

2nd Edition of International Conference on
Green Chemistry and Renewable Energy
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Presentation of Arno A. Evers:

**“Will Hydrogen be able,
to solve the Energy Problems of the World?”**

www.hydrogenambassadors.com/aae/green-chemistry2022/

Greetings

Good morning, good afternoon, and a good evening to everybody.
I would like to welcome you from the Garden City of Samal Island in the Philippines. My sincere thanks go to Ruby Dawson, Conference Manager from the organizing team at magnusconference.com.

Thank you for your attention to my keynote presentation:

“Will hydrogen be able, to solve the Energy Problems of the World?”

I am trying to present it to you in a different way.

I am also thanking my team here, and also in Germany for their ongoing support.

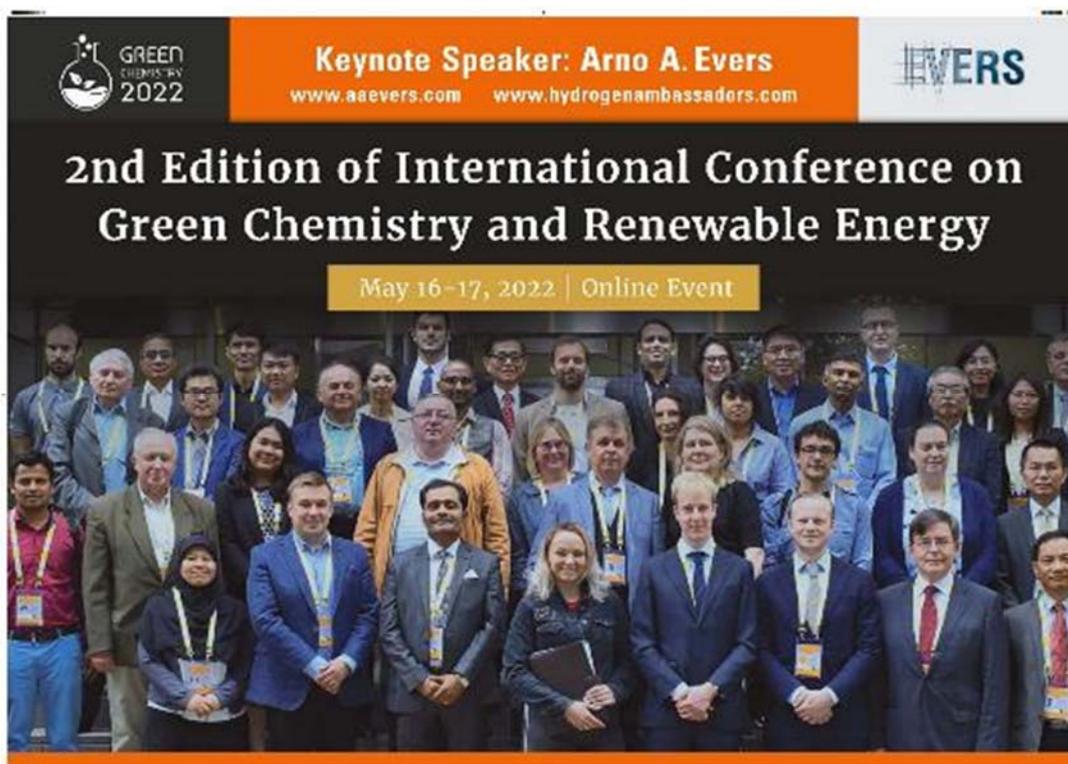
My nearly 30 years-long experience on this field is global and this is my 117 international conference on this topic.

So let us start.

You can follow this keynote presentation also on our YouTube channel:

<https://www.youtube.com/c/ArnoAEvers/videos>

Title



Content

I would like to explain my topic in eight steps.

First, let us share some basic about the power of the sun.

Then, we'll have a look at the Energy Production by Source from the beginning of the industrialization in 1860 to the year 2020.

We will share some insight about the facts and figures of the German Power grid, which may be surprising to you.

Then we'll come to hydrogen as such.

Let me explain the laws of physics and the potential of hydrogen.

You can recapitulate some of my older Energy ideas, starting with one from the year 2003, and an idea from 2006.

We will finish with the introduction a Personal Power Provider 3P+, a positive outlook, which we released first in year 2008 at the Fuel Cell Seminar in Phoenix, AZ, USA.

There will be time for some Q and A.



GREEN CHEMISTRY 2022

Keynote Speaker: Arno A. Evers
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EVERS

Will Hydrogen be able, to solve the Energy Problems of the World?

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Background



I started my career in 1962, learning the job as an Electromechanics in Hamburg, Germany. From 1965 to 1996, I worked with the British Decca Radar and Navigator Ltd., company in Europe and the Middle East, later joining the German aircraft industry. With a stint at the German Air-force.

I was involved from 1969 through 1985 in implementing the European Airbus Program from their Hamburg plant. My last position was Deputy Spokesman at the Munich-based Messerschmitt-Boelkow-Blohm GmbH (MBB) where I served a total of 23 years. In 1992, I started my own company in Munich, Germany with the goal of simplify trade fair participation for exhibitors and visitors alike.

Subsequently, I organized several conferences and symposium on the Youth in the Aircraft Industry, Computer and Communication technology, and the Environment.

I founded the Group Exhibit Hydrogen + Fuel Cells at the annual HANNOVER FAIR in Germany in 1995 to serve as a bridge for moving this technology from laboratories to practical applications. I owned and led the entire organization of the Group Exhibit which developed into Europe's largest industry and research gathering.

In 2006 I transferred my ownership to the Deutsche Messe AG, who is the owner of one of the worldwide biggest fairgrounds in Hannover, Germany.

I attended numerous H₂/FC conferences and trade shows worldwide to promote the Group Exhibit, as well as to gather and provide an unique internet documentation about the events and other informative areas on-site.

I have published more than 300 information graphics (Energy Images) and 50 newsletter contributions (Arno's Energy Ideas) on alternative energy, and served as a global hydrogen ambassador. Looking for the right people, who are able to realize the potential of hydrogen.

In 2019, I came to the Philippines and based on a number of really unbelievable circumstances, I started to make my dream come true:
 To built a small community, which shows, how cheap, easy, straightforward and efficient the energy supply of the world will be in future.
 There are many online documentations about my Sunny Houses @ Samal Island.
 Find more also on our YouTube channel:

<https://www.youtube.com/c/ArnoAEvers/videos>

BASIC: 1 Earth's Energy Balance

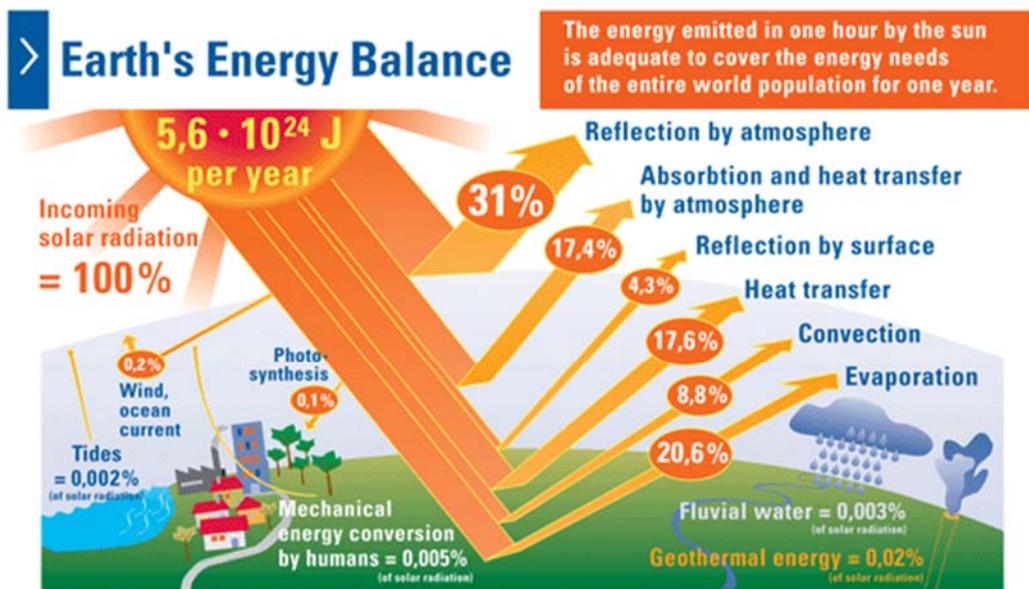
The power of the sun is immense: The energy supplied by it in just one day would supply the Energy needs of the whole world for almost 30 years.

We even need a magnifying glass, to see the Man-made Mechanical Energy conversion by humans. Only 0,005% of the $5,6 \cdot 10^{24} \text{J}$ emitted by the sun per year is converted into mechanical energy by humans.

These figures are based on publications from the University of Munich LMU in Germany

The energy released from the Sun in one hour would be adequate to cover the energy needs of the entire world population for one year.

Although we now use Biomass, and Hydro since many decades, Wind, Solar energy came later, but at this time, mankind is not really smart enough to make proper use if the sun's abilities.



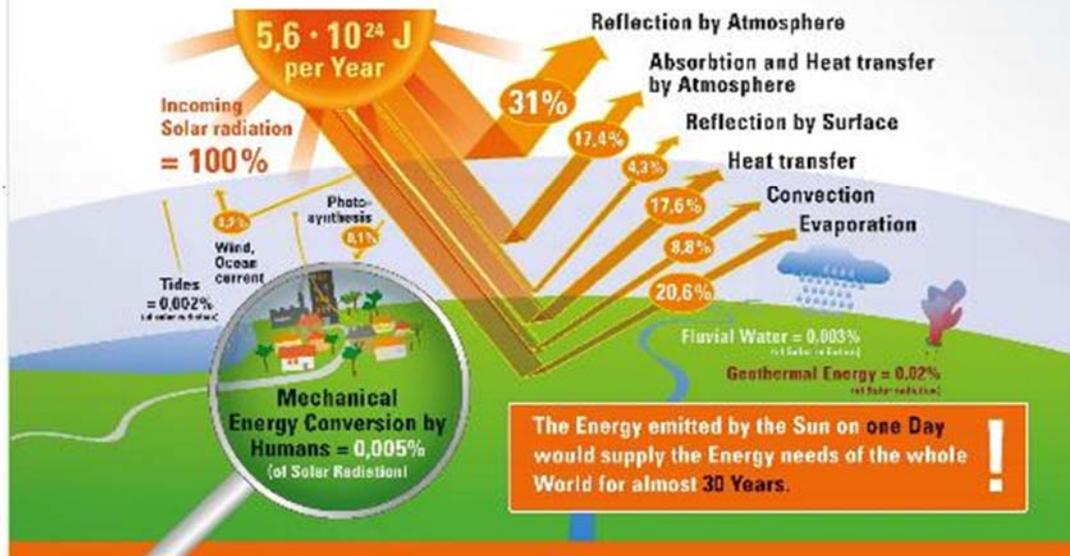
Go to where the market is! www.fair-pr.com IMPLEMENTING NEW IDEAS

Source: www.physik.uni-muenchen.de,
 Staatsministerium für Wirtschaft



Latest update: January 2010

Earth's Energy Balance



ANALYSIS: 2

World Wide Energy Production by Source 1860 – 2020

This can be seen by the World Wide Energy Production by Source from the beginning of the so called: Industrialization around the year 1860 to 2020.

I am well aware, that energy cannot be produced, only converted, but we simply use this headline to simplify the matter.

We observe a fast increase of the fossil energy sources, first coal from the 1860, starting with the industrialization in the United Kingdom with their first steam engines and also in Europe.

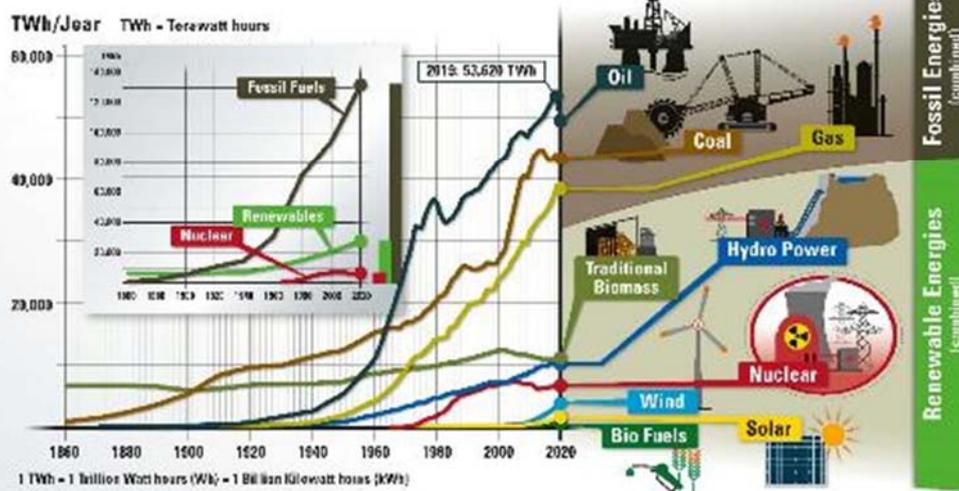
Later oil followed, speeding up from the 1960, when the inter-coastal highways in the USA were built. Gas stepped up as the third biggest energy from fossil sources. The increase of Traditional biomass was not so great, mainly based on the in-availability of manure. Nuclear energy started in the 1970. First with research reactors and later with commercial ones. Solar and wind energy are taking up at slower speed, compared with the increase of the fossil sources.

Allow a personal remark: I was born in the year 1946, just one year after WW2 ended. Let us make a line in 1946, some 76 years ago. And let us imagine the increase in living standards for many billions of people all over the world, that has come with it. For this we should be grateful to the politicians, scientists, engineers, technicians, skilled workers and clerks involved who made this possible.

But will it always continue to go on like this?

We can already see a signal from the decline in oil consumption in recent years. In the case of gas, this will follow, according to the recent, current events.

World Wide Energy Production by Source 1860 – 2020



ANALYSIS: 3 The German Power Grid 2020/2021

The German power grid has a total length of more than 1.8 million kilometers. This corresponds to 4.8 times the distance from the earth to the moon, which is equal to 45.8 times around the equator of the earth. It consists of four voltage levels.

The transmission network (220 k Volt to 380 k Volt), nearly 37.000 km long, it is owned and operated by four private companies, which have divided Germany in four independent areas (= monopolist structures).

They also manage the revenues and expenses of the renewable energy law in Germany.

The lowest voltage level (voltage of less than 1 k Volt) is responsible for supplying households and smaller businesses.

It has a total length of around 1.200.000 kilometer.

All four voltage levels are interconnected by 566,300 substations.

Here, the voltage is converted 24/7 to a higher and lower voltage.

In this process, the substations emit huge amounts of conversion heat.

Unfortunately this figure is from the year 2006.

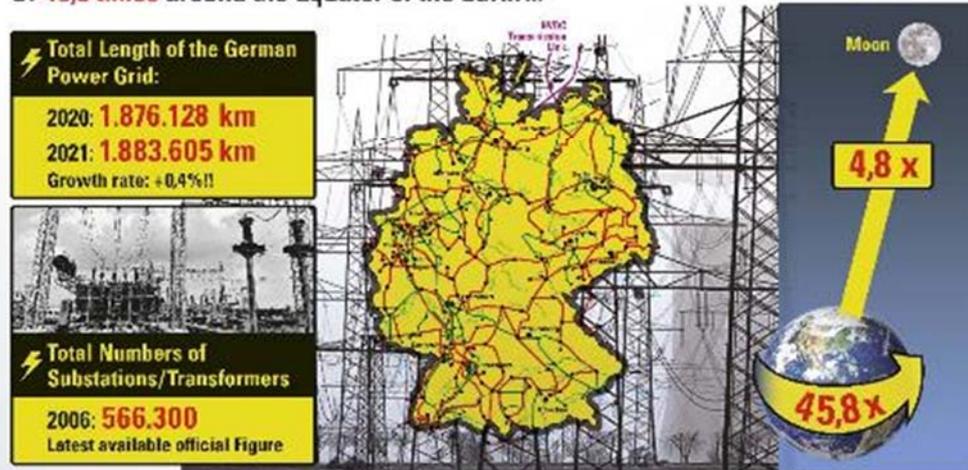
There is not a newer official figure available than this 26 years old one.

The German electricity grid, as all grids in the world, in its present form is based on historical developments of the past centuries.

It was and is not really physically intended to feed fluctuating voltages and frequencies, as they come from so-called renewable energies.

The German Power Grid 2020/2021

The Power Grid reaches **4,8 times** from the Earth to the Moon.
Or **45,8 times** around the Equator of the Earth ...



HYDROGEN: 4

Hydrogen and the Laws of Physics

Every conversion is creating losses, mainly in the form of heat.

That applies to internal combustion engines, which have an efficiency of between 25% to 30%, as well as to the making of hydrogen from electricity and vice versa.

In an ideal system, 3.9 kWh of electricity and 1 liter of pure water are required to produce 0.111 kg of hydrogen. Typical commercial electrolyzer systems efficiencies vary between 56 and 73 percent which corresponds to 70.1–53.4 kWh/kg or roughly 5.6 kWh for extracting 0.111 kg of hydrogen from 1 liter of water.

In these calculations the energy lost to generate the electricity in the first place (and to transform it from AC to DC) is not included.

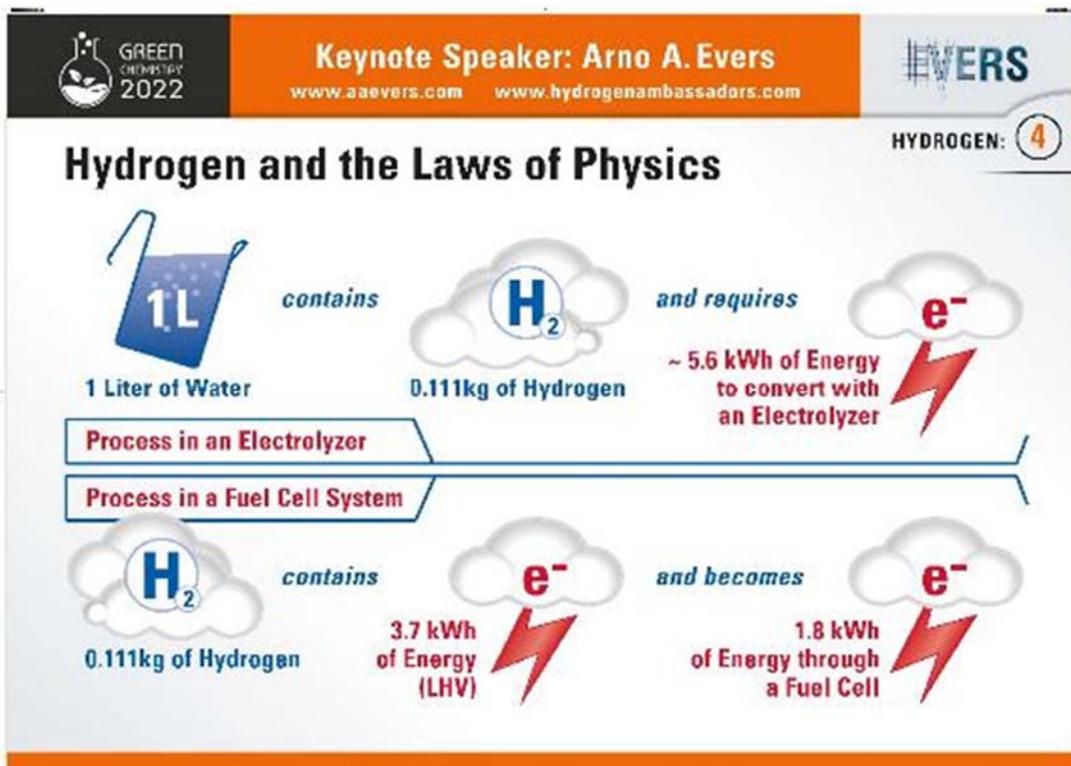
Splitting water into hydrogen and oxygen is reversible, therefore, it is possible to let both gases react and combine to form water using a fuel cell, releasing electrical power, and producing only water and heat as a by-product!

But there is a catch: 0.111 kg of hydrogen contains only 3.7 kWh of energy which becomes 1.8 kWh of electricity through a fuel cell (which is roughly 50 percent efficient). So the combined efficiency adds to around 33%.

Which means, we need three times as much primary energy, if we would like to use hydrogen.

Data Source:

Daryl Wilson, former CEO of Hydrogenics Corporation, Mississauga, Ontario Canada



HYDROGEN: 5

Four Steps to new Energy supply and distribution

Actually it will be the cars that could be (or more pronounced: Which have to be...) play the key role and the lead for a new energy supply. Because in electrical vehicles, the most sophisticated and most expensive parts are the storage media (Batteries or hydrogen tanks); and the power electronics. Which is responsible to manage the flow of energy inside the cars and also the charging and recuperation.

All components to implement this idea are ready and available. All it takes is four steps:

Step 1:

– Renewable energies (like wind, solar, hydroelectric and/or biomass energy) produce a new energy carrier, e.g. electricity and/ or hydrogen.

Step 2:

– The cars drive on this new energy carrier, which may be hydrogen, using fuel cells and electrical motors. These first two steps are available since many decades. Used in prototypes by all car manufactures worldwide.

However, at this time, there is not enough public demand to buy and use these options.

To get the repeatedly promised Hydrogen economy on its wheels, we need added value.

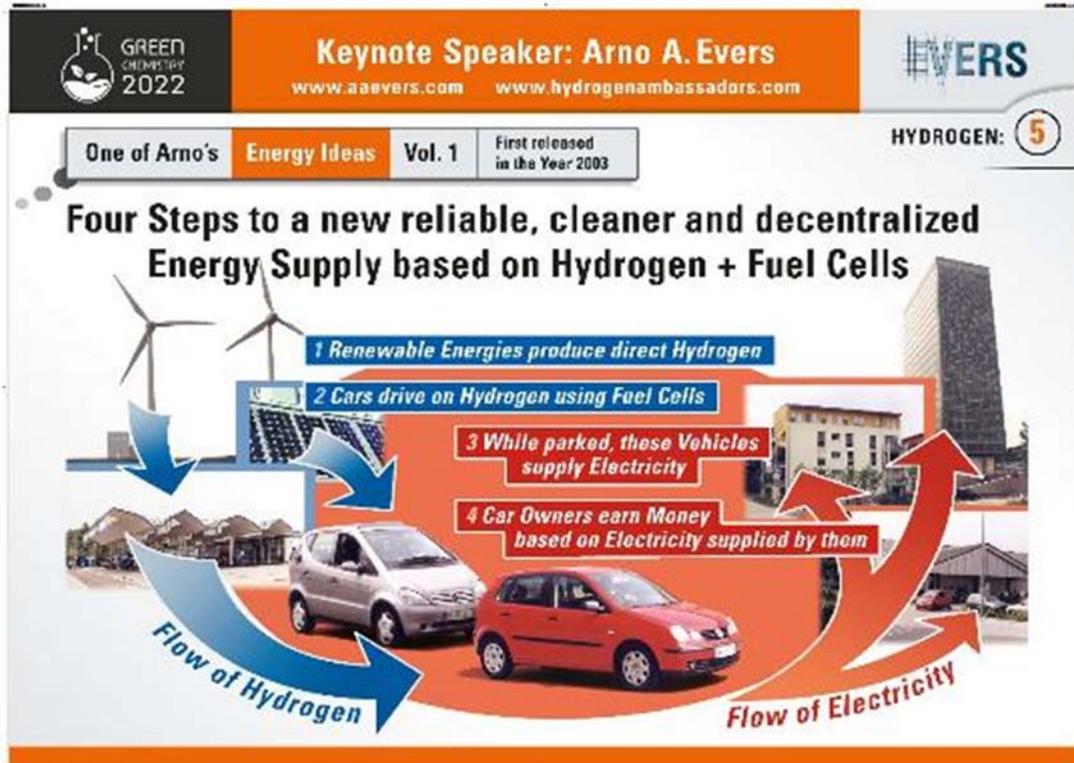
To create that, two more steps have to follow:

Step 3:

– While parked, these vehicles drive their fuel cell idle and supply electricity and heat to the buildings where they are parked. At the same time they are "refueling" while sunlight is shining on the body of the car, equipped with a special hydrogen producing "two or three component coating" on their surface, instead of the conventional painting as they now have.

Step 4:

– Car owners earn money, based on the electricity/heat supplied by their cars in this mode, when parked during shopping, at the doctor or hairdresser. The balance will be drawn in cash) or at touch-less payment methods at “check out”, when the car owner is leaving the parking position



HYDROGEN: 6

Can 35 Cars power one Skyscraper?

This building shows a skyscraper in Singapore. On the photo next to the building are 35 cars, standing idle, a very typical situation world wide. Today, these cars have nothing to do with the energy supply of the building, as they are only used for transportation and as an energy consumer. However, if you imagine, at one future day, all these cars have instead of an combustion engine (ICE) a fuel cell system installed, these cars might than as well be able to power the buildings where they are parked, with both electricity and surplus heat from the fuel cell for cooling (in summer) and heating (in winter).

Under the assumption, that the cars have an installed power of 23 kW each, which is not much for a car, but a lot for electricity all cars plugged together via a smart docking station which is connected to the building, would create as much electricity as one wind power station in Hong Kong (0.8 MW).

35 cars with an installed power of 515 kW (which do not really exist yet, but can soon be on the market when you interpolate the increase of power in new electrical cars in Germany), can create as much electricity as is needed to power 90 single family homes in the US. This equals the same power, produced by one 18 MW Waste Energy Power Plant with steam turbines.

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HYDROGEN: 6

One of Arno's Energy Ideas Vol. 2 First released in the Year 2005

Can 35 Cars power one Skyscraper?

Comparison	Power Output
35 Cars with 23 kW = 0,8 MW	1 Office Building in Germany (el. + therm.)
35 Cars with 77 kW = 2,7 MW	180 Offices in China with 15 kW
35 Cars with 242 kW = 8,6 MW	290 Appartm. in Italy with 30 kW
35 Cars with 515 kW = 18,6 MW	90 Houses in USA with 200 kW

OUTLOOK: 7

Use of a Personal Power Provider (3P+)

If we really want to create a really sustainable hydrogen society, hydrogen has to become a common commodity:

It must be produced directly at the point of usage in just one conversation step. All "real renewable" primary energy sources, which are available on-site have to be utilized. Some of them may even not been known today. There is no need for expensive, risky and not efficient transportation of a future energy carrier. The future lies in the new (and not yet existing) device.

I called it: Personal Power Provider, 3P+, when I first presented this idea at the Fuel Cell Seminar and Exhibition in Phoenix, AZ, USA, in the year 2008.

Maybe we need even more of similar additional, today not known devices, to meet all personal power demands for electricity, cooking, transportation, heating, air-conditioning, and hot and cold water supply simultaneously.

Even new application applications, which are not known today, can be fulfilled with the Personal Power Provider 3P+.

Hopefully, units like this will soon be on the market

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One of Arno's **Energy Ideas** Vol. 3 First presented the Year 2008 at The Fuel Cell Seminar in Phoenix, AZ, USA **OUTLOOK: 7**

Use of a Personal Power Provider, (3P+)

All Renewable Energies Input >>> Output All personal Power Demands

CONTACT: 8

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Thank you! Any Questions?

Power to the People ⇨ **People to the Power** ⇨ **People are the Power**

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Any Questions?

Let me please summarize

My personal answer to the topic of my keynote lesson:

“Will hydrogen be able, to solve the energy problems of the world?”

Is: Yes, it might be.

But not the way, it is thought of and partially done today.

We can, however, make it happen, when we analyze the status quo and look into the situation, to finding out, how it developed until today.

Now it is your task to develop solutions, individually or together in a team that do not yet exist today. But which are urgently needed.

I trust in your technical imagination, your creativity and persistence.

You`ll need all three. Don't worry about money, that will come on its own.

Get in touch with me directly, we can do it!

I trust in you, that you will find the right way.

Don't hesitate to send me your further ideas and/or questions:

arno@aaevers.com

Check out our websites:

www.hydrogenambassadors.com

www.aaevers.com

www.sunnshouessamalisland.com

And go also to our YouTube Channel:

<https://www.youtube.com/c/ArnoAEvers/videos>

I would like to thank you all for your attention.

Also I would like to thank the international audience from xxx countries for your interest.

Thanks also to the fantastic team here on Samal Island in the Philippines and my Graphic Designer Thomas Schirmaier and Uli Felger in Germany. And also to Javaprint Advertising in Babak here on Garden City of Samal Island.

All the best to all of you!

Now I am looking forward to your questions.

Enjoy the rest of this conference.