

The Outline of the Solution.

At present, the US is expending vast resources in a vain attempt to support the status quo in energy. A less wealthy Nation would not even be able to attempt efforts of this magnitude.

Consider that at the present day, counting both civilian and military personnel, and those on the scene and those supporting them at home, we have perhaps 300,000 persons or more engaged in work to “stabilize” or “pacify” areas in the world from which we either derive our fossil fuel supplies, or from which terrorist attacks against them may originate. This involves the direct expenditure of at least a billion dollars a day. Further, we have lost over 3000 American lives in the effort.

Despite this heroic effort, we are no closer today to stability or peace in these regions. There is no real prospect that there ever will be peace or stability in these regions. Besides this, we cannot use these fossil fuels anyway, without disastrous results. So, what is to be done?

The answer is obvious. We must make a clean break with this policy. We must move instead to a sustainable future, while preserving stability for the present, and bringing some measure of immediate relief to our people.

In the US, we must undertake a very diverse set of complementary activities that will all act together in pursuit of our goal of abundant, low cost, sustainable energy. These will combine, both in the short term and the long term, to assure that our goals are reached.

The eventual scale of these activities must be massive. A scale not less than the scale of our present efforts to maintain the status quo. We must deploy our resources productively, on this large scale, to incrementally change our entire energy supply to a sustainable, renewable, carbon neutral future base.

In outline form, here is the solution.

The Short Term.

In the short term there are many varied programs that can be undertaken with immediate payback, both in financial terms and in terms of relief for people.

A. An effective legislative program must be put forward at once to move us quickly forward. The legislative program must advance each of the items listed below. It must remove barriers and supply incentives to proceed as outlined. Feed in tariffs, grid interconnection, investment incentives and tax breaks are among the instruments to be used to shape policy and encourage positive actions. Further details are listed in the sections below.

B. Conservation Efforts.

1. Enabling legislation should both support and reward conservation efforts, especially in the early adoption stage. Later, when the benefits become more obvious and the products more available, such rewards will be less needed.

Beyond support and rewards, in some cases the use of conservation principles may have to be mandated, if only to level the financial playing field. In this area it may be necessary to require that new construction be done to minimum green standards, such as including more insulation, better heating and cooling plant, superior windows, efficient lighting, and the like. Otherwise there will always be a certain percentage of builders who will compete on price alone, and will, in the long term, "cheat" their buyers by saddling them with inferior housing.

2. In the area of transportation, efforts should be made to utilize less fuel for this purpose. Fuel efficient vehicles should enjoy advantages in taxation and purchase incentives over less efficient models. Fuel taxes are not the answer here as they penalize everyone. Rather, direct taxation of the vehicles themselves when sold, plus incentives available to purchasers of efficient models is the appropriate, and fair, approach.

In order to reduce fossil fuels used in transportation, several steps can be taken. These include:

- Purchase Hybrid autos that combine electric motors and batteries with a backup internal combustion engine. Most of the time, this auto will run on electricity, rather than fossil fuel. Mileage of the vehicle will increase dramatically. If the electricity used comes from renewable sources, then even more fossil fuel will be saved.

Since this option is very expensive today, this is a good area for incentives to be included in the legislation mentioned. Otherwise a typical person will perhaps not be able to justify the

expense for such a vehicle. One could start by requiring all Government owned autos to be of this type.

Next one could require all government vehicles, including localities to be of this type. Grants could be offered to speed up the process and also to lessen the financial burden on less affluent localities.

By requiring these steps, sales of hybrids would increase considerably. More dealers would carry them. Price competition would improve. And Detroit would be encouraged to produce more such vehicles.

- Encourage the use of all-electric vehicles such as the proposed Chevy Volt. This will further reduce the use of fossil fuels. The Electricity used will come from an increasingly renewable grid.
- Address the largest uses of fossil fuels in transport by encouraging use of the most effective transportation modes. Specifically, haul trailers on trains until they reach the vicinity of their destination, when they can then be hooked to tractors for local delivery.

Then encourage mass transit use compared to use of private automobiles. Similarly, encourage travel by train compared to travel by plane, as far better energy economy is realized in this way.

Address the large amounts of fuel used by heavy equipment, such as construction vehicles, farm vehicles, mining vehicles, and the like by encouraging the adoption of more efficient models and the use of Bio-fuels in these vehicles.

Any forms of alternative fuels, whether Bio-diesel, methanol, ethanol, or the like should come from sustainable sources. Care should be taken that the actual production of the fuel itself does not consume more fossil fuel than is actually saved in its use. This point is very important.

One must not inadvertently use more fossil fuel in total, in order for a smaller number of individual users to consume less.

3. Owners of existing homes will nearly always benefit from the addition of more insulation, and energy saving windows. Attractive financing or even grants, should be made available for these purposes. At the same time,

free energy audits would assist homeowners in making informed decisions about how best to spend their money in this area.

- Insulation is probably the least costly and most effective investment that a home owner can make in the energy area. Adding ceiling or attic insulation plus wall insulation will save both heating and cooling costs. Savings can be very large, particularly if little or no insulation is present to start with. Lower income home owners, who often live in the oldest homes, could be given either low interest loans or grants for the purpose. Using this grant money to re-side their home and add wall insulation in the process will also improve neighborhoods.
- Energy efficient windows are also a very cost effective investment. They, like insulation, will last for the life of the home, and will yield savings in both heating and cooling. Insulated doors are also available.
- Proper use of window shades, that block high angle solar radiation will save cooling loads in the summer, while allowing in lower angle solar radiation for heat gain in the winter.
- Installation of a modern hot water heater will save energy. Further insulating this device with a blanket made for the purpose will make additional gains. As an energy audit will show, most people are unaware of the large percentage of their energy budget that is spent heating water.

All of the items in category 3 above, for homeowners can yield substantial financial benefits in the short term. They are all low in cost, especially the various forms of insulation. Compared to money spent, for instance, on a new auto, these items offer much larger gains and a faster payback.

On the other hand, we must all replace our autos at regular intervals. Take advantage of the regular replacement interval to upgrade the efficiency of your automobile. However, most people should prioritize their home energy savings first, unless they are not the owners of their own housing.

4. Although not strictly a short term item, legislation should favor construction of new homes that are inherently energy efficient. Use of prefabricated wall and ceiling structures containing large amounts of built-in insulation, for example, should be encouraged. More details will be listed in this area in the sections on longer term plans. Legislation may have to do more than just favor such homes, it may have to level the playing field by mandating minimum standards.

5. Changing to modern, energy efficient furnaces and air conditioners will also yield large savings to the owner of the typical existing home. Since nearly every home must have a furnace or an air conditioner, or both, special attention should be paid to incentives in this area.

This is the next logical step after insulating a home and changing windows and the like. Now that the total energy requirement has been reduced, a smaller and much more efficient model of furnace or can be installed. This ensures that the least amount of fuel is then used to service the smaller load. The same may be said of the air conditioner.

6. Energy efficient appliances and compact fluorescent lamps can save significant energy in the home. These should be advertised and encouraged. Many people have no idea how much energy they expend in lighting their homes and businesses. Advertising based on education in this area would help.

7. Since consumers are often not aware of the options for saving energy that are open to them, an educational program should be started in this area. It should be supported financially by the legislation. Utility bills are an obvious outreach area. Require utilities to distribute an educational brochure in this area.

8. Utilities can also make gains in the area of conservation. Short term investments with immediate payback in energy savings in existing plants should be encouraged. Likewise, efforts made to improve existing electric infrastructure, especially where line losses are concerned should be encouraged. In many cases today, especially in more rural areas, the lines are carrying their absolute limits of power, and must be upgraded, eliminating much resistive line loss.

Much work such as replacing older transformers, raising line voltage back to nominal values from sub-nominal (where it now stands in many places in this country), and reducing losses through faulty insulators and contacts with tree limbs, poor quality connections and the like should be done. It should be required.

C. Development of Small Hydroelectric Power.

Many mature devices are already on the market to produce electricity from very small streams. These devices produce power in the range from a few hundred watts to a few thousand watts.

There are an enormous number of small streams, especially in the many hilly portions of the Country, where a small percentage of the flow could be diverted invisibly, and routed to these small hydro devices. Each could then be grid connected, and thus, in concert, deliver many megawatt hours of energy per year to the grid.

Many companies already produce small hydroelectric power production devices. These businesses have established dealers in the state. It would be straightforward to expand the dealer network. In addition, new plant capacity for production of the devices should be built.

The distributed nature of this resource would avoid grid feed in limitations while at the same time stiffening the grid generally. They would act to directly displace much fossil fuel now used to produce electricity. And they would produce a profit for those investing in them. This activity should be specifically encouraged.

D. Renewable Energy.

Our Country has abundant sources of renewable energy. Two of the most obvious are solar and wind. Yet, adoption of these technologies has greatly lagged. In many cases this is simply because of a lack of information, or ill-informed, very small and localized opposition.

We have abundant wind resources available. Modern wind turbine designs are able to utilize far lower wind speeds than the devices produced only one or two years ago. That opens up large areas of the country to their use. In many cases family farms could be saved by having lease income from turbines located on their lands.

For the present, until wider ranging plans can bear fruit, this small scale adoption of wind should be encouraged. Legislative relief may be required to remove the burdensome permitting process. Attractive incentives and feed in tariffs should be offered.

There are also terrific off-shore wind sites available. Here, out of sight of land, very large wind machines could be installed. While this is not an overnight project, the enabling legislation should be put in place now, to allow the process to start. It is worth noting that these turbines would be located within direct reach of the most energy use intensive locations in our Country, thus yielding their benefits to the greatest possible numbers of persons.

Next consider the use of PV cells. Although every State does not enjoy the solar resource of, say, Arizona, the sun does shine everywhere, every day. Even on cloudy days, PV power can be produced. And PV cells work better when they are cold than they do when hot.

Installation of solar PV cells on homes and businesses should be encouraged. Attractive interconnect terms should be put in place. Solar cells can be installed immediately, sometimes within days. Each watt-hour of power produced saves the owner money, while directly displacing the use of fossil fuels. Solar cells have an extremely long life, and will pay for themselves plus earn a profit. As economies of scale kick in, the up front costs will be driven down, and the payback will come sooner.

E. High Efficiency Batteries.

Since we have established that almost all of the systems advocated, from hybrid cars to renewable energy plants all require batteries for energy storage, this should be an early focus.

Many companies already offer these devices, so they are readily available. But more energy density and storage and recovery efficiency would be desirable. Although attaining this goal is longer term, the first step of funding research at local universities should be taken immediately. Local companies should be encouraged to participate in the activity.

Battery technology has advanced in recent years by leaps and bounds. Anyone using cell phones or laptops is well aware of this. But costs must come down further and storage capacity must increase. The research should forward these goals.

The Intermediate Term.

First of all, more legislative action of the appropriate types will be required. Roadblocks to the adoption of alternative fuels, renewable power, and intelligent dispatching of energy must be eliminated. A system of penalties should force the reluctant away from fossil fuel use when practical alternatives exist. A system of rewards and incentives should benefit those who make progress in the desired directions. Financial instruments should be put in place to encourage and reward financial investments in the right fields. And government sponsored development and research dollars should be made abundant.

Further, investments and legislation should be put in place to support early adopters of hydrogen. It will be found effective to produce hydrogen in an environmentally sound, and financially rewarding manner, using renewable energy to power the process.

For an example, wind or PV power can be used to power the hydrogen conversion plants. This ensures that the energy stored in hydrogen will have come, as much as possible, from renewable sources, and will not have exacerbated the fossil fuel shortage in the process. Meanwhile the beginnings of a hydrogen fuel infrastructure can be established.

Hydrogen use however should be strictly limited to those areas where the use of alternatives is not practical. One should not look to an overall use of hydrogen in a hydrogen energy economy.

A much more aggressive and proactive approach to more development of renewable energy sources such as wind and PV should be put in place without delay.

Arrangements should be made for the first, large-scale, grid connected renewable energy power plants to be placed online on the nations electrical grid. These early plants could be built in those places with clearly superior wind and PV resources.

Much would be learned from this. New technology would be developed. Economies of large scale would begin. And of course, many thousands of gigawatt hours of renewable energy would be produced for use.

More development of alternative transportation and power generation fuels must also be undertaken. Hydrogen, and Electrically powered equipment must be made available. The nations businesses will benefit greatly from the large increase in demand for their products. Much use of fossil fuels can be avoided as well. Renewable energy would be used in production of the energy.

All of these efforts will combine in setting the stage for the long term. New technology, large financial investments, economies of scale, demonstrated effectiveness and reductions of risk will all play a role.

Businesses, individuals and legislators will be ready and informed so that the next stage can proceed expeditiously and effectively. Resources will be conserved rather than wasted.

The Final Energy Sources.

Since fossil fuels will ultimately be used up to the extent possible there is no question but that our final energy sources are to be completely renewable. For these we must employ Solar Photovoltaic, Wind Energy, Solar Thermal and Biomass. We must meet the entire energy needs of our country from these four sources alone.

Can this be done practically ? The answer is a simple yes. The details will be expanded on in the later sections.

The result will be a nearly infinite supply of clean, renewable energy, with no possibility of disruption of supply, no issues of pollution or global warming, and no escalation of price over time.

The Distribution and Storage of the Energy

Our final energy sources must be built in numerous, decentralized renewable energy power plants. Each plant must be designed to supply the entire energy needs of the region it is intended to support. In addition, a generous surplus of energy must be available for export to other regions, to accommodate downtimes for maintenance, as well as outages and other problems.

For all this to work, the form of the energy must be electric. This is the highest quality energy, and the most easily transported and produced. It can also be stored.

To facilitate the use of these quantities of electricity, the national power grid must be completely rebuilt, on a suitable scale.

When other forms of energy are needed, such as heat or fuels for transportation, the electrical energy can readily be either converted to these forms, or used to produce them.

The Financial Means of Accomplishing the Goal

Both the power plants and the grid facilities will be expensive. Obviously significant financial resources will be called for. It is obvious however, that these resources will be available and must not be wasted.

By the end of the time allocated to the short term and medium term Energy initiatives above, significant progress will have been made. There will be less

dependence on fossil fuels than would otherwise have been the case. Significant development of alternatives will have taken place. Economies of scale will have reduced the costs of these alternatives.

If we had many thousands of workers, and billions of dollars to spend, this renewable energy system could quickly and painlessly be built. In the process, we would end our dependence on foreign supplies of energy. All of the money spent would be spent in the US. This would create millions of jobs in industry and elsewhere, and create great wealth for American citizens. And of course, we would immediately end the senseless wars of "pacification". Thousands of lives would be saved.

Since in the end our dependence on fossil fuels will be over, the persons now engaged in military and commercial efforts to rebuild and pacify the middle east for example, will find their tasks either mostly complete, or less vital to the national interest. Their return home will free up billions of dollars and the labor of many thousands of people for diversion to this project should we so choose.

When the system was complete, it would be ours to keep and use forever. No other country could deny us access to it. The huge amounts of low cost energy it would provide would greatly benefit American industry. This would make us more competitive on the world market, bringing us still further financial benefits.

Thus, rather than being a cost imposed on society, this project would apply already available funds much more productively, to benefit Americans for generations to come.

The Benefits

In addition to the benefits already mentioned, the growth of carbon in the atmosphere would be halted, and then reversed. Since the US uses much of the world's energy, we alone by undertaking this effort could produce this result.

The rest of the world would see our success, and would eventually follow in our path, as their resources allowed. This would further improve the world situation.

With an end to global warming, and the stabilization of the environment, would come a reversal of the damage to the environment that we have seen thus far. We would also see the elimination of other kinds of pollution, such as acid rain.

The remaining supplies of oil and other fossil fuels could be put to much better use than that of burning them. For instance, plastics and pharmaceuticals rely upon hydrocarbons for their production.

The financial benefits, already alluded to, would ensure that our Nation enters upon a sustained period of prosperity. This would benefit everyone, without imposing a cost for future generations to bear.

Energy security and abundance, would likewise persist for the indefinite future. This would allow our people to undertake virtually any project they chose. Benefits to society are the inevitable result. In a period of sustained stability and prosperity the efforts of man could be directed to the arts and sciences, with resulting benefits to all.