6 DECEMBER 2021

VOLUME 3 ISSUE 8

SYNERGY

BİLKENT ENERGY POLICY RESEARCH CENTER NEWSLETTER

New Era in Germany

SYNERGY
6 DECEMBER 2021 **VOLUME 3 ISSUE 8**
#69

In This Issue...

BRENT OIL	71.44 $/BL	GASOLINE	9.63 ₺/LT
USD/TRY	13.78	DIESEL	9.44 ₺/LT
EUR/TRY	15.57	FUEL OIL	8.88

EDITOR:
GÖKBERK BİLGİN
CONTACT: gokberk.bilgin@bilkent.edu.tr

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.

Energy Security 3.0:
Has Anything Really Changed?

Barış Sanlı

Many definitions can be made about energy security. But probably the shortest and most revealing would be the "temporal and spatial control over energy". The concept of security and the word security can be thought of not only threats in English or Turkish, but also as a resilience and ability to respond to all kinds of threats to come. Therefore, the threat is uncertain. In short, "whatever", preserving the original state of the system would be a logical but questionable description.

According to the definition above, "Is energy security already established?" the answer will always be ambiguous. Because the threat or many events that would disrupt the original stability of the system did not occur. This is even more visible in the electricity sector where there is no storage. The “perfect” interruptions caused by Egyptian Vultures in Turkey's first 420 kW lines are one of the interesting events that have been the subject of academic publications.

But everything is not so uncertain. It is an engineer's approach to consider the scientific projection of uncertainty as probability and to use probabilistic methods. We can think that probabilistic approaches with methods such as advanced computer technology and artificial intelligence will go a long way with big data. Looking at current technical advances, greater progress is expected in the next 10 years than in the past 100 years. This will also have some consequences.

How did the concept of energy security take shape in the past?

Energy security can be divided into three periods. If we could give a keyword to each of these periods:
1. First period: Diversification
2. Second period: Institutionalization
3. Third period: Foresight

When we consider these three periods together, foresight can already be seen as the most important part of all processes. Likewise, diversification and institutionalization. But as of the periods, there are parts where some things come to the fore, while others lose their importance. Finally, energy is a necessity of human and machine activity. It contains all the methods that humans use to survive.

In the first period, as Daniel Yergin pointed out with reference to Churchill, “variety”, diversification is the main argument. Speaking of diversification, Churchill's switching of ships from coal to oil in England, one of the world's most important coal producing countries, was applauded today, but it was an irrational act at the time. Because coal is right next to it, at any time and under its control. But oil comes from Iran and other geographies.

So why did Churchill do this? For one reason, speed. British ships that switched to oil were gaining speed advantage over German ships. Of course, there were additional benefits such as coal storage and boiler burning. So was it cost effective or cheap? No way.

We can find a projection of this in bringing natural gas to Turkey from Russia. In fact, if it is considered as a cost, instead of a system that would be cheaper if wood was burned, a rapid transition was made to another energy source, where the cleanliness and comfort of the cities were considered. We see the same emphasis on diversification in Turkey's natural gas development. When we look at the whole process, marketing future energy transformations as "cheap" creates obstacles in terms of social acceptance.

In the second period, we can bring it up to the European Coal and Steel Union, perhaps from the European Coal and Steel Union, to OPEC, IEA, IRENA, and perhaps in the last part, the European Union's "Energy Union" idea. So why did I name a special period in energy security as institutionalization? Because diversification brought a geographical dispersion, and this event started to touch many people with similar concerns. Some of them are producers (OPEC, GECF), some are consumers (IEA) and some are mixtures of them (IRENA, IEF etc.).

The main concern during this period is coordination. In institutionalization, it is essential to eliminate the information asymmetry by keeping the records of the knowledge, experience and lessons produced by humanity. Institutions that do not generally publish (which is gradual: statistical reports, plans, reports of lessons learned) cannot become institutionalized. For this reason, institutions such as the IEA and OPEC have monthly reports that affect the markets. Now the energy sector is huge and information is so fluid. It has to be somehow guided by the exchange of information.

The last period is the “Foresight” period, which started a little later in the 2010s. In many developing countries, institutions are looked upon as gods, i.e. they are tools that can prevent events and make history-altering movements. However, by nature, institutions work ex-post, that is, from behind and act with a foresight. There is a misconception that if there were the "right people" in these institutions, the institutions could have already made the right interventions. I call this the “plane crash paradigm”.

In the plane crash paradigm, we can solve that plane by approaching that if the pilot wasn't there, if he wasn't the tower personnel, the accident wouldn't have happened, then the culprit is the pilot or the tower attendant. This is convenience. Advanced methods look for "systemic offenders" rather than "human offenders". Because institutions that seek criminals do not see the structural

problems and they think that everything will work very well when the "troubled person" leaves the system. However, this is a precursor to larger problems. A choice is required between short-term human blame and long-term systems design. For this reason, the last part of the "plane crash documentaries" describes the redesign of the processes and the establishment of structures that the system prevents even if that person makes that mistake.

Likewise, until the 2010s, the energy system was seen as a structure that resisted cyber-attacks and blackouts, and in a way repelled these threats with bullets. But we see that this arrogance has left its place to a modesty. In other words, we are entering a period where the system may somehow move away from its original balance, but how it will return to this balance is the basis of the security phenomenon. For this, it will be useful to look at the development in electricity. Because almost all of the net zero policies predict that half of the total consumption, that is, our future, will be electricity in 2050.

Canay Özden Schilling's book "The Current Economy Electricity Markets and Techno-Economics", in which she describes the electricity market development through the eyes of an anthropologist, has a different approach to the phases of the electricity market. From biological systems comes a stability approach to an engineering system. Fred C. Schweppe's "Homeostatic Utility Control", whose name we hardly pronounce, is perhaps a further definition of today's smart grid. Because basically we are trying to stabilize this steel and electron mass like a biological system.

Then, with a political intervention in the system, marketization efforts began. In fact, many things were not invented from scratch, although many theories have been available since the 1950s, it was uncertain whether this would apply to the electrical industry. A mechanical price formation actually misleads many people. The price naturally does not occur as designed in the electricity markets. The main thing is that thousands of handovers and transactions are uncontrolled.

For this reason, many people may think that they understand the pricing issue when they model the electricity market. For this reason, it can be recommended to try the oil price with similar models. Because oil prices are not determined by a regulation or regulation. In this field, which is completely determined by human and machine movements, we can only talk about approaches with financial movements that are getting complicated. For example, issues such as the effects of gamma in options on oil price movements can also be a serious determinant in price formation.
Finally, the electrical system models that were tried to be set up digitally with Excel spreadsheets, then the software,

have evolved to a different point with the emphasis on "optimization". At this stage, which is called optimization in Turkish, whole system optimization was one of the most important goals. But it is important to combine optimization and the numerical shadow of physical reality on a macro-large scale.

Creating digital twins, which has been talked about for a long time, will also apply to the grid and the entire energy system. In fact, while the grid and energy system were modeled as digital flows in the 2000s, a world in which physical assets will be digitally twinned to cable connections due to effects such as wind and weather should not be seen far away in the upcoming period. As image quality improves with satellite technology, it may not be difficult to deal with the already existing topography data, perhaps with a few special flights.

That is, the concept of foresight goes beyond moving complex models beyond time t with the model. Maybe we can divide the new shaping of the concept of foresight into four main headings:

1. Recognizing that threatening events will increase (modest)
2. Advanced and second-to-second weather observation and local scale forecasting
3. Commissioning of new topology and automation-artificial intelligence systems for system balance
4. Reducing the recovery time from full collapse

Because the share of electricity in total energy will increase even more. So our life will become more dependent on electricity. Storage is transformative. But the "storage problems will end" approach will also take time. In fact, storage solves the most fundamental problem in energy security: Spatial and temporal control. For this reason, storage is vital in all energy sources. We are following the natural gas levels in Europe this winter, 5 major countries tried to respond to the rising oil prices by removing products from their stocks.

But the cyber security of storage systems will also be important, malicious control of these network tools, which have rapid spikes and decreases, can crash systems very quickly. Maybe it will be part of the subscription like storage, microcontroller structures, counter. But this still doesn't solve the whole system security issue.

Instead of the conclusion:

In a good article, it is essential that the discussion continues in the mind of the reader when the article is finished. But it may be necessary not to exaggerate. In energy security, artificial intelligence, cyber security, extreme weather events will be important agenda items with their positive or negative effects. Creating pools of ideas from today rather than waiting for the future will enrich the discussions. This article is also a contribution to this pool.

New Era in Germany

Ali Berk Bilir

On December 6, Germany's Olaf Scholz of Social Democratic Party (SDP) will swear as new Chancellor and effectively end Merkel and her Christian Democratic Union of Germany (CDU)'s 16 years of rule. Coalition governments are a norm in German politics. Olaf Scholz's government is not an exception to that norm, as his government will be a coalition government made up of SDP, Greens, and liberal Free Democrats. The prospective government parties agreed on a treaty and announced it as a guide to their policies. The agreement consists of ambitious economic, foreign, civil, climate and energy policies and will likely affect all over Europe and possibly the globe.

During the election process, climate and energy were two of the crucial topics that parties and the public focused on. Even so that, Greens, whose main platform is based on environment and climate, enjoyed a high poll record until CDU and SDP struck back. After the election, where SDP came as the leading party with a narrow margin, energy and climate issues were significant topics to make or break coalition talks between parties. Two months after the election, a coalition agreement was announced named "Daring more progress-Alliance for Freedom, Justice, and Sustainability." The agreement has strong climate and energy goals. The agreement foresees reforms and policy changes in renewable energies, natural gas, CO_2 pricing, negative emissions, industry, and so on. The coalition predicts to phase out coal by 2030, 8 years before the previous plan. Accordingly, natural gas is viewed as a bridge during the transition process. They also support an increasing CO_2 price along with support for low-income households. Regardless, gas prices are already high due to every crisis. Therefore, the agreement mentions that there will be no increase in CO_2 price on heating and transport fuel. The coalition also aims to power 80% of the electricity grid with renewables within ten years. Furthermore, the deal proposes phasing out gas for power by 2040.

Additionally, the coalition promises to reform the federal Climate Action Law in 2022 and implement an immediate action program for climate protection. Accordingly, ministries are now required to check its law proposal's effect on climate impact and its compatibility with the national climate targets. This shows the government's seriousness to institutionalize pro-climate policies. I believe it is further enhanced that the new government establishes

a new climate and Economy Ministry, which will be headed by Green's Robert Habeck, who is also the co-chair of the Green party. Furthermore, the coalition aims to develop an industrial strategy that prevents carbon leakage. There are also proposed changes and aims in many other areas, such as reaching electrolysis capacity of 10 gigawatts by 2030 or sustainable mobility transition that makes Germany a lead market for e-mobility.

More can be written for the agreement's climate and energy focus and aims as it basically includes every sector and even day-to-day issues. However, the coalition agreement has bigger implications. Germany is the biggest economy in Europe and the 4th bigger in the world. Also, it is one of the, if not the most, important actors in the European Union. COP26 was not a huge success for climate politics. The new German government's commitment and its reform promises seem revolutionary. Germany also has the means to influence European politics and institutions. For example, the coalition aims to push for an EU-wide carbon floor price under the energy trading system (ETS). Moreover, the government will support the creation of a European Union for green hydrogen and initiate an International Climate Club with a uniform CO_2 minimum price and a common carbon border adjustment.

The EU and Germany themselves face energy insecurity, especially this winter as gas prices skyrocketed and Russia leveraged its natural resources to deal with the EU countries. Regardless, the coalition agreement does not mention Nord Stream 2, ultimately increasing Germany's dependence on Russia and Russian influence. However, the coalition is critical towards Russia on the topics of Belarus and Ukraine which Russia's aims alarmed many in the West. Being critical towards Russia and promises of "pushing back" against authoritarian developments needs to be conducted carefully if the new German government does not want to alienate Russia, which the Merkel Government was very careful in its dealing. On the other hand, the promises and aims on the energy and climate policies would decrease Germany's dependence on fossil fuel, and apart from helping the Globe in its struggle against climate change, it would also strengthen Germany's energy security.

Constructing the Future: NEOM

Erkin Sancarbaba

When the Vision 2030 program of Saudi Arabia was announced on April 25, 2016, the comprehensive plan delivered a clear message about the country's future expectations. With its growing economy and increasing population, the Vision sets comprehensible targets to Saudi Arabia such as reducing dependency on oil revenues, creating alternative energy sources, promoting infrastructural investments, and revising health and education systems. As a major actor of the Vision, the futuristic NEOM giga-city project is planning to gather the aforementioned goals under a single roof. The relatively new and ambitious leadership of the Kingdom expresses determination about building a regional attraction center that has high potential to become the new financial and hi-tech hub of the Middle East region. The giant project represents the investment model that revises and transforms investors' line of business. Furthermore, the construction plan has the potential to reveal the evolution process of a country that is highly reliant on its oil revenues into an ecosystem that is environment-friendly and self-sufficient.

As the largest exporter of crude oil, Saudi Arabia's plan to construct a sustainable giga-city that is fully energized by renewable energy sources can be inspirational for other energy producer countries. The $500 billion worth of giga-city plan that is part of the country's 2030 vision is not only about building a sustainable ecosystem. The plan represents a model in which fossil fuel revenues fund sustainability at last. The aforementioned model cannot be implemented without the support of the new Saudi leadership and local investors alongside international investors of course. The Saudi Arabian Public Investment Fund, which operates $500 billion and has shareholders such as SABIC and Saudi Aramco, is the leading financier of the project. Furthermore, the contribution of the money flow which is the result of the Aramco IPO cannot be underestimated. After the actualization of the project, the world will be witnessed to an investment that is funded by a group of companies including oil giants, and fully energized by renewable energy sources same time.

As highlighted, the project NEOM promises a giga-city that meets its energy requirements from renewable sources only. The giga-project targets to save three million tons of CO_2 per year which equals the emissions of 700.000 automobiles. By using solar, wind, and hydrogen-based power generation, the main purpose is to provide clean

and pollution-free urban environments. These green energy production methods have the potential to evolve production and manufacturing back into the community in a zero-emission, carbon-positive ecosystem. As a part of the project, Saudi Arabia predicts to generate more than 10 GW of energy per year from renewable sources such as solar and wind. The aforementioned production capacity means replacing about burned power of 80.000 barrels per day with green energy. This kind of energy production capacity has a crucial role not only in meeting the energy requirement of the giga-city but also in supplying energy to surrounding settlement areas.

Furthermore, the futuristic city project aims to become one of the world's pathbreaking hubs for green hydrogen as well. The planners of NEOM's green hydrogen plant estimate that the construction of the production units will start in the first half of 2022. The plant will have the capacity of producing produce 650 tons of carbon-free hydrogen per day and 1.2 million tons of green ammonia per year, which can potentially reduce carbon dioxide emissions by the equivalent of 3 million tons per year. In the current state, that kind of investment constitutes a unique example and positions the country in a highly strategic position in the sector and the region. As a country that has targets to achieve the positive separation in the region, the aforementioned investment opportunity can be an accelerator effect.

All in all, the 2030 vision of the Saudi Arabia and the NEOM project represents an alternative future for the country and its people. The project that is planned to be constructed under Vision 2030 has the potential to overcome the country's main and upcoming challenges which can be defined as becoming sustainable and self-sufficient. In this direction, maintaining the determination of the aimful leadership of the country is crucial, just as continuous local and international investments. On the other hand, the fate of the giga-projects which are within the scope of comprehensive Vision is directly related to the country's image on public opinion. The human rights violations, direct interventions to the freedom of the press, and deficiency on the rule of law are just the some of factors that directly threats the future of the initiative. In short, the NEOM centers around the vital challenges of Saudi Arabia, and it should be implemented as a part of national policies towards the future of the country.

Carbon Pricing: Why Does It Work In Theory But Not Reality?

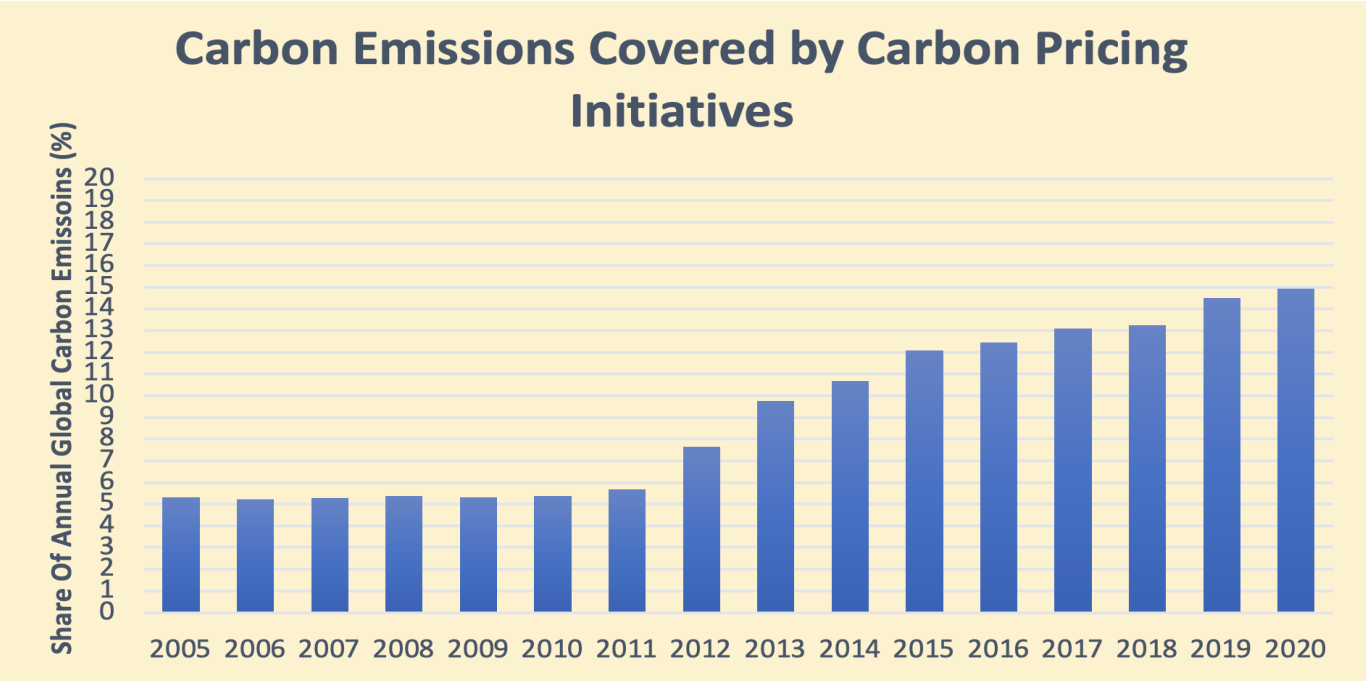
Büşra Öztürk

As the awareness of global warming has been growing, new solutions have begun to be sought, and new ideas have been put forward to slow climate change. The most common solutions were expanding the use of renewable energy, electric vehicles, and increasing recycling products, etc. Almost all these solutions have for the same purpose; reaching Net-Zero Emission by 2050. Since the aim is lowering carbon dioxide emissions, the economists came with the idea of putting a price on greenhouse gases. In this writing, we will try to understand the theory behind the pricing of CO_2 and discuss whether it works efficiently or not.

Carbon pricing is a kind of environmental pollution recompense. It mainly aims to demotivate the polluters who cause highly CO_2 emissions in the industry and transportation by charging them. In other words, it will no longer be free to pollute the air. Carbon pricing can be imposed in one of two ways: as a tax or as an emission trading system. A carbon tax is implemented on all goods and services that result in carbon emissions during production, and the tax impacts all consumers and producers. The carbon price in an emission trading system is issued for manufacturers that are required to get licenses in order to emit carbon. A maximum level of pollution has been settled, and a trading mechanism determines how much these licenses cost. As emissions approach the maximum level, the cost of a license rises.

The concept of placing tax for the emission of carbon is not a new policy, it has been implemented at the start of the 1990s in Scandinavian countries. However, there was no considerable amount on the carbon emissions. After approximately two decades later, in 2005, it has been debated across the EU countries and adopted. Then, it was subsequently implemented or scheduled by some other countries. According to Earth.Org reports, there are currently 27 countries with carbon pricing implemented. Turkey is one of the countries which have been considering implementing an emission trading system. The Minister of Environment and Urbanization of Turkey declared the deployment of a national emission trading system on February 17, 2021, although the exact start date is still unknown.

The fundamental purpose of carbon pricing is canalizing the manufacturers and businesses to environmentally friendly energy sources rather than using fuel derivatives. We may think of this situation as a traffic jam in a street. If there are too many cars on the single way, the traffic would be unsustainable to arrive at the destination. As a solution,



Source: World Bank

some drivers may find another route or come up with a different mode of transportation. In this respect, a similar effect was expected on polluters as on drivers here. In theoretically, bringing a carbon tariff would be a dissuasive action for the polluters and lower the climate change effects. Putting a price on emitted greenhouse gases could be the best cost-effective way to reduce them. However, it has been found disappointingly counterproductive in recent years.

In the graph above, the global greenhouse emissions covered by carbon pricing between 2005-2020 is demonstrated. The total coverage for CO_2 emissions has been increased thanks to the implementation from 5% percent to approximately 15% percent. However, affecting less than 15% percent of total greenhouse gas emissions is insufficient when the Net-Zero Emission by 2030 goal has been considered.

The first reason that inquires the efficiency of the carbon pricing is the fact that the demand for fuels is not changed regarding the price. Although how much the cost is increased, people still have to drive to work. Carbon pricing, in this political sense, would serve to further divide the country. These initiatives do not fall solely on the shoulders of those who can afford them. The rich ones would find the ways around them. However, the policy and the pay may be a burden for the middle class. It does not change the consumption due to compulsories, but the cost of consumption increments.

Secondly, the rise in pricing has generally been seen so punishing for small businesses. While small businesses are rigorously suffering from dealing with taxes, the bigger businesses could change their manufacturing regions to the countries where there is no implementation of carbon pricing. You may consider thinking of big brands that manufacturers their products in unexpected countries. It causes that while some countries are satisfied with having part-owner of decreasing greenhouse emissions, other countries are could be found responsible for emissions. However, actions in decreasing emissions should be taken internationally.

All in all, carbon pricing encourages investments in clean energy until it becomes political suicide. However, the main point, clean energy should be able to compete on an equal footing with fossil fuels. If not, in my opinion, we should continue to do scientific research in order to make renewable energy affordable without relying on carbon pricing.

Energy
Policy
Research
Center

bilkenteprc.com