



If the world is to abandon fossil fuels and nuclear power it will have to diversify to other sources of power other than wind farms which are incapable of supplying the required energy for a human race that is rapidly expanding and converging.

Hydrogen is a suitable source of energy and it can be produced through –

- Steam Methane Reforming (SMR)
- Electrolysis

Hydrogen gas is difficult to liquify, due to the minus zero freezing (33 Kelvins: - 8,980.95 degrees centigrade) required to convert it into liquid form and maintain it as a liquid. In gas form it is highly explosive and requires to be stored in tanks that can contain a 5,000 to 10,000 PSI pressure, but consider this - to drive a hydrogen electric fuel cell in a vehicle, hydrogen would be stored in gas form in hydrogen gas stations and pumped into the hydrogen gas tanks of vehicles. These stations and vehicles are already in development.

**Steam Methane Reforming (SMR)** - Today, hydrogen is mainly produced from fossil fuels: steam reforming, partial oxidation, or autothermal reforming are the traditional technologies to convert gas, oil or coal into hydrogen. In other words, a chemical reaction using fossil fuels which defeats the purpose of mining for fossil fuels.

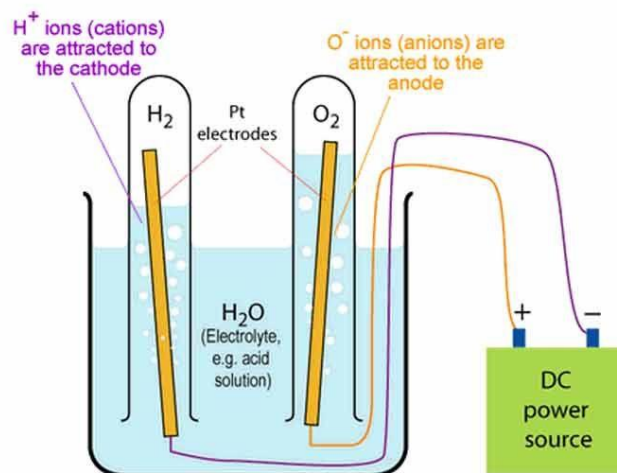
**Electrolysis** – A far greater challenge is to produce hydrogen from the electrolysis of water on an industrial scale and to develop the tanks that can contain up to 1,000 PSI and hydrogen gas injection systems that can drive a hydrogen combustion engine or heat water to drive steam turbine generators at a power station. The greatest obstacle to overcome is to upscale electrolyzers to generate via an electricity supply, the electrolysis

of water and create hydrogen gas. In simple terms, electrical power is used to split water into hydrogen and oxygen which is accomplished in an electrolyser.

Imagine a massive power station that produces hydrogen gas and oxygen by using electricity to push a 'high voltage' current through stainless steel metal plates in an electrolyte solution. Similar, but on a massive scale, to the basic science 'electrolysis' experiment (see attached image below) that most kids experience in a school laboratory. Of course, in a hydrogen power station, this is on a gigantic scale. The hydrogen gas produced is stored and distributed to hydrogen gas stations on the roads and motorways to be injected into high pressure tanks in motor vehicles to propel conventional combustion engines that have been mechanically modified or manufactured to run on hydrogen gas. It is well known that hydrogen gas cannot be liquified, due to the extreme minus centigrade temperatures required.

The hydrogen power station is of course, perpetual, thanks to some of the hydrogen gas it produces being used to drive its combustion engines or heat water boilers to drive steam turbines that drive the electric generators that produce the electricity for the stainless-steel plate 'electrolysis' reaction. Some of this electricity is fed onto the national electricity grid for the needs of consumers.

The basic science experiment to produce hydrogen that we used to get in school -



Well, it seems that the UK is (as usual) way behind the curve, because Germany is one country that is leading the way. Together with energy supplier Vulkan Energiewirtschaft Oderbrücke (VEO), and plant supplier McPhy Energy, steel and mining group ArcelorMittal will set up a pilot electrolysis plant and a hydrogen filling station at its Eisenhüttenstadt site in Germany. Announced by subsidiary ArcelorMittal Eisenhüttenstadt, the plant will feature a total power capacity of 2MW (megawatt) which will be provided by two electrolysers to be supplied by McPhy. The electrolysers will be used to produce hydrogen to be used in steel production, a sector that is responsible for around 8% of global carbon dioxide (CO<sub>2</sub>) emissions.

**Hydrogen Power Stations - Electrolysis Electrolysers & Perpetual Energy** – If upscaling electrolysis electrolysers can be achieved whereby hydrogen gas can be used to heat water to drive steam turbines to drive electrical generators (hydrogen power stations) to power homes and factories, the next step is to syphon some electricity off in the hydrogen power stations to power the power station's own electrolysis electrolysers and you have perpetual energy.

**Fusion Power Stations – For Powering Electrolysis Electrolysers** – An alternative route to a Hydrogen Power Station is a Fusion Power Station. Once powered up, this fusion reaction heats water to drive steam turbines which drive electrical generators which create electrical power to power homes and factories with electricity. Some of the electricity is syphoned off to create hydrogen gas through powering electrolysis electrolysers. In simple and conceptual terms, the greatest impediment to creating fusion is the ability to generate enough power to start the reaction and the means to contain it. Once the fusion reaction is started, there is a power source of heat, equal or greater than the sun. The by-product of fusion is the fusion torch concept which can be used to incinerate garbage and solid wastes, whereby the atoms and small molecules that are produced can be used as raw materials for industry.

**Developing Hydrogen Powered Combustion Engine Vehicles (JCB Have Already Achieved This)** - Once you have developed either Hydrogen Power Stations and/or Fusion Power Stations to produce hydrogen gas on an industrial scale (as above) then converting existing combustion motor vehicles or manufacturing new hydrogen gas powered combustion engines is not impossible (JCB has already manufactured one). Existing motor cars and lorries have already been converted to use LPG gas, so why not hydrogen gas? It only requires a government with a social and environmental conscience to invest in that development.

**The Case for a Hydrogen Combustion Engine Rather than an Electric Car Battery** - Amnesty international challenged industry leaders to clean up their battery supply chains. Lithium for manufacturing electric batteries for powering electric cars is mined mostly in Bolivia, China, South Korea, Japan and its carbon footprint continues to grow as deposits diminish and demand increases. Amnesty also warned about the deep-sea mining taking place to farm lithium, which studies have predicted will have an irreversible impact on biodiversity. Prolonged exposure to lithium can cause fluid to build-up in the lungs, leading to pulmonary edema. The metal itself is a handling hazard because of the caustic hydroxide produced when it is in contact with water causing an explosion. Lithium mining carries high environmental costs but the British government refuses to face facts and carries on regardless.

**The Case for a Hydrogen Combustion Engine Rather than a Hydrogen Electric Fuel Cell** – A hydrogen gas powered fuel cell generates electricity to power a vehicle's electric motor to drive the wheels using a chemical reaction. A fuel cell has two electrodes; a negative anode and a positive cathode. The reaction to produce the electricity happens at these electrodes, with an electrolyte carrying electrically charged particles between them and a catalyst to speed up the reactions. Materials, such as Lanthanum strontium manganite (LSM or LSMO) and Yttria-stabilized zirconia (YSZ) are used in the manufacture of a hydrogen fuel cell which delivers a detrimental impact on the environment and the wildlife. LSM nanoparticles are spherical high surface metal particles that appear as a brown or black crystalline powder. Numerous studies on LSM's mechanical and electrical properties have been conducted, but very little research has concentrated on its biological effects.

Nanoparticles have illustrated tendencies to promote mucus secretion and accumulation, and are linked to respiratory illnesses and mitochondrial disease - poor cell growth, muscle weakness, neurological problems, autism and hearing problems.

**Existing Battery & Hydrogen Fuel Cell Electric Vehicles** – These are the white elephants of the future, due to the mining of the metals required to manufacture the batteries and the disposal of the depleted batteries and fuel cells. The long-term impact on the environment and the human race is not being properly analysed and to compound the problem, consider the amount of electricity and roadway charging points to re-charge electric vehicles. Given time, the technology will fail. There is no doubt that the route is not being driven by global warming but by new electric vehicle sales and tax returns which far outweigh any logical reasoning. Likewise, the production of hydrogen driven fuel cells outweigh any logical reasoning as the fuel cell manufacturing and their depleted disposal, place the same impact on the environment and the human race as the batteries in electrical vehicles. If we are going to install hydrogen fuel stations for refilling vehicle hydrogen tanks to power their fuel cells, then why not develop hydrogen driven combustion engines?

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Adapted from [The British Empire and its Social Implosion](#)

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