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Should We Expect A Battery Revolution?

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BRENT OIL	51.31 $/BL	GASOLINE	7.27 ₺/LT
USD/TRY	7.41	DIESEL	6.63 ₺/LT
EUR/TRY	9.05	FUEL OIL	4.32 ₺

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Energy Policy Research Center

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Should We Expect a Battery Revolution?

Barış Sanlı

When moving forward into 2021, we are all interested in new revolutionary technologies. There may be perovskite solar panels with high efficiencies, or there may be new revolutionary batteries. They are all welcomed to the age of clean energy transition. QuantumScape's latest lithium solid-state battery is one interesting example.

The memories of Envia's failure and fraud are still fresh in my memories. As a Bay Area startup, they promised a 400 W/kg battery for 125$/kW in 2012. Later on, there were lots of disputes about it, and Envia has collapsed.

Solyndra manufacturer of solar cells, has also lost more than 500 million $s of US government loan and bankrupted in 2011. It was said that they couldn't compete with cheap Chinese PV manufacturing. But there were also disputes about their promises and numbers. Therefore it took a long time to trust new startups with revolutionary technologies. There was also an academic side to this. In solar, for example, you hear about record efficiencies. But most of these papers rarely mention durability and stability.

But what is the big energy revolution after all this R&D for clean energy technologies? Tesla's latest investor presentation has some tips about what to expect from a revolution. In battery chemistry, it is not easy to make giant leaps. Rather you either tune the materials or the processes. Tesla seems to do both. They have incremental progress in battery technology. But their biggest leap comes from battery manufacturing.

While thinking about an incremental revolution on the battery side, OxfordPV breaks the news for efficient solar cells. Their claim is bold, "35 kg of perovskite generates the same amount of power as 7 tons of silicon". Using them with silicon can give us a theoretical efficiency limit of 43%. Can we spray our energy generators? With perovskites, this looks possible.

We can also hardly forget about Nikola Motors, an electric and hydrogen fuel cell truck company. A report titled "dozens of lies" accused the company of fraud and resulted in its CEO Trevor Milton's resignation. A January 2018 video of Nikola's semi-truck in motion was a fraud. It was just a non-working prototype rolled down a hill. The company is still valuable, but the damage has been done.

Here come QuantumScape's claims that quadruple their value in a month. Unlike traditional batteries, they do not have an anode before manufacturing. The revolutionary part is not the exotic materials but a solid-state separator

that separates the cathode active and lithium ions after getting charged. Their youtube videos show the revolutionary part at the 13th minute. This technology achieves %80 percent charge in 15 minutes and north of 400 W/kg energy density.

Yet, the battery needs at least 2-3 years to enter commercial manufacturing. Volkswagen is one of the investors as well as Bill Gates. But they have the independent tests for their batteries, and the manufacturing process seems not too challenging. Scaling can be an issue.

The short future of battery and PV technologies look increasingly like perovskites and solid batteries. What will be their effect is a deeper question? For one thing, what happens if we see 100,000$/MW solar systems? The whole fossil ecosystem may find it hard to survive in such an environment.

The road is not an easy one. In the clean energy ecosystem, fraud and deception are no different. But the radical claims by the battery, solar companies make us wonder whether they are the next Envia, Solyndra, or Nikola. Independent verification of these technologies is as important as fossil reserve verifications.

But what if QuantumScape's tech is the right battery revolution? What if the age of solid-state batteries is starting? Then we will enter into a new realm. Electric cars will be the future for sure. That is probably why Apple announced its intentions.

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What about the electric systems? Then we have to think about whether batteries become part of household electric equipment just like meters. This changes the definition of a blackout, market operation, and electricity services. Personally, I think a battery revolution is coming.

Statement's of Iran's Oil Minister and OPEC+

Batuhan Özkan

Iran is a country that has an importance in the energy market thanks to its natural resources, geopolitical location, and sphere of influence. As a result of this situation, the Iranian officials' discourse and moves have importance for understanding the developments in energy markets and Middle Eastern politics. On the other hand, OPEC+ is an entity that assumes the decision-maker role in energy markets with output cuts and output growths. So, I believe that taking the statements of the Iranian Oil Minister's statements about OPEC+ as a reference for understanding and analyzing the functions of Iran's OPEC+ and energy policy. In the following paragraphs, I will try to touch on activities of OPEC+, statements of the minister and Iran-OPEC+ relations, and finally, interpretations of these decisions, relationships, and results.

OPEC+ is a large group that emerged with the articulation of some countries (e.g., Russia, Mexico, Kazakhstan) to OPEC. Russia's participation and sphere of influence in the organization is a point that should not be dismissed for understanding the character of the organization. In 2018, OPEC members supplied 35% of oil, and they were the owner of 82% of the proven oil reserves. With the enlargement of OPEC+, these numbers went up to 55% and 90%, respectively. So these countries gained power over the global economy, which has not been seen before. For example, between the beginning of 2017 and March 2020, the OPEC+ coalition implemented a production cut to increase crude oil prices. March 2020 has been a breakpoint for the organization due to Oil Price War. Russia's refusal to continue the production cut paved the way for this war. In the aftermath of Saudi Arabia's move, we witnessed a dramatic decline in oil prices, and this plunge has not been recovered even at the end of the year. When we consider the pressure on the oil-dependent economies that emerged from the remarkable decreases in oil price, such as increasing debts and budget deficits and shut-down of the producer companies, we see the importance of harmony between the member countries.

According to Bijan Zanganeh, Iran's Oil Minister, OPEC+ policies helped balance the oil market. He also expresses that he is hopeful for maintaining the prices at acceptable levels. He also expresses his optimistic views about the future. The last

agreement of OPEC+ is easing the output cuts starting from January 2021. In my opinion, this positive approach is worth examining. Because when we evaluate the OPEC+ policies, which is in the direction of output cuts, they favor Iran. Since Iran is a country that has to face Western sanctions, it cannot use its full capacity for oil production. So, production cuts are necessary for the increase in prices, at least stability in prices. Iran is one of the countries which supports the production cuts. In this context, the positive sentiments of the minister are not a surprise for us.

In conclusion, OPEC+ is an organization that is very effective in oil markets and naturally global economy. OPEC's enlargement by new countries that can have a difference of opinion and conflict of interest can be considered a positive situation. Because OPEC+ provides a platform that contributes to the emergence of the zone of agreement, the detrimental effects of the Spring 2020 Oil Price Wars could have been harder to compensate for in the absence of the OPEC + coalition. COVID-19 process is also an important point for understanding the mission of OPEC+ and overcoming the Oil Price War. Since the COVID-19 crisis has been a situation that all countries suffer from, countries had to act harmoniously for humankind's interests. So the consensus of countries under the umbrella of the organization has importance. Although the realist theory in international relations suggests that states are actors who look out for themselves, we cannot ignore the restraining effects of these institutions, alliances, and organizations. Making compromises that can prevent negative results that affect the whole world economically. When we continue with Iran, it can be said that their stance about the OPEC+ organization can be described as "cyclical." Due to the sanctions, they are content with the policies. However, expected or unexpected development may change their position. For instance, Biden, vice-president of the U.S. during the Obama government, which eased the sanctions, can follow the same path, and Iran's interests can conflict with the current decisions of OPEC+.

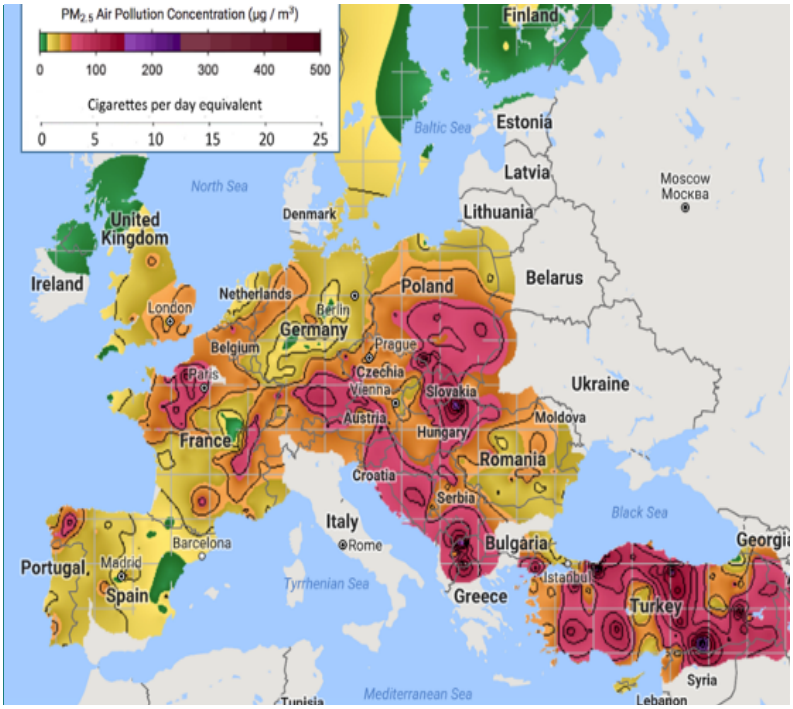
The Impact of Environment On Health

Mihael Gubas

The European Environment Agency (EEA) has published a new study entitled "Healthy environment, healthy living: how the environment affects health and well-being in Europe", which concludes that in 2012, 13% of all deaths in the EU could be attributed to environmental pollution. and human health. They immediately refer to the conclusion of the World Health Organization (WHO) according to which these deaths could have been prevented, and add that similar outcomes can be reduced in the future by increasing efforts to improve the quality of the environment.

They point out that the current state of the environment in Europe has a negative effect on the health and quality of life of Europeans. According to WHO data in 2016, the number of deaths caused by the state of the environment was estimated at 630,000 cases. The burden of diseases resulting from the environmental situation is uneven, and while the situation is best in Iceland and Norway (9%), it is worst in Albania (23% of deaths) and Bosnia and Herzegovina (27%) such as cancer, heart disease, stroke, respiratory disease, and neurological disorders.

Air pollution is a major cause of disease caused by environmental pollution. Poor indoor air quality is associated with solid fuel heating, which causes around 26,000 premature deaths per year in the European Economic Area. After polluted air, noise is another disruptive factor affecting human health. It claims 12,000 lives a year and is linked to another 48,000 cases of ischemic heart disease. Then there are climate changes that affect health, for example by sudden changes in weather and more frequent heat strokes, extreme cold and rapid and extreme changes in temperature. But in addition, climate change is causing zoonotic diseases such as COVID-19 as well as those that spread through water and food. Thus, the evidence collected so far suggests that prolonged exposure to polluted air may increase susceptibility to COVID-19 as well.



Following the climate, exposure to hazardous chemicals also causes damage to human health, and the WHO estimates that globally, 2.7% of deaths can be attributed to this cause. In the EU, the situation is complicated because the overall negative impact of chemicals on humans is not really known. The European Environment Agency points out that there are gaps in understanding how chemicals affect human health in the EU because they can have "synergistic and long-lasting effects on the endocrine system". However, while we even know something about it - the impact of electromagnetic fields on people is more or less a „health mistery“, but it is necessary to start dealing with it, according to the Environment Agency, since this impact on people is expected to increase. Although there are well-defined acute health effects of exposure to certain electromagnetic fields (on the neurological system and senses, tissue warming...) there is little evidence regarding long-term effects on the health of the general population. In addition to these, there is also the issue of water quality, both drinking and communal, antibiotic pollution that creates resistance and allows the development of superbugs. It seems that the problems of bacterial infection (various sepsis) and antibiotic resistance in the EU could affect 25,000 people a year. But death is not the only thing that environmental

pollution causes, but it also causes an increase in cardiovascular disease, stroke, asthma, hypertension, dementia, stress, and heat stroke, diabetes and immunological diseases.

The most exposed to dangers from the polluted environment are the most socially exposed groups of society. At the macro level, this becomes clear at a glance at the pollution map in Europe. The situation is much better in the richer than in the poorer countries of the continent. The same pattern is shown at the micro level within individual countries. Older people and children are particularly at risk from these problems. In one pan-European group about the presence of harmful substances in the environment - harmful chemicals were found in the urine of 90 percent of women and children! Exposure to dirty air, noise, heating with solid fuels (as opposed to heating with sustainable energy sources) and the like, depends on where we live, where we go to school, where we farm, where we go to work. These are all socio-economic issues inseparable from the topic of environmental pollution and health impacts. The European Environment Agency therefore draws particular attention to the social aspects of pollution and emphasizes that the small number of options available to us to start addressing these issues must by no means become an excuse for inaction.

As solutions, they certainly offer "green options" - from the simplest - maintenance, preservation, and planting of new parks and forests in urban areas, to the preservation of the sea in coastal areas. Biodiversity conservation, ecological transport and other well-known ideas. A quality natural environment also encourages physical activity, relaxation and regeneration, and also helps social cohesion (as can be seen, for example, in the example of social movements that grew out of the need to preserve parks, rivers, forest, etc.). Staying in the green belt encourages better functioning of the immune system, mental health and cognitive functions, reduced mortality from cardiovascular disease, reduced risk of developing diabetes, lower infant mortality and ultimately - in general - reduced premature deaths.

EEA explains the evidence of the positive impact of nature on man in about 50 pages of research, which I present here briefly. Due to such a lack of accurate information, instead of understanding the environment in which we live, we begin to trust some celebrities and religious fundamentalists, we develop conspiracy theories about vaccines and telecom networks, and soon probably about electromagnetic influences. In the last dozens of pages of its research, the EEA lists concrete possible steps to achieve the goals, but this is where the political issues actually begin, and the Environment Agency loses power. The instruments for achieving a better life and a healthier environment are not really unknown, it is not necessary to devise some radically new solutions that require technology that we do not have and that is in its infancy, will not be commercially available for a long time. Therefore, as it subtly permeates this, but all other research published on the topic of climate change in recent X years, we actually need a change in the social paradigm. And in order to make it happen, we all need to have accurate information, not look for answers to crucial social problems in conspiracy theories. The problem is also that the most widely available information is not well enough processed, it does not offer the public an insight into the overall causal sequence, and the lack of that insight results in conspiracy theories. Therefore, it is difficult to expect that the state of our environment will improve, as long as its overexploitation is economically viable. And it is profitable as long as the real price of that exploitation is not counted. The real price does not count because, as we have already said, the public's combination of all this is not transparent.

Energy Charter Treaty: Is there a way out for the European Green Deal?

Selin Kumbaracı

The Energy Charter Treaty (ECT) was adopted in 1994 and entered into force in 1998. It was designed to foster investments in the energy sector and assist former Soviet-bloc countries, following the USSR's collapse, in rebuilding. It does so through how it protects investments in natural resources in former Soviet states by allowing private companies to institute legal proceedings against governments in cases where legislation enacted damage the current value or future potential profits of investments. Furthermore, these lawsuits are settled in private arbitration hearings, not in public courts. Opponents argue this process is not transparent and that even the threat of such a lawsuit can get in the way of governments introducing environmental legislation that would be in the public interest.

At the moment, there is debate on the future of the ECT, with some arguing for its modernization and others opposing the entire purpose of the Treaty. The European Union particularly has a key stake in the ECT due to its implications for the European Green Deal and the broader Paris Agreement. All EU Member States, except for Italy, are members of the Treaty, and the EU itself is also a member in its own right; thus, the issues at hand are matters of concern for the entirety of the bloc.

Due to the investment protection measures in the ECT, the plans the EU is developing to move away from fossil fuels seem to be at risk of becoming grounds for litigation by fossil fuel companies. Indeed, one can see an example of this in the way in which the German energy company Uniper, which opened a new coal plant in the Netherlands in 2016, is threatening to sue the Dutch government, under the ECT, for its 2019 law on phasing out coal by 2030 and is allegedly demanding €1 billion as compensation.

In response to these concerns on whether the ECT can obstruct the implementation of the Green Deal, the European Commission—the EU executive, in other words—has been given the mandate to renegotiate the Treaty by the EU Member States. They have particularly said that the EU needs to regain its' right to regulate' when it comes to climate change.

Nonetheless, it seems that this renegotiation process will be anything but easy. The biggest challenge can perhaps

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be attributed to procedural issues: any ECT changes require unanimity among the more than 50 countries party to the Treaty. This unanimity will be difficult to reach given the composition of the Treaty's membership. Countries earning substantial amounts of income from fossil fuels, such as Azerbaijan, Turkmenistan, and Kazakhstan, are also parties. According to leaked documents, Japan seems to be blocking many of the changes the EU would like to bring, for instance, concerning modifications that would safeguard low carbon investments instead of fossil fuels.

Additionally, some challenge how meaningful it is for the EU to modernize the Treaty. One such argument is that such efforts are inherently redundant due to how investment will (arguably) naturally shift toward renewables due to their price-competitiveness against fossil fuels. As stated by Alan Riley, a senior fellow at the Atlantic Council, "why should the Commission be spending precious political capital on persuading other states to remove fossil fuels from the ECT when the market will do that job in any event?"

Furthermore, as many environmental groups have, others propose that the EU simply withdraw from the Treaty. However, this is not as quick a solution as it may seem. Withdrawing from the ECT automatically brings into effect a sunset clause, wherein investors would still be able to bring lawsuits against governments for 20 more years.

Due to the challenges above the EU is facing, it now seems to be looking for a solution with the Court of Justice of the EU (CJEU). Belgium put forward a request for the CJEU to rule on whether or not the investment protection stipulations in the Treaty are even legal under EU law. This is not so far-fetched of an idea, given that in 2018 the CJEU ruled that investor-state dispute treaties signed between two EU Member States are illegal since the protections provided by EU law on this matter are sufficient as well as because of how such agreements undermine the legal system of the EU, with their bypassing of public courts.

Even if the Court were to rule that the ECT is illegal, this would only apply to the Treaty's applicability amongst the EU Member States—a company incorporated in an ECT-member country, but not in the EU, would still be able to sue EU governments.

The solution perhaps lies in a different path. There is a collective withdrawal of EU countries from the Treaty but with an agreement to keep their companies from instituting legal proceedings, based on the ECT, against one another.

If countries in the European Free Trade Association (EFTA)—namely, Iceland, Liechtenstein, Norway, and Switzerland—were to join in on such an agreement, that would potentially protect about 80% of foreign investment in the EU energy sector from legal action that could arise due to climate action legislation.

While the exact way out of this situation for the EU is not clear at the moment, the political will to move ahead with climate policy seems to be weathering this latest storm.

Renewable Energy Certificates in a Nutshell: Turkish Certificate Scheme and Beyond Part 2

Onur Uyanusta

In the previous article, we have explained why using renewable energy certificates (REC), the dynamics behind it, and previous legislation that made the baseline for the YEK-G system for the Turkish energy market. In this article, we will continue with the initial dynamics of Turkey's new YEK-G system, and Energy Market Regulatory Authority (EMRA)'s further ambitions for the future.

It is narrated in the previous article that EMRA has come up with the legislation in 6 months of collaborative action. During that time, many systems worldwide are inspected for an optimal REC system regarding the Turkish energy market and economy's needs. In the end, the researches, the candidates, and their deductions for role modeling reduced down to three options, which are:

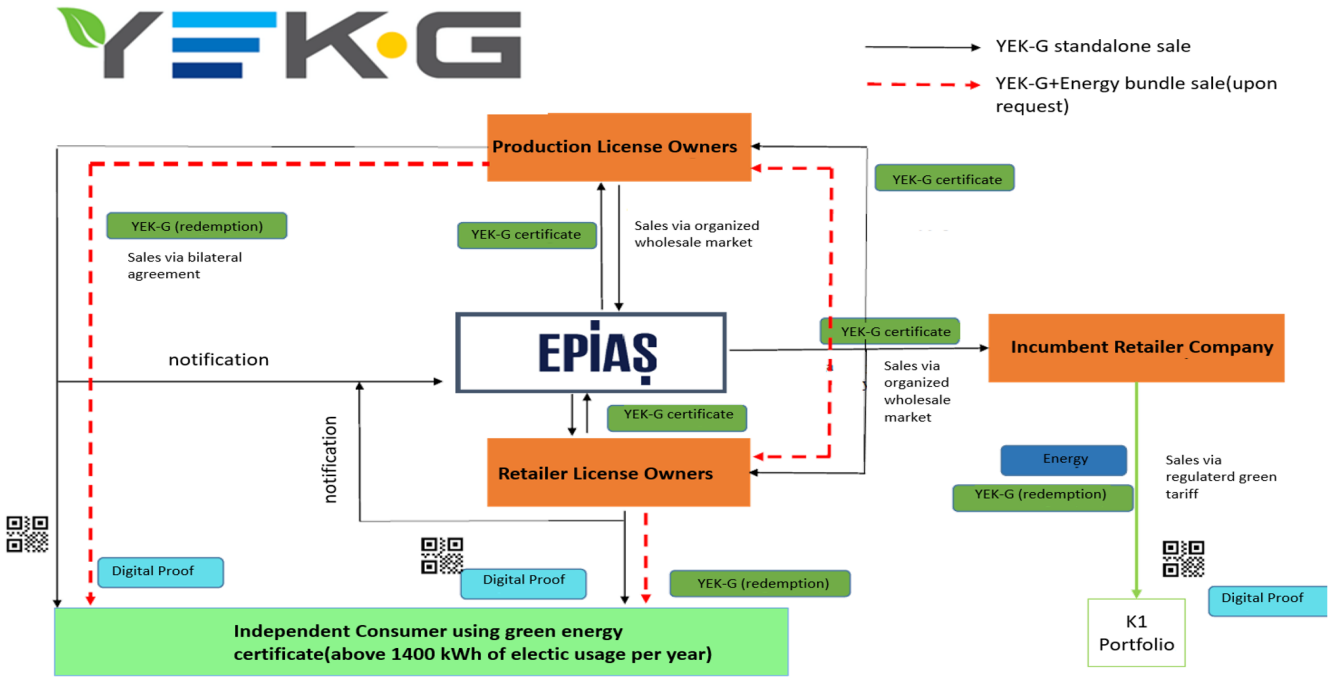
1-Guarantees of Origin System: European Union (EU) REC system, only usable within the EU electricity network system (ENTSO-e), highest REC trading volume, demanding walls of entry,

2-International REC System: International REC trading system, no electrical network connection required, low REC trading volume, international usability (except EU), reasonably easy to enter compared to GO

3-National REC Systems: REC systems designed for the countries' requirements, flexible in design, a good baseline for building up know-how, easy to convert to GO or I-REC if designed correctly.

From those deductions taken from researches and many meetings with the players on the energy market, EMRA has decided to start with the "national REC system." The main motive behind this choice was building the baseline for the system domestically before going international. In the research, we found out that EU members established their own systems before creating the GO ecosystem altogether. So we decided to go in the same way.

Starting with the EU and GO, another issue must be noted on that point. EMRA chose compliance with the GO system not only because it is significant in volume but also the problems bigger than REC trades. EU consists half of Turkey's gross export volume according to the Turkish Exporters Assembly's reports, which means one of every two euros entering our country is coming from an EU member country. When the Green Deal (GD) passes from the EU Commission, a new risk will arise for our export goods produced, especially carbon-intensive products such as steel. After the GD, the EU will start carbon taxation for its imports (aka Carbon Border Tax-CBT) to equalize the competition where relatively more carbon-caring EU domestic production and the imports currently clashing with the advantage of the latter. That mostly can turn the tide for their products' level of competition for sure and reduce global carbon emissions. However, it is not good news from the perspective of the EU's exporters like us even though its promising environmental impacts. Our exporters will pay more to the EU with CBT to sell the products or will not be able to sell the product



at all because its carbon footprint is out of bounds. So the producers will either redesign their production process to emit less carbon or find some zero-carbon electric energy for a start. Although there are many ways to reduce the carbon footprint technologically, the fastest solution for this kind of imminent threat is using the RECs and carbon certificates. In the matter of issuing speed, RECs are much faster.

Coming back to our main track, that imminent threat was another reason that made EMRA do its part by releasing the novel YEK-G system. In short, EMRA tried to do its part for this threat by supplying a solution to the customers.

YEK-G system mainframe was designed in accordance with the GO system. As seen from many successful EU examples, such as Germany, EMRA has chosen EPİAŞ, the market operator, to execute certification operations on its behalf. In the YEK-G system, EPİAŞ will be the issuing body that issues, transfers, and cancels the YEK-G certificates. EMRA will stand as the competent body on the regulatory side. The main dynamics of the YEK-G system are as follows in Figure 1.

As seen from the mainframe, the system has three main sides: The generation side, the supplier side, and the consumer side. The generation side is taking part in the actual creation of certificates. Every 1 MWh of renewable energy (renewables defined in Law No:5346) is eligible for YEK-G certificate ownership if desired. At that point, we must reply to many complaints that EMRA took during the legislation public opinion phase, which was the unlicensed generation's exclusion from the YEK-G system. As widely known, unlicensed generation conciliation processes in EPİAŞ are handled under incumbent retailer companies (IRC). IRCs are currently reporting the unlicensed generation to EPİAŞ in total production. That is an effective way for IRCs to simplify the conciliation processes, but for REC schemes, that is bad news. Because every YEK-G certificate (and its' similars) must disclose some explicit information on the certificate such as power plant name, resource type, et cetera. In the current conciliation mechanism, this information does not flow to the YEK-G issuing body. The problem with this issuance problem is still being studied. EMRA's main goal is to make EPİAŞ able to issue YEK-G certificates to the entire Turkish renewable portfolio. This certificate issuing process does work relying on the past energy conciliation numbers obtained by EPİAŞ. Although there are examples of REC futures mechanisms in the world, we thought claiming a REC must be done after the actual energy flows through the grid for the time being.

The retailer side (companies that obtained a retailer license from EMRA) will have the power to trade YEK-G certificates generated by the renewable

producers. As the generation license owners can act as a retailer in the market, they also will be able to trade YEK-G certificates. Certificates will be tradable via organized market and bilateral agreements. The organized YEK-G market will not operate daily but intermittently. Retailers also will have some key responsibilities in the system. The most prominent one is their disclosing duty, which means telling its customer under his portfolio some sort of announcement like "To the customer no: 1234567. You consumed 100 MWh of renewable energy last month. As proof, I bought 100 YEK-G certificates for you and told EPİAŞ to cancel them on your behalf according to our bilateral agreement. Congratulations". The cancellation percentages can change due to the bilateral agreement, so the green energy usage can change either.

The consumer side is our final destination in the YEK-G system. They will be able to get their green energy package proposals from the retailers with bilateral agreements. In that case, we shall also give some information about the novel green tariff(GT) mechanism for non-free consumers. The GT has been in use since August'20, which is not giving proof of energy for now. The retailer companies are compelled to buy renewable energy for their GT portfolio from the energy markets, but the YEK-G certificates cannot be supplied at the moment because the system will be operative by mid-2021. By the time the YEK-G system is operational, the certificates will be canceled to the previous renewable consumption in total.

The details for the YEK-G system will be more discernible when the procedural principles for the system are released. EMRA is making the final touches with EPİAŞ for deciding the fine-tuning of the dynamics of the system. Speaking of technicalities, we can proudly say that EPİAŞ is using some cutting-edge tech to build the digital framework. A blockchain infrastructure will support the YEK-G system, which in short is expected to make the system both fast and foolproof.

By that, we are done with explaining the YEK-G system. Many argued the system during the public opinion phase and will be arguing still in the future for its purposes and dynamics, which will be the foundation for us to make the system quasi-perfect in the end. A new non-carbon world order is being established at the moment, and Turkey will surely take its place in that order by any means.

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