Solar Fire Economy - Outline and Summary

By Eerik Wissenz

The goal of the book is to give any reader a firm understanding of humanity's energy needs and how most of those needs can be satisfied by solar concentration.

Summary of parts

I. **Theory**, explores the necessary concepts that must be learned, such as available energy on earth (as well one's that must be forgotten, such as infinite oil supplies)
II. **Technique,** gets right into technique of solar concentration to give the reader a precise understanding of the technology.
III. **Niche Applications**, tries to focus in on what sorts of activities are most ideal for solar concentration to start with.
IV. **Development**, explores the activities that can be based on solar concentration in the future.
V. **Culture**, focuses more on the cultural adaptations, and blockages, required to use solar energy.

Outline

Part I. Theory

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3. And what about the rest of the world?
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5. Why aren't we almost totally solar then?
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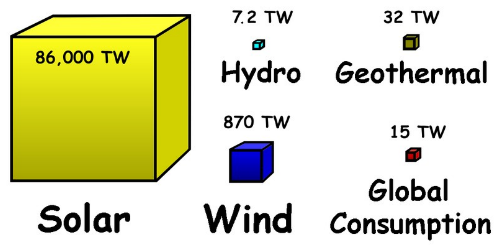
Chapter 4. Total solar energy

This chapter strives to gives the basic energy facts about solar energy in a way people can understand and visualize easily. Fuel wood, oil, wind, and damns all represent indirect solar energy, and so cannot possibly contain, individually or together, more energy than the direct solar energy that gives rise to them.



For instance, the wind is caused by the sun heating the atmosphere both directly as well as indirectly through heating the ground below it. It's estimated about 2 % of solar energy hitting the earth is converted into wind energy. But even this 2 % is not all accessible to us because the wind is distributed mostly in the troposphere which has a height of about 10 kilometers. So to capture any significant amount of the wind energy that exists would require building walls at least 10 kilometers high where all the wind would be forced through tubes containing turbines. Any other strategy could only hope to capture a tiny, nearly insignificant, fraction of the wind energy that exists in the atmosphere; the fact that such minuscule fractions captures by windmills can be economical is simply a testament to just how much solar energy there is to start with.

Wikipedia also expresses this in a succinct form: "Mostly thanks to the Sun, the world also has a renewable usable energy flux that exceeds 120 PW (8,000 times 2004 total usage), or 3.8 YJ/yr, dwarfing all non-renewable resources," as well as visually in the picture above.

Not only is there at least 50 times more solar energy available, but just as importantly it's not distributed in a large 3 dimensional volume. The suns rays stay remarkebly parallel through the atmosphere to the ground, only losing on average 300 our of 1300 watts, leaving 1000 watts at ground level. Thus the bulk of solar energy available on earth is effectively represented to us in 2 dimensions at ground level, we thus only require building relatively short structures to capture it a significant portion that exists on that area.

Chapter 5. Why aren't we 100% solar then?

The answer to this question is that our “traditional” and “conventional” energy sources are simply solar energy that nature has concentrated for us in the form of living plants, warm wind causing air, the water cycle, as well as dead plants we call fossil fuels. For instance, 1 liter of oil represents around 200 hours of human work.

So, as long as these concentrations of energy seemed free for the taking, inexhaustible and without any negative consequences, there was no need to concentrate the sun's light ourselves. However, now that we are exhausting these energy supplies, especially wood, hydro, and fossil fuels – and are discovering the enormous consequences of doing so – solar energy is far cheaper and abundant and sane in every respect.

The chapter then explores the novel perspective of our environmental problems in terms of our exploitation of solar energy that nature has concentrated for a reason, such as in rivers and trees.

More importantly there's no reason we must take energy from key natural systems like rivers and trees, and not concentrate it ourselves directly from solar rays. The chapter then provides just a few examples of existing solar systems that are cheaper than the traditional or conventional alternatives.

Chapter 6. Why aren't we switching to solar fast enough?
The answer to this question is mostly cultural and political but one part technical.

The technical part is that solar energy is not only an energy source but also a distribution system. There's no reason to concentrate solar energy capture in huge installations if the final activity can simply use the sun that falls nearby. The vast majority of everyday tasks in the home, in agriculture and in industry, can be accomplished with local solar energy. Even if centralized energy capture can be theoretically more efficient, the advantage of these gains is far outweighed by the cost in infrastructure needed to distribute the energy afterwards. For instance, half of the cost of electricity today is the cost of the infrastructure.

The modern economy as it exists now is based on the complete opposite assumption that it is best to centralize everything from energy, production to people and so almost all technologies are designed and developed for and by centralization. This is made possible by centralized energy sources such as coal, oil and gas that the modern economy is based on; oil in particular is easily transformed into transportation, and so “high production efficiencies” can seem to outweigh the cost of distribution afterwards (if the transportation infrastructure is paid for by the taxpayer of course).

With solar energy this system is no longer possible and so all the technologies we want to use must be miniaturized to be compatible with decentralized solar energy. We are beginning to see this with electricity, which can now be produced, stored and used all within a single house.

However, this simple technical problem of using solar energy directly must face many cultural barricades. For instance, with solar energy it's far cheaper to have the habit to wait for the sun to do any energy intensive things, as it decreases the need for storage, which can exceed the cost of the rest of the system if the desire is to have full power capacity all of the time. However, we accustomed the exact opposite energy use habit since hydrocarbons are already in a stored form ready for use at anytime.

Furthermore, solar energy cannot be based on consumer products that have be replaced from far away all the time, since then there would be no energy sense to using solar energy. Local solar energy has to be maintained locally, and so essentially anyone working with solar must learn basic maintenance. Even more fundamentally, the entire modern economic edifice of extreme specialization must be seriously reviewed when faced with a decentralized energy source. These issues are discussed briefly and then revisited at the end of the book when the reader has a clear understanding of in what ways exactly solar energy requires cultural adaptation.

Chapter 7. Simple Solar Technology
Though the mainstream media greets with fanfare anyone who proposes some super complicated mega project of which we can only speculate as to the feasibility and cost, it is the simple technologies easily

reproducible anywhere in the world which will form the basis of a global solar economy. The reasons for this are straightforward: simple technologies are easy to develop, build and maintain by construction workers that already exist using familiar materials; simple technologies can also be understood by the final user who will have to do some of the maintenance; and, complicated global solar systems can be developed in the future, but only on the basis of global solar skills and infrastructure created through the widespread use of simpler technologies.

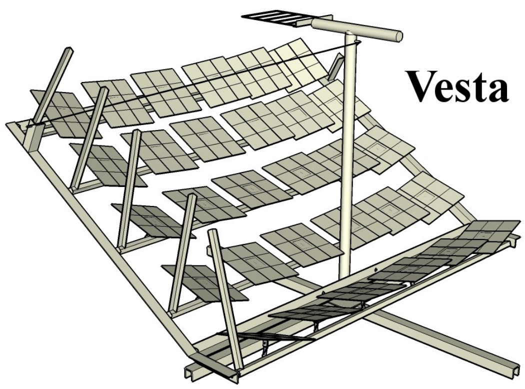
<u>Part II. Technique</u>

The best way to give the reader a precise understanding of solar concentration is to show the plans of a some solar concentrators. We will start with the Vesta-Helios type solar concentrators, since this is the technology I work with and so know most about. After, I will briefly present some other designs and point you towards the experts in them.

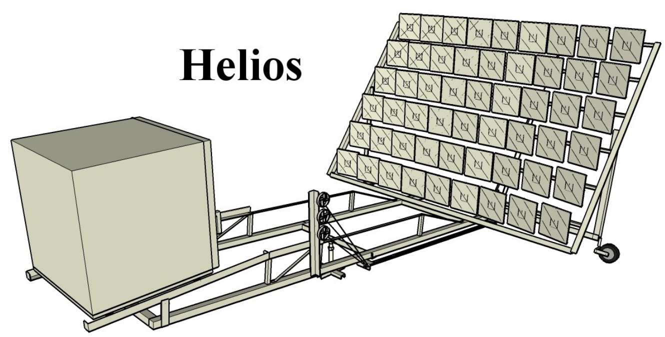
Chapter 1. Designing a solar concentrator

In this chapter I briefly review how do go about designing a solar concentrator. The necessary geometry and the useful characteristics, as well as what must change with respect to different uses.

I also derive the compound parabolic technique developed by solar fire from these principles. A condensed version of this defense is also available on: http://www.solarfire.org/Vesta-Helios-Advantages .



Solar Concentrator - vertical reflection - Stove Top - 400 C° - 1800 W



Solar Concentrator - Horizontal Reflection - Oven - 900 C° - 3000 W

Chapter 2. The Batant

This chapter is simply the Batant solar concentrator guide, as featured on:
onhttp://www.solarfire.org/Construction-Guide
A few explanations and alternative methods can also be added. The guide has 22 images that can be displayed 2 to a page. A better name than the Batant may be found.

Chapter 3. The Vesta

The Vesta is essentially the same as the Batant, but bigger and more powerful. A similar style construction guide as the Batant will be shown, but only dealing with the pieces that change (most pieces described in the Batant are exactly the same for the Vesta) so only a few images would be necessary.

Chapter 4. The Apollo

The Apollo is even bigger than the Vesta, so big that the focal point is 3 meters of the ground; but, the focal point is fixed with relation to the ground and so piping can easily capture the energy automatically. It is not adapted for oven type applications but is ideal for steam production. Only the differences between the Vesta are shown as well as how to couple many Apollo's together to move and function in together.

Chapter 5. The Helios

The Helios is the same basic idea but reflects horizontally; one consequence is that the focal point moves and so many machines cannot be coupled together, but another is the focal point is close to the ground and so ideal for oven type applications. Only a condensed Helios guide would be shown with the essential structure and measurements, but the complete guide can be downloaded from the Internet. Since it's the same basic idea as the Vesta type concentrators it is easy for the reader to imagine how it functions.

Chapter 6. Defense of manual tracking

One big assumption in western engineering is that solar concentrators must be tracked automatically to be of any real use. Such tracking systems often cost more than the machine itself and are usually the first to break requiring a specialized repairman. However, tracking a solar concentrator manually, even size of a Helios, is far less work than maintaining a fire. For instance, in areas where 6 hours are spent collecting firewood, often on dangerous roots, solar tracking is nearly insignificant. But even when fire wood is delivered the time to organize fire wood, start and maintain a fire is still greater than tracking a solar device.

Also, the focal point is very obvious so it doesn't take much mental effort to know when adjustment is necessary. Finally, there are many jobs that require heat and constant supervision. And of course most traditional fire applications require at least the fire to be constantly supervised, so manual tracking would not change any already present practice in many activities. The Helios is adapted to such uses because the focal point is at human level. When large amounts of energy are needed to run something continuously, then it would be a Apollo type system required. Since many Apollo's can be coupled together only one person is required to adjust the system, and again it is likely someone is necessary to supervise the system anyway.

And of course when it makes sense to do so, automatic tracking can be installed. A typical business might start with an investment in the basic machine with manual tracking and then when it has paid for itself and then some, upgrade to automatic tracking. Also, in the case of the vertical reflectors they can be coupled together mechanically, requiring only one machine to be tracked by hand or automatically.

Many automatic tracking techniques are possible, from electric motors, pneumatic, compressed air, gravity clock gear system, to magnets.

Chapter 7. Scheffler and other designs

The Scheffler reflector is probably the best know reflector and it is easy to explain. Other designs to be discussed are box cookers, water heating panels, and even large technologies.

Part III. Niche applications

Chapter 1. Criteria (charcoal)

Before talking about how the entire economy can be based on solar energy it is useful to focus on a few niche activities that solar concentration is particularly well suited for. It will be these niche activities where direct solar concentration can take root and develop further, after which it becomes easy to transfer to different things – as technical and cultural barriers are broken down.

The characteristics we should probably look for in finding such niche activities are that the time of day of the activity doesn't matter and that the use of solar concentration not only saves energy but adds in itself further value to the activity. When both these conditions are met no cultural change is required for the activity to be of use and the incentive is far higher than simply saving energy, thus providing the motivation to pioneer using a completely new technology and not experiencing any particular challenges (like convincing people to eat a different times).

We can identify 4 such activities: biochar production (charcoal from biomass), roasting coffee and cocoa, water purification and tourism.

Chapter 2. Biochar

I start with biochar because perhaps the most added value is attained. Biochar has so many uses and is also a way to store of energy.

The reasons for making charcoal with solar is straightforward. First we can note it doesn't matter what time of day charcoal is made or even which months as it can be stored easily for later. Second, in traditional biochar making between 40 and 60 percent of the wood used is to heat the oven to make the charcoal. When charcoal is made with solar the fuel cost is zero and so there is an immediate increase of production by a factor 2 without any increase in wood consumption. Furthermore, as we shall see in more details in the chapter "economics of free energy" when fuel is free, large scales are not required for efficiency. This especially true for biochar since it doesn't require extremely high heat, only between 180 and 300 C°, easily obtained by most if not all solar concentrators.

Technical details are provided on biochar production and use.

Every village with with a relatively small solar concentrator can make charcoal for their own use. When wood is transformed into bioshar without burning wood to do it, more energy can be obtained from the charcoal than burning the wood directly. This is because wood has a fair bit of moister which is evaporated in the biochar making process. Furthermore, since biochar is is nearly pure carbon when it is burned is produces only CO_2 which is not hazardous to human health with a bit of ventilation. Burning wood directly creates many poisonous gases and particles which harm the lungs. Indoor air pollution from indoor fires is a major global health concern. So, not only is less wood needed when transformed into charcoal but quality of life increases significantly. In many countries charcoal is considered a luxury product.

When this system is put into place people become accustomed to solar energy and should naturally figure out they can cook directly with the machine when it's sunny reducing the need to collect wood.

There are also uses in agriculture and one byproduct of charcoal production is tar (when the gases are condensed and not burned directly to speed up the charcoal process or some other use. The chapter then reviews briefly all the uses charcoal and tar have had over the centuries.

Chapter 3. Roasting

Roasting is an excellent application of solar concentration because it can be done at any time of day and results in a pure roast. With coffee and cocoa, and other things, a solar roasted label could be made, further increasing the value of the beans. The rest of the chapter discusses the Solar Fire Projects actual experience with solar roasting, since it is the activity we have done the most of in Oaxaca and Chiapas Mexico.

Chapter 4. Water purification

One incredible potential of solar energy is water purification in even the most remote locations in the world. When fuel costs money it can be impossible for many to boil water, but, when fuel is free, huge amounts of water can be purified with a single solar concentrator, as outgoing hot water can preheat incoming cold water with even extremely simple heat exchanges. This activity is of course complimentary with any other use of the solar concentrator at hand. Even if a solar concentrator is installed for the production of biochar or roasting, these activities are unlikely to be performed all the time, or even a majority of the time. With free solar fuel all sun hours can be taken advantage of, to sterilize water and other things.

In conjunction with biochar production simple carbon filters can be made which would also remove chemicals.

This chapter explores this issue and describes a few purifying techniques.

Chapter 5. Tourism

Any new technology creates in itself a tourist attraction and solar concentration is particularly well suited for eco-tourism. The tourist industry is generally well funded and so in a position to purchase many different prototypes doing many different things. Furthermore, tourism is perhaps the ideal place to expose west-northerners to solar concentration. In northern latitudes the benefits of solar concentration are less obvious and so it may be difficult to understand how solar concentration could be a primary energy source for most people on the planet. Seeing a solar concentrator work first hand when it's 30 degrees outside and there's not a cloud in the sky for days is perhaps the best way to realize the potential of solar concentration. But solar concentration is even useful in the north so seeing solar concentrators in the south can inspire constructions and development in the north and true global cooperation.

The rest of the chapter simply lists a few tourist ideas. For instance, many natural parks have isolated areas which must be supplied with gas (sometimes by helicopter), so a solar concentrator on location would not only be a tourist attraction but reduce required gas. If a bit of charcoal can also be produced sustainably on location then no gas would be required.

Part IV. Development

Chapter 1. Economics of free fuel

One of the big blockades in the development of solar energy is the assumption in modern economics that fuel costs money. When fuel costs money any increase in fuel efficiency will pay for itself eventually. Thus huge scale central processing that can marginally gain in efficiency is the preferred method.

However, with free fuel from the sun fuel efficiency is insignificant compared to transportation costs. And of course solar energy is already distributed in decentralized way, and so it is far more logical to produce closer to location. For instance, with free solar fuel the isolation of an oven is not essential for a profitable activity. Charcoal, which requires fairly low temperature, from 180 to 300 C°, which can be accomplished with just a tin box. Better efficiency, such as insulating the oven to lose less heat, of course allows more to be done in less time, but it is not prerequisite to start an activity with solar energy.

Furthermore, when fuel costs money, many activities, especially local activities, are economically impossible. With free energy this changes. Anyone unemployed in the current world economy is so because there is not enough energy available for further useful tasks, with solar energy this is not the case (at least not within a few centuries) and so essentially anyone unemployed today can do something useful with solar energy tomorrow (without diverting the resources away from some other employed persons). Though fossil fuel is often viewed as the ultimate source of energy it is finite and fundamentally limited, resulting in a fundamentally limited economy, as all activity requires energy and the economy simply represents activity in society. With essentially unlimited energy, there is an essentially unlimited economy and so no involuntary unemployment. For the next few generations solar energy on earth is essentially unlimited. At some point solar concentrators would occupy too much area reducing biodiversity. However, at such a time solar panels in space might be a good idea.

Chapter 2. Direct energy

Pasteurization, pottery, ceramics, space heating, and many other things can be done with direct solar energy. This chapter describes the general developments that are required on a global scale.

Also, it is also worth mentioning that since solar concentration can create very high temperatures the temperature difference between summer and winter does not affect the system so much, so heating homes and other things in the winter can be done in even very cold continental winters who still receive much winter sunlight.

Chapter 3. Electricity

Though in the first chapter we wanted to forget about electricity because the energy issue is far bigger than electricity, there comes time to consider this issue as well. Electricity is of course extremely useful for electronics, electric motors and producing temperatures higher than the 2500 C° limit of solar concentration.

Electricity can of course be produced with solar concentration. A photo-voltaic panel is more expensive than simple mirror and can transform more light into electricity than normal sunlight delivers. So an elegant solution is to simply concentrate a lot of light onto a smaller photo-voltaic panel. The only problem is that the panel heats up and after a certain temperature efficiency is significantly reduced. Or ... this is only a problem if we are convinced we can only to one thing at a time. However, if we use this excess heat to heat water, not only hot but sterile water can result. Such heating can be done on a local level but also at larger scales. The heat can also be circulated through the foundation of a house for space heating.

The chapter then deals with these high tech systems that already exist, and briefly explains how to do the same thing with a Helios and normal photo-voltaic panel.

Finally, this potential local solar concentration has of satisfying most energy needs, does not make electricity grids or industrial scale solar energy redundant. A grid allows energy to be shared between many decentralized and centralized producer, which makes sense, even with the energy transmission loss, if the energy would otherwise be wasted. But it is important to realize that stability is only increased if the majority of localities could still function independently if need be. Today energy grids create huge inter-dependance and so instability and vulnerability. Storms, ice, war can all bring an entire energy grid down for many weeks, and can only be repaired in such a short period of time with the help of fossil fuels.

Industrial scale solar energy will still be required for industrial purposes and can also supplement cities.

Chapter 4. Decentralized recycling

One of the big problems with recycling today is re-centralizing the material from the vast locations it was distributed to. However, if we remember from the first chapter we only require centralization if we are based on hydrocarbons. If we are based on free decentralized solar fuel then recycling in decentral way dispersed materials makes a lot more sense. Plastics and aluminum (melting point of 700 C°) can be easily transformed into bricks locally and then sold to the closest user (who can also be based on solar concentration), whether local or far away. Wood of course can be recycled directly into biochar, and paper, which takes a lot of thermal energy, can be based recycled with solar energy both industrially as well as in small local units that could be developed. Things like copper are already recycled at close to 100 % so solar energy would just make it cheaper. With some development the temperatures necessary to melt steal and other metals can be reached: through higher concentrations and efficiencies but also with electricity to boost the temperature.

This chapter expands on these concepts and provides a some technical details.

Chapter 5. Mechanical power

Solar concentration can boil water or power a Stirling engines, both of which can create mechanical energy. The chapter discusses in what fields this mechanical energy can be used directly or through compressed air. And of course it can be transformed into electricity when idle.

Chapter 6. Concrete and metallurgy

Solar concentrators can reach 2500 C° and are even used in experimental material research, such as at Front Romeurs solar station at Font-Romeur, France, because the heat is pure with no pollutants that could contaminate the experiment. On a larger scale however metal and concrete can be produced with solar concentration, both on an industrial and local scale. This chapter discusses the ways this can be done directly or through electric or biochar hybrids (and fossil fuel hybrids in the short term). Since the essential energy consumption of these activities is heat the utility of solar concentration is fairly straightforward.

Chapter 7. Transportation
As we saw at the beginning of the book it was largely the western transportation issue, "how will we drive", that inspired the hydrogen, biofuels, compressed air, and electric economies. The proponents of the electric economy are correct in that electric trains are far more efficient than trucks and that electric cars are far more efficient internal combustion cars. Electric trains and trolleys have existed for some time, and electric cars are already coming on the market.

Also, a lot of the cost of the transport system is to move people around who's purpose is simply get something and take it back with them. It is far more efficient to for the person to send the information and then the object sent to the person. This system is already emerging with Internet sales and the post. A postman going on a loop will consume far less energy than everyone on that loop going to and from location. Many things can be done to improve this system further.

The only thing that is difficult with electricity is jet travel and large boats. In both cases mass jet travel and large tankers are not necessary for humanity to survive, so we should be careful not to place more importance on transportation as we do growing food, and heating food and homes. However, transportation is not unimportant, and there are some interesting alternatives to fossil fuel based transportation, such as the solar air ship and wind powered boats. For the limited but useful transportation that can't be all these method bio-fuels may also be a good option on relatively small scales.

Chapter 8. Architecture
Solar energy also poses a lot of architectural problems which this chapter deals with, both in terms of adapting existing architecture and building new architecture with solar in mind.

Chapter 9. Cooking
Finally, the last chapter deals with cooking. Since cooking is so central to culture, in terms of how and at what times of day, cooking with solar may only take hold after people have become accustomed to solar technologies in other sectors, such as biochar and food processing. This chapter deals with these cultural challenges to solar (even the height of the machine can be very important!)

However, on large scales solar cooking systems already exist, and so this chapter describes these systems as well.

Part IV. Culture

1. Importance of culture in energy

Discussions of energy quickly become abstract and technical but culture should never be lost sight of. Culture is the ultimate reason we need energy. The term "economy" is just a useful way to separate the physical aspect of culture from the mental aspect of culture. However, they fundamentally go together, if we think of economics disembodied from any actual people a lot of false problems are created and real solutions ignored.

For instance, modern economists living in abstract economic land come to think of any thing and everything as needs. So, if you ask them what our energy needs are, they will usually simply hand over a graph of current energy consumption. However, "consumption" does not necessarily mean "need" for real people living in the real world.

2. False cultural problems

If we assume current consumption equals current and future needs then it's impossible to imagine humanity adapting to any problem because any change would change consumption, and insofar as they're needs, result in the collapse of humanity. However, common sense tells us that humanity has changed consumption patterns many times in the past, is changing consumption patters all the time.

This false needs problem originated from the realization that it's possible to sell someone something they don't need; unfortunately to be successful at selling something one must truly believe in it. Insofar as economists were primarily hired to sell people things they don't need, it was necessary for them to truly believe that all possible consumption represents needs.

Transportation is probably the biggest false need that results from this world view. Doubly so because modern economics only exists in abstract lands where the the cost of transportation is insignificant; in the real world it's possible to pretend this abstract land actually exists as long as there is cheap fossil fuels to run a global transportation system. So modern economists have focused almost entirely on the transportation issue of energy transition, since without an equally cheap transportation issue their mental framework completely breaks down.

Modern economists also assume that common people are incapable of affecting any useful change in society; only central solutions advised by economists can perform that function.

These centralized mega projects are easy to identify by their lack of feasibility. Though they may contain some good ideas, it's important to remember that an authentic solution must not only replace current electricity production, but also produce at least 10 times more electricity to replace the rest of the fossil fuels we currently use, probably in the context of peak oil, and furthremore would also have to simultaneously solve global poverty in order for the majority of people on the globe to be able to buy into any such a – insert hydrogen/electric/biofuels/local nuclear power/solar panels in space – economy super technological system (not only purchasing the electricity itself but also all the appliances needed to use it).

Though at first these solutions seem new and exciting, the basic lack of feasibility eventually comes to the fore and excitement abates, but the basic desire for a super technological fix remains so a new idea is generated shortly after.

However, these solutions are not only false solutions, they try to solve false problems. It's possible to base the economy on local production of both energy and objects. It's also possible that common people are the impetus to these changes based on simple tools and skills easy to learn.

3. Real Cultural problems

However, simply because the idea that our problems are unsolvable is itself a false problem, does not mean our problems will solve themselves. There may be resistance to necessary changes as well as real difficulty in making any changes even for the people that want to.

The first real cultural problem is mitigating the affects of the false cultural problems outlined above. Many economists may come out against decentralized energy, especially with respect to the poor countries, claiming people aren't intelligent enough or responsible enough to use decentralized energy. This may slow governments in taking an active role in promoting decentralized energy. However, there are plenty of economists that are for decentralization, and so finding and supporting their work can counter balance centralized institutional pressure for seeing centralization as the only solution.

The second real cultural problem is adapting life to the rhythm of solar energy. It's of course technologically possible to store solar energy, but only at a significant cost, and so we should not rely primarily on direct solar energy use and only on storage in limited circumstance. Simply changing habits to do energy intensive things when there happens to be sunlight can greatly reduce the need for and cost of storage systems. Through the niche approach of concentrating on energy activities in which the benefit is the greatest, people can get used to how best to interact with solar energy, and so transitioning other activities becomes easier and easier.

Then there is of course big business, largely co-dependent with the modern economists who see themselves as existing solely due to centralization. Though some of these multi-national companies may be genuinely threatened by decentralized solar energy, most multi national companies have in actuality best chances for growth in a decentralized energy world. First, if the global society breaks apart into resource wars multi-national companies become impossible. Second, with peak oil, solar energy is the only way to not only maintain current economic activity but create new activity. Third, though global transportation will diminish it won't disappear. It would still make in a decentralized energy world that multi national corporations produce high end products and services which depend on centralization. For instance, though bread can be bakes locally, it's more difficult to make a computer locally. Smaller complex objects and components such as tracking mechanism for solar concentrators as well as applications could be built for example by today's car manufacturers.

4. Some ideas

Cultural events can go a long way to sparking discussion, imagination, and action. For instance, music concerts based entirely on solar energy would be totally rad. Proof of concepts, such as melting steel, are being done now and can be done much more in the future all over the world by universities and enthusiasts. Just having a solar concentrator in the front yard not only mitigates the risk involved in peak oil, but also is the best educative tool to teach others about the benefits of solar energy. Because everyone can be involved in local solar concentration (transition does not depend on some gigantic government program), anyone can advance this plan inspiring others, leading to exponential growth of decentralized solar concentration. A solution without potential for easy exponential growth is unlikely to succeed against the exponential destruction of nature.

Most importantly solar centers should be created all over the world, to display, train, and develop solar technology. Though it is easier for everyone if governments do thing for us, there is nothing stopping a single person or group of people opening a solar demonstration, training and development center on their front lawn or roof.