

## Particles for a good climate

Sustainable hydrogen is considered to be a key element for the energy transition. If Berlin puts its mind to it, the city can take on a pioneering role

*by*

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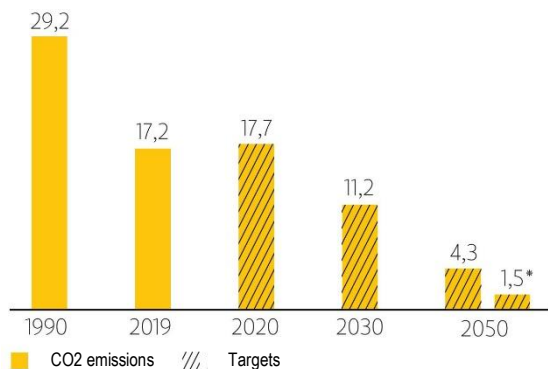
The energy transition is not complete with the introduction of a new type of electricity powered by renewables. Experts assume that there is a potential between 50 and 60 per cent. This also applies for Berlin. Although the city does not have industry that can't be decarbonised with electricity, such as steel, chemicals, refineries or cement, it does have a building supply and a transport sector that are neither economically nor technically feasible and socially acceptable to fully electrify. Against this background, the short-term introduction of greenhouse gas emission-free hydrogen plays a central role in achieving the climate goals.

Berlin wants to become climate-neutral by 2050. In December 2019, the Senate recognised the climate emergency. Even though the climate targets for

2020 could already be achieved in 2019, missed targets and new challenges are emerging, particularly in the transport and heating sectors. But Berlin has the capital, for example with huge amounts of waste and wastewater, to produce hydrogen. With the electrolysis of hydrogen from solar energy, the expansion of photovoltaics on Berlin's roofs does not need to be aligned with the limited capacities of the electrical grid. Hydrogen can store the surplus electricity produced in summer for the winter months. Together with the almost perfectly developed gas and district heating grid infrastructure, this forms an efficient overall composition for achieving the climate goals. Why do away with existing infrastructure if it can be used in a cost-optimal way for the energy transition and the achievement of climate targets?

## Berlin's climate protection targets for 2050

For the year 2050, the data for the final target is still pending. CO2 emissions in million tons



Source BEK monitor report 2020

Until the early 1990s, the city had a share of around 50 percent hydrogen in its gas networks. If we replace the then grey, coal-derived hydrogen with green, sustainable hydrogen today, there is a chance to decarbonise the heat sector quickly without massive intervention. In the theoretical considerations of converting buildings to low-energy values, the practical reality is often misjudged. The typical old building stock in Berlin must be completely renovated inside and out. Tenants have to be relocated for months. Where to? Who is to bear the considerable costs required for this? A blending in the gas network or the use of hydrogen in district heating or in combined heat and power facilities would have a quickly scalable effect on emission values.

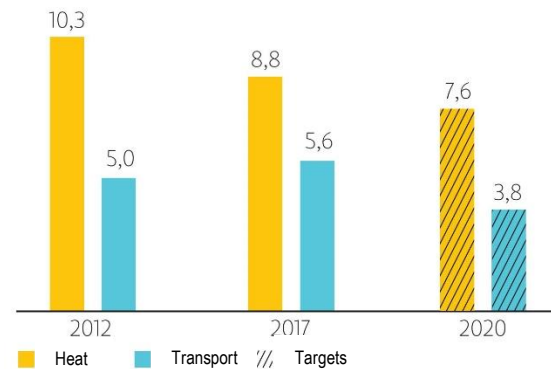
We find a comparable situation in transport. For long distances, there is so far no practicable battery solution for Berlin's double-decker buses. The Capital's municipal cleaning service has ordered its first hydrogen-powered refuse collection vehicles for 2021, which can reliably provide the additional energy needed to press the refuse. A battery drive would also quickly reach the end of its capacity for the commercial vehicles with heavy pumps used by water companies or the fire brigade. Refuelling time for hydrogen drives is comparable to refuelling petrol or diesel, and the range with one kilogram of hydrogen is roughly equivalent to 100 kilograms of battery. Sustainable hydrogen is also the basis for producing synthetic fuels to provide climate-neutral kerosene at Berlin's BER airport.

Production is still comparatively expensive. Similar to photovoltaics and wind energy, industrial processes need to be set up in order to be able to scale up and become competitive with fossil fuels

with the help of mass production. This will take place in the coming years. Until 2030, 400 billion euros will be invested in the EU for this purpose. Why this massive intervention in the economy?

## Development of the heat and transport sectors

From 2012 to 2017, CO2 emissions in the heating sector have decreased significantly. Figures in million tons



Source BEK monitor report 2020

The energy transition has stalled. Renewable energy production is curtailed. Wind turbines stand still. We pay for electricity that is not produced: 1.34 billion euros in 2018 and 2019 in Germany alone, and the trend is rising. Efficiency is different. The generation project of the energy transition will only have reached its goal when renewable energy is always available in terms of time and space. As things stand today, there is no other energy carrier in the world that can solve this challenge better and is easier to produce, whose reserves are unlimited and whose applications are more diverse than hydrogen.

This is a key reason why the introduction of a hydrogen economy is one of the essential cornerstones of the Green Deal, the EU's biggest ever project. In contrast to the Asian-dominated battery market, Europe has the chance to expand its world-leading competence in process and plant technology. In the process, people can be offered sustainable prospects for the future after the coal phase-out. According to EU calculations, the development of the new hydrogen economy could create up to 5.4 million new jobs by 2050. For this reason, the Federal Republic of Germany is also moving in this direction with its own hydrogen strategy and formulating the claim of a leading role worldwide in the development of hydrogen technology and its application.

There is a limited time window for the ramp-up of the hydrogen economy with the corresponding funding options, which should also be used for Berlin. The capital city has a unique opportunity to take on a pioneering role, especially in a sector that, from a national perspective, will only be decarbonised with hydrogen at a later point in time. The building sector is the city's largest CO2 emitter, accounting for about 50 percent. Measured against the targets it has set itself, Berlin cannot reduce emissions there at the current rate. Introducing hydrogen here offers the opportunity to use available funds for the city now, to build up knowledge that others will use later, and thus to give Berlin an advantage as a business location.

### Balance of CO2 polluters



The households and tertiary sector are the largest polluters, CO2 emissions in million tons

This is the basis for the foundation of H2Berlin, an association of the city's utilities, waste disposal companies and other business houses. H2Berlin shares the conviction of the EU Commission and the German government that in order to achieve energy transition and climate neutrality, the widespread introduction of hydrogen as an energy carrier must also be economically sustainable and consumer-friendly. For this purpose H2Berlin is planning its first large-scale lighthouse project.

Hydrogen is to be made available on a massive scale for several business applications in different sectors. Purchases will be secured in the process. Infrastructures are provided across companies and synergies are created. Business cases thus move closer to economic viability. Three hydrogen hubs were derived from a study carried out by H2Berlin, which are intended to act as nuclei for the widespread introduction of hydrogen as an energy carrier and which now need to be evaluated in more detail.

### Hydrogen Hubs in Berlin



#### H2Berlin Hub West:

Energy site Rudow / Reuter West (waste-to-hydrogen, commercial vehicles, CHP, grid-balancing services), Siemensstadt 2.0 (CHP, mobility incl. public transport), BEHALA (port logistics, shipping), Urban Tech Republic Tegel (hydrogen future power plant)

#### H2Berlin Hub East:

Marzahn power plant (CHP, H2 for electrolysis, H2 in mobility).

#### H2Berlin-Hub South:

BER (airport logistics, synthetic kerosene, electrolysis), Waßmannsdorf sewage treatment plant (wastewater-to-hydrogen, commercial vehicles, electrolysis), Neulichterfelde district (mobility incl. public transport), Mercedes-Benz factory site Marienfelde, Technology Park Adlershof (Technology development to market maturity)

Further information: [www.H2Berlin.org](http://www.H2Berlin.org)

The companies associated with H2Berlin see a need for strategic action on the part of policymakers to kick-start the ramp-up of a hydrogen economy by 2023 in line with the European and national hydrogen strategies. The aim is to provide a suitable funding framework and to create the (legal) framework conditions with the goal of achieving the competitiveness of hydrogen solutions.

The crucial point here is that Berlin's hydrogen roadmap cannot be decoupled from that of Brandenburg. The previous approach of small-scale, fragmented projects in the region must be replaced by an overarching systemic concept. H2Berlin is therefore initiating the research project "Optimal Hydrogen System for the Capital Region" together with TU Berlin, Fraunhofer Gesellschaft, FZ Jülich and MPG. The results will serve as a guideline to follow the cost-optimal path of the energy transition towards climate neutrality.

Saudi Arabia announced at the last G20 summit in Riyadh that it would phase out oil production and produce hydrogen in its solar energy-rich deserts in the future. The EU's marine spatial planning for the North Sea envisages offshore wind farms with a capacity of 300 gigawatts to produce hydrogen in

the next few years. The Netherlands is already phasing out natural gas. The first EU-funded "Hydrogen Valley" is being built in the Groningen region. The entire private and economic supply will be converted to hydrogen from the wind of the North Sea. At the forefront here is the supply of buildings with heat and electricity.

As Germany's largest metropolis with limited electrical connections to the extra-high voltage grid, but unparalleled scaling potential in applications, its urban dimensions and its many young innovative

talents, Berlin is predestined to put hydrogen on the agenda. The question is no longer if and when. Now, we take care of how.

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