

## GLOBAL ENERGY MYTHS

News, these days, seems to have so much emphasis on climate change, CO<sub>2</sub>, pollution, waste management, environmental impact and the like. All interrelated topics that really only impact our day-to-day lives in small ways, but, we, as a collective society, city, nation, are having massive, often detrimental effect on the 'garden' in which we live. The ancients expressed it this way – "that man was placed in the garden to work the ground and keep it in order". (The Message Bible Gen 1:15)

These issues and concerns cannot be resolved by taking a myopic view of our world influence, we need to take a strategic, global view. Humans not doing a good job - Globally.

Our houses may be clean, swept and tidy but our 'back yard' is an entirely a different story.

For the sake of this topic the four primary requirements to survive as humans on planet Earth are (there are many different 'lists' that can be made) :

Water, Shelter, Food and Fire (energy)

In particular, we should take a really close look at energy, since that component of survival has far reaching impact on the environment, without energy we do not have the materials, the metals, the communication, the transport and so on, to do anything in 'our garden'.

The most basic question to be asked then, is – What is the source of energy and how much of it do we currently need – globally?

Oil, Coal and Natural Gas make up around 80 percent of the world requirements today – 2022.

Hydro, Solar, Wind and Nuclear make up the balance.

Over the last ten years the massive push toward electric energy has resulted in a focus on solar panels and wind energy, and after hundreds of billions of dollars in investment, subsidies and incentives one would think that renewables would have significantly dented our reliance on fossil fuel energy.

They haven't.

Why?

Because the major portion of Fossil Fuels are used to power - transport (private, corporate, shipping, commercial and air) ~14%, Heating and Cooling ~27%, Electrical Generation 24% - that's at least 65%, because Fossil Fuel is energy dense, can be efficiently converted into electricity, reasonably easily extracted from the earth and safe to transport.

The downside is that they are finite and that there are pollutant effects on the environment in extraction and use.

Electrical energy is the most beneficial form of energy to society as it can be used for all human activity, has low visible pollution, low maintenance and is very efficient, but electricity is always derived from a primary source such as heat producing fuels (biomass, coal, nuclear) or gravity (Hydro) or geothermal (heat again) or concentrated solar.

In recent times the push to move away from Fossil Fuels has concentrated on mostly two diffuse sources – Solar and Wind (Hydro power and Geothermal are useful but largely limited by topography and could contribute smaller fractions of total requirements). Both fluctuate wildly with frequent low to no generation.

The 'green' solution – Batteries to store excess capacity and release in times of need.

For the purpose of this analysis we will exclude pumped hydro batteries (recirculation water with excess electricity in peak solar and wind generation and gravity hydro power when low solar or wind power is available).

Lithium Ion batteries are the current commercial benchmark for 'green' batteries.

What is known as 'base load' power is the most challenging difficulty with any mix of energy sources. In other words that there is a constant reservoir of energy available when requirements peak (for instance extreme hot or cold climatic conditions) and then kept on standby when there is less demand.

Many people would immediately say that we should all just use Solar Panels and be done with it.

By definition solar power generation, from solar panels, is intermittent (clouds/rain) and cyclical (day/night).

Likewise with wind power.

Proponents of these 'green' power sources claim that power storage systems - dams, electro-chemical or heat storage – will be able to provide an alternative base load power to replace fossil fuels in their entirety, remembering that this is now converting electrical generation from an energy dense source to a diffuse form.

Herein lies the problem.

Advocates of this policy are also against mining of finite resources, against damaging the environment and against pollutant practices (circular processes).

BUT in order to switch to the 'clean and green' we need to mine vast quantities of metals, minerals and elements to build the billions of solar panels (need to be located mostly on vast tracks of land), mirrors (also use considerable land area), batteries and components. Some estimates are that we will need to ramp up mining a thousand fold!!

So, to achieve the switch we must :

- Vastly increase mining, especially in search of more exotic 'rare earth' minerals and metals which are not so much 'rare' as diffuse (thinly dispersed and not concentrated) in the earths' crust. Mining these materials often requires sifting/processing massive amounts (compared to coal and oil) of overburden to extract tiny amount of the target material. The environmental impact is immense.
- Many more factories to build these products.
- Accept that enormous areas of land are required to be cleared of natural vegetation and animals, scarring the environment for solar farms (panels) and solar concentrators (heat storage).
- Realise that wind farms on land kill millions of birds and bats, disturbing the natural attrition rate of species.
- Work out ways to recycle the solar panels (can be highly toxic) and wind turbine blades (almost impossible to recycle) that will be needed in an economical and environmentally sensitive, viable way.

The numbers on these factors, whilst guesstimates vary in size, are all staggering.

There is no way that the push for solar and wind power generation as well as battery production can be call 'clean and green' - nothing could be further from the truth, it is a myth and a lie. Promotion of this policy is effectively kills the truth.

And then we have the question of converting our rail, ocean and air transportation needs to something other than fossil fuels.

Well, Hydrogen is the next 'clean and green' option.

It's the 'new' under utilised 'wonder' energy source touted as being the second most important driver in the Age of No Carbon footprint.

Maybe it's just a little too great and wonderful!

Hydrogen sits at the very top of the periodic table.

It's the most abundant element in the Universe.

As an element it is very clingy and binds readily with other abundant elements such as Oxygen – to form water.

If you want to use Hydrogen as a fuel source it needs to be reduced back to it's pure form. But at Earths ambient atmospheric pressure and temperature it's a gas.

Difficult to store and transport, explosive and expensive to concentrate BUT it's perceived as being 'carbon neutral', the only by-product of it being used as a fuel being water.

However, it does work with internal combustion engines which have become really efficient and powerful.

So, it is now officially part of the energy solution for a Carbon free world.

Wrong.

How is it made?

The simplest is electrolysis. Pass an electric current through a solution of say Baking Soda and water and we can take off pure Hydrogen, pressurise it to increase its energy density and we are home. It's always been cheaper and simpler to just burn fossil fuels directly though. It still is.

Are there other ways?

- Use Natural Gas (fossil fuel) and take off the Hydrogen – this is called '**Grey Hydrogen**' and clearly it's 'dirty' because of the large Carbon footprint.  
But - here's a lovely work around - if you Carbon capture all the dirty waste we can make it '**Blue Hydrogen**' (we'll ignore the Methane that is also part of the waste and leaks in the supply chain .....)  
So we have a green solution!
- What if we used renewable sources of electricity (wind, thermal, solar) to power the electrolysis?  
Well, that will work – we then have 'Green Hydrogen'  
Another great innovative solution!

So, we can now produce Green Hydrogen (from the atmosphere and fossil fuels) using renewable (wind and solar and hydro) electricity and water, converting low density diluted and dispersed gas into a high-density fuel.

The medium of extraction is electricity using supposedly 'green' electrical generation.

All the media hype, rhetorical smoke and the mirrors of political nuance and inuendo blind the public into being unwitting participants in a fraud!

Are there perhaps any proven solutions to this malaise?

Well, here is one country that may have a solution – France.

It has no natural coal deposits and no coal fired power stations, it has a significant hydro-power generation (~20 percent) and for over 40 years an increasing dependence on nuclear with around 18 different sites and over 50 reactors and a policy to increase the number.

The truth about Nuclear Power is that in comparison to any other energy source it has a low (construction only) to no carbon footprint, minimal waste (highly controlled and its safe final destination has miniscule impact on the environment), various new designs are very safe with many fail safe controls built into the designs.

Alarmists point to various nuclear disasters that have occurred.

There have been seven, but really only three from commercial electrical generation.

1. 1957 **Windscale UK** Unit 1's core caught fire and melted, which led large amounts of radioactivity to be released to the surrounding area. **Experimental**
2. 1959 **Los Angeles, California, USA** A partial meltdown occurred at the Sodium Reactor Experiment (SRE) due to cooling flow blockage that caused the reactor core to overheat. **Experimental**
3. 1961 **Idaho Falls, Idaho, USA**, The withdrawal of a single control rod caused a catastrophic power surge and steam explosion at the SL-1 boiling water reactor that killed all the workers on duty at the time. **Experimental**
4. 1966 **Frenchtown Charter Township, Michigan, USA**, Coolant flow blockage in two fuel channels led to the partial meltdown of two fuel assemblies at Fermi Unit 1. **Experimental**
5. **1979 Middletown, Pennsylvania, USA**, The partial meltdown at **Three Mile Island Unit 2** is considered the most serious nuclear accident in U.S. history, although it resulted in only small radioactive releases.
6. 1986 - **Chernobyl, Ukraine (former Soviet Union)**, Chernobyl is considered the world's worst nuclear disaster to date. It occurred on April 26, 1986, when a sudden surge in power during a reactor systems test resulted in an explosion and fire that destroyed Unit 4. Massive amounts of radiation escaped and spread across the western Soviet Union and Europe.
7. 2011 **Fukushima, Japan**, The earthquake and tsunami that struck eastern Japan on March 11, 2011, caused a serious accident at the Fukushima Dai-ichi nuclear power plant on the north eastern coast of Japan.

Lessons learned from these accidents have resulted in improved safety mechanisms being built into the newer designs, they are extremely safe, have small footprint, integrate easily into power distribution networks (poles and wires) and most of all produce electricity that is at a lower cost than other methods.

How many Nuclear Power plants are in the world, now?

Four hundred and thirty six. 436.

The first commercial plant – from 1967/68 in the UK.

Then 1969 to 1970 USA, India, Switzerland, Japan and Canada

And now a total of 31 countries.

Compare the environmental impact of the above accidents over 53 years and their ratio to the number of stations to what plastics have done, what coal mining has done, what oil production has done ....

None so blind ..... comes to mind.

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