

Energy *and* Climate Change

BY LYRIC HUGHES HALE

*We are heading
toward the merger
of energy and
finance instead of the
substitution of one
energy for another.*

COP26 ended in overtime after more than two weeks in Glasgow. As with the Paris Agreement, a joint statement outlined measures to counter adverse climate effects, with no guarantee they will be more effective or enforceable than they were in 2015. For when we talk about climate change, we are really talking about energy. During the Covid recovery, rising energy costs have been the primary input stoking inflation, and they will in large part determine if current inflation is transitory.

Despite noble pronouncements of cooperation, we can reasonably expect that individual nations will continue to act in their own best interests when it comes to critical resources that allow their economies to grow and to prosper. The biggest emitters of greenhouse gases are the two largest developing economies, China and India. The targets they have set for themselves are distant in time, beyond the lifespans of many who attended COP26 except, perhaps, Greta Thunberg.

As Albert Bressand, energy expert at University College London, observes, “the same governments that fought hardest for the Glasgow Deal were at work the very next day to decrease the price of carbon-heavy oil and natural gas by increasing global supply.” The United States led the charge to release oil from the Strategic Petroleum Reserve, and asked China and others to do the same to tamp down prices.

While regulators met in Scotland, energy science and innovation have been moving ahead at a tremendous pace. Technology leaders Elon Musk, Jeff Bezos, and Richard Branson are turning their attention towards space, which is exactly where the climate crisis could be solved. Solar geoengineering, in which particles are released into the stratosphere to create shade from the sun and lower the Earth’s

Lyric Hughes Hale is Editor-in-Chief of EconVue and Director of Research at Hale Strategic in Chicago.

temperature, simulates the natural effect of an active volcano albeit with greater control.

Sadly, just as the World Health Organization, with a miniscule budget and no transnational enforcement authority, was unable to stop a pandemic, we should not expect institutions such as the United Nations to keep the environment safe for human habitation. They can best contribute through discussion, creating awareness, and by setting standards, but individual countries, regions, and private enterprise must take up the baton to keep energy both safe and affordable.

LEAVING OIL BEHIND

Where are we today compared to twenty years ago, when carbon dioxide emissions targets were more manageable? Eighty-one percent of global energy usage is still carbon based—the same as in 1999. Yet the bulk of alternative energy investments are in solar and wind technologies, instead of carbon mitigation and orphaned alternatives such as nuclear energy. As Albert Bressand explains, “The German case shows us how the Green movement can trap policy in a proverbial hamster cage: closing

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The new mantra is that carbon-based fuels and nuclear power are seen as existential threats, while solar, wind, and “clean” electric energy are unquestionably good. Full electrification is seen as the inevitable alternative. As described in this article from *Foreign Affairs*, “From today’s vantage point, no single domain offers greater opportunities for deep decarbonization than electric power.” The authors clarify:

The use of electricity does not increase or reduce emissions in itself ... Still, electrifying the economy—in other words, designing more processes to run on electricity rather than the direct combustion of fuels—is essential. This is because, compared with trying to reduce emissions in millions of places where they

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—L. Hale



China's President Xi Jinping

might occur, it is far easier and more efficient to reduce emissions at a modest number of power plants before distributing the clean electricity by wire.

—“*The Paths to Net Zero*” by Inês Azevedo, Michael R. Davidson, Jesse D. Jenkins, Valerie J. Karplus, and David G. Victor; *Foreign Affairs*, May/June 2020

From a strategic viewpoint, diversification might make more sense. Electric grids can be hacked, as can electric cars, and brought to a standstill. Unlike petroleum and other forms of stored carbon energy, electricity cannot travel very far. If we enter a period of slower growth and higher costs, we should be wary of creating fewer points of failure, be realistic about how long an energy transition will take, and realistically assess the hidden costs of all sources of energy over their entire life cycle.

The reality is that carbon-based fuel is not going to disappear anytime soon and, in some cases, is irreplaceable at our current level of technology. The aviation industry and the military are among the heaviest users of petroleum. Referencing a study in *Nature Energy*, *Vox* writer Umair Irfan explains: “Right now, some of the best lithium-ion batteries have a specific energy of 250 watt-hours per kilogram, which has already proved viable in cars. ... Jet fuel, by comparison, has a specific energy of 11,890 watt-hours per kilogram.”

In terms of tailwinds, the worldwide stock of military aircraft is twice that of commercial aircraft. Ships, tanks, and heavy equipment also require high-density fuel. Given current tensions, military budgets are unlikely to fall, and they are not accountable to regulators for energy usage or environmental impact.

TAKING THE ELECTRIC ROAD

Proponents of electric vehicles are certainly having their day. At the dawn of the automobile age, electric cars were

Three Takeaways from The Glasgow Climate Conference

We are past the stage of global warming being controversial. An increase in global surface temperature of 1.5°C is the new red line; currently we are at 1.1°C.

The Paris Agreement is working reasonably well with “net-zero by mid-century” as the widely shared goal.

Sadly, all this would have been excellent policy back in the 1990s. But with atmospheric concentration of carbon dioxide equivalent now above safe levels (350–400 ppm) at 413 ppm, we are already exposed to enormous risks. These include non-linear warming spirals that could spin out of control as the Earth evolves from a self-balancing to a self-warming climate regime. (See, for instance, mathematician René Thom’s Catastrophe Theory.)

I. LIMITATIONS OF THE CURRENT FRAMEWORK

The present institutional framework for climate action under the United Nations can only deliver about half of what is required. Green political correctness has locked us into running a marathon on one leg: carbon dioxide mitigation. We need a second leg: optimization of all available

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sources of energy. The German case shows us how the Green movement can trap policy in a proverbial hamster cage: closing German-built zero emission nuclear plants, while ignoring Russian Chernobyl-type plants still in operation. If mitigation is no longer the only game in town, then the politically correct crowd fears moral hazard and assumes that India and China will emit more. In fact, the same governments that fought hardest for the Glasgow Deal were at work the very next day to decrease the price of carbon-heavy oil and natural gas by increasing global supply.

III. INSTITUTIONAL GRIDLOCK

Glasgow is the good-looking offspring of Paris—but that shouldn’t blind us to what is wrong with the family’s DNA. Climate confabs have a tendency towards pass-the-buck, blame-the-other-guy, and show-me-the-money posturing that matters more to many countries than the future of, say, oceanic circulation.

The 2015 Paris Agreement and its progeny, NDCs or Nationally Determined Contributions, are themselves sons of the 2009 Copenhagen Accord when President Obama “saved the day” by lining up just twenty countries (not the European Union) around one core principle: national sovereignty. Ironically, despite aggressive lobbying of other countries by Obama, the U.S. pledge on emissions was the lowest of all.

What about the scientific community? The Intergovernmental Panel on Climate Change is an eminent group of earth scientists who wrongly assume that awareness of coming catastrophe will result in an appropriate response. As energy expert David Victor has remarked, the social sciences are foreign to them.

III. REALISTIC ALTERNATIVES

The time has come to look at the United Nations Framework Convention on Climate Change rocket and admit that it cannot reach orbiting altitude. It urgently needs boosters such as:

- Maintaining operation of safe nuclear power plants that political platforms have designated for closure.
- Walking the talk on CCUS (Carbon capture, utilization, and storage). Examples: the one-million truck project, and large-scale use of pyrolysis to keep natural gas flowing with very low carbon emissions.
- Launching one or several national or mini-lateral geoengineering research programs. In this case, literal rockets that could provide shade from the stratosphere.

—Albert Bressand,
Professor of Energy & International
Governance, University College London

stiff competition for Henry Ford, preferred in fact by his own wife, but the internal combustion engine prevailed. Now the auto industry appears to be going in reverse. GM has announced that they will produce only electric vehicles by 2036.

The strategic implications of electrifying the auto industry begin with sourcing for the manufacture of electric batteries, and end with their disposal. Half a million pounds of earth need to be moved to produce the minerals for a single electric car battery, according to Mark Mills of the Manhattan Institute. As we pivot from fossil fuel, where we have achieved energy independence, we

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open geopolitical fault lines by choosing to become dependent on rare earth minerals mined by strategic rivals such as China. China has invested enormous capital in projects such as cobalt mining in Congo, where conditions are harsh and sometimes politically unstable.

It is likely that we have these same resources here beneath our feet in North America. However, it takes decades to develop new mines that also impact the environment, which is why they were developed in China and Africa in the first place. Onshoring is not simple. Rio Tinto has announced it will invest \$2.4 billion to build Europe's biggest lithium mine in Serbia, but local opposition is growing, lengthening the time reach to full operation.

ALTERNATIVES: SOLAR GEOENGINEERING AND CARBON CAPTURE

Given these obstacles, what are the alternatives? Physics professor David Keith is leading the development of an interfaculty research initiative on solar geoengineering at Harvard. Shooting chemicals into the stratosphere to ward off global warming might sound like science fiction, but experiments are planned by SCoPeX—the Stratospheric Controlled Perturbation Experiment—to do just that in Sweden. If everything else fails, this is what might save us.

Keith also serves on the board of Carbon Engineering, a company in Western Canada that offers direct removal of carbon dioxide from the environment. Once captured,

the carbon must be solidified or stored. In this case, planned storage is underground, where it is estimated there is capacity in underground caverns for hundreds of years. The Interactive Worldmap on Geoengineering shows the impressive number of ongoing pilot projects around the world and gives a sense of the momentum in energy innovation.

GROWTH VERSUS THE ENVIRONMENT

When the Paris agreement was negotiated in 2015, the extent of the current pandemic was unimaginable. Recovery as measured by GDP growth has so far been disappointing, significantly hampered by energy cost hikes. Can we tackle climate change, an unprecedented energy transition, a global health crisis, and economic recovery all at the same time?

My colleague Robert Madsen, chief economist at Hale Strategic and an expert in the politics of global energy, says that tradeoffs between growth and the environment are inevitable.

Can the supply of clean energy expand fast enough to supply the requirements of marginal accretions to global GDP? If not, then the climate damage continues. If yes, then there will be a net decrease in the output of greenhouse gases. Technology and investment will determine how big, or small, the net progress is.

ENERGY INEQUALITY

Energy constraints will be even more challenging for developing countries with fewer resources and larger carbon footprints that are dependent on investors and financial institutions with new environmental, social, and governance mandates. The World Bank's Debt Service Suspension Initiative offered to seventy-three of the poorest countries affected by Covid is set to expire at the end of 2021. The World Bank's sister organization, the International Monetary Fund, has told Nigeria, one of the largest oil-producing countries, to end domestic gas subsidies by 2022, or lose funding. The unintended consequence could be greater inequality.

Not only poorer countries, but the poor everywhere could suffer from well-intentioned but misguided climate policies. Could a carbon tax help to cushion this outcome? Diego Känzig at London Business School has studied this dynamic and writes in his recent paper "The Unequal Consequences of Carbon Pricing" about a possible negative policy outcome:

I find that a tighter carbon pricing regime leads to a significant increase in energy prices, a persistent fall in emissions and an uptick in green innovation. This

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comes at the cost of a temporary fall in economic activity, which is not borne equally across society: poorer households lower their consumption significantly while richer households are less affected. Not only are the poor more exposed because of their higher energy share, they also experience a larger fall in their income.

INVESTING IN THE ENERGY FUTURE

Although carbon-based energy will be required for the indefinite future, some funds are now excluding any investment in carbon fuel technology, even to make it cleaner. This kind of virtue-signaling could result in a misallocation of capital, away from projects that could have a more immediate impact.

U.S. government policymakers are worried. Jigar Shah of the U.S. Department of Energy says the infrastructure of energy investment is not up to the task. The DOE's Energy Earthshots Initiative is meant to remedy this by targeting solutions to pressing problems. According to Shah, the sector that does the best job of investing in the energy transition so far is fintech. This should not be surprising, because cryptocurrencies such as Bitcoin and blockchain technology are dependent upon cheap energy.

Philip Verleger, in the Spring 2021 edition of *TIE*, makes an intriguing argument for an abrupt transition away from carbon energy to electrification, citing the sudden decline of railways in the twentieth century after the introduction of automobiles and airplanes. But perhaps this time is different in a different way, and we are headed towards a merger of energy and finance, instead of the substitution of one type of energy for another.

A NEW ENERGY STANDARD?

Cryptocurrencies, now criticized for energy consumption, could harness stranded electricity and flared natural

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gas worldwide, and in the process ignite new technological development. If the world's economy eventually runs even in part on cryptocurrencies, it is not impossible to imagine that electricity could be supplied for free on the back of processing fees, for example. The intersection of the worlds of energy and finance could intensify as we adopt currencies based upon an energy instead of a metallic standard, or trust in central banks. Nic Carter, a leading blockchain investor, writes:

Put shortly, bitcoin mining is converging with the energy sector with amazing rapidity, yielding an explosion of innovation that will both decarbonize bitcoin in the medium term, and will dramatically benefit increasingly renewable grids.

NOTHING SIMPLE

There is no single clean, cheap, simple solution for sourcing energy and limiting damage to the environment.

Taking care of the earth might involve leaving it, at least as far as the stratosphere. We should clean up carbon rather than eliminate it, and foster innovation wherever we find it, instead of betting that we can achieve elusive global standards and agreements in time.

Or we can just wait for an errant volcano to do the job for us. ◆