THE END OF FOSSIL FUELS
An Energy Strategy for the United States

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A Global Energy Strategy for the United States

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1 October 1997

There is a growing set of indicators that suggests that the world is on the verge of an energy revolution that would rapidly make fossil fuels obsolete. If, in fact, one of the many techniques now being developed becomes commercialized, it will signal the beginning of a new era in the history of human endeavor.

The potential implications of such a breakthrough would be hard to overestimate as it would, in time, effect almost every area of life in almost every place on earth. It would accelerate the rate of change on the planet. There would be great opportunities for economic development in places of the world where such advancement is now thought to be quite remote. A reordering of the geopolitical relationships of nations would certainly take place. Big problems -- like much of the environmental pollution that is a byproduct of our industrial processes -- could be solved. On the other hand, it could potentially be seen as a threat to the present energy industries, generate significant unemployment and result in significant opposition.

The net effect of such a breakthrough will vary directly with the sophistication with which the major players in the global energy equation respond. This document is meant to be an initial attempt to develop a blueprint -- a strategy -- for an energy revolution that, if implemented, would hold out some hope of making the transition to a new energy world benign.

RECENT DEVELOPMENTS

The new energy technologies that are the subject of this study are interesting because they are new, they appear to produce more output energy than that which is directly put into the system, and it is not clear what produces this behavior that in an increasing number of cases can be predictably engineered and demonstrated. By new, we mean that the technologies that produce the phenomena have been patented and/or publicly demonstrated within the last two or three years. In a couple of cases, patents have been issued within the last year.

In most cases these technologies convert energy from one form to another and in the process generate "over unity" output (more out than in). The assumption is that additional energy is being accessed in each case from a source that is part of the larger open system in which the technology operates -- it is not coming from within the closed system.

There are a number of emerging theories about what is transpiring in different cases, but in the end, no one knows for sure. Nevertheless, the analysis is such that more and more observers are beginning to believe that we are seeing the early indicators of a breakthrough to a new understanding of physics.

There are two broad areas of thought and activity that might be used to describe all of this technology: *"cold fusion"* and *zero-point energy*. The term "cold fusion" comes from the original experiments described by Fleischmann and Pons in October, 1987, which although discredited by the press and the scientific community at the time because they were not immediately replicated, have since been duplicated in scores of laboratories around the world (and within our government at national labs). Although the effects that are seen happen at relatively cold temperatures (compared to hot fusion), there are questions about whether this activity is, in fact, technically fusion.

While the cold fusion moniker may still have some utility, it nevertheless continues to be confusing, so some researchers are attempting to distance themselves from the term. In general, though, the term practically, if not actually, seems to describe the class of effects that are mentioned here. As will be seen, there are a number of divergent technologies which are of significance, only one of which looks and acts like the Pons and Fleischmann device.

The broad theories that may ultimately best explain what is happening here focus on zero-point energy -- that great sea of energy that quantum electrodynamics and experimental results show is the essence of the matter, and everything else in the universe. All of space is filled with an extraordinary amount of this vacuum energy, so much so that the physicist David Bohm said that a cubic centimeter of space has more energy in it than all of the known matter in the universe.

This energy can theoretically be accessed in a number of ways, and perhaps that is why there are a number of different technological methods (electromechanical, chemical, thermal, magnetic, etc.) that all are reported to be producing access energy out of the larger system in which we all exist.

Recent scientific papers suggest that the "cold fusion" process in fact may access the zero-point energy field, and from that reservoir produce the excess energy that is seen. Zero-point energy theory is quite robust and there is at least one group of researchers that is attempting to develop energy technology based upon that science. So on one hand, there is a family of technologies that are hard to explain, and on the other, a relatively refined area of science for which no fielded technology yet exists.

The point of this project is not to rule one way or another on a particular nascent technology. This is an industry aborning. It is very ragged, with assertions being made and then retracted as experimental results either can't be duplicated or the originator moves on to another phase. Some of the experimenters are world-class; some aren't. It is almost certain that some of these technologies will not be judged to be successful or will be early failures that lead to something else. It is possible (but not probable) that all of them may never make it to market. But there is enough activity, professionalism and money collecting in the same place that it is our opinion that something significant is happening. If only one of these technologies is successful (and it appears that at least two are fast on that track) it will be revolutionary. It will presage a fundamental shift in the way humans access and distribute energy. This list is therefore included in order to be suggestive of what is emergent in the field and to establish that the conditions exist that justify doing some initial thinking about how this country might respond if, in fact, these early indicators are a trend.

NEW ENERGY TECHNOLOGIES

There is a growing cottage industry of researchers who claim to have operated devices that produce more output energy than that put in. A good example would be the Congressional testimony of Dr. Randell Mills of then Hydrocatalysts Power Corporation (now renamed BlackLight Power, Inc.) of Lancaster, PA on May 5, 1993. At that time Mills said:

> Hydrocatalysis Power Corporation (HPC) has an extensive theoretical and experimental research program of producing energy from light-water electrolytic cells. HPC and Thermacore, Inc., Lancaster, PA are cooperating in developing a commercial product. (Thermacore is a well-respected defense contractor and its expertise is in the field of heat transfer.) Presently all of the demonstration cells of HPC and Thermacore produce excess power immediately and continuously. Cells producing 50 watts of excess power and greater have been in operation for more than one year. Some cells can produce 10 times more heat power than the total electrical input to the cell.

A more recent report on the occasion of BlackLight having filed the largest private stock offering to date with the Pennsylvania Securities Commission (almost $5 million), says that tests are being conducted by a graduate student working on his master's thesis in engineering at Rowan University in Glassboro, NJ, and a employee of Atlantic Electric (a utility company investor in BlackLight) . . . "Jansson is reproducing Mills' experiments and those of Jonathan Phillips at Penn State. Jansson's tests are showing that Mill's process is producing 100 to 1,000 times more heat than would be produced if the same amount of hydrogen was burned."

BlackLight is representative of a number new methods that are reported to produce heat and/or electricity as end products using quite different approaches. The table on the next page, kindly provided by ENECO, Inc., one of the leading firms in the new energy area, summarizes the different approaches that many researchers were pursuing a year ago.

The common characteristics of all of the identified technologies are:

- Over unity energy production: Each of these new devices purports to produce more measured energy output than the input required to sustain the operation, generating what is referred to as "over unity" energy production. In most if not all cases, the output energy is in a different form than the input force, i.e. mechanical energy input to rotate a mechanism that produces electric energy output; or electrical energy in and heated liquid out.
- Relatively small size: Initial indications suggest that the first usable devices that could be developed from present research might produce a large enough output to have general applicability in physical sizes varying from that of a small battery to the size of a large microwave oven. The smaller sized devices would generate outputs in the fraction of awatt vicinity with planned/advertised outputs of up to 10KW for the larger units.
- No pollution: Generally speaking, these processes produce either very low or no identified negative waste products that are integral to their operation.

- Self sufficient: The ability to produce over-unity power output presents the theoretical opportunity to take some of the output power and reinsert it into the input side of the device, making it self sustaining. Although this may not yet have been accomplished, when and if it happens, a whole new class of energy devices will emerge that, once started in operation, require no traditional external source of energy to sustain their output.
- Portability: The combination of size and self sufficiency would yield devices that were highly portable, making it possible in more cases than the present to produce the energy at the location where it will be used.

The following table provides a general overview of the claims of a number of researchers that seem to have commercial potential. It is not complete. There are some groups, like The Cincinnati Group, who have recently emerged who appear to be mainly focused on transmutation. More detailed information on some of the companies and individuals are included in the appendix.

Energy Conversion Company	Input/ Output	Process	Patent?	Stage of Development
Electric/ Thermal				
Clean Energy Technology Inc. *PATTERSON ENERGY CELL*	*In:* DC *Out:* 100 deg C water >1:5	Electric charge across a bed of palladium-nickel coated beads through which water is pumped	yes	-Licensing technology -Developing a commercial heater -Remediating radioactive liquids
Cold Fusion Technology, Inc. RAGLAND CELL	*In:* DC *Out:* Heated water >1:2	Electric charge across two anode sandwich of palladium plates in heavy water bath	?	Being tested in two other laboratories
MacroLabs/ MicroLabs, Inc. – Nova Resources Group, Inc. ELECTROLYTIC THERMAL CELL	*In:* Electricity *Out:* Steam to drive turbine	Refrigerator-sized unit sealed, replaceable electrochemical cold fusion cartridges that use electrolytic cell to produce heat which drives turbine generator	Yes	$25 million contract signed with Peoples Republic of China to supply small, 20kw, generators
Magnetic Power Inc. RING TYPE THERMOELECRIC GENERATOR	*In:* Heat/electricity *Out:* Electricity/ heat	Semiconductor based	Yes	- Report a number of breakthroughs including high temp superconducting. - - - - Looking for funding.
Electric/Electric				
LABOFEX – Experimental and Applied Plasma Physics XS NRG TECHNOLOGY	*In:* Constant DC *Out:* Pulsed DC >1:10	Pulsed plasma discharge releases short, repetitive pulses of multi-kilowatt magnitude from charged metals in a vacuum which can be utilized to drive electric motors and charge batteries.	Yes	- More than ten times cheaper electricity than any existing source - Talking with auto manufacturers
EarthTech International, Inc. ZPE/FUSION	*In:* Electricity *Out:* Electricity & heat >1:60	High intensity microarc discharges are formed which cluster electrons in micron-size bundles to extract energy from the vacuum field or trigger a fusion process	Yes	-Research phase

Energy Conversion Company	Input/ Output	Process	Patent?	Stage of Development
Mechanical/Thermal				
Hydrodynamics, Inc. SONOFUSION	*In:* Rotation of metal rotor *Out: Heated water >1:1*	Pump-like rotor turbulates water causing small collapsing bubbles which appear to give off light and excess heat	Yes	Commercially available and installed in variety of locations
E-Quest Systems SONOFUSION	*In:* Hifreg ultrasound acoustic signal *Out:* Heated liquid >1:1	Acoustic signal drives collapsing bubbles against a metal plate. Bubble gas driven into metal.	No	In laboratory operation at 50-100 watts
Chemical/Thermal				
Blacklight Power, Inc. BlackLight Power Process	*In:* Heat/water/ electricity *Out:* Heated/ hydrogen >1:100	Heat energy from water is released by shrinking hydrogen atoms in catalytic cracker similar to pretrochemicals or vapor phase gas energy cell	Yes	- Operating at power densities equivalent to commercial electrical power plants. Scaling up to Mw size. Working with utilities. - Estimate 3-5 years to market
Mechanical/Electric				
Aspen-Adams Electrical Motor Generator	*In:* Rotational mechanical energy or electricity *Out:* DC or AC or torque >1:1	Uniquely designed motor-generator produces more output than input whether operating in motor or generator role	Yes	Recently patented in UK
Kawai Motive Power Generating Device	*In:* Electricity *Out:* Torgue >1:3	Uniquely designed motor generates more mechanical energy out than electrical energy in	Yes	Recently patented

These results are not just limited to private researchers in their own laboratories. The basic proof of concept has been replicated in many government laboratories both in this country and in others. There have been scores of successes. For example, on January 27, 1992 at the ISEM IEEE meeting in Nagoya, Japan, Dr. Akito Takahashi of the Department of Nuclear Engineering: Osaka National University, reported having tested a device that put out, on average, 70 watts of excess heat -- three times more heat output than electrical input -- continuously operating for a month. Dr. Edmond Storms of Los Alamos National Laboratory announced on August 15, 1992 that he had successfully replicated the Takahashi cold fusion experiment. His success was published in *Fusion Technology.*

A recent NASA lab report confirms a 1994 experiment where cold fusion excess heat of 11 watts was generated in a cell for which 60W of electrical power was supplied. The cell used was on loan from a private corporation whose own tests with similar cells are documented to produce 50W steady excess heat for a continuous period exceeding hundreds of days.

Although a period of early public announcements has sifted to a period of focused efforts to patent and fund laboratory devices, continuing positive results continue to be reported from enough fronts that a cottage industry of magazines and newsletters have grown up to report on the findings and speculate on the potential implications of the work taking place in many different countries. A growing group of newsgroups and web sites also provide a forum for new energy news and ideas. These sources are augmented by a number of professional conferences that seem to be drawing increasing attendees each year. A list of these resources is included in the appendix.

POTENTIAL APPLICATIONS

Although the potential use of these kinds of technologies would be almost limitless, the simple table below begins to give a feel for the breadth of the impact that this technology would produce.

	Transportation	Industry	Home	Military
HEAT				
Small Scale	Interior heat for electric automobiles	Space and water heaters	Space and water heaters	Portable field heating units. Active heated winter clothing
Large Scale	Heated highways. Auto, truck, bus & aircraft turbine engines. Closed cycle steam engines Operates across a broad spectrum of speeds and power requirements.	Distributed industrial heat source. Produce electricity	Provide all HVAC requirements for homes	Building and system heating. Full spectrum energy production units
ELECTRICITY				
Small Scale	Car/Truck batteries. Individually powered components	Batteries. Generators on PC boards. Individually powered products	Self-contained power sources on appliances	Independently powered equipment
Large Scale	Electric drive for all modes	Replacement of boilers of central power plants. Locate anywhere	Home power generating plants	Infinite energy weapons. Large logistics tail reduction

There are a host of other potential applications that open up when heat and/or electricity become very inexpensive or free and ubiquitous. For example, extraordinary new capabilities such as mobile high-energy lasers could be used for tunneling -- and open up a whole new era of underground development. Once it becomes obvious that most any device can carry unlimited power with it, a whole new mindset would evolve in the product design field. The middle ground between battery powered devices and large items that have generators associated with them would open up. Where in the past carrying power sources into the field was problematical or prohibitive, now such devices would suddenly be limited only by the creativity of industrial designers.

This whole trend could be exacerbated by the parallel development of high-temperature superconductivity, a field where breakthroughs now suggest that superconducting wire that operates at 300 degrees F that developers believe will be available within three years.

The advantage -- and disadvantage -- of this new technology is that it is a *replacement* technology, not a supplementary one. While it will replace aspects of the existing energy industry, it will open up a huge market and opportunity for new products.

On a large, global scale, this new access to energy holds the promise of solving some of the planet's most pressing problems:

- It would eliminate most air pollution.
- Because it operates in a fundamentally different way than internal combustion engines, cold fusion heat engines derive more usable energy from the generation process and put far less heat back into the atmosphere. Although over time the use of energy would increase, the amount of heat exhausted into the atmosphere would decrease.
- Drinking and irrigation water problems could be eliminated. Sea water could be easily desalinated . . . and mined . . . and transported to where it was needed.
- Third world development would be possible without the environmental impact that has attended the industrial age model of progress.
- Climate and geography would decrease in importance. Work could be done wherever it was required.
- It would greatly increase the space exploration capabilities of humans.

THE REVOLUTION

If all of this indeed points toward a new energy future, there will come a time -- probably sooner rather than later -- when it becomes obvious to the mainstream in science and government that something real is happening. "The day the American Physical Society accepts cold fusion, or the Department of Energy accepts cold fusion as a real scientific field, hundreds of people all over the world will jump into it within a fortnight. I can guarantee it!" said Dr. Mahadeva Srinivasan, head of the Neutron Physics Division and an Associate Director of BARC (Bhabha Atomic Research Center), Bombay, India.

That day will be the beginning of a major shift in interest by policy makers and venture capitalists. There will be a rush -- a gold rush -- to obtain early positions in what certainly will be an unparalleled opportunity. What will begin then will be an extraordinary confluence of the existing energy industry, the new emerging energy players, the market of energy users, and government taxers and regulators, each fighting for their piece of the new world that will result. Vested interests will fight for their lives. Governments will fight for their taxes. New players will fight for the revolution. Financiers will smell the opportunity and move large amounts of money rapidly into the fledgling industry. Consumers will benefit.

How long will it take for a new energy industry to become established? Once it becomes clear to the mainstream that these technologies are real, the initial transition could be quite rapid. There are five or six new energy companies/groups that are in the process of commercializing their products at this time. Deals with industrial hot water companies, automobile manufacturers, utilities, countries like China are all reported to be in the works. With present funding levels researchers see commercial products within 1-4 years. That could accelerate rapidly with the influx of new money and the proliferation of the licensing of existing technology.

It is important to keep in mind that the research into new energy thus far has been quite limited. Presently the "industry" has a scale of about two to three dozen players who are talking about their work. Perhaps there is something real in half of those labs. Additionally, in countries like Japan there are indications that far more significant activity might be underway than is obvious.

When the rest of the word realizes what is going on here, whole new levels of business and financial capability will quickly become part of the development process. Newly available venture capital will fund once-struggling teams. Licensees will refine earlier developments and move the technology to greater levels of sophistication. It is likely that researchers will close in on explanations of the basic science at work here -- which will fuel the development new applications in other areas.

This transition will be encouraged by a couple of major trends, which are already in place: the Internet and the present redesign of automobiles. The Internet is allowing researchers to almost immediately discuss and analyze the latest announcement from the field and to implement changes to their experiments. It facilitates a significant increase in the metabolic rate of the discovery and engineering process in ways that can't be quantified, but nevertheless are very significant. Information flows between researchers, both within companies and between them, at a rate that was not part of any similar "revolution" in the past. The Internet will make this transition faster than it otherwise could have been.

The legislation in California and New England dictating that ten percent of cars sold by a manufacturer in those states by 2002 must be emission-free has engendered a revolution in automobile design -- particularly in power trains. All of the major automobile manufacturers are moving toward electric cars in one form or another, and this redesign is a perfect setup for a follow-on generation of power plants which produce electricity and are cold fusion-based. The timing could be ideal to propel both industries to new products and applications.

Another forcing function could be the military -- particularly the ground services. If it was clear that the possibility existed to eliminate most of the huge energy "tail" that is an integral part of any military ground operation, it would seem likely that the Army and Marine Corps would very quickly move to adapt that technology to military vehicles. A military force that could get to any place on earth and operate for an indefinite length of time without the need to consider how to get fuel to the location and continue to supply it would have a significant advantage indeed.

The awareness of activity in the "cold fusion" area is expanding into the popular area with films like "The Saint" and another feature film based upon the new technology which is now being shot. National Public Radio has had programs on the subject and ABC-TV has three times featured the work of Clean Energy Technology, Inc. on *Nightline* and *Good Morning America.*

This revolution is broadly enough based, both within this country and in others, that the likelihood of major existing powers, like the present energy companies or governments, squelching it are remote. Too much is happening in too many places. And again, with the Internet, the knowledge can be moved to any place on the planet almost instantaneously.

At this time, an enlightened government could play a major role in assuring that the new technology was able to flourish, that American products and ideas had the best chance to influence the huge foreign markets, and at the same time helped the present energy players make the most effective transition to the new era.

THE PLAYERS IN THE CHANGING ENERGY CONTEXT

There are a number of important players in the developed world who make up the present global energy equation. The relative ability of each player to adapt to a rapidly changing base technology is suggested.

Present Players		Ability to Adapt
Producers		
Electrochemical Processes (batteries)		Quickly
Oil, natural gas, coal, nuclear		Perhaps not possible. Huge infrastructure costs
Distributors Utilities		Very slowly. Perhaps will change their business
Users		
Homes		Quickly. Individual decisions. Fast payback
Commercial		Less quickly. Larger investment in infrastructure
Transportation		Rather quickly. Natural turnover
Agriculture		Slowly. Large infrastructure cost
Financiers		Very quickly.
Taxers		
Local and National governments		Lags. Responds to other changes

Producers - Present oil, gas and coal producers will have a hard time with this revolution. They are an established industry with huge sunken costs in fossil fuel production infrastructure. They are big and influential. They do not -- in fact, cannot -- move their basic business quickly because of their huge capital investments. They could, though, seeing themselves in the energy business -- rather than just petroleum -- buy into the blossoming alternative energy industry.

Battery manufacturers, on the other hand, should be able to adapt rather quickly by licensing the new technology. Battery power is the most expensive electricity there is. Some common batteries cost up to 6000 times more per KWH than common household electricity. New energy technologies could make significant inroads quickly here because of the dramatic decreases in cost that could be available.

Distributors - Some utilities have already been reported to be investing in some of the new technology companies. Their objective, presumably, would be to scale up the technology so that it can replace fossil fuel cores in existing plants. There is also the possibility, advanced first by a study by the Progressive Policy Institute, that some utilities could see the value of the network that they have in place which connects all of their customers as a resource by itself and get into the information providing business. Some power companies are already doing this.

Those in the business of hauling and selling gasoline at retail will likely find that their business will decline rather quickly over a ten to fifteen year period.

Home owners - As Jed Rothwell has suggested, "Homeowners will leapfrog the power companies because they do not have an installed base of equipment." He uses the example of a cold fusion co-generator costing the same as a gas-fired one - $8,500. If it lasts 15 years and saves $200 per month on average, eliminating both gas and most electric bills, it would pay for itself in three and a half years and save an additional $27,500 before it wears out -- which is $1800 per year over the life of the machine. That kind of decision is an easy one for most homeowners to make and with those kind of numbers, there would certainly be financing available to make the switch almost painless. A small refrigerator-sized unit that provided unlimited electricity would probably generate similar responses.

Commercial Users - With the financial incentives of new energy providing encouragement, it is likely that business will, in some cases, quickly move to embrace the new technology and decrease their costs. Office buildings could systematically be converted to independent power sources. Industrial environments, with their generally larger capital expenditures for energy associated equipment would probably be slower . . . although they would probably quickly begin to integrate the new technology into their products.

Transportation - As mentioned above, the conversion of automobiles to emission-free electric models provides a natural evolutionary path to a new power plant for wheeled vehicles. The transition would probably come first in over-the-road trucks and busses, for which the potential fuel savings would be strong incentives to change.

In the long run, the safety aspects of aircraft without fuel that burns in a crash -- to say nothing of the savings in fuel costs -- might spur research in the redesign of aircraft. In time, the cost efficiency of the new technology would certainly generate new engine designs for ships and locomotives. The combination of cheap electricity and advances in superconducting materials could enable a new generation of magnetic levitation high-speed railroads.

Agriculture - Easily accessible energy would be a boon for agriculture, first in terms of providing water for irrigation. That water could come from the oceans or, in time, be derived from the atmosphere (combining hydrogen and oxygen). Deserts and other locations that have little natural water would become potential agricultural sites. Downstream, there would be significant advantages to bringing agriculture indoors into agrafactories where all of the elements needed for growing food could be easily controlled.

Financiers - As is suggested later, the markets and financial institutions may respond in a couple of different ways. In any case, some will see the new world very clearly and move aggressively. If the defining event that establishes the validity of the new technology is very high profile and a big surprise, it will have a dramatic short-term effect with many players moving in the new direction. On the other hand, if notices of cold fusion successes seem to leak on to the business pages over time, inertia may be harder to overcome. Many people will look at the size and strength of the existing system and choose to support the status quo, presuming reasonably that the end is not near. It may be in ten years, but it won't be in two.

Taxers - Dramatic shifts would be required here. Changes would need to be made in two areas: incentives and revenue generation. Lawmakers, in the face of a rapidly moving environment, would need to wisely put in place incentives and regulations that encouraged new development and provided safety, and at the same time, found new sources for revenue that replaced that lost from the use of energy products. Furthermore, governments would need to think seriously about how they can shape a benign rather than painful transition to this new era.

NEW PLAYERS

The new energy industry will be populated with many new players who are not now counted in the energy sector.

Science - There will be a great increase in basic research in this area. In Japan alone, it was estimated in 1994 that 600 scientists were working full time in the alternative energy field, and this before any major breakthroughs had changed the mainline thinking of science. In an area as fundamental as this, whole new areas of science will certainly evolve. We have here a new understanding of physics. When it becomes clear how it works, it will spill over into many other areas and produce secondary effects of great magnitude.

New Companies - There will, of course, be a great number of new enterprises that will enter the marketplace to both design the basic power generation equipment and to adapt it to other products. Early on they will tend to be smaller, fast-moving firms, perhaps much like the beginning of the information technology revolution 25 years ago. Many parallels could probably be drawn between the development of the computer industry and the future of the new energy industry. In the same way that high-tech firms are leading humanity into the future, so the new energy players will be the discoverers who will explore, map and claim this new energy landscape. In time they will be more important than the whole energy industry is now. Keep in mind that the annual production of oil is about 27 billion barrels and generates $489 billion per year in sales.

Early on, as in the case of computer products, this new technology will be used to replicate -- although much more efficiently and cleanly -- those things that are being done by the present energy industry. But in the same way that experimenters have learned how to produce computers that can understand common conversation -- something never dreamed of with the advent of the first PC -- so second and third generation new energy devices will easily do tasks that seem farfetched now.

Developing Countries - Those places with the most needs are those with the most incentive to embrace these new energy processes. Countries like China, which have great potential but a relatively undeveloped power system would have the most to gain from a revolutionary new energy technology. The incentives associated with the development that cheap energy could provide would more than offset their interest in the infrastructure that was already in place. This technology would allow countries like China to sidestep many of the negative aspects of traditional approaches to economic development. It would be much less expensive, much faster to implement, and highly flexible.

At the same time this technology fundamentally threatens the role of centralized governments. This energy revolution will decentralize the energy supply process. No longer will governments be required to come up with the huge amounts of financing required for (in the case of China, hundreds of) large power plants. The infrastructure -- stringing wires throughout countries -- will also not be required. Efficiencies of scale not at all the same with a cold fusion unit. Energy will be available to anyone, where they need it, in the amounts they can afford. Much smaller entities will be empowered by this technology -- it enables energy autonomy. Governments will lose some of the natural control that they have had.

India is another nation that would benefit greatly from the new energy technologies, as would Viet Nam and other Southeast Asian countries. Ten or twelve groups at the Bhabha Atomic Research Centre in Bombay who tried to replicate the original Pons and Fleischmann experiment in 1989 got positive results.

Cold fusion coupled with the new communications satellite constellations that will be in place by 2002 also offer hope to African and Latin countries. The possibility of inexpensive information and energy infrastructure now could offer some hope where otherwise there would be none. Cheap, ubiquitous energy could lead to the elimination of water-borne diseases. Boiling water is the easiest way to guard against these killers, but the availability of fuel is now a big problem in many countries -- especially in Africa. Cold fusion could make big changes in food, water, sanitation and health in third-world countries.

GEOPOLITICAL CONSIDERATIONS

It is immediately obvious when considering this subject that great changes in world politics will likely flow from this energy revolution.

The Middle East quickly comes to mind. If they continue to think of crude oil mostly as fuel, in the end they would lose much of their political and economic influence in a relative short period of time. There are ways to soften the blow but little chance to eliminate it. Far-thinking Gulf leaders who anticipated the coming energy shift could immediately begin to invest in fledgling new energy companies, thus guaranteeing a major role in the next energy industry. They could also invest in research to identify alternative uses for petroleum -- although the options here are not clear.

Russia now earns about 60 percent of its hard currency from crude oil sales. Some analysts have suggested that the economic future of the Russian republic hinges directly on its ability to continue to sell oil in the future in equal or greater quantities than it now does. If the energy revolution comes and Russia has not identified a new pillar for their economy, it is likely that this new era could become disastrous for Russia.

Japan could become energy independent as the result of this revolution. That would have interesting trade and other economic implications. It is reported that most of the big Japanese companies are involved in cold fusion research at this time. The Japanese government two years ago announced that the cold fusion R&D budget was now $100 million annually It is administered through MITI with labs based in Sapporo near the Toyota R&D effort and at the University of Hokkaido. Over 100 cold fusion patents have been granted in Japan.

As mentioned earlier, China, India and places like Viet Nam could see unprecedented economic development as the result of this revolution because they wouldn't have the high capital infrastructure investment costs that were required of other developed countries.

ECONOMIC CONSIDERATIONS

The economic implications of this energy revolution will be profound, to say the least. They revolve around four major axes:

- **A great increase in new economic activity**
  - Decreases in costs for most things
  - The birth of a new, major industry
  - Major exports likely - Shift in energy balance of payments
  - Many new secondary activities
  - Solutions possible that seemed impossible.
- **An effective assault on air pollution**
- **Sharp disruption of the present energy sector with failures and shifts at all levels**
- **Corrections in financial markets as they adjust to the new reality**

Increase in new economic activity - This is the first energy technology that need not be promoted by governments. Its small size makes it a natural for exploitation by commercial enterprises.

As the new technology penetrates the marketplace, there will be drops in the prices of most things as the cost of energy decreases, be it agriculture, mining, or manufacturing. The price of real estate could also be influenced as the proximity of a parcel to an energy source becomes moot. The existing financial structure for electricity, for example, assures that there will be many new opportunities. Michael Block and Thomas Lenard have written,

> Due to the significant advances in combined -cycle gas-turbine technology and low natural gas prices, the cost of new generation is about 3.5 cents/kWh and falling.* Because of excess generating capacity, the current spot price of electricity is even lower.
>
> The average price faced by electricity customers, on the other hand, is about 8.5 cents/kWh for residential customers, 5 cents/kWh for industrial customers and 7 cents/kWh for customers as a whole. The gap between the cost of producing electricity and the price that customers pay, combined with large variations in prices between nearby jurisdictions, creates intense pressure to open up markets.

Remote areas will become much less remote. The rate of economic change would increase as the cost of things decreased. The economy would also be influenced by the decrease in costs associated with environmental pollution and humanitarian advances. Technology change would also increase as the cost for the equipment associated with research and product acquisition decreased.

An effective assault on air pollution - Many of the world's air pollution (and ultimately health) problems will be effected by this revolution. As up to 80 percent of the planet's air pollution is finally eliminated it will manifest itself in significant reductions in health problems associated with breathing particulates in the air. This will be a particular boon to countries like China, India and Russia, where in some major urban areas it is unhealthy to breathe the air. In countries like the US, the cost of health insurance will probably decrease over time. Clean air will also have a spillover effect in reducing the cost of maintaining buildings and other outside edifices.

Sharp disruption of the present energy sector - At the same time, the cost of plastics and chemicals may well increase as the flow of oil for fuel decreases, making the lesser volume of petroleum more expensive for higher value uses. More significant than that, it is the likelihood that throughout the duration of this transition many business will fail and many people will be put out of energy-related jobs. Although this kind of market change is happening already in many "rust belt" industries and traditional blue collar jobs are harder and harder to find, that will not offset the impact that this major transition will have on the most significant industry in the world.

Corrections in financial markets - No matter how this revolution plays out, the financial markets will respond. One possibility is rapid adjustment. "History shows that a surprise can quickly reduce a market to a crowd, and crowds easily panic," suggests Wm. A. Boas, Jr. "A panic could ignite a sell-off in certain stocks, bonds, mutual funds, and commodities that would make the global experience of October 1987 seem like a mild market correction." There are currently thought to be a couple hundred years of BTUs in proven underground reserves of coal, gas, and oil now valued at $75 trillion by transnational private companies, state monopolies, and governments playing in today's fossil energy arena. Those assets, and the cash flows derived from them, would erode to a fraction of their current value, as cold fusion technology starts to capture and finally dominate all energy consumption markets."

On the other hand, the markets may have more resilience and reasonably judge that this transition is a rather lengthy one and that large energy companies will not be threatened any time soon. If that scenario transpires, it would provide an ideal entry for the new industry without major disruptions. The degree of surprise will make a lot of difference as to the response of the markets.

Although there clearly will be losers in this shakeout, if the general awareness of the new technologies seems to slowly show up in different places, it could be that some existing energy companies could put into place defensive strategies that would address some of the market's concerns before the reality clearly settled in. Major energy mining and drilling companies would have to rethink the whole notion of their businesses. Keep in mind that this shift will also effect the secondary industries that generate significant income from transporting oil, coal and natural gas, like railroads, etc.

THE NEXT TWENTY YEARS

Although in some very important ways this energy revolution is unprecedented, it is also true that the world in general and the U.S. in particular has seen major systemic change in a relatively short period of time before. Just 102 years ago," . . Wilhelm Roentgen announced his discovery of x-rays, a form of radiation. This was the seminal starting point from which the world of that time was transformed within a span of less than a generation."

"People living in 1895 had no ideas of airplanes or radio or radioactivity or of relativity or motion pictures. If they had heard of automobiles, it was only as an expensive toy of the rich."

"Yet those who lived another 20 years would see all these having become familiar objects or topics. Ten years further on, they would be an integral part of the common fabric and background of daily life. We live today on the threshold of an even greater era of radical change. It will be resisted by many, but they cannot hold it back for long." And so, it is likely that the world will see even more change in the next twenty years than it did at the turn of the last century. But this time it might come faster. "There is no reason why a new technology has to develop like fission and fusion on a thirty-year time scale. All it needs in order to go fast is small size of units, simple design, mass production, and big market," said physicist Freeman Dyson. And those are the characteristics of the new energy revolution.

But this revolution got off to a shaky start. Dr. Ramon Prasad England, writing about scientific revolutions said, "Because of the way in which the cold fusion era started with the Fleischmann-Pons announcement, together with the three flawed attempts at replication, the scientific community is polarized between two opposing paradigms, one that cold fusion exists, the other that it does no. The first lesson we can draw from Kuhn's example is not to be too concerned about this. It is absolutely to be expected in a development of this kind. Patient accumulation of high-quality experimental results will yield results. However impervious the scientific establishment may appear, this is just a mask of external show covering an internal debate. If cold fusion is an idea with the appropriate "destiny", as I believe it is, then it is only a matter of time before the revolution begins to gather apace."

Part of the problem, as England implies, is that there is great debate going on about what in fact is actually going on. Mainline science says that it is impossible for these results to actually happen according to the present understanding of physics. "There is absolutely no reason" England replies," why a newly discovered phenomenon should have a theoretical explanation lurking in the undergrowth of established physical theory, apart from the conceit of established theoreticians. They would have you believe that everything is known and comprehended." And so this conflict will continue to influence the transition process. It may, in fact, cause the final push to be more benign than it otherwise would if early, clear evidence was broadly accepted. The scientific argument over global warming comes to mind as a similar debate that is slowly working its way through societies without causing rapid, extraordinary damage on the way.

At some point, commercial products will be fielded. At that time although some in the scientific community may still argue that the whole thing is fraudulent and the equivalent of snake oil, nevertheless, factories will be manufacturing product and the learning curve of production will be growing.

Perhaps we could use the recent history of transistor and microprocessors as example of what the early years may look like. Silicon transistors were invented in 1952. Four years after their invention, Western Electric was having trouble getting 5% of those they manufactured to work, scrapping the rest of the batch. That is essentially the situation with cold fusion today. Researchers are struggling to find the keys to consistency, inspecting a hundred samples of palladium to find one that they believe will successfully exhibit over unity energy production.

The transition is also effected by the character of the inventors. Sometimes the scientists who develop a new technology are their own worst enemies. In the case of the Wright Brothers, for example, from 1906 to 1908, after battling with the establishment for five years over the credibility of their claims, they began acting like paranoid flakes. As Jed Rothwell of *Infinite Energy* magazine has said, "Some cold fusion scientists are worse." There will be a time, perhaps after early commercialization, where it becomes clear to the major players which way the wind is blowing . . . and they will move into the field. Cold fusion/alternative energy will quickly change in character when the institutions pushing the technology are primarily business people rather than researchers and inventors.

WILD CARDS

There are a number of major wild cards associated with this transition that could go either of a couple of different ways. In some cases they could enable the move to new energy sources, and in other situations they could be a major impediment. These three are representative of a larger set that would have to include the possibility of scientific breakthroughs, major natural disasters, a major event that convinced the world that this was not a safe path, among others.

Wild Card: Environmental Movement

In practical terms, free energy applications run directly counter to the philosophy and activities of many environmental groups and their leaders. If energy were "free" what would be the incentive for small, fuel-efficient cars? If electricity was free, then why be efficient in one's use of it? If there are no negative byproducts that attend the use of energy then doesn't it solve many of the problems upon which the environmental movement is based? What is the definition of "sustainable" if energy is free?

There would certainly be room for refocusing the movement toward restoration of land that was used for fossil fuel extraction, etc., but that would be a major shift which, for organizational and personal reasons that also exist in the energy industries, would be very hard for many people negotiate. If the war is over and you didn't lose -- but someone else won, it is hard to just declare victory and move on to the next thing.

On the other hand, some far-thinking environmentalists might grasp the new technology as the final solution to most of the air pollution problems of the planet and push it strongly. One possible scenario would have selected environmentalists becoming the loudest cheerleaders for the revolution -- a force that would only accelerate the transition.

[Opportunity: To help refocus the environmental movement in a new direction. To work with environmental leaders to help them realize that the new technology is clearly to the benefit of the country and the planet.]

Wild Card: Taxes

A great deal of federal and state government income is derived from taxing the present energy structure. The natural response to a revolution of the type suggested here is to fight it -- to suddenly see taxes evaporating away and to immediately attack the cause of the change. There are likely to be many instances of local laws and building code changes put into effect in response to pressures by local utilities, service station owners, water heater manufacturers, etc. This could be a significant impediment to the revolution . . . and provide countries like China and Japan major opportunities to refine the technology and underlying support systems (including taxing) that make the new paradigm shift quickly.

Although it may appear so, this is not a problem that will be unique to the energy sector. Changes in many other areas of human activity including the effects of new information technology, revolutions in manufacturing techniques, a coming redefinition of the notion of work, etc. will all tug at the existing system and will require new solutions to old requirements.
[Opportunity: A real chance for leadership exists here. Someone in a position of influence (White House, Ways and Means Chair, think tank) who understand that this energy revolution

(and others) are inevitable should begin to rethink the taxing system in this country and propose an organized transition from one form of income to another. Rather than fight the change, influence and shape it so that it works best for us]

Wild Card: New Replacement Industries

Perhaps the biggest wild card is what happens to the energy workers who are not needed after the new technology becomes established. Very negative scenarios can (and have) been written that suggest that the whole energy industry will collapse and that wealth-producing machine will be destroyed and millions of people laid off with horrible implications for the world. That seems to me to be a unidimensional perspective of the process because it does not consider broadly what else might happen in the energy production sector of the economy, and it discounts other major forces that are driving global change in other areas.

Although this changeover will be the biggest technological shift in history, it will not be centralized or planned -- influenced, for sure, but not determined. Certainly these new technologies -- in all of their manifestations -- will spawn, initially, at least, a great number of commercial attempts to adapt it to every significant area of energy need. Those span the spectrum from small generators on printed circuit cards (or as part of an integrated circuit), to batteries, small utility generators, space heaters, home electrical generators, water heaters, automobile and truck engines, large engines for ships, planes, etc., replacement central electrical generators . . . and many more.)

And the ability to carry electricity and heat generation capability within a product will certainly produce a revolution in design that rethinks the whole idea of product development and production. When usable electrical and heat energy is *anywhere,* and not limited to the length of a cord, or the duration of a battery, or the size of a tank, extraordinary opportunities suddenly are possible. Geography also becomes less important -- working at the North Pole could be as easy as working 200 feet below the Pacific Ocean. Space exploration and development capabilities suddenly multiply.

Then there are the transmutation implications. If it is really possible to easily and predictably change the form of matter, then extraordinary new opportunities -- that were never possible before -- become so. Garbage dumps become mines. Getting rid of waste becomes an even greater industry than it now is. New materials could be invented, dangerous ones eliminated. The underlying approach of health care changes when elements can be manipulated -- so say nothing about the spin off implications of the Human Genome Project and other advances in longevity and biotechnology.

Then there are the concurrent ascents of other technologies, like molecular nanotechnology, that could use feed stocks like crude oil for manufacturing everyday devices. If petroleum could be focused in more profitable areas than it was for fuel, then, in the short run, at least, there could be a new secondary industry for oil that would utilize the existing infrastructure. Think of oil not as fuel but as something else. There would probably not be a requirement for as much of it as when it was burned for heat, but it could be much more profitable -- and continue to be useful and employ large numbers of people.

SCENARIOS

This revolution could evolve in any of a number of ways. One powerful way to explore the possible excursions into the future is to use scenarios. Scenarios -- stories of possible futures -- could be written around any of a number of variables. But selecting two that are most important to the U.S. guarantees that these are *important* scenarios and in the aggregate they represent a high-order consideration of the options. If it is presumed that one important variable is the *rate of change* at which the revolution happens (the changeover could vary from slow to fast, with far more chaos associated with the shorter transitions), then another important consideration for the U.S. would be the *location* where the main brunt of the assault took place (the effect on the U.S. would further vary with where the locus of change was centered -- either within the U.S. or outside of the country). For the purpose of this study, we will assume that one of the options is that the new technology takes off in Asia, as opposed to the U.S.

The combinations of the two extremes of the two major variables -- rate of change and location of focus -- would yield four scenarios

Energy Revolution Scenarios

If each of these four worlds is imagined, and the major characteristics that describe them are captured, a simple table can be built that directly compares the alternative futures.

Scenario	2nd US Century	Domestic Overload	World Turnover	Have-not Retreat
Rate of Change	Slow – 20 Years	Fast – 10 Years	Fast 10 Years	Slow – 20 Years
Focus	U.S.	U.S.	Asian	Asian
Central Idea	US converts and then exports	US gold rush. Chaos, big swings, big bucks	Big time China/ Japan revolution. US holds back	US-others export to third world. Slowly manage domestic conversion
US Economic Effect	Minimum upheaval, Major new industry	High unemployment. Big market swings. The rich get richer	Foreign products cheaper, better. Learning curve there. Much greater efficiencies	US learning curve. Many new productive players.
US Security Implications	No change. No one approaches US	Potential domestic problems.	New mini- super-powers. Big players, fast (maybe not military)	Lessening of big, global problems for everyone
Geopolitical Implications	America predominant	US flails. Great uncertainty	China an instant world player. Japan strengthened	Leveling of the world. More friends. Less problems.
Biggest Problem	US bigger target	Internal instability. Big welfare problems	Whether they can effectively interface with rest of world	Influx of foreign university students
Biggest Benefit	We solve some big domestic problems	Rapid tech development.	Decreasing dependence on middle east	World stable. Great social development
Probable Drivers	Slow technology development.	Media reaction. US insecurity	Reluctance by US power companies/USG to change	Enlightened world leaders agree
Role of US Government	Major role in managing change. Builds incentives for domestic investment	Trying to keep up	Sides with established interests	Leads in international agreement. Facilitates US technology development

A Fifth Scenario: A Common March to the Future

There are significant problems with each of these scenarios from a U.S. perspective. When we play alone, the global have-have not situation only gets worse -- and ultimately comes back to hurt us. When another part of the world responds first, the international economic tables turn so fast as to produce instability . . . and American business is presumed not be a dominate player in the largest business opportunity to hit the planet, which seems unlikely.

Therefore, these four scenarios beg a fifth: two decades in which this revolution in a measured way benefits the entire world at the same time. In that situation an effectively managed proliferation of the new technology would, because of global incentives worked out by the major powers (established perhaps at the UN), systematically spread the wealth around.

Maybe, as in Toronto where a real estate developers must provide a certain percentage of new housing for subsidized tenants thereby spreading the cost around to everyone in the business, a manufacturer of the new technology would, because of appropriate incentives, find it in their best interest to make some their products available for use in third-world situations. This approach would result from an enlightened awareness of the fact that the revolution would do more good faster where the need was greatest, and that if the developed and developing world kept the new energy technology it to itself it would only exacerbate some of the biggest problems that we all now have as humans -- problems that will be on our doorsteps if we don't do something about them.

It also must be kept in mind that this revolution is not like any other that modern humans have experienced. It is about energy, the most fundamental commodity that is required for life. It has the potential, unlike almost any other technology that can be imagined to directly benefit anyone and everyone in all economic and cultural situations at the same time. It therefore requires a higher sense of consideration than just about how it would economically or politically benefit one nation or group. It would be foolish to allow this powerful new force to be used against us or not to benefit from its further development and commercialization, but it would also, in light of the big global problems that it could address, be irresponsible to selfishly keep it only for ourselves. The most desirable scenario, then, would be one that encouraged American development of this technology but also encouraged its spread to those places in the world that need it most in somewhat of a systematic, orderly way.

A STRATEGY

So what then do we do? We have looked at alternative scenarios of how this revolution might play out and decided that because of the extraordinary, profound significance of this revolution and the fact that it has the potential of solving so many pressing problems in many countries, that our normative, or desired, scenario should be one in which the US, in a way that does not weaken it, helps to facilitate a global energy revolution that benefits the poorest countries as well as the richest. In this way some of the most basic problems associated with the global population explosion would be addressed at the same time that the rest of the world was increasing their quality of life.

Beginning with that premise, we should identify our assumptions and the objectives we would strive to accomplish.

Assumptions and Objectives

We have made a number of assumptions in proposing this strategy:

1. That the possibility exists that new over-unity methods of producing usable energy will be developed that do not produce any negative byproducts and will therefore make fossil fuels obsolete
2. It would be advantageous to the world to embrace a clean over-unity energy source as quickly as possible with the minimum amount of disruption necessary
3. Such a transition could only be accomplished if active attempts were made to allay the legitimate concerns that would arise from those with a significant interest in the present energy development and distribution processes
4. The United States, being the largest present energy user in the world could, in the short term, be most effected by such a revolution and would therefore want to play a leading role in orchestrating the global transition
5. These technologies give significant advantages to those who have them compared to those who don't. Furthermore, many could probably be weaponized, therefore this revolution will have both direct and indirect security implications for most all nations.

Therefore the goal of this strategy is to:

- Identify how a global shift to a new energy source could be accomplished in the most efficient way that offered opportunities and incentives to both the new and old producers and distributors of heat and electricity.
- Solve the hard problems first. Use the new technology where it would have great benefit for enduring problems.
- Start with small scale, high profile applications
- Assure that there is broad, quick initial distribution
- Assure that no one country or group obtained inordinate control over the technology

SHORT TERM OBJECTIVES

Considerations

1. Although some of the advantages might seem obvious, a change of the magnitude considered here could also be highly disruptive to present human support systems if not effectively introduced. Huge amounts of money have been invested in building the present infrastructure -- that must not be discounted in any effective strategy. The United States is home to one-third of the world's installed electric energy capacity. Investor-owned utility assets are in excess of $500 billion and revenues of the electric power industry total about $200 billion annually.
2. It is not clear which technologies will be winners, although there seems to be a movement in some labs toward solid-state devices. In small sizes these would have many existing applications, like batteries and powering circuit boards and individual integrated circuits.

3. It is easier to replace expensive energy with very cheap energy than it is to replace cheap energy with very cheap energy.
4. Early adapters, both in terms of consumers and in industries will provide the initial economic momentum. Big returns will be in areas with no suitable alternative
5. If present fossil fuel companies saw themselves in the energy (not oil or coal) business, they could well provide the engine for rapidly commercializing alternative energy technologies and moving from one focus to a new one.
6. Japan will be pushing hard in this area to gain energy independence. As has been mentioned, work is also being done in India and there are contracts for equipment being let in China. It will not be possible for one country or one industry, like the present energy industry, to stop this revolution. The Internet moves ideas around the globe almost instantaneously, they cannot be isolated or eliminated. American subsidiaries of foreign headquartered companies can move the new technological knowledge into this country as quickly as it is acquired.
7. The military will be a player in some way and must be factored into the equation.
8. Consider supporting technologies and what the secondary effects might be.
9. The intrinsic inefficiencies of the U.S. representative form of government may really come to bear here as power companies, oil and gas exploration and refining companies and others with a vested interest in the present system weigh in to blunt change.

So, a short-term strategy must address:

- Jobs and job loss
- Reaction from and alternatives for the existing energy and power industries
- The decentralization aspect of the technology
- Areas of early penetration
- Taxes and alternative revenues
- The role of the military
- Maintaining national and global economic stability
- Incentives to funnel some of the advantages to the third-world

LONG TERM OBJECTIVES

Considerations

1. Potential negative implications must be identified (e.g. possible impact on global warming, unintended secondary market effects).
2. Must think about what the long term aspects of what having new third world countries being effective economic players would be. We are changing one of the fundamentals that have defined the relative roles of different global social groups.
3. Must determine what to do with old products (U.S. auto inventory could largely turnover within 10 years.)
4. Thought must be given to what the second and third generation products/capabilities might be from this technology. In the same way that the integrated circuit has enabled communication satellite constellations, so this technology will make possible many things that no one has yet visualized.

5. Consider what the space exploration implications might be. There could be new exotic propulsion aspects to the technology.
6. Perhaps set some long term national and global goals relative to the conversion to the new technology.
7. A whole new industry will evolve here -- think of the growth of the computer industry times 10, or 20, or 50. What does this all mean?

The long term aspects of the strategy must address:

- Big uncertainties -- what can go wrong
- The new role of the third world
- Second and third generation products
- Disposing of old products

Strategy

The above issues and concerns could be woven together in the following way:

- Encourage the U.S. military to take a rapid, early interest in the transportation aspects of this technology. If military vehicles were the place where the leading edge of large application research was accomplished it would accomplish two things:
  - Maintain a dominant, highly adaptive military capability that would need a much smaller force but would be unequaled by any other force, particularly a second or third world nation, for many years
  - The technology could be transferred into the domestic automobile and truck industries, perhaps with safeguards that would make it hard for others to use it in military situations.
- Understand that lesser developed countries with the least developed energy infrastructure will probably be the big early adapters. Assure that export technology cannot be weaponized. Put incentives in place to encourage applications associated with agriculture, residential use, transportation, etc. Regulate size of export units. Big markets: China, Viet Nam, Turkey, Indonesia.
- Anticipate that major initial domestic penetration may come in small battery area which will not only meet a U.S. market but would have major export potential with little security risk.
- Encourage energy companies soon to begin thinking about alternatives to their historical business and to develop transition strategies.
- Initiate a high-level international task force to begin to think about common interests associated with this transition. Make an agenda item at all summits.
- Begin immediately to develop a new tax strategy that understands the dynamics of this epic change and proactively crafts the next generation of tax laws which move the country ahead. A series of initiatives should be rolled in, phase by phase, with incentives driving each on toward a predetermined goal.
- Task major think tanks to begin to think about selected aspects of this transition -- taxes, unemployment, decentralization, unanticipated consequences, third world strategies, disposal of old products.
- Use G7 mechanism to develop process for funneling technology to the third world. Develop credit system or local tax incentives to encourage business participation.

- Develop plan to push public opinion quickly to the side of new energy technology so that business comes to believe early and puts their effort into developing solutions rather than fighting the change.

This is an extraordinary opportunity for government to provide a leadership role that only they can provide. Only government can work with all of the parties to this epic transition and bring them together to advance to this new energy era with confidence. If government doesn't respond confidently to this extraordinary change, it is likely that the road ahead will be far rockier than it need be.

SOURCES and RESOURCES:

Articles:

Dr. Robert W. Horst, "Cold Fusion in 2001 and Beyond: Lessons from High Tech", *Infinite Energy*, May-June 1995

***Magazines, Newsletters**:* Samples of a number of these publications are included in the appendix.

INFINITE ENERGY, Dr. Eugene F. Mallove, Editor-in-Chief and Publisher

Cold Fusion Technology, Inc., P.O. Box 2816, Concord, NH 03302-2816

ELEMENTAL ENERGY (Cold Fusion), Wayne Green, Editor and Publisher

Scientific Frontiers, Inc., 70 Route 202N, Peterborough, NH 03458-1107

NEW ENERGY NEWS, Dr. Patrick Bailey, editor

The Institute for New Energy (INE), P. O. Box 58639, Salt Lake City, UT 84158-8639

FUSION FACTS, Dr. Hal Fox, Editor, also *JOURNAL OF NEW ENERGY*

Fusion Information Center, P.O. Box 58639, Salt Lake City, UT 84158-8639

ALTERNATIVE ENERGY NETWORK, 119 South Fairfax Street, Alexandria, VA 22314

JOURNAL OF SCIENTIFIC EXPLORATION, ERL 306, Stanford University, Stanford, CA 94305

COLD FUSION TIMES, Dr. Mitchell Swartz, Publisher and Editor, P.O. Box 81135, Wellesley Hills, MA.02181

ELECTRIFYING TIMES, Bruce Meland, Editor; 63600 Deschutes Road, Bend, OR 97701

Books

Manning, Jeane, *The Coming Energy Revolution* (Garden City Park, NY:Avery Publishing Group) 1996

Mallove, Eugene F., *Fire From Ice: Searching for the Truth Behind the Cold Fusion Furor* (New York: John Wiley & Sons, Inc.) 1991

Graneau, Peter and Neal, *Newton versus Einstein* (Carlton Press) 1993

Newsgroups and Web Sites

Cold Fusion Links Page http://www.telepport.com/~genet/coldf.html

Alternative Energy Resources
http://www.mit.edu:8001/afs/athena.mit.edu/user/r/e/rei/Old/files/www/CFdir/feb5

Links to energy pages from Jed Rothwell of ***Infinite Energy*** *magazine*
http://ourworld.compuserve.com/homepages/JedRothwell/otherinf.htm

Article by Jeane Manning, author of *The Coming Energy Revolution*
http://www.earthpulse.com/science/zeropoint.html

BlackLight Power, Inc. http://blacklightpower.com

Conferences

International Conference on Cold Fusion (ICCF): ICCF-7 will be held in Vancouver, April 19-24, 1998 (c/o ENECO 391-B Chipetaway, Salt Lake City, UT 84108, (801)583-2000)

Fourth International Symposium on New Energy - Denver, CO; May 23-26, 1997, Sponsor: Academy for New Energy

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