



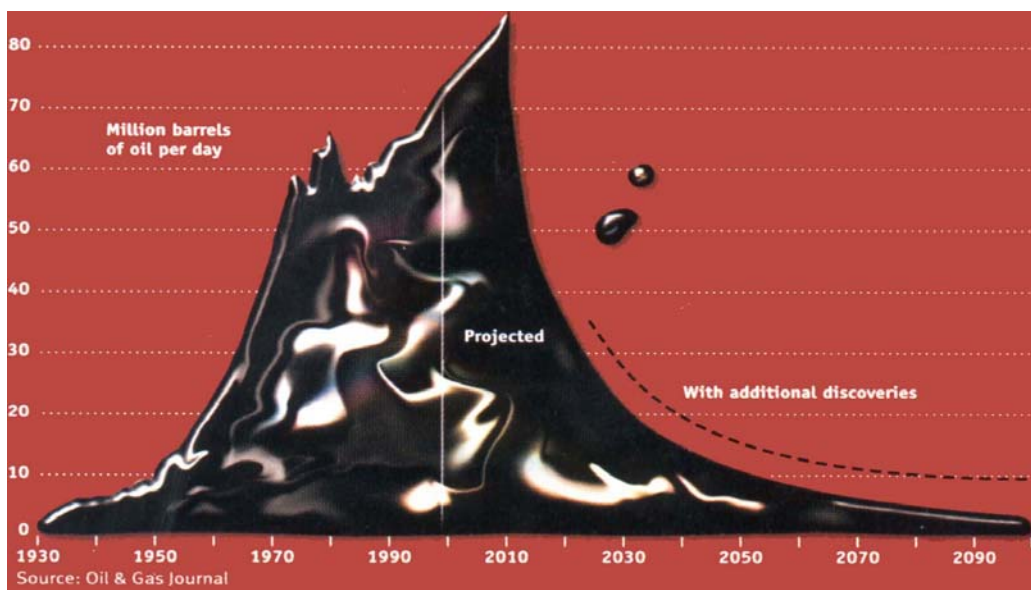
## Phoenix Project Foundation

Rising from the ashes of fossil and nuclear fuels by shifting to a Solar Hydrogen Economy by 2020

### Comparing the Energy Plans Proposed by Pickens, Gore & Braun

Al Gore and T. Boone Pickens have recently proposed energy plans that include wind and other solar energy technologies, but neither plan will phase-out all fossil and nuclear fuels by 2020, which is the focus of Harry Braun's Phoenix Project plan, which was initially proposed in 1984 as the centerpiece of his campaign for Congress against John McCain. Details of Braun's plan were provided in his subsequent books that were published in 1990 and 2000, and his most recent paper that is being published in the July issue of the *Chemical Industry & Chemical Engineering Quarterly*, Vol.14, Number 2, which can be found on the journal web site: [www.ache.org/rs/CICEQ](http://www.ache.org/rs/CICEQ).

Unlike the plans proposed by Gore or Pickens, Braun's plan is the only one proposed that meets the technical specifications of Dr. James Hanson and his colleagues at the National Academy of Sciences, who have testified that fossil fuels need to be phased-out by 2020 in order to avoid irreversible and catastrophic damage to the earth's major food production systems. In addition to these climate concerns, the Oil Age graph below, which was published in the *Oil and Gas Journal*, graphically underscores the urgency of what is now approaching, and why it is simply not possible to drill our way out of the problem.



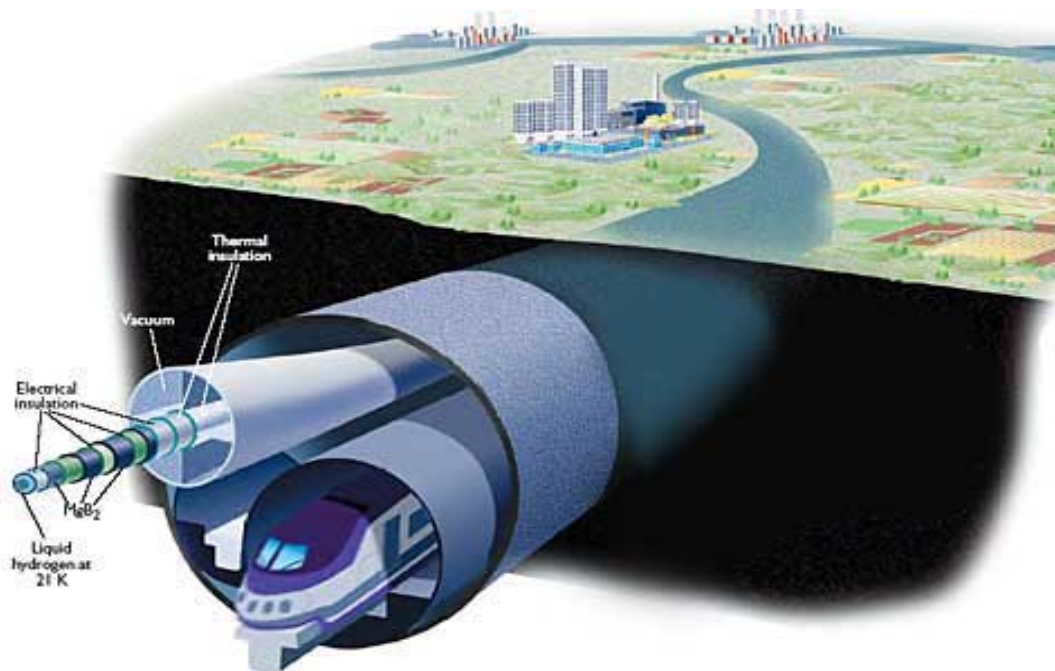
Most analysts now estimate that the "Peak" of global oil production occurred in 2005.

T. Boone Pickens was provided with a copy of Braun's 365-page Phoenix Project book when he was briefed by Braun on wind and other energy technologies in 2000, and while Pickens has correctly focused on wind technologies and resources, he missed the critical hydrogen element completely, which means he needs Congress to essentially condemn private property in order to install a vast new network of inefficient and unsightly high-voltage electrical transmission lines. Pickens assumes that the natural gas, which now powers most of the new power plants, can then be used to fuel a small percentage of the vehicles in the U.S. The problem is that the reserves of natural gas, like oil, coal and other non-renewable fossil and nuclear fuels, are rapidly being consumed worldwide, as more and more people compete for fewer and fewer energy, water, and food resources. While Pickens refers to natural gas as a short-term "bridge fuel," its production results in serious long-term environmental and water contamination problems.

Gore's plan to phase-out the use of fossil fuels for the production of electricity by 2020 is an excellent first step, but electricity only accounts for about one third of U.S. energy consumption, and Gore's plan also misses the hydrogen variable completely. As such, he assumes all of the 250 million vehicles in the U.S. will need to be replaced with new electric or hybrid vehicles. Assuming the new vehicles cost \$25,000 each, over \$6 trillion would be needed just to replace the automotive vehicles. It is also important to note that electricity will not be able to be used to power existing trucks, heavy equipment, commercial aircraft or power plants.

Braun's plan, by contrast, is primarily focused on making hydrogen from water with the electricity generated from the wind and other solar technologies. Since hydrogen is a "universal fuel" that was used to power the first internal combustion engine in 1807 as well as the Saturn V moon rockets, as well as a Coleman stove cooking dinner on a mountain top. Thousands of vehicles, including some German submarines and torpedoes in World War II, were modified to use pure hydrogen as well as diesel and other hydrocarbon fuels, where the hydrogen is chemically bonded to carbon. Assuming a conversion cost of 2,500 per vehicle, the 250 million vehicles could be modified for approximately \$625 billion – compared to the \$6 trillion that would be needed to replace the vehicles.

While Pickens wants to build a thousands of miles of new high-voltage transmission lines, which are inefficient and will be an eyesore for over a century, Braun proposes to have an underground Interstate Hydrogen Pipeline System, which will be able to carry electricity with virtually no energy loss from coast to coast, as well as passengers who will be able to travel in high-speed, magnetically levitated rail systems. Such a concept was proposed by Engineering Professor Nejat Veziroglu who is also the president of the International Association for Hydrogen Energy, a professional society with over 2,000 Ph.D.-level members from over 45 countries, and the concept is also being developed by the Electric Power Research Institute, which prepared the Supergrid image below:



### The Supergrid

*The image above was prepared by the Electric Power Research Institute, a national utility research group.*

### The Silver Bullet

Braun's Phoenix Project Plan is the only "Silver Bullet" proposal that can allow the U.S., China and the rest of the rest of the world to shift to a wind-powered solar hydrogen economy by 2020. Given this timetable, there is little or no time for R&D, thus the Phoenix Project plan assumes that automotive and aerospace manufacturers will simply mass-produce state-of-the-art wind powered hydrogen production systems, as well as the necessary engine and vehicular conversion systems, which will allow all the *existing* vehicles and power plants to simply be modified to use the hydrogen that will be made from the sun, wind and water. *From a technology perspective, all of these wind-powered hydrogen production and end-use systems could have been mass-produced in the 1920s.*

Less than 5 million 2 MW wind systems would displace all fossil and nuclear fuels in the U.S. and an additional 15 million systems would essentially displace fossil fuels worldwide. To put these numbers into perspective, wind systems are very similar to an automobile from a manufacturing perspective, and over 17 million new vehicles are sold in the U.S. annually. This underscores that the obstacles to this "transition of substance" are not technical or economic, but political.

### Economic Considerations

As with most products, mass-production is a key to reducing system costs, and given the exponential consumption of the remaining fossil fuel and uranium resources, energy costs will likely continue to sharply increase in the future. This is already impacting every product produced, *including wind systems*, which is why the longer this capital intensive transition to a renewable hydrogen economy is delayed, the more expensive it will be. The only question is whether the trillions of dollars in profits from this macroengineering project will be going to private companies like ExxonMobil, or the American taxpayers. Assuming the capital costs of the mass-produced wind powered hydrogen production systems are \$500 to \$1,000/kW, a 2 MW wind system would cost from \$1 million to \$2 million. Thus the 5 million units would cost between \$5 trillion to \$10 trillion. Given the USA now spends approximately \$1 trillion annually for energy, even the higher value would be paid off in less than 10 years, providing a renewable rate of return on the investment with equipment that will last indefinitely.

To put these numbers into perspective, according to a May 5<sup>th</sup> 2008 article published in the *Oil & Gas Journal*, Matthew Simmons, a highly regarded analyst who is Chairman of Simmons & Co. International, stated that the oil and gas industry will need to invest \$50-100 trillion to rebuild its ageing infrastructure within the next 7 years and stave off a serious drop in oil and gas production. This number does not include any of the staggering environmental costs that will be incurred as the shift to mountain-top mining and the extraction of hydrocarbons from shale and tar sands is intensified. Over 90 percent of the remaining crude oil is not owned by oil companies, but by the governments of countries such as Iran, Iraq, and Venezuela. Global oil production peaked in 2005 but as the Oil Age graph indicates, the exponential plunge phase of global oil production has only begun. Once the public sees this graph, they will understand that soon it will not be possible to get gasoline at any price, which will have a catastrophic impact on both the economic and food production systems worldwide.

### The Hydrogen Variable

While hydrogen can be made from water with any source of electricity, the vast majority of hydrogen that is now used to make everything from gasoline to peanut butter comes from natural gas and other fossil fuels. It is why making hydrogen from such non-renewable fossil or nuclear fuels only makes the environmental and resource supply problems exponentially worse. This is why the Phoenix Project recommends making hydrogen from renewable resources, principally from water with the electricity supplied by the wind and other solar energy technologies as they become cost effective.

### **The Answer is Blowing in the Wind**

At present, wind systems have the greatest potential to be economically mass-produced for large-scale hydrogen production on a scale to displace fossil and nuclear fuels by 2020. Wind systems have been in use for over 1,000 years, and if they are mass-produced for hydrogen production, they alone could displace all fossil and nuclear fuels worldwide by 2020. Wind-powered hydrogen production systems can also be deployed at sea, where they would provide a vast sanctuary for the remaining fish and marine organisms that are in the final phases of being hunted into extinction.

In spite of the remarkable energy potential in wind and other solar resources, such systems currently generate less than 1% of the current energy demand in the U.S. This is primarily because the sun and winds are intermittent and inherently unpredictable in nature; and winds often blow at night when the power is not needed. This means solar and wind systems typically only operate 30% of the time, but no one can predict when the solar resources will be available. In addition, there is a lack of transmission space on the electrical grid systems nationwide for any new power plant projects, and the vast majority of the power used in the U.S. is not from electricity – but from a combustion fuel that powers engines, vehicles and power plants.

These obstacles, however, are fundamentally eliminated if hydrogen fuel is made from the wind and other renewable energy technologies. Unlike electricity, hydrogen can be stored and delivered to national and international markets by cryogenic tanker trucks, ships or underground pipelines.

### **The Exponential Urgency**

Given the exponential nature of the evolving economic and environmental emergency, which is already impacting food supplies and prices worldwide, there is no time to waste. Many distinguished atmospheric chemists have documented that climate changes are now occurring much faster than were predicted just a few years ago, and given that the methane hydrates in the oceans and the permafrost in the Arctic, Siberia, Alaska and Canada is already starting to rapidly melt, this alone could release 50 to 100 times more carbon into the atmosphere than is now generated from the burning of fossil fuels. As such, humanity is rapidly approaching an exponential “tipping point” of no return, which is similar to a car accelerating towards a cliff. After a certain tipping point, it will not matter what the driver does because the force of momentum will propel the car over the cliff.

Few people have an understanding of exponential growth, yet it is clearly the most significant factor in the energy, economic and environmental problems that we are now faced with. The danger of exponential growth is that when it first starts, the level of growth seems insignificant, which leads to complacency. After a few doubling times, however, even small amounts will increase into staggering quantities. In biological terms, when the ascending curve of consumption intersects the correspondingly descending curve of resources, mass-extinctions typically result.

It is because of the exponential nature of this problem that Hanson and others have warned that the combustion of fossil fuels need to be phased-out by 2020 if irreversible damage to the earth's climate and food production systems is to be avoided – and the Phoenix Project proposal is the only plan that thus far meets this critical 2020 implementation specification. In spite of this, however, the national news media have never made the American public aware of the only option that can allow humanity to shift from fossil and nuclear fuels while there is hopefully still time to minimize the catastrophic impact of global food and water shortages, which are already occurring.

### **The Limits of Ethanol**

Although ethanol has received most of the attention in the media and investment community, the National Academy of Sciences has stated that even if all of the corn in the U.S. was used for ethanol production, it would only displace 12% of the gasoline now used in the U.S. Moreover, ethanol is not renewable because it erodes the soil 18 times faster than it can recover, and it typically requires more energy from fossil fuels to make ethanol from corn than the ethanol will generate when it is used as a fuel. Ethanol from corn produces significant levels of pesticide runoff that wash into the oceans and contribute to the creation of vast "Dead Zones" in the oceans, as well as carbon and carcinogenic acetaldehyde emissions. In addition, even ethanol's relatively small usage has already caused unprecedented increases in food costs worldwide, which disproportionately impacts the world's poor.

### **Water Considerations**

Solar-sourced hydrogen made from water, by contrast, emits primarily pure water vapor as its combustion byproduct, which means if vehicles were fueled with hydrogen, urban areas would have clear air even in rush hour traffic. Given the global water shortage is just as serious as the energy, economic and environmental problems, it is also important to note that while it takes about 18 gallons of water (and significant amounts of hydrogen) to make a gallon of gasoline from crude oil in the refinery, it only takes about 2 gallons of water to make an equivalent gallon of gasoline in the form of hydrogen. By contrast, *it takes over 12,000 gallons of water to make a gallon of ethanol from corn.* The Earth is now warmer than it has been for thousands of years and record droughts and heat waves and cold fronts and major crop failures are already occurring in large agricultural areas of the U.S.

### **National Security**

Given the national security implications of implementing a transition to a solar hydrogen economy by 2020, the Defense Department, which is the largest single consumer of fossil fuels, should be at the forefront of initiating this transition by modifying all of its vehicles, which will then be able to generate pure water from their engine exhaust. This is a particularly important consideration when one realizes that in the initial invasion, U.S. troops went for over a month without a shower because the water was simply not available. The general public will then be able to benefit from the engine conversion systems that will be developed for Defense Department vehicles, including ships and aircraft. Such a "transition of substance" would have profound implications for the U.S. and global economy, the environment, national security, foreign policy as well as the fundamental global problems of more and more people competing for fewer and fewer resources.

This reindustrialization effort would transform the U.S. from being the world's largest energy importer to being one of the world's largest energy exporters of a pollution-free fuel that is inexhaustible. Millions of jobs would be created in the process, and the multi-trillion capital investment could be recovered in less than 10 years, providing a renewable rate of return with equipment that will last indefinitely. Given that no new technology is needed, the real obstacles to this transition are not technical or economic -- *but the lack of public awareness.*

This underscores that the focus on consuming the remaining fossil and nuclear fuels and converting food crops to biofuels wastes both time and money, and since many of the most respected climate scientists have said that the shift from fossil fuels needs to occur before 2020, it is critical that the American people be made aware of the only plan that can accomplish this transition of substance in time: Braun's *Phoenix Project* plan. The critical Congressional Hearings and a National Hydrogen Implementation Plan will then be inevitable.



**Harry W. Braun III**

Harry Braun is a technical analyst and author who has been working on finding realistic and fundamental solutions to the global fossil fuel and nuclear energy dependence, resource depletion and pollution problems since his undergraduate work at Arizona State University in the 1960s. It was during this time that he became aware of the exponential consumption of resources by physics professor Alpert K. Bartlett, and the insights by Dr. M. King Hubbert, the geophysicist at Shell who accurately calculated the rate of fossil fuel production in the U.S. (which peaked in 1970) and world production that peaked in 2005. In 1981, after reviewing his research into solar and hydrogen energy technologies and resources, Braun was invited to become an Advisory Board Member of the *International Association for Hydrogen Energy* (IAHE), a peer-review professional society, which now has over 2,500 Ph.D.-level scientists and engineers as members who represent 45 countries. The IAHE Advisory Board Members can also be viewed on the IAHE.org website.

If the “transition of substance” to a solar hydrogen economy Braun proposed in 1984 had been implemented, much of the economic, environmental and ecological damage that is now unfolding could have been avoided, and this critical reindustrialization effort could have been made when oil and other fossil fuels were still relatively inexpensive. The news media, however, were not interested in the quality of these ideas Braun proposed, because he was not focused on fundraising. Braun even made an attempt to run as an independent presidential candidate in 2004 (BraunforPresident.US) but the media still refused to make the American public aware of the interdisciplinary ideas of substance he was proposing. Without media exposure, it is virtually impossible to raise any serious money, and as a result, the time-sensitive insights he provided were ignored, and the global economic and ecological problems are now going critical.

According to Braun “We have hit the iceberg and ignoring this harsh reality is like ignoring the water rushing in the lower decks of the *Titanic*. Enough time and money has been wasted on the false hopes of nuclear power, ethanol, LNG from abroad, tar sands and oil shale. There is now very little time left to mass-produce the wind and solar-powered hydrogen production that will serve as the foundation of a solar hydrogen economy.” For more information, please contact Harry Braun at the address below:

Harry Braun has been the CEO of Sustainable Partners International (SPI) since 1994. SPI is a systems integration firm that was the initial developer of a \$150 million wind farm project in New Mexico and is now focused on having wind systems mass-produced for large-scale hydrogen production. Braun has been working as an energy and environmental analyst for the past 35 years. He received a Bachelors degree from Arizona State University in 1971. His undergraduate work was in history and general science, while his graduate work focused on evolutionary biology and anthropology. His post graduate research has been in the areas of energy technologies and resources, photobiology, molecular biology and protein evolution. Braun has been an Advisory Board Member of the International Association for Hydrogen Energy ([iahe.org](http://iahe.org)) since 1981. This international peer-review professional society, which is comparable to the American Medical Association, is composed of over 2,500 technical analysts and Ph.D.-level scientists, chemists and engineers from 45 countries.

Braun is also the founder of the Phoenix Project Foundation (**PhoenixProjectFoundation.US**), a non-profit, scientific educational organization that is focused on educating the general public about the critical interrelationships of exponential growth, energy, the economy, and the environment, as well as the origin of life, protein evolution, photobiology, molecular biology and U.S. foreign policy.

Braun is the author of numerous technical papers, as well as *The Phoenix Project: Shifting from Oil to Hydrogen*, a 360-page book first published in 1990 and again in 2000, which provides a scientific overview of the origin of matter and life in the known universe, how the “big bang” created hydrogen atoms, which gravity condensed into the stars, which then emitted the electromagnetic spectra that served as the spark for the origin and evolution of life on the Earth. The book documents how the microorganisms on the primitive earth were exponentially exhausting the hydrogen they were extracting from hydrocarbon molecules in the primordial soup. In order to avoid extinction, the microbes figured out how to extract hydrogen from water with solar energy (i.e., photosynthetic green plants), a process that has been successfully working on a global scale for over 3 billion years.

The primary emphasis of the book, however, is to provide a technical analysis of how the U.S. and other countries can rapidly shift from non-renewable fossil and nuclear fuels to renewable solar hydrogen production systems, which will resolve many of the most serious economic and environmental problems.

The book reviews both the positive and negative aspects of exponential growth, which explains why humanity is on the threshold of both a technological “utopia” of molecular medicine as well as an ecological “oblivion” of mass-extinctions, which are already well underway. It is why we on *Spaceship Earth* are all like passengers aboard the *Titanic*, and there is only a limited amount of time left to “change course.” Although hydrogen is often mentioned as the “Holy Grail” of all energy sources, Braun is the only technical analyst who has thus provided a specific plan for how this “transition of substance” can happen by 2020 by mass-producing wind and other solar powered hydrogen production systems, and modifying every *existing* vehicle and power plant to use hydrogen.

Braun ran for Congress in 1984 against John McCain on a platform of shifting to a Solar Hydrogen Economy with wartime-speed. Braun also ran as an independent presidential candidate in 2004 on a platform that also offered significant insights on foreign policy, education and healthcare. Details on his presidential platform can still be viewed on the **BraunforPresident.US** website. Braun has also organized the Phoenix Project Political Action Committee (**PhoenixProjectPac.US**), which is focused on the political aspects of helping to organize Hydrogen Hearings in the U.S. Congress, which will be a prerequisite for the passage of a number of Constitutional Amendments, including the Fair Accounting Act, which would factor in the environmental and healthcare costs of using fossil and nuclear fuels, thereby providing the financial incentives for oil and other energy companies to shift their investments into wind and other solar hydrogen production systems.



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