



Science

A CONVENIENT SOLUTION

Second Edition
Updated with the latest
developments

How America Can Solve the
Energy Crisis in Just Ten Years

Howard Johnson

A CONVENIENT SOLUTION

How America Can Solve the Energy Crisis in
Just Ten Years.

by
Howard Johnson

Sneak Peak



AKW Books
Washington

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Dedication

It is with great humility I express here my gratitude to all of my family and friends who have endured hearing and reading my technical rumblings about the energy crisis and what should be done about it. They have been tolerant of my passion, my “techno speak,” and numerous essays on the subject that they have been asked to read and critique. Thanks to my sister and brother-in-law, Bobbie and Bob Grimm, for their considerable emotional and financial support of this effort. Without that support, this book would not exist. I especially appreciate and treasure the memory of my late wife, Barbara, who was my editor, proofreader, counselor, and constant support during much of the early time spent on this book even to her last days. Much of her effort is reflected in these pages. She is surely cheering the publication of this work from on high. Thanks also to Daphne Fox whose help and support have been invaluable for the last years of my writing. Last, but not least, many thanks to a really great friend, John O'Renck, who sent me an invaluable critique of an earlier manuscript. Thanks also to Al Kalar who made several excellent suggestions about the layout of the book and some of the content. Their excellent critiques enabled me to refine and improve the book and make it easier to read.

Nearly ten years ago I started writing a book titled simply, SOLUTIONS! In it I proposed practical solutions to many of the knotty problems facing our nation and even the world. I developed solutions to serious problems like drugs, the environment, tax systems, and national security, among others. I described various practical solutions, making each a chapter in the book. Among the many problems examined was a complex one — energy and fuel systems. In 2003, while working on this, I heard a gentleman being interviewed on NPR talk about the great promise of the hydrogen fuel cell. He explained with great enthusiasm how it was going to revolutionize the transportation industry with vehicles that only exhausted pure water. It sounded quite promising to one who had worked and done research in the petroleum and energy industries often during the previous fifty years.

I went on the Internet, found his website and emailed him that I was interested and asked him if he would provide access to more information about this new technology. He replied quickly thanking me for my interest and providing me with a list of references, articles, and books on the subject, many he had written. I also began looking into the realities of the entire system of which the vehicle and its source of power are but a small part. By the time I had discovered what the whole system

would entail: the raw materials, manufacturing processes, distribution, storage, and dispensing of hydrogen, the infrastructure required for such an undertaking, and the new technologies needed to create all these interacting systems, it looked to be more than a daunting task. It looked prohibitively expensive. When I emailed him asking about infrastructure costs, he referred me to another member of his “staff” saying they would answer my query. Several unanswered emails later, I received a notice from “his assistant” informing me that the staff member I had emailed left for other employment, for greener pastures I presumed, and that I would soon be hearing from another. Months passed during which time I repeatedly emailed his office without any response. A few months later I received a failure notice from Yahoo. His email was no longer active. So much for the touted “expert” on the hydrogen fuel cell vehicle. Perhaps his government grant ran out and was not renewed.

My curiosity was piqued, my interest was heightened, and I noticed the growing public concerns about energy and the environment. I began researching energy, energy systems, fuels, transport, and all the other parts of the complex interactive systems that comprise energy. Added to what I had learned from my education and years of experience, it became a fascinating store of information — practical

data about systems from past, present, and future. This information has been cataloged in this book, *A Convenient Solution*, along with my opinions about the forces that will control how we deal with the problems, the motives of those making important decisions, and the technologies involved. I'm certain there is much I have missed and much waiting in the wings to be discovered and touted by those who do such things. That's how it is with virtually every item of science and technology. By the time information is published it has been changed or replaced by a new discovery, system, or use of technology.

The reader may notice places where facts or descriptions are repeated. This is because many facts or descriptions fit into several different areas covered in the book. Rather than use cross references that could cause confusion for the reader, many of these usually small parts are simply inserted in the new position within different points of reference. Some simply have more than one place in the orderly progression where they are a necessary fit.

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Introduction

This book is about energy, energy systems, energy use, fuels, and fuel use. It describes some history of energy and fuels, their sources, practicality, and uses. It also describes many new and revolutionary materials and systems that could be solutions to the current energy crisis. The best combination of the solutions described could solve our energy crisis in just a few years, a decade at most. The real problem is in enacting these solutions. Implementation will be dependent on varied systems of interacting disciplines, companies, researchers, investors, and governments.

The many forces that will shape our energy systems

Energy, fuels, and all their associated products and services make for some complex and interacting systems on a huge scale. This rapidly changing, worldwide set of systems are affected by a broad range of factors and circumstances. Some of the major ones include:

1. The state of the world's economy
2. Supply/demand balance
3. World prices of crude oil
4. The politics of nations and organizations that produce and sell crude oil

5. The politics and power of the oil importing nations

6. Supposed global warming and its effects on policy and markets

7. The “global warming” movement and the power it wields

8. Profitability of alternate fuels compared with petroleum products

9. Profitability of various energy use systems

10. Profitability of various energy generating systems

11. Government involvement at many levels

12. Private investment

13. Public and private research efforts

14. The news media and even the world of entertainment

There are certainly many more, but to try to list them all would be foolish and counterproductive. Suffice to say that there are enough interacting variables to tax even the expert operators of the most sophisticated super computers. What this means is that significant changes in any of these factors can affect a number of the others and not always in predictable ways.

There are many ideas and systems, new and old described herein.

I make no apology for favoring some over the others. Favored mostly are those that

seem to be practical, economical and especially speedy. Some of these have come to prominence recently and thus are not covered as thoroughly as others. Things are changing rapidly in this field with new ideas and products appearing almost daily. These are being triggered by the rapidly fluctuating price of petroleum. It is my belief that an energy shortage or crunch is coming much sooner than most expect. The long range forecast is for oil prices to spiral upward. The worldwide recession has temporarily halted the rapid rise over the previous few years, but sooner or later the recession will abate and oil prices will continue their long range rise. The systems described in this book or new ones not yet imagined will eventually replace petroleum because of market forces.

The purpose of this book is to provide information and encouragement for doers, movers and shakers. The many energy systems described run from those used for several hundred years to those just discovered and in their infancy. Many of these will fall into disuse or be kept for historical or sentimental usage.

Here's a bit of old news: For all practical purposes, the horse and buggy have left the American scene. Except for the Amish and some nostalgic sight seeing uses, they have disappeared. The Stanley Steamer and the Baker Electric, once quite popular are now

found only in museums or in the hands of collectors. The “iron horse” of the plains is but a memory with a rare few still in collections or on sightseeing railroads. A few WWI Sopwith Camels and WWII Japanese Zeros are still flying. Last fall I witnessed a WWII B17E Flying Fortress fly by while I was walking on a popular Florida beach. It was quite a thrill watching that half a century old legend still flying. How vastly different it is from the modern B2 bomber. This illustrates the increasing speed with which technology advances. Most of what we have today would be as unrecognizable during the era of the B17 as the B17 would have been at the time of the revolutionary war.

As time passes the evolution of technology accelerates. It has been said that the sum of scientific knowledge doubles every fifteen years. This has been going on since the time of Copernicus in the fifteenth and early sixteenth centuries, Galileo and Kepler in the sixteenth and early seventeenth centuries and Newton in the seventeenth and early eighteenth centuries. Western science seems to ignore the work of Muslim mathematicians and astronomers who knew that the earth was a sphere and revolved around the sun centuries earlier than Europeans. They in turn had learned from Greek and Persian astronomers and mathematicians after translating much knowledge into Arabic from Greek and Per-

sian. These early scientists in turn probably learned much of their knowledge of mathematics and astronomy from the Egyptians.

How about today? With computers to record our work and the Internet to distribute it, new knowledge quickly spans the globe as the sum of knowledge continues its geometric expansion. Not only are we learning new things faster, but new, practical and sometimes serendipitous findings now spread around the world at the speed of light. Information can be distributed instantly, but the actual creation of new items, systems, procedures and processes still requires time and considerable effort to move from raw material to finished products. Most of these fall by the wayside because of unattractive appearance, lack of understanding of their actual value, lack of economic appeal, or even erroneous perceptions. If another item or system is cheaper with the same value or even more expensive but with superior value, that system will prevail. Except within government bureaucracies, profitability is the clue to the economic success of any item or system. The life of even a well-accepted technology can soon be eclipsed by a newer, better or cheaper technology. Witness the evolution in recorded music from the wax cylinder to the brittle 78, the flexible LP and 45, to reel tape, to 8-track tape, to cassette tape, to CD, to DVD, and now micro chip and Ipod. The effective life of each

system lasted for a shorter period of time than its predecessor. This is the nature of accelerating technology in the music business as in many other industries.

This book is about the same kind of thing happening in the energy industry, a much broader field than music with many more variations and possibilities. A problem or need arises. Creative minds search for answers, primarily to find ways to make money, a living, even wealth. The many answers are presented to the public in ways from simple word-of-mouth contacts to mass media advertising. All things being equal, the highly advertised will always prevail over the word-of-mouth simply because it reaches far more people in a short period of time. By the time widget A gets started by word of mouth, widget B has thousands of orders from its massive advertising.

So on with the new systems described in this book. These have been proposed or developed and are being pursued by companies of many different sizes, some with patents, some without. I have some distinct opinions of the systems we can and should end up using. The same can be said for those interim products needed to move us from total dependence on petroleum to multiple energy systems in the next decade or so. I also have some definite opinions about those I think will not be successful. These opinions are

shared with readers in the section on conclusions and predictions.

It makes no difference who or what is blamed for rapidly rising fuel prices, or where they go in the future. It makes no difference what your position on environmentalism is. It makes no difference what the reality is about global warming. It makes no difference how much oil companies are hated or loved. None of these things change the fact that we still need alternative fuels and energy sources. They have become an absolute necessity because of diminishing supplies of petroleum.

Use of any fossil fuel will add carbon dioxide to the atmosphere. There are only two known ways to use energy without adding carbon dioxide to the atmosphere. The same two reasons apply if we are forced to survive without petroleum fuels for any reason.

The first and most obvious is energy from fuels derived from plant materials — non fossil sources. Carbon dioxide created by the burning of these fuels came originally from the atmosphere. Thus, use of fuel produced from plant sources only returns carbon dioxide to the atmosphere that was originally taken from it. These no-net-CO₂ fuels include: wood, ethanol from corn, methane recovered from landfills, methanol, butanol, DMF and ethanol from plant material fermentation, oils from plant sources including soy beans, palms, and algae, pelletized agricultural

waste, and any other form of fuel from recent biological activity.

The second way is and promises to be far larger than no-net-CO₂ fuels both today and in the future. It includes all non combustion processes for generating energy. Those energy systems currently in use include: nuclear, river water, solar, wind, tidal water, ocean wave action, and geothermal. Each of these has its own set of challenges, including practical limits, funding, new technologies, environmental impacts, site locations, weather problems, real or imagined dangers, and concerns of the public.

Any or all of these processes could be used to generate electric power for grid distribution in the Optimal Energy Economy of the future as described in these pages. It remains for some nation or organization to take the high road to the cheap, safe, portable, no-net-CO₂-producing energy that these processes promise. Once in use, the benefits to the economy of any nation that uses it will be unlimited.

Nuclear power, is it passé? In the past, nuclear power has been touted as the best way to produce safe, clean, non CO₂ producing energy. Unfortunately, a very slanted and scary movie, *The China Syndrome*, so frightened the American public that the entire nuclear industry was scuttled there and then at tremendous expense and waste. Once more,

perception of the American people trumped reality. This false perception was generated by a fictional story. It baffles me that the public believes a completely fictional story over the obvious reality. Hollywood must still be gloating over the destructive power wielded by their movie. It is interesting to note that it was based on an actual nuclear accident, the one at Three Mile Island. The interesting thing about that accident is that **the safety features of the plant worked**. The danger was contained just as the plant was designed to do. Radioactive leakage was far less than the maximum considered safe and the resulting dispersed radiation was barely detectable above normal background radiation. There was never any detectable radiation danger. Fortunately for France and China, they didn't believe or ignored the intended message of the movie, understood the reality, and are now rapidly developing and building nuclear power plants. By the way, nuclear power has been proven the safest of all types of power plants in real terms of human lives lost and bodies injured. I wonder why Hollywood and the media never acknowledge that fact.

Two far different methods could turn out to be the best in all ways including economic. Geothermal power could be the real winner in an all-out competition given that useable geothermal energy is available in about 60 percent of the area of North America. This is

covered in sections II C and III A 5 on geothermal power. I wonder if Hollywood will mount a new attack on progress with *The China Syndrome II* about a cataclysmic geothermal volcanic explosion. Don't put it past them. Right now in California, several geothermal plants have been supplying power for some time. Though still a tiny part of the overall mix, geothermal power has the greatest long term potential of any system, including wave energy power.

Following are some recently released estimates showing the present distribution of the various worldwide energy sources. Also shown are two potential energy sources and how they could stack up for the future.

Worldwide Distribution of Electricity Sources

<i>Hydro electric</i>	15%	2,665	Ter- awatts
<i>Nuclear</i>	15%	2,665	Ter- awatts
<i>Natural Gas</i>	20%	3,481	Ter- awatts
<i>Oil</i>	7%	1,218	Ter- awatts
<i>Coal</i>	40%	6,963	Ter- awatts

<i>Renewable fuels</i>	<i>2%</i>	<i>348 Terawatts</i>
<i>Geothermal</i>	<i>1.25%</i>	<i>268 Terawatts</i>
<i>Wave Potential</i>	<i>200%</i>	<i>34,816 Terawatts</i>
<i>Geothermal Potential</i>	<i>1000+%</i>	<i>160,000+ Terawatts</i>

Even more than geothermal, the marine energy sector is in its infancy compared with all the other energy sources we use today. It's only now starting to gain a lot more attention, and what is more important, the large influx of investment capital it needs to expand. Wave action of the ocean is a recent technology with great promise and, like geothermal, it is already in use for a tiny portion of our electric power. While wave energy is only a possibility to many people, the truth is it is no longer just a possibility. Several ocean energy companies are not only producing power right now, but they are landing power purchase agreements with the major utilities. No better proof exists that this power generation system is viable than a power purchase agreement. A small Canadian firm that few people even know exists recently picked up a long-term deal with a major utility in California to deliver power to the grid.

Here's what we are facing: Pundits now report that the coming change in energy is

certain to be the most drastic and overwhelming disruption the energy markets will ever see. Besides water, there is nothing more critical for the entire world than adequate supplies of cheap energy. We rely upon it for our transportation, our food, our medicine, our clothing, our agriculture. It's the underlying force that keeps the world moving. As we've already begun to see with oil, it is also the one thing that can bring the global community to its knees, if there isn't enough of it. So needless to say, an energy resource that is immeasurable and inexpensive is an energy resource that will drive the next evolution of our energy economy. There are not many proven technologies to choose from right now.

Why Petroleum Won't be the Answer

Back in March of 2005 I read a dire prediction about petroleum. It was a confirmation of what I and many in the oil industry had known and supposed for as long as 50 years. We have known and predicted the growing, rapid decline in world oil production between the year 2000 and 2025 even that long ago. The March 2005 prediction said we were about to run out of oil. Actually, that is not true. It should have said the discovery and ex-

traction of new crude combined with existing supplies was not keeping up with demand. It correctly reported the price of oil was about to go through the roof. Oil was predicted to reach \$80 a barrel within the next two years and go as high as \$185 a barrel.

Steve Forbes couldn't resist ridiculing this prediction. He made his own prediction, "In 12 months, you're going to see oil down to \$35 to \$40 a barrel. It's a huge bubble, I don't know what's going to pop it but eventually it will pop. You cannot go against supply and demand, you cannot go against the fundamentals forever."

The last part of his statement was right on the money. You cannot go against supply and demand forever. That was more than three years ago and now it's reality. Crude oil passed \$130 a barrel in May of 2008, and everybody from President Bush to OPEC to the CEOs of Big Oil now say exactly what that prediction was saying in 2005. The world's supply of easy oil is quickly running out. In spite of this, the current economic down turn quickly brought crude oil prices down dramatically. Strange how the recession made Steve Forbes' prediction come true. A quick economic turnaround and oil prices will return to the stratosphere. This pause in rising prices could provide us the time to convert to alternatives, but that is not likely to happen. Besides the human nature to put things off,

venture capital required to develop alternative energy has suddenly dried up. The increase in taxes promised by our new government will further inhibit investment.

Little has changed even though they all seem to have gotten the message: government officials, oil company CEOs, even consultants to the petroleum industry worldwide. Statements like, "Growth in global demand for oil is accelerating and the supply is not." "The era of cheap energy is over, permanently." "Access to oil and gas can no longer keep up with the demand." "Prices of all petroleum products are poised to go through the roof." Then there is my own prediction made early in 2007 in the manuscript for this book of \$200 per barrel petroleum and \$8 a gallon gasoline for the U.S. in 2010. When I first included that full page prediction, I wrote it as a scare tactic, an attention getter, a way to capture the imagination of the reader. Little did I realize it would be a fairly accurate prediction. It is still there in the middle of Section II of the book along with a new prediction of what will happen with low oil prices.

As the world's oil production slows and the demand for oil rises, the results could be catastrophic. Prices are already rising precipitously, not only on oil and oil products, but on virtually every other product or commodity. The first indicators of the looming disaster, rising prices for food and then other items are

already evident. Grain prices have doubled in the last year as they are taken from the food supply to make biofuels. The ripple effect of this switch is already creating shortages in poor areas of the world where starvation is a major problem. The world recession of 2008 has temporarily reversed these price increases. The rapid drop of petroleum prices and the cost of fuel at the pump pleased most Americans. Of course, the job losses and business failures that accompany these dropping prices are not very pleasing. When and if economic stability and economic growth return, oil prices will once again head for the stratosphere. This will only get worse until and unless we develop the new energy systems described herein. The long range prospects remain for less and less oil at higher and higher prices.

In their edition of May 12, 2008, The Maine Sentinel reported, "The modern world needs cheap oil like the human body needs oxygen; remove it, and we could be headed for economic decline, resource wars and social chaos." To me, if cheap oil is like oxygen then even more so is the broader term, cheap energy. Cheap alternative fuels and cheap and plentiful energy are essential to the health of the world's economies. To prevent monumental economic disasters for the whole world some individual or group must come up with viable solutions to cheap fuels and energy. Vi-

able energy alternatives are certainly within our grasp. It is vital that we develop these into practical, working systems.

High prices for virtually everything could lead to lower demand, but this could spiral into a very bad depression. In view of the rapidly increasing demand for oil in China followed closely by India and several others, economic disaster could be upon us soon and will be the most serious challenge the modern world has ever faced. Hungry and angry people lead to desperate people which in turn can lead to horrible consequences. Should the price of oil and energy continue to escalate it will eventually be priced beyond the ability of ordinary people to pay for it. At this point the economic collapse will be sudden and catastrophic. No developed nation is equipped to handle such a collapse. That's why we must act now — immediately and decisively. Delaying will lead to widespread conflict and even war — war unlike any we have ever seen.

Although most people still believe we have plenty of oil and natural gas and that the prices will soon return to previous levels, others are beginning to realize that is just not true. Left leaning politicians and the talking heads on TV are still saying how we can solve the problem with conservation and new technologies. Reducing our consumption of oil, it will fall back to less than fifty dollars a gallon. That places them firmly among the glue-

sniffers. In all seriousness, how can they possibly believe this will happen? This is especially true for the pundits and analysts who regularly appear on television to talk about how improved technology will continue to lower energy costs and bring as much energy to market as we demand and force the price of oil back down to \$35 a barrel. It will never happen in that way. Market forces will always control the price of oil even as it has dropped the price precipitously because of the deepening recession of 2008. Even if we opened up all the fields in and around our nation to drilling, it would only delay the problem and not for long at that.

Again, remember Steve Forbes' infamous prediction in 2005 that higher oil prices would cause supply to increase and outpace demand. But, according to Matthew Simmons, the world's top oil investment banker and an energy adviser to President George W. Bush, the idea that cheap oil would last forever is a 21st-century myth: "The religion was faith-based, not fact-based! It was an illusion!" At the first Association for the Study of Peak Oil and Gas (ASPO) conference in 2005, Simmons observed that the peak oil problem had started to look like a "theological debate," and quoted Dr. Herman Franssen, saying, "It is time to leave 'I believe' inside a church." The facts are that our largest oil reservoirs are running out of oil and their production is fal-

ling. Most of the world's current oil production is from fields that are past their prime and are now declining. These fields include most of the world's biggest and most productive.

Kuwait's Burgan Oil Field — In an incredible revelation early in May of 2008 it was reported by the Kuwait Oil Company that its Burgan field, the world's second largest oil field, is tapped out and has passed peak output.

Cantarell, The Third Largest Oil Field in the World, Petroleos Mexicanos (Pemex), Mexico's state oil monopoly, expects its production at the Cantarell oil field to slow earlier than previously forecast. Their chief executive said the decline is now expected to average 14% a year starting in 2007 and go down soon after.

Most of the other known reserves of petroleum are in fields that are at least beginning to decline. New fields are getting smaller and harder (read more expensive) to find and bring into production. This has been going on for at least ten or fifteen years. Even the latest oil recovery technologies have had less than dramatic results. Instead of increasing the amount of oil available, these techniques have brought about the more rapid depletion of the existing reserves. The future for cheap oil looks even grimmer as these technologies have hastened the demise

of existing oil reserves and reduced the promise of future production. This is already a factor in the rapid rise of the cost of crude.

Add to this, the huge oil deposits offshore and in Alaska that have been removed from exploration and production almost exclusively by over zealous environmentalists. Then there are those proven fields in our country where the cost of drilling and extraction is between \$20 and \$30 a barrel. These fields, including one in North Dakota that holds as much as a fifty-year supply of sweet crude, were never tapped when crude could be purchased for \$10 a barrel. Now that crude prices have gone so high and it becomes economically feasible to mine, it will take several years to drill, reach, and pump enough of this oil to make any impact. Drilling will take a huge investment which comes only from the profits of the oil companies. Should the government, as suggested, increase the taxes on those oil companies, this oil will take just that much longer to be made available. Those politicians and media talking heads never mention that while whipping up public animosity toward Big Oil, do they? They don't want you to know their efforts are the largest contributors to the high prices you must pay for fuel and those efforts are the chief reason we are sending trillions to despotic states that plot our destruction.

Many oil experts both in and outside of the industry correctly predicted the rising prices of crude almost to the dollar as long ago as early 2005. What amplifies the problem is the fact that for every calorie of food consumed in the United States, there were 10 calories of fossil fuel consumed to make the fertilizers, pesticides, and herbicides; fuel to run the machines that plant, tend, harvest, transport, and process the goods; and fuel to deliver them and refrigerate them. That is without considering the energy you use going to and from the stores and then to cook your food. This means that as fuel prices rise, everything that includes a cost of fuel in their mix will rise along with fuel. The extensive use of cheap fossil fuels in food production is what has enabled the world population to multiply by four and a half times in the last century to around 6.7 billion people at the present.

It's really quite simple; food is fuel and energy. Food travels an average of 1,300 miles from the farm to the plate in North America, leading critics such as James Howard Kunstler to decry the "3,000-mile Caesar salad" that travels from California's breadbasket, the San Joaquin Valley, to his table in Scranton, Pennsylvania. We need oil for nearly everything we do, and our entire infrastructure is built on the assumption that there will always be lots of it. Serious problems and expensive

shortages are no longer coming. They are already here.

“A Saudi oil-output hike would not solve U.S. problems:” George Bush 10:04 A.M. May 17, 2008.

U.S. President George W. Bush said that a hike in oil output by Saudi Arabia would not solve American energy problems. **“It's not enough, it's something but it doesn't solve our problem,”** Bush told reporters in Egypt's Red Sea resort of Sharm el-Sheikh. Bush said he was “pleased” with a Saudi decision taken on May 10 to increase its oil production by 300,000 barrels per day in response to customers, but said that he was “also realistic” about what the Americans should do.

“Our problem in America gets solved when we aggressively go for domestic exploration. Our problem in America gets solved if we expand our refining capacity, promote nuclear energy and continue our strategy for the advancing of alternative energies as well as conservation,” he said. “It is divided into three comprehensive parts *The Crisis in a Barrel, Making Money from the Fossil Fuels That Are Left, and Energy after Oil.*”

The first two are only band-aids on the problem and merely delay our eventual succumbing to depletion of crude supplies, and not for long. The third is the only option we have and that is what this book is about.

The sad reality most politicians, the media, and the public seem to ignore is that the billions of dollars of investment required to power the twofold answer to the energy crises — new oil and alternative energy — must come from business profits. Increasing taxes on business will lower this amount substantially and discourage research and development. Substantial profits of American business are essential to our economic health and the real solutions to the real energy crisis. The economic explosion of China and other countries will cause the price of crude to keep right on growing past \$130 per barrel and heading for \$200. Witness the following news report:

China's crude demand is expanding at 11% a year. China has already passed the U.S. as the emitter of the most CO₂ in the world and will soon replace the U.S. as the world's biggest oil importer. The growth of India's oil demand is not far behind. These two nations account for a third of humanity. As their breakneck development continues, the energy needs of their factories and construction firms along with those in Brazil, Mexico and other populous emerging markets can only escalate.

Specifically, as these countries get richer, and their citizens can afford more, the number of cars in the world, now around 625 million, is set to double in less than 20 years. Think of the impact of that on global oil demand, seeing as

around 70% of current crude output is used to fuel cars.

The UK Telegraph, April 2008 (before the economic crisis broke)

But wait just a minute! The imminence of “peak oil” may not be as threatening as we’ve been warned. In an article in the *October 2009 issue of Scientific American*, author Leonard Maugeri reports on advanced technologies that offer ways to economically extract nearly as much oil known to be underground as has already been delivered. This could extend the actual supply available well into the next century at around current crude prices that fluctuate between \$50 and \$80 per barrel in 2009 dollars. This means that competitive fuels and energy systems will of necessity need to be in the same or lower range of cost or they will simply not be viable for a very long time. Steve Forbes’ price predictions may not have been so far off the mark after all. Such information will definitely make the gurus of global warming unhappy.

SECTION II - Some General Information

What this Book Is Really About

It is possible that the best way to explain what this book is about is to tell what it is NOT about.

It is definitely not a hand wringing message of doom, gloom and contempt for America.

We have far too many of these messages of doom and gloom given to us daily in the media and by politicians who have nothing good to say or predict about America or Americans. These defeatists seem to be doing everything they can to discredit, take away and destroy all the things most Americans — actually most people in the world — want for themselves and their families. It all boils down to **E-N-E-R-G-Y** and what it costs — energy to light our cities and our homes, power our factories, move our vehicles, operate our computers, fly our airplanes, power our medical technology, grow our crops, and build our buildings — energy that does so much for us every day. Of course, fuel is but one part of the energy equation.

Two opposing views of how to manage energy come from differing political viewpoints. One is to utilize the systems proposed in this

book to expand energy systems and grow our domestic economy. The other is the way of those who would limit its use, and reduce consumption. Mostly they would use government to enforce stricter and stricter limits, often by levying taxes to artificially raise the price and so reduce use. The power of those who idolize this method has virtually shut down our domestic oil production. Using state and federal laws they have stopped us from drilling in virtually all areas in the country where new oil can be found. An example is the Gulf of Mexico. The known reserves of oil in the ground there and elsewhere in and around our country are huge.

It is Not about Solutions in the Distant Future

This book proposes solutions in years, instead of decades, with little infrastructure changes using existing technologies. These solutions are based on total energy systems including: creation, storage, distribution, use, power grid stations, fuel manufacture, waste disposal, local power generators, vehicles and vehicle power systems. Not to examine and develop these alternative energy sources is economic suicide.

It Is Not Just about the Growing World Demand for Oil

It is interesting to note that the rapidly expanding economies of India, China, and some

other third world nations are demanding increasing amounts of petroleum and will continue to do so for years into the immediate future. China is currently on a binge of building power plants and developing sources for petroleum, even near our Gulf Coast. Since the Florida legislature had the wisdom to prohibit American companies from drilling for oil in the Gulf of Mexico, our friends, the Chinese, in cooperation with our friends, the Cubans, are now drilling for that oil a few miles off our coast. By using slant-drilling techniques they will be able to extract oil from beneath our continental shelf off Florida and Louisiana. They are not restricted by the safety and environmental rules American companies must abide by so they can do it the cheap and dirty way. So much for the wisdom of our politicians in protecting our Gulf Coast from oil spills.

It Is Not Just about Alternative Fuels

The only real question is, can we convert to alternative fuels fast enough to avert economic disaster. These fuels alone may not provide the solution as they bring about problems of their own like competition with food. What we really need is new and more practical energy systems for generating electricity.

It Is Not Just about New Types of Vehicles

Snazzy new cars are the part of the energy use system that the public most responds to and the media most reports about. They are also among the last essential parts needed for our overall energy systems. Without a complete operational system to distribute energy from source to vehicle, those cars are merely a useless hunk of unmovable metal and plastic.

It Is Not Just about Reducing Global Warming

There are several overwhelming reasons why we must quickly develop new, innovative energy systems requiring non fossil fuels and the infrastructure to create and distribute that energy. Supposed global warming caused by carbon dioxide is the least of these. Even without this consideration, we desperately need an alternative to petroleum products. Thanks in large part to limits imposed by our over zealous and intrusive government, they are becoming more difficult and expensive to find and recover. A sudden major disruption of the oil supply would wreak havoc with the world economy and create a depression that would make the one in the thirties look mild in comparison. This is not an American problem, but a worldwide one.

It's Not about Waiting for a Major Catastrophe

Many of the concepts and systems described are already in existence. We have started to design, build and even use some of these advanced non-fossil fuel systems. This major shift away from petroleum fuels must be made quickly enough to avert the catastrophic economic menace that rising prices for petroleum fuels promise. Those accelerating prices are even now beginning to bring serious economic problems to the entire world. An adequate solution could probably be found within the systems described in these pages.

It Is Not Just about an Economic Bonanza

Should we develop programs using these systems, the benefits to our nation and the world would be substantial and almost immediate. The optimal energy system would provide far more material benefits than just economic growth and prosperity.

It *IS* about Preventing Economic Collapse and War

Make no mistake, the real threat of war looms larger each day. This tension is fueled by the growing demand for energy from those huge nations now experiencing explosive economic growth and demanding more oil as their economies accelerate. The dangerous conflict in The Republic of Georgia was most likely one of these over control of energy. This is compounded by an accelerating food short-

age that is possibly even more dangerous than the fuel shortage. As the prosperity of these large nations grows, the demand for fuel and food is far outstripping the supply. The result can be hungry people running amuck in killing frenzies as is happening in much of Africa. Add Islamic fundamentalist terrorists from nations awash in oil money and there are two easily recognizable groups that either care nothing about human lives and would not hesitate to snuff out a few hundred million, or who would cheer loudly at the murder of virtually every person in the West. That we find new, non petroleum-based systems for energy generation, transport and use is essential to help prevent this from happening. The answer to this can certainly be found by pursuing some of the avenues laid out in these pages. Hopefully, an abundance of cheap energy that doesn't interfere with the food supply will relieve some of that danger as well.

It's Not about Words and Emotional Reactions

We always have plenty of that from politicians and the world of entertainment including the media whose stock in trade is the use of words to stir emotions. These voices, frequently of doom and gloom, often falsely condemn many who could be instrumental in solving problems. In fact, they can be causing great damage by dividing us and

generating discouragement and conflict. They use class envy and contrived figures to entice anger and distrust among the people for the very organizations that are best equipped to solve our problems.

What we need is positive action — actually many actions by creative people who do much more than talk — and the leadership to help guide and inspire us all. We desperately need people who design and build, the men and women with creative minds and laboring hands who are willing to work hard to provide us both the ideas and the actuality of new energy technology. We need those skilled and hard-working hands that till the soil, build the infrastructure, and operate the computers and machinery, and yes even those who manage and invest. These are what drive the productive engine that has been and will continue to be America.

Those people are there, now, hard at work trying to solve our problems in the old-fashioned way, American ingenuity and drive. Spurred on by the promise of great rewards if their efforts are successful, those who participate are many, often unknown. The promise of profits — a dirty word to the ignorant and those who would control them — is the fuel that drives the creative human engine that could solve most of our problems if given the chance. It is these free entrepreneurs and investors who will solve the energy crisis if only

those posturing and strutting politicians and government officials would stay out of their way.

This book tries to describe the wonders entrepreneurs have created and the ones that will solve our energy problems.

For those who think I am a bit over critical of our government let me say that I appreciate and applaud the effort of those dedicated public servants who work hard within the burdensome bureaucracy and help our nation. My criticisms of government are of the make-work leeches in the bureaucracy created by self-serving politicians, and those many self-serving politicians themselves.

I have gained much information from DOE web sites:

<http://www.pi.energy.gov/>, and
http://www.pi.energy.gov/documents/new_econ_appendix.pdf

America Needs a Mission for Energy Independence

That mission is to discover, develop, and implement practical ways to save us — the United States and the world — from the ravages of the fossil fuel dragon. We should do our utmost to make everyone aware of avail-

able options for safe, affordable energy generation and use. We should also try to motivate entrepreneurs to pursue the development of as many of these options as are found to be practical, while continuing to look for new and better ones.

It is paramount that we develop realistic solutions to the energy crisis from among the multitude of products and systems that are in use, under development, or even latent ideas in the minds of America's creative genius. We must collect and examine descriptions of fuels and energy systems — past, present, and future — and of many possible and practical ways to replace fossil fuels with renewable fuels or energy systems. It matters not to a driver what powers his vehicle when he presses down on the accelerator pedal. Any power system that provides adequate mobile power economically when that pedal is pressed will satisfy his needs. All of the new systems could replace fossil fuels as the prime energy source for our nation and even the world. In the process this could lead to a carbon dioxide neutral energy system, one that adds no new CO₂ to our atmosphere. The options needed are real and practical alternatives to fossil fuels that will replace the use of petroleum and coal-based fuels with renewable, non-polluting fuels or electrical energy and in the process:

1. build an American energy system that will stop the hemorrhaging of billions of U.S. dollars, mostly to despotic nations that preach our destruction.
2. build an American energy industry that boosts our economy and provides good jobs for many Americans.
3. stop the growth of atmospheric carbon dioxide and that possible link to global warming: and accomplish most of this within just the next ten years.

Our total energy system consists of many types of energy systems, sources, fuels and conversions. The requirements of the components of such a workable system should be judged by the following criteria:

1. They should be comparatively inexpensive to use.
2. They should be developed using environmentally sound, sensitive principles.
3. They should be far easier, simpler and less expensive to implement than the hydrogen fuel cell system.
4. They should be adaptable to our existing infrastructure with minor changes.
5. They should use raw materials we already have or that can be developed here, locally.
6. They should be applicable to existing vehicles with upgrades or conversions.

7. New fuels should be useable with existing IC (Internal Combustion) engines of all types.
8. They should be developed using existing, evolving technology able to be essentially complete within ten years.
9. They should create a system that is a net zero contributor of carbon dioxide to the atmosphere.
10. They should use evolutionary as opposed to revolutionary changes — a good start to becoming constantly improving, adapting systems driving numerous growing and improving technologies.
11. They should be developed by America-based industry with the many resulting substantial benefits to our nation — social, political, and economic.

While the main thrust of such systems will be to provide new, better, less expensive and less environmentally intrusive systems for energy and transportation, many benefits other than just getting away from fossil fuels accrue. These include direct positive effects on four of the first seven of the top twenty-two “most serious concerns of the American public” as shown in a public survey conducted by MIT and cited next.

Public perceptions and concerns

Howard J. Herzog, a principal research engineer at the MIT Laboratory for Energy and the Environment (LFEE); MIT graduate student Thomas E. Curry; and professors David M. Reiner and Stephen Ansolabehere developed a survey including questions about the environment, global warming, and climate-change-mitigation technologies, and the most important issues facing the United States today¹. The survey in its entirety can be viewed at the following website:

http://sequestration.mit.edu/pdf/LFEE_2005-001_WP.pdf

Questions showed that the environment in general and climate change in particular are not high-priority issues for the public. The environment came out thirteenth on a list of twenty-two possibilities for “the most important issues facing the United States today.” The front-runners on the list were terrorism, health care, and the economy. On a list of ten specific environmental problems, “global warming” came up in sixth place, well behind water pollution, destruction of ecosystems, and toxic waste.

IMPORTANT NOTE: This list represents public perception of the severity of a problem, **not the reality**. It is well known that media attention to a particular problem or situation influences public opinion. Since the survey

was taken, and with the growing hype about global warming, that concern now tops the list of environmental concerns, having moved from sixth to first in just a year. That could well be described as the “Chicken Little” effect. Whether or not it is an actual cause for concern is irrelevant. Public perception and the assumption by so many public figures that human created carbon dioxide is causing catastrophic climate change for the worse makes it a real concern to many people. Some realities of our current understanding of climate change including global warming are described elsewhere in this book.

The solutions recommended in this book directly relate to and could be a powerful and positive force toward the following items on the survey, showing their position of importance to U.S. citizens according to the survey taken in 2005. The number two concern, health care, though not directly affected would benefit from the economic growth these solutions would provide.

No. 1 Terrorism

No. 2 Health care

No. 3 The economy

No. 4 Unemployment

No. 7 Federal budget deficit

No. 13 The environment

Changes in three years

The public's perception has changed considerably since 2005 because of many factors that include: the rising cost of petroleum and petroleum products, the rising cost of food along with worldwide shortages, the lack of any significant terrorist attacks on the United States, and the general acceptance as a "proven fact that global warming caused by human production of carbon dioxide from fossil fuels represents a real and imminent threat. Add to that the long ago predicted mortgage meltdown and it becomes evident our economy has taken several damaging blows. This latest economic blow was brought about by foolish and even unscrupulous lending practices and speculation that should have been illegal, but were not. Once more our politicians hurry to lock the barn door after the horse has been stolen.

Those who are complaining the loudest are the very ones who orchestrated this crisis. Now they have the gall to ask to be put in charge of the solution. How stupid do they see the public? Are they right? That all of this together has not brought on a collapse of our economy is a testimonial to the strength of that economy. Just how well it continues to grow or decline depends on many interwoven factors. Not the least of these is the result of political actions. The specter of increased taxes and government controls on business in America looms large in the minds of business

managers and owners all around the world. People will always react to their perceptions rather than to realities particularly regarding poorly understood phenomena. This is amplified in importance by the media's preponderance to report in detail any bad news or frightening scenario. Add to that those politicians and media personalities who use any possible bad suppositions no matter how insignificant as bludgeons with which to batter any who would dare to disagree with them or their agendas. The effect on the public's perception of virtually anything is influenced greatly by all the ranting and raving.

A poorly supported yet probably fairly accurate report on the current state of public's perception provides the following new list of related concerns:

No. 1 The economy, especially as it relates to rising food prices, and now the mortgage meltdown and suddenly lower fuel prices

No. 2 Unemployment

No. 3 Terrorism

No. 4 Health care

No. 7 Federal budget deficit

No. 11 The environment (global warming leads)

This is strange considering that until the sudden economic downturn, the economy continued to expand and unemployment had risen only to around 6%, a normally accept-

able level in good economic times. The public's attention has shifted from those figures and in 2008 focused on recession, the mortgage, and corporate credit debacle, unemployment, and rising energy and food prices that they see and deal with every day. These really scare them. With politicians and the media constantly waving the recession flag for more than a year, it is no wonder people are nervous. In fact, media pessimism could have been a powerful force in creating the recession or at least making it worse.

A monumental task with many obstacles

Even with these substantial benefits bundled into grand plans, the planners must still deal with significant forces. These forces can make a new idea work or relegate it to the ash can of history. Real difficulties and obstacles must be overcome in order for any new system to become a reality no matter how positive and/or effective that system might be. The battle to get the most beneficial systems noticed and made a reality may require more effort than the implementation of the idea or system itself. The process, once begun, may take unexpected twists and turns in moving, sometimes forward and sometimes back, but always in the ultimate direction of success.

Our space program and its goal to ***“put a man on the moon in ten years”*** followed just such a wandering path en route to its success. We can expect no less from our efforts to find a new fuel/energy system that has a far more powerful practical and obviously profitable goal. Clearly, President Kennedy's commitment to put a man on the moon in ten years and the follow-up on that commitment was a major force in making it happen. Media hype and glamorization helped garner public support and enthusiasm. That was a government program operated by a government agency implemented mostly by private contractors according to government bid specifications. It was a **process**-oriented solution with a single defined goal.

What we need now is leadership that is courageous enough to state a goal such as ***“convert to new, home based energy systems in ten years”*** and then work ceaselessly toward achieving that goal. We need leadership that will initiate a system oriented, broad-spectrum approach to solving our growing energy crisis. This is an even greater challenge than putting a man on the moon, a serious challenge that could be instrumental in securing our survival. We need this ten-year goal declaration to be well stated and backed by leadership with vision and the dedication to follow through. The commitment would be to develop new energy systems

that will provide American-made renewable fuels or other portable energy systems and will add no more carbon dioxide to the atmosphere and do it within the next ten years.

This commitment is a much broader goal than putting a man on the moon. It has many branching and interconnected avenues that could lead to successful solutions. The key to final success will be found in the development of many areas of research rather than just one or two. These include the best combination of energy sources, means of obtaining that energy, means of moving the energy from source to point of use, and finally the systems of using that energy. A variety of equally effective systems fitting differing needs could be developed by a diverse group of privately funded entrepreneurs and inventors. The result could end up a variation on the current theme where we use several types of fuels in different configurations for similar purposes.

Delaying that, as many are now doing by talking about reaching that goal in thirty or fifty years, is a recipe for disaster. We do not have that kind of time to wait. Just run the numbers. Continuing to transfer billions of American dollars offshore for thirty to fifty years will destroy us economically long before we can develop an alternative fuel economy. Even ten years could be too long, but I believe we can handle that. Certainly it would be less disastrous than thirty to fifty years.

What we don't need now are politicians that use class envy, and every negative action they can promote including global warming as smoke screens to hide their own obvious and damaging failures. Not just to hide their gross negligence, but to use false factors as the reasons for new and oppressive taxes, and government powers to control commerce and punish those they see fit to punish for any reason. These power hungry opportunists and their lackeys in the media ridicule and oppose anything proposed or suggested by anyone who is not in their camp. The kindest thing to be said of them is they are the blind leading the blind.

Here's some information about one large oil field from the U.S. Geological Survey official results of a groundbreaking study released on June 9, 2008. The report confirmed a massive oil reserve in an area the locals have nicknamed the "Bakken," which stretches across North Dakota, Montana, and southeastern Saskatchewan. The study estimates a huge 3.65 billion barrels of undiscovered oil in the Bakken. Compared with the agency's estimate back in 1995, the study reports a 25-fold increase in the amount of oil that can be recovered. The reported mean estimate of 3.65 billion barrels of oil is for undiscovered oil only, and doesn't include known oil. The total amount of recoverable crude in The Bakken deposit could be as

much as 400 billion barrels. Once impossible to extract, this oil has yielded to new horizontal drilling and rock fracturing techniques. The Bakken is now being hailed as the single largest oil find in U.S. history. Experts estimate that this light, sweet (low sulfur) crude will cost Americans about \$16 a barrel. Let's hope we can obtain major production from this field before opportunistic obstructionists can figure out a reason to prevent drilling there.

It may be that the current crisis can be diverted by new recovery technology in this field, but hopefully the incentive to produce viable non fossil fuels and other energy systems will continue. Eventually we will run out of fossil fuel and will need alternatives. The attention given to new energy and fuel systems will undoubtedly involve effort into other seemingly unconnected areas. We are still deriving long-term benefits from technology developed for our space program. It would certainly be the same for any fuel/energy program. It is amazing to discover that so many of our serious problems are interrelated and how finding one solution often leads to another almost totally unrelated solution and so to the demand for another workable system.

Existing systems

Presently there are at least seven petroleum-based and mined fuels used in a variety of engines and boilers. These are in addition to coal used mostly in power plants. Use of all of these fossil fuels adds carbon dioxide to our atmosphere. There are at least six non fossil-based fuels currently being used or being considered for use. Most are manufactured from plant materials and add no-net carbon dioxide to the atmosphere in use. Some do add carbon dioxide in their process of manufacture. There are a few non fossil solid fuels, mostly used for heating and cooking. There is a wide variety of harvesting and manufacturing processes used to obtain or make these fuels. Some of these manufacturing processes require more energy input than the resulting fuel can produce.

There is also the special case of nuclear fuels that use radioactivity to generate heat to boil liquids that drive turbine generators. Since these do not use combustion, they do not release carbon dioxide to the atmosphere.

The only reason we need fuel is to provide heat energy which we then convert to electricity or mechanical power. There are at least five combustion-based systems in use. The internal combustion piston engine is the most common and the most developed. Turbine engines make up the rest of the internal com-

bustion types. Other sources of power include: piston steam engines, turbine steam engines, several types of nuclear reactors, fuel cells, and batteries. All of these power sources turn energy derived from chemical reactions or nuclear fission into electricity or mechanical energy, which then powers vehicles, tools, and factories.

There are at least six types of batteries in use, some of which are new and just beyond the development stage. These new technologies will come of age when continuing development of improved technologies lower their costs and improve their safety and efficiency.

Electric motors of many types and sizes, long important in stationary applications and semi-portable tools are growing in use in vehicles. The fastest growing application of new battery technologies is now battery-powered, cord-free tools and electronic equipment. Application of these new batteries to hybrids, plugin hybrid electric vehicles (PHEVs), and even pure electric vehicles (EVs), is just in the beginning stages.

In the power plant segment of our energy system there are at least eight different sources of energy used to drive the generators that produce our electricity. Each has its own positives and negatives and all can pose serious environmental problems.

All of these parts of our energy system have been described to illustrate how complex it is. Making any major change would be a difficult and arduous task. Even deciding which changes to make — what system to develop — will be difficult. The answer could lie in a very successful technique used mostly in America for a long time, individual entrepreneurship in an unfettered, free enterprise, business environment.

The challenge ahead

There are literally thousands of individuals using their genius to develop new energy technologies motivated by the promise of rewards for themselves and for their organizations. We are not alone in free entrepreneurship. The powers that control China have suddenly realized its value and are now encouraging it. This has created one of the biggest economic turn-arounds in the history of nations. Other countries have seen the light for some time and their economies are booming. Even India, the other Asian giant, is beginning to loosen the socialist government reins that have held their economy in check for so long. The phenomenal growth of the Irish economy is another example.

Internet access to the rest of the world and primarily the free world has been a factor in these changes. Even some governments that once controlled virtually every aspect of their