

BY NIKOLAUS PIPER

In early August, President Donald Trump was able to celebrate a small yet tangible success in his beloved trade war. The European Union and the United States had just signed an agreement on the import of American beef to Europe – one in which the EU committed to accepting up to 35,000 tons of hormone-free beef from American suppliers over the next seven years. As the total of EU imports is not allowed to exceed 45,000 tons per year, the agreement is basically a deal that will be carried out to the detriment of other supplier countries, such as Argentina and Uruguay. In the future, they will have a quota of only 10,000 tons.

Welcome to the brave new world of Trumpism. As seen from Brussels and Berlin, the agreement is the price they needed to pay for a kind of cease-fire in Trump's trade war against Europe. The president postponed the decision on whether he wants to levy new tariffs on European cars – that is, on German cars – until Nov. 13. Prior to that, the EU had also already pledged to promote the sale of American soybeans and liquefied natural gas (LNG).

Agreements such as these seem to confirm Trump's belief that trade wars are "good and easy to win," and thus that protectionism pays off. Either way, he appeared conciliatory at the latest G7 summit, where he said he did not need any tariffs on cars and that he was hoping for a good trade agreement.

In other words, Trump has actually achieved something with his policy of threats. The only question is how the citizens of the US actually benefit from this approach – at least beyond narrowly defined interest groups, such as cattle breeders. Indeed, it is ultimately American consumers who are going to bear the cost of tariffs by having to pay more for imported consumer goods. When trading partners defend themselves and retaliate against Trump, US industry also ends up suffering.

In this context, it can be instructive to look at the indirect consequences of these actions, that is, at the collateral damage associated with customs duties. The Kiel Institute for the World Economy recently presented a study in which experts pointed to the fact that today's industrial products are manufactured in long supply chains, which means that those primary products entering the chain at almost any point will now be subject to Chinese or US customs duties. This, in turn, has an effect especially on countries not involved.

Today, Canada has \$648 million in customs costs as a result of the Chinese-US trade war; Mexico has

\$522 million and the EU more than \$1 billion. The chemical, electrical and automotive industries are the sectors most affected.

However, the victims also include – and this might surprise Trump's trade policy experts – the US itself, which now has to pay \$415 million more for primary products. The damage is almost the same level as in China.

And this is just the short-term view of things. The long-term perspective makes everything even clearer. Economists at Germany's Commerzbank are now referring to a "new cold war" having broken out between the US and China. As

a consequence, US imports from the People's Republic have plummeted by 10 percent over the past three months, and China's imports from the US have fallen by as much as 20 percent.

In an ironic quirk of fate, America's current accounts deficit – which, in Trump's view, illustrates the US disadvantage in world trade – has continued to rise during his term in office. In fact, the US deficit in trade with China rose to \$420 billion last year, from \$375 billion in 2017. It has grown not *despite*, but *because* of his policies. Indeed, the uncertainty that Trump engenders tends to weaken the global

economy, which means that the EU and China – as trading partners – start to suffer; today, their currencies, the euro and the renminbi, are coming increasingly under pressure, the dollar is getting stronger and American exports are becoming more expensive.

The economists at Commerzbank argue that Trump's policy will also lead to a strengthening of the trend toward deregulation, which began with the 2008 financial crisis. Entrepreneurs are now rating the risks associated with doing business in foreign countries higher. As a result, the value chains become shorter and over-

all production less efficient. This, too, will ultimately harm the US economy.

However, the worst consequences of Trump's economic nationalism are political and strategic in nature. In a recent article in *Foreign Affairs*, US economists Chad P. Bown and Douglas A. Irwin accuse the president not only of being openly protectionist, but also of having launched an "attack on the global trading system." By overriding international trade rules, they argue, the government in Washington has damaged America's image in the world and encouraged others to follow suit.

In other words, the multilateral trade system that existed for 75 years under US leadership is now up for grabs. At this point, we can only guess what this means for America's position in the world.

Take, for example, the World Trade Organization. Founded in 1994 in Marrakesh with strong involvement from the US government under Bill Clinton, the WTO has played an important role ever since as a referee in trade disputes among its 164 member states. If one country believes that another has violated its rights through some form of tariff or trade restriction, it can file a lawsuit at the WTO, where arbitration tribunals ("panels") – made up of equal numbers of member representatives – decide on each case. If the verdict comes down in favor of the plaintiff country, then that country is permitted to raise tariffs to protect its economy, as long as the defendant government refuses to change its policy. So far, the US – as the world's largest trading nation – has effectively been the WTO's guarantor, while itself following the rules of the multilateral organization.

This system would seem to be pretty much over. The US is actively sabotaging the WTO by no longer appointing judges to the arbitration panels. The tribunals must be filled according to a fixed country key, which means that other countries are not permitted to intervene. This is why everything is likely to come to an end on Dec. 10, which is the last day in the tenure of the two judges Ujal Singh Bhatia (India) and Thomas R. Graham (US).

If the US does not submit the names of the new judges to which they are entitled to as part of these WTO tribunals – and no one is counting on this happening – then the tribunals will no longer be able to function. Trump even tweeted that the US might quit the WTO altogether.

The US president has been violating the spirit of the organization for a while now. In 2018 he justified the tariffs he imposed on steel and aluminum by referring to a supposed threat to national

security. While it is true that WTO rules allow trade to be restricted when the security of a country is threatened, the reasoning in the case of steel and aluminum was declared by many, including the Federation of German Industries (BDI), to be "absurd." In fact, roughly 70 percent of the steel and aluminum used in the US is actually produced in the US anyway. In other words, the duties were a purely arbitrary act.

The departure of the US from the WTO's disciplinary reach will no doubt trigger counter-reactions from trading partners, and these moves are going to be hard to calculate. Indeed, arbitrariness often produces its own unique dynamic. The *Süddeutsche Zeitung* recently reported on comprehensive plans coming out of Brussels with regard to a trade policy upgrade at the European Commission. According to this plan, the EU would be able to immediately impose punitive tariffs in the future, that is, without WTO approval. And they would be able to launch these punitive tariffs against states that obstruct the WTO arbitration courts.

It should be noted that the only such state at the moment is the US. In other words, Europe's most important partner to date has now become an opponent. Incoming European Commission President Ursula von der Leyen will have to decide whether these EU plans actually become a reality.

So far, Trump and his team have tended to underestimate the counter-reactions coming from foreign countries. In an interview with Fox News last year, one of Trump's radical protectionist economic advisers, Peter Navarro, said the following: "I do not believe there's any country in the world that wants to retaliate for the simple reason that we're the biggest and most lucrative market in the world."

This hubris has consequences. Of course, the victims of US protectionism – China, Mexico, Canada and the EU – have long since started fighting back, and by 2018 they themselves began charging tariffs on US agricultural products. As Bown and Irwin write in their article, those US tariffs designed to protect the jobs of 140,000 steel workers are now threatening the economic well-being of 3.2 million farmers.

Finally, it is quite possible that Trump's trade policy will end in a global recession. The only question is whether this happens before or after the 2020 elections in the US.

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Tired of winning

Who bears the consequences of President Trump's tariff policies?

Power rankings

Bill Gates is wrong. Nuclear power will not save the climate. Beyond Chernobyl and Fukushima, there's too much speaking against it

BY CHRISTOPH VON EICHHORN

Nuclear power? No, thank you! "That chapter is over," a spokesperson recently proclaimed. Nuclear power isn't even a topic anymore, she argued. And this spokesperson wasn't from some environmental organization or the like; she was representing RWE, one of three large corporations in Germany that still produces electricity from nuclear energy. The two other companies, EnBW and Eon, have issued similar sentiments, pointing to the fact that their priority is now the decommissioning

of nuclear power plants and the switch to renewable energies.

Just prior to those comments, members of Germany's industrial community had joined up with the WerteUnion – a group of conservative parliamentarians from the CDU – to suggest longer running times for the remaining German nuclear power plants. But this suggestion was greeted with a unanimous negative response from electricity corporations: the use of nuclear energy in Germany was over, they argued. Period.

In 2011, after the nuclear catastrophe at Japan's Fukushima Daiichi power plant, Germany decided to phase out nuclear energy production for good by

2022. With its clear pledge to abandon nuclear technology, the country has remained an exception on the international stage.

Today, nuclear energy is experiencing renewed momentum worldwide as a result of the climate change debate. In January, for example, in the journal *Science*, energy experts called for a "transformation in our thinking," arguing that it would be a serious mistake to shut down nuclear power plants, because it would lead to an even greater increase in climate-damaging greenhouse gas emissions. "We should preserve existing nuclear power plants and reimagine how new plants can be delivered."

One of the most prominent advocates of a nuclear renaissance is Bill Gates. Late last year, in an open letter to employees, the Microsoft founder wrote: "Nuclear is ideal for dealing with climate change, because it is the only carbon-free, scalable energy source that's available 24 hours a day." The problems associated with today's reactors, he argued, "can be solved through innovation."

For decades, the idea of being in favor of nuclear energy for environmental reasons would have seemed a contradiction in terms

to many people. In Germany, the environmental movement and the political party known as The Greens have their very roots in the resistance to nuclear power.

Today, however, the climate crisis is causing this united front to crumble. Groups like Environmental Progress and the Ökomodernisten (Ecomodernists) no longer see nuclear energy as an ecological evil, but as a climate-neutral solution to energy problems. These groups advertise nuclear energy vociferously on the internet and at public "Nuclear Pride" festivals.

Bill Gates has moved beyond the advertising phase. The Microsoft founder now owns a company called TerraPower, which performs research into novel nuclear reactors including the "wave reactor." Gates wants to invest \$1 billion of his own funds in this particular technology, while raising the same amount from private investors. He also wants to get state funding for the technology, if possible. According to the *Washington Post*, Gates even met with US Congressmen to convince them of the benefits of nuclear energy.

In the United States, the question of what to do with nuclear energy is particularly acute. Nuclear fission currently accounts for roughly 11 percent of global electricity, and for

around 20 percent in the United States. As the Union of Concerned Scientists (UCS) points out in a recent study, one in every three of the approximately 60 nuclear power plants in the US might have to be shut down in the next few years because they are either too old or are already losing money today.

According to the scientists, this would become a problem if the decommissioned capacities were replaced by fossil fuels such as coal and gas, which would increase greenhouse gas emissions. This scenario, however, is not guaranteed. Indeed, although the price of natural gas has fallen in recent years, due to booming shale gas mining, for example, the costs of photovoltaic and wind energy are also falling.

This decline in the price of renewables is seen as one of the major reasons why nuclear energy is less and less viable. Some states in the US, including Illinois, New Jersey and New York, have nonetheless subsidized unprofitable nuclear power plants in order to secure their operations.

This is by all means a daring investment. The UCS estimates that it takes an average of \$4 billion to make an unprofitable power plant profitable again. Equipping

nuclear reactors to continue running only 20 years longer than planned usually requires expensive modernization measures designed to keep the aging technology in good condition, says Frank Peter, co-head of the think tank Agora Energiewende. "These investments often make no economic sense."

UCS researchers advise against the construction of any new power plants due to the high investment costs. "The fundamental problem is the cost," says a recent report by the Massachusetts Institute of Technology on the future of nuclear energy. While technologies such as photovoltaics and wind power have consistently become cheaper, new nuclear power plants have become more expensive.

The MIT researchers calculated the costs of nuclear energy for several regions and came up with very clear results: In terms of the cost of generating energy, wind and photovoltaics always beat nuclear power. In order to make nuclear competitive again, there would have to be massive changes in the way the technology is developed and managed. To this end, the MIT experts suggest producing components on an assembly line and testing innovative new reactor prototypes in

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Petromelancholia and its discontents

Fossil fuels have driven prosperity, technology and politics but have also created dependencies as well as new possibilities for waging war and destruction

BY BENJAMIN STEININGER

In 1944, one year before the end of World War II, the Russian-Ukrainian biogeochemist Vladimir Ivanovich Vernadsky (1863–1945) published his final paper. The text, titled “Some Words on the Noosphere,” holds that science and technology have created a new, geohistorically significant layer: the noosphere. Although “knowledge is not a form of energy,” mankind has become the Earth’s “greatest geological power,” and the world war is evidence of this to a drastic degree.

Vernadsky’s diagnosis is being widely discussed in today’s political circles, wherein the climate crisis and biodiversity are but two catchwords. Geologists and cultural theorists speak of the “technosphere” and the “Anthropocene,” a new geological era that follows the Holocene and denotes the period beginning when human activities have first been determined to have had a noticeable and significant impact on the Earth. And it is clear that the industrial use of geohistorical energy in the form of coal, oil and gas has transformed humankind into a geohistorical force.

The ability to think in biogeochemical terms is thus no longer a privilege reserved for scholars such as Vernadsky. Today, CO₂ is much more than just a molecule studied by chemists; it is a symbol of the dire need for political decision-makers to think in terms of chemistry. After all, chemical processes in refineries and engines have defined the process of history in the modern age and will continue to resonate in our planet’s biogeochemical processes. Politics, science, industry and societies across the globe are facing the challenge of changing the course of history.

Historically speaking, this situation is new. Neither the taming of fire, nor Europe’s plundering of the Americas, nor the advent of industrialization nor the Manhattan Project were considered to have exceeded planetary boundaries. In those cases, we humans sought to achieve whatever appeared feasible to us. Today, however, it is vital that we rethink our actions, not because our resources are running dry, but because the consequences of the unrestrained burning of coal and oil will ultimately be fatal to us all.

We must act with urgency to combine development goals with climate goals. But we must also understand how we became what we are now. Since their initial use around 1800, fossil fuels have defined the standards of prosperity, technology and politics in ways both positive and negative. The outlawing of slavery and child labor was not only the triumph of ethical achievement and fundamental human rights; it was also a byproduct of engines and power stations obviating the benefits for such exploitative industries. On the other hand, energy derived



Coal comfort: Brown coal mining in Welzow in Brandenburg. The mine still produces 20 million tons per year.

from fossil fuels has created new and unhealthy dependencies as well as new ways of waging war and wreaking destruction.

We are only now beginning to recognize the explosive power – both literally and figuratively – of fossils fuels, their intrinsic importance for concepts such as growth and individual liberty, and thus also for the time after fossil energies. In recent years, a new discipline called “energy humanities” has emerged – most prominently from petroleum engineering centers such as Houston, Calgary and Edmonton, but also increasingly on the international stage – that seeks to examine the interplay between energy, society and history.

Much like in a system of communication tubes, all societies are interconnected in their way. Fossil-fuel pipelines form one such system. All raw material economies, including Canada, the Gulf States and Russia, are directly or indirectly linked to the producers and consumers associated with industrial and refinery economies in Europe and Asia. And we are going to need knowledge from all strands and facets of this system in order to develop the next, essentially sustainable system.

Fossil-based energy has the effect of technologically uniting various political, economic and social systems. Capitalist and communist societies, democracies and dictatorships as well as state-supported high culture and counterculture – they are all petromodern entities.

It’s not just America’s urban sprawl and its petrochemical sector’s penetration into all areas of life that falls under the petromodern umbrella. Model social democratic countries such as Norway, which invests the earnings it receives from

its state-owned oil and gas industry directly back into the welfare of its population, also constitute the petromodern mosaic, as do despotic regimes in the Persian Gulf, where oil and gas profits cripple all social progress, as they function merely to cement the unjust conditions so pervasive in these states.

In historical terms, all parties to World War II can be described as petromodern states. While Nazi Germany managed – through considerable technological effort and

What ingredients of the post-World War II economic upsurge should we discard and which post-fossil fuel energy path do we now embark upon? The answers to these questions will vary depending on the individual society or state. It would thus be fatal for Germany’s economy – and indeed for its image as an industry-based country – if it were to ignore the planet’s shifting climate parameters and continue to rely on the combustion engine to fuel its robust economy.

Cars are bigger than ever before, air travel is at an all-time high and the production of plastic has reached record levels

innovation – to use coal to extract liquid hydrocarbons for its ships, tanks and aircraft, this process proved insufficient to sustain the needs of its military. With the US and the Soviet Union – the two most prolific oil-exporting countries during the war – as its foes, Baku remained out of reach for the Nazi war machine.

The Soviet T-34 tank, with its diesel engine, was superior to its German counterpart, as was the 100-octane gasoline used by the US air force in comparison to Germany’s liquefied coal. And the United Kingdom, whose navy, even before World War I, had switched to petroleum, which it could source from a number of countries across the globe, was indeed a prime example of a petromodern empire.

How these same issues play out in the US will be of particular interest. It’s patently clear that the wasteful, resource-intensive lifestyle that has come to define modern-day living in the West has no future. But precisely as a reaction to this diagnosis, the idea of embracing a particularly lavish lifestyle is actually gaining traction.

Cars are bigger than ever before; air travel is at an all-time high; and the production of plastic has reached record levels. Stephanie LeMenager, an American literature professor at the University of California Santa Barbara, has described the current state of affairs as a psychological crisis, that is, as an acute case of separation anxiety from a beloved historical condition – “petromelancholia.”

All economies that are currently based on the sourcing, refining and consumption of fossil fuels are now going to have to critically address their practices and cultural habits that depend on petroleum. However, this process of self-examination often touches on national self-images and their continued propagation.

It can be valuable for a country to explore its history of energy production and consumption. Still, the sense of self-assurance that comes from being a petromodern state can be hard to let go of. The linking of East and West, which currently reflects the linking of the world of mineral and natural resources with that of their chemical and industrial processing, is anchored by oil and gas – and has been since Nobel’s first pipelines and oil tankers in Baku in the 19th century, and since Brezhnev’s gas contracts. Moreover, this bond is fortified by a number of far-from-insignificant other substances.

Fossil industries are chemical industries that require a multitude of chemical elements. Almost every element from Mendeleev’s periodic table has played a role in our tech-based economy. Accordingly, all development areas for these elements have played a role in the technological culture of the world.

It is likely that a number of the milestones achieved in the realm of chemistry in 19th-century Germany would have been impossible without certain resources provided by Russia. When Johann Wolfgang von Goethe’s friend Johann Wolfgang Döbereiner experimented with platinum in Weimar salons during the 1820s, thus advancing the chemistry of catalysis, the only way he was able to source those

precious metal from Colombia was through connections to the ruling house of Weimar, and then ultimately from the Urals via Maria Pavlovna, the wife of the crown prince of Russia.

Some decades later, around 1900, platinum became the key metal for the catalytic generation of sulfuric acid, a critical compound throughout the chemical industries. Platinum ultimately become on the most important catalysts in the fertilizer industry, in refineries and in petrochemistry.

Our global present, our fossil fuel-laden chemical modernity is characterized by the exchange of goods and resources between economies belonging to countries with widely varying self-images and narratives. Societies like Germany, which since the 19th century has cultivated its self-image as a country without natural resources – that is, as a country that must create all of its goods itself through chemical means, including beet sugar, artificial indigo dye, rubber, nylon and liquefied coal – can foster aspirations for the future of industrialism. Projects like the generation of artificial hydrocarbons from CO₂ and sustainable electricity point in this direction. Yet, sustainable development requires a shared perspective.

Knowledge exchange is of immense value on several levels. Of particular importance is the exchange of a variety of different political, economic and even geo-strategic experiences and perspectives, as well as the sharing of the lessons learned in victories and defeats. The gap of knowledge between the countries at the two ends of the pipeline is vast.

Our past treatment of resources should fuel the debate on the future of our resources. History reveals upheaval, and with it the possibility for change. Raw-material economies can develop into champions of high-end technology; yet, setting a faulty course can also inhibit development.

A joint departure into an uncertain future requires working together to build on our varying histories of experience and tradition to forge a new philosophy for advancing our planet. The Russian-speaking tradition holds particular potential for planetary “energy humanities.” Vladimir Ivanovich Vernadsky is already known in the West as a pioneer in Anthropocene theory as well as biogeochemistry, but he is also renowned for his historico-political forays into the geohistorical significance of science and technology. Vernadsky himself published his planetary discourses in several languages, and in so doing stimulated the advancement of science. This legacy must live on. ■

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Power rankings

huge “reactor parks” as quickly as possible. They even mention the idea of simplifying regulations for nuclear power plants.

Similar calls for costs savings in safety spending are coming from the Nuclear Energy Institute, a nuclear industry association that advocates replacing some external controls with “self-assessments.” They also recommend the merging of the highest safety category with the second highest, which would render the ratings virtually meaningless.

In this case, for example, the Pilgrim nuclear power plant, which has the second worst rating of all power plants in the US in terms of safety, would be placed in the top safety category. Also, at an average of 39 years, the host of US nuclear reactors happens to be one of the oldest in the world.

In the face of disasters such as those in Chernobyl and Fukushima, it is unlikely that the regimen of having lower safety standards and test sites for non-mature reactors will be able to be enforced in many countries. Even the standardization of reactors has not yet brought the savings many had hoped for. For example, European Pressurized Water Reactors are currently being built in Finland, France and the UK, and in all three cases, the costs and construction time have long since moved beyond the original scope.

Construction on the third unit of the nuclear power plant in the Finnish city of Olkiluoto has already taken 10 years longer than planned. According to calculations by Greenpeace, the British plant Hinkley Point C is set to cost €10.8 billion in subsidies over a period of 35 years.

There is one question above all that dominates the discussion, and it revolves around whether or not nuclear energy can even contribute to reducing greenhouse gas emissions. This issue has been investigated by the International Energy Agency, among others. In order to limit global warming to two degrees higher than pre-industrial levels by 2100, world emissions would have to drop from 37 billion tons today to less than five billion tons by 2050. And, according to the International Energy Agency (IEA), the largest share of this reduction – almost 40 percent – could come from improved energy efficiency.

One third of that could be covered by renewable energies, while in this scenario, nuclear power would account for five percent. That would involve a reduction of

more than one billion tons a year, but it would still not be enough to fundamentally shift the direction in climate policy. Indeed, in order to actually deliver on such a contribution, hundreds of new reactors would have to be built. “It would involve a gigantic nuclear dimension just to make a minimal contribution to the climate,” says Manfred Fischedick, energy expert at the Wuppertal Institute for Climate, Environment and Energy.

One of the questions that has received very little attention so far is how reliable nuclear power plants will be in a warmer world. In the drought-plagued summer of 2018, several reactors in Germany and France had to be shut down because the surrounding rivers had overheated. Plant operators were no longer allowed to feed in cooling water so as not to endanger the

already stressed ecosystems. This year, reactors were again disconnected from the grid in Europe as a result of heat waves.

All we can do now is hope for new reactors, such as the traveling wave reactor sponsored by Bill Gates. Similar to the very slow burn of a glowing cigar, this type of reactor would produce its own fuel and consume it for decades. As it would use old fuel rods from light-water reactors and depleted uranium, this reactor type would be able to eliminate high-level nuclear waste, for which there are still no good solutions – even seven decades after the beginning of the nuclear age. If this concept were to actually work, it would certainly be a blessing.

But we would be well-advised not to actually rely on this approach in our efforts to stop

global warming. The concept for this type of reactor dates back to the 1950s, and the basic foundations have yet to be fully researched. For example, nuclear engineers would have to deal with enormous amounts of material that is generated in reactions involving temperatures exceeding 500 degrees Celsius.

TerraPower is aiming for a prototype by the mid-2020s, and it would most likely take another 10 years to achieve a reactor that actually produces electricity. This is a very important timeframe – one in which we will have to have already shifted gears and set a course for a climate-neutral energy supply. ■

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