

## Living Energy Farm

October - November 2021 Newsletter

### Spreading LEF's Energy Technologies

At Living Energy Farm, we have largely finished up our harvesting season. We have been making progress in developing solar ovens for distribution in the U.S. and abroad, working on our small harvesting machine, our biogas system, taking Magnolia off-grid, and other useful projects. Our farm is doing well, and we have lots of energetic folks living at LEF.

### Energy Use At Living Energy Farm

Amount of Fossil Fuel or Firewood Burned to Keep LEF's Buildings Warm to Date This Fall -- **0**

Amount of Fossil Fuel or Firewood Burned to Heat Water to Date This Fall at LEF -- **0**

Amount of Fossil Fuel Burned to Generate Electricity for Lighting and Electronics to Date this Fall at LEF -- **0**

Climate Changing Gases Emitted to Support for All Domestic Energy Uses at LEF Excluding Cooking -- **0**

Global Contribution of Heating and Cooling Buildings to Total Climate Change Gas Emissions -- **42%**

Contribution of Heating and Cooling Buildings to Total Climate Change Gas Emissions at LEF this Fall - **0%**

Cost to Build Our Buildings and Supporting Renewable Energy Systems Per Capita - **About \$15,000 USD**

### Exporting Our Model to Jamaica

Our friends in Jamaica are setting up a non-profit corporation called Living Energy Solutions to distribute equipment for DC Microgrids on the island. To support this effort we ordered 12,000 watts worth of solar panels, as well as 200 water pumps. We asked for donations of solar panels in the last newsletter, and we have received over 7,000 watts of panels! Thank you!!! Those panels will be a huge help in building up Living Energy Solutions so they can acquire equipment in the future without ongoing help from us.

We have gotten together most of the tooling and equipment we need to set up a small metal fabrication shop and will be sending it down, along with the solar panels and other materials. The tooling and materials will allow us to start distributing solar powered water pumps and Insulated Solar Electric Cookers (ISECS). We want to distribute nickel iron battery kits, solar fans, and other needed equipment, but we do not currently have the funding. We have ordered a small number of nickel iron batteries from our preferred supplier (ADS in Ukraine) to be delivered to the U.S. We will be building kits here with their 55 amp hour batteries to test them and optimize kit design. Hopefully we can secure more funding and send batteries to Jamaica next year.

In the meantime, the clogging up of international trade is complicating our planning quite a bit, but we are doing the best we can with the situation. We ordered some pumps to be sent directly to Jamaica. They are en route. Electrical cable and other hardware is en route. Hopefully, it will all arrive in the next couple of months. We will keep you posted as our plans come together.

The energy model we have developed at LEF allows for modern services with no support from coal, natural gas, nuclear, or industrial "renewable" energy systems. Our energy systems are not prohibitively expensive, and have near zero maintenance costs. Working class Jamaicans desperately want something better than the corrupt, expensive, and unreliable grid power they have now. Particularly in the Global South, grid power is simply unnecessary for billions of people



*Kris running our new daylight drive powered milling machine at LEF.*

who need basic services in their homes. We are hoping our model can help people in Jamaica and spread far beyond there.

### **Daylight Drive Machining at Living Energy Farm**

At LEF, we have a shop equipped with a drill press, metal cutting band saw, compressor, multiple grinders, and a lathe. All of it is daylight drive powered, running motors straight off of the solar photovoltaic panels. Kris Ward is a friend of ours from Missouri who is a machinist of the highest caliber. Kris and I have been exchanging emails several times a week since LEF was started. He introduced us to nickel iron batteries. Without Kris, we would have been able to do far less than we have done.

Kris and I have been talking for a while about his coming out to help us some. He came out in November and helped us set up a Bridgeport Milling Machine. A lathe and a mill are the backbone of a machine shop. With them, a skilled machinist can build a wide variety of machines. There are a lot of machinists in the world. Indeed, without them modern civilization would come to a screeching halt. But Kris is quite unique. He is highly skilled. He has spent many years working on and thinking about the different machines that empower a more



*Our new biomass grinder has a spiral of heavy blades welded to a 1.25 inch black steel pipe.*



*The shaft with blades drops into a welded box. Organic material is crushed and pushed through the slots.*

sustainable, environmentally low-impact lifestyle.

One of our more complex backburner projects has been trying to figure out how to make nickel iron batteries on a village scale. We have a team of folks who have worked on that off and on for a few years. Kris has been dissecting them and pondering the question of how they are built. He has skills far beyond mine in looking at the intricately folded and punched metal that makes up the powder pockets in a nickel iron battery and understanding how it was done at the factory. We discussed that subject while he was at LEF.

Another project at LEF has been the creation of a biogas tractor. Kris helped us upgrade and make repairs to our lathe. With the lathe and the new mill, we cut the adapter couplings to put an engine on a small tractor of ours suitable for biogas. Kris can cut parts to a dead zero fit. That means zero clearance between parts, and an immaculately tight fit. That ain't for amateurs.

An amusing note on Kris' visit came as a result of my asking him to look at our old drill press. I had purchased an old, heavy iron drill press because that kind of drill press is a lot stiffer, a lot sturdier, than the counter-top and lightweight ones that are more common. To some extent one can use a drill like that as a milling machine (to cut steel on a horizontal table, not just drill). Kris knows more about old machinery than most anyone. After studying our drill press, he dated it to pre-1900! I knew it was old, but that was surprising. You can have your little plastic-g geared, battery powered drills. We like our old iron.

Modern environmentalists are blithely unaware of the complexity of the machinery that makes solar panels, windmills, electric cars, lithium batteries, or all of the other machinery that is supposed to power a post fossil fuel future. We are not. I have learned a lot from Kris. Now LEF is empowered to make more sophisticated machine parts than anything we have done in the past. We may have the only well-tooled daylight drive machine shop on the planet. If that is true, it will change very soon.

## Biogas

We put our new biogas system into operation. It stayed warm and produced biogas later into the fall than our previous digester, but has now cooled off and is not producing much at all. The new digester has two layers of straw bales around it, and a solar heating coil inside of it, and it is still not warm enough to produce much biogas. That's a bit frustrating. We are working on improving that situation.

In building our new digester, we ran into some unexpected complications. We have had trouble figuring out the best way to crush or grind up the organic matter going into the digester. Winter squash rinds, melon rinds, rotten potatoes -- all yummy food for the digester, but how to you make that into a substance resembling oatmeal? We ran a garden chipper/ shredder off of a DC motor for our previous digester. That worked great on sunny days, but it isn't really a solution for taking this technology around the world. After a few failed ideas, we welded together a very sturdy crusher/ grinder that is hand turned and works very well. (See photos.)



*Our new biogas slurry pump for pushing organic material into our third generation digester. It is a big improvement over trying to push organic material in by hand.*



*Sleeve and piston assembly for our new biogas slurry pump.*

A biogas digester needs to be fed organic matter regularly, on a daily basis ideally. Getting organic material into the tank after it is ground up has been more challenging than we expected. All of the biogas designs have a pipe going into the digester down which the user is supposed to push slushy organic matter. That works on very small digesters, but as the digester gets larger, the static pressure in the tank pushes back harder. Imagine pushing a volleyball to the bottom of a swilling pool, then doing it over and

over again. That's tiresome.

Facing the problem of pushing the material into the tank, we conducted more experiments, and we learned mostly what would not work. There are a lot of heavy industrial pumps made for pumping concrete, for dredging river bottoms, or even small pumps made for pumping sewage, but none of those would work in this case. The material is simply too fibrous to move through any pump other than massive, expensive industrial ones. Sooooo... we invented one. We started thinking about some kind of piston pump. A piston pump has a piston sliding back and forth inside a sleeve (bore). As the piston pulls back, liquid flows in a valve and fills the sleeve. Then the piston pushes forward, the inlet valve closes, and the liquid is forced under pressure out of an outlet pipe and goes where you want it. But what about the sludgy, coarse, fibrous material we are trying to push into a digester? No way is that going to flow through any valve.

For our newly invented pump, the biogas slurry is poured into a small, open-topped tank. There is a piston inside a sleeve that starts out above the tank, each on an independent lever. First you drop cylinder, effectively chopping right down into the slurry. There is a pipe running out the bottom of the slurry tank that aligns with the sleeve that has dropped down. Then you shove the piston lever down, and it pushes down through the sleeve, pushing slurry along in front of it. There is a check valve on the outlet pipe that only lets material flow in one direction. The new pump works great!

It wasn't until after we put the new pump in service that I realized this new input system (grinder and pump) has another big benefit. There are organizations pursuing biogas for low-income communities all over the world. The cheapest kits are made with a big plastic bag. That's not durable at all. Biogas production has been around for centuries. The Chinese made millions of village units during the Cultural Revolution out of rock and plaster. (Sounds pretty challenging to me....). Modern plastic tanks are relatively cheap. Every plastic tank has inlet and outlet ports. But the pipe going into the digester needs to be big enough to accommodate the coarse feedstock, and quite large indeed if you are shoving that stuff in there by hand. The inlet/ outlet ports on any commonly available tank are not large enough for that use.

Before we figured out the homemade pump solution, we connected a large pipe to the side of our third generation digester. The issue of how to seal the connection between the pipe and the tank as the pipe entered the tank at an acute angle proved difficult. We tried to solve that problem by building a plastic box (made with heavy, 3/4 inch thick plastic) and attaching the box to the side of the tank. Then the input pipe came into the top of the box at a more manageable angle. It seemed like a good plan. But assembling the box and sealing it up properly proved all but impossible. I worked on it quite a bit, as did a few other people. We purchased fancy epoxies and hot glue made to stick to plastic. In the end, the results were not satisfactory, and not something we could repeat in Jamaica or elsewhere.

The new pump solves the problem of how to get slurry into the tank without attaching a big heavy pipe to thin plastic at an acute angle. The pump is easy enough to use for any able-bodied person. The output is pressured, albeit at very low pressure. That allows us to push the slurry through a smaller pipe, and it will allow us to use either the existing pipe flanges on existing plastic tanks, or to add moderately sized pipe flanges. We added several flanges to our big digester. That was easy and simple. The big pipe connection with a fabricated box was messy and ineffective.

LEF is unique in that we live daily with the technologies that we are trying to export. With our biogas, we have looked at a lot of designs. They all have the same design with a pipe going straight into the digester that supposed to allow the user to shove slurry in there. But it's a pain to feed a digester that way, and it is not a good match for modern plastic tanks. Our new pump system seems like a useful improvement. At LEF, we do not use modern fossil fuel technologies at home, and then propose second-rate solution for low-income people abroad. We live it, and learn from it, and try to get everyone interested. Please support us if you can.

*Living Energy Farm is a project to build a demonstration farm, community, and education center in Louisa County that uses no fossil fuels. For more information see our website [www.livingenergyfarm.org](http://www.livingenergyfarm.org), or contact us at [livingenergyfarm@gmail.com](mailto:livingenergyfarm@gmail.com) or Living Energy Farm, 1022 Bibb Store Rd, Louisa VA, 23093. Donations to the Living Energy Farm Education Fund are tax deductible.*

**Articles and videos about LEF:**

### **How to Never Pay an Electric Bill**

<https://www.youtube.com/watch?v=N5Wk7inoIxI&t=201s>

This video is a walk-through of our energy systems at Living Energy Farm. It is a concise summary of how these systems work, and why they are not in common use already.

### **Solar Installations In The Navajo (Dine') And Hopi Reservations, March 2020**

<http://livingenergyfarm.org/solar-installations-2020/>

This is a photo essay about our project to bring durable solar energy systems to the Dine' and Hopi Reservations, where thousands of people live without grid power involuntarily.

### **Support Living Energy Farm's Climate Justice Campaign, and Bring DC Microgrids to People Who Need Them**

<http://livingenergyfarm.org/support-our-climate-justice-campaign/>

This is an updated web page describing our broader social justice ambitions.

**How to Live Without Fossil Fuel (Introductory Video)** <https://www.youtube.com/watch?v=Ri2U6u8p65E>  
**Powering a Community with Solar Electricity** (LEF has the only DC powered community that we know of, here's how it works) <https://www.youtube.com/watch?v=FvdExgvHnRI&t=23s>  
**The Best Way to Store Off-Grid Energy** <https://www.youtube.com/watch?v=2wOxQ3sL9zc>  
**Batteries that Last (almost) Forever** <https://www.youtube.com/watch?v=dfrgLsyFs0E>

Virginia Homegrown created a program at LEF (the LEF part starts at the 29 minute mark in the program)  
<https://www.youtube.com/watch?v=MDGP0C9MIzU>

International Permaculture has done 2 articles on LEF. One is in issue #93, Autumn 2017, and the second is in issue #94, Winter 2017. See <https://www.permaculture.co.uk/>

Article about LEF at the Atlantic Online Magazine

<https://www.theatlantic.com/politics/archive/2017/01/anarchism-intentional-communities-trump/513086/>

Article about LEF in The Central Virginian

<http://www.livingenergyfarm.org/cvarticle.pdf>

LEF on CNN

<http://www.cnn.com/interactive/2015/09/us/communes-american-story/>

Cville weekly in Charlottesville VA

<http://www.c-ville.com/off-grid-model-environmentalism-made-easy/#.VcHobF054yo>