

## Gearing-up for Solar Fiesta!

April 27-28 at

### Santa Fe Community College

By Janet Bridgers, NMSEA Vice-President

As members know, for over 10 years, NMSEA has produced Solar Fiestas as an environmental fair, with exhibits and workshops focusing on practical uses of renewable energy and other sustainable living practices.

As in the past, this year's event will offer two days of workshops and exhibits. What's new about this year's Solar Fiesta? It's a free event that we're producing with the Santa Fe Community College (SFCC) Solar Club in and around their beautiful new building that houses the School of Trades and Advanced Technology. The building is a training center where the college offers trade certification in PV, solar thermal, green building and biofuels. The building incorporates many of these technologies into its design.

We're very excited about working with SFCC. It gives our organization another new way to connect the sustainability-oriented public with the experts who can guide their process. We hope this spring's Fiesta will be the first of many successful collaborative efforts between NMSEA and the state's community colleges.

In addition to free entry, this year the workshops will also be free of charge. A new program of workshops is being developed that will include tracks tentatively titled "Community Involvement in Solar" and "The State-of-the-Art – the Latest on RE Technology." If you are interested in speaking or holding a workshop, send a topic proposal to [info@nmsea.org](mailto:info@nmsea.org) with the subject line "Workshop Topic Proposal." Screenings of NMSEA's "Renewable New Mexico" TV shows will also be presented, and SFCC will conduct tours of their facility every hour.

Saturday's events will be followed by an SFCC Foundation "sunset social" to raise funds for the college's

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## "Inside Collectors" Today

By Steve Baer, Solar Pioneer

Years ago Zomeworks sold many Big Fin solar water heaters, what we called an "inside collector." An 8 inch wide aluminum extrusion snapped on 3/4 inch copper pipe was fastened to glazing joists (indoors). We placed these in greenhouses, sunrooms, and underneath skylights. The back of this fin was un-insulated to be sure the solar collector was kept warm by the house and never froze. After decades many of these are still in use today in New Mexico.

Our extruder can no longer make this 8 inch wide 0.080 inch thick extrusion, yet other developments make

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Send all letters, comments, and articles to the Editor, or to the NMSEA office. Preference is given to articles on solar energy topics (PV, passive, technology, performance histories, incentives, cost benefits, etc.), but we will also consider other renewable energy subjects as space allows.

## Advertising Rates

All advertising is in black and white, and photos and graphics must have a resolution of at least 250 dpi in JPEG, TIF, or PDF format. Text-only ads may be provided in MS Word format. Ad copy must be e-mailed by March 31 for the Solar Fiesta Guide. Circulation is typically 600 copies. Size requirements and prices for individual ads are as follows:

		<u>Mar/Apr</u>
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Call 805-487-2999 for Solar Fiesta package discounts.

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## The Baer Truth

By Gary Vaughn, NMSEA President

Checking out the "local authors" section at BookWorks in Albuquerque's North Valley recently, I came across a new arrival - *More Sun Spots*, self-published in the fall of 2012 by Steve Baer. What solar energy aficionado could pass that up? I've already read it twice. My once-brand-new copy is now highlighted and bookmarked and dog-eared. Steve was one of the founding members of the New Mexico Solar Energy Association way back in '72. His well-earned reputation for "not suffering fools gladly" envelops him like an incandescent corona. What NMSEA member would dare to publicly review his book? OMG!

Steve Baer is best known for inventing the geometrical forms known as "zomes," for his creative and innovative work in passive solar energy applications, and for his iconic company, Zomeworks. Zomes are 3 dimensional "space frames" intricately linked to sophisticated concepts in math, science, art, and architecture. Steve is the God-Father of the zome. He designed the first zome structure; he and his wife Holly built the first zome home; and they've lived in that zome for 40 years. Ancient news you say? Well, the Belgian "Delft Architectural Studies in Housing" (DASH) group just published an impressive book called "The ECO House," which features the Baer zome home as one of the most interesting ECO houses IN THE WORLD.

Steve is fervently and passionately dedicated to pure PASSIVE solar designs. Combine all that with a personal ideology devoted to fundamental principles, elegant simplicity, abhorrence of waste, and emphasis on empirical knowledge. Now toss in fierce independence, anti-authoritarianism, strict self-sufficiency, uncompromising bluntness, and a healthy dose of distrust and suspicion of government and all other large (and small) institutions. Is an image starting to form? Toss it out - it's incomplete.

Those who know Steve well will feel right at home exploring these essays in *More Sun Spots*. (You'll even hear his voice, encoded, somehow, between the covers.) Those who don't know Steve - well, fasten your seat belts, you're in for an exhilarating ride.

Looking for a mathematical "paper" on zomes? It's there. Fascinating descriptions of the unique properties of H<sub>2</sub>O? The how and why of Zomeworks' famous passive solar trackers and heliostats, which use no motors? How "Cool Cells" work? Details about Zomeworks' latest "Double Play" passive solar heating and cooling system (including thermal storage)? All there. How about some poetry and even flashes of inspired prose? Check. Conspiracy theories and classic Steve Baer rants about government subsidies, the National Labs, utilities,

corporations and non-profits? Of course. No one escapes his critique, including his own personal hero, passive solar pioneer Harold Hay - and, most telling of all, another well-known passive solar pioneer, Steve himself.

Reading Steve's essays, I'm often reminded of other gurus and masters in disparate and unrelated fields. Quality guru W. Edwards Deming shared the same devotion to fundamental truths, the same distrust of academic credentials, and the same disdain for political correctness. "The route to transformation is what I call Profound Knowledge," Deming would intone over and over in the manner of an Old Testament prophet. "This book is for people who are living under the tyranny of the prevailing style of American management." When Deming, then in his early 90s, spoke at UNM's Popejoy Hall at the invitation of the Anderson School of Management, he was asked by a recent MBA graduate what he should do, at this point in his management career, to support Deming's mission. "Well," Deming growled, "I'm afraid it's too late. You have an MBA - it's already too late for you. Next question!"

Does Steve Baer sometimes sound like an Old Testament prophet? You bet. Is he devoted to hands-on and minds-on work that teases out fundamental insights? Absolutely. Is he suspicious of fancy credentials, outspoken to a fault, and outraged by much of what most people call "progress"? Yes, yes and emphatically yes!

One of his essays is devoted to chainsaws. For decades Steve has used the chainsaw as a glaring example of the failure of "progress." Who can argue? I'm 100% with Steve on this one. Every time I see "Texas Chainsaw in 3D," I complain to the theater manager - "This is outrageous! Axes and swords would be much more sustainable, not to mention quieter!" Nobody listens - probably because they're all deaf from that noise.

Uncompromising devotion to fundamental principles has its price. In another essay Steve relates that when his old pickup finally fell apart, he searched diligently to find a brand new pickup WITHOUT an air-conditioner, WITHOUT electric windows and door locks, and one that could be push-started when the battery went dead. Impossible! Other folks' concepts of "progress" are being forced upon him without his consent, and that really boosts his blood pressure. Design simplicity simply cannot be found in a modern vehicle - today's cars and trucks are incredibly complicated. The fact that they are also far, far more dependable, reliable, comfortable, and safe, not to mention less polluting than ever, is completely beside the point.

The clothesline. Ah yes, a shining example of elegant design simplicity for many solar energy purists who see the electric clothes dryer not just as grossly wasteful, but as a poster child for "technological betrayal" and even personal irresponsibility. Steve's logic is flawless. Don't

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# Solar Adobe Wall Heat Loss

Ron Herman, Editor

*This article is presented in the spirit of the 40<sup>th</sup> anniversary that NMSEA celebrated in December. It is a summary of the poster session paper that I presented at the 1980 Passive Solar Conference in Phoenix, AZ, titled "The Effects of Thickness, Insulation, and Surface Color on the Net Heat Loss Through an Adobe Wall." I developed a finite difference computer program as part of my graduate studies in mechanical engineering at the University of New Mexico under Professor Fran Wessling in 1977. I ran that program to study the net thermal losses through a large variety of adobe walls. Fifty-four different combinations of surface color, wall thickness, and insulation position and insulation R-value were modeled. I thought NMSEA members might appreciate seeing how mechanical engineering analysis can be used to compare the heat loss properties of various building structures and characteristics under real weather conditions. Some solar architects use these types of programs, and hopefully some engineering students still conduct these types of studies. You may find the results interesting, but perhaps generally accepted now.*

*There are actually three analytical options for calculating heat loss in a massive building wall, and I compared those three. A steady state calculation is the simplest, and it uses a single set of constant external (inside and outside) temperature, wind, and inside air conditions. However, it is still complex, since heat loss coefficients change depending on surface temperature. A more advanced and exact calculation uses variable conditions simulating actual weather over time, a transient analysis. Two possible transient analyses were done; one using a simplified heat loss coefficient,  $U$ , calculated for each condition, the other using more precise temperature-dependent finite difference methods. Weather data for a typical two week winter period in Albuquerque, New Mexico, was used for the transient and  $U$ -value analyses.*

The heat lost from a home or commercial building must be re-supplied for comfortable living at considerable expense to the residents, as well as depletion of our natural resources and the emission of pollution and  $\text{CO}_2$ . If the walls of the structure are made so that they restrict heat loss, or even provide a net gain from incident solar energy, a significant advantage can be realized. An adobe wall has long been known as a successful structure from this standpoint. The two analyses presented here yield (1) the steady state heat loss for eighteen different-adobe walls, and (2) the thermal performance for transient conditions for those

walls facing south and north (no winter sun) with and without insulation.

The walls considered were identified with a number between 1 and 9. Wall 1 was an adobe wall with no insulation, while walls 2 through 5 had insulation on the outside with thermal resistances, or R-values, of 3, 6, 9, and 12  $\text{hrft}^2\text{F/Btu}$ , respectively. Walls 6 through 9 had the insulation on the inside with the same R values as walls 2 through 5, respectively. In addition, all walls were finished on the outside with 3/4 inch stucco and walls 6 through 9 had an interior finish of 1/2 inch gypsum board (sheet rock). This construction represents typical adobe walls in New Mexico, but not a Trombe wall, which is a simple adobe with outside glazing spaced an inch or two from the wall with no insulation. (Analysis of a Trombe wall requires additional complexity because of the convection currents inside that air gap.) Two adobe thicknesses, 10 inches and 14 inches, representing different block orientations were considered for each wall 1 through 9. The material properties assumed in the analysis are shown in the table below.

TABLE 1. MATERIAL PROPERTIES

Material	Thermal Conductivity k (Btu/hrftF)	Density $\rho$ ( $\text{lb}_m/\text{ft}^3$ )
Stucco	0.420	116
Adobe	0.298	108
Gypsum	0.084	50

## Theoretical and Numerical Analyses

One-dimensional nodes, or isotherms, were defined at each surface, each boundary between materials, and every 2 inches in the adobe cross-section. The method used was to formulate energy balances describing the "finite difference" between heat flows from the material sections (or space) on each side of each isotherm [1]. These equations were then solved for the isotherm temperatures. The resulting equations and those for the heat loss through the wall were used in a computer program to calculate temperature distributions and resulting heat loss values. The heat flows were identified in the calculations as follows:  $q_s$  is the solar input, and  $q_{ro}$  and  $q_{rr}$  are heat transfer rates due to radiation at the outside and room surfaces, respectively.  $q_w$  and  $q_c$  are convection transfer rates for the outside (wind) and room, respectively. All other  $q$  denote heat transfer by conduc-

tion from another wall section as indicated by the subscripted numerical isotherm index, i.

### Steady State Analysis

For a steady state analysis the ambient conditions are held constant and solar radiation is excluded from the conditions, since it varies over time. For this study the inside or room temperature,  $T_r$ , was set at 70°F and the outside temperature,  $T_o$ , at 30°F. On the outside of the wall the convection heat transfer or wind coefficient,  $h$ , was 6 Btu/hrft<sup>2</sup>F, representing a 17 mph wind. On the inside the coefficient was 1.6 Btu/hrft<sup>2</sup>F.

No internal heat storage, or capacitance, is considered in a steady state analysis. The energy balance for isotherm 1, for example, becomes  $q_{ro} + q_w + q_2 = 0$ . Similar equations for all isotherms were developed in detail. The total steady state heat loss per square foot for any wall is the temperature difference between the inside and outside divided by the sum of the resistance terms, or

$$q = (T_o - T_r) / \text{Sum}(R_i)$$

The sum of the resistance terms,  $R_i$ , include the convection coefficients, material thicknesses, and radiation effects that are based on material and surface properties. Some of the coefficients are actually dependent on temperature, so their values had to be obtained from “finite difference” equations in an associated computer program I called ADOBE. An iterative procedure was required to determine each isotherm temperature, since each calculation was based on the temperature of the next isotherm in the wall, which was initially only an estimate based on the previous calculation. Thus, each isotherm temperature was “improved” through the wall until all heat losses matched within an acceptable error. Those three losses compared were from the room air to the inside surface, from the outside surface to the outside air, and the total value as calculated from the equation above. In this way the temperature distribution through the wall was obtained.

### Transient Analysis

For a transient analysis the ambient conditions change, and thermal storage in the massive wall becomes an important factor. In this case the room temperature was assumed to remain at 70°F due to controlled space heating. The outside weather conditions, including solar radiation shining on the wall, were modeled using actual hourly weather data for the first two weeks of February, 1962, in Albuquerque. The outside temperatures ranged from 26.3°F to 67.7°F and wind speeds ranged from 0 to 18.4 mph. The analysis was carried through the night hours, and the sky varied from clear to very cloudy during the day.

For each wall the energy balance for isotherm 1 is now

$$q_s + q_{ro} + q_w + q_2 = dE/dt$$

The right side is a non-zero term that represents the change in the energy stored in the massive wall. Similar equations were written for each type of isotherm in the cross-section of the wall and air spaces on each side. A “forward finite difference equation” was used to calculate the temperatures in the wall in two-minute time increments for each hour of weather data, which was good enough for accurate calculations of wall temperatures and heat loss. Initial conditions were set to simulate past exposure to the weather, but heat losses were not accumulated until the fourth day, so that errors due to the artificial initial conditions would be negligible. The program, which I called TRNSWL, stepped through each hourly weather data point until the analysis for the two weeks was complete. Then I repeated the computations with different values for the wall thickness and for the solar absorptance of the outer surface, representing dark and light colors and finally a north wall, where there would be no absorptance at all ( $\alpha$  values of 90%, 40%, and zero, respectively).

(Most of the equations for the analysis were included in my original paper.)

### Results

The calculated steady state heat losses are compared in TABLE 2 (page 8). These results indicate that if there is little or no insulation, the 14 inch wall is significantly better. Insulation on the inside of the wall is only slightly better than on the outside, and calculations show that this is due to the additional material (gypsum board) required for the inside surface. Finally, an R value of 3 hrft<sup>2</sup>F/Btu can reduce losses by 50%, but higher R values produce “diminishing returns”. It should be recognized that the true significance of these figures, as well as the results

*(Continued on page 8)*



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## Santa Fe Sustainability Collaborative

By Monte Ogdahl, NMSEA Past President

As anyone who comes to Santa Fe knows, there are an abundance of non-profit organizations, small businesses, independent newspapers, and social groups here. A large percentage of these are of a sustainable nature directly or indirectly. A collaborative group is forming in Santa Fe to bring together these focused entities, first of all through social media and electronic communication, and with monthly face-to-face gatherings. We are calling it the Santa Fe Sustainability Collaborative, SFSC. These gatherings might be an after 6pm event starting with light snacks and beverages with mingling and introductions. An opening presentation might be on “how to” do, find, or join with others in something sustainable, followed by a presentation by an organization, business, or individual with a focus on a particular part of sustainability, followed by a discussion. This group will be started as a 501(c)(3) non-profit chapter of the NM Solar Energy Association. For more information, contact me at [solpwr@plateautel.net](mailto:solpwr@plateautel.net) or via Facebook or LinkedIn.

Also, please join us for a collaborative at the NMSEA Solar Fiesta at the Santa Fe Community College on April 27 and 28, a free event with speakers and exhibitors on renewable energy and sustainability for living, working, and transportation.



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## ABQ Chapter Meetings

Be a part of the change toward a more sustainable future and join us at our monthly Albuquerque Chapter meetings. Our chapter leader is Jim DesJardins, a sales consultant for a local solar company. Meetings are held on the fourth Tuesday of each month from 6-8 PM at the REI store, 1550 Mercantile Ave NE, 87107. Watch for e-mail Blasts or call the office for information on meeting topics.

## Solyndra and Schott

By Ron Herman

As editor of the SunPaper, I tend to collect all sorts of news and memorabilia, thinking that perhaps I will find something that NMSEA members and friends might find interesting. Well, it's time for me to clean house, so I was sorting through my file on solar companies and found some brochures and Albuquerque Journal clippings about Solyndra and Schott Solar. What do both of these have in common, besides being solar companies that received government funding or incentives and didn't make it?

Well, if you look into their core technology, they both like the idea of glass tubes. When I was a young engineer, I had the opportunity to visit the Schott glass factory in Mainz, Germany. I had no idea what “shot” glass was when I first heard it. It turns out that Otto Schott led a team that developed borosilicate and high-quality optical glass around 1890. Borosilicate glass is exceptional for its high tolerance to heat and resistance to thermal shock (sudden temperature change), as well as resistance to degradation from chemicals. Now Schott AG is a very diversified company, but all of its products involve glass in some way.

A couple of years ago I went on a tour of the Schott PV plant here in Albuquerque with the NMSEA Board of Directors. I was amazed at their robotic technology that assembled flat panel PV modules with the occasional help of human eyes and hands. However, I noticed a couple of things that made me wonder.

First, the technology most prominently displayed in their lobby was their hermetically-sealed glass tubes with PV cells inside. Glass tubes are relatively expensive to manufacture, especially with air-tight glass-to-metal seals, and difficult to maintain when constantly exposed to sunlight and weather. I had some experience with this type of solar receiver made by other companies in the 1980s, and it seemed they often experienced seal failures.

*(Continued on page 12)*

*(The Baer Truth, Continued from page 3)*

try to argue with him. Just put him in a room with 100 working moms, 100 apartment dwellers, and 100 families who have to spend a couple of hours every week at the laundromat. Then call in the swat team to keep them from stuffing him into a king-size electric clothes dryer and pushing "permanent press."

South facing windows, skylights, natural light instead of fluorescent, free heat and even "coolth," proven passive solar designs. What is wrong with you people? Wake up! Truly impressive innovations all - and worthy of our full appreciation and gratitude. But even Steve admits that while these designs usually work great here in the desert southwest, they still have room for improvement. In some other parts of the US, and where most people live in the rest of the world, passive solar heating isn't practical, or even needed, and passive cooling simply won't fly. These days many of the things that are having the most impact on transforming lives for people in the third world (which could include parts of NM) are electricity-centric: 1) access to light at night 2) access to modern means of communication - yes, I mean cell phones and internet access, and 3) refrigerators and air conditioning.

New Mexicans have played an enormous role in pioneering and refining passive solar technology and

architecture, and Steve Baer has been in the front ranks. That's a genuine gift to the world. But I can't help recalling the response of some mid-school students right here in New Mexico when I showed them a photo of a beautiful Santa Fe passive solar home designed by one of our most prominent architects. It featured huge south facing windows balanced by gorgeously integrated thermal mass. "But everyone can see you inside," they said immediately. "And they could shoot you, too." A few years ago, one of NM's adobe gurus was touting adobe - not for its thermal mass, but for its ballistic impenetrability. There is more than one design reality. There is more than one design priority.

New Mexico would be a far less enchanting (not to mention less energy efficient) place without our solar powered gurus, purists, fundamentalists, and iconoclasts. They channel that special energy that holds entropy (and perhaps even global warming) at bay. So buy the darn book! You owe it to yourself, and you owe it to Steve Baer. Hear the man out. If some essays delight (as they will), then be delighted. If some essays intrigue and confound (as they will), then ponder. If the Baer Truth contained in some essays is just too much to swallow (and it will be), then, as Steve would say - "the hell with you."



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from the transient analysis, must be weighed against the costs of materials and construction.

The results of the transient analysis are given in TABLE 3, which shows the accumulated heat loss through each wall from February 4 through February 14, eleven days. There are actually 54 different walls; and the heat losses were calculated in two ways, as described above. The various alpha values changed the standard U value calculation by only 1%, so only one column for each thickness was needed to present those results.

The conclusions drawn from the results of the steady state analysis are substantiated by the transient analysis. The percent reductions in heat loss are almost identical. However, due to the warm weather conditions and thermal storage in the wall, the accumulated values are very different from the steady state results. Multiplying the steady state heat loss for wall 1, 10 inches thick, by 11 days, or 264 hours, yields a total value of 3022.8 Btuft<sup>2</sup>, 11% of the steady state figure given in TABLE 2.

It is interesting to compare the effects of different parameters at the end of the 11 days. Notice the difference between a 10 inch and a 14 inch thick adobe wall. The 14 inch walls actually had higher losses because they did not benefit as much from sunshine and warm outside temperatures. As mentioned above, the effect of the position of the insulation - outside versus inside - was due to the additional material on the inside.

The value of insulating a north facing adobe wall is indicated very definitely. Also, adding minimal insulation is more effective than 4 additional inches of adobe. (An 18 or 20 inch adobe block is probably required to match the R = 3 insulation.)

It is important to notice the difference between light and dark colored outside surfaces,  $\alpha = 0.4$  and  $\alpha = 0.9$ , respectively. A room with a south facing adobe wall with a dark colored outside surface, either with or without insulation, will lose very little heat during a cool winter period when the sun is low in the south. In fact, the absorption of solar energy during sunny days can result in considerable energy storage, resulting in net gains to the room over the night hours and even during cloudy days. A white wall will reflect 55% of the available solar energy ( $[1078.2 - 336.2]/[1690.7 - 336.2]$ ). Painting the outside surface a dark color is roughly equivalent to insulating it on the inside with an R value of 9. A dark colored surface on an insulated wall with R = 3 is far superior to a white wall with R = 12 insulation.

In addition, it can be seen from TABLE 3 that the method of calculating the heat loss using a standard U value does not correspond very closely to the finite difference calculation except for a north facing wall.

In summary, to reduce winter heat losses in an adobe structure in Albuquerque, it may be most economical to

build both north and south facing walls 10 inches thick with R = 3 insulation. A much thicker adobe wall without insulation may be comparable, although it was not considered in this study. In either case, the south facing wall should have a dark outside surface ( $\alpha = 0.9$ ).

References

- [1] Arpaci, V.S., *Conduction Heat Transfer*. Reading, Massachusetts: Addison—Wesley, 1966.
- [2] Duffie, J.A., Beckman, W.A., *Solar Energy Thermal Processes*. New York: John Wiley and Sons, 1974.

TABLE 2. STEADY STATE HEAT LOSS

Wall Thickness	W A L L N U M B E R								
	1	2	3	4	5	6	7	8	9
	STEADY STATE HEAT LOSS (Btu/hr ft <sup>2</sup> )								
10"	11.45	6.16	4.21	3.20	2.58	5.72	4.00	3.08	2.50
14"	8.67	5.26	3.77	2.94	2.41	4.93	3.60	2.84	2.34
	PERCENT REDUCTION IN HEAT LOSS								
Due to Thickness:	24	15	10	8	7	14	10	8	6
Due to R Value:									
10"		46	63	72	77	50	65	73	78
14"		39	57	66	72	43	58	67	73
R Value:	0	3	6	9	12	3	6	9	12
		O U T S I D E				I N S I D E			

TABLE 3. 11 DAY ACCUMULATED HEAT LOSS (Btu/ft<sup>2</sup>)

WALL	R	S O U T H				N O R T H		U F I X E D	
		BLACK $\alpha = 0.9$		WHITE $\alpha = 0.4$		$\alpha = 0.0$		10"	14"
		10"	14"	10"	14"	10"	14"	10"	14"
1	0	336.2	241.9	1078.2	828.9	1690.7	1314.0	1674	1280
I N S U L A T I O N O U T S I D E :									
2	3	168.2	167.3	589.9	534.6	943.6	842.9	917	785
3	6	122.9	154.1	414.7	416.9	660.4	638.2	632	566
4	9	100.8	148.6	323.7	352.7	511.6	524.9	482	443
5	12	87.8	145.6	268.0	312.4	420.0	453.1	389	363
I N S U L A T I O N I N S I D E :									
6	3	163.9	154.0	553.3	495.5	875.4	778.0	853	783
7	6	116.0	118.9	391.2	367.4	618.9	573.0	601	541
8	9	89.9	96.5	302.5	291.4	478.5	452.8	464	427
9	12	73.5	81.1	246.6	241.3	389.9	374.0	377	353

**NMSEA Board Meeting March 23**

The next meeting of the NMSEA Board of Directors will be on Saturday, March 23, in the conference room at the office at 1009 Bradbury Dr. SE, Albuquerque, 87106, from noon to 3:00 with a potluck before at 11:30AM. Members welcome. Call 505-246-0400 by March 19, if you have an item for the agenda.

## Letter From a Friend On Solar for Emergencies

Forwarded by Astrid Webster

Thought this was a great idea, sent by a friend of a friend! She used her Solar Lights inside the house at night when the electric power went off during a hurricane. She stuck them in jars and bottles and said they gave off plenty of 'free light' in each room. She put them outside in the daytime and brought them back inside at night for several days while the power was off. They are safe to use and cheaper than batteries. She recommended we bring a Solar Light into our own house one night to test it for ourselves.

Due to a thunderstorm, we lost power for about 5 hours one night. We were scrambling around in the darkness, looking for matches, candles, and flashlights. Then we looked outside and noticed our Solar Lights shining brightly all around the patio, stairs and dock. My wife walked outside and brought several of the solar lights inside. We stuck the Solar Light pipes into plastic drink bottles and they made the nicest, brightest, safest, lighting you could imagine. We put one in the bathroom, one in the kitchen and in the living room.

There are many types of Solar Lights available. We bought quite a few and put them all around our yard. They look nice and do not attract flying bugs like other outdoor lights. The lights we have fit into 20-oz. water bottles and also fit into most larger 2 liter bottles. If you need a weight in the plastic bottle to keep them from tipping over, put in a few of the colorful flat marbles they put in aquariums and vases. You can also use sand, aquarium gravel, or whatever you have available.

The Solar Lights we have are perfect inside our home. They burn all night, and next day we take them back outside, where they recharge and are ready for use again when needed. Solar Lights are the perfect light solution for power outages. I had never thought of it before seeing what my friend did, and now you know about this idea too. ☀



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(Solar Fiesta, Continued from page 1)

scholarship fund. Exhibitor maps and event and workshop schedules and descriptions will be published before the Fiesta in an early version of the May/June SunPaper, the Solar Fiesta Guide.

Besides offering the public information about SFCC's range of career-oriented renewable energy training programs, the event will give vendors an extremely cost-effective way to market to Santa Fe's affluent environmentally conscious community. Vendor categories will include (but are not limited to):

- Photovoltaics (electric solar)
- Thermal solar
- Solar "air-conditioning"
- Zero- and low-energy new home construction
- "Green" remodeling
- Wood-burning fireplaces
- Insulation
- Replacement windows
- Hybrid and electric cars
- Xeriscaping
- Water efficiency
- Water harvesting
- "Green" construction materials (adobe and others)
- Gifts and household products from recycled materials
- Nontoxic household maintenance products

Both indoor and outdoor exhibitor spaces are available with special pricing for home-based businesses and nonprofits. To obtain a sitemap, pricing information and registration forms, download them from [www.NMSEAEvents.org](http://www.NMSEAEvents.org), or call or email Janet Bridgers at [janetbridgers@msn.com](mailto:janetbridgers@msn.com) or 805-487-2999. ☀



### Schedule a Free Climate Presentation!

Jill Cliburn speaks as an Al-Gore-trained volunteer and from professional experience in clean energy innovations. [climateresality.org](http://climateresality.org)  
Contact: [cliburn.associates@gmail.com](mailto:cliburn.associates@gmail.com)



**The Climate  
Reality Project**

*("Inside Collectors," Continued from page 1)*

the inside collector a more promising design today than ever. Several firms manufacture fins for solar collectors that can be used alone in place of the Big Fin. We use Thermafin Fintube Absorbers manufactured by Alternate Energy Technologies in Florida. Their fins are 5-1/4 inch wide instead of the Big Fin 8 inch; their copper tube is 3/8 inch instead of 3/4 inch; and the fins are only 0.008 inch thick instead of the Big Fin's 0.080 inch. Yet, I suspect they are better. A big advantage these Fins have is their selective surface. These hardly radiate to the cold glazing in front, which helps them produce hot water in the day and protects them from freezing at night. The manufacturing is superb. The copper fin is machine welded to the tube, a perfect bond, and the tube wall is only 0.022 inch thick. All these innovations save material and money.

Decades ago we sought solar water heater designs with the tank above the absorber to thermosyphon. Yet today with PV and PV-powered pumps so inexpensive, one can make a pump-driven system. We recommend using electricity for backup, using the top element of an electric water heater. At our house we have two such tanks with the top element on a switch. During our cold snap in January 2013 we were glad for electric backup, but our electric usage was small and did not reach 240 kwh for the month. With all the craze for subsidizing PV and wind, inexpensive solar water heaters have been neglected. We have not sold any of these. At my house I use freeze-tolerant, unglazed, selective surface, low pressure solar water heaters with the electric backup as described. I would recommend these inside water heaters to those on propane or electricity; they can pay for themselves without subsidies. If you have natural gas, skip solar.

While our Big Fin solar water heater has retired, inside collectors can still be used. It is painful to watch better and better hardware and tools be ignored, as interest in solar energy brings on a frenzy of misguided electric subsidies and programs. The inside collector avoids a heat exchanger, expansion tank, outside lines or racks. The window glazing should be oriented toward the sun – within 30° of south and tipping between 20° and 50° back from the vertical. In Albuquerque single glazing is sufficient, but double glazing will work. Give about 10 square feet of collector for the house and 10 square feet per person. The electric tank needs about 2 gallons per square foot per collector. Valves are needed to isolate the absorber and prepare it for a vinegar flush if you get deposits.



## Energy Investments

Closing share prices compared to the DOW index:

2/22/13                      12/27/12                      2/24/12

First Solar (FSLR):

\$33.81                      \$30.02                      \$35.58

Market Vectors, Solar Energy ETF (KWT):

\$44.42                      \$35.12                      \$4.45

(reverse split July 1, 1sh/15sh)

Dow Jones Industrial Average (\$INDU)

14,001                      13,096                      12,983

Crude Oil//barrel (NYMEX futures)

\$93.13                      \$90.87                      \$109.77

Natural Gas/mmBtu

\$3.29                      \$3.35                      \$2.55

Gasoline/gal

\$3.08                      \$2.82                      \$3.15

NG and gasoline are national averages.

Selected prices provided for relative information, only; NMSEA does not recommend specific investments. All investments involve risk; invest cautiously.

## ASES National Conference in April

SOLAR 2013 will be held April 16-20 at the Baltimore Convention Center in Maryland. The American Solar Energy Society (ASES) presents America's longest-running solar conference series, America's leading conference on emerging trends, technologies, and opportunities. Go to [www.ases.org](http://www.ases.org) for more information. NMSEA members can receive a \$50 discount on conference registration and a \$100 discount on exhibit booths. Please call or email the NMSEA office to receive your discount code. ☀



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## Natural Gas for San Juan And Reducing Global Warming

By Ron Herman, Editor

Back in the May/June issue of the SunPaper, we featured an article by this editor titled “How Bad Is It?” referring to pollution in New Mexico. I agreed with our President (then Vice-President) Gary Vaughn that for San Juan electric generation “replacement of coal power plants by more efficient natural gas plants would reduce pollution and prepare them for even greater uses of RE.” As Gary said, “Get rid of the dirtiest stuff first!”

### San Juan Changes

In the subsequent issue of the SunPaper we co-authored the article “A Modest Proposal,” where we outlined the benefits to NM of replacing coal plants with natural gas ones, which are pretty obvious:

All air, water and land environmental pollution standards would be met; CO<sub>2</sub> emissions per megawatt-hour (MWh) would be reduced by at least 30%; the increasing costs and problems associated with main-taining a 40-year-old coal plant would be avoided; the replacement generating facilities could be located closer to

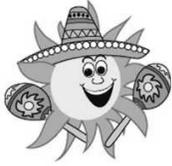
their demand centers, reducing transmission line losses and maintenance, as well as improving reliability; and the new plants would be inherently more efficient than the old San Juan dinosaur.

Modern natural gas plants are much more compatible with renewable energy (RE) than San Juan (coal plants) will ever be, and that just might be a critical way of justifying the shift, while still supporting the future of RE in NM.

What could such a shift mean for PNM? Few if any environmental related lawsuits and legal/management expenses; a huge public relations coup in significantly reducing greenhouse gas (global warming) emissions and slashing air and water pollution; system efficiency improvements that would dwarf PNM’s current efforts; significant long term cost savings; and far fewer hearings before the Public Regulation Commission (PRC).

Apparently the New Mexico Environment Department (NMED) and PNM have agreed to this enlightened approach. According to the February 15 article by Michael Hartranft in the Albuquerque Journal, the NMED and PNM have agreed that units 2 and 3 could be closed and replaced by a 150 to 200 megawatt natural

*(Continued on page 13)*



The SFCC Solar Club and the NM Solar Energy Association invite you to

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[www.sfcc.edu](http://www.sfcc.edu)   [www.nmsea.org](http://www.nmsea.org)   [www.nmsolarfiesta.org](http://www.nmsolarfiesta.org)



*(Solyndra and Schott, Continued from page 6)*

Guess what Solyndra's technology is based on. Yes, sealed glass tubes. How long do your air mattresses last before they leak? Yeh, I thought so. Solyndra apparently had a good financial team that sold their idea to the federal government, but a look at their technology and their flat panel competition should have raised red flags.

I'm sure that flat panel PV modules are much cheaper per watt than the tube-type and have lower life-time costs. And with competition from China for flat PV modules, which should have been expected 10 years ago, the result is obvious. The second observation I made was that Schott in Albuquerque was apparently using glass sheets for their panels that were made in China and shipped here, with some flaws and breakage in transit, of course. It was my understanding that they were not made in a Schott glass plant. So, what was Schott's advantage over other module manufacturers? I could see none.

So, I guess I can throw away all my brochures from my Schott tour and the clippings about their demise here and the controversy over their \$16M grants from the state of New Mexico. That experience may result in new legislation to allow the state to "claw back" some of those kinds of investments when they fail. My Solyndra clippings join them in the same recycle bin.

By the way, Solyndra's \$535 million loan from the U.S. Department of Energy was initiated by the Bush administration, involved no illegalities, became a very small part of the Obama stimulus package, and about 19% will be recovered for the DOE. None of the NM grants to Schott will be recovered, although they did provide some training and employment here - and some solar hype - for a while.



## New Solar Water?

The Pacific Institute recently compiled a list of major world water shortages throughout history. Of the 225 they identified almost half have occurred within the past 20 years. With human populations still growing rapidly, is our modern civilization sustainable if we don't solve our water problems? Are we likely to see more wars over water than we have over religion or oil? Could solar energy come to our rescue to help recycle this limited resource? Already some cities are considering charging more for water to encourage conservation, and some nations have constructed desalinization plants, some of which are solar powered. Could we remove other forms of pollution and recycle large amounts of water using solar energy? Let's hope so.

RH

*(Natural Gas, Global Warming, Continued from page 11)*

gas-fired unit. Furthermore, under this plan units 1 and 4 will be fitted with Selective Non-Catalytic Reduction (SNCR) technology, which was favored by the state because of its lower costs, compared to the catalytic technology requested by the US Environmental Protection Agency (EPA). Although not everything we might want, this seems to be a major step toward improving pollution conditions in the state and surrounding areas. As Gary Vaughn has pointed out before, a modern combined-cycle gas plant would be much cleaner and more efficient than the planned combustion type for the replacement of units 2 and 3. A combined-cycle plant has a quick response time, so it's more compatible with wind and PV generation sources. But, of course, PNM prefers the other, because it is cheaper to install.

The implementation of these changes will take more than a year, as PNM must formally submit their plan to the NMED, which will then submit it to the NM Environmental Improvement Board and the PRC. After the required hearings and filings, then it must go to the EPA for final approval. Pat Vincent-Collawn, Chairman, President and CEO of PNM Resources wrote by e-news on February 19, "We believe this proposal is worth the effort it will take to see through to completion. It has a number of benefits:

It will cost our customers less than the required federal plan.

It has far broader environmental benefits, including the reduction of emissions beyond nitrogen oxide, such as carbon and coal combustion byproducts .

It provides a more balanced generation resource mix to serve our customers with less reliance on coal.

It doesn't jeopardize reliability.

It addresses concerns about the economic impact to the Four Corners region."

### Global Warming

Just prior to the announcement of the NMED/PNM agreement, Journal readers were treated to an unusually clear support for global warming concerns by David Thomas, president of New Mexican's for Science and Reason. He is a physicist and mathematician who has studied the climate debate for many years. In his article provided at [www.nmsr.org](http://www.nmsr.org) and printed in the Journal on February 4, Thomas criticizes global warming deniers for not checking facts and not telling the truth. Although he was addressing an article by a particular denier, his four "critical observations" in general (with my own interpretations) were as follows:

- It is not true that environmentalists use the term "climate change" because there is not enough evidence

for claiming actual "global warming." Both terms have been used for over 100 years in relation to the greenhouse effect caused by carbon dioxide emissions. (This is the same effect we create in solar greenhouses by using glazing to keep the heat in.) A strategist for President Bush in 2003 suggested that Republican politicians "refer to 'global warming' as 'climate change' to make it sound less frightening," and also that they should claim a lack of scientific certainty as a strategy in the debate.

- The accusation that global warming scientists are just extreme "greens" who are only trying to support their own incomes is not true. Not all of those scientists are environmentalists, and "the great majority" of those scientists active in the research agree that the release of greenhouse gases by humans activity is causing most or all of the warming.
- The claims of fraud and scandals surrounding climate data have proven to be groundless by several state and national investigating agencies.
- There continues to be significant data indicating warming over the past 15 years.

Of course each of us only experiences the annual weather changes in our small part of the globe (which are different even on the east and west sides of Albuquerque). It is a common misconception that an individual can really detect changes in average temperatures, even seasonally, much less detecting any changes in average conditions anywhere else on the globe. Careful measurements at many locations are required along with good data analysis. Thomas suggests that anyone interested in this debate should attend a meeting of the American Geophysical Union. He says debates there are fierce and passionate, but that deniers there are "virtually non-existent."

Thomas concludes by saying that observations of increasing large-scale glacial melting and ice calving are "worrisome," and that this "climate crisis is every bit as real as our current economic doldrums, and potentially far more costly in the long run." The Rio Grande Sierra Club calls it "The fight of our lives."

As Lisa Silva, an NMSEA board member, recently wrote, just what we learned in kindergarten should be enough for us to act to retard global warming. She says it's just a matter of cleaning up our own mess, playing fairly, and sharing responsibility for our actions. Hopefully, the people at PNM and state and federal agencies have learned those principles. ☀





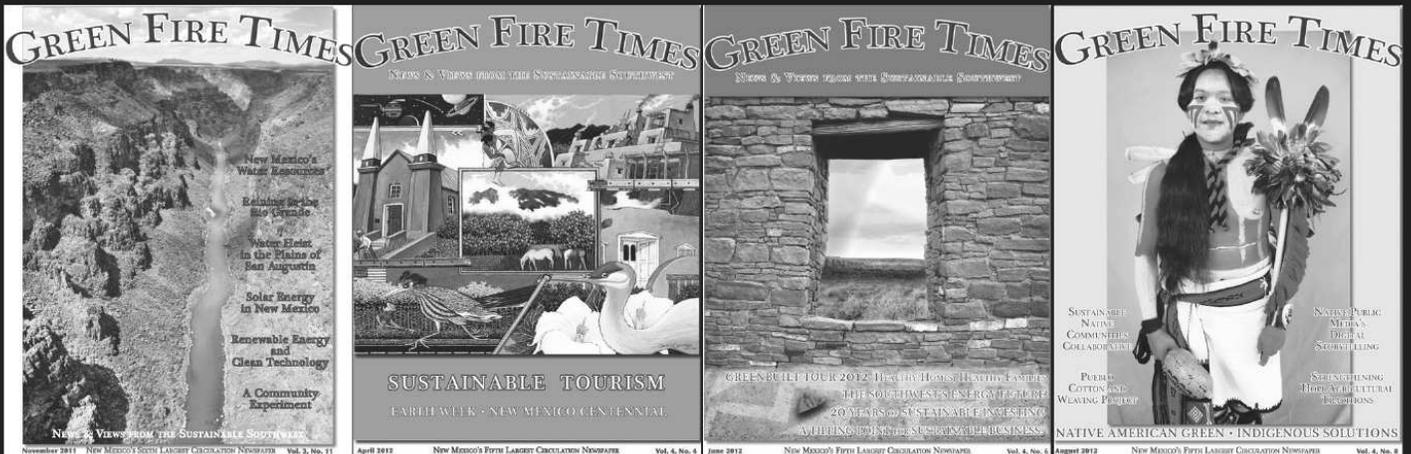
## Anyone know this house?

The SunPaper editor found this picture, probably from the 1980s, in an old file and remembers it being a Trombe wall in a very nice passive solar home. If you know who owned it then, who owns it now, or where it is, please contact Ron at 505-292-4375 or rhermansolar@aol.com. Let's build more of these!



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ZIP Code: \_\_\_\_\_

Phones: \_\_\_\_\_ (W)

Email: \_\_\_\_\_

Any special solar interests? \_\_\_\_\_

How did you hear about us? \_\_\_\_\_

Yes, I would like to volunteer on occasion!

## NMSEA Membership Dues

- |                                                                                        |       |
|----------------------------------------------------------------------------------------|-------|
| <input type="checkbox"/> Individual and Family, 1 year                                 | \$30  |
| <input type="checkbox"/> Business, 1 year                                              | \$75  |
| <input type="checkbox"/> Individual Lifetime                                           | \$250 |
| <input type="checkbox"/> Business Lifetime                                             | \$400 |
| <input type="checkbox"/> Teacher/Student/Senior (62 & up)<br>w/copy of ID (circle one) | \$10  |

## NMSEA Chapter Options

All NMSEA members are invited to participate in our local chapters around the state. When you register, you will be placed in the chapter nearest to you geographically, or you may contact the office to change your chapter, if you desire. (Note: members are not limited to the chapter in their area and are welcome to visit other chapter events.)

Check if you would like to be affiliated with and/or donate an additional amount to any of the following chapters or to the main office general fund:

- | <u>Affiliation</u>                                        | <u>Donation</u> |
|-----------------------------------------------------------|-----------------|
| <input type="checkbox"/> Alamogordo Chapter               | \$ _____        |
| <input type="checkbox"/> Albuquerque Chapter              | \$ _____        |
| <input type="checkbox"/> Las Cruces Chapter               | \$ _____        |
| <input type="checkbox"/> Las Vegas, Sustainable Las Vegas | \$ _____        |
| <input type="checkbox"/> Los Alamos Chapter (LASE)        | \$ _____        |
| <input type="checkbox"/> Santa Fe Chapter                 | \$ _____        |
| <input type="checkbox"/> Taos Chapter                     | \$ _____        |
| <input type="checkbox"/> Silver City Chapter              | \$ _____        |
| <input type="checkbox"/> Main Office / General Fund       | \$ _____        |

## ASES Membership

NMSEA is a chapter of the American Solar Energy Society, and we encourage our members to join ASES as well. ASES members receive SOLAR TODAY magazine, Solar Action Network (SAN) alerts, the Sunbeam e-newsletter, discounts on publications, and more! Five percent of your ASES dues are dedicated to special outreach programs including ASES Legacy Schools, library gift subscriptions and the purchase of Green Tags.

For more information and for ASES business membership categories, please visit [www.ases.org](http://www.ases.org).

Check category if you want to renew/subscribe to ASES with your NMSEA membership. Fill in total below:

- |                                                               |      |                                                      |        |
|---------------------------------------------------------------|------|------------------------------------------------------|--------|
| <input type="checkbox"/> Professional                         | \$89 | <input type="checkbox"/> Supporting                  | \$125  |
| <input type="checkbox"/> Senior Professional (proof required) | \$45 | <input type="checkbox"/> Contributing                | \$250  |
| <input type="checkbox"/> Basic                                | \$39 | <input type="checkbox"/> Lifetime                    | \$1200 |
| <input type="checkbox"/> Student (proof required)             | \$35 | <input type="checkbox"/> SOLAR TODAY Subscriber only | \$29   |

### ASES Options

- |                                                                               |                                                                                         |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <input type="checkbox"/> Do not rent my name                                  | <input type="checkbox"/> I do not wish to receive the Sunbeam on-line newsletter        |
| <input type="checkbox"/> I do not wish to receive Solar Action Network Alerts | <input type="checkbox"/> I do not wish to be listed in the on-line Membership Directory |

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Payment options:  Check or money order enclosed  Visa  MasterCard

Credit Card # \_\_\_\_\_ Exp. Date: \_\_\_\_\_ Signature \_\_\_\_\_

Credit Card Billing Address (if different from above) \_\_\_\_\_

Mail this form with payment to: NMSEA, 1009 Bradbury Dr. SE #35, Albuquerque, NM 87106.  
For more information, please call 505-246-0400 or 888-886-6765 or visit [www.nmsea.org](http://www.nmsea.org).

**The SunPaper**

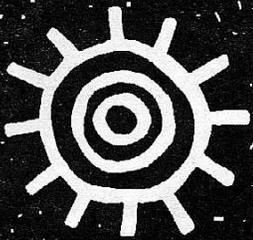
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**Mission Statement**

We promote clean, renewable energy and sustainability in New Mexico through education, empowerment, collaboration and advocacy.

Please consider investing your time and/or money toward solar energy education through NMSEA.

**Vision Statement**

We envision a thriving, bio-diverse earth, with civilization powered by clean, renewable and sustainable energy from the sun.

**Coming Events**

- March 23 **Board of Directors Meeting**, Saturday, NMSEA office, 1009 Bradbury Dr. SE, Albuquerque, 87106. Members welcome. Meeting noon to 3:00PM, potluck lunch starting at 11:30AM.
- March 26, April 23 **Albuquerque Chapter Meetings** at REI, 1550 Mercantile NE, 6:00 to 8:00 p.m.
- April 16-20 **National ASES Solar Energy Conference**, Baltimore Convention Center, Maryland. See p. 10.
- April 27, 28 **NMSEA Solar Fiesta**, Santa Fe Community College Campus. See page 1.