Go to: Start Next Chapter

JUNK POWER:
THE NEW ALTERNATIVE ENERGY

Subheading Links:

Throw-out "lay-out-in-the-back-yard junk" may be the key to energy independence for you! Trapped inside ugly, old, scrap metal are thousands of kilowatt-hours of free electricity just waiting to be tapped. Scrap metal? Yes, the smelting and refining of all sorts of metals encapsulates tremendous amounts of energy. That chemically bound energy is still available long after it's container is otherwise unusable. The trick is to free that energy inexpensively, in a readily useable form.

The method is simple, easy, well known for over 200 years! In 1796, Al Volta, (Alessandro to his mother and sophisticated colleagues), produced electricity from a stack of zinc and silver disks separated by salt-water-moistened paper. Thus, was born the first "Voltaic Pile"...commonly known today as a battery.[1]

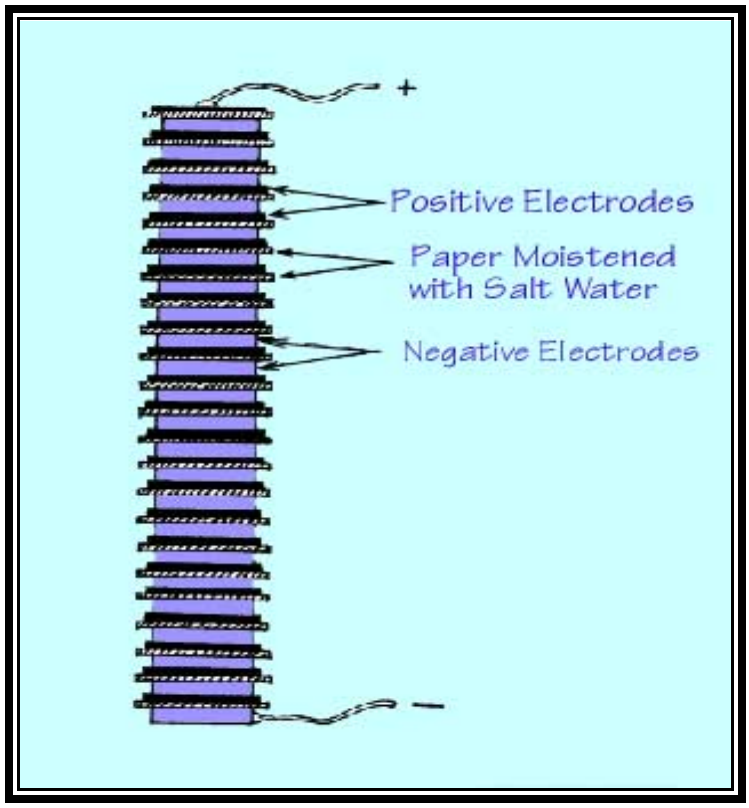

Figure 1 Al Volta's First Junk Pile Power Source

[1] A little history, a little tongue-in-cheek humor, and a gentle introduction to the terminology of electrochemistry.

Batteries come in all sorts of sizes, shapes, and power ranges. Some are big, bulky, and brawny, able to crank over a rusty old Ford pickup at 30 below. Others are tiny, thin, and trim (hardly larger than a dime) but ***surprise*****,** they can power a computerized digital clock for over ten years. These tiny technological marvels are handy, and dandy...but eaten like candy by today's electric "toys." I'll bet the battery people ***like*** it that way, because, you're forced to buy ***another***...and ***another***...and ***another***. Have you seen the price of batteries nowadays?

Fortunately for us, Al's little bundle of energy shares a secret with today's copper-tops, Energizers, and Die-hards. They all eat metal to make electricity. Home-made batteries can just as easily eat throw away scrap metal to produce free electricity whenever and where ever you need it. Home-made "Scrap-o-gizers" can really keep your bunny hoppin'. In fact, almost anything that runs on batteries can be powered up from your very own junk-powered back-yard electric utility.

There is an amazing amount of power locked up even in little gum wrappers. With just a few little pieces of aluminum foil as the fuel source, in eight recycled yogurt-cup-cells on the kitchen table, the author was able to run a boom-box all day long.

WHY USE THIS NEW ALTERNATIVE ENERGY?

Do you live in an isolated place? Is your commercial energy supply unreliable? Do you wish to become energy independent? Are you preparing for an emergency? Are you concerned about world-wide battery-addiction? (Well maybe not.)

Do you have an abundant supply of scrap that you would like to turn into money or at least use it to knock a dent in your light bill? Gas prices getting to high and you want to switch to an electric vehicle? How about running your own back yard utility company?

If eight yogurt-cup cells with a fist full of aluminum foil can run a radio all day, how much more energy can be extracted from the junk in your back yard. Consider this example:

A car's battery has only 6 medium-sized (rechargeable) cells, yet look at all of the power it holds. Note how many things there are from radios to small appliances that run on Direct Current (DC). (The same kind of electricity produced from scrap metal.) Cars, bikes, wheel chairs, power drills, computers, cell phones, and all sorts of toys run on DC.

Even though your back yard utility may be physically larger than commercial cells having the same power, the more portable commercial batteries can be easily recharged using power taken directly from scrap metal.

Whether recharging commercial cells, or running an appliance directly, simply

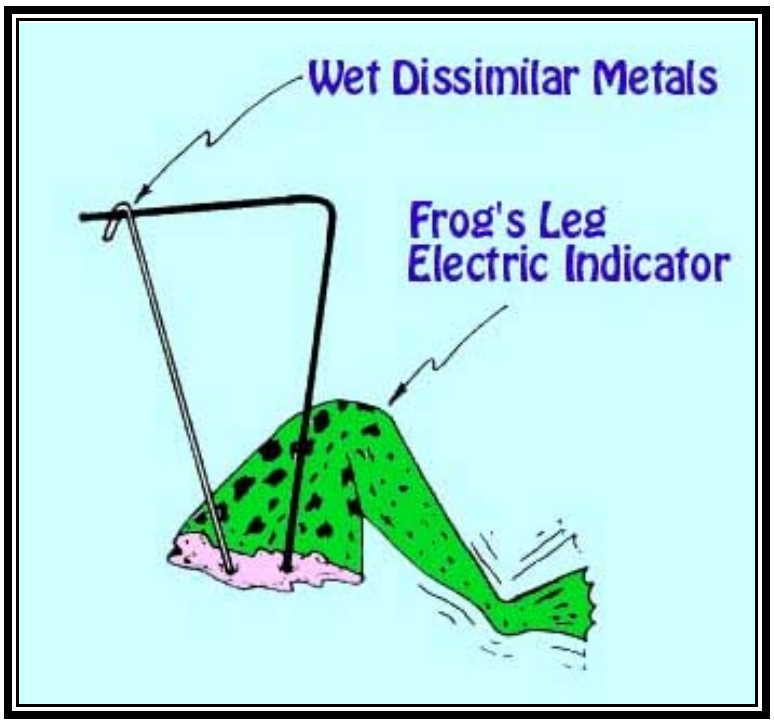

Figure 2 Luigi Galvani's first electrochemical cell.

connect the required number of cells together to produce the needed current at the right voltage. The energy provided by electro-chemical cells is cumulative. If it takes only 67 flashlight batteries to produce 100 volts, think what you could run on 100 volts wrung out of an old Chevy.

Solar cells produce only about 0.5 volt each. Yet, there are whole communities that run on solar cells. Half-volt scrap metal cells have it all over solar panels, they can produce a lot more power per dollar (often they can be built entirely for free) and they don't run down at sundown!

Think about this: people even pay to have energy-filled scrap hauled off. Recycling scrap metal into electricity could turn into quite a lucrative business. So, all you need is a little junk, a little know-how and a desire to put them together to make sparks fly.

SEVEN GOOD REASONS TO USE JUNK POWER?

1. It produces useful electricity compatible today's electronic needs.
2. It is environmentally friendly.
3. It helps clean up the Earth.
4. It can be made to work anywhere.
   - Remote sites.
   - Your kitchen or back yard.
   - Aboard ship
   - In your car.
   - On the Moon.
5. You can sell the electricity to your neighbors or even the power company.
6. You can loose weight working out in the fresh air collecting metal.
7. Do you need a better reason?

ELECTRO-CHEMISTRY, WHERE DID IT COME FROM?

The electro-chemical reaction that makes batteries work is a form of corrosion called Galvanic action after Luigi Galvani. Luigi made freshly-cut frog's legs jump by touching them to copper hooks hanging over an iron wire in the 1780's. From this, the whole electronics industry was born. By understanding what they did, we can implement what is otherwise taught as dry physics, and have fun doing it.

Actually, this basic electro-chemical process was reported earlier by a German writer named Sulzer. I couldn't find a first name for him...I suppose his friends called him Sultzy. Anyway, Sultzy wrote a book called The General Theory of Pleasure back in 1767. He said that a peculiar taste would be perceived when two dissimilar metals are put in ones mouth. He put one metal above the tongue and the other below it, with the ends sticking out touching each other. It constituted the world's first spit cell.

Now back to Luigi. He was a professor of anatomy in Bologna. (That's a town in Italy not an opinion of his work.) It happened that one of the Prof's pupils was in the kitchen with an electrostatic generator. He was playing with the machine and a kitchen knife. With the static machine going, he touched the knife to the exposed nerve on a freshly skinned frog leg...something shocking happened. The leg jumped!

Mrs. Galvani told Mr. Galvani and Luigi lost no time in repeating the experiment... probably to see if Mrs. Galvani would jump too. It turned out to be of more interest to the Prof than just another way to scare the co-eds back at the dorm.

Luigi found that the action could be extended further away by the use of metallic conductors (wires). With the help of wet dissimilar metals, the muscle contractions would occur without even using the static machine.

No sooner did he let the frog...er... cat out of the bag than frog's legs were jumping all over Europe. From that came an intense study of electricity. Some people thought it was "animal electricity" but others, including Luigi himself, recognized that it was a chemically produced electricity from outside the animal, and that the frog leg was just a sensor.

18th and 19th century investigators soon found that different metals (now called ***electrodes***) immersed in a liquid that is capable of conducting electricity (an ***electrolyte***) would produce a difference of electric potential between the two metals... that is, it made electricity. While at the same time, one of the electrodes would corrode away. Soon there where all sorts of electric "cells". The Daniell Cell, Weston Standard Cell, Leclanche' cell (flashlight battery), the Edison cell, and the lead-acid car battery.

Sensing equipment improved too. Deviating compasses, electromagnets, and galvanometers soon replaced the frogs legs. Which was a good thing for the frog population ... not to mention that otherwise Sam Morse would have had to invent the Frog-o-graph!

Soon, much of what is known about electricity, batteries, electrochemical

processes, electrolysis, and electroplating (all very similar chemical reactions) was figured out by Mickey (Michael) Faraday early in the last century. He laid out the mathematical laws that govern electrochemical reactions, and named many of the parts of cells, such as electrode, electrolyte, and ion.

Figure 3 Little John with a fine Fuel Source for a back yard battery.

In case you are unfamiliar with ions, they are the little babies in the liquid electrolyte that make batteries work. Ions are molecules that carry an electric charge, that is, they carry electricity. Of course, molecules are little thing-a-ma-bobs that nearly everything is made of; the smallest piece anything can be ground into without changing its chemical qualities. They are usually clusters of atoms, although some molecules have only one atom each.

Molecules can be ionized by removing at least one electron to make a "positive ion" or by adding an electron to make a "negative ion." So how do we do that?

Water is the most common electrolyte. Actually, distilled water doesn't conduct electricity at all, but with a little Draino, or vinegar, it makes an excellent electrolyte. Even sea water is a good electrolyte. By adding such things to water we produce lots of conductive ions that corrode one of the scrap metal electrodes we put in it, and electroplate onto the other. In the process, we can use the electricity outside of the cell, so long as the two electrodes aren't shorted out...by touching each other.

Much of the detail associated with home-brew batteries has been edited out of modern text books, however, it is these very details that are most useful when concocting back-yard chemistry. Just as they used everyday stuff to find the power of electricity, you too can discover junk power, the new alternative energy, right in your own back yard.

So...a workable method for turning metal into useful electricity has been available for a long time. The next logical step is to find an inexpensive "fuel", and a simple arrangement for making a practical home-brew power source.

JUNK POWER FOR FUN AND PROFIT

Why not for profit? Scrap metal is often rather inexpensive if not free. Like I said above, some people will even pay you to haul it off. A home-made battery can eat old metal to produce your needed power just as easily as the pocket-book-eating copper-tops can. Broken up bedsteads, worn out wash tubs, squished up screen doors all make fine "fuel" for building a back yard battery.

Figure 4 Anchors Away!

The economics of metal power depends on many things: the price of energy at the location where it is needed, the cost of other alternative energy forms, and how much they would give you for the same junk at a scrap recycling yard...or a garage sale for that matter. In some cases you'd be better off just hauling the stuff off and selling it, but under other circumstances it would be better to buy junk from your neighbors and sell the electricity back to them. Recycle Power!

Junk power is especially useful at remote sites away from commercial power lines. Homesteads, tropical islands, 3rd-world countries, survivalist encampments, and high-priced electrical areas are all good candidates for scrap pile powerhouses. So are places with dirty air.

Figure 5 A truck load of energy!

Recycle power is clean. No one can say that for the coal-fired utility plants. A simple test, to see if recycle power will help alleviate the air pollution in your vicinity was devised some time ago...by a great-great-great grandson of Billie (William) Tell. After his first "nearly scientific" air pollution test he is reported to have said: "I shot an arrow into the air...and it stuck!" Junk power to the rescue!

Home-brew power cells are very inexpensive to build, require very few parts, and no more skill to build and

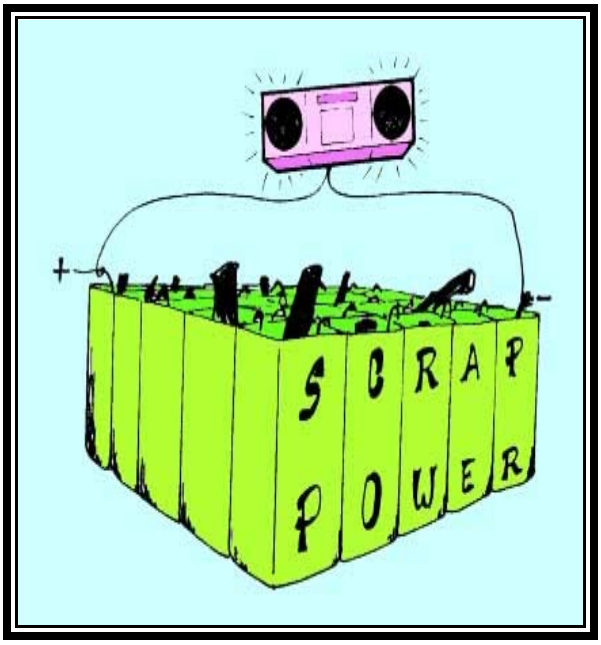

Figure 6 Backyard batteries clean up rather than mess up

operate than you can obtain from a little practice and this book. The real economic question lies in the cost of fuel and the value of the electricity delivered where you need it.

The amount of energy locked up in plain old metal may surprise you. Think how much use you can get from a simple dry cell, a flashlight battery. Yet, it uses only its thin zinc case as fuel. In numbers, a pound of zinc (in the right cell) will produce about .61 kilowatt-hours (kwh) of electricity; scrap iron .56 and aluminum 3.7 kwh/lb. That means that a 2,654 pound Chrysler le Baron (if at least 80% of it is really steel) should have about 1.189 megawatt-hours of hidden power.

Therefore, a 3,000 pound Cadi has about 1.344 megawatt-hours of hidden energy. That is much more than the paltry 145 horsepower produced by its V8 engine, which works out to be only 108 kw (per hour), if its 350 cubes are running wide open. However, it would be quite some backyard metal eater that could consume a whole Cadillac in 12 hours! I'd say that much power is unlikely from your first build-it-yourself battery, but the potential is there.

What about efficiency? When gasoline is used to make electricity the total efficiency is usually less than about 35%. Electrochemical cells often work in the 90% range.

Batteries are not subject to the "Carnot limitation". Nickie Carnot found out in the last century that heat-engine efficiency can never be greater than the ratio of input and output absolute temperatures. Thus, the wider the temperature difference, the more efficient the engine. Batteries, even hot batteries are not "heat engines" and therefore are not subject to Nickie's rule, which describes the nature of HEAT not Electrochemistry. Therefore, batteries ***can*** be very efficient. And, considering what gas cars are doing to the environment, it'll be easy to smell the difference.

That reminds me of an earlier invention of mine. An electric car that can go any where in the U.S. for free. It only requires 4,273 Radio Shack battery cards! (When I first wrote this, Radio Shack would give away free batteries to card holders...but not any more.) Batteries are just to expensive to give away. Now with scrap power, you could design a car that would run on itself--until it completely disappeared. Wouldn't Detroit love that one?

Many electronic devices, tools, even golf carts, and some cars run on batteries.

Back-yard batteries can make power from throw-a-way junk. Can your electric utility do that? (Sure...if they read this book, but then, they would probably just sell the power and make a lot of money.) Just think, you can beat them to it with your own back yard powerhouse.

One must weigh and balance the economics and future of junk power, whether it will be profitable or just for fun. After all, one minute you can think that a whole industry is unsinkable...and the next minute it's the Titanic!

Speaking of the Titanic...wouldn't that have made a whale of a scrap iron power cell! "RUST POWER!"[2] Ah, but now that grand ship-of-the-line is just lying around wasting its locked-up energy away and even the electric eels don't get a charge out of it.

However, there are a lot of things that are just lying around rusting that are much more accessible, maybe even in your own back yard. So a junk pile power house would be just the thing for cleaning up the yard, and your neighbor's too. Even for people who just have a lot of junk they don't know what else to do with. They may be very happy to make throw-a-ways into something useful or beautiful like clean electricity for listening to Peter, Paul & Mary...or Mozart.

Had a war in your vicinity recently? Old weapons make fine fuel for batteries. (Take the powder out before you take the power out.) Think of how many little electrons are just itching to get out of a Sherman tank.

Junk-power batteries can be sized to suit the particular job at hand, run a particular appliance, or supply energy for a household. They can be located where the need is, or where the fuel is. Batteries can work when the local utility does not. Or when some kind of natural or unnatural disaster hits. Rust Power batteries can even ***be*** the local utility.

Batteries are beautiful. Or at least they can be made that way. Junk is ugly. If it weren't, it would be art. Come to think of it some art ***is*** junk. Wouldn't it be nice to have something beautiful that eats things that are ugly.

Junk power batteries are quiet. You can't say that for diesel generators. Rust cells don't fill the air with blue oily smoke either. And you can't get nuked from one; there's no "China Syndrome". Think how much happier and healthier the people of northern Europe would be if the Russians had built a Recycled Metals Electricity Plant at Chernobyl instead of what they did?

About the only things a back-yard battery puts out are hydrogen gas and metal oxides left over from the digested metal. You can cook with hydrogen. While the metal oxides, like rust, are simply metal ore, just like before it was refined. Red dirt.

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[2] You're supposed to thrust your fist into the air when you yell that. Nobody really cares, but you do get a little attention.

So, is a junk pile power source practical for you? You must decide. But whether you are just interested in an alternative energy work shop, an emergency radio, or an energy supply for an island in the Pacific, back yard batteries can mean power for you.

Go to: Start Next Chapter