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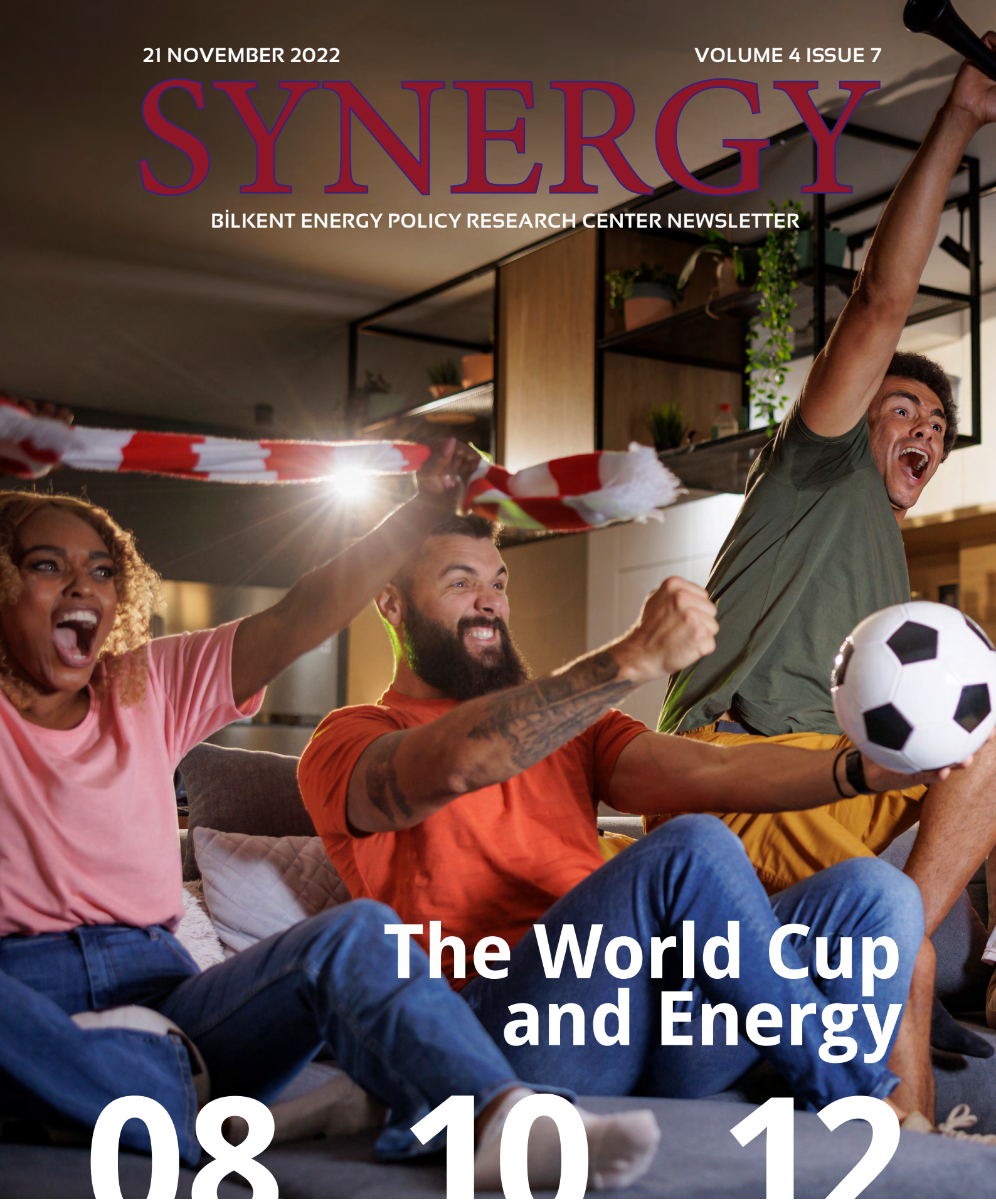
SYNERGY

BİLKENT ENERGY POLICY RESEARCH CENTER NEWSLETTER



The World Cup and Energy

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21 NOVEMBER 2022 **VOLUME 4 ISSUE 7**
#99

In This Issue...

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ABOUT US

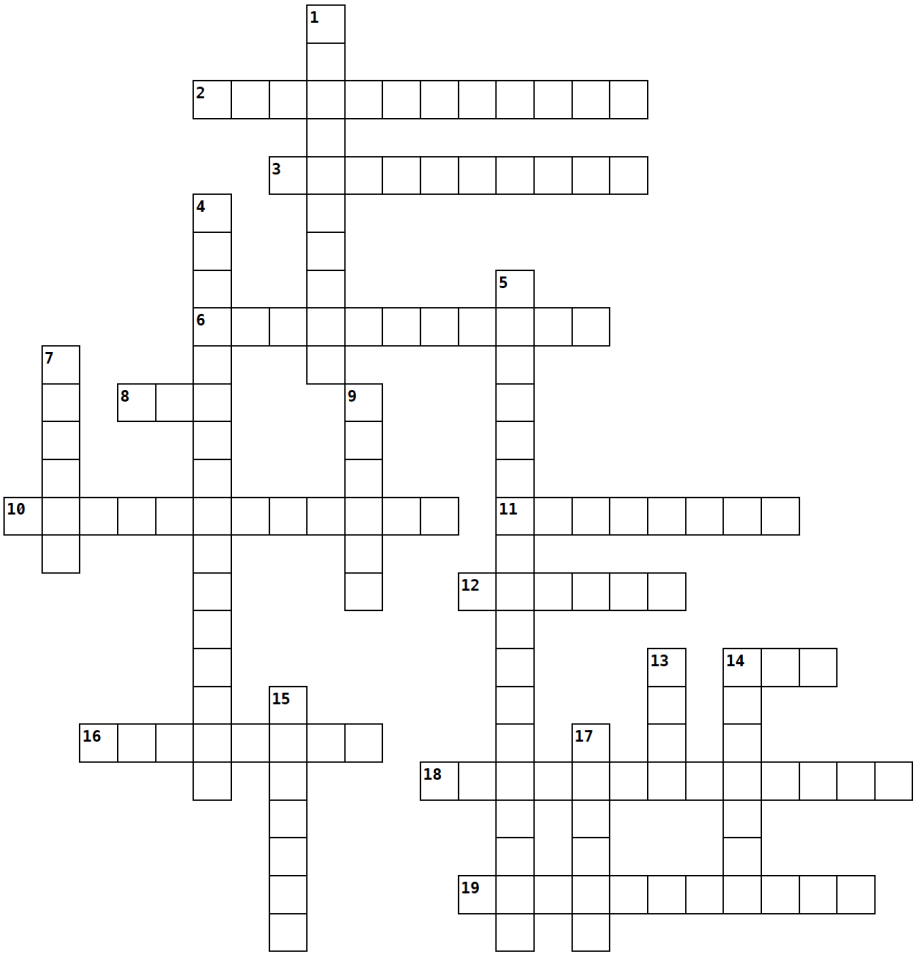
Energy Policy Research Center

Synergy is a weekly online newsletter published by volunteers on bilkenteprc.com. It welcomes feedback from readers. Please submit your letters to eeps@bilkent.edu.tr. The Editorial Board will review the letters and print them as space permits. The contents of this newsletter are the author's sole responsibility. They do not necessarily represent the views of the Bilkent Energy Policy Research Center or any of its Members.

BRENT OIL	85.47 $/BL	GASOLINE	21.35 ₺/LT
USD/TRY	18.63	DIESEL	24.97 ₺/LT
EUR/TRY	19.05	FUEL OIL	16.04

Weekly Puzzle

Prepared by Büşra Öztürk



Across

2. Inventor of the diesel engine, which designed the use of different fuels in the engine in order to reduce Germany's dependence on oil

3. One of the largest international oil giant companies

6. A term used in economics to describe the sustainable use and protection of the marine environment

8. A measure of the corrosiveness of the crude oil

10. The conversion of high voltage electricity at substations to lower voltages that can be distributed

11. One of the most common non-hydrocarbons in natural gas

12. One of the countries where TAP's route passes

14. A unit of measurement used to describe the concentration of something in water or soil and expressed as one in a million

16. A period of unusually hot weather that typically lasts two or more days

18. The name of the pipeline that transmits natural gas from the Shah Deniz gas field to Turkey and Georgia

19. A type of renewable source of energy produced by the surge of ocean waters during the rise and fall of tides

Down

1. The shield in the stratosphere that protects life on earth by filtering out harmful ultraviolet radiation from the sun

4. A term for balance between the amount of carbon dioxide removed from and released into the atmosphere

5. An international platform that broadly addresses the world's energy challenges

7. The country which has the highest valued currency due to selling oil with its currency

9. A non-profit organization funded by Elon Musk that hosts competitions to encourage the development of new and emerging carbon conversion technologies to help solve climate change

13. The abbreviation for Turkey's national oil company

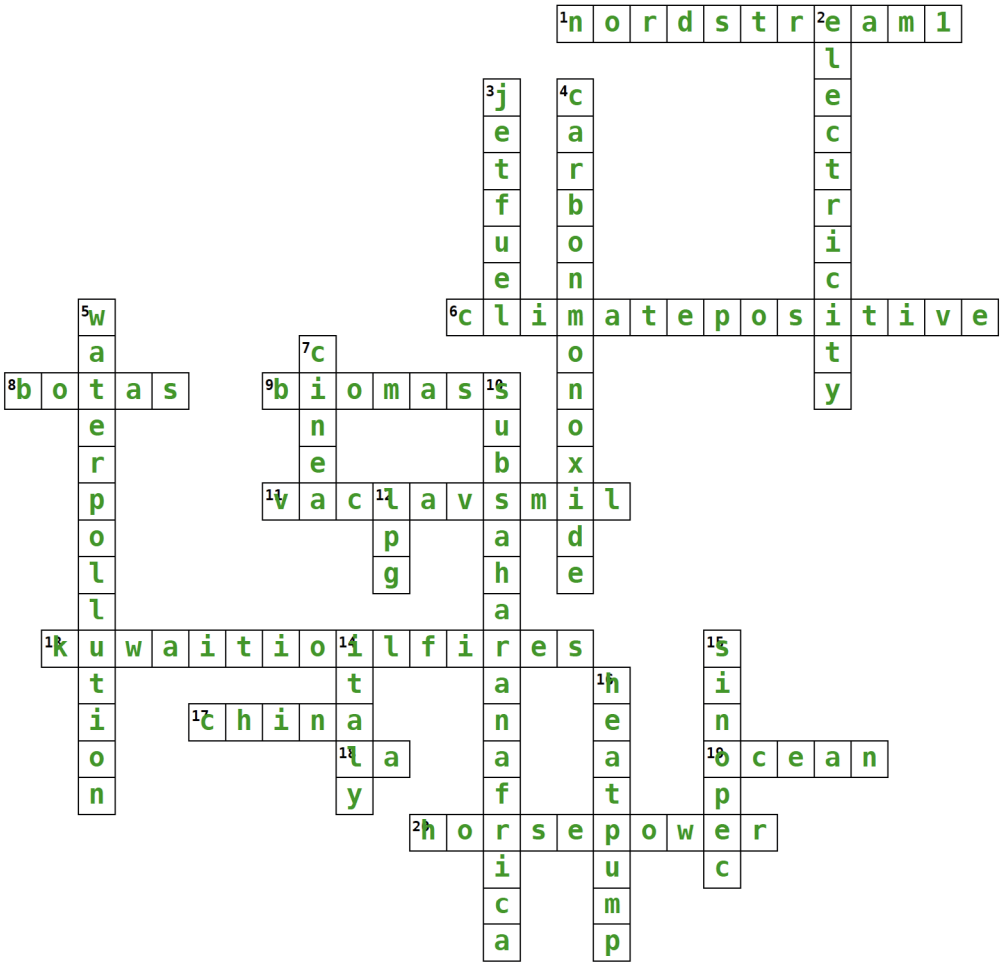
14. A final carbon-rich solid material that derives from oil refining and is used as a fuel source in power plants

15. A specification detailing how to demonstrate carbon neutrality produced and published by the British Standards Institution

17. The toxic gas leak caused by an accident at a pesticide factory in India is the name of the environmental event considered the world's biggest and number one industry disaster.

Previous Week's

Correct Answers



Across

1. The biggest pipeline that was used to transport natural gas between Russia and Europe via Germany

6. A term anointed for a business if the net result of its activities is a decrease in the amount of carbon in the atmosphere

8. The state-owned crude oil and natural gas pipelines and trading company in Turkey

9. One of the non-conventional energy sources

11. A distinguished professor who does interdisciplinary research in the fields of energy, environmental and population change, technical innovation, etc. and an author of numerous books steadily grown in influence

13. The environmental disaster which was started with the burning of oil wells during the Gulf War and described as the biggest fire and the most terrible atmospheric pollution ever initiated by the hand of man

17. The top producer country of solar energy

18. The symbol of one of the rare earth elements that is used in high performance batteries

19. A major carbon sink

20. A unit that refers to the power an engine produces

Down

2. One of the most commonly used forms of energy in the world

3. A product of oil refinery that is used in jet engines

4. A gas leaking from the stove that could poison people

5. An environmental issue that is led by pollutants released from industrial plants

7. The abbreviation of European Climate Infrastructure and Environment Executive Agency which manages programmes contributing to decarbonisation and sustainable growth

10. A region where more than half of people lack access to electricity

12. The abbreviation for liquefied petroleum gas which is used as a fuel in a range of applications including in heating and cooking

14. The arrival country where TAP transports natural gas to

15. One of the largest international oil giant companies

16. A device that carries the heat from the outside to the indoor environment by using electrical energy

The World Cup and Energy

Burak Yitgin

Although the 2022 FIFA World Cup in Qatar is advertised as a "carbon neutral" event, many civil society organizations, including Carbonwatch, have agreed that the World Cup is not actually "carbon neutral". Aside from the carbon neutrality of the event, another point to focus on is the demand impact on people as a whole.

Despite the fact that the warm fall and the resulting full storage levels have led to a decline in natural gas and electricity prices across Europe, it remains uncertain how a cold winter will affect prices. In Europe, we should not only discuss a crisis in the context of natural gas.

Falling river levels due to the drought in Europe, especially in the fall, affected some nuclear power plants and some coal-fired power plants that operated on coal transported over rivers. These factors increased the gas price sensitivity of European spot electricity prices. Here we see supply shocks arising from various reasons. On the other hand, we are also experiencing many demand shocks, especially heat/cold waves.

If we look at this situation for this December, we expect a colder winter than previous years in 2022, what would be the impact of the 2022 World Cup finals, which will be played during a possible cold weather wave?

According to National Grid's data, the instantaneous change in people's consumption habits was observed to have increased by 1400 MW during the half-time of the EURO2020 semi-final between England and Denmark in the United Kingdom alone, and by 2800 MW on the electricity grid after

the penalties of the 1990 England - Germany World Cup semi-final. Given the need for instantaneous balancing of electricity supply/demand, it is obvious how difficult this is to meet. For this reason, National Grid is known to make statements for similar moments from time to time.

The main reason for these spikes is that users change their consumption habits. Although the most well-known example is "kettle use", it is also known that the increase in water use in the home is primarily due to the increase in electricity from the water pump. This is not only a European phenomenon and not only in electricity. With the end of the 2018 Superbowl, it was observed that instant water demand rose by 20%. Although there is not yet a study on the electricity used by water pumps, the electricity consumption of water pumps is a known fact.

We know that the World Cup final will be played on December 18 at 20:00 Central European Time (CET), in other words, at peak demand time in Europe. Of course, all market stakeholders, especially system operators, will anticipate demand increases. The European Network of Transmission System Operators for Electricity (ENTSO-E) has already publicized in its Winter Outlook that it sees a qualification risk in France during the week of the World Cup final. On the other hand, no stakeholder knows how many minutes the match will be extended during a potential Germany - France final. We will see how instantaneously changing the consumption habits of millions of people will undermine supply security.

Great Divergence Between Modelling and Reality in Energy Supply-Demand

Barış Sanlı

Are numbers a sealed guarantee for arguments to be scientific? Are math and equations a predictor of the future, or is it an abstract language to communicate rational choices? Recently we are more into selling future energy supply-demand visions through numbers that can be confused as scientific facts. These are products of thousands of human assumptions; therefore, they are simulation instruments. On the other hand, science is not fact per se but a never-ending quest to find the truth. There are no full stops in science, even for gravity.

Climate models are atmospheric models, and global warming has a scientific and proven basis. There are several issues with radiance or other minute parts. But this is a physical phenomenon model, like 3D structural simulations. Energy supply-demand modeling is a different beast. Our subject is the latter model.

Recently we have seen a stall in the energy transition. The root problem is the way our world works. We have two realities, bits and atoms. Bits are the currency of electronically produced information of all sorts. Atoms are, on the other hand, the tangible and physical assets we encounter. You can change the design and test a wind turbine in a few days, but the new turbine manufacturing process and implementation will still take months. The only positive part of this energy transition is solar panels, but this is thanks to China's aggressive industrial and export policies. The world depends on China for solar panels much more than OPEC+ for oil.

The time multiplier between bits and atoms is, unfortunately, huge. For example, training people and engineers for new technologies will take years. A permit takes 4-10 years for clean energy technologies. The infrastructure takes up to 16 years in developed countries. But in a computer simulation, it is a matter of minutes. The solution is easy, integrating physical realities into simulations.

For example, creating digital twins is a good way to have more realistic numerical models. However, most of the energy future models, even the most famous peer-

reviewed ones, do not consider permitting times, standard requirements, time to train human beings, and financing issues in developing countries like the quadrupled cost of capital for new investments. These models look as if they first have the cart and try to find the horse.

Like social media acting as a medium for the rapid transmission of disinformation rather than the immediate broadcasting of the truth, the modeling world is more about ideas reflected as numbers than numbers reflecting reality. This is not wrong, and I am not against this. I have seen future scenarios on energy where academicians have no idea how an investment is made or why wind companies are suffering from major losses or a China scenario where clean energy manufacturing prices may rise.

This great divergence between modeling and reality is creating a pseudo-scientific debate about energy futures. These 1000 GWs of investments, those millions of EV cars, behavioral changes that can decrease energy consumption like 20%, water and electricity poor Africa exporting rich countries hydrogen with limited water resources are ideas, not science or reality. We need more of these ideas. But we should understand that these are not facts, the science of laws but ideas and imaginations decorated with numbers and equations.

We are dreamers. One theory says that our dreams are alternative scenarios our brains run when we disconnect from consciousness. Models are more about abstract realities constructed by numbers, and equations pushed into alternative scenarios. We have to dream and use our imagination to the end. But confusing this with reality is not the way to go.

Energy transition needs more technology, engineers, technicians, financing, and infrastructure than we can ever encounter. For models, this is a number tied to an equation fed by some assumptions. This is a long journey for the real world, requiring lots of experimentation, backlashes, and probably the greatest challenge we have seen. We are just scratching the surface.

An Outlook to the Externalities of the Energy Sector

Alperen Ahmet Koçsoy

The energy we use for heating our homes, manufacturing, and all other benefits also have some downsides that we might not be aware of. Climate change, environmental damage, human rights violations, and conflicts worldwide are some results that come together with energy production. They are called negative externalities in economic terms. The concept of externalities, developed by Arthur Cecil Pigou in the early 20th century, means that there are social costs of the production process that the supplier does not feel as a cost of production. Every part of society must bear these costs at the end of the day. We need to ask ourselves how to reduce these costs to a minimum.

The most known externalities are environmental damage and, subsequently, climate change. The excessive wealth created with the help of fossil fuels costs us global warming. Along with the environmental damage, it has enormous costs to humankind. The cost should not be thought of only from the perspective of "We should save our planet!" The cost we are talking about is also in economic terms. According to a University College London study, the world GDP in 2100 could be 37% lower than a world that does not suffer from climate change. The effects are not only long-term, as the yearly cost of a typical individual's CO2 emissions is estimated to be over $1300.

Energy production is also associated with social evils, as it sometimes fuels human rights violations and regional conflicts. The resource curse is a typical example of why resource-rich countries are prone to create authoritarian governments that can use their natural resources to be resilient to the costs of being authoritarian. Resource-rich countries can also use their economic leverage to create conflicts. The most recent example of that is the Russian invasion of Ukraine. There is certainly a reasonable argument that Europe's dependence on Russian gas contributed to the decision to the invasion.

These problems are not peculiar to fossil fuel production. Renewables can also be the reason for human rights abuses and regional conflicts. The dispute between Ethiopia, Egypt, and Sudan arises from the construction of The Great Ethiopian Rennaissance Dam (GERD) and the water security on the Nile River. Solar panels, an alternative to fossil fuels, need cobalt to become solar panels. Non-industrial cobalt mines in the Democratic Republic of Congo (DRC) are known for exploiting child labor, which should have been the case in the past centuries.

Social evils are not purely about morality. They also harm the economy, so they are negative externalities. What are we going to do to prevent these negative externalities? The answer is not to stop generating energy. The solution is more market regulation by national governments to correct

market failures. The textbook neoliberal economics started to fail to deliver solutions to emerging problems. This matter of fact was also contributed by Liz Truss's resignation, as her neoliberal ambitions had got backlashed, even by her party, the Conservatives. As the neoliberal global economy faces supply chain problems and geopolitical risks, there are enough imperatives to transform the current global economy to a more regulatory direction. Economists like Dani Rodrik argue that there are signs of a system change. Rodrik foresees a future global economic system following what he calls the New Productivism Paradigm, which is rooted in 'production, work, and localism instead of finance, consumerism, and globalism.' Although there are variations between the foresight of different economists, the world is heading towards prioritizing resiliency over efficiency.

This paradigm shift has implications for the energy sector too. Firstly, governments must design their economies to prevent negative externalities with gigantic long-term costs, such as the aforementioned CO2 cost. To be successful in that goal, long-term planning and state intervention are needed since the free market often fails to operate with negative externalities in mind. Energy efficiency is one of the state interventions that could work. For example, the European Commission targets utilizing energy efficiency of up to 13% by 2030. Another solution to tackle externalities from energy generation is to spend more from the national budgets on green energy investments. Secondly, building a more resilient energy economy is another goal that policymakers will have strong imperatives to achieve. As the Ukrainian War demonstrated, there is more need for reliable and diverse energy sources. Cheap gas from Russia was a lucrative incentive for European homes and industries, but relying too heavily on one energy source can create shocks.

However, there is a caveat to this story: the problem of social externalities such as human rights violations in raw material exporting countries. While energy supply security is at stake, it is hard to predict that the countries in desperate need of secure energy sources will focus more and more on the negative externalities of human rights violations.

To sum up, the global economy is moving away from neoliberalism and directing towards a more resilient and regulatory way. The trend is getting its power from solid imperatives to deal with externalities such as climate change and energy supply problems. Proper long-term planning and state intervention are necessary to tackle today's problems. Moreover, since it seems that today's problems will persist over the coming years –maybe decades– it is crucial to have consistent strategies to be more resilient and sustainable.

Power Outages in Cuba and Cooperation with Turkey

Yaren Öztürk

Power outages caused social unrest in Cuba last year and were targeted in various protests. Although a slight reduction in power cuts ended the protests for a while, the situation has worsened since May. As of May, power outages in the country have not decreased, and the duration of outages has been getting longer. It is reported that the blackouts affect the entire island and that most of the country experiences blackouts twice a day for between 4 and 6 hours. According to data from the Union Electrica de Cuba (UNE), there were power cuts on 29 out of 31 days in July, which continued similarly in August. The situation is no different in Havana, the capital of Cuba, a Caribbean country with a population of 11 million. Last month, a power outage at a local substation left most Havana's 15 municipalities in the dark for two hours. Locals complain that their lives are becoming increasingly complex, with power outages lasting more than 8 hours in some areas and up to 20 hours in others. The daily power outages are causing businesses to suffer economic losses and people to have difficulty in many basic things, from cooking and washing clothes to watching television and accessing the internet. The energy crisis, which has become one of the country's biggest problems, stands on a thin line in threat of becoming chronic.

Livan Arronte Cruz, former Minister of Energy and Mining, stated that solving the crisis is a complex issue and may take time. The minister said that malfunctions in Cuba's 20 ageing power plants, whose maintenance has been delayed due to lack of funds, combined with a fire in two generators this year worsened the situation. Those power outages could continue into next year. Cuba's existing power plants are, on average, 35 years old and have a backup system of hundreds of small generators at least 15 years old. Cuba imports more than 50% of its fuel from Venezuela. Power plants mostly burn heavy and corrosive local crude oil. Only 5% of electricity comes from renewable sources. This shows that investments in renewable energy in the country have not yielded any tangible results. Cuban officials say

increased sanctions imposed by the United States during the Trump administration and Biden's broken promise to roll back the sanctions, which are still primarily in place, have made it challenging to buy spare parts and fuel for power plants. The government, for its part, blames a lack of funds for its inability to replace the ageing grid and says breakdowns, not fuel shortages, are the leading cause of power outages. Analyst Jorge Piñon, director of the Latin American and Caribbean Energy Program at the University of Texas at Austin, said the Cuban government is unable to produce enough crude oil to run the island's power plants, and the country faces a growing energy deficit.

The Cuban government wants to find a solution to the ongoing energy crisis in the country before it becomes chronic. In the search for an answer, talks are said to have resumed with Karpowership, part of the Turkish energy company Karadeniz Holding, which designed and built the first fleet of floating power plants "Powership". The Cuban government has reportedly approached the Turkish company about doubling the megawatts it currently generates for the island from offshore ship generators. Cuba needs to generate more than 3,000 MW of electricity to meet its minimum electricity demand but currently can only generate between 2,000 MW and 2,500 MW. On the other hand, Karadeniz Holding presently has five vessels with a capacity of around 250 MW offshore Cuba. Negotiations between the Cuban government and the conglomerate date back to 2018. In October 2018, the holding signed an agreement with Cuba's state-affiliated electricity company Union Electrica de Cuba (UNE), to generate 110 MW of electricity with its three ships for 51 months. Two of these ships, Barış Bey and Esra Sultan, were commissioned in Port de Mariel in July 2019, while the vessel named Ela Sultan was commissioned in November 2019. In November 2019, the contract capacity was increased from 110 MW to 184 MW. It was stated that the Turkish company met 10 percent of the country's total electricity needs with three ships.

Last April, negotiations were held to increase the contracts' capacity and power, and former Cuban Energy and Mining Minister Livan Arronte Cruz announced that the number of ships would be increased. He said the new vessels would have a power of 15 MW. Officials believe that the Turkish company needs to add more to the fleet off Cuba to meet the island's energy needs and reduce power outages. In this context, if the deal becomes clearer, it could relieve Cuba, which the energy crisis has bogged down.

For over two years, Cubans have been coping with the severe consequences of the Covid-19 pandemic, US sanctions and a worsening economic situation. The economy of the communist-ruled country declined by 10.9% in 2020 due to the pandemic and recovered only 2% last year. In addition to power outages, people are struggling with access to medicine and food, fuel shortages and the gradual decline of public transportation. They are left with long queues and high prices to meet their basic needs. Also, following Hurricane Ian at the end of September, Cuba's power grid collapsed, sparking massive protests across Havana. Since then, there have been numerous protests in towns and cities where blackouts have persisted and even worsened. Last month, the government decided to replace Arronte with Vicente de la O Levy as minister of energy and mining. While the country is dealing with many problems, it is not possible to say when the power cuts will end. At this point, the negotiations with Karadeniz Holding and the agreement's details may be instructive.

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