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New Solutions

The Community Solution SM

Community, a solution for saving the environment and conserving resources with equity for all.

Report from Germany: The 3rd International Meeting on Peak Oil and Gas

This issue of New Solutions brings to our readers the latest information on Peak Oil, obtained when we attended the Association for the Study of Peak Oil and Gas (ASPO) conference this May in Germany. For us, the conference seemed to divide into three parts.

The first was probably the most important, and covered the status of oil and natural gas depletion. The presentations were succinct, complete, and gave hard numbers.

The second part of the meeting consisted of what one might call "denial presentations" by the big oil companies, car companies and power companies, as well as economists.

The third part consisted of alternative panaceas, talks long on options but short on hard data. Our conclusion from the meeting? Peak Oil is real, and it's getting closer.

The third annual conference of the Association for the Study of Peak Oil and Gas (ASPO) was held in Berlin, Germany on May 25-26, 2004. ASPO is an organization of European petroleum geologists and oil exploration scientists, many of whom worked in the oil industry. Its mission is "to determine the date and impact of the peak and decline of the world's production of oil and gas, due to resource constraints" (www.peakoil.net).

Two hundred seventy people attended from around the world (11 from the U.S.). There were far more press people present and the media coverage was more comprehensive than at the previous year's conference held in Paris. Higher attendance, greater media coverage and more participation by the oil and car companies, and government agencies all attest to more serious attention being paid to the ASPO story.

Peak Oil – Getting Closer

The first morning sessions included talks by Colin Campbell from Ireland and Matthew Simmons from the U.S., two of the most knowledgeable and respected people in the world studying peak oil. They have inherited the mantle of M. King Hubbert, the Shell Oil geologist who in 1954 correctly predicted that U.S. oil production would peak in 1970 (Jan. 2004 *New Solutions*). Campbell, who founded ASPO in 1999, is a retired petroleum geologist. Simmons is the founder and president of Simmons International, Inc., an investment banking firm specializing in oil and gas discoveries. He was also an advisor to the Cheney Energy Task Force.

Colin Campbell lead off the conference presentations by emphasizing the urgency of the Peak Oil crisis.

Campbell reported that his research group has moved the date of peak oil from 2010 to 2008, only four years away, and discussed his organization's current efforts to communicate the significance and urgency of the situation. Campbell thinks that many people have now accepted ASPO's predictions as valid, and that industry, government, and oil experts are no longer discounting his organization.

Bad News for Natural Gas

Most attendees were looking forward with great anticipation to Simmons' talk, as he is writing a book (due out this fall) on Saudi Arabia's oil reserves that questions the numbers provided by the Saudi government. In recent months there has been much debate between Simmons and the Saudi-Aramco (Saudi Arabia's national oil company) representatives, who deny any foreseeable limitations to their oil and gas production. Simmons, who disagrees, debated the head of the Saudi Oil ministry at a meeting of the Center for Strategic and International Studies in late February.

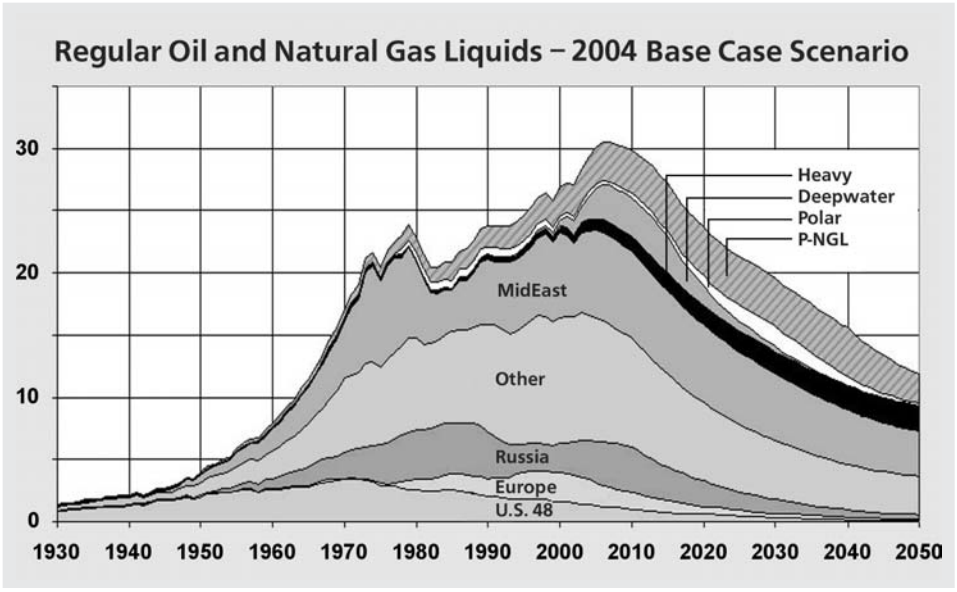
However, Simmons did not speak of Saudi Oil. Instead, he gave a disturbing talk about natural gas, entitled "The U.S. Natural Gas Disaster." He began his talk by pointing out that the U.S. bet its future on electricity from natural gas in the late 1990s. Oil production had peaked in 1970, oil import capacity was declining, nuclear power was ending, and coal was too polluting. Furthermore, renewable options had failed to develop adequately and their contribution to energy production was minuscule (solar and wind currently supply less than 0.25 percent of our energy). At that time natural gas was abundant in our hemisphere and was efficient, clean and cheap.

These natural gas assumptions included many serious mistakes. The demand for energy grew much faster than expected. Projected new supplies never materialized. Fuel substitutes for oil and natural gas were far more difficult to develop than originally thought. And new technology

Matthew Simmons surprised conference attendees with his forecast of serious near-term natural gas shortages for the U.S.

failed to materialize as had been hoped. But most important, an accelerated decline in natural gas production, because of dwindling supplies, was a complete surprise.

Simmons explained that natural gas production in the lower 48 states (not including offshore sources) peaked in 1973, only three years after the 1970 oil production peak. He noted that offshore gas supplies had masked this peak but that now both total offshore and onshore gas production combined are nearing



The latest graph from ASPO, released in May 2004, estimates the peak of global oil production to occur in the year 2008, based on new data.

their peak. Simmons expects the base production supply to fall from 60 bcf/day (billions of cubic feet of gas per day) to 35-50 bcf/day within a few years.

Other Natural Gas Problems

There was a somber feeling at this early point in the conference. The two most prominent men in the area of peak oil had just announced that oil and gas were peaking faster and earlier than projected only a year ago. Added to this was the possibility of a short-term shock in the next six months or so from overstated Saudi Arabian oil reserves.

Four more presentations on natural gas focused on particular geographic areas. The difficulties associated with providing Liquefied Natural Gas (LNG) were also presented. According to the speaker, natural gas cannot be transported as easily as oil. Normally, pipelines are used to move gas, as it is not easily transported by truck, train, or tanker. Natural gas brought from another continent must be liquefied under pressure to minus 260 degrees Fahrenheit, a highly energy-consuming process. Expensive terminals must be constructed in the exporting and importing countries. These transportation difficulties exacerbate the natural gas situation because as domestic gas production declines, replacing it from overseas sources will be difficult.

On a worldwide basis the lack of natural gas liquefying terminals as well as tankers capable of transporting liquefied natural gas may bring on a crisis in the next year or two. Soon almost all of Europe will become dependent upon Russian natural gas, and Russia probably has much less natural gas than the economists and bookkeepers have predicted. These problems with natural gas are aggravated by the fact that natural gas reservoirs have a much steeper decline rate after their peak has been reached than do oil reservoirs.

Left to right: ASPO member Jean Laherrère, current ASPO President Kjell Aleklett, founder of ASPO Colin Campbell, and Community Service Inc. Executive Director Pat Murphy listen to presentations on natural gas.

The two most prominent men in the area of peak oil had just announced that oil and gas were peaking faster and earlier than projected only a year ago.

Jean Laherrère, a seminal figure in ASPO who spent 35 years as a TOTAL (a French oil company) geologist, emphasized in his presentation that the natural gas reserves of the former Soviet Union are overstated. His concern was recently amplified when Russia passed a law last February making its oil and natural gas information a state secret.

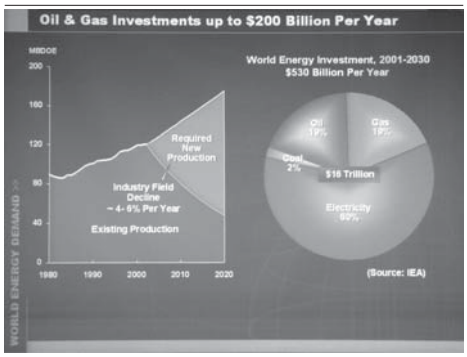
Canada's gas supplies, as well, appear to be more limited than had been previously assumed, bad news for the U.S. which has become more and more dependent on imports of gas from our northern neighbor.

Obfuscation and Denial

The first day's afternoon sessions on oil included talks from three major oil companies – British Petroleum, ExxonMobil (U.S.), and IFP (the Institute of French Petroleum). BP's spokesperson, Frances Harper, gave an excellent presentation on reserve growth, showing major increases in reserves from the older oil fields. Unfortunately, he noted, the more recently discovered oil fields have not matched the reserve growth of the older ones. Harper explained that reserve growth has come from new methods of extraction used on older fields. As the latest estimates on new fields already take these new technologies into account, there is not the same potential for "reserve" growth as has been found in older fields.

Jeffrey Johnson of ExxonMobil gave a presentation with a very positive outlook for the future, which was not well received. Questions from attendees were somewhat hostile, and most people were disappointed with Johnson's unsubstantiated optimism. The ExxonMobil official position is that the world faces great challenges and that ExxonMobil will work hard to meet them, though their own figures on global oil production show declining discovery since 1965. Johnson's optimistic comments on fuel cells were deemed by many as extremely naïve.

Many attendees expressed their disappointment with the superficial presentations by the oil companies. Although their presence legitimizes the role of ASPO, their participation was not seen as useful as long as it is limited to the standard corporate presentation of "all is well."



This chart from Exxon-Mobil's presentation shows an expected oil field decline similar to that forecasted by ASPO. Other Exxon-Mobil data confirms a 40-year declining discovery trend.

The Volkswagen presentation included a slide that showed hydrogen would be "inexhaustible," completely ignoring the controversies raging around that possible fuel (see the Hydrogen section of this report).

Coping with Energy Constraints

The highlight of the second day's morning meeting was a panel discussion on future energy constraints. Panelists sat in two groups of three, and each gave a brief opening. The differences between the two groups quickly became apparent.

Colin Campbell (Ireland) and Ali Bakhtiari (Iran) spoke from the "surveyors" perspective, noting that peak oil was coming soon and had been proved. Bakhtiari shocked some in the audience when he said, "[The Middle East] is the front line of the Third World War…it is affecting every person there and will, sooner or later, affect every citizen of the world."

The third speaker was Hans-Josef Fell, Managing Director of Hammelburg Solar Power Ltd., and spokesperson on energy for the Green Party in the German parliament. He talked of Germany's decision to implement the Kyoto Protocol, stating this would be done in seventeen years.

The three "opposing" members of the panel included Dr. Hans-Wilhelm Schiffer, head of the Energy Economy, a department of RWE Power, and Hartmut Schneider of BMWA. Schneider is also the Deputy Director General of General and International Energy Policy for the European Union. The third "opposition" member was Fatih Birol, Chief Economist and Head of the Economic Analysis Division at the International Energy Association (IEA).

After the opening presentations, a debate began between Hans-Josef Fell and Fatih Birol about the utility of alternative energy sources. The issue quickly moved, however, from peak oil to the economics of alternative energy, and the focus on fossil fuels was dissipated.

"[The Middle East] is the front line of the Third World War…it is affecting every person there and will, sooner or later, affect every citizen of the world."

Economist Fatih Birol was eloquent and persuasive, but he dodged the real questions about oil reserves. However,

Jean Laherrère (left), Ali Bakhtiari (center), and Matt Simmons (right) are pragmatists who rely on getting their facts straight and objectively analyzing the situation.

after the formal meeting, he communicated to a group of attendees that some of the limitations he had avoided discussing in the open meeting were indeed serious. When the panel took questions from the floor, Pat Murphy, of Community Service, Inc., asked a question about Cuba as an

Jean Laherrère (left), Richard Heinberg (center), author of The Party's Over, and Pat Murphy confer before a presentation at the 3rd annual ASPO meeting.

alternative model to the growth model we now use, which Fatih said he would answer privately. In that later one-on-one meeting with Pat, Dr. Birol emphasized his respect for and support of Cuba's efforts in dealing with the loss of oil since the fall of the Soviet Union (May 2004 *New Solutions*).

It was interesting to note how constrained the participants from these large business and government organizations are in what they can say publicly.

Renewable Energy – All Words, No Data

The second day's afternoon session covered renewable energy sources and hydrogen. The best presentation was on alternative fuel programs being implemented in Europe. However, the talk lost its credibility when the speaker, in answer to a question from Pat Murphy, said he had no data on Energy Return on Energy Invested (EROEI), a way of determining how much energy it takes to produce a different form of energy. For example, it takes a certain amount of oil to manufacture and transport a wind turbine, which must be compared to the amount of energy the turbine will produce. Though critical, this cost is typically ignored in upbeat pitches about alternatives.

Another presenter offered a model of renewables showing that Europe could

It was interesting to note how constrained the participants from these large business and government organizations are in what they can say publicly.

possibly have an economy based on renewables, albeit with major changes in lifestyle. The presenter's opening charts showed great promise; unfortunately, he had no data to back them up – just philosophical comments. As in the case of the alternative fuel presenter, everything looks good until the needed details (particularly the EROEI) fail to appear.

Conclusion – Peak Oil Is Verified

We came away with the feeling that Peak Oil, which was questioned by many a year ago, is now accepted as a real phenomenon that will happen soon, causing great turmoil. The only question is when it will occur. According to ASPO, a peak in global oil production in this decade looks highly probable. Natural gas, which is a new focus of ASPO, is another fossil fuel whose supply prospects are worrisome, especially for North America. In conclusion, it appears that the overall energy outlook has worsened since the meeting of a year ago. We expect that in another year, Peak Oil could be a household phrase.

For the post-conference activities, we had prepared a presentation for participants on Cuba's response to the rapid loss of oil when the Soviet Union collapsed in the early 1990s, entitled "Artificial Peak Oil." It was a valuable addition that showed an alternative way of life to what many view as a hopeless situation.

We found that the concepts of localization and decentralization described in our presentation were acceptable and gaining popularity. We were even asked by the current president of ASPO, Kjell Aleklett, to give a presentation at Uppsala University in Sweden before the 2005 ASPO meeting. ■

Hydrogen – Panacea or Hoax?

This year's ASPO presentation on hydrogen as an energy source was similar to an overly optimistic one given at last year's meeting. As concerns about fossil fuel shortages grow, many consultants and alternative energy companies are touting hydrogen as the miracle fuel that will "save us." So far this has resulted in lots of government grants but very few results.

Unfortunately, many people are using enthusiasm as a substitute for sound data. The presentation was extremely misleading, giving the impression that the "hydrogen economy" is close at hand. Completely unrealistic time estimates for highly questionable technologies were given. During the question period, Pat Murphy said that the presentation was not only misleading but unfair to the energy-savvy people attending; his statement elicited a round of applause from the audience.

Pat pointed out to the speaker that he was negligent in not mentioning the many papers on the problems of hydrogen written by Ulf Bossel, the Swiss founder of the European Fuel Cell Forum, or the book, *The Hype About Hydrogen*, written by Joseph Romm, Executive Director of the Center for Energy and Climate Solutions and former U.S. Assistant Secretary of Energy. In March of this year Dr. Romm explained the problems of hydrogen to the U.S. House of Representatives Science Committee (see Resources on the back cover). A recent paper of Bossel's, "The Hydrogen Illusion" (see Resources), also reiterates the impracticality of hydrogen being the main energy fuel for the world and explains why.

The Four Hydrogen Deceptions

It is not overly harsh to accuse the hydrogen proponents of "deliberate deception." That is an apt description of an attempt to explain or convince people of the merit

of hydrogen without reporting all the known facts about the gas.

Deception #1 – Hydrogen Will Provide Unlimited Energy

The first deception gives the impression of unlimited amounts of energy available from hydrogen. A typical opening statement notes that hydrogen is the most abundant element in the universe. Amory Lovins, one of the leading proponents, says that 75 percent of the matter in the universe is hydrogen. This is true – and deliberately misleading.

We will have to get our hydrogen from this planet and not from other sources in the universe. The actual distribution of elements, by weight, in the earth's crust – the only part of the planet and the universe accessible to us – is oxygen (46.6%), silicon (27.7%), aluminum (8.1%), iron (5%), calcium (3.6%), sodium (2.8%), magnesium (2.1%), potassium (2.6%) and hydrogen (1.4%).

Hearing the relevant fact that hydrogen is 1.4% of the earth presents a much different picture than does the statement that "it is the most abundant element in the universe." What is missing from the abundance claim is the caveat, "but not on earth." Hydrogen advocates make this misleading claim to garner enthusiasm for their proposals for investing in hydrogen since the relevant factual data would destroy their basic premise.

Deception #2 – Hydrogen Is Clean Energy

The second deception is a claim that hydrogen is a clean, non-polluting fuel. In a similar way, one could say electricity is a clean, non-polluting source of energy. Both statements are true. However, the methods of producing both are extremely polluting.

Most power plants that generate electricity burn fossil fuels. The major source of electricity is burning coal, which releases carbon dioxide, nitrogen oxides and sulfur oxides. So, while using electricity is non-polluting, generating electricity is very polluting.

Hydrogen is also produced from fossil fuels; ninety-four percent is manufactured directly from natural gas, oil or coal using a process called "steam reformation," and six percent is manufactured by "electrolysis," a process that uses electricity generated by fossil fuels. Thus the hydrogen manufacturing process pollutes the environment, just as do power plants which produce electricity.

Electricity generation causes pollution and hydrogen generation also causes pollution. The fact that neither pollutes at its point of use is irrelevant.

Deception #3 – The Energy Cost of Making Hydrogen

A very important deception occurs when hydrogen proponents fail to explain the extremely high energy cost of manufacturing hydrogen. This is exemplified by the statement that you can get hydrogen from water, which leads one to envision the placing of a garden hose in the gas tank of one's car.

Hydrogen can only be made from water by expending huge amounts of electrical energy for electrolysis, or it can be made from natural gas or other fossil fuels by "steam reformation." Steam reformation uses fossil fuels (mostly natural gas) both as a "hydrogen feed stock" (or raw material) and as a source of energy to run the reformation process. But the resulting energy from the manufactured hydrogen is much less than the energy contained in the original natural gas.

Hydrogen apostles have developed a fallback argument to these obvious flaws. When challenged with the fact that hydrogen is made from fossil fuels, and that the process is energy inefficient, they say that natural gas or oil sources are only "transition fuels" to be used until "renewables" are available. Thus hundreds of billions of dollars are to be spent to develop a hydrogen network based on fossil fuels that cannot be justified by energy savings.

Deception #4 – Renewables Are Viable

Another unrealistic view presented by hydrogen proponents is that renewables can take the place of fossil fuels. Unfortunately, renewables do not "scale," and they do not "dispatch," according to energy investment banker Matthew Simmons.

The term "scale" refers to the normal economics of scale obtained with full production of most high technology products. Wind turbines, however, are not very "high tech," and the only way to get more energy is to build more of them. One can't build larger and larger wind turbines, as one can build larger coal generating plants, to obtain economies of scale. Nor do you derive economies of scale by simply building a greater number of turbines.

We are told that wind is as cost-effective as fossil fuels. Typically these statements include the caveat "at the best sites" (never written, or, if written, put in small print). This points out that a wind turbine, unlike a fossil-fuel power plant, is at the whim of nature. If one installs a hundred natural gas power plants, the last installed generates the same amount of electricity as the first, assuming the same design. It would take 10,000 wind turbines to match the power output of 100 power plants. But even if one installs 10,000 wind turbines, the last turbine installed will not generate as much electricity as the first one installed. The windiest, most productive sites are developed first, followed by the less windy sites.

The term "dispatch" refers to the intermittent nature of renewable energy sources, in most cases wind and sun. Wind can die down for days and a week of cloudy weather is not at all rare. Backup power plants that use fossil fuels are required to deal with the intermittency. These plants must "idle," burning fossil fuels, so they can be brought "on line" quickly when the wind fails or the cloud cover persists.

Hydrogen advocates obscure the fact that the main sources of electricity for hydrogen manufacturing will have to come from coal and nuclear power. The one who does not hide this is the father of the fuel cell, George Ballard, founder of the world's leading fuel cell company, Ballard Systems of Canada. He has long based his hydrogen strategy on using nuclear power. He is one of the more honest people in the hydrogen business, as he acknowledges the reliance on nuclear power (see Fuel Cell Folly at www.communitysolution.org).

Yet, even Ballard has the tendency to stretch the truth a bit. He tells the story of his company's first fuel cell bus, displayed

onstage at a press conference in Canada. When the bus could not be driven off the stage, group of Ballard staff, standing behind the bus and invisible to the audience, pushed the bus off, at which point rapid repairs were made. The audience had the impression that the bus drove off the stage.

To Ballard, this is an amusing anecdote. But it shows that truth has never been given a high value in the hydrogen world. Mr. Ballard has followed the example of the recent dot-com executives whose stocks were inflated by the wild statements of the Internet economy and later crashed. The stock of his company, Ballard Systems, went from $3 to $110 and back to $12.

The Exorbitant Energy Cost of Producing Hydrogen Explained

Ulf Bossil has done a superb job of explaining the high energy cost of the hydrogen-fuel cell combination. His analysis shows that, regardless of whether the source of electricity is renewables or nuclear power, the electrolysis approach is extremely costly. Bossil deliberately uses the term "electrolysis" rather than "from renewables," because renewables, like wind and solar, generate the electricity used in the electrolysis process to create hydrogen. Using the term electrolysis reminds us that hydrogen is being made from water by using electricity that is being generated from some fuel source. If the electricity is from a renewable energy source, we say the hydrogen "comes from" renewables. If the electricity comes from a nuclear plant, then we could say hydrogen "comes from" uranium.

Bossil's analysis shows the essential fallacy of creating hydrogen by electrolysis using electricity from either renewable or conventional sources. He has compared the electrolysis (hydrogen-making) option to an alternative option of "shipping electrons." He argues that "shipping electrons" directly to the end-user's appliance – a toaster, a TV, or an electric car – is much more efficient than going from electricity to hydrogen to fuel cell and back to electricity as is the case with the electrolysis option.

With the "shipping electrons" option, a power plant (whether it be coal, nuclear or a wind farm) generates electricity that is sent through wires of the current electrical grid. At the other end of the wire (many miles away) the electrons heat the house, cook meals or run a TV or dryer. The electrons are shipped directly from the plant to the devices in your home.

In the hydrogen electrolysis process the same power plant sends its electrons to a hydrogen manufacturing plant that has a source of water. The electrons provide the energy for electrolysis, which removes hydrogen atoms from the water. The manufactured hydrogen is placed temporarily in storage tanks, and then, by truck or pipeline, is transported to your house. Once it gets to your house, a fuel cell processes the hydrogen back into electricity to generate electrons to heat the house, cook meals, or run a TV or dryer.

In this case, the initial electrons generated from the turbines at the power plant are first used to make hydrogen, and secondly the hydrogen is converted back to new electrons. Because of the physical laws of nature (the second law of thermodynamics first postulated by Sadi Carnot in 1824, which states "it requires energy to change the form of energy"), these two conversions require a great deal of energy.

Illustrating the Process

In Figure 1, the two columns on the left illustrate the original generation of electricity. Although this figure uses a renewable source, the same argument applies if the source is a conventional fossil fuel or uranium power plant or even a hydroelectric dam.

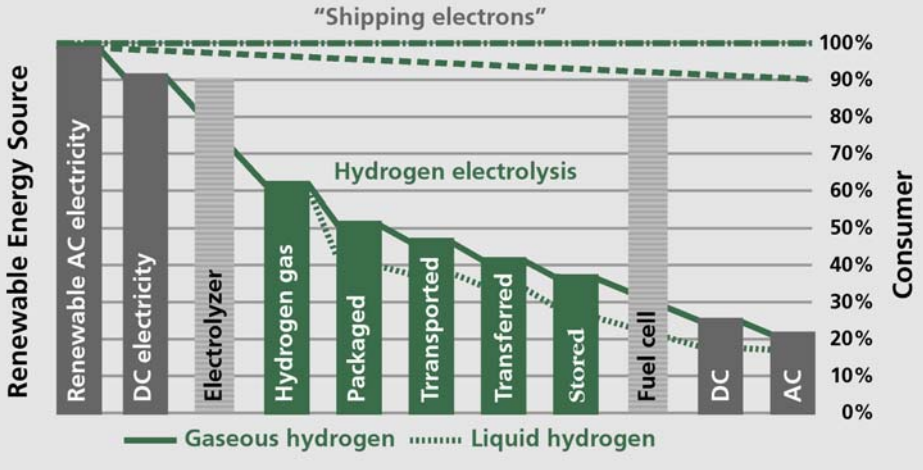
The third column represents the electrolyzer machine, which creates hydrogen from water using the generated electricity. Note that the fourth column, labeled hydrogen gas, is much lower than the original column representing generated AC electricity, indicating a sizable loss of energy.

Next, the hydrogen gas is packaged in some way (possibly as a liquid), transported by pipeline or truck, then transferred to a fueling station of some kind, and finally stored until needed by the consumer. At each step in the process, some of the energy is used or lost, as represented by the declining heights of the subsequent columns.

Eventually, the hydrogen will be used in a fuel cell as a source of electricity generation. The fuel cell column represents this second machine. The first machine, the electrolyzer, has converted electricity to hydrogen and the second machine, the fuel cell, now converts the hydrogen back to electricity.

Converting energy consumes energy. Shipping electrons directly from a power plant to home appliances is 100 percent efficient. Delivering those electrons via hydrogen consumes 75 percent of the initial electrons. It is only 25 percent efficient.

Figure 1: Electricity Transport



The last two columns show the final amount of electricity produced. The declines in energy from the original AC electricity to the hydrogen gas and from the hydrogen gas back to electricity are due to the aforementioned second law of thermodynamics. The amount of energy left for powering a device in a home is only 25 percent of the original amount.

In other words, it would take four power plants or wind turbines to get the same amount of electricity via the hydrogen method as can be provided by a single one shipping electrons directly to your home. This is a four-to-one difference in efficiency – one requires four times as many equivalent sources as the other. It makes no difference if these are coal or natural gas power plant sources or if they are wind turbines or photovoltaic cells – there is a four-to-one ratio. (See Figure 2.)

Calculating the Cost

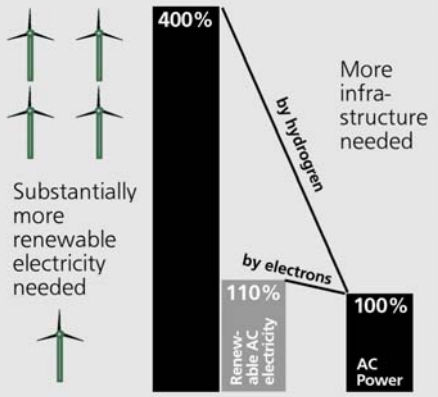
We wondered then what the approximate cost of a "hydrogen economy" based on renewables would be. From the Energy Information Administration we learned that our nation's annual energy use is 96 quads (quadrillion BTUs). Part of that is nuclear and part hydroelectric (a total of 11 quads). We removed these sources, leaving 85 quads to be replaced by a "hydrogen economy."

Next we defined the "hydrogen economy" as one where all 85 quads of electricity are consumed by a first stage in which hydrogen is generated from electricity from wind turbines, and a second stage in which electricity is generated from fuel cells that burn the generated hydrogen.

We converted the 85 quads of BTUs to its equivalent in electricity, which is about 25,000,000,000,000 (25 trillion) kilowatt hours (kWh) yearly. We then assumed a standard wind turbine rated at one-megawatt capacity, operating at 27 percent efficiency, with a price of $1,000,000.

Dividing the yearly kWh by the yearly output of a single wind turbine shows it would take 10,000,000 wind turbines to meet the load. This is the "electricity economy." To make an equivalent "hydrogen economy," we used Ulf Bossel's 4 to 1 ratio, where four times the number of wind turbines are needed than the number of turbines needed for "shipping electrons." The result is 40,000,000 wind turbines. At a price of $1 million each, this comes to $40 trillion.

Figure 2: Renewable electricity generators needed for energy transport by electrons and by hydrogen



This breaks down to initial capital costs of $577,200 for a family of 4! And yearly operational costs must be added as well as allocations for the replacement of the wind turbine after 30 years. Hundreds of billions of additional dollars would be needed to finance a new infrastructure.

Why the Push for Hydrogen?

The inefficiency of hydrogen as a fuel seems so obvious that a skeptic might ask why a hydrogen system is even being proposed. Hydrogen makes no sense for almost any application except one – our dedication to automobiles and other transportation vehicles that use internal combustion engines.

Clearly getting electricity directly is the most cost efficient way of heating, cooling, cooking, and a variety of other tasks. But direct electrons cannot drive a car – the wire isn't long enough.

Of course the alternative touted is an electric car with batteries, a combination that has been around for as long as the automobile itself. However, batteries are bulky and heavy, and to date, no battery-powered vehicle can drive as far as a gasoline-powered one.

The problem with an electric car is that it is less convenient for the consumer and less profitable to oil companies and car manufacturers. The government programs that forced this step on reluctant manufacturers failed in California in the 1990s. The current California fuel cell program which, in our opinion, has almost no chance of success, took its place.

Progress in the use of electricity or other fuel-driven cars will, however, continue, as evidenced by the hybrid cars from Toyota and Honda, and a natural gas car made by Honda. It is noteworthy that the Toyota Prius hybrid cars made for Europe can be charged from an electric outlet. This option is not available on the American version.

Summary

Many people are more emotional than factual about hydrogen, and others are easily manipulated. The current administration has proposed $1.7 billion for hydrogen research and $20 billion for nuclear power. On the other hand, the tax credit for wind turbines has not been renewed. This investing in hydrogen, a bonanza for scientists, maintains people's illusions and allows time for the development of coal and nuclear power.

Hydrogen advocates ignore the fact that the first hydrogen automobile was invented in 1902 and that the fuel cell has been around for almost 50 years. A small number of million-dollar fuel cell cars will be built over the next few years, supported by tantalizing ads, until the fuel cell car follows the General Motors Electric Vehicle (EV) into obscurity.

The great tragedy is the continued apathy and ignorance of people who are waiting for another technical solution. As a nation, we cling to our current lifestyle, one that must and will change as oil and natural gas decline. This attitude is best illustrated by a quote from a *New York Times* article, "Pushing Energy Conservation Into the Back Seat of the S.U.V.," 11/22/03:

"Mark Rutecki, a 37 year-old lawyer… owner of a Hummer… [said], 'The way I think about it, we're close today to switching to a hydrogen economy, so it won't matter what mileage we get on cars now. I think that will happen soon.'" ■

New Solutions

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Events

The First U.S. Conference on Peak Oil and Community Solutions, November 12-14, 2004, Yellow Springs, Ohio. Keynote speaker Richard Heinberg. Information at www.communitysolution.org

Resources

Books on Peak Oil & Hydrogen

The Coming Oil Crisis, Colin Campbell, 1997

* **The Party's Over: Oil, War and the Fate of Industrial Societies**, Richard Heinberg, 2003

* **Powerdown: Options and Actions for a Post-Carbon World**, Richard Heinberg, 2004

* **High Noon for Natural Gas: The New Energy Crisis**, Julian Darley, 2004

The Hype About Hydrogen: Fact and Fiction in the Race to Save the Climate, Joseph J. Romm, 2004

On the Web

Talk by Dr. Romm on the problems of hydrogen: www.house.gov/science/hearings/full04/mar03/romm.pdf

Ulf Bossel's, "The Hydrogen Illusion" printed in the March/April 2004 issue of Cogeneration and On-Site Power Production: www.efcf.com/reports/E11.pdf

Association for the Study of Peak Oil (ASPO): www.peakoil.net

Speeches by Matthew Simmons: www.simmonsco-intl.com

Museletter, Richard Heinberg: www.museletter.com

The End of Suburbia, a DVD: endofsuburbia.com

Sustainability and Peak Oil, the website of Folke Gunther: www.holon.se/folke

The Post Carbon Institute – Learning How to Live in a Low Energy World: www.postcarbon.org

Other Recommended Resources

The Small Community, Arthur Morgan, 1942 (available from CSI)

The Long Road, Arthur Morgan, 1936 (available from CSI)

The Unsettling of America: Culture and Agriculture, Wendell Berry

The Land Report, A publication of The Land Institute, www.LandInstitute.org

Earth in Mind: On Education, Environment, and the Human Prospect, David Orr, 1994

* **Ecocities: Building Cities in Balance with Nature**, Richard Register, 2001

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* Available at www.postcarbon.org

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