Climate and Energy Forum

Enabling Energy System Integration

VDMA Key Recommendations for an integrated energy system

Registration number
in the register of representative bodies:
976536291-45

June 2020

VDMA welcomes the opportunity to contribute to the elaboration of the EU Strategy for Energy System Integration.

VDMA supports the continued strive towards the 2050 climate neutrality target including due consideration of the Paris Agreement measures and goals. The long-term transformation must be a model for success ecologically and economically and socially. The current challenges we all face as a result of the Covid-19 crisis make it all the more clear that Europe must not fail in the transformation. The goal of climate neutrality requires an integrated energy system. It is a comprehensive approach to integrate renewable energy in all sectors by using existing and innovative technological solutions. Climate policy therefore needs to be industrial policy. It will make the goal of climate-neutrality more achievable and will at the same time accelerate the economic recovery.

An integrated energy system is key for a climate-neutral Europe

The mechanical and plant engineering industry has long been developing innovative solutions and is a key enabler for a fully integrated energy system. VDMA believes that a fully integrated energy system enabling a climate-neutral future builds on four pillars:

- **Carbon-neutrality** is the benchmark an integrated energy system needs to achieve given that the goal of climate neutrality by 2050 is clearly stated. This includes the shift away from fossil fuels to carbon neutral fuels, so-called defossilisation.
- **Technology neutrality:** The goal of climate neutrality requires a comprehensive approach in all sectors by using existing and innovative technological solutions. Regulation should not determine which technology is used or which energy carrier should or should not be used in which sector. Climate-neutrality is reached best in an open competition between energy carriers and different technologies.
- **Holistic Approach:** A new energy system strongly based on renewable energy must ensure that the security of power supply is guaranteed at all times on the European and global markets and is available at internationally competitive prices. The whole lifecycle of products and the efficiency of processes could be taken into account (in a voluntary system) and not only energy consumption or CO_2 equivalents during usage of machines. The transfer of the energy system can only be successful when it takes the existing infrastructure and its benefits into account. Additionally, renewable energy sources will increase the necessity of storage systems. Rechargeable batteries play an important role alongside Power-to-X (P2X)[1] solutions. Renewable gases and fuels can be produced in a climate neutral manner by producing hydrogen from renewable energy or other derivates when carbon is added. In combination with renewable energies, batteries can be used to relieve the power grid, especially at peak loads, and to store and use the energy as needed. Moreover, P2X increases the flexibility of the energy system, using the existing infrastructure for gases and fuels, and its long-term storage capabilities, which can then also be used in flexible power generation. To

[1] In this paper Power-to-X (P2X) refers to all gases, fuels and feedstock, which are produced by means of renewable energy and electrolysis and, if necessary, the addition of carbon or other chemical components. The term P2X explicitly includes the direct use of hydrogen.

VDMA e.V.
80 Boulevard Auguste Reyers,
1030 Brussels, Belgium
Telefon +32 2 7068217
Telefax +49 30 30 69 46-20
E-Mail anna.feldman@vdma.org
Internet www.vdma.org

produce these energy carriers the energy system should allow for a barrier-free conversion.
- **Cost efficiency**: Resources should be allocated in such a way that they have the greatest impact.

Creating an economically efficient integrated energy system

The objective should be an economically efficient integrated energy system. **Energy efficiency** is an essential prerequisite for the successful transformation of energy systems and the achievement of climate targets - both nationally and internationally. There is **considerable potential for energy savings** both in electricity and heat generation and in the consumption sectors of industry, transport and buildings. Investments in efficiency technologies are essential. Which technologies will ultimately prevail, must be left to the forces of the market. However, the market must be designed in such a way that the **price reflects system effects**, such as externalities coming from additional CO_2-emissions. Energy efficiency is one criterion, but not the only one for assessing the suitability of technologies. In a resilient and secure energy system other criteria also play a role:

- **System costs** can be drastically reduced by relying on existing infrastructure rather than building new ones. Grid expansion is still lagging the demand for renewable energy. The existing gas and heating network infrastructures, on the other hand, can also absorb large amounts of energy and facilitate an efficient and greenhouse-gas-neutral energy supply. An integrated energy system should not make a choice between the two but rely on both options.
- **Social acceptance** is a prerequisite for transforming the European economy. It is therefore imperative to give technology users the option to choose those technologies that work best for them. This applies not only at the level of individual technology users but also at Member State level. The National Energy and Climate Plans (NECPs) demonstrate that the Member States are at different starting points. Although they share the same target there will not be a “one-size-fits-all” solution to climate-neutrality. Additionally the costs for living expenses and basic consumer goods which might be effected by higher energy costs must be kept on an affordable level (e.g. food price).
- An integrated energy system provides **security of supply**: Renewable electricity is an excellent energy source but needs to be complemented with energy storage. Batteries as well as P2X solutions help increase the flexibility. P2X for example is utilising the gas network and its long-term storage capabilities. Stored gases may be re-converted by flexible power plants into renewable power and heat/cold. The gas engine and gas turbine industries are further developing their technologies to increasing shares of hydrogen.

Accelerate the transformation

Simply raising targets will not accelerate change. Rapid action is required. The path to climate-neutrality in 2050 is ambitious and must be pursued in a straightforward way. One example for this is the transport sector: VDMA considers the challenges in defossilising this sector are very high. Switching to electric vehicles will be too slow for addressing the challenge. We must find clever and manageable solutions for the fleet stock. We therefore need to allow a broad portfolio of technologies, such as electric mobility, fuels cells and e-fuels.

Current barriers to energy system integration

In our view, there are three main barriers to energy system integration that need to be addressed:

Slow pace of increasing the share of renewable energy
Energy system integration will lead to a significant increase in gross electricity demand in the coming decades. Many sectors still rely heavily on fossil energy carriers. This needs to be substituted by renewable energy, be it electrons or molecules. By comparison, the expansion of renewable energy is progressing far too slowly. Europe therefore needs higher and binding RE-targets matching the increasing demand in the sectors. The installation of photovoltaic systems is likely to see a sharp increase in response to further energy system integration. In order to achieve the goal of energy system integration it is important to increase the PV production in Europe. This would reduce dependency on imports from suppliers in Asia. The pace of expanding installed renewable capacity shall not slow down the transition towards renewable energy in the sectors.

Insufficient CO_2-pricing
Many solutions that are needed are ready for industrial scale, but they do not pay off economically yet. To give an example: Fossil gas and fuels are much cheaper than energy carriers produced by P2X. The current Covid-19 crisis and the following economic downturn further accelerate the issue of low oil and gas prices. A viable concept must be developed in which prices are aligned to CO_2-intensity. Together with the *Forum Ökologisch-Soziale Marktwirtschaft* VDMA has demonstrated in a study how a reorganisation of current pricing systems according to CO_2 content would create an effective, market-based, climate driven incentive.

Biased sector integration
Regulation should not dictate where defossilisation should be driven by direct or indirect electrification. A biased regulatory framework, e.g. based on the notion of hard-to-abate sectors, hinders the uptake of other energy carriers. Ultimately, this will slow down and increase the costs of the path towards climate-neutrality.
An example for this is the transport sector. P2X is a politically accepted solution for the maritime and aviation sector. In road transport, partly even for mobile machines, direct electrification is foreseen by the regulatory. A market-neutral approach, however, enables fundamental changes in the refinery and chemical processes making these industries fit for climate neutrality. The production of synthetic kerosene via P2X generates a high spectrum of by-products (e.g. diesel, gasoline, ethylene, propylene). These by-products can be used and enable the necessary replacement of fossil crude oil in other applications. The more business cases there are for these by-products, the more economical and efficient the market ramp-up of P2X becomes. Other examples are mobile machinery or agricultural machines. There are many niche sectors which do not allow a usage of battery or fuel cell technology. Either

because the machine is limited in its dimensions or weight or because there is no chance of covering development costs for special applications.

The role of gas and heat in the power sector

In the last decades, climate policy efforts focussed mainly on increasing shares of renewable energy electricity generation. The results are impressive. But an affordable, reliable and climate-neutral energy system will need to go beyond replacing fossil-based electricity generation with RE. In a system with increasing shares of variable renewable sources, P2X solutions contribute to more flexibility, utilising the existing infrastructure and its long-term storage capabilities. P2X energy carriers may be re-converted by flexible power plants into dispatchable renewable power as well as heat and cold. Gas as an energy carrier and the existing gas network enable the large-scale and long-term storage of energy and offer an efficient transport infrastructure. These energy carriers should therefore be recognised as energy that can contribute to a climate-neutral energy system, similar to renewable electricity. The provision of heat and cold is a crucial component of an integrated energy system. Heat/cold account for half of Europe's energy consumption. It is needed in buildings and industries (process heat). Cogeneration plants are bringing together electricity, gas and heating/cooling networks. From micro-cogeneration in buildings (engines or fuel cells) to distributed or large cogeneration plants for district networks in cities (turbines or engines) and industry, these plants supply about 11% of EU's electricity and 16.5% of its heat, providing flexibility, synergies and efficiency gains to Europe's energy system. Cogeneration makes efficient use of district heating networks, which exist in many European countries.
There will be a variety of renewable gases (renewable or decarbonised hydrogen, methanised gases, biobased gases, such as biogas or biomethane, blends). Principles for transporting these gases need to be established, by maintaining one gas market. The variety may change the composition of the gas. A flawless digitalised communication in the gas network is needed, enabling the adaptation of technologies to changes in the gas composition.
A dedicated detailed and binding roadmap should be developed with manufacturers and operators of gas technologies connected to the grid to ensure a smooth, predictable and reliable process.

The gas engine and gas turbine industries are developing their technologies to increasing shares of hydrogen: already today there are several examples of gas engines running with more than 50 percent hydrogen and the turbine manufacturers have committed to provide 100 percent hydrogen solutions by 2030. Power plants capable of running on renewable gases created using P2X technologies in the future are a future-proof solution, which helps addressing the system flexibility challenge. These P2X solutions can be industrial scale or small-scale, decentralised units.

Decentralised sector coupling and sustainable resilience technologies

- In the transition to more and more renewable energy, **the resilience of the overall system** is important. Decentralized power generation, e.g. with gas-fired power plants, must make an important contribution here.
- **Decentralised power and heat cogeneration** supports energy efficiency
- **Decentralized sector coupling**, for example, through Microgrids and P2X increases the overall resilience of the system.

- The EU should take into account and promote the idea of (decentralized) resilience in its regulations and considerations. It is important here that **all instruments are harmonised**.

Buildings

In the **building sector**, cost effective measures which increased efficiency must be the priority. The upcoming **Renovation Wave** should set **clear targets**, prioritise **staged deep renovation** measures and make sure that these new funds will be used to achieve net-zero carbon buildings by 2050 through the **deployment of smart, cost-effective technologies**. Cost-effectiveness should be set as a determining factor for allocating public funding to energy efficiency measures in buildings renovation.

Creating a market design for energy systems integration – Policy recommendations

The smart sector integration strategy should be built upon a technological neutral approach which enables machine manufacturers and users to choose and integrate the most suitable and best technological options and to continue to focus on the essential: to remain innovative and competitive. VDMA's vision is an internationally competitive and industrialised Battery and P2X technology leadership based in Europe. The regulatory framework should not exclude any sectors from using Batteries and P2X. The guiding principle should be how to achieve the greatest possible impact with the least amount of subsidized measures.

CO_2-price as leverage – Reform of the Energy Tax Directive

In order to successfully transition to a low carbon economy it is essential to set technologically neutral, market-based incentives. The Energy Taxation Directive of 2003 does not yet follow the climate priorities of the European Union. The pricing of energy carriers has developed inconsistently and unsystematically without taking carbon emissions into account. Converted into Ct/kWh, the impact on electricity is significantly higher than for heating and motor fuels. So far, the climate-damaging nature of energy carriers has been reflected exclusively by the CO2 price within the framework of the EU ETS: current energy tax rates take neither the energy content nor the CO2 intensity of energy sources into account.

A reworking of the directive would set an incentive to invest in low-emission solutions. If properly designed, it could act as an effective and cost-optimised instrument for reducing greenhouse gas emissions and act as an investment signal. The effect of this would be that green electricity becomes cheaper, heating and fuels more expensive. A reorganisation of energy carrier pricing does not necessarily have to be an extra burden, if the pricing is reorganised in an economically revenue-neutral way to reflect the carbon intensity of the energy carrier. This would lead to no artificial increase in price but redesign according to actual climate damage, having a climate protection effect. This would be a revenue neutral, market-based mechanism with emission-oriented pricing, instead of an additional burden for all.

As a market based instrument it includes all sectors, as is therefore an economically viable framework for sector coupling. Maintaining the competitiveness of industry is essential. Such an instrument would provide carbon leakage protection as under the concept all current

exceptions could continue to exist. Such an instrument would reduce the bureaucratic burden on companies. Numerous individual regulations and compliance efforts of companies will be replaced by only two components in the future.

The Commission should exercise caution in extending the EU ETS to other sectors, as cost of CO2 reduction may vary greatly between the different sectors and some industrial branches will be able to buy more certificates at a higher price than others, which may drive some sectors out of Europe, rather than achieving the desired goal of cleaning up all industrial sectors.

Enable immediate business cases with the Renewable Energy Directive (REDII)
The Renewable Energy Directive (REDII) offers a timely and very promising opportunity to turn sector integration into a business case. It offers the framework to replace fossil-based energy carriers with P2X in transport, including the refinery process. The Delegated Act (Art. 27 and Rec. 90) defining the conditions under which electricity from the grid for electrolysis is considered green should enable as many business cases as possible: Guarantees of origin together with power-purchase-agreements should be sufficient proof to provide evidence for the renewable character of the energy and its additionality. REDII, however, is too restrictive when imposing a time and geographical correlation. Especially in the market ramp-up phase, this will constitute a barrier in the uptake of P2X in transport. The approach is biased against different technologies, as it imposes stricter conditions for electrolysers taking energy from the grid than e-charging stations. As the P2X market develops, the concept may be extended by introducing further elements and criteria upholding legal certainty for existing projects.

Open up international markets for renewable energy
While Europe has a huge potential for homegrown renewable energy, we will only be able to achieve climate neutrality in partnership with other regions in the world. P2X allows to easily store and transport imported renewable energy from places where wind and sun-derived energy is plentiful and cheap, through an existing infrastructure. By exporting P2X solutions and importing carbon neutral energy carriers, Europe can make a significant global contribution to climate protection and the UN Sustainable Development Goals. At the same time, the EU can diversify its energy imports. The EU should therefore create and use instruments under the Paris Agreement to support such climate friendly partnerships and create a monetary advantage for local operators. To unleash the international markets, guarantees of origins and a regulatory recognition of imported renewable energy via P2X is needed.

Unbiased access to sustainable finance
The planned taxonomy on "sustainable finance" is an additional bureaucratic barrier and burdens the investments and financing that are necessary for the transition to climate-neutrality. For the VDMA, it is of central importance that there is no exclusion of technologies. Thus, all technologies that can contribute to reducing emissions must continue to have access to sustainable finance. For the design of the technical criteria under the taxonomy there must therefore be an expansion and integration of all low-emission technologies. It is not acceptable that technologies that have not yet been included in the positive list should have to demonstrate their emission reduction potential through elaborate product life cycle analyses and third-party certification. This results in a great cost burden and bureaucratic disadvantage for manufacturers of climate-friendly technologies that are not yet listed. For example, investments in the gas infrastructure itself (including power and heat/cold generation) do not lead to carbon lock-in or stranded investments, as long as there is a clear path towards decarbonised or

renewable gases. The importance of gas infrastructure needs to be acknowledged, including gas power generation.

Contacts at VDMA

Anna Feldman
European Office Brussels
Phone +32 2 7068207
E-Mail anna.feldman@vdma.org

Matthias Zelinger
Climate Spokesperson
Phone +49 6 966031351
E-Mail matthias.zelinger@vdma.org