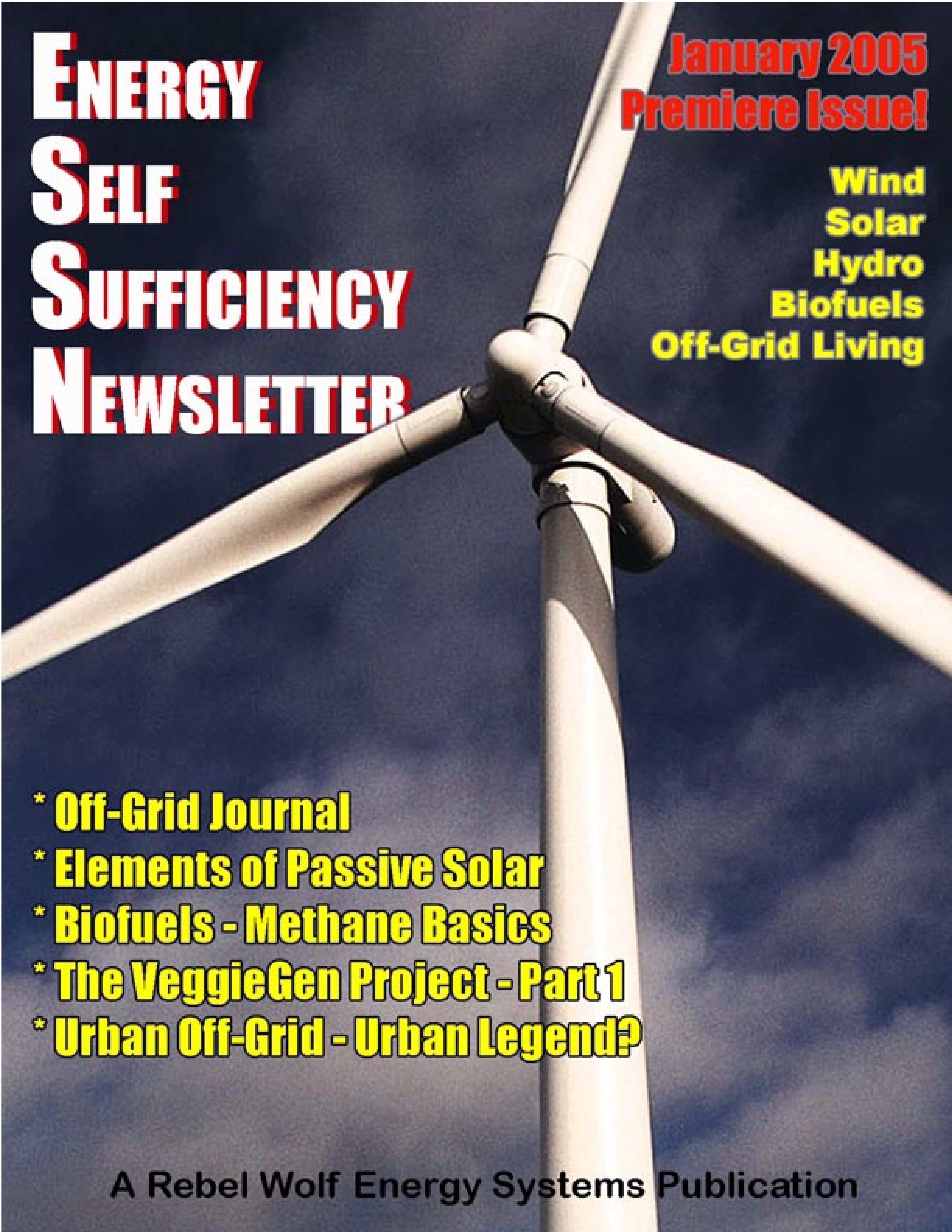
ENERGY SELF SUFFICIENCY NEWSLETTER

January 2005
Premiere Issue!

Wind
Solar
Hydro
Biofuels
Off-Grid Living



* Off-Grid Journal
* Elements of Passive Solar
* Biofuels - Methane Basics
* The VeggieGen Project - Part 1
* Urban Off-Grid - Urban Legend?

A Rebel Wolf Energy Systems Publication

Welcome to ESSN!

Welcome to the first issue of Energy Self Sufficiency Newsletter. We're dedicated to furthering the renewable energy movement and providing current news and information for those who choose to take responsibility for generating their own energy, and who choose to preserve the resources of Mother Earth in the process.

Our publication is free and will always remain so. It will be available for download as a PDF file here at Rebel Wolf Online each month. As time progresses, we'll have more ads in an effort to offset the costs involved in the production of the publication. But, I promise you that we will never become advertising-driven. We will always provide our readers with accurate, unbiased information and if any of our advertisers feel that our content conflicts with their advertising, they are free to withdraw their ads. We will never compromise our editoral content to satisfy the desires of our advertisers. You have my word on that.

Let's talk about our cover for a moment. It really does apply to our content this month but, admittedly, somewhat obliquely. We all dream of megawatts but, in reality, on a good day we're stuck with kilowatts at the very best. Our cover image, a great wind turbine at a grid connected wind farm, points out the true dichotomy in the world of renewable energy.

This publication acknowledges the stellar contribution of the giant wind farms, but let me affirm our ongoing dedication to the homestead based efforts of the many folks around the world who are working on a daily basis to achieve true energy self sufficiency and to live their lives unencumbered by the existing utility grid. This publication is for you. We will be there with you, and in many cases we have been there before you. Together, we will gain true energy independence.

Our intention is not to replace any existing RE publication in your reading habits, but rather to provide a fresh viewpoint for your consideration.

We'll be a bit more relaxed than most magazines, more laid-back, so to speak. But we'll always provide accurate info with detailed "how-to" instructions for all the projects we feature. Thanks for being with us, and please share ESSN with your friends.

Our minds, and our email inbox, are always open to your input and your suggestions. Please let us know how we're doing. Our goal, and our reason for being, is to fill your needs. Please let us know if we do that.
Larry D. Barr, Editor

Submissions Needed

I've been very fortunate in enlisting the talent, skill and experience of Steve Spence, Laren Corie, Maria Alovert, Mike Nixon, Lisa Craig and Al Rutan as contributing editors to this publication. But, the seven of us can't do it alone. We need your contributions too.

ESSN needs articles of all kinds -- Do It Yourself, How I Did It, New Ideas or Inventions, What If? and, very important, Why We Should.

At this time, we can't afford to pay you for your article (maybe someday), but you'll have the satisfaction of being a published writer. And, the even greater satisfaction of helping to spread the word about renewable and alternative energy sources and their use.

We welcome all types of submissions, but we're especially looking for articles describing your successes at off-grid living and those about DIY projects for the utilization of renewable energy. You may have created a new device, or modified an existing one for RE use. Either way, we want to publish your story. Please include photos and circuit diagrams with your submission. Send submissions to: essn@rebelwolf.com

From The Editor's Laptop

by Larry D. Barr

The first issue of any new publication is always an exciting event. This one is, for me, more so than any other that I've worked on. First, it's the first online publication I've been involved with and, second, it's about my favorite subjects; renewable energy, off-grid living and achieving a sustainable lifestyle.

I'm looking forward to finding out where we'll go in the future with ESSN. Regardless of the plan, a new publication takes on a life of its own, and tends to find its own way. I'm sure we'll learn things we didn't know, maybe even some things we didn't want to know. I know we'll learn a lot about RE sources, how to build our own projects and what other folks are doing at their homesteads.

Our focus will be on homestead sized projects, single family dwellings, in either urban or rural areas. It's easier, I believe, to become energy self sufficient in a rural area. But, just because you're living in town, don't let that keep you from trying. I'm in town right now, and I'm going to be installing a PV system in a rental house. Yes, with the landlord's permission.

Although we're certainly in favor of large grid-connected RE systems such as wind farms, solar electrical generation, and renewably produced hydorgen, we won't be discussing these because they are not the reason we're here. I'd originally planned on writing an article for this issue pointing out the shortcomings in the "Hydrogen Highway" plan currently being advocated in the US. But, I scrapped the article because it's out of our frame of reference, and would only take space away from our primary focus.

We will stay focussed, I guarantee that. And we have some great contributors onboard that will share their knowledge and experience with us each month. I hope that you'll find information each month in our electronic pages that will be useful to you in your quest for energy self sufficiency. I also encourage you to send us your stories of your experiences with renewable energy. We'll be glad to act as a clearinghouse for articles from all over, but we can't tell the whole story without your input. Send your articles to: essn@rebelwolf.com

ldb

The VeggieGen Project, Part 1of 2

by Steve Spence

When we first moved off-grid, our power system consisted of a 90 watt PV array, a 300 watt wind turbine, a 675 ah battery pack (six Trojan T105 batteries), a 2kw inverter, and a 5kw gas generator. The generator was too small to fully charge the batteries, run the well (1/2 hp Gould Jet Pump), the front loader washer and the propane dryer. Additionally, it was a standby generator being put to semi-fulltime use, and wasn't holding up to the duty cycle. We needed something bigger, that would last for years of full time service, cleaner for the environment, and easier on the budget.

So the search began. We talked with many vendors, searched the Internet, and finally found our choice. After extensive conversations with Jim and Pari at Affordable Power, we chose a well used, but tested good, Detroit Diesel 2-71 powered, 12.5 kw rated generator set. This unit had seen many years of service as a power unit for a railroad reefer (refrigerator car). Although the number of hours on the engine are unknown, it starts and runs well, and supplies more than the rated power. Another factor in our decision was the legendary reliability of the 71 Series Detroit engines, which were in production for over 50 years.

We placed our order, and watched the progress of the long journey from Idaho to NY on the shipping company's tracking page. Many of you watched with us, as we posted the tracking link on our blog at www.green-trust.org. After just over a week on the road, the VeggieGen finally arrived, putting joy in the hearts of those of us here at Green Trust, until we realized that a 2000 lb generator doesn't easily come off a truck that only has a 1000 lb. lift gate. Our neighbor, Bob, came to our rescue with his backhoe, and supported the lift gate with his bucket, and then lifted the engine into place by hooking chains from the lift points on the generator to the bucket of his backhoe.

I wired the generator into the house, using a automatic transfer switch from Back Woods Solar. With the gen off, power is supplied to the house from the battery

Continued on next page . . .

Steve Spence with the VeggieGen on delivery day

VeggieGen, Pt. 1

Continued from previous page

pack, through the inverter. When the gen is started, the transfer switch transfers the load to the gen and back to the inverter when the gen turns off.

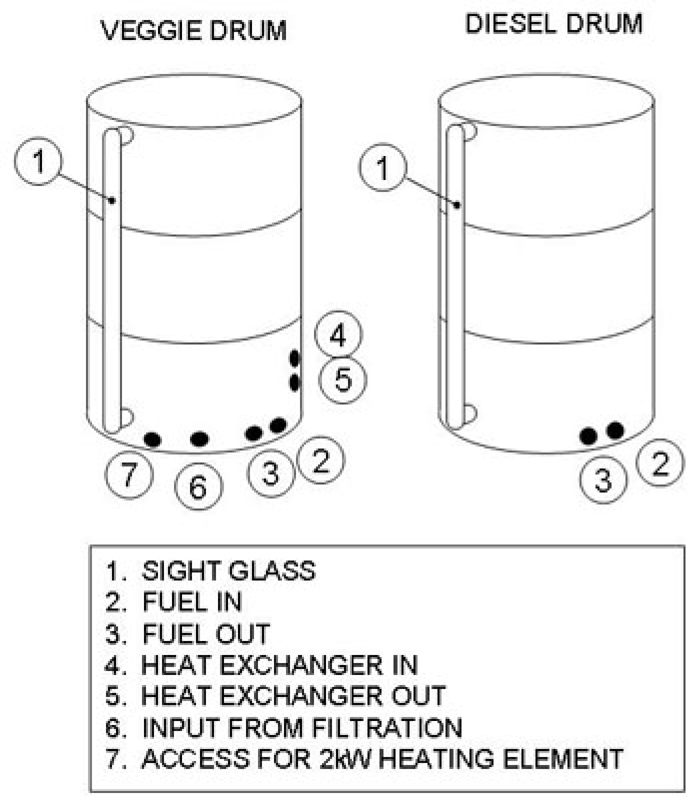
Now that we have the system working, how does this benefit the environment, and our budget? Although the system consumes about 3/4 gallon of fuel per hour, depending on load, we aren't running diesel. We pick up free waste vegetable oil (WVO) from the restaurants when they are finished frying. In warm weather the gen burns V100, what we call 100% WVO. In cooler weather, we mixed kerosene with the veggie oil (V50), as we designed a combination electric/coolant heated veggie oil system. Now the design is complete, and we have started building the heating/filtration system for easy, high volume V100 filtration and consumption.

As per the diagrams, we have two tanks, one for diesel, and one for veggie oil. We start up on diesel, and a 2kw electric element in the veggie tank starts warming the oil. A Hayden transmission cooler takes engine coolant and also heats the oil. At 100F, the electric element shuts off, and the coolant heater continues to heat the oil. A electric fuel valve switches the fuel supply from the diesel tank to the veggie tank, and V100 is consumed until it's time to shutdown the engine. At that time, supply is switched back to diesel to clean the veggie out of the fuel system for shutdown.

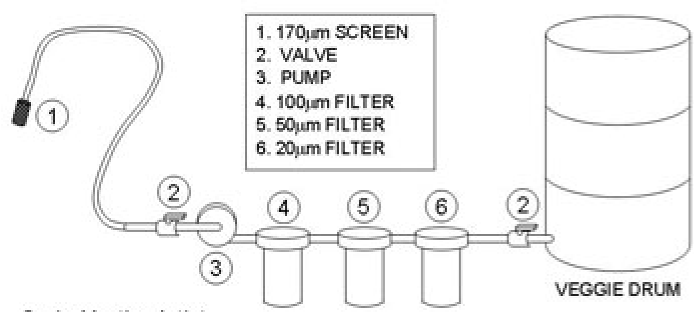
The only unscheduled downtime we have had with this unit was when we rebuilt the starter with higher capacity coils for more torque (we toasted the old original coils), and when we replaced the clogged and frozen fuel filters (common NAPA stocked items) after forgetting to shutdown on diesel. Filters now have 12volt 68 watt heating pads being installed.

Next month we will show you how to build the heated fuel system, and the high volume veggie oil filtration system. All sources, part numbers and prices for the various accessories and consumables will be posted.

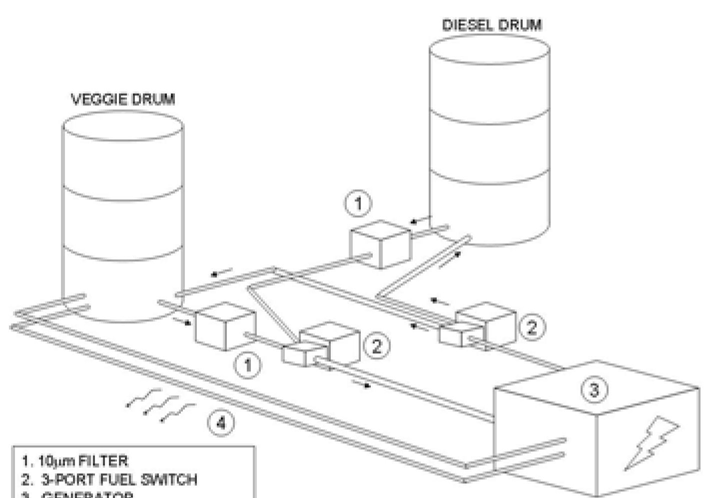
www.affordablepower.com
www.backwoodssolar.com
www.green-trust.org



Craig Martin, Artist



Craig Martin, Artist



Craig Martin, Artist

Biofuels -- The Series

This article is the first installment in an ongoing series that will explore methane, ethanol, biodiesel and waste vegetable oil (WVO). We'll start at the beginning with each one and continue as we build a base of knowledge on the subject. Each article will be accompanied by photos and/or diagrams, so that you'll be able build your system to produce biofuel at your place. We begin the series with methane (CH4). Al Rutan is our Contributing Editor on the subject and is regarded as one of the masters of the craft. There's a short bio of Al elsewhere in this issue. It's good reading so try not to miss it. ldb

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Utilizing Natural Design Parameters for Methane Digesters

by Al Rutan

The process of anaerobic fermentation is not "fussy." The reason this can be said is because we know that it occurs in lake bottoms and bogs, swamps and landfills. Obviously, what goes into a landfill is put there without any "rhyme or reason." The biogas formation that results does so from organic material that was simply dumped and then covered with dirt to exclude air.

However, it takes from 50 to 100 years for a landfill to be generating a significant amount of biogas. And this is accomplished without any stirring or heating. But if we want the most biogas possible in the shortest length of time, we need to heed the parameters for the optimum conditions of the process.

We like to think of ourselves as "engineers." This is not the best mindset to have when working with living creatures. Rather, we should better think of ourselves first and foremost as "biologists." An engineer tends to impose on living creatures what he thinks they should have. A biologist is more inclined to be sensitive to what a living organism wants and needs.

Over the last century sewage engineers in many places throughout the world have had time and money at their disposal to study and document anaerobic activity at close range in their labs. We know from this research that optimum warmth is a major factor in rapid gas formation and that gentle mixing also is important. Both these actions mimic what happens in the gut of warm-blooded animals, including ourselves.

Another feature of the process that isn't so readily recognized is the fact that in the gut of an animal the anus is at the end of a long tube. We call it the intestine. While the stomach of an animal is similar to a "pot" the major part of digestion occurs in the intestine and not the stomach. The stomach is a preparation place for what occurs in the gut. So if we adhere to a "natural pattern," the digester is going to be a tube rather than a "bulk container." This makes possible the process of digestion at different points along a route. We are simulating what occurs in a gut.

A gut excludes air, has a gentle, involuntary mixing action we call "peristalsis," and provides constant, even warmth throughout at just the right temperature in a living animal. Given these guidelines, we can look at what a well-designed biogas system should display. We want to accomplish (1) exclusion of air, (2) constant, optimum warmth, and (3) gentle mixing with a minimum of "machinery" and controls.

It is very easy to start designating all kinds of "bells and whistles" to a project. The genius of the best design is to have as little dependence on "machinery" such as pumps and motors with controls as possible. These are the things that shoot up the cost of a system and the bacteria are not impressed..

Monitoring is important. But there are various levels of complexity when it comes to monitoring. We require only the simplest instruments possible. A good design is going to use the natural forces of gravity and and thermosiphon whenever possible to reach the necessary guidelines. This is what we call common sense.

Continued on Next Page

Natural Methane Digester Design . . . cont.

The big challenge for any project is the manner in which warmth is supplied to the digester. Because heat rises the only way to move heat downward if the source of heat is above the digester is with a circulating pump. If this is the case, the circulating pump must run constantly. Any pump running constantly is obviously a huge energy drain.

In the best of all worlds, the design that requires the least expenditure of energy is going to supply warmth to the entire bottom surface of the digester tank. This is done not with pipes or lines of any type but with a “warmth chamber” that covers the entire bottom surface of the digester.

So the heat source, no matter what it is, must be below the bottom surface of the digester, similar to the manner in which the double boiler on a kitchen stove provides even warmth to the unit on top.

For moving warmth around, we need to employ the simple physical action of thermosiphon - the circulation of warmth either in air or liquid by the displacement of what is cooler by what is warmer. Thus warmth can be “moved” if we harness a completely natural process. Again this is really cheap. No pump required.

And for moving the methane gas from one place to another, there is nothing less expensive and more positive in its action than a gasholder that uses the force of gravity to exert pressure on the gas. A flexible fabric can exert pressure, but not evenly between maximum expansion and half-fill. With a flexible fabric for containing gas the pressure is not a constant force. But in a solid vessel with a provision for expansion serving as a gasholder the pressure is constant and consistent because the force of gravity is evenly applied no matter how full or near empty the gasholder is. And again, the force of gravity is really cheap.

If gravity is not employed to move the gas, then a fuel pump must be. This is another piece of equipment that is not necessary in a project of better design.

One last observation about capturing heat from machinery. A common way of picking up heat from a generator is from the exhaust by means of a heat exchanger.

My criticism of this approach is not that it doesn’t work but that only a fraction of the heat so generated is “captured.” If one puts one’s hand on the exhaust pipe after the heat exchanger, the pipe is still exceedingly hot. When heat is being dumped it is not being captured.

The Co-Ray-Vac people have demonstrated with their product (an infra-red heater) that one has not “squeezed” all the heat from an exhaust pipe until one can comfortably lay one’s hand on the end of the exhaust pipe. Then we are sure that virtually all the available heat has been transferred to a heat exchanger. Anything short of this means that valuable and expensive heat is being lost to the atmosphere. This is sheer waste and poor design.

What are the best sources of warmth for keeping a digester at optimum warmth? Obviously, one can burn some of the gas produced once the digester is up and running. But this is not the first choice for supplying warmth. Most likely we want all the biogas produced to more directly provide for our needs. Warmth from the sun is the most obvious choice for acquiring digester warmth. And we can think of no better source for harnessing solar warmth than heat tubes. We recommend the equipment available from Back To The Future Solar:

http://www.btfsolar.com

The details for various sized biogas systems can be found on the Methane Gas website:

http://www.methane-gas.com

Click on the tab that says “How To Order” for the specifics found with the Plans for various sized digester systems.

Contact Al Rutan at:

RUTAN RESEARCH
P O Box 50, Liberty Center IA 50145-0050
Phone 612 805 9377
Website: http://www.methane-gas.com

Check out the pictures ofAl and some of the gear described in the article on the next page . . .

Al Rutan with the digester and warmth chamber

Welder Ross Wood holds the mixing mechanism

Pictured here are views of a methane gas digester system small enough to sit on a sturdy table, yet large enough to produce enough methane gas to fire a Bunsen burner. The reason this digester has been assembled is to visually demonstrate the fact that a digester does not have to be large or expensive in order to be practical.

A digester does not have to be large in order to work well. Gas produced from living creatures occurs in all kinds of situations. All warm blooded animals produce gas in the gut—some more than others. The thing that is essential to understand when harnessing the process for our own energy needs is that both the chemistry and the biology requirements of the organisms that work anaerobically need to be kept in mind. Even a small digester can demonstrate these parameters.

In the picture we see a tank before it is covered with insulation. Beneath the tank is a foil lined enclosure that works as a warmth chamber, providing even warmth for the entire tank.

There is a mixing mechanism in the tank which is turned from time to time by the crank handle at one end of the tank. This mixing mechanism is important. The bacteria that digest the organic material do not have fins as fish do making it possible to swim after food. With bacteria either food must be taken to them or they must be taken to the food. A gentle mixing action supplies this needed motion.

This digester is a displacement flow design. The fill pipe is at one end. The exit pipe is at the other. The organic material that does not become burnable gas leaves the digester via the exit pipe. Gas production is continuous.

Ross with the gasholder

Elements of Passive Solar

by Laren Corie

Passive Solar Heating in the Cold Cloudy North

(when you stick it where the sun don't shine)

As I thought about what to write for this first issue of ESSN, I recognized the wisdom of Larry's suggestion to present an overview of passive Solar building design. However, I also suspect that most of you are already fairly familiar with the basics, and besides, the Internet, and all those leftover Solar books from the 70s and 80s do a really good job of covering that historic stuff. So, it didn't seem all too useful, for me to just go over the same old material, for the five hundredth time. If there are terms you don't know, and I don't explain them, a simple web search should furnish you with several definitions.

Anyway, I thought a while longer, in a few different directions, and decided that, of the many messages I want to get across, the most important may be, that every climate is different, and that passive Solar design between climates, can vary just as widely as the weather. Almost all of the popular information I see, is about passive Solar designs that are wonderful for a consistently sunny winter climate. Colorado and New Mexico come to mind. These climates have low humidity, clear skies, wide daily temperature swings, consistent sunshine, and often moderate, average annual temperatures. That type of climate is a passive Solar dreamland, ideal for very simple passive systems, which function primarily through the stabilizing effect of thermal mass, plus a little boost from pointing some glass at the winter sun. They have little need to be highly efficient Solar collectors. This simple strategy worked very well for the pueblos, and they didn't even have glass or insulation. There are a few variations, but basically; the sun shines through south facing windows, onto some sort of thermal mass (heavy material like stone, concrete, adobe, water, etc), which only heats up a little bit (if designed right), then later releases its heat out to the living space, once the house drops a few degrees in temperature.

The simplest systems are called "Direct Gain" with the winter sunlight shining into the house through south facing windows. When a massive wall, or containers of water are located between the living space and the windows, then it's called "Indirect Gain" If the space between the windows and that mass is wide enough to walk in, then it becomes a "Solar Greenhouse" or "Isolated Gain". Solar panels are a form of Isolated Gain, too. There are also "Thermal Siphon" systems, which move warm air from an Isolated Gain collector to the house or a heat storage, with the buoyancy of heated air, in tune with the old adage "Heat rises." If a fan or pump helps move the heat, it's then called "Hybrid." You can begin to see how these terms may have very blurred edges, and can often not serve well to actually define how a systems works. All of these systems can gain a lot of energy in a climate with consistent winter sunshine, but most also lose a lot once the sun sets. Just because they are excellent for a climate with abundant sunshine is no guarantee they will even perform as well as a non-Solar house might, on most December days, somewhere else. That is the message of this article.

So, what do we do, if these systems will not heat a house in the Great Lakes, or New England regions, or much of Canada, where the winters are cold enough, that the heat is certainly needed, but there are months when the days are extremely short, and there are many more cloudy days than sunny ones? Do we have to completely forget about passive Solar technologies? Must we turn to Solar panels, in an active system? What are our best options? The good news is that there are good options, which are similar in many ways, to the standard passive systems of the west, but have their distinct differences, too

Later, in this article we will take a look at how these traditional passive configurations might work in a typical Mid-western/Great Lakes locale, right on the line between what are considered the temperate and cold zones, South Bend, Indiana. This location gets some of the "Lake Effect" from the snow and cloud machine of Lake Michigan, and some of its winter weather straight off the Great Plains. It represents a good mix of the

Continued on next page

Passive Solar, continued . . .

weather that makes passive Solar heating design a challenge, but still workable, once we understand the issues, and can assign some numbers to them.

We will also look at some of the passive Solar strategies that do work well, in this fairly cloudy and cold Solar climate. A major difference, for a passive Solar design to work in one of these more challenging locations, is that it must store the heat in a way that it will not be lost back out the collector glass. These systems will include Low Thermal Mass Sunspaces (sun porches) which go cold at night, wall mounted Solar air panels, and Direct Gain windows, with tightly sealed high R-Value insulating, shutters, shades, or curtains.

There are areas, of Michigan and other states, that only receive a small fraction as much sunlight, for the amount of heating they need, as most of Colorado and New Mexico. It is very common for there to only be four or five hours of sunlight to heat the house for typically three days, and quite often as many as six. For instance, in the south eastern Michigan area, in the first eighteen days, of the month between Thanksgiving and Christmas, twice, there were five totally overcast days in a row. Not once, the whole month, did two clear sunny days occur in a row. The average temperature was 25-30°F. That is the mildest climate in Michigan.

In contrast Pueblo, Colorado, averaged 31°F, and got 2.85 times the sunlight per HDD* as south eastern, Michigan. 3.55 times the sunlight per HDD as Traverse City, Michigan. Traverse has 4.3 times the HDDs, per hour of sunshine in December, as Albuquerque, NM. That is just the figures for December.

*HDD Heating Degree-Days A heating degree-day is a measurement of heating need, equal to one degree below 65°F, for a full 24 hours.

Let's look at the amount of sunlight per day, with the baseline being Albuquerque (average for December in BTU/ft² day, on south facing windows)

Albuquerque, NM	1610	100%
Pueblo, CO	1480	92%
Flint, MI	580	36%
Traverse City, MI	490	30%

Now compare the heating loads.....

Traverse City, MI	133%
Flint, MI	127%
Pueblo, CO	114%
Albuquerque, NM	100%

Traverse City requires a third more heat, from 70% less sunshine. It should be obvious from this, that a house designed for Albuquerque, will not perform the same in Traverse.

To show the difference between the basic passive Solar system strategies, for South Bend, I will divide them into two basic groups. The first group includes simple south facing windows (Direct Gain), and massive walls behind glass (Indirect Gain), like most Solar greenhouses, water walls, or mass walls. For the purpose of this article, which will only deal with loss and gain, through the collector, instead of temperature stability, I will lump this group together. The second group will include Low Thermal-Mass Sunspaces, Direct Gain windows with consistently used night/cloudy weather window insulation, and wall mounted Solar air panels, with or without fans. It is not my objective to compare exact systems, only the idea of isolating the collector heat loss, from the house and the heat storage. I will keep this simple, and just do basic Solar gain and heat loss calculations. Perhaps in a future article I will go into more detail, but right now I just want to show the rough relationship of these very different strategies, when they encounter a Midwestern winter.

The house that I will look at has a living space daily heat loss, in the heart of the winter, not counting the south glass, of about 300,000BTUs. That can represent a variety of different houses. The area of south facing glass is given in three options. The Group II glass area is 220ft.² That represents roughly 15% of the house floor area. There is also a 220ft² example in Group I, for direct comparison. The next larger Group I area (294ft²) equals about 20% of the house floor area. The largest Group I glass area equals a third of the house floor area. The group I options are all single glazed. Double glazing would generally not make a big difference, because it has almost all of its heat loss during the time that it is also gaining far more energy from the sun shining in.

Continued on next page . . .

Passive Solar, continued . . .

Double glazing, on a low mass sunspace, an air panel, or a direct gain window with consistent night insulation usage, can block more incoming than outgoing energy.

The Group II collectors will show three glazing options, include typical R2 double glazing, R3 Low-E glass, and ultra high performance R4.55 (.55 Solar transmittance) windows, which would add thousands of dollars to the cost of the house.

Group I

Low Mass Sunspaces
Wall Mounted Air Panels
Direct Gain Windows with High R Night Insulation

Group II

Direct Gain Windows (no night insulation)
Indirect Gain. (mass walls, etc)
Sunspaces and Greenhouses, with thermal mass

Table 1 (on Page 12) shows approximate net Solar Gain per day.

Table 2 (on Page 12) is a rough estimate of heating percentages. These are quite rough, since they encompass so many variables. I just guesstimated, without calculating the actual degree-day ratios of the different months. I am confident that they are adequately representative, for this general purpose. These figures are only intended for comparison between the various collector, and glazing options, in a broad variety of situations.

Anyway, those are fast and rough, but they reveal that the systems, which are standard practice for the western climates, and are the only systems featured in most of the passive Solar books, are far from well suited for the climates of the upper Midwest and North Eastern states. And, that there exists a different set of systems which can do very well there.. These will be addressed in more detail in future articles.

All these systems should give higher averages, when the entire heating season, which includes milder months, is taken into consideration. The real-world results will also be highly dependent on the efficiency of the heat storage at keeping the average sunspace operating temperatures down to 80°F (for instance 65° inlet, 95° outlet).

Variables, which could radically detract from the performance, include adding thermal mass to the sunspace interior, having glass end walls, shading of the glass, and poor air movement from the sunspace to the house and storage. Group I Direct Gain performance would be affected negatively by less than diligent use of window insulation. Group II Direct Gain performance could be enhanced by the use of window insulation.

All houses need windows for light, and ventilation. The windows could be located in the wall between a sunspace and house. This reduces the need for, and effectiveness of night insulation on such windows, but may require additional considerations for summer ventilation.

A good basic rule for higher efficiency is; store the heat inside the house, not in the collector, and reduce all your heat losses.

Though very high quality windows out perform less expensive units, the super windows will save very little of this house's annual heating, compared to the R3 Low-E direct gain windows At that rate, it would take beyond the replacement time of the windows, for their energy savings to ever equal their additional cost.

This article has been very general, and has made many assumptions that would not be made when looking at a specific real-world house. It is only intended as a basic demonstration, to raise your awareness of performance differences, between these groups of passive collector strategies, for cold climates with limited available sunshine.

The simple elegance of passive Solar design, with its basic south facing windows, and sunlight shining on heavy materials, is deceiving. Though it is true, that during most winter months, in most climates, a south fac-

Continued on next page . . .

Passive Solar, continued . . .

ing window will gain more heat than it loses, it is never that simple, and it is very easy to go far, and get little in return, except a cold chill as you walk past your wall of glass. A house, that gains great amounts of heat, while the sun shines, just to lose most of it back out the same glass, soon after, is not a comfortable house. Do not build the wrong kind of house, for the right reasons, in the wrong climate.

In future articles, I will be addressing many ways to apply passive, active, and hybrid Solar approaches to both new and existing homes. Next month's article will show how to build very simple, extremely low cost sunspaces on existing houses, to save many times their cost, and provide a place to bask in the heat of the mid-winter sun.

May your days be sunny, and your sunspace warm,

Table 1

	Group I			Group II-220ft²		
	497ft²	294ft²	220ft²	(R2)	(R3)	(R4.55)
November	226,000	134,000	100,000	40,000	51,000	52,000
December	134,000	79,000	59,000	(-)14,000	10,000	22,000
January	199,000	118,000	88,000	0	25,000	37,000
February	259,000	153,000	115,000	32,000	55,000	61,000
March	279,000	165,000	123,000	59,000	77,000	76,000

Table 2

	Group I			Group II-220ft²		
	497ft²	294ft²	220ft²	(R2)	(R3)	(R4.55)
November	100%	65%	49%	18%	23%	24%
December	45%	26%	20%	0	3%	7%
January	66%	39%	29%	0	8%	12%
February	90%	53%	40%	10%	18%	20%
March	100%	85%	63%	30%	40%	39%
Average	80%	54%	40%	12%	19%	20%

Editor's Note: Elements of Passive Solar is a monthly feature in ESSN. During the ensuing months Laren will cover many varied topics relating to the subject. If you have questions of general interest regarding Passive Solar construction, email them to essn@rebelwolf.com, subject "Passive Solar". ldb

Meet the Writers

Just so you'll knowwhose writings you're reading, this section of ESSN will be a regular feature until we've introduced all our regular writers. I just think you should have a chance to meet all of us that work on this project every month. ldb

Steve Spence

Professionally, I'm an IT Engineer (Executive Level) and Electronics Tech. Philosophically, I'm a Green Conservative, and probably would have been a hippie in the 60's if I had been old enough. I live off grid, with Solar (PV), Wind, and veggie oil fueled diesel generator power. Contact us at sspence@green-trust.org or call (315)328-5726 More about me at:
http://www.blogger.com/profile/1632891

Al Rutan

I am asked from time to time how I became interested in methane gas production. It goes back about 40 years. In the 60's I was teaching high school in eastern Montana. The school was small so we on faculty came to know not only the kids but their families as well.

Eastern Montana is ranching country and very dry. The average annual rainfall is only 11 inches of precip in an entire year. The strip mining of coal was well underway by then. The many ranching families I came to know were distraught over the strip mining. They quickly impressed on me the fact that one strip mine adversely affects the ground water table for 1,000 square miles.

I remember asking one rancher, "How big is your ranch?" He said, "Forty sections." I responded, "That's huge." He said, "No. It's really small. Even though a section is a square mile of land, this area is so dry we can only graze 13 head of cattle on a section. If we put 14 head on a section, we are overgrazing." So from his perspective of 13 head of cattle times 40 he was correct. It was a small ranch.

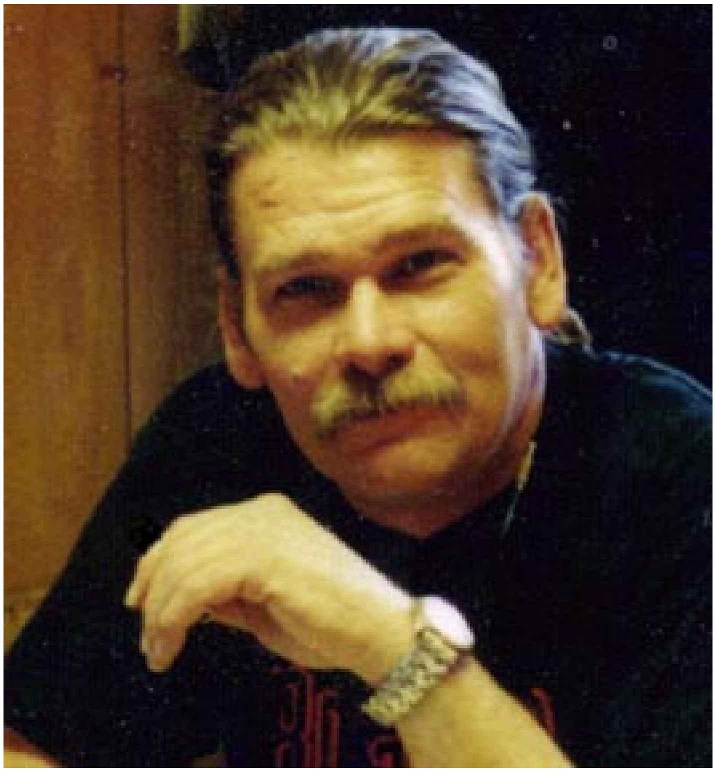
My delving into waste to energy conversion was a response to the ruining of the land in our western States via coal mining. I began at the local sewage plants where organic matter has been converted into useable energy for over 100 years. And I concluded that there was a lot more organic material lying around that could be so converted.

There are many places on the earth where we are destroying the quality of life for every living thing by the deforestation of the land as well as mining. Once again correct thinking dictates that we have a sensible regard for the world in which we live.

Al Rutan

Continued on next page . . .

Meet the Writers . . . Continued



Larry D. Barr

I've been interested in electronic and electrical gadgets since I was a kid. I began to see the light, so to speak, about green living, sustainability and renewable energy in my early 20s. I worked as an electrician for 8 years during that time, and managed to sneak in a bit over a year of off-grid living, using a Wincharger 1222H, a Honda 3500 genset and a Redi-Line 1600 watt rotary inverter. I really enjoy the feeling of freedom and independence of that lifestyle -- and knowing that my power is coming from Nature makes it even better. I'm on-grid now, but planning to be off-grid again soon.

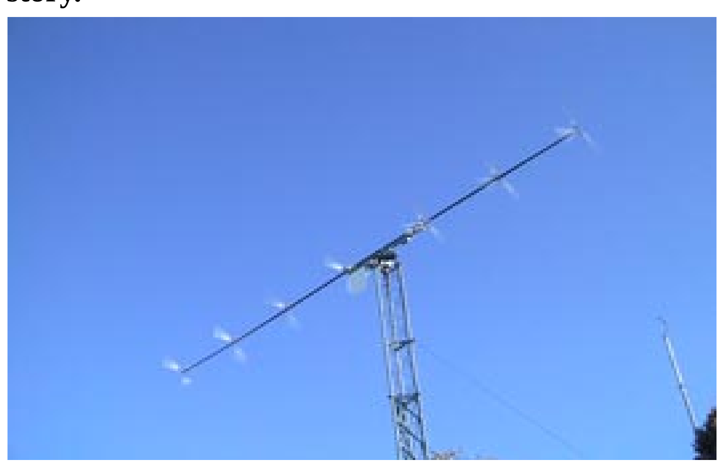
I started Rebel Wolf Energy Systems to facilitate my research and development into the homestead utilization of renewable energy sources and ESSN is the culmination of an idea that first came to me in 1991. It's a way to help spread the word about renewable energy and sustainable living to folks around the world.

When I'm not at my 'real' job, Assistant Planetarium Director for Tarleton State University, I'm working on ESSN, trying to develop a new device to make life more convenient or more efficient for those who are seeking energy self sufficiency or, occasionally, doing a bit of traveling, photography or videography.

Coming in February 2005

VeggieGen, Part 2 -- The completion of the project. VG is shown above in the framed but uncovered GeoQuon at the Spence homestead.

GO Inc.'s sustainable living demo project in an old flakeboard plant in Evanston, IL. We'll have the full story.



More Rotors=More Power, Doug Selsam's Superturbine

Urban Off-Grid -- Urban Legend?

Is it possible to go off-grid in the middle of a small town in Texas?

by Larry D. Barr

First off, I guess we need to ask ourselves if a town just shy of 16 thousand folks actually constitutes an urban area. Or is it just a really populated rural area? Well, it's an incorporated city, with all the regulations that go along with that condition so, just for purposes of this experiment, let's consider it to be urban. OK?

I live in a small (~700 ft^2) commercial building in a generally residential district. It's a one room building that used to be a small construction company's office. The building lends itself well to my single lifestyle and I like it. I like it so well that I'm thinking about buying it. The price is right and the only drawback is that it doesn't have a big enough yard to have a dog.

I've enacted all of the usual conservation measures and the next step is to start using RE sources to supply some of my electrical requirements. Let's talk for a minute about what my loads are. Regrettably, the house is all electric. That means that the fridge, range, water heater and window A/C are the obstacles to my energy independence. So, we'll start with some of the easier problems to solve. I have two 115 Ah deep cycle batteries, a 1000 watt MSW inverter, a 64 watt Uni-Solar PV module and a Xantrex C12 charge controller. I'll add a couple more batteries and another PV module as I can.

So, what will I run off the PV system? Actually, just about everything except the aforementioned devices. I just picked up a 600 watt microwave oven with a mechanical timer. According to the nameplate, it only draws 8 amps of 120 VAC. Theoretically, it should run off the inverter. We'll see, once the system's up and running.

The indispensable air condtioner is a real problem. If there's one thing you can't do without in Texas in the summer, it's A/C. Like they say, "It's not the heat, it's the humidity." Oh, so true. In drier climes, I'd run a 12 VDC swamp cooler and the problem would be solved. But not here. Until the air conditioner can be made to lose the grid, my conversion to energy self sufficiency will only be a partial one. It's a power hungry 220 VAC unit.

Since, except for 2 built-in fluorescent fixtures, I've replaced every bulb in the house with CFLs, the lighting load is very light (no pun intended). However, since I can't really modify the existing electrical system in the rent house, I'll need to augment the existing lighting system with my own off grid setup. So, I'm going to run a few additional wires without tearing into the walls. I'll use the clamp-on utility lights with CFLs in them.

The other loads I can't live without are: computer (it's a laptop, but Dell hasn't released a 12 VDC adapter for it yet), printer, DSL modem, USB hub, speakers (my total sound system) and the 9" AC/DC TV with a built-in DVD player.

Over on the workbench are a light, Dremel and a soldering iron. Now and then I drag out the drill. Those will run off the inverter if needed. On occasion, I'll need to fire up the oscilloscope,the battery charger, 120 VAC MIG welder or the dual 500 watt halogen work lights. But those will run off the grid.

So, we're looking at basic lighting, the computer equipment and TV and tunes. Plus the small loads on the workbench. Just what do I gain by doing a partial conversion to RE? One, the satisfaction of making the decision and taking the action. Two, basic conveniences and capabilities in the event of a power failure and, three, a reduction in the amount of power I'm drawing from the grid and a corresponding reduction in my electric bill each month and the pollution I'm contributing to.

Right now, I'm turning the water heater off when I know I won't need hot water. That helps the bill. If I buy the house, I'll convert the H_2O heater, fridge and range to propane. That leaves only the A/C as a major problem. Propane? If I can find one. Solar? I'd love to. Haven't found one yet. But I know folks are making large solar A/C units. Just not home-sized at this time. The truly big hang-up is that converting major appliances to propane may get me off-grid. But it doesn't make me truly energy self sufficient. This conversion will be an ongoing project here in ESSN. See you next month with pictures.

Off-Grid Journal

A Monthly Feature by
Steve Spence, Director
Green-Trust.org

Before I show you how we live off-grid, some background is in order.

Growing up as a child, my parents exposed me to a number of skills & experiences that were "survival" or "self sufficient" in nature. We raised goats for meat and milk, rabbits for meat, chickens for meat and eggs, and grew a garden. My parents were missionaries, and converted an old farm into a summer camp for children. We had volunteers show up every year to help build the facilities, so I was 'gofer' for a variety of craftsmen. I learned carpentry, plumbing, HVAC, electrical, mechanical, and other construction skills that would come in handy as an adult.

My dad was a subscriber to The Mother Earth News, so I started learning about self sufficiency, environmentalism, cooking and canning, boiling maple syrup, and other practical lessons. We even converted a few vans and trucks into "RV's".

As I got older, my interests went in a different direction. I took an interest in computers and electronics, and built a career as a network engineer/executive. I married, had 3 children, and didn't think about being self sufficient or living lightly on the earth until . . .

Y2K, that phenomenon of the millenium where half the world thought everything was going to crash, and the other half worked hard to make sure it didn't happen. OK, so maybe it wasn't half, but the 'doom and gloomers' were very vocal. Actually, the potential was there for some catastrophic crap, had we not got our act together, and remediated or retired major systems. It was in the midst of these Y2K remediation projects, that I again started thinking of becoming less dependent on conventional "systems" for my comfort and, instead, concentrated on providing as much as I could for my family directly. I started a website about survival, growing your own food, providing your own energy, efficient and effective shelter, and related concepts.

Fortunately, Y2K came and went, and nothing serious happened. But I realized, there were more scenarios out there that were in the realm of possibility. Weather, terrorism (who woulda thunk?), economic crashes . . .

So I changed my focus to renewable energy and disaster proof self sufficiency. My thought was that there were so many things that could disrupt one's life, that instead of planning for a specific disruption, think about those factors common to all disasters. Food, Shelter, Energy, Transportation, with the common purpose of providing an environmentally clean, sustainable, self sufficient replacement for each. It was time to throw off the rabid consumerism that I had got caught up in and look for more personal, self fulfilling concepts.

Life had more hiccups to throw my way before I could put this plan into practice. First the Dot Bomb fiasco. I was involved in a series of dot com company crashes. Then 9-11, for which I had front row tickets. Enough was enough. So we moved back home to upstate NY, bought 5 off-grid acres of my original homestead, and started putting into practice what I had been researching, experimenting with, and preaching for the last 8 years.

Welcome to our adventure . . .

— To be continued —-

ESSN Classified Ads

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FOR SALE -- 12.5 KW Biodiesel generators. Conbines the 2-71 Detroit Diesel engine with an extremely heavy duty Delco or Emerson brushless alternator. This is the generator Steve Spence chose for his own BIODIESEL system. Rebuilt units starting at $4395. Non-rebuilt units starting at $1995. www.affordablepower.com 1-888-454-1103 X3

FOR SALE -- Own the tabletop digester described in Al Rutan's article in this issue. See a digester work, prove out various feedstocks and learn more about the conversion process. Digester kit also includes gasholder and Bunsen burner. Only $500.00 + shipping. To order, email info@methane-gas.com or call (612) 805-9377.

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