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

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

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, CO_2 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 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 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.

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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.

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 CO_2 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 geostrategic 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.

Benjamin Steininger is a fellow at the Max Planck Institute for the History of Science in Berlin.

continued from page 9

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 €108 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.

Christoph von Eichhorn is a science editor at the *Süddeutsche Zeitung*.