. Still, he believes the growth of the Texas solar industry is secure. Traditional utility rates will continue to rise, regional incentives and rebates are proliferating statewide, the 30% federal tax incentive extends for eight years, and public awareness of global environmental issues continues to grow. With revenues expected to double this year over last, and with expansion of Meridian's staff, "It's an exciting time in the industry," says McCalla.

All three company representatives interviewed for this article radiated an enthusiasm for their field of work. They each spoke of the personal and professional enjoyment they experience working with forward-thinking customers and co-workers. They are clearly proud to be contributing to what they believe will be a better world by distributing clean technologies.

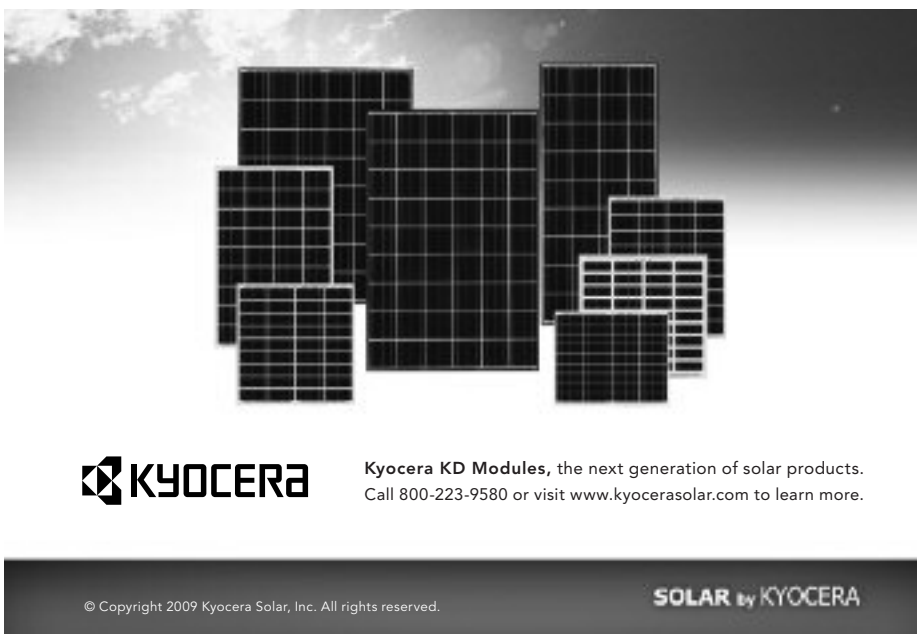
The complex set of policy, technical, business, and market components of a vibrant solar industry appear to be falling into place, but as the past legislative session revealed, significant obstacles remain. Manufacturing interests, energy producers, legislators reluctant to raise rates, and stakeholders have their legitimate positions to protect.

Russel Smith, with the Texas Renewable Energy Industries Association (TREIA), frames the current state of Texas solar with a succinct observation: "The idea is to match the demand at the same time you have the qualified solar installers." Even if demand were to skyrocket today, Smith suggests, a qualified solar workforce isn't yet in place to answer that need. Arriving at that point involves a confluence of policy, technology, business and market forces. Each influences the other to no small degree.

We can all hope the 2011 Texas legislature will rise to the occasion and support the Texas solar industry, as it did with the wind energy industry in the 1990s. That Texas now leads the nation in wind energy production is a powerful testament to the hard work of renewable energy advocates.

Imagine tapping into even a fraction of the approximately 2, 344,568,000 kWh (or, approximately eight quads) of sunlight pelting Texas every clear day.

Mike Albrecht is a TXSES Board member with an interest in education and renewable energy policy.



Business Profile - Texas Solar Power Company

Texas Solar Power Company - Creating Energy for Homes, Office Buildings, and SunFlowers

In business since 1995, Texas Solar Power Company (TXSPC) has deep roots in Central Texas. The company was started out of necessity. There were no other options in town for Craig Overmiller (member, American Institute of Architects) and Joe Garcia (builder) when a client requested a solar installation. Their interest led them to install the first project; passion led them to do another, then another, until they decided to focus their efforts full-time in renewable energy. Fourteen years later, the original crew of two has grown to 30, but the enthusiasm towards the work remains unchanged. The deep roots have also spread. In 2008, TXSPC opened Georgia Solar Power Company in Atlanta, a branch office in Houston, and one in Boulder via Colorado Solar Power Company. They have projects in other states and beyond U.S. borders, including Mexico, the Caribbean, and one at Texas A&M University's satellite campus in Qatar. From initial assessment and design phase through to final inspection, each project has one "point person," a professional engineer. Clients appreciate the focused, personalized attention to their installations as well as the high level of professionalism.

TXSPC has managed almost every variety of installation imaginable. They've installed roof systems, and ground- and pole-mounted systems. Their customers include commercial, residential and institutional clients seeking grid-tied, battery backup and stand-alone projects of a permanent, temporary and event-based nature. The majority of those projects are grid-tied residential and commercial, such as the Gold LEED-certified Office Depot on Anderson Lane in Austin. They have even stepped into the art world with "SunFlowers, an Electric Garden," an iconic public installation using solar power to light the west entrance to the Mueller community in Central-East Austin and visible from I-35!

"Sun Flowers, An Electric Garden" *welcomes shoppers and residents to Austin's Mueller Community, the former Robert Mueller Municipal Airport.*

As the first solar design/install company to plant "green boots" on the ground and on rooftops in Central Texas, TXSPC supports the growth and evolution of the overall industry. Co-founder Craig Overmiller recently joined Austin Community College as an adjunct professor, teaching PV installation and thereby helping to train tomorrow's renewable energy leaders. With continued focus toward clean, reliable, renewable and increasingly affordable solar energy, Texas Solar Power Company's, and our industry's, futures are indeed bright.

You may visit Texas Solar Power Company's website www.TXSPC.com or call 512.459.9494.

Shanda Sansing is actively involved in the solar community and is the Marketing Director for Texas Solar Power Company

GEEK SPEAK

with Chuck Wright

Presto Chango! A look at Phase Change Materials

In my last column I think I suggested that I might be done talking about thermal energy storage for a while. Since then I have learned some things that I would like to pass on to everyone. So here is the fourth (and final, for a while) article about thermal energy storage.

This time I want to talk about the interesting thermal properties that materials have when they change from solid to liquid, or vice versa, and how they might be used in conjunction with renewable energy. Let's start with water. Recall that it takes a BTU (British Thermal Unit) to raise a pound of water one degree F. Knowing this, we might consider using containers of water as "thermal mass" inside a building, to even out temperature excursions.

But let's now talk about what happens around the freezing point of water. You probably know that water freezes at 32F. If you cool a pound of water down from 33F to 32F, you will have to draw 1 BTU out of it. But to actually freeze that water, you will have to draw another 144 BTU out of it, and until the water is all frozen, it will remain at 32F! Once the water is frozen, you can cool it another degree F by drawing another 0.49 BTU out of it.

You can see that this is potentially a very good heat storage mechanism. 32F is not a very good temperature for your living room, so it is not much good in passive design, but ice is actually sometimes used for heat storage in real building cooling systems. Some quantity of water is frozen at night, when the utility offers cheaper electric rates, and then the ice is used to cool the building during the day.

The solid and liquid states of a material are known as "phases", and the change of states is known as a "phase change". The amount of heat required to change phase of a particular mass of the material is known as the "latent heat of fusion". (There is also the vapor phase, and the heat for the liquid to vapor transition is called the "latent heat of evaporation").

Most materials require transfer of a relatively large amount of energy to change phases (and this is true from liquid to vapor as well, by the way), inviting the question of whether any kind of phase change action could be useful in passive design. Building scientists have long recognized this potential, and have researched "phase change materials" (PCMs) for many years. A web search for this term will provide some interesting information.

Imagine incorporating some material into a building structure that changes phase at, say 75F. The building's structure would have a strong tendency to remain at this temperature. You could add lots of energy from solar gain, and the building would just soak it up until all of the PCM was melted, still remaining at 75F. At night, the PCM would gradually freeze as the PCM released heat, continuing to remain at 75F.

This sounds like a very desirable property. Unfortunately, the materials have had various problems. For one, you have to contain the liquid. Another problem is that many of the materials have tended to break down with repeated thermal cycling. One possibility is a particular paraffin wax. Of course, this is flammable, so it must be well encapsulated.

I recently learned of a commercial PCM product made by BASF that is specifically designed for this purpose. It is called "Micronal® PCM", and is based on a paraffin wax. It is microencapsulated in tiny beads of plastic that are so small that the product is actually a fine powder (also available as a liquid). BASF talks about using this as a component in wallboard, or mixing it into plaster. It has a phase change temperature of 73F (they also produce versions for 70 and 79 degrees F).

This sounds really interesting, so I decided to compare it against an 8" thick adobe wall that I used for some previous calculations. I was given an approximate price for Micronal of $5 per pound by BASF, and used some costs for adobe obtained from a builder who uses the material. Given Micronal's published thermal properties, if applied as a 1/3 component in a 1" thick plaster layer, it will store about 27 BTU/ft^2 and cost $2.40/ft^2. This comes out to $0.09 per BTU of storage, in addition to the base cost of the wall of about $7.50/ft^2.

By comparison, an 8" thick adobe wall will store about 13 BTU/ft^2 for each degree of temperature change. If we allow a 5 degree F swing on the wall, we can get 65 BTU/ft^2 of thermal storage, at a cost of about $16.00 per square foot, costing us $0.23 per BTU of energy storage.

Of course, the adobe keeps on giving and taking as you get cooler or warmer, so if the building occupants are more tolerant of temperature swings, they get more heat storage. The Micronal has minimal additional heat storage once it gets away from 73F.

Micronal-containing wallboard could be used to introduce a substantial amount of thermal storage into conventional construction. I was directed by BASF to National Gypsum as a possible source for this, but that company indicated that this is only a possible future product.

How about mixing Micronal into adobe to make a super effective thermal storage wall (an untested idea)? A 1/3 Micronal adobe wall would contain $21 of the material per square foot, on top of the base cost of about $16 per square foot, more than doubling its cost. The thermal capacity would be about 240 BTU per square foot for the Micronal, in addition to the approximately 9 BTU per degree for the 2/3 of the mix that is still adobe.

This dramatically increases the effectiveness of such a wall, at an admittedly high price. But micronal is a fairly new product. If it can make its way into high volume production, and especially if competing products emerge, its price might drop substantially.

It is entirely possible that having a distinct transition temperature is not especially desirable. If the occupants naturally like cooler or warmer temperatures then the transition temperature, they might not allow the product to ever reach transition, which would obliterate its usefulness. This would not happen with regular thermal mass.

Still, keep your eyes out for PCMs in future green building developments. They are not natural, but they could be considered green, and could make a valuable contribution to passive solar design.

http://www.functionalpolymers.basf.com/portal/streamer?fid=394458

Chuck Wright is a principle of Powerdash, LLC.