

Future

Industrial production

E-FUELS



THE NATION THAT SEIZES THIS EPOCH-
MAKING OPPORTUNITY WILL RESHAPE
GLOBAL ENERGY MARKETS
DR. PETER GRAUER

PLANET CUBES GMBH
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INDUSTRIAL E-FUELS PRODUCTION

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Dr. Peter Grauer



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I. The start of a new industrial era

As one of the industrialized countries, Switzerland took the first steps in 2010 to establish a nationwide, coordinated production network for e-fuels (green methanol). The basic idea behind this pioneering project is that an additional e-fuels production plant will be built at each of at least twenty hydropower plants in order to produce green methanol from renewable electricity, water and biogenic carbon dioxide. At the time, the initiative was supported by several political players and authorities across all party lines and categorized as being of public interest. At the time, this categorization made it possible to significantly facilitate approval procedures for e-fuels plants at federal, cantonal and municipal level.

The initial spark for this concept was based solely on a private initiative: in 2007, a team of investors (Peter Grauer and three co-partners) decided to provide a significant double-digit million sum for the development and industrial rollout of e-fuels production plants. With the exception of three million Swiss francs around ten years later, the team of investors used exclusively private assets and completely dispensed with state subsidies, bank loans or institutional investors.



II. The most important key to success: the independence of the Peter Grauer investment team and the vision of e-fuels

Dr Peter Grauer, one of the pioneers in the field of e-fuels, recognized the need to introduce industrial energy storage systems at an early stage. In order to make electricity available in industrial capacities in the long term, regardless of how it is generated, it must be stored exclusively chemically. Nature and the laws of nature do not permit any other decision.

After intensive research and a global comparison of various chemical storage media, the Peter Grauer team of investors decided in favour of methanol as the ideal storage medium - particularly due to the availability of resources, industrial feasibility and cost-effectiveness. The decades of work by the Peter Grauer investment team laid the scientific and technological foundations for the establishment of an e-fuels market, now also among international corporations, which have now adopted many of the fundamental principles and results of this work.

III. Important prerequisites for market development

In order to create the first industrial e-fuels market, numerous factors had to be taken into account:

1. development and engineering of decentralized e-fuels plants and construction of a pilot plant



2. partnerships with international industrial players
3. financing structures and approaching investors
4. site selection, authorization procedures and contract safeguards
5. establishment of long-term purchase agreements for continuous methanol production

From the outset, the Peter Grauer team of investors attached great importance to developing realistic and economically viable solutions. 'There is no point in pushing ahead with expensive technologies that ultimately only have limited applications or have to be permanently subsidized,' was and still is the guiding mantra of the development work and engineering to this day. The consistent industrial implementation of Nobel Prize winner Professor Olah's findings that green methanol, as a versatile energy carrier, can play a key role in the complete shift away from fossil fuels, led to the breakthrough in the worldwide acceptance of e-fuels as a new fuel sector.

IV. Scientific foundations and global perspectives

Over the years, comprehensive scientific studies have been carried out to investigate the production and application possibilities of methanol as a chemically simple structured e-fuel. Co-operations were established with leading universities and research institutions such as the Technical University of Munich, the Paul Scherrer Institute and international experts. Thousands of scientific papers were



analyzed to ensure the industrial and economic viability of an internationally oriented e-fuels production technology.

A key lesson learnt was the need to focus on practical solutions: Technologies that are immediately operational and cost-effective. Projects such as CO₂ extraction from the atmosphere proved to be visionary, but currently still uneconomical in the long term, which was also confirmed by leading experts. Instead, the focus turned to proven and scalable approaches such as decentralized green methanol production.

V. The future lies in implementation

With this theoretically designed network, Switzerland has created a solid foundation for a further climate-friendly energy supply if institutional investors agree to make the necessary investments in a second stage. The global markets in other nations are already showing that there is a lucrative market for e-fuels as green methanol that is not only technically feasible immediately, but also economically viable. It is now up to the will of forward-looking countries, the industry and investors to roll out these approaches worldwide and thus bring about a global turnaround in the field of sustainable fuels.

The Peter Grauer investment team sees this as one of the key answers to the challenges of climate change: 'The future belongs to technologies that utilize existing infrastructures, can be used globally without resource procurement problems and sustainably reduce the burden on the



environment. But the most important thing is the willingness to actually do it.

VI. The first decisive step towards establishing a new industry: development, construction and commissioning of a pilot plant for e-fuels

1. Research and development work as a cornerstone

The first industrial pilot plant for green methanol production was built between 2007 and 2010. A team of former methanol plant engineers took over the planning of a mobile, decentralized plant that nevertheless meets all the standards of a large-scale industrial plant in the individual production phases. Working closely with an experienced engineering firm, the plant was completed and commissioned in Frankfurt within two years. During the first test runs, it already produced 75 to 100 liters of green methanol per day and was equipped with a control system from Siemens, which is also used in larger power plants to control the various power plant processes.

2. Self-financing of the pilot plant

The prototype was financed entirely from private funds by the investor team Peter Grauer. A high single-digit to almost double-digit million sum was required to complete and commission the plant. The self-financing ensured that



completely independent and ideology-free decisions could be made.

3. Practical tests and authorisation procedure

The first test runs of the pilot plant took place in Frankfurt. The plant was then extensively tested in Switzerland on the premises of a Swiss energy company. The approval process was particularly challenging, as the plant was the first of its kind in Switzerland. Several authorities, including the EMPA (comparable to the TÜV in Germany), inspected the plant to the same extent and intensity as a large-scale plant. These comprehensive inspections led to a valuable wealth of experience, which later considerably accelerated the preparation and actual implementation of authorization procedures for larger plants, even in other countries than Switzerland.

4. Initial market experience

In 2012, the first renewable produced methanol was successfully launched on the Swiss market in very small quantities. It was mixed with conventional petrol and sold at a regular filling station in the canton of Sankt Gallen. This pilot phase was crucial for testing the entire logistics and sales processes - from production to transport and sale to the end customer. The experience gained during this phase can still be used today as an important basis for the industrial commercialization of e-fuels and green methanol.

5. Innovations in the field of diesel reduction



In addition, tests were carried out with a methanol-water mixture to reduce the diesel consumption of lorry engines. On a specialized test bench, the tests showed a significant reduction in consumption of up to thirteen percent. However, this innovative solution was not pursued further, as lorry manufacturers did not yet see the need to make the relatively simple adjustments to the motor controlling electronics.

VII. The second decisive step towards industrialization: Cooperation with open-technology countries and established partners

1. Licensing as the key to scaling

The realization that the global distribution of such plants is only possible through partnerships with established industrial players led to the search for suitable cooperation partners. Almost every company that could be considered for the construction of e-fuels production plants was scrutinized for its performance and track record. As a result of these activities, the Peter Grauer team of investors has qualified expertise and direct access to renowned plant manufacturers.

Today, a large number of global corporations are prepared to work with the Peter Grauer investment team to construct e-fuels plants according to the individual specifications of refinery owners and clients. Ten years ago, the Peter Grauer team of investors initiated some e-fuels industrial plants



based on their own pilot plant, which can be scaled up at short notice and brought into production mode in any country in the world.

2. Necessary discretion and protection of expertise

In order to protect the technical expertise, it was contractually agreed that key details of the systems would not be passed on to third parties. Nevertheless, the partnership enables the acquisition of standardized systems that meet the highest industrial requirements.

Together with the industrial companies, the Peter Grauer team of investors provides expertise and service packages based on a customized concept that enables the partner to achieve its industrial goals in cooperation with the industrial company it has selected.

In doing so, the Peter Grauer investment team continuously contributes the experience it was able to gather when the first industrial pilot market for e-fuels plants in Switzerland was prepared down to the last detail, but could not be realized due to the changing political attitude against combustion engines in Europe and hesitant attitude of institutional investors.

VIII. Financing and location identification: building blocks for the future

1. Financing models for a new industry



Financing such innovative projects posed a major challenge. For this reason, we worked with experienced banks at an early stage to develop standardized financing solutions. A leading European bank finally agreed to a comprehensive financing model that also convinced future investors and other universal and investment banks. The Peter Grauer investment team also makes these business relationships, which have been established for decades, available to its partners.

2. Integration of e-fuels plants into hydropower sites

Potential sites at hydropower plants have been evaluated for years in order to create synergies between renewable electricity production and e-fuels methanol production. The necessary legal and technical interfaces were defined and long-term utilization rights to the sites were also contractually secured. This pioneering work forms a central basis for the industrial development of sustainable e-fuels production.

3. Evaluation and identification of alternative e-fuels production sites

If the transition from the conventional fuel world to the e-fuels fuel world is to succeed on an international level, supra-regional concepts must be defined as to which locations have sufficient renewable energy available and in which forms this energy can be utilized for e-fuels production. Hydropower is not available in sufficient quantities in every part of the world.



What alternatives are there? What about the availability of other raw materials? The Peter Grauer team of investors has spent years scientifically investigating these fundamental questions, which are of crucial importance if e-fuels production is to be organized in such a way that marketable and internationally accepted sales prices can be called up for the e-fuels.

IX. Future prospects: Challenges and solutions

With its pioneering ideas and concepts for the development of renewable fuels, the Peter Grauer team of investors has shown that technological innovation alone is not enough. Regulatory, financial and logistical hurdles must also be overcome. An integrated approach - from technology development and partnerships to full-scale market introduction - is crucial to establishing e-fuels as a sustainable alternative in the energy and mobility sector.

As the founder of cross-national concepts for the industrial application of e-fuels, the Peter Grauer team of investors has spent almost twenty years defining the key basic principles and procedures for the development of a sustainable infrastructure for the production and distribution of renewable fuels. This clearly shows which approaches are suitable for achieving this goal - and which are not.

1. Clear foundations for investments and stable price models



One of the key elements in the realization of renewable fuel projects is the definition of long-term stable and predictable electricity costs. Fixed price modalities over a period of ten years create planning security and enable the financing of such plants with a high proportion of borrowed capital. This stability is not only essential for project development, but also for the involvement of infrastructure funds that are prepared to invest in such forward-looking projects.

In addition, flexible pricing models must be developed that are favourable to both investors and energy suppliers. This will give future operators the necessary leeway to reach customized agreements depending on their risk appetite. A balanced interplay of these factors is crucial for success.

2. Infrastructure and biogenic CO₂

Another key element for the production of renewable fuels is the reliable supply of biogenic CO₂. Industrial partnerships and clearly defined pricing models ensure the logistics and availability of this raw material. Due to its geographical extent, the Swiss market serves as an ideal pilot market in which fact-based experience can be gathered and then extrapolated to other countries and continents and applied on a large industrial scale.

3. Customers and market integration

The involvement of established market participants such as mineral oil companies is essential for the success of renewable fuels. Long-term purchase agreements with floor prices secure the economic basis for the operation of such



plants. As a first step, these fuels can be blended with conventional petrol to facilitate the transition to fully decarbonized mobility.

The adaptation of existing infrastructures such as refineries and the development of a coordinated logistics system for the transport and distribution of products are further key building blocks. This demonstrates the importance of long-term and strategic planning.

4. Partnerships and investors

A global industrial rollout requires cooperation with experienced industrial partners and infrastructure funds. Projects such as industrial e-fuels production can only be realized through strong partnerships and the involvement of various players. Investments in research and development play just as central a role as networking with companies from the technology, energy and mobility sectors.

X. Vision for the future

The path to the future of renewable fuels clearly lies in an industrialized and strategic approach characterized by solid partnerships, innovative technologies and sustainable business models. The focus should always be on long-term profitability and the creation of a global market for renewable energy sources, including e-fuels.

The experience and strategic principles of the Peter Grauer investment team show how important it is to learn from the past and focus on pragmatic solutions. A clear definition of



framework conditions, innovative technologies and close cooperation between different players form the foundation for a sustainable energy future.

In the future, the pace will be set solely by those nations that are prepared to be the first to consistently convert refineries to e-fuels production on a large scale, without neglecting or even cancelling the cash flow from the conventional fuel world during the transformation phase. In direct combination and correlation with supranational distribution and logistics concepts, this can certainly succeed according to our current state of knowledge.

The world is waiting for market participants who are now boldly building the industrial basis for the turnaround to the world of e-fuels production with vision.

Gez. Dr. Peter Grauer, 2024

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