Re: Also I tried to be open−minded, I tried splitting H2O tonight with 12V 120 amps,

Source: http://sci.tech−archive.net/Archive/sci.energy.hydrogen/2007−12/msg00477.html

- *From*: Willie.Mookie@xxxxxxxxx
- *Date*: Sun, 23 Dec 2007 19:22:34 −0800 (PST)

On Dec 24, 12:21 pm, Damon Hill <damon1S...@xxxxxxxxxxxxxx> wrote:

> Willie.Moo...@xxxxxxxxx wrote innews:47ae998a−e855−4550−93d0−a7f6e0170b3d@xxxxxxxxxxxxxxxxxxxxxxxxxxxx:
>
>> I take DC electricity and produce hydrogen and oxygen from an alkaline solution of water with 85% efficiency. I put in 50 kWh of DC electrical energy into a high pressure variable load electrolyzer from a solar panel array and get 1 kg of hydrogen gas out.
>>
>> What is so controversial about that? (Setting costs aside)
>
> Was it an efficient investment of the electrical energy?
>
> −−Damon

WHAT I'M DOING

Well, Damon, I just wanted to be clear about what it was − physically I was doing. Taking sunlight, making DC electricity when the sun shined, loading those panels efficiently given the lighting conditions, and producing hydrogen by electrolyzing water at an efficient rate for the lighting conditions.

ECONOMIC QUESTION

Is it economically efficient? That's another question.

The answer is, yes − when one considers that not all electricity is created equal.

Solar electricity from photovoltaic sources is intermittent and direct current. Far inferior to alternating current available on demand.

So, I'm trading low−value electrons for higher value protons as a way to increase their value by storing some of the energy contained in them.

Consider that if I were to condition the electrons from the DC source I'd have to peak power match using a second generator. I'd also have to invert the DC source. This not only limits the size of the energy market I can play in, a huge strategic limitation, it also increases my costs dramatically.

NANOSOLAR PANELS AND INTERTIE − REFERENCE CASE

The cost of peak power matching and intertie runs around $0.50 per Wp. Let's say on a larger scale this drops to $0.20 per Wp. Now, if I'm running a nanosolar panel at $1.00 Wp − the $0.20 per Wp doesn't do much to change the value of the system. I'm paying $1.20/Wp total, and with say 1,700 hours of sunlight a year, each peak watt produces 1.2 kWh at a cost of $0.10 − about $0.08 per kWh. That's good, phenomenol for solar power, but not as good as $0.04 per kWh which is what it costs at the generator for the lowest cost generation around coal or hydro electric.

NANOSOLAR PANELS + ELECTROLYSER − REFERENCE CASE

At these prices it doesn't make much sense to make hydrogen with the electricity. Using my variable load electrolyzers with nanosolar's $1.00 per Wp panels, obtains $1.02 per peak watt, and about $0.085 per year, and the same 1.2 kWh − that's $0.07 per kWh energy. It takes 50 kWh to produce 1 kg − so, that's $3.54 per kg − or $3,540 per metric ton. A metric ton of hydrogen has the same heating value as;

6.2 tons coal = equals $570 per ton
23.4 bbls oil = equals $150 per bbl
2.55 tons natural gas = equals $1,390 per ton natural gas

Obviously NOT economic at these prices. − and a dumb thing to do.

Mök SOLAR PANELS − INTERTIE − 2% MARKET SHARE

Now, substitute my $0.05 per peak watt solar panels and add the $0.20 per peak watt intertie, and we can obtain $0.25 per Wp AC add−in to the power grid. This is $0.02 per year in capital costs, at normal discount rates, and producing 1.2 kWh reduces that to $0.0174 per kWh − this is HALF the cost of coal fired or hydro electric generation. So, its very economic − demand for this sort of generation will grow until dis−economies of intertie take their toll. That is, you can't shut off your baseload, and you can't reduce your turning peaking plants below 30% − so, you're limited at peak output during the day to 35% of your peak demand at local noon. That's it. This limits your total ENERGY contribution to about 5% of the total electrical market which is about 2% of the total energy demand of the planet. A significant increase in our present solar usage, but this amounts to no more than a warning shot across the bow of the major energy producers, and really doesn't position the solar energy producers well to compete head to head against other primary energy producers.

Mök SOLAR PANELS + ELECTROLYSER DOMINANCE

So, with these thoughts and analyses in mind, consider then taking my $0.05 per peak watt soalr panels and add $0.02 per peak watt electrolysis units − you've got a combined system cost of $0.07 per peak watt (Wp NOT kWh) and an annual cost of 0.59 cents per year which produces the same 1.2 kWh as above. This is 0.47 cents per kWh − which is very inexpensive − and produces a kg of hydrogen for $0.24 − this is $240 per metric ton.

A metric ton of hydrogen has the same heating value as

6.2 tons coal = equals $40 per ton
23.4 bbls oil = equals $11 per bbl
2.55 tons natural gas = equals $95 per ton natural gas

Which is competitive in ALL forms.

OIL FROM COAL + SOLAR HYDROGEN INCREASES VALUE

Now, when one considers that a ton of coal plus another 1/8th ton of hydrogen one may produce 7 barrels of petrol worth $100 per ton, its easy to see that by taking 6.2 tons in trade for a ton of hydrogen in a coal burning power plant, and adding another 3/4 ton of hydrogen to the 6.2 tons of coal recieved one may make 43.4 barrels of petrol worth $4,340 by making 1.75 tonnes of hydrogen − a net gain of $2,480 per tonne of hydrogen consumed − so this is the obvious place to start.

HYDROGEN COMPETITIVE WITH ALL ENERGY SOURCES

Hydrogen burns under a wide range of conditions. That means hydrogen may be directly substituted for ANY of the fuels described above with very little change to the systems that use these fuels.

STRATEGIC ANALYSIS − AN EFFECTIVE ORDER OF BATTLE

COAL TO PETROL

Clearly, by taking a low value source of low rank carbon − say sub−lignite coal in a depleted jungle mine in equatorial Indonesia, cleaning up the land and arranging drainage of water, and installing solar collectors to make hydrogen − then using that hydrogen to dewater the coal, and then convert the dewatered coal to petrol − is a way to use the project finance models of oil field development to create substantial solar hydrogen installations.

Using this model I have arranged to convert two 500 sq km coal fields, one in Sumatra, one in Borneo, into solar collector sites that will convert 3 billion tons of carbon in the form of 6 billion tons of low rank coals, into 21 billion barrels of petrol using sunlight and water. This oil has a value of over $2.1 trillion when produced, and discounted for rate of production and other factors, is worth well over $200 billion today.

HYDROGEN FOR COAL FIRED PLANTS

Having demonstrated large scale production of solar hydrogen, one arranges for land − say 2,000 sq km in Queensland Australia, to produce 14 million tons of hydrogen per year. Shipped via pipeline along the rail way rights of way throughout Australia from Alice Spings, this hydrogen displaces 50 million tons of coal each year with 8 million tons of hydrogen, essentially eliminating nearly all coal fired power generation in Australia. An additional 6 million tons of hydrogen is combined with the stranded coal to create 350 million barrels of petrol each year − converting Australia from an oil importing nation (335,000 bbls/day) to an oil exporting nation (600,000 bbls/day)

ACQUIRE PETROL MARKETING CHANNEL

There are two kinds of gasoline retailers in the world. The gasoline marketer, which makes small margins on their sales buying in the market wholesale and selling retail. The integrated oil company, who owns reserves, tankers, pipelines, refineries, trucks, retail outlets − who make rather large margins. Integrated oil companies are worth far more than gasoline marketers.

Consider buying two gasoline marketers, who do not have much capacity to produce gasoline themselves − but have substantial capacity to market gasoline. Sunoco and Citgo. Imagine buying these companies and integrating their operation to sell 'Sunfuel − gasoline made from the clean power of the sun' The value of the companies purchased through a leveraged buyout − using ones petrol production as a means to support the buyout − should rise 35 times their acquisition price. This will allow expansion of the marketing channels, and marketing of sunfuel across the United States and Canada.

ENTER A PRICE WAR

Commit to the public that you will monitor pricing of your competitor and endeavour to sell your sunfuels at 5% below market price.

ADD HYDROGEN TO THE MARKETING CHANNEL

Commit to sell 20% of all energy in the form of hydrogen at the retail level. Commit to put hydrogen infrastructure in place. Commit to have 1/5th of your pumps at ALL stations, provide hydrogen. Sell the hydrogen at 20% below retail level. Endeavour to maintain the tax free status (no fuel taxes or road use taxes) for a period of 20 years or until you reach 25% market share. Work closely with innovative auto manufacturers that produce hydrogen fueled vehicles.

EXPAND HYDROGEN FUELS − REDUCE FOSSIL FUELS

As more vehicles and processes use hydrogen you eventually exceed 70% of your sales as hydrogen − reduce the number of fossil fuel pumps, sell increasing volumes of hydrogen rather than hydro−carbons from your solar sites − sell remaining hydrocarbons at 20% below market levels − as a loss leader to keep price pressure on the majors.

BACK FILL INTO LOWER VALUE MARKETS

As you saturate the demand for hydrogen as a primary fuel, use your low cost solar panel technology to 'back fill' secondary markets, like direct solar electrical generation (2% of the market where hydrogen fueled generators produce 98% of the market) and remote or unitary applications (<<1% of the market, primarily remote applications or emerging markets)

CONCLUSION

Making hydrogen from sunlight is the only way to compete head to head using low cost solar technology. Efficient use of solar panels creates an opportunity to market 2% of the energy as electrons and less than 1% of the energy as electrons on your roof or building − but these are entered after dominance is achieved in the primary market.

.