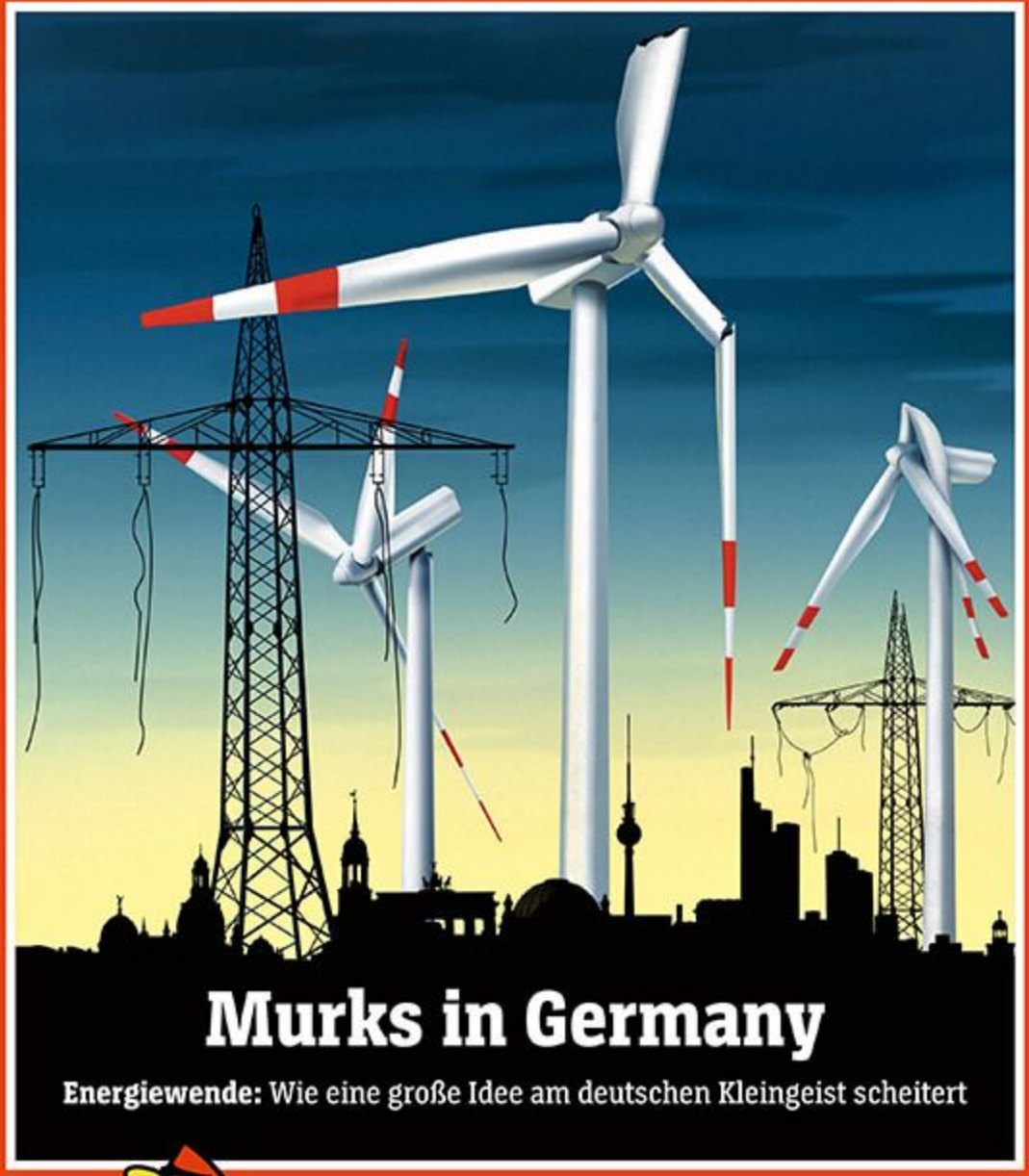
DER SPIEGEL

Nr. 19
4.5.2019



Murks in Germany

Energiewende: Wie eine große Idee am deutschen Kleingeist scheitert

70 JAHRE GRUNDGESETZ

Braucht unsere Verfassung mehr direkte Demokratie?

A Botched Job in Germany

Energy transition threatens to fail

The conversion of the German energy system lacks power plants, grids and storage. The state has wasted billions.

By Frank Dohmen, Alexander Jung, Stefan Schultz, Gerald Traufetter

May 03, 2019

It's a fantastic idea, the idea of a world of energy tomorrow. 675 employees of the Federal Republic of Germany work daily on their success, in federal ministries and subordinate authorities, in committees and units, in committees and subcommittees. They are working on a world that, in all its beauty in one day, has not only remained an idea, but has already become reality. In Germany. It was April 22, Easter Monday.

On this day, the sun was shining from dawn to dusk, the wind drove the windmills all over the country to full power, and when the sun went down, the renewable energies had come to 56 gigawatts without the slightest hint of toxic gas which covered almost all of the needs of the world's fourth largest industrial nation. It was a magic, the perfect combination of nature and modern technology. Unfortunately, he only stopped for this one day.

The reality of many other days is dirty and gray. Much of the electricity needed in Germany continues to come from the burning of coal. Oil and gas burners bounce millions in German boiler rooms. Germany's roads belong to the cars of yesterday, powered by heavy, gasoline and diesel-powered engines.

The idea for that fantastic world of tomorrow was born eight years ago, on March 11, 2011. In Japan, a tsunami had damaged the nuclear power plant in Fukushima. Chancellor Angela Merkel (CDU) and her cabinet decided to quit nuclear power. A historic event and a historic step.

And it stayed that way.

What was once thought great, lapses in the little thing of German reality. The Energiewende, the biggest political project since reunification, threatens to fail, the dream of a low-carbon future burst. In the eight years since Fukushima, nobody in Berlin has really accepted the project, especially the Chancellor. Although politics produces laws, regulations, directives, there is no one who coordinates or even accelerates the energy transition. And all

fear nothing more than the resistance of the citizens, if somewhere a wind turbine is to be installed or a power line to be laid.

Since 2012, McKinsey's management consultants have been tracking the energy transition, with the latest news stealing every illusion. Germany was "far from the self-imposed goals", so their verdict.

The Federal Court of Auditors names the failure even more sharply. The energy transition has cost at least 160 billion euros in the past five years. The effort was "in stark disproportion to the previously poor income," said President Kay Scheller last autumn. His criticism died away largely without consequences in the political sphere. Scheller even sees the danger that the citizens could soon lose confidence in government action because of this blunder from the highest point.

Surveys show how the great idea of the energy transition leads to even greater frustration. Despite all the sympathy for the project, citizens today regard it as expensive, chaotic, unfair.

A real mortgage. Because that depends on the future of the whole country: ecologically, economically and technologically anyway. But also socially. Unlike Berlin Airport, the project of the century can no longer be dismissed as an embarrassing, but somehow touching regional phenomenon. This is about how citizens will live and work in the future, how industry will manage, how living together should work.

National importance is quickly discussed in politics. This time the vocabulary applies. Especially because it belongs to the self-image of the Germans, to be a global pioneer in this question. The majority of Germans were proud of this project, and politics could have used that feeling.

But now the system change has got stuck in the middle of the way. The expansion of wind farms and solar systems is not progressing. There is a lack of everything: in networks, in storage, and above all in political will and capable management. The Federal Government trivializes itself in space and time.

In the Ministry of Economic Affairs alone 287 officials are involved in the topic. They are divided into four departments and 34 units. In addition, there are at least 45 committees in the federal and state governments with people who also want to get involved. They collect vast amounts of data, invent complicated funding mechanisms, the effort is tremendous, the result modest.

The funding program "Step up!" should help companies to handle electricity more efficiently. The goal was to approve 1000 applications in 2017 - in the first nine months of the year it was 7th or the law on the tax

incentive for electromobility: six months elapsed from the draft to the promulgation. The law had been classified as "particularly urgent".

The professionals lose themselves in detail, they produce papers - but no strategy. For months, the important post of Energy Secretary was vacant, so what? No one feels responsible, no one determines which task has to be done with which priority. As well as: As long as there is no separate ministry of energy, the topic wanders between the departments. And the Chancellor denies her authority competence, just in this question.

In December 2015, Angela Merkel signed the Paris Climate Protection Treaty, Germany undertook to make its contribution to curb global warming. Since then, more than three years have passed, largely unused. With the migration debate and the rise of the AfD, climate change has become a marginal issue.

At the 2007 G-8 summit in Heiligendamm, Merkel sympathized with the idea that it was fair for every inhabitant of the earth to be able to emit the same amount of CO2. A revolutionary idea. But more did not come of it.

Even earlier, in March 1997, the then Federal Environment Minister Merkel in the SPIEGEL confessed: "As far as the CO2 reduction is concerned, transportation is the biggest problem." That's the way she could put it today.

Merkel's biggest failure, so the balance to the end of her chancellorship, is that she has moved climate policy little, although she personally the subject so early drifted, a typical German topic, after all, the energy revolution was invented in Germany.

In 1980, the term appeared on a book title. He has entered the vocabulary of the world, such as "Twilight of the Gods" or "Kindergarten". Successfully implemented, however, the idea is now elsewhere.

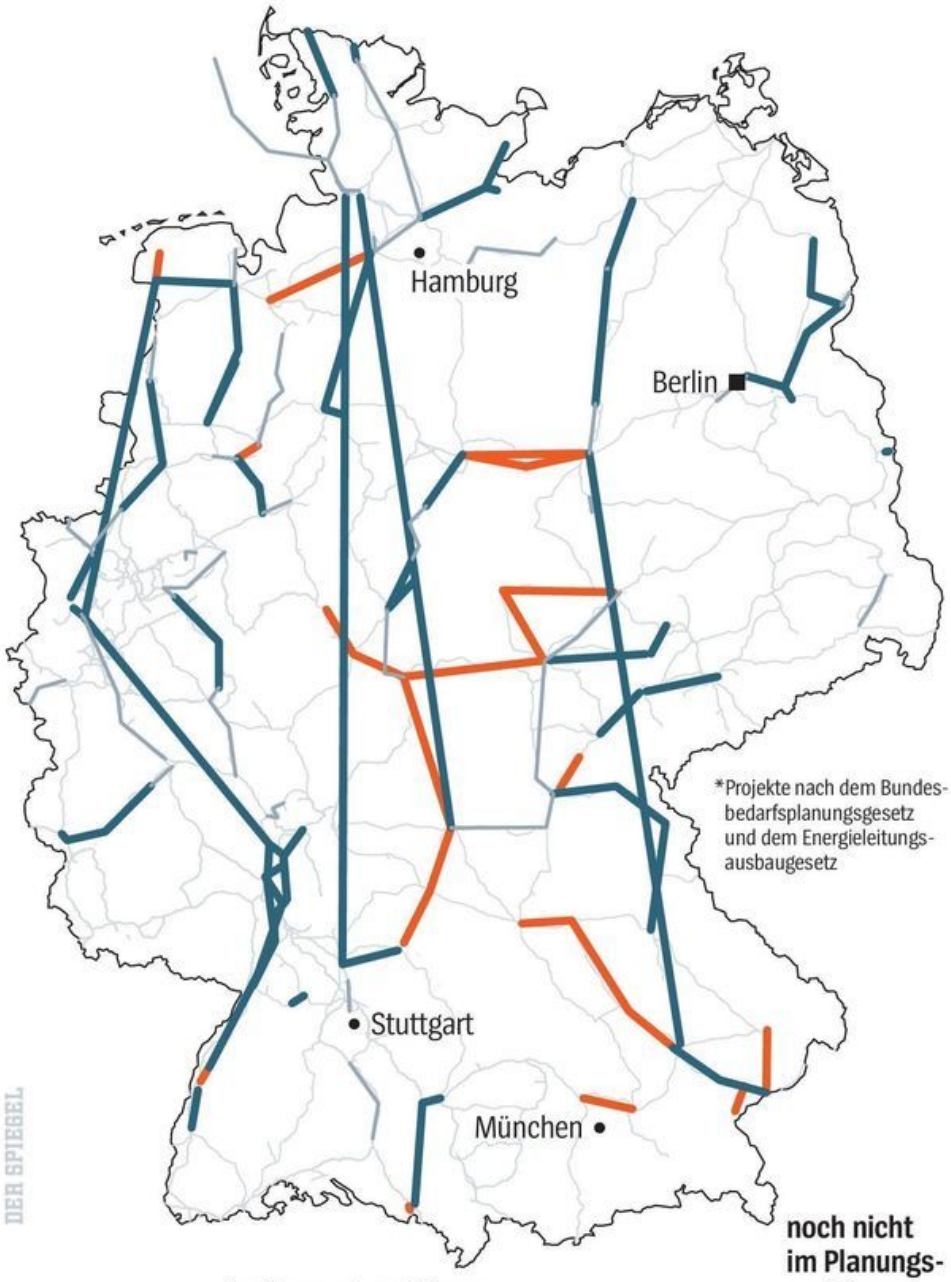
In the Netherlands, for example, the EU's largest supplier of natural gas so far: the neighbors have decided to abandon production of the fossil fuel within a decade. In future, they will also use the pipes for gas produced from wind power. Or in Norway: In six years there will no longer be a car with an internal combustion engine.

And in Sweden, which, according to the International Energy Agency, is world champion in terms of the energy transition, a high CO2 tax, just under € 120 per tonne, is driving citizens and businesses to heat, drive and produce in a climate-neutral way. In 1991 she was introduced there. In Germany, the debate has just begun (see box on page 16).

Even the US is on the mend. Instead of coal, Americans are increasingly burning natural gas to generate electricity. Although this is only a less dirty option, but at least: CO2 emissions tend to decline.

Lange Leitung

Stand wichtiger Stromleitungsbauprojekte* zum Jahresende 2018



Quelle: Bundesnetzagentur

Progress everywhere, but not in the pioneer country of the energy transition. CO2 emissions have declined only insignificantly during this decade. Eberhard Umbach is board member of the science initiative "Energy Systems of the Future" (ESYS), a large-scale project with its own office. Umbach observes how the view of the energy transition has changed. A few years ago, foreign colleagues would still have followed, shaking their heads, but also with admiration, with what verve the Germans had worked hard. And now? "In the meantime, this has completely turned around," said the scientist at a conference in February. "Now others are much faster than us."

Yet what was done so far was still the easy part of the exercise: the turnaround, costing billions of dollars at a high price. The other sectors, on the other hand, have embezzled politics: industry, buildings, especially transport. Involving them and forming a concept out of them is the difficult part to come. This will decide whether Germany will become a model for sustainable business - or whether the whole experiment will fail. From exuberance to weariness: why has this fabulous idea become such a fulminating flop?

Why Germany could fail with the energy turnaround

There is a central mistake made by the federal government when it decided the end of the nuclear age in Germany eight years ago: it opted to abandon nuclear power but at the same time failed to take its leave of the coal.

Wind turbines and solar panels were erected, and the coal miners continued to run happily. The government put a dirty system next to the dirty one. Why? Just to hurt no one, no company, no citizen.

An energy turnaround from a single source, conceived and managed with care, something like that never existed in Germany. Rather, there were always two different ideas of the energy transition, basically since the red-green time.

Politicians such as the Green Environment Minister Jürgen Trittin or the later Secretary of State Rainer Baake championed the radical change, costs did not matter. On the other hand, people like the SPD Minister of Economic Affairs Sigmar Gabriel or his successor Peter Altmaier (CDU), who took more account of industry and jobs. Both sides did not dare cross each other's path, they kept each other in check. And nothing went ahead.

This makes it understandable why no government dared to form a powerful Ministry of Energy, but has divided the powers: distributed to the Chancellery, the Ministry of the Environment and the Ministry of Economic Affairs. In this unholy Trinity, the same pattern of action always takes place.

The Ministry of the Environment is pushing ahead with maximum demands. The Ministry of Economic Affairs warns of dramatic job losses. And the Chancellery expresses itself before decisions.

Most importantly, the hare-footedness of politics has an effect on the expansion of electricity grids. More than ten years ago, the Federal Government decided to build the transmission lines quickly, with around 7,700 kilometers now considered necessary. Of these exist so far 950 kilometers. In 2017, 30 kilometers were completed nationwide.

In Berlin, the following mockery goes around: 30 kilometers, that's about the distance that a snail travels within a year.

Instead of explaining why high-performance roads from the windy north to the industrially rich south are necessary, the politicians fear the resistance of the citizens against the masts. Because almost everywhere, where a new route or a large wind turbine to be built, the authorities encounter resistance. The rulers decided to move much of the connections underground, which is many times more expensive and takes years longer.

Nine years ago, Rainer Spies, mayor of the Hunsrück community of Reinsfeld, began planning a wind farm. He wanted to build 15 plants together with energy supplier EnBW in a forest near the motorway between Trier and Saarbrücken. "Everything seemed perfect," says Spies. Then the approval process started.

The mayor and EnBW submitted the applications, several hundred pages thick, plus a lot of environmental studies. The district administration repeatedly demanded: expert opinions on species protection, bird flight, noise emission, shadows and, last but not least, the endangerment of the pug-bats, including a detailed survey of their local population. Last year, at the fourth attempt, the authority approved the zoning plan.

Actually, the district administration should immediately issue the building permit. But then someone discovered on a spruce a few hundred meters from a part of the planned wind farm away the nest of a Red Milan. It could hardly have been worse.

The bird of prey, an elegant sailor with forked tail, enjoys special protection in Germany. He eats mice and moles, his enemies include Uhus, Baummarder - and wind turbines. Unfortunately, he likes to hunt on the fallow land under the grounds, because the prey is easy to spot there.

Red kites are mostly migratory birds, coming back from the south in spring, but not reliably every year. Therefore, the mayor would even be glad if the bird would turn up soon. Then he could have the flight behavior of the

bird examined and possibly realign the wind farm. An expensive venture, but you could finally start.

If the Milan does not return, the planning is still for the time being. Spies would have to wait at least five years to see if the poultry did not move to his nest. Then he could build the wind turbines in 2024 - twelve years after the project started.

The Reinsfeld case is without question an extreme example, but it provides an important explanation for why the Energiewendeland has become a laggard. Plans for the construction of wind turbines regularly cause conflicts with the authorities, especially with residents. There is hardly a project more at the start, which is not fought and complained.

In the past, less than 40 months passed from the conclusion of a lease to commissioning. Today, the operators expect 60 months. At least.

How much this spoils the willingness to invest is evident in the course of the auctions, in which the Federal Network Agency auctioned licenses for wind farm construction. There are now fewer applicants participate, as quotas are offered, the logical consequence: There is no more competition. "The whole system is a little bit out of joint," says EnBW CEO Frank Mastiaux, "it needs to be revised urgently."

Nationwide, the number of new construction projects has plummeted, 743 wind turbines went to the grid last year, a good 1000 less than in the previous year. In 2018, eight plants were installed throughout Bavaria. The wind power boom is over for now, the manufacturers are suffering. Enercon and Nordex are cutting hundreds of jobs. Senvion, known as "Repower Systems" until 2014, has filed for bankruptcy. The industry is afraid that a descent is imminent, as the German solar industry has already suffered.

Even with the expansion of the marine wind parks Germany misses the original goals. Last year, capacities of less than one gigawatt were added in the North and Baltic Seas, 23 percent less than in the previous year. Chancellor Merkel inaugurated the wind farm "Arkona" in the middle of April off the island of Rügen. The pretty pictures of people who blew colorful toy windmills at the party can not hide the fact that even offshore is no longer a real growth industry.

The problem lies in the system: Wind farm operation and grid connection are in different hands in Germany, unlike in Great Britain. It is difficult to vote, the costs are high, potentials remain unused. No wonder: no one wants to produce electricity on the high seas, whose land-based decline is not assured, because the lines to the south are missing.

Even the connection of a normal solar park can become a game of patience. In Spain, the building permit guarantees the network connection at the same time. In Germany, this is "often an incalculable risk," says Dierk Paskert, head of Encavis, the largest independent solar park operator in Germany. Even if the network operator plays along, it often happens that planning authorities, municipalities or even individual citizens are involved. "Planning security looks different," says Paskert.

The green-power crisis is exacerbated by the fact that 20 years after the introduction of the Renewable Energy Sources Act (EEG), the first wind turbines, photovoltaic or biogas plants will be phased out in the coming year. Those who installed a solar system at that time, often farmers and homeowners, sometimes collect up to 50 cents per kilowatt hour fed in, but today only 5 cents are needed for larger systems.

The state has redistributed gigantic sums of money. The operators receive more than 25 billion euros a year via the EEG for renewable electricity. Without the money in the future, the operation of wind turbines or solar parks will be hard on many owners. As is so often the case with subsidies, they create an artificial upswing, a straw fire that burns quickly and leaves only ashes.

The energy site is caught in a dilemma. Germany has become accustomed to running two systems in parallel: a fossil from which society does not easily get rid of, and a regenerative one that does not get going. However, the longer the transition from one system to another, the more costly and less predictable the project becomes.

In just under four years, the utilities are expected to shut down the last nuclear power plant, Neckarwestheim 2. By then, the first coal rigs will be shut down. At the same time, electricity demand is expected to continue growing.

Thus, if the green power plant infrastructure is not rapidly expanded, a supply gap could soon open up. In January of the year 2023, it may only be a matter of ice cold and gray for a while, no sun, no wind. If this so-called dark recession dragged on for days, it could be tight and push the system to its limits. In the middle of January 2017, such a constellation occurred last.

In such critical periods, reserves will soon be missing, which have so far provided coal and gas power plants to keep the grid stable. It needs solutions, very fast, to master times of darkness. The insight slowly seeps through in Berlin. At least that's how it was when a kind of Jamaican climate policy alliance sat on the podium at a conference in the Berlin Erlöserkirche in April. The discussants assured each other the will to give new impetus to the energy transition, each in their own way.

Green Party member Cem Özdemir, a constituency in Stuttgart, home of Daimler and Porsche, swore to say goodbye to the combustion engine soon ("The fair for the car is over"). FDP leader Christian Lindner urged a faster expansion of the power lines, not without the Weinberg snail punch line to install.

The CDU leader Annegret Kramp-Karrenbauer acknowledged that climate protection earlier had taken a higher place in their party, and reminded of the former Federal Environment Minister Klaus Töpfer. "We are working to catch up," she promised. Climate, according to the party leader, will be "the dominant theme of this year".

That is possible. Contributing to it are the student protests "Fridays for Future", which also increasingly caught on parents and grandparents. In addition, politicians have mobilized the prospect that failure to meet climate targets will entail tangible sanctions in the future, and that too is new. From next year onwards, the government will have to pay fines for every tonne of CO2 emitted by the country more than agreed with Europe's neighbors. Since Germany is likely to break the target values, the Federal Finance Minister is planning as a precautionary measure for the coming years with additional expenditure of 300 million euros.

With this perspective, it is now in the government: Better invest money in climate protection as penalties abroad. But even in the government has meanwhile heard that the energy turnaround has come under heavy disrepute voters.

The man who should give momentum and acceptance to the energy transition is Andreas Feicht. He has been Secretary of State in the Federal Ministry of Economics since February. How hard his job is, he got to feel on one of the first days in office. His boss, the Minister of Economic Affairs, took him on a trip to get an idea of the grid expansion on site.

It went to Niedernhausen, a Hessian community north of Wiesbaden. Luckily, the lenses turned to Altmaier as he got out of the black bus with the tinted glass and ran through a trellis of angry citizens, many wrapped in yellow vests. "No experiments over our heads" was on one of the posters.

The Niedernhausener are literally surrounded by infrastructure of every kind. Within sight, a highway, several rail lines, including the ICE route Frankfurt-Cologne, and just the power line, it goes directly over the houses. The network operator Amprion also wants to attach extra high-voltage cables to the existing masts.

Ultranet is the name of this line, 340 kilometers long, it is part of the connection, which is to transport the electricity from the coast to the

industrial centers in the middle and in the south of Germany; south of the Main Line are only 15 percent of German wind turbines. At Suedlink, a route that runs further east, the cables are to be laid underground, which is considerably more expensive.

"Peter, give us an E," it said on a poster in Niedernhausen, "E" for "underground cabling". The chairman of the local citizens' initiative rushed to Altmaier. The project is a human experiment that insufficiently researches the magnetic radiation of such a cable. Altmaier promised: "I will let me show the course of the route exactly." Then he and the undersecretary got back on the bus.

Feicht is a practitioner, he knows his way around in the energy industry, but on a regional level: He was previously the head of Wuppertal municipal utilities. His ambitions sound modest when he says about the energy transition: "We have to move a bit further."

In fact, Feicht must succeed in what his boss Altmaier has not packed: to model out of nothing but a new, stable overall system. Because even if currently fit together little: There are a few working items, which could be a reasonable energy policy zimm.

After all, the EEG subsidies have caused around 1.7 million photovoltaic systems to be installed in Germany today. Nearly 30,000 wind turbines on land and 1,305 in the North and Baltic Seas feed electricity into the grid. The plants generate it partly at a cost of less than four cents per kilowatt hour, cheaper than coal or nuclear power.

Germany gains 35 percent of the required electricity from wind, solar, biomass or water. Renewable energy has for the first time equaled coal as the main source of electricity last year. And yet this is nothing more than a start. The turnaround needs to be a real energy transition, involving all sectors: buildings, industry and transport.

‣ There are around 19 million residential buildings in Germany, only a good four million of them are energy-efficient. Many heaters are outdated, in about a quarter of the houses in the basement still the oil burner. Only gradually, the owners change the facilities, every year at most one percent of the house stock in Germany is fundamentally modernized. If this pace continues, about ten million buildings will be redone in 2050, barely more than half. For years, every federal government in the coalition agreement to promote the refurbishment of buildings tax, but the intention has never become a law - for donated the Grand Coalition 2.7 billion euros for Baukindergeld until the end of 2021;

‣ For the industry, energy continues to be a key cost factor, despite digitization, so manufacturing companies are making an effort to trim their factories for efficiency. The successes are relativized, however, as the economy is growing steadily. On balance, energy consumption in industry remained almost unchanged in two decades;

‣ Transport is the most dependent on all sectors and mobility is still almost entirely based on gasoline and diesel fuel. The emissions of cars and trucks are at a similar high level as in 1990. The targeted goal of reducing them to just under 40 percent by 2030 is still a long way off. How long the road is, shows a simple calculation: In Germany, about 47 million cars are approved, every year around 3.4 million are sold new. Even if half of these new cars were equipped with an electric drive - which is unrealistic - at the end of the twenties, there would still be little more than around 15 million alternately powered cars.

So it can not be enough to just put more and more green electricity. That will not be enough to realize the dream of a low-carbon future. The energy transition, version 2.0, needs to be rethought, much broader, more universal. It must integrate all sectors, technologies and markets. In the end, there must be a highly interconnected system that is much more than just a gigantic machine that generates and distributes electricity from wind and sun.

An important component of this new energy world will be hydrogen. Hydrogen is an energy source that does not cause toxic emissions and is available in infinite quantities. The potentials of the molecule are known, and hydrogen evolution has been proclaimed years ago. Too soon, as we know today. But now the time should be right.

How the energy transition could succeed

"Head of Hydrogen" is the spectacular title of René Schoof, he is the master of hydrogen at the energy utility Uniper. The company produces green hydrogen in Pritzwalk near Lake Müritz. Schoof strolls past silvery, shiny boilers, inside which honeycomb compressors split water into its components.

The facility, opened in 2012, is one of the first and largest of its kind in the world. It demonstrates that green electricity can easily be transformed into synthetic energy sources: in hydrogen or methane, in gasoline, diesel or kerosene. The technology is mature. And yet, manager Schoof does not like the Pritzwalker project. At the moment it would be enough for him, he says, if it "does not stand idle in the landscape at some point," he says.

Economically, the whole thing does not pay. A large part of the energy used is lost, the efficiency is below 40 percent, when wind is first converted into electricity and electricity into hydrogen and hydrogen into methane. So far no viable business model can be developed from this.

There are some things that speak against the process - but one crucial idea for this is that as the number of wind turbines continues to increase, it becomes more and more common for operators to shut down the plants because the grid is over-supplied. For the failure, they get a compensation. In 2017, a sum of more than half a billion euros was incurred. Before so much money is wasted, utilities could just as well use and store the excess power. Then they could produce methane and hydrogen, which they feed into the natural gas grid, the lines are 500,000 kilometers long. It's a kind of giant battery that could also serve as a buffer against dark skies.

Another possibility would be to turn the wind into methane or hydrogen and then into fuel, so-called e-fuels. Here one could also take advantage of the already existing infrastructure: the fuel storage facilities, pipelines or filling stations of the petroleum industry.

A study by the Institute of German Economy and Frontier Economics certifies e-fuel's amazing potential, global demand could be mid-century as large as half the global market for crude oil today. In particular, mechanical engineers who produce electrolysers would benefit from this. German companies are the world market leaders here. They control almost a fifth of global business. These include Siemens, ThyssenKrupp or MAN: the old industrial elite.

But even young companies have opportunities. In the province of North Frisia, the founding duo of GP Joule, two agricultural engineers, are building a complete hydrogen process chain. "EFarm" is the name of the project: wind turbines supply the region with electricity. Next to them are electrolysis plants that turn the wind into hydrogen and whose waste heat heats the houses. The generated hydrogen is transported to filling stations in Husum and Niebüll, according to the plan, two fuel cell buses will then be used in local traffic. So the North Sea wind comes in the vehicle tank.

Today, renewable energy is being pushed into the grid from all sides, with volumes fluctuating according to wind and weather. There is always the danger that the system will lose its balance. On the other hand, it only helps to control it as intelligently as possible.

In Hagen, at the "Platz der Impulse", there is often a white Nissan Leaf on an electric charging station lately. There, at the headquarters of energy supplier Enervie, he draws electricity for his battery. What you do not look at

the car: It is also able to release its energy at the right time, it can be loaded and unloaded. Hardly any other electric car in Germany can do that.

So the vehicle contributes its little part to stabilize the system. If the utility Enervie just needs energy, the car feeds power into the grid within three seconds. The quick help gets the e-car owner remunerated. In a test week came for the operator 20 euros together, ideally this would be around a thousand euros a year. A vehicle that earns money.

In principle, every motorist could become an energy provider just as the operators of wind turbines, solar collectors, biogas plants, cellars or heat pumps can also feed energy into the grid. Together, they create a kind of virtual powerhouse. The supplier has the task of coordinating the interplay, he acts like the conductor of a huge orchestra.

Sure, that questions arise here: what, if the citizens at the same time at the end of their e-car hanging on the plug? Then the provider could lure them to charge the battery late at a cheaper rate. There are software and algorithms for this.

In some communities, the local municipal utilities have long been developing such intelligent supply concepts, they are taking the energy transition to a certain extent in their own hands, also out of frustration at the shutdown in Berlin.

In Bordesholm, a community of 7,500 inhabitants near Kiel, the Stadtwerke last week inaugurated a battery storage, a black, windowless building, the size of two bungalows. The shelves are lined with 48 048 modules. The ventilation hums, at 17 to 23 degrees, the batteries work best.

Here, the municipal utility stores electricity that is generated in a neighboring biogas plant. The battery supplies the citizens with electricity, if necessary, but it can deliver power within 0.2 seconds to the national grid to keep it stable, similar to the Nissan Leaf in Hagen. The provider Tennet rewards the help with a fee. "That's how we earn our money," says Frank Günther, Managing Director of Utilities Bordesholm.

Intelligent systems are important. But even more important are incentives for citizens and entrepreneurs to act in a climate-friendly way. And that's where the price comes in. The more expensive the production of CO2, the more likely it is to invest in climate-friendly technologies.

There is hardly a project more at the start, which is not fought and complained.

European emissions trading, launched in 2005, has so far proved unsuitable for this purpose. The EU has spent too many pollution rights, so

prices have remained very low for a long time, their course is hardly foreseeable. In addition, certificates trading covers just under half of the emissions; Traffic, buildings, trade or agriculture are not covered.

A climate control would be an elegant solution to include all sectors and interlink to a system. More than 3,500 economists have signed a call for a steadily increasing, globally consistent levy. Even in the grand coalition, the idea of a CO2 tax gains sympathy. The question is just how high it should fail.

Again, everyone is careful. Federal Environment Minister Svenja Schulze (SPD) referred to the chief economist Christoph Schmidt, who had brought 20 euros per ton in game. At such a level, the effect would be barely noticeable, the liter of gasoline would only increase by a few cents.

The "Fridays for Future" activists have other dimensions in mind. They consider a price of 180 euros to be appropriate. Then the liter of gasoline would be about 43 cents more expensive, heating oil 58 cents, a flight from Germany to New Zealand and back would cost a good 2000 euros more.

One thing is clear: the higher the policy screws the price, the more citizens will feel like losers: the job commuters, the old building dwellers, the frequent flyers. At the ESYS meeting in February, Thomas Herdan, Energy Policy Department Leader at the Department of Commerce, described the dilemma facing the government. Many now pushed for higher CO2 prices, but if you really want to change something, it means: "For God's sake, just keep your fingers off, otherwise I put on a yellow vest."

In France, nationwide protests last year were triggered by higher taxes on fuels. That is why Berlin favors a model like that in Switzerland, in which a large part of the revenue from the CO2 tax is refunded to citizens and businesses, as compensation for the fact that climate-neutral action can be inconvenient and requires sacrifices. That is the central lesson of more than two decades of energy transition: the policy must take the citizens. Citizens need to get an idea of what the conversion costs, and also understand that it is necessary to change behavior. It will not work without a certain renunciation. With the second, the more difficult part of the energy transition, the intelligent networking of the sectors, the energy transition is now approaching much closer to the citizens. It influences,

Technologically, it is possible to free the energy system from fossil sources by 2050, especially at the high-tech location Germany. Everything is ready: the studies, the strategies, the facilities. The scientist association ESYS has formulated recommendations on how politics, business and society can achieve the goal.

According to ESYS, Germany has to increase the capacity of solar and wind turbines five to threefold, making synthetic fuels a pillar of the energy system, and introducing a CO2 price across all sectors. According to ESYS forecast, such a system conversion costs two percent of the gross domestic product annually. Currently this would be around 70 billion euros.

Depending on the scenario, spending will total between 2 and 3.4 trillion euros by 2050; other forecasts vary between 500 million and 2 trillion euros. Either way, the second part of the energy transition will be expensive and exhausting, a project as elaborate as reunification.