The Energy Net

The free enterprise solution to revive our economy, stem radical Islam and solve climate change – built by ALL of America

Joseph A. Gilbertson

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Joseph A. Gilbertson

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1.0 Introduction

The Energy Net is a strategy and a set of finite projects to transform our energy grid, adding a massive market for solar energy, eliminating "barriers to entry" and providing income streams to anyone who cares to invest. The government plays a part to provide a skeleton infrastructure, but this strategy is fueled and paid for by free enterprise. It inspires the construction of a massive manufacturing base to produce sophisticated and highly exportable technologies, providing likely 3-4 million jobs and establishing an American expertise to lead the world.

The Energy Net is a solution based in free enterprise, striving to emulate the 1990's Tech Boom in a number ways. It allows hundreds of thousands of Americans to innovate, invest and contribute to the American ideal, dramatically improving our economy and creating jobs, and (believe it or not) stemming the tide of Radical Islam, and solving Climate Change completely.

Free enterprise has proven to be the most powerful force on Earth. America, the most powerful nation in world history was built on free enterprise. Whenever invoked, free enterprise asserts its will, be it industrial revolution (1760-1840), automobile production in the early 20th century, or the tech

boom of the 1990's. If you can guide free enterprise toward a goal, it will surpass your most optimistic expectations.

The Energy Net guarantees energy independence, and at our option, we have the ability to suck all of the money out of the Middle East. Or we can choose to buy oil selectively from our friends, i.e. those who do NOT support terrorism.

It will be much easier to negotiate and make objective decisions in the Middle East when we don't desperately need their products. And we will find it much easier to deal with radical Islam when certain oil billionaires lose their revenue streams and are out of the picture. With control over our oil imports and substantial leverage over countries in need of our cheaper solution for energy, we will have that kind of influence.

Terrorism is "asymmetric." That means the good guys have to spend a lot more money than the bad guys to keep up. The proponents (the aforementioned billionaires) of radical Islam have tens of billions of dollars in oil money to wage war, and we must spend hundreds of billions of dollars to counter it.

Climate change has been primarily a liberal cause in America. Despite some (in my opinion) rather dubious evidence, it is widely accepted as an existential problem for humanity.

In the political world, climate change is batted about like a tennis ball, it rallies the people toward the liberal side then goes away. No progress has been made, in fact, if the U.S. were completely carbon-free, the larger problem of China, India and the rest of the developing world would continue unabated.

International treaties have been a joke, and liberal politicians have not made a dent in the global climate.

The Energy Net means the U.S. will have the means to do away with fossil fuels at whatever pace it chooses, and when we export it at great profit, it will make a cheaper and cleaner alternative to fossil fuel available to the rest of the world. The Energy Net does not require additional complex battles to solve climate change - it wins the war.

I make pretty bold claims in this book - that complex and difficult problems, seemingly intractable for years or decades, can suddenly be brought to submission with a single strategy. But we have seen what the massive American free enterprise engine can do when properly motivated. Information technology (driver of the tech boom) is about 7% of our GDP (by some estimates). Energy is higher and likely closer to 9%. The Energy Net will inspire a massive economic boom using methods that have always made American successful.

Warning: This plan is designed to be compatible with free enterprise principles. But beware:

- If you treat this as a tax, it will fail.
- If you attempt to socialize it, it will fail.
- If you regulate it to enforce climate change aspects, it will fail.
- If you attempt to force it on people, it will fail.
- If you attempt to make a worldwide treaty, it will fail.

Let's look at the plan in a nutshell.

2.0 Strategy

2.1 Preliminary - Open all means of energy production

First, let's be real about this, the initial goal is for America to become energy independent and to become an energy exporter. While the thrust of this strategy is a massive solar energy play and the "micronetworking" of our energy grid, we arrive at energy independence much more quickly by enabling every form of energy exploitation, the Keystone pipeline, oil, shale, natural gas, nuclear, etc. Free enterprise is about competition. Let's compete!

Only in this manner will America be free to deal with the rest of the world objectively. Right now when we buy oil we send billions of dollars to countries who hate us. This must stop as soon as possible. Once the plan takes off, the rest of the world will negotiate to reap the benefits of our efficiently produced power. Our success depends on our ability to walk away from the negotiating table.

Thus the first part of the plan is to open the floodgates on oil, shale, natural gas, and whatever else can go online. Get the ball rolling to make sure we are energy independent and exporting as soon as possible.

2.2 Phase I - Announce the first 2500 square mile Tract of solar

Power, Equipment Produced Domestically

This is the crux of the plan. We set up a competitive market, where private industry produces solar energy on a dedicated parcel of land (the "Tract"). The infrastructure is provided, and all barriers to entry - regulatory, technical and bureaucratic - are eliminated.

Start by finding an area 50 miles by 50 miles in a desert region of the U.S. This is easy enough. U.S. government agencies currently manage over 1 million square miles of land, much of which no one has set foot on for years. Prime areas are readily available in sunny states like Arizona, New Mexico, Utah or Colorado.

The federal government would provide the land and the power lines connecting the three major American power grids to the east and west. The Tres Amigas power hub in New Mexico, is working to connect to all three. An ideal location for the first Tract would be close to that location in order to access energy markets across the country.

Existing and entrepreneurial energy market makers can handle distribution and billing processes. America has no shortage of creativity, and with proper forethought will be ready on day one. The ability to coordinate revenue distribution to the thousands of individual entrepreneurs is not a difficult problem (talk to Amazon, Google, eBay, etc. and scale downward from millions to thousands) and first movers will make a lot of money.

The initial infrastructure reduces the barriers to entry to our Tract to almost zero. The red tape with public utilities that can take months or years goes away, and the goal to turn on a new system can be reached a matter of days. An entrepreneur simply leases some land in the Tract at a low cost, installs his panel set and starts collecting money. Connection engineering and standards development are done ahead of time.

As a value added, the federal government augments its buildout with the installation of superconductor transmission lines (we will explain why later) at a premium cost. This amount of volume will build the superconductor industry to world class status.

Calculations (see section 3.1) show an area 150 miles by 150 miles covered in solar panels using current technology would replace all energy consumed in the United States, including household, business and transportation needs. 50 by 50 miles is the initial Tract, but while this is underway, we would survey the next five Tracts. We don't expect to replace 100% of our energy needs at this point. We don't have to (see Phase II!). But we do have to show we are capable of it.

All material and equipment must be produced in the United States - ***strictly enforced***. A key principle is to develop the manufacturing scale of solar equipment and the supporting technologies to the point where costs are well below that of any other energy means. And of course, with an eye toward export. China already produces solar panels at 50-75 cents a watt and this is near cost competitive versus other generation methods. With the kind of volume we need to fill the first 2500 square miles, we will be able to scale up and do much better.

2.3 Phase II - "Micronetworked" power, national net metering

Metering, Homeowner and Small Business Systems

Once the new industrial base for solar panel production has driven the costs down below that of any other competitor, the second phase of the plan is to use this scale to produce equipment for homeowners and businesses for their own installations of solar power. Hundreds of thousands of people will find it easy to contribute to the power grid, and get paid for it!

To make this work, we implement a national "net metering" law. In its current form, net metering is a billing mechanism that allows residential and small business customers to put energy into the grid (with solar panels, or sometimes small hydro), usually on some schedule that doesn't correspond with the customer's usage . The energy is "banked" by the utility company, and the customer draws it out for normal use when they need it. Most states, e.g., New Hampshire, have at least some implementation of these laws already.

We intend to go further with this and establish a mechanism by which anyone can receive money or money equivalents by putting energy into the grid, thus establishing incentives for individuals to invest and produce on a "micro-networked" basis.

This increases the robustness of the energy grid. Hundreds of thousands of these contributors spread around the country in a properly organized grid, would ensure small communities would never be cut off completely from power. This is a grid much more survivable in the event of an attack or other national emergency. The distributed infrastructure is also a lot more efficient

since the average distance from generator to consumer will be reduced substantially.

Billing and revenue for individuals can be handled by third parties. The models for this are well known (i.e., we don't need to burden the current power companies). People will be able to sell to whatever power entity is paying the most. It's conceivable in later stages a worldwide grid will exist, and one will be able to sell directly to Liberia or Malaysia on an individual basis.

A series of X-prizes (more on X-prizes later) would push this substantially faster. Once the idea takes hold, it's a trillion dollar market.

2.4 Develop battery technology and industrial base

In the last few years, researchers have produced amazing advances in all aspects of battery technology, e.g., storage capacity vs. volume, charge times and discharge rates, cost factors, maintenance characteristics and manufacturing. Researchers have increased the potential utility of batteries by at least an order of magnitude. The best of these technologies will hit the commercial market, and timing will depend on the market's needs. While this research has mostly been targeted to the massive consumer market for mobile devices, Phase I of the Energy Net will create a huge need in a different direction.

Most opponents of solar power point out the sun does not shine at night.

True.

However, this creates an opportunity. As solar power generation increases, the gap between daytime energy prices and nighttime prices will increase. This creates an opportunity gap into which the market will insert the most suitable batteries to store energy for nighttime use. As solar power generation increases worldwide, this is a market worth tens, perhaps hundreds of billions of dollars.

With this kind of market, our expertise in battery technology will ascend well past that of any other country. This will lead to improved batteries for electric cars, and perhaps for cell phones and portable computer equipment as well. Remember, energy storage has always been a limiting factor for everything from bug-sized drones to interstellar spacecraft.

Very little federal government investment is needed, market forces will take care of this. When it is needed, battery storage will be available, quickly and cost-effectively. With the requirement that all equipment in the Tracts be built in the U.S., a robust large-scale battery manufacturing industry will emerge.

The federal government should monitor this closely and perhaps encourage the development of the industry toward certain directions through an X-prize strategy.

More on X-prizes later.

2.5 Develop superconductor technology and industrial base

The U.S. must take a leadership position in superconductor technology. Since we are already set to install power lines to connect Phase I to the Tres Amigas grid intersection point, it makes sense to consider going the extra step to invest in superconductor transmission lines. Transmission lines generally lose about 5% of transmitted power. Superconducting transmission is theoretically lossless.

Superconductor transmission lines have already been installed in short runs of a few miles. U.S. companies are in place and stand ready to produce. While there may be a risk of cost overruns, the technology risk is low.

In this case, it is estimated the superconducting lines will likely come at a premium of 50% or more over traditional transmission lines (1). But the added efficiency should pay for the extra cost over the lifetime of the transmission line even for initial full premium cost runs. Once manufacturing scales up, costs for this technology should fall in line with traditional installations.

Why? Superconductor materials are a “raw material” with huge potential for enabling technology development for the next generation. It has application not only in large-scale energy transmission, but also in petaflop computing, transportation (e.g., magnetic levitating trains), medicine, and so much more. An order of this size not only makes its manufacture cheaper per mile, but it also creates a critical mass of superconductor researchers and engineers that

will put American companies at the forefront of the technology. The export potential will be massive.

2.6 Export selfishly

The total investment to add substantial (more than 50% of consumption) solar energy generation to our infrastructure will easily exceed one trillion dollars in private money over the 10-20 year building process, financed by individuals, entrepreneurs and Wall Street. This should not surprise you considering energy is a 1.4 trillion dollar per year industry in the U.S.

With the innovation and volume generated in this plan, prices for solar panels, storage batteries and superconductor transmission cables should fall dramatically. This massive new American industrial base should easily produce the most cost effective method of energy generation worldwide (beating fossil fuels, nuclear, and any other alternative fuels), complemented by new electric vehicles produced increasingly in the U.S. as electricity prices fall.

Flexibility and forethought are key. As a condition of export, we could negotiate long-term supply contracts for American companies, freezing out competition. Perhaps auxiliary terms could be applied. For example, we could offer to finance a country's energy infrastructure provided while it is being built they buy coal only from Kentucky, Pennsylvania and West Virginia. Japan and China have been very good at negotiating these kinds of arrangements; we need only apply the same principles.

This flexibility means our negotiating positions in every instance will be strong. We can say to the world: "If you want this energy, you must be our friend" (and we define 'friend' this way…).

No doubt the Chinese would want to provide their own infrastructure inside their borders (perhaps buying our stuff until they can copy it), and they are indeed making investments here. But the rest of the world would open as a market. Energy hungry countries like India would move to convert their infrastructure, and perhaps countries not so populous would invest in order to sell electricity to those energy hungry countries.

It might be difficult for much of Europe to find twenty thousand square miles of free land. However Ukraine, the Czech Republic, Romania and other surrounding countries may have land close enough to sell power into Europe. They could buy our panels, our batteries and our superconducting transmission cables with energy export in mind.

3.0 The Parts

3.1 How much solar power do we need?

Current energy consumption

How much energy is consumed in the U.S.? According to references and with some straightforward calculations we find the total amount of energy consumed in the U.S., including cars, homes, factories, etc., is:

97 quadrillion BTU per year

In more slightly more useful terms this is

28.4 quadrillion watt-hours

Currently, the total cost of this energy is $1.2 Trillion dollars, or about 8.3% of GNP (2).

Calculations

So if we wanted to convert this to solar energy square footage, then

hours of daylight:	**9**	**hours of effective sunlight per day**
panel size:	**7.2**	**sq ft**
watts per panel:	**100**	**watts per panel (1000mmx665mm)**
watts per square foot:	**13.9**	**watts per square foot**
watts hours/sqft/day:	**125.0**	**watt-hours/sqft/day**
watt hours/sqft/year:	**45,625.0**	**watt-hours/sqft/year**
sq ft needed for U.S.	**622,926,027,397**	**sq ft needed**
Sq ft/sq mi:	**27,878,400**	**sq ft/mi**
sq mi needed for U.S.	**22,344**	**sq. mi needed**
Area squared needed	**149.5**	**miles to a side (if square)**

With this simplistic calculation, an area 150 miles by 150 miles covered with solar panels would replace all energy consumed by the United States.

Obviously panels may require space between them for maintenance. Plus we have to account for losses in transmission and storage. So perhaps the area must be larger.

On the other hand, solar panels will become more efficient, and battery and transmission technology will get better so perhaps the required area may be smaller. And remember we still have hydroelectric plants and nuclear facilities that will generate electricity even if fossil fuels were discontinued immediately. So we will likely need fewer than 150x150 square miles.

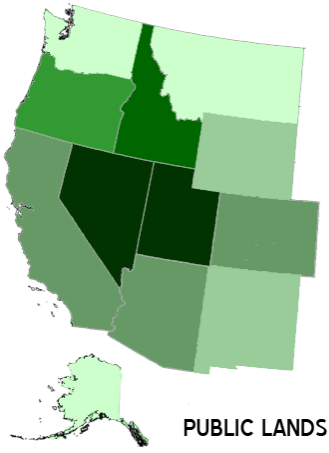
Disclaimer: The calculations made in this book are rough numbers designed to show impact. These are not intended to be exact nor even close. But I firmly believe my arguments support my assertions and calculations are as accurate as they can be without a team of engineers and architects writing detailed

plans. In many cases, known errors will offset each other. As mentioned before, certain inefficiencies will be made up for by increased efficiencies as research and the market produce better solutions.

3.2 Where do we get that much land?

The Bureau of Land Management and National Forest Services currently oversee over one million square miles of land. We need less than 2% of that to fulfill all of our land needs for this project. In fact, we can afford to be picky about it. Much of this land is in areas of high geological stability and bright sun, perfect for solar power.

We can see from the charts below the Bureau of Land Management manages a great deal of land in Nevada (84,000 sq mi) and Utah 59,500 (sq mi), Colorado (35,000 sq. mi.) and Arizona (36,000 sq. mi). All of these states have sufficient land area to house the entire project, if other concerns are ignored.



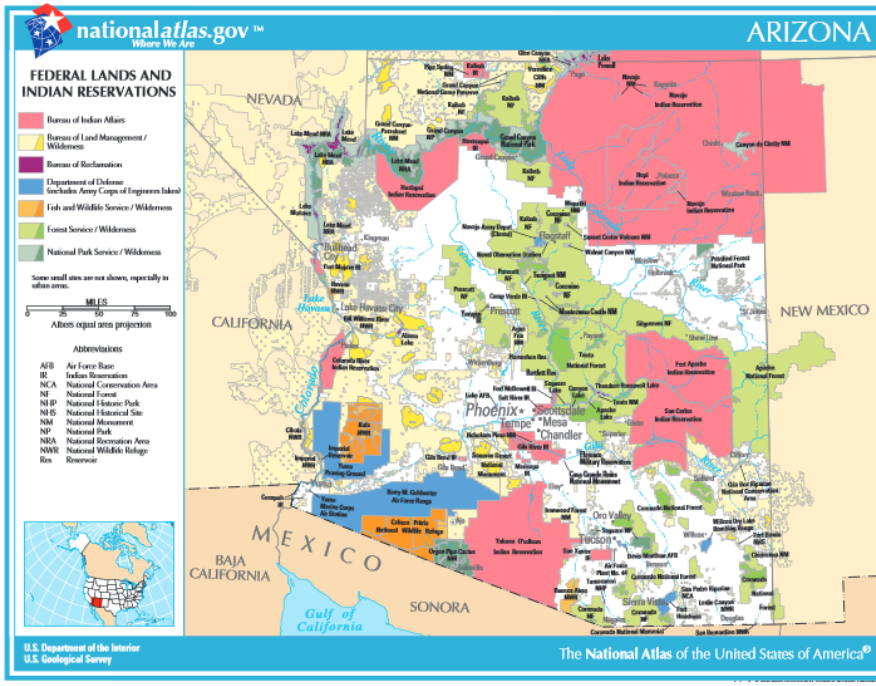
	percentage of total land area	NFS land in million acres (1,000 sq km)	BLM land in million acres (1,000 sq km)
NEVADA	76.1%	5.9 (24)	48.0 (194)
UTAH	70.2%	8.2 (33)	29.9 (121)
IDAHO	60.5%	20.5 (83)	11.9 (48)
OREGON	46.2%	15.7 (64)	15.7 (64)
CALIFORNIA	35.4%	20.8 (84)	15.2 (62)
COLORADO	34.4%	14.5 (59)	8.4 (34)
ARIZONA	32.2%	11.3 (46)	12.2 (49)
WYOMING	29.5%	9.2 (37)	18.4 (75)
NEW MEXICO	29.4%	9.4 (38)	13.5 (55)
MONTANA	26.5%	17.0 (69)	8.0 (32)
ALASKA	25.7%	22.0 (89)	87.0 (352)
WASHINGTON	22.7%	9.3 (37)	0.4 (1.6)

PUBLIC LANDS HELD BY THE NATIONAL FOREST SERVICE AND THE BUREAU OF LAND MANAGEMENT

Source: http://www.wildlandfire.com/docs/2007/western-states-data-public-land.htm

For Phase I, we will locate a Tract of about 2500 square miles of contiguous area. This would be sufficient, if fully subscribed, to replace about 1/9th of the country's total needs.

We would like to focus on Arizona first, because according to the charts of solar effectiveness, Arizona is a very efficient area. A 50x50 mile area can be extracted from wilderness areas northeast of Phoenix, or perhaps leased from the Navajo tribe in the northeast corner of the state. Federal lands in New Mexico are a bit more fractured.



It should be noted that many in Navajo nations are at or below the poverty level, and they suffer 48% unemployment (3). This could be a tremendous opportunity for them if they are amenable. On the other hand, perhaps control should stay with the federal government. Negotiating the deal will be key.

We also note that the power industry is just beginning to build out the Tres Amigas Superstation in New Mexico to join the three major power grids in the U.S. The first Tract would be within a few hundred miles of the Tres Amigas connection point and would be able to transmit power to all three of the major power grids in the U.S. The Navajo lands could be within 200 miles of the Tres Amigas facility, minimizing costs.

As an alternative, in case of political difficulties, the initial Tract could be located slightly north in Nevada or Utah, each of which is managed 70% or more by BLM and NFS. The following chart (4) provides more information on where the best land is for solar energy.

Table 5. Impacts of 1-Axis Tracking on Land-Use Intensity Compared With Fixed-Axis Mounting

Region	Direct normal radiation (kWh/m2/yr)	Estimated energy production (kWh/kW)			1-axis tracking increase in energy yield relative to Fixed	2-axis tracking increase in energy yield relative to Fixed	Land-use intensity (acres/GWh/yr)			1-axis tracking change in land-use intensity relative to fixed	2-axis tracking change in land-use intensity relative to fixed
		Fixed	1-axis	2-axis			Fixed	1-axis	2-axis		
San Francisco, CA	1,883	1,551	1,828	1,951	17.9%	25.8%	4.94	4.72	5.44	-4.40%	9.30%
San Diego, CA	1,965	1,607	1,864	1,974	16.0%	22.8%	4.77	4.65	5.39	-2.70%	11.40%
Alamosa, CO	2,530	1,813	2,200	2,606	21.3%	43.7%	4.23	3.93	4.08	-7.50%	-3.60%
Phoenix, AZ	2,519	1,733	2,113	2,419	21.9%	39.6%	4.42	4.1	4.4	-8.00%	-0.60%
Jacksonville, FL	1,507	1,380	1,634	1,504	18.4%	9.0%	5.56	5.29	7.07	-4.90%	21.40%
Newark, NJ	1,263	1,268	1,422	1,321	12.1%	4.2%	6.03	6.08	8.06	0.70%	24.90%
Seattle, WA	1,112	1,100	1,249	1,136	13.5%	3.3%	6.97	6.92	9.37	-0.60%	25.50%

3.3 Implementation

Fees for using land in a Tract

With the infrastructure taken care of and all bureaucratic barriers to entry removed, entrepreneurs will find they can get into business and generate

revenue as fast as they can install solar panels. However, to keep entrepreneurs from taking advantage, they must be charged a fee for the use of the land (This is the free enterprise approach after all!). This will also allow the federal government to recoup its investment in transmission lines and other infrastructure.

Simple calculations suggest a solid acre of solar panels should generate about 160,000 kW hours/month. At a wholesale rate of about $0.03 per kW-hour, this yields just under $5000 per acre per month. Depending on efficiencies, this could vary widely. However a nominal fee of $200 per acre per month is pretty reasonable. A fully subscribed 50 by 50 mile Tract could at this rate provide close to $3 Billion per year to the Federal Government. As revenues and efficiency rise, it may be advisable to raise the rent. If progress is too slow, we may wish to lower it. The market rules.

3.4 Market organization

As climate change advocates open their wallets to make an investment, Wall Street will certainly step in to help organize, vet and finance.

By the time the first Tract is set up and connected to the grid, we expect solar panels to be available within the U.S. at competitive rates (entrepreneurs will certainly pre-order). Dozens of companies will arise selling shares to climate change advocates and others in a massive grassroots campaign.

It is reasonable to assume non-profits will invest, perhaps municipalities as well. Utilities have traditionally been a safe haven for retirees. After an initial

chaos (predictable from observation of the deregulation of other industries), this market should settle into a stable range with reliable dividends.

The concept of an energy exchange is a tried and true concept. A small company on the Tract or even a homeowner with a small excess of power may wish to deal with an energy broker somewhere else in the nation, certainly not the stodgy local power company. These markets are easily built with existing technology and customer service strategies.

We expect energy prices to roller coaster a bit. Within the U.S. energy prices will drop substantially, which will allow cheaper operation of hybrid and electric vehicles. Within 10 years, non-gasoline powered vehicles will likely rise to become the standard in the U.S., and will cause electricity prices to rise again. As international automobile manufacturers increase the manufacturing scale of electric vehicles for the U.S. market, developing nations will find them cheaper to buy and will need more capacity in their own electrical infrastructure.

While the federal government would be tasked to set up the initial power infrastructure, it is reasonable to assume private industry would step in to maintain the energy transport infrastructure. These private companies would receive a transport fee much like internet players do with data transport. The revenue streams would push efficient expansion of the network, provided the barriers to entry (mostly access to rights of way) are eased. With planning and attention to technical standards, the free market will take care of this.

In Phase II, with national net metering in place, look for farmers and other landowners to install solar power perhaps even on a temporary basis just to offset the cost of fallow land. In fact, a land speculator may wish to place solar equipment for any parcel of land he currently owns, then moves the

equipment when he sells the land. Every house can throw equipment on their roof or in their backyard. Its free money, why not?

One can imagine if the market becomes valuable enough, countries like China may export equipment to the U.S. to compete with ours, even if they are not allowed on the Tracts provided. Since China would likely subsidize this equipment to gain market share, it may be necessary to tax them heavily to maintain our ownership of the market. As I suggested before – negotiate well and export selfishly.

As U.S. manufacturers start to export equipment, the federal government should support it (again selfishly) in the form of loan guarantees and other incentives. Maintaining first mover advantage, maintaining a critical mass of research, and flexible financing should keep America at the top of this market.

3.5 Develop a superconductor manufacturing base

The U.S. must take a leadership position in superconductors technology. Since we are already set to install power lines to hook our Tract up to the Tres Amigos connection point, it makes sense to consider going the extra step for superconductor transmission lines.

According to an industry source(5): “When looking at the 1,000-mile, multi-GW transmission runs required to transport renewable energy from America’s heartlands to its cities, Superconductor Electricity Pipelines are comparable in cost to 765 kV AC overhead transmission lines.”

The industry expects a 50% price premium for such an installation:

"The estimated cost of a Superconductor Electricity Pipeline, which includes the cost of seven sets of 750MW DC converter stations, would be in the range of $8 - $13 million per mile fully installed for a 1,000-mile cable system. The low end of this estimate is based on a single 5,000 MW pipeline while the upper end is based on a fully redundant 5,000 MW system (two cables). This estimate is comparable to the $7 to $10 million cost per mile estimate for two to three 765 kV transmission lines complete with required substations, which is what would be required to carry 5,000 MW for 1,000 miles."

It is estimated 5% of energy is lost in transmission lines. At a wholesale rate of $0.03, a 5% loss means about $4 billion in losses per year if the Tract is fully subscribed. While the breakeven points are difficult to quantify with this range of uncertainty, the development of the industry, and the subsequent advances should certainly make it worthwhile.

3.6 Develop the battery manufacturing base

We talk about batteries, but what we really mean is energy storage of any kind. As mentioned before recent developments in battery technology have been incredible. Exotic materials, innovations in structure and such have provided substantial advances. The solution to effective large-scale storage is very close, at least in the laboratory environment.

For example, materials under intensive research such as graphene and carbon nanotubes (6)(7) are poised to improve storage in batteries by increasing the surface area to which a charge attaches. Just recently discovered, nitrogen added to metal-air batteries triples the capacity. (8) A liquid based "redox"

flow battery is said to have 10 times the storage of the previous version. (9) Batteries for electric cars are improving in rapid increments because the market demands it. Electric car company Tesla is continually rolling out vehicles with greater range.

Research funding at the moment is mostly aimed at small devices. After all our mobile phones MUST stay charged! Knocking the price down for a cellphone battery by a couple of bucks could be worth tens of millions of dollars. Hundreds of potential improvements are being researched as we speak because the market will reward success.

Once the price gap between daytime and nighttime is large enough to fill at a profit, and once that first entrepreneur shows it can be done, a frenzy for that solution will ensue. Efficiencies will improve from there, just like in almost every evolutionary product industry.

Imagine the size of this prize. Imagine our first Tract to be completely subscribed, with a 20% difference between daytime and nighttime pricing. This price gap is worth over $6 Billion per year with only the first 1/9th of the American market.

Battery manufacturing in just this first segment is worth $6 billion. The rest of the U.S. and worldwide market is potentially fifty times larger, or a quarter trillion dollars per year. This gap may represent a million jobs or more.

Yes, this market gap will be filled. And Americans should be the country to fill it.

4.0 Who Will Pay For This?

4.1 Climate change advocates

Who will pay for this? Obviously, the people who believe in it! From the perspective of the climate change advocate, this is the perfect investment. They can acquire shares in corporations guaranteed to generate revenue whose purpose is to replace fossil fuels with renewable solar energy. The power flows into the grid and into the energy market, revenue flows immediately and the stocks pay dividends. As solar energy becomes more cost effective, the dividends go up.

And at the same time, if you are a climate advocate, you have the opportunity to contribute to the solution of the single greatest threat to planet Earth.

Indeed if properly marketed, this could literally bring hundreds of billions in investment from the U.S. and around the world. Saving the earth is a powerful vision, and saving the earth and getting a dividend is irresistible.

4.3 Savvy financiers

Wall Street is filled with geniuses and opportunists who will see the desire for investment from the climate change advocates. As a utility type investment, it should have a very stable return. Once this is borne out, institutional investors will swarm to this as a safe investment with a guaranteed income (think the scale of the mortgage bubble but without the nasty sensitivity to slight economic downturns!). It may very well become the favorite investment of retirement funds, both private and public. Energy utilities have always been stable investments, and with the right supporting industries these can also be stable, but with the potential to continually improve in efficiency and generate ever higher returns.

Speculators and venture capitalists will find a role in the riskier aspects, or structural aspects where leverage can be had. For example, I'm imagining a number of investors going after the tracking and distribution of revenue, first for small companies in the Tract, and then for individual homeowners.

4.4 X-prizes

To keep technology development focused in the right direction, the government (perhaps through DOE or entities similar to In-Q-Tel) and private organizations would be wise to offer "X-prizes" for solutions to certain technological problems as they arise or are identified. This gives the government the farseeing ability to steer technology toward the goals of the plan, and private organizations the ability to urge technology into niches they believe to be in their own interests.

Such tremendous leaps have been made in battery technology over the years that I believe a sizable X-prize would immediately focus laboratory successes to solve large-scale or product-centric storage.

An X-prize for a homeowner compatible 1000 watt system to retail for under $300 could advance Phase II by focusing entrepreneurs on the right product.

In the shorter term, a useful X-prize would be to generate strategies to manage a survivable grid, coordinating hundreds of thousands of power contributors, and serving the community directly in emergencies.

4.5 The federal government

Initially, the U.S. Government brokers the land and foots the bill for connections to the power grids at the Tres Amigas Superstation, or by some other route. The cost for this could be anywhere from $2 billion to $20 billion depending on how far the Tract is from the connection points. As more infrastructure is needed, private industry can step in and provide it on a fee basis much like what happened in the data pipeline industry with cross country fiber optics cables for the internet. The model is there.

The U.S. energy economy is over $1.4 Trillion per year, so the initial investment leverages a much larger industry. As mentioned before, since we have determined the land is worth a lot to entrepreneurs, the federal government should break even within a few years and generate substantial return revenues.

We mentioned before a 50% premium to install superconductor technology. It may also be that this will have some growing pains in scaling to this level. It may be necessary to install temporary traditional transmission lines in the short term.

Some of the cost of universal net metering will likely be borne by the federal government. This is difficult to quantify, however, and eventually the cost will shift to private industry.

This would be a good time for the federal government to take a look at security and smart infrastructure. In addition to universal net metering, let's create that survivable grid, where hundreds of thousands can contribute energy. If a power plant goes offline, then at least some power can allow continued function of business and government in a community. Let's get this functionality ready for export.

As mentioned, the federal government would fund X-prizes to encourage technologies when needed. These are trivial in cost compared to the value of the strategy.

All of these costs will be returned to the U.S. Treasury many times over from land leases and energy transport charges. As with most free enterprise solutions, it is win-win.

5.0 Effects on Climate Change

In short, The Energy Net evolves into a worldwide plan. It solves the problem of climate change on a global scale by making an alternate source of energy more cost effective than fossil fuels.

While we continue to believe the best effect will be the draining of funds from radical Islam and the creation of jobs, it is the climate change advocates who will drive this forward for the climate change solution.

Climate change advocates will realize if this doesn't work it is unlikely anyone will muster the political will to try again. Then their worst nightmares are on their way to being true. This is an important psychological factor in motivating this group to provide investment dollars to make it happen.

5.1 How will this solve the majority of the climate change problem?

This plan would dramatically reduce the use of fossil fuels by simply making it cheaper to use solar energy and electricity. Traditional vehicles will become

more expensive, because they will be produced in lower quantities and because gasoline will be more expensive than electricity. Now that Tesla has made electric cars "cool," this strategy causes the evolution of electric vehicles to be swift, lucrative and worldwide.

We have had great difficulty convincing China and India to sacrifice their rapid growth by spending money to control pollution. This plan does not interfere with their growth; it enhances it by producing more energy at a lower cost.

The developing world will follow our lead, and those who are thinking of a new infrastructure may even get there before us, importing American technology.

While the path may be a bit jagged, depending somewhat on political whims, fossil fuel consumption will follow a slow but inevitable decline. This is not a partial solution to climate change as it is currently understood, it solves all of it.

5.2 Possible objections

Certainly someone is going to object to re-purposing any particular land tract for power. After all, 22,500 square miles to replace all American energy is a lot of land. But for perspective, according to the UK's Kew Royal Botanical Gardens study (10), about 888,000 square miles of forest disappeared in 2015.

With this perspective and the worldwide alarm on climate change, it is difficult to fathom these objections would be more than local. Plus the boom to the economy local to the initial tracts would be overwhelming.

6.0 Effects on Terrorism and National Security

Energy is at the center of the expansion and radicalization of Islam because it is essentially free money to countries who export oil. It relieves a large portion of that population from the obligation to build an infrastructure and earn a living, and allows them to expand beyond what their resources and industry could otherwise support. Without it, the areas they occupy would be, in many cases, very difficult to inhabit since industrial and natural resources other than oil are almost nil.

The relief of the obligation to earn their survival has in many instances perverted their society, affected a socialist characteristic and allowed them to invest in the export of radical Islam. Much of the Islamic world has little or no working economy. They are dependent on oil revenue.

6.1 Who is funding radical Islam and terrorism

Known

We know certain elements of the Islamic religion are funding terrorism within Saudi Arabia, Qatar, Kuwait and the United Arab Emirates, all our ostensible allies. And of course, more comes from our perennial foes Iran and Syria. We know the individuals providing support to terrorists are wealthy because of oil money, and it is seemingly a never-ending source.

Despite the fact a great many organizations are proven to support terrorism in these countries, their hosts have not shut them down, they still exist and operate. If you can take away their income, these wealthy entities will suddenly find themselves much less able to fund terrorism and the expansion of Islam (11) and still support their own lavish lifestyles.

We have no leverage. At this point the world needs oil, and these countries have it. The Energy Net gives us a choice. We will have a choice to either buy oil from these places or buy it from someplace else, or, of course, not buy it. Our choices will have serious economic consequences for these countries, and so our desires become more meaningful, come negotiations.

Follow the money

Back in the 1920's when the FBI wanted to take down Al Capone, they were never able to catch him committing a crime. He was finally convicted and thrown in jail for a much different charge - tax evasion. From here the phrase "follow the money" has been the watchword to represent a strategy of tracking

money transfers, disrupting money flows and cutting the criminals off from their funds. After all, why commit crimes if you can't make a profit?

The individuals who actually disperse funds to terrorists don't care much about how much they spend because the supply of oil money is seemingly endless. If oil money dries up, these individuals will find their fortunes static. They may be in favor of radical Islam, but they will not be willing to go broke and give up their rich lifestyles if these revenues ceased. My guess is they would move to France with their riches and retire.

Note: The author worked in the Crime and Narcotics Center of the Central Intelligence Agency, wherein the "follow the money" strategy is powerful and highly nuanced. Analysis and surveillance of money flows will be key to this strategy and to negotiations with oil-producing countries. Our intelligence services are very good at this. With the right leverage, the damper on terrorism could be hugely effective. The "move to France and retire" scenario is often seen.

6.2 Where is the oil money?

Saudi Arabia's income was about $359 Billion in 2014. They have a massive and over-subscribed welfare system and with more recent price drops their cash reserves are falling at $12 billion per month as of this writing. Saudi Arabia acts like an ally, yet a great deal of funding for terrorism comes from wealthy individuals in Saudi Arabia whose income is based on oil. Osama bin Laden was one such example.

Kuwait's income in 2014 was $110 Billion; in Qatar is was $120 Billion and in the United Arab Emirates it was over $404 Billion. Russia, Iran, Iraq, Yemen, Syria all benefit from oil exports as well.

In each case except Russia (where it is indeed still important!), oil is the primary export and accounts for a great deal of their wealth. Without the income, these economies would be devastated.

6.3 How do you suck all of the money out of those places?

With the current state of the energy market, any disruption in the flow of oil causes severe problems around the world. The world truly moves on oil. The Energy Net provides massive leverage over oil producing countries by the real or threatened displacement of oil as the primary source of energy. Any country who decides to sponsor or allow support of terrorism can be negotiated into oblivion. Conversely, we can arrange for our friends to continue to serve whatever oil and gas needs are left in the transition, and perhaps assist them in building a real economy.

If worse comes to worse, with the progress of The Energy Net, we even have the option of militarily threatening the oil infrastructure. At present this is not an option, the collateral economic damage would be too great. But knowing a military option is available is a tremendous point in negotiation and policy formation. For example, if ISIS manages to capture a set of oil wells, and can be taken down no other way, perhaps the oil wells are expendable.

Some radical Islamist groups in Africa rely on extortion and kidnapping to further their cause. This is not the norm for radical Islam and will not sustain them with enough resources to export terrorism. ISIS has taken ground and is

attempting to maintain infrastructure, but it cannot sustain itself just with the land (unless they settle down and become farmers!). Its holdings are not enough to support their war locally and certainly not enough to export terrorism. And now ISIS is a static target. Oil money supported their growth, but without it the terrorist activities are limited.

These groups have always had backers with deep pockets. The Energy Net allows us to control, and, if need be, cut off the money supply to any oil producing countries that support those backers.

This means those rich individuals from oil producing countries bent on exporting terrorism and radical Islam will no longer be so flush with cash they can afford to waste it. As the money spigot turns off, these rich individuals will begin to focus inward on themselves and the welfare of their immediate families, to engage in "capital preservation." Money for funding jihad will become scarce.

As mentioned before, I predict these individuals will put their money in Switzerland, and move their sorry butts to Paris.

Yes, this will make a mess in the short term, like stepping on a beehive. Economic, political and social upheaval will ensue along with extreme pressure on all sides. Governments will fall, and wars to capture land and resources will break out in the Middle East. Radical Islamic factions will likely plan to attack us throughout the world, wherever they can reach us. But wait! Now they don't have the money to do it.

A policy of "containment" may be required to keep violence and unstable populations from spilling out (such as is seen with Syrian refugees pouring into Europe right now). However, weaning these populations from their

socialist economies and dependence on oil revenue will ultimately give them self-sustaining economies. The adage "idle hands are the devil's workshop" applies here, if you are working to earn a living in a desert, you probably are not focused on destroying the infidels in America. And you may even learn to appreciate the value of free enterprise.

6.4 More robust energy infrastructure

With an energy infrastructure of solar panels, the destruction of any part doesn't mean catastrophic failure. You could literally throw $1 billion worth of MOABs into a 50 by 50 mile area of solar panels and leave it 90% operational. Individual panels, even if dislodged could still be serviceable (tech standards should be designed to make sure it is!) - not to say that such areas will not be vulnerable if planned incorrectly. Of course, an electromagnetic pulse weapon (EMP) such as a nuclear bomb would throw any energy plant offline. We should think about "hardening" critical infrastructure pieces in due course.

"Net metering" is the ability for anyone who is generating power to sell it into the power grid, and is a vital part in the transformation infrastructure of our energy grid in America.

Imagine an internet analog for the power grid. Electricity is sometimes generated from massive power plants (in the internet analogy these might be Wikipedia, eBay or Amazon), but also generated by tens of thousands of homeowners and business owners who happen to have a bit of extra real estate (in the internet analog this is every business or individual web site). If for some reason a major plant should be disconnected, locally produced

power from these smaller sources should be able to maintain a community in power. The smart grid will determine priorities and keep the community's productivity at levels sufficient for business to continue, at the expense of less important power uses.

Indeed the net-metered grid should be planned so such a community can withdraw from the broader market so as to serve itself in an emergency. From a national security standpoint, this means if America is attacked, the power system will be robust, each community able to sustain itself to a varying degree. It would be virtually impossible to have significant effect on America by attacking its power infrastructure.

Obviously, like the internet, the transport system must be maintained and expanded to meet expanding needs. AT&T, Comcast, Bellsouth and others provided this for the internet and are compensated handsomely for it. And like the internet, power transmission providers will need to be compensated.

But this industry is perfectly capable of self-organizing, under the right leadership and plan. Business craves predictability, so the political resolve must not waver. Companies will arise to manage and redistribute power from the homeowner systems, taking care of the transport and providing income to the producer of the energy. In fact, the energy spot market already does this to a large degree, but entrepreneurs will find ways to make it more robust.

Such a scenario is far more survivable than nuclear, hydroelectric, or oil-fired plants, in the unlikely event America is attacked.

7.0 Affects on the American Economy

7.1 New technology boost (can we please not give this away?)

Solar manufacturing

Phase I plans 2500 square miles of solar energy with a total potential of 22,500 square miles within the U.S. Add to this an export market several times that much around the world. It could easily be over a trillion dollars in exports over ten years, larger than most other manufacturing markets. So let's call this $100 billion per year just in the manufacturing of solar panels.

Manufacturing alone could easily provide over 600,000 new jobs in the private sector. We should see a like amount of jobs from installation, management, powerlines, administration, etc.

According to Trade.gov, one billion dollars in exports provides 5,796 jobs. As manufacturing efficiency increase, exports of equipment will rise. This could easily generate another 500,000 jobs.

It is not only the manufacture of solar panels that will benefit us. We will also have the greatest laboratory in the world for solar power conversion and improved efficiency.

This could easily add a full percentage point to our GDP, with the conversion of savings into working capital and America will benefit largely at the expense of overseas oil producers who hate us.

Superconductor Technology

The business of superconductor transmission is in its infancy. The Energy Net incorporates superconductor transmission into Phase I to encourage the large-scale manufacture of line materials to push the price into the competitive range. The ultimate goal is to create a critical mass of researchers who can develop cost effectiveness in smaller scale uses such as cars, computers and in the home. The uses of superconductivity are endless, and with sufficient research should dramatically improve an energy infrastructure shifting away from fossil fuels.

Using superconductor transmission lines for hundreds of miles at the initial stages may add 50% to the total cost, but will make the U.S. a leader in the manufacture of superconductors and likely reduce the price substantially. This is an exceedingly important technology and could be another major export product, as described previously.

But suppose we are able to invest enough and create enough demand for superconductor transmission lines to be ***more cost effective*** than traditional lines?

Considering the massive transformation anticipated for energy around the world, the market to reclaim the 5% in transmission loss should fuel an export market for American superconductor companies. In the U.S., transmission line construction is about $47 billion per year. Exports of equipment and expertise could easily be on the same order of magnitude if we can monopolize this technology.

Perhaps we will see another half percent improvement in GDP and another half million jobs through the export of this technology. Provided of course we export selfishly and don't give this away.

Battery technology and manufacturing

As we described above and as is patently obvious, solar power only produces electricity during the day. As power becomes more expensive at night, it will become obvious that a storage medium of some kind is necessary.

Storage technology will need to approach the lifetime of solar cells, which, under current technology and proper maintenance can retain 80% of their power output after 50 years.(12) This is a huge issue with batteries, but the incentives to solve it will be considerable.

Throughout history, people have come up with clever ways to store energy, including flywheels, water reservoirs, etc. But a traditional style battery format is the goal here.

The Energy Net strategy does not preclude such solutions as flywheels or water reservoirs but some methods lack a certain engineering elegance in a solution to energy storage and do not support the flexibility needed to create an export market.

Water reservoirs are convenient when a source of water is available. But the adaptability and efficiency are limited. They also would not create an export market, so perhaps a better solution should be encouraged.

Flywheels as energy storage are novel, but it seems an awkward technology, likely with a limited lifespan and having maintenance requirements. Plus the spin rates make them dangerous and unreliable due to their rapidly moving parts.

Battery formats (including fuel cell, and supercapacitor technologies) are conceptually easy, portable, exportable, have no moving parts, and can be continuously improved for efficiency. When the market demands it, a 50-year battery is certainly not out of the realm.

If a third of power is distributed at night, and if the cost of storage will be roughly the same as the solar panel installation on a watt per watt basis (and yes these are outrageous guesses), you might consider it will build another 300,000 jobs and a like amount in export. This could easily add a quarter to a third of a percent to our GDP.

As vehicles transition from gasoline to electric, automotive batteries will become a major manufactured item. About eight million cars are sold per year in the U.S. This means batteries for electric vehicles could grow to an industry well over a trillion dollars over 10-15 years. The worldwide market is over 65 million vehicles per year.

And of course research into smaller and more compact batteries for electronic gear could be influenced by this greater research base. As we mentioned before, the battery is always the limiting factor in making devices smaller and

more capable. While we can't make a guess what innovations our newly enhanced research community may generate, this should certainly add to our economic well-being.

The Auto Industry

When I first started noodling on this problem and the idea solar power could solve it, electric cars were seemingly nerdy, unmanly and unreliable. This has always been the kiss of death; auto manufacturers had no incentive to push the industry. The adoption (or ridicule) of new vehicles styles has always been led by the "alpha male." The alpha male must be impressive to attract women; people go to car shows to see what the alpha male drives. This is an industry sensitive to ridicule, and electric cars just have not measured up.

However since the advent of the Tesla, this problem has been solved. I once said the solution to the problem is to build a Corvette that could beat the gas powered version in the quarter mile. Tesla has done this and now every cool car manufacturer has at least one hybrid or fully electric vehicle that moves in muscle car circles. The psychological barriers are gone.

With the Energy Net, the auto industry now will begin to produce electric vehicles to serve the U.S. market. It's a very big market. Eventually these cars will be super cheap, and even more bang for the buck than their gas-powered counterparts. Believe it or not, provided the storage is sufficient, electric motors are simpler, smaller, lighter and more powerful than internal combustion engines.

If we can maintain dominance in this industry, cheaper cars with cheaper fuel means a huge demand for American products worldwide. If we can provide

incentives to produce inside the U.S., Detroit could potentially revive nicely, and another million jobs will be created.

7.2 Balance of trade

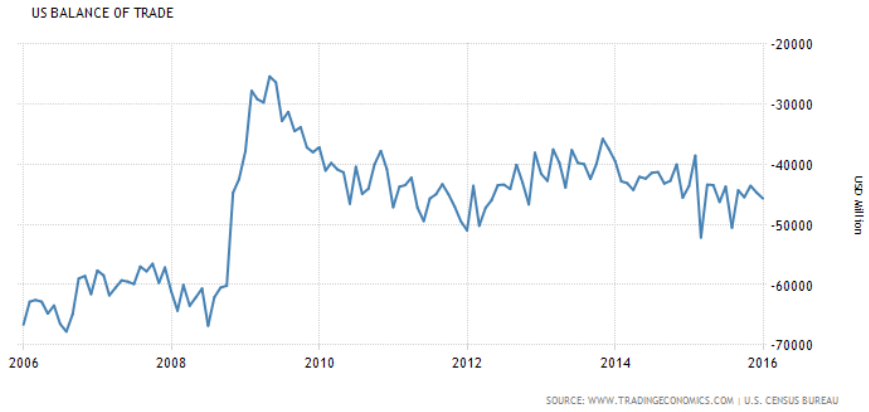
How the Energy Net will affect the Balance of Trade

Our trade deficit is over $40 billion per month and has been there or greater for a long time(13). This means precious capital is leaving the U.S. and being invested in other countries.

The Chinese use our trade deficit dollars through their banking system to buy U.S. Treasury Bills. Essentially our trade deficit becomes an additional burden to our national debt. Mathematically it is an exponential growth curve – and it runs against us.

Many of our other trade partners follow suit, and our trade deficit becomes part of their national cash reserves. These funds, in turn, get loaned back to us to fund our deficit in the form of Treasury bonds. And of course we pay interest on that. If the trade imbalance were in our favor, the bank accounts of American companies would be the ones getting fatter, and the interest being paid from Treasury bonds would go to Americans instead of foreigners. This interest, of course, would be taxable to reduce the federal deficit and would become part of our own GDP. Again exponential, but in OUR favor.

Even more effective would be the working capital added to the U.S. economy. If you imagine private industry could generate a 15% return from these funds, this alone would provide a permanent half percent increase in GDP.



The location of capital is important. A reduction or reversal of the trade deficit would make capital for investment more readily available here in the U.S. In other words, money stays inside the U.S., more money comes in from the production of export goods, and corporations make investments here instead of overseas.

Balancing trade would make the dollar stronger. Stronger demand for American goods means a stronger dollar, even while the trade deficit is decreasing. That means Americans can buy more and have a better quality of life.

How do we reverse the trade imbalance?

Our energy imports are a huge chunk of our trade imbalance (14). In 2011, oil imports totaled $327 billion, accounting for 58% of all imports, over $27 billion per month on average.

These figures have dropped over the past few years primarily due to the recession. Oil imports under the present regime will likely fluctuate

dramatically, and we have no control over the price of oil. No doubt the import value will rise if left to the OPEC nations.

The Energy Net makes it possible to reduce energy imports to zero. Not importing oil might mean our trade deficit is cut in half.

As described earlier, a bold new set of exports related to solar energy, batteries and superconductor equipment could perhaps mean the U.S. trade deficit would go away completely and generate a trade surplus. The market is there.

7.3 Manufacturing output

We are talking about 622 billion square feet of solar panels in the U.S. alone. The export market should be five times that much and should manifest before anyone else can challenge us - if our political leaders are good at negotiation, perhaps we can lock in 10-15 year non-compete agreements on a country to country basis to guarantee the export market.

If we can also manage not to give away the lead in newly developed battery technology and superconductor technology, we should have substantial sustained increases in manufacturing for years to come, along with the jobs they produce. A package non-compete including all of these goods, plus perhaps a guarantee on automobiles would be a nice boost to the American economy.

7.4 Re-establish America as the leader

The increases in economic output will be tremendous; the shift in balance of trade will make our economy stronger. Our energy security will be assured, taking away any timidity with respect to negotiating with oil producing countries, and indeed others from whom we import goods.

Climate change is a global movement. It has its very vocal proponents in every country. An American solution to the climate change problem (even if it is advertised as something else) will make America admired in every corner of the world. Other countries have looked to us to solve global problems, and we will fit into that role once again.

The U.S. will also experience a newfound strength and independence when it comes to dealing with the Middle East and Terrorism. Since we will be able to buy oil only from people we wish to deal with, the bad actors will no longer be able to blackmail us or leverage us into concessions. At this point, denying oil revenue to bad actors by destroying or disabling and entity's oil production (ISIS for example) becomes a viable option.

These are powerful factors, any of which could restore America's leadership in the world. The Energy Net strategy provides all three and more.

The establishment of a "micro-industry" to bring free enterprise to the third world

Now imagine how this same solution has an impact on income in the third world, in poverty-stricken nations.

Imagine a nomad with a set of panels (and perhaps some very light but high capacity batteries) on his camel or pack mule. He goes from town to town and finds a place to plug in his panels. He just stays long enough to generate some energy, collect his revenue (from a bankcard arrangement), and spend that revenue on supplies before moving on.

In the case of a family of nomads, a portable supply of electricity provides for the basic needs of a wandering lifestyle, any excess is stored, acting as a limited but useful bank account. The family could send its teenage son into the nearest city to exchange energy for goods and services, provided the storage medium was up for it. Universal net metering means there will always be a market for energy.

This is referred to in third world economics as a "micro-industry" where tiny business supports the welfare of the very poor. The Energy Net strategy can bring hundreds of millions of people much closer to the formal economy. If a local entrepreneur can save to invest a few hundred dollars in solar equipment, he could earn an additional $20-$30 per month, perhaps a substantial part of his income. In effect, a free enterprise based redistribution of wealth could occur.

It is common for politicians to attempt redistribution of wealth by taxing the rich and providing services for the poor. It rarely works as intended and always has the detrimental loss of productivity inherent in socialism. The Energy Net allows people to earn their own money by being productive, with many times the beneficial effect. The Energy Net in a mature form could easily shove $500 billion per year into the pockets of the poorest people on Earth.

This is how an American implementation of The Energy Net could have a profound impact on the poorest of nations. We could easily set this as a foreign policy goal and encourage free enterprise around the world.

8.0 Other Issues

8.1 Why not wind and tidal power?

Many forms of renewable energy exist, each with its advocates and each with its advantages and disadvantages. Some will argue the federal government should not be "picking winners."

"Picking winners" is what President Obama tried to do by subsidizing individual solar product companies. Unfortunately, President Obama has no experience at all in private industry, nor the energy industry nor in free enterprise in general. Almost all of his "investments" have failed.

The Energy Net creates a market for solar energy and then allows free enterprise to choose the winners and the losers. It establishes rules, creates competitors and then lets chaos ensue. This is free enterprise at its best.

But we have no reason to exclude other technologies. Any solution that wishes to compete will have the advantage of universal net metering and an increasing demand for electricity. If another solution shows promise, Wall Street will certainly jump on it.

Windmill advocates will claim windmills are a better solution or must be a companion solution. If those advocates can pull it off, more power to them (pun intended!). They would certainly be allowed to install windmills within the Tract, if they believe the wind currents would be sufficient (15). If not, then anyplace in the grid should be accessible, attaching through net metering.

This is, of course, my own bias, but as an engineer I believe windmills are simply an inelegant solution to the problem. They are large mechanical monstrosities that do not scale well, with lots of moving parts that wear out and a large maintenance tail.

Given that certain liberal lawmakers denied construction of a windmill project in New England because it would have been within view of their homes, my sentiments about them being ugly are probably widely shared.

Actual effects on heat retention, a systems perspective

Let's look at the earth as a closed thermodynamic system, assuming any energy strategy might eventually reach sufficient scale to have an impact on the earth's natural processes. In field study, the system has many inputs and outputs. The measurements, influences and interactions are complex. Conceptually, however, it is a simple system. Heat comes from the Sun, balanced by heat radiating from the earth out into space. The global temperature is the net heat retention between the two.

Let's assume that any energy produced eventually turns into heat, which increases the earth's temperature (how much is certainly open to debate).

- The earth has a great deal of stored energy. Fossil fuels are Nuclear energy (fission or fusion), are essentially stored energy, from millions or billions of years past. Using these forms of energy releases the energy, doing work, of course, but largely ending up as waste heat. The result is added heat on Earth in the present time. Climate change advocates insist that with oil, rising CO_2 levels trap heat in the earth's atmosphere reducing the loss of heat into space and raising the contemporary temperature even more. The ultimate effect has been subject to heated debates (pun?), but from a systems point of view, a heat rise of some kind and some level is not in doubt.

- Some have proposed elaborate satellite based solar generation systems that beam microwaves back to the earth. This strategy gathers energy not normally be incident to the earth and beams it to the earth. This would also add heat to the Earth.

- Wind power and tidal power are different; they take only the existing Earth processes to generate energy. From a systemic point of view, this adds no new heat to the Earth.

  Yet, there is another factor still not considered. Windmills absorb energy from the wind (Yes! that's right). If you absorb enough energy from wind power to make a dent in our national energy footprint, could you be changing wind currents globally? What would be the effect of that?

  "Conservation of energy" is basic to all engineering. It may take a great deal of work in very specialized areas to do a study, but eventually someone will assign a cost and consequences to it. At this point, no one (as far as I know) has a clue. The effects are not certain

by any means, but I'm sure the potential for harm will come to the forefront, if wind power generation increases substantially.

I do not anticipate wide-scale use of tidal power since it might interfere with beaches and tourism. But is it possible that undersea systems could be cost effective? Will it add heat to the earth? No. Might it interfere with natural coastline or undersea ecologies? Yes, it might.

- Solar power takes energy already incident to the earth. It neither adds nor subtracts from the total energy and therefore is not likely to change any of the earth's normal processes. One could clearly argue it requires a lot of land that cannot be used for other purposes. And perhaps it will be a problem that the energy is distributed in a different manner and not absorbed by the land upon which it is incident. I'm sure these will be studied.

The question in all of these cases is to what degree any of these have an impact. While it is easy to argue solar has the least impact, I am not prepared to argue the impact of any of these is substantial or even noticeable. It could easily be that the normal fluctuations of the earth's climate are of such greater magnitude we need not worry. But this is beyond the scope of my work.

9.0 The World's Perception of America

As America once again takes the lead in solving climate change, we will become very popular in many European countries. Our exports and new products will make us very popular in the third world, at least among those who are not our enemies for some other reason.

However, let's not be too optimistic, our leadership always brings out the national insecurities of many countries. We cannot expect constant cheering in any circumstance. We can, however, expect new influence.

The non-Islamic third world will likely benefit the most. With a cheaper form of energy, these countries will not have to spend precious cash reserves to import oil. If they do indeed institute net metering, you may find that even the most indigent will save to purchase a solar panel or two, as a source of income.

Islamic countries may no longer maintain the façade of tolerance, nor will we have to bend over backward to avoid offending them. Certain countries will attempt belligerence, but find themselves impotent without oil funds and without access to Western weaponry.

But with the Energy Net, America will be the leader again. This reminds me of a favorite quote:

"...It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat..."

Theodore Roosevelt in
Paris, France, April 23, 1910:

10.0 Conclusion

Are there any politicians out there with the guts and the savvy to pursue this? I don't know. Seems like a relatively easy lift, but it may fall on the sacrificial alter of political expediency. And it is very clear from the breadth of politicians out there (this has been written during presidential campaign season), that many do not understand free enterprise, and indeed don't understand how our economy works.

I can also see many political pundits poking at it. Many foreign policy experts will certainly predict death and dying, and advise against it. Some will call this plan naïve, that major strategies like this have too many opponents, and it will never get through the political process.

And of course, some might say it is "poorly written" as was once ascribed to my work (sorry we engineers sometimes don't write good…).

My fervent hope, however, is that it is not ignored, that the idea will at least make it into the limelight and considered for what it is - a plan to build The Energy Net.

11.0 Strategy in Brief

If you have read this book and just need a refresher on the pieces parts, here is the entire strategy point by point.

1. Develop all resources for energy across the country, oil, shale, natural gas, etc. Move toward independence by whatever means necessary.

2. Start with a 50 mile by 50 mile area in a region good for solar power (total to replace all power in America is 150 by 150 miles, but 50x50 is a good start).

3. Provide the infrastructure for the area, lines to the power grid on each side of the country. Encourage the use of superconductor technology by installing several hundred miles of superconductor cables.

4. Lease parcels of land to anyone to place solar power into the grid as long as all of the equipment is sourced to America. Allow the market to organize itself.

5. Investors will be climate change advocates; they will save the world and make money at it. Wall Street will jump in.

6. By sheer scale, dramatically reduce the price of the equipment to produce solar energy.

7. Require net metering across the country.

8. Encourage the manufacture of small, efficient and inexpensive solar power sets available to home and business owners

9. Watch the development of battery technology for mass energy storage take off (no need to do anything here, it will happen on its own, or small X-prizes to steer if necessary).

10. Watch the popularity of electric cars take off.

11. Watch our manufacturing base and GDP improve.

12. Watch our balance of trade actually balance (exports of energy equipment increase radically, imports of energy decline radically).

13. Export solar equipment to third world countries, especially those using a lot of oil. Solve global climate change.

14. Stop importing from countries that support terrorism. Watch their oil revenues dry up, anyone with money left absconds and takes sanctuary in France. Countries supported by oil money now must find a way to develop real economies. Solve terrorism and radical Islam.

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