INTERNATIONAL ENERGY SUMMIT REPORT

20 May 22 | MUSIAD Headquarters

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Preface

With the industrial revolution, energy has become an indispensable need of humanity. Energy is the need of everything in our lives, from the mobile phone we use today, to heating and cooling, from transportation to electronic goods.

Energy started the transformation of humanity and every transformation needs more energy. Now, this vital need is going through its own transformation with the “Climate Crisis”. Now, there is a need not only for energy, but also for sustainable, safe and clean energy. This transformation changes all the habits we know from the production of energy to its consumption.

Being aware of the transformation of energy, as MUSIAD, we wanted to create the future roadmap of energy with global and local stakeholders with the “International Energy Summit”. We are aware of change and energy by explaining our MUSIAD Energy Strategy. We say that we are ready to take responsibility.

Energy supply and security, clean energy production, domestic and national energy industry, green-collar employment, critical minerals and energy efficiency will change our behavior, production and investment plans, as well as our habits.

As Hannibal said, “We’ll either find a way or make a way.”

The world of the future will rise in the hands of those who have a clean, safe and sustainable energy policy who spend their energy on natural resources.

On this occasion, We would like to thank to our Minister of Energy and Natural Resources Mr. Fatih Dönmez for his participation in our program and his contribution to our country’s green development move, to Mr. Mahmut Asmalı, our esteemed President of MUSIAD, who provided his full support and shared our Energy Strategy with the whole of Turkey, to OECD Permanent Ambassador of Turkey Prof. Dr. Kerem Alkin, who encouraged and supported us in the realization of our program, and our esteemed guests from domestic and abroad who participated in our program.

Altug KARATAS
President of MUSIAD Energy and Environment Sector Board

MUSIAD ENERGY STRATEGY

MUSIAD; sees energy above daily policies and supports environmentally friendly energy policies that ensure a sustainable, competitive and reliable energy supply in line with the goals of growing Turkey.

There is an energy crisis in the world and a transformation has begun. There will be winners and losers but there are also opportunities. Turkey should be affected by this situation the least and should both ensure its growth and be on the side of the winners by completing its transformation.
Turkey has doubled its primary energy supply and tripled its electricity installed power in 20 years. By increasing the share of renewable resources, it focused on production from domestic and national resources.

We think that the transformation in energy will proceed on 3 basic principles.

1 - Domestic, efficient and technology-oriented energy production and consumption,
2 - Building Turkey's energy industry,
3 - Independent, reliable generation road Turkey's perspective in energy,

In this context, we share the MUSIAD Energy Strategy with the public in its 32nd year of foundation:

1. The most expensive energy is non-energy. For this reason, energy planning that is sustainable, uninterrupted, innovative, environmentally friendly and most importantly suitable for Turkey's conditions should be the first condition.

2. The share of renewable energy in electricity production should be increased to 75% by 2050, and our share in the world's renewable energy supply should be increased to 3%.

3. Energy efficiency is a domestic and national energy source. With the 10-20-40 model, a national energy efficiency mobilization should be declared by providing 20 billion dollars of financing for energy efficiency investments in the next 10 years, and setting a target of 40 billion dollars reduction in energy efficiency and imported energy.

4. While we support oil and natural gas exploration activities with all our strength, we propose that natural gas and nuclear energy be given the status of green fuel within the scope of climate change targets. In this context, the production of renewable and low-carbon gases should be emphasized and the development of domestic technologies should be encouraged.

5. In order to achieve our greenhouse gas emission targets and increase our independence in energy, we demand that the share of nuclear energy in total electricity production should be increased to 20% in 20 years.

6. An energy industry strategy should be established to support our domestic and national energy policy. Turkey should be the number one supplier of the EU, which sets a clean energy target in renewable energy equipment production. It desires to take part in this move with the members of MUSIAD. In this context, MUSIAD is proud to share with the public that it has decided to invest in photovoltaic panel production with its members.

7. Turkey should initiate the national hydrogen move that will export 5 billion dollars/year in 20 years and invite foreign capital to invest in Turkey.

8. Turkey which is at the center of three continents should increase the oil and gas lines passing through its territory. Not only it should guarantee the increasing demand in energy but also strengthen its position as a stable energy supplier with the slogan of Turkey, the energy belt route of the world.

9. Energy may turn into an income item, not an expensebfor Turkey. Young, qualified employment force is required for this transformation. With the preparation to be made, Turkey can provide 200,000 new jobs in 10 years for energy transformation.

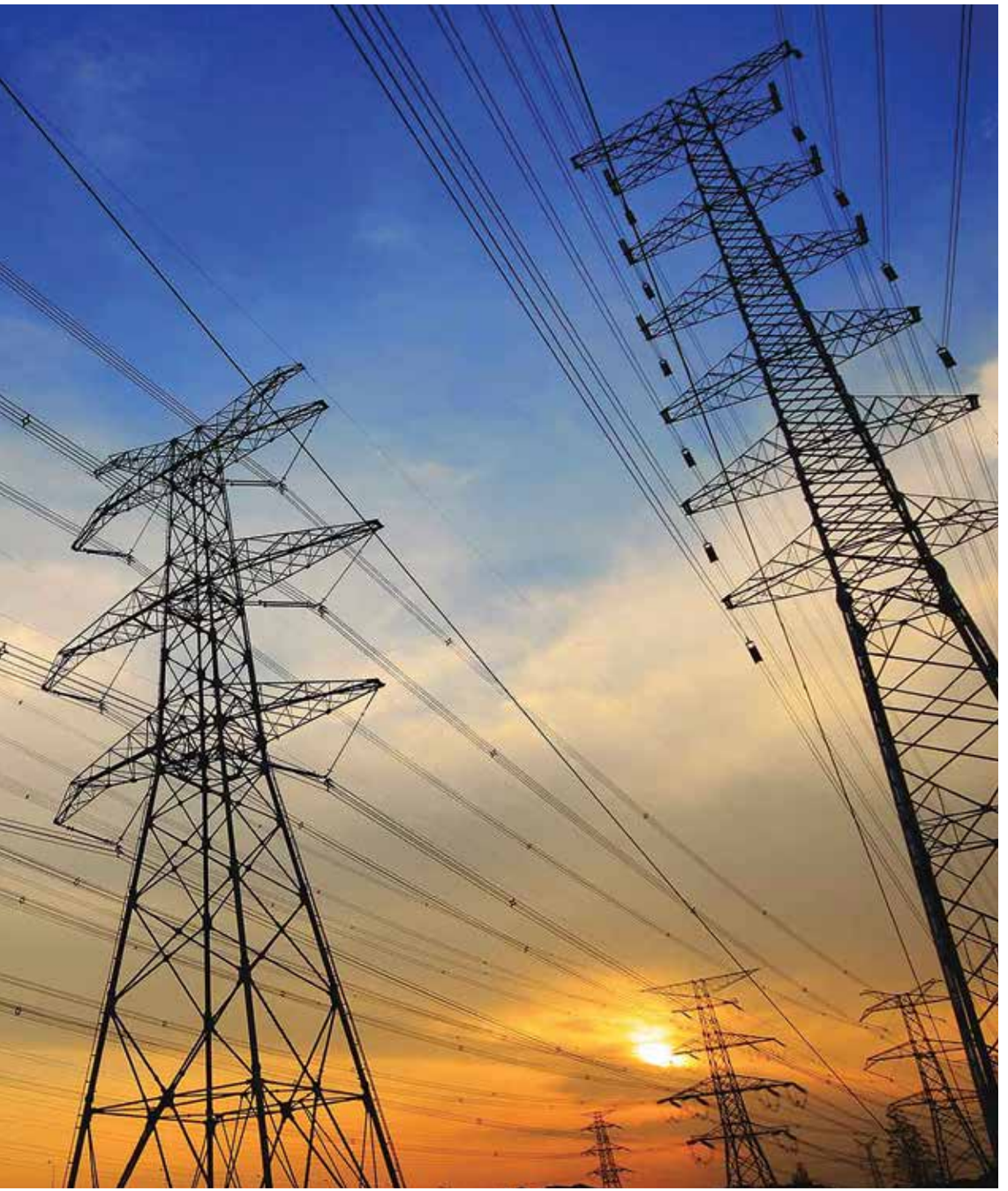
10. With the transformation of the existing building stock and the mobilization of financed domestic production insulation, energy savings of 7 billion dollars per year can be achieved in 10 years. With this policy, it can provide energy savings, domestic production, economic revival and employment. This is also an important factor in reducing foreign dependence on energy.

11. Together with our domestic car TOGG, studies should be carried out to provide the necessary energy for electric vehicles from distributed energy and renewable energy. In this context, incentives and supports for storage technologies should be increased.

12. The bureaucracy of individual renewable energy investments should be reset.

13. Sustainable supply and security of critical minerals, which are the most important needs for energy transformation, should be ensured.

14. Emphasis should be given on the development of domestic energy technologies with the cooperation of the public, university and industry.



Mahmut ASMALI
President of MUSIAD

Global warming and climate change are among the most important challenges in human history. Even the most remote corners of the world are faced with natural disasters, health problems, economic and social problems triggered by the climate crisis. The sector that will make the most important contribution to the solution of this problem is undoubtedly the energy sector...

MUSIAD, which set out with the dream of an economically active and respected Turkey in the world, with the cooperation of the Energy and Environment Sector Board, it aims to reduce the use of traditional energy sources, to expand renewable and clean energy sources, and thus to increase energy efficiency.

At the MUSIAD Visionary'21 Summit, we invited the business world to an all-out struggle with the climate crisis, especially with the motto of "Be aware of the Climate". We believe that the 10-item Climate Manifesto we published will create a different awareness on issues such as sustainable renewable energy, green fuel projection, circular economy, digitalization of energy, and zero energy production.

We work in cooperation and great synergy with our Ministry of Energy and Natural Resources, our non-governmental organizations that develop different projects in this field and our energy-oriented companies.

Turkey is on the way to become an important energy center with its unique geopolitical position in the world and the new energy policies implemented.

There are the world's richest oil and natural gas rich countries around us. Turkey, which is a natural bridge in transporting these resources to Europe, is transitioning from being a transit country to being an important regional energy center.

As MUSIAD, which has reached 83 contact points in Turkey and a total of 164 contact points in 81 countries abroad, we believe that the energy transformation aimed by Turkey will be realized with 3 basic principles:

1 - Domestic, efficient and technology-oriented energy production and consumption,
2 - Building Turkey's energy industry,
3 - Independent, reliable generation road Turkey perspective in energy.

In 2022, when we celebrate our 32nd anniversary, I am very proud to share with the public the 11-point Energy Strategy of MUSIAD.

We can summarize this roadmap as follows:

1 - The share of renewable energy in electricity production should be increased to 75 percent by 2050, and our share in the world renewable energy supply should be increased to 3 percent. The bureaucracy of individual renewable energy investments should be reset.

2 - Energy efficiency is a domestic and national energy source. With the 10-20-40 model, a national energy efficiency mobilization should be declared by providing 20 billion dollars of financing for energy efficiency investments in the next 10 years, and setting a target of 40 billion dollars reduction in energy efficiency and imported energy.

3 - While we support oil and natural gas exploration activities with all our strength, we propose to take natural gas and nuclear energy into green fuel status within the scope of climate change targets. In this context, the production of renewable and low-carbon gases should be emphasized and the development of domestic technologies should be encouraged.

4 - In order to achieve our greenhouse gas emission targets and increase our independence in energy, we demand that the share of nuclear energy in total electricity generation should be increased to 20 percent in 20 years.

5 - We demand the creation of an energy industry strategy that will support our domestic and national energy policy. We hope to focus on the development of domestic energy technologies with the cooperation of the public, university and industry. Turkey can be the number one supplier of the EU, which sets a clean energy target in renewable energy equipment production. MUSIAD aspires to take part in this move with its members. In this context, I would like to proudly state that an investment decision has been made in the production of photovoltaic panels with the members of MUSIAD.

6 - We demand the creation of an environment suitable for investment in Turkey for domestic and foreign capital by starting the national hydrogen move, which can export 5 billion dollars/year in 20 years.

7 - We expect the continuation of the will to both guarantee the increasing demand in energy and strengthen its position as a stable energy supplier by increasing the oil and gas lines passing through the lands of Turkey, which is located in the center of three continents, with the slogan of The World's Energy Belt Road Turkey.

8 - Energy can turn into an income item, not an expense for Turkey. Young, qualified employment force is required for this transformation. With the work to be done, Turkey should initiate the energy employment move that will provide 200 thousand new employments for the energy transformation in 10 years.

9 - We demand the creation of a legislative infrastructure that will reach 7 billion dollars of energy savings per year in 10 years with the transformation of the existing building stock and the mobilization of financed domestic production insulation. With this policy, energy savings, domestic production, economic revival and employment will be achieved. This is also an important factor in reducing foreign dependence on energy.

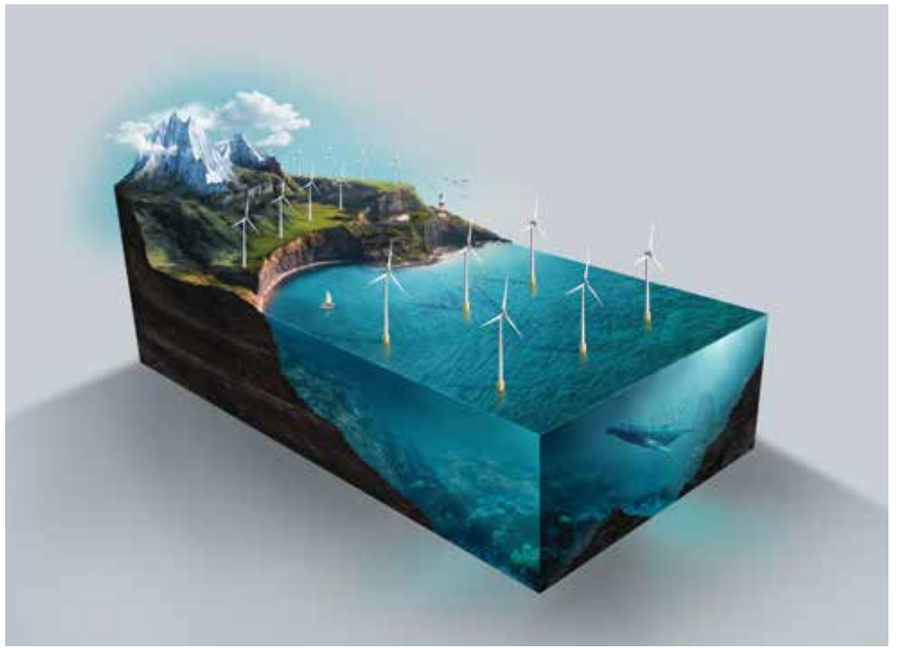
10 - Together with our domestic car TOGG, studies should be carried out to provide the necessary energy for electric vehicles from distributed energy and renewable energy. In this context, increasing incentives and supports for storage technologies is important for this transformation.

11 - Sustainable supply and security of critical minerals, which are the most important need for energy transformation, is one of our main items for transformation.

Our government, which reads the changes and developments in the world very well, is making a great mental and structural transformation in every field under the leadership of our President Recep Tayyip Erdoğan.

Undoubtedly, one of the most important of these reforms took place in the fields of energy and energy geopolitics. It was aimed to make our country self-sufficient in energy with domestic and national resources and to reduce foreign dependency as much as possible.

In line with this goal, a lot of work was spent on the inclusion of nuclear energy in our resources in order to use domestic and renewable energy resources more efficiently and to increase energy diversity.



For example, with the Karapınar SPP, the share of solar energy in electricity production in Turkey will increase to 20 percent and it will contribute to the green development revolution by reducing carbon emissions.

As the first step of Turkey's new energy geopolitics, in the context of measures to reduce foreign dependency in energy, priority was given to increasing the share of domestic energy by using domestic coal resources more efficiently.

In addition to the public efforts of our state in this area, Turkey's coal production has increased significantly thanks to the incentives it provides to the private sector. While this increase made a significant contribution to the number of thermal power plants and electricity production, the negative effects of thermal power plants on the environment were minimized thanks to the environmental measures taken.

The government has made great incentives and efforts to use renewable energy resources, which are the second pillar of the measures to reduce foreign dependency in energy, in a way that will contribute to the country's economy. Today, Turkey ranks 5th in Europe and 12th in the world in renewable energy based installed power.

In the field of renewable energy, it is noteworthy tha in the last 20 years the installed power has increased 4.5 times, and althoug it is the driest season in recent years in our country, 36 percent of the electricity produced in 2021 is from renewable sources.

VAT and customs duty exemption for solar and wind energy investments also created a multiplier effect. In addition to these incentives, 30 percent tax reduction for investments to be made in the field of solar and wind energy and insurance premium employer support for 6 years were also provided.

The nuclear power plant, which will carry our country to the next level in energy, is being built in Mersin Akkuyu. I would like to underline that this power plant is a strategic energy policy move that will contribute to Turkey's breakthrough not only in electricity production and energy supply security but also in many fields of science such as medicine, physics and chemistry.

As MUSIAD, within the scope of our energy strategy, we will focus on providing route and resource diversification in the supply of oil and natural gas, taking into account the increasing demand and foreign dependency.

While contributing to regional and global energy security, we will develop strategies to become a regional trade center in energy.

As we move forward in this field with our stakeholders, We will consider social and environmental impacts at every stage of the energy chain. We will focus on increasing the share of domestic and renewable energy in electricity generation.

Hoping that our 11-item energy strategy will raise awareness both in Turkey's fight against the climate crisis and in ensuring clean energy transformation...

Fatih DONMEZ
T.R. Minister of Energy and Natural Resources

While determining the agenda topics of the panels, you can usually see the issues that marked that period in the theme of the meeting. The theme of MUSIAD's International Energy Summit was also

very appropriate. The future of Energy... Unfortunately, the future of energy actually contains some contradictions, especially in this period. On the one hand, there are zero promises that came with the Paris Climate Agreement, on the other hand, the increased use of fossil fuels recently. Also, decommissioned nuclear power plants, efforts to include nuclear in the scope of green energy, the trend towards electric and autonomous vehicles, increasing oil demand are some of the other issues. We have millions of internal combustion vehicles in traffic right now. In short, in the future of energy, we come across two opposite futures. There are goals on one side and facts on the other. Time will tell how energy policies will balance these two.

When we look at the upcoming period, we can say that three main trends will shape the medium-term period. The first of these is the upward trend in commodities. Although there is a global recession with different events this year, according to some experts, financial crises, not recessions, can cut the energy deficit. Therefore, we can foresee a new era of high-priced commodities. There is a simple reason for this, demand is faster and more lively. The demands that accumulated during the pandemic period started to come true quickly after the pandemic. There is only one solution to this, more investment.

Turkey has had an active investment environment for a long time. From electricity generation, transmission and distribution to oil and natural gas exploration and production on land and at sea, from mining to nuclear energy, we have recently undertaken serious infrastructure and superstructure investments, both privately and publicly. Now it is time to reap the fruits of these. As of today, our installed power in electricity has exceeded 100 thousand MW. The number of countries with installed power over 100 thousand MW is 14. Today, we have a country that continues its own energy transformation with the steps it has taken in renewable energy, energy efficiency, energy technologies and nuclear energy. As we ensure our self-sufficiency in energy, I believe that Turkey will approach its goal of being a center in both production, distribution and markets in a more concrete way.

Today, there is a Turkey that continues its own energy transformation with the steps it has taken in renewable energy, energy efficiency, energy technologies and nuclear energy.

As we ensure our self-sufficiency in energy, Turkey will approach its goal of being a center in production, distribution and markets in a more concrete way.

The second trend is the balance of struggling with climate change and energy security. Because nowadays, it is not possible to discuss energy security independently of the environment or the climate. As a matter of fact, the Energy and Environment Sector Board in MUSIAD is working in this direction. We have similar assessments among us. While meeting the needs, we must not harm the people first and then the environment or if it is unavoidable, we have to keep it at a minimum level.

Developed countries, which promised net zero to the world at COP26, are reevaluating their gas-oil investments today. Of course, in this sense, the goals of the West are not binding. This is actually a statement of intent. In this direction, countries share what they have done and will do with the world public and their own citizens. They are making a commitment: By 2050, the carbon we keep will be equal with our carbon emissions. As a matter of fact, our President has set such a target for 2053. These targets can include anything from not getting internal combustion cars into city centres, to zero coal targets. If the targets are not followed, there is no sanction or responsibility because everyone is aware of the energy security problem in the background.

The International Energy Agency spent a lot of time under three headings, the first one is energy security, the second is prices, because supply is limited and demand is still increasing, so there is a rise and volatility in petroleum products, natural gas and subsequent coal prices. Thirdly, energy efficiency was equally important. Now we have to decide; Will we move forward by closing or will we move forward by building? There may be a shutdown method for climate change but there may also be earlier exits. You can close the coal plants, there is a nuclear issue on the agenda but on the other hand, you have to maintain energy security, so you cannot say to your citizens that we are fighting against climate change or we have closed our coal plants and our wind power generation areas are limited so you will have to wait in the dark for an hour and two. For example, it is evening, there is no sun. You cannot say that Our power plants do not work so we will turn off the electricity when we need it. Also, you can never say that we will stop the wheels in industry.

So, If we are going to close some facilities, when are we going to close it? If we are going to build, instead of these, we will establish a cleaner and safer power plant by using which technology and which resource. They need to be well planned and these plans are not for 5 years or 10 years. In our sector, 5-10 year plans are not long-term or medium-term. They are seen as shorter-term. Today, you cannot build a medium-sized facility and realize it before 5 years. If you do not sign those critical decisions today, you may leave the country in the dark tomorrow. Finally, there are geopolitical trends, the effects of which we have felt in the last period.

Our nearby geography has a suitable structure for producing a continuous crisis. However, with the recent Russia-Ukraine war, geopolitics has turned even harder. There is only one antidote to geopolitics. Using your own resources to the maximum with your own people and technology. Then, you will reduce your external dependency. The duty of a state is to utilize its underground and surface resources to the fullest. Today, countries that use their own resources more are in a more advantageous position compared to other countries. The US is shipping liquefied natural gas (LNG) to Europe with its own gas resources. Israel is taking steps to take part in Europe's energy geopolitics. This includes the national energy and mining policy that Turkey has initiated especially recently.

In electricity generation today; We use domestic resources up to 65%. In renewable resources, this rate is around 50%. 54% of our installed power consists of renewable resources.

Apart from electricity, we also have important studies related to the maximum use of underground resources, especially the discovery of new hydrocarbon fields. With the introduction of Black Sea gas, we will have a significant increase in domestic resources. Unfortunately, we are currently a country that is 99% dependent on foreign gas. We are one of the four largest countries in the natural gas market in Europe. Last year, we used approximately 59-60 billion cubic meters of gas. Today, natural gas is now available in 650 districts in all of our 81 provinces. With the introduction of Black Sea gas, there will be a significant increase in Turkey's use of domestic resources. Our work on land and sea in Filyos continues rapidly. Our fourth drilling ship has arrived at Taşucu Port. There will be a maintenance period of 2 months here. Then, it will start its first drilling at the location we will determine. It is the seventh generation and it is a ship that we will use for the first time. We hope to receive good news with our new ship.

Regarding mines, we reached the highest production and export figures in the history of the republic. We will continue to take steps to ensure Turkey's energy independence.

We still have work to do within the framework of our 2053 net zero carbon promises. There is still a lot of work to be done, especially in terms of further development of energy technologies. Here, we need our entrepreneurs, our industrialists and our engineers. It is one of the issues highlighted in the Strategy Document of the Energy and Environment Sector Board. Critical elements and critical minerals are an important issue. If you cannot stop the price of these critical minerals, technological costs will start rising again. Especially in the last 10 years, there have been price reductions of 5% to 10% every year in renewable technologies, while after the pandemic, those prices stopped falling, even there is a tendency to increase, we have to find a solution to this. While we used to talk about oil speculations, now we are talking about important metals such as nickel, and lithium has doubled and tripled its price in dollar terms.

This information shows us that in the future of energy, there is not only resource constraints, but now we have to talk about critical elements and critical minerals. Whether you have as many resources as you want, if you do not have the raw materials and minarets used in the material that will transform that resource into energy, it is meaningless. A few key points came to the fore from the latest International Energy Agency report. Solar panels seem to be one of the elements of another trade war. As a result of the US sanctions on Chinese origin products, there was a slowdown in the supply of solar panels in the USA, which South East Asian countries could not meet. It has been tried to create alternative supply chains to China. We will see this in lithium and other metals. Could it be a new production point or a new production center at the point of solar panels? Turkey has covered a good distance with the investments it has made in this field in the last 5 years. Turkey is the fourth in the world and the first in Europe in solar panel production with an annual production of 7,960 megawatts. In a few years, we will be among the top three in the world, and then the first. China is in the first place, Vietnam is in the third place and South Korea is the fourth. We are a sector that was first planted in Turkey 8 years ago, and today it rises not only with resource production but also with technology production.

If you do not have independence in technology that will convert natural resources into energy, you are actually faced with another constraint and another problem. Therefore, we take the issue of indigenization under two headings. The first one is domestic resource and second is to have the technology to turn this into a secondary product. Why is there an increase in the demand for oil and gas, which is expected to decrease while the share of renewable increases in the energy equation? 8 billion people live on earth and there are still 750 million people who do not have access to electricity. Demand for electricity will increase if they reach electricity, most of which are in Africa and Asia. And if electric cars come on top of that, the demand for electricity will increase even more.

Although the prices of fossil commodities are at record highs and consumers are complaining so much, the accelerating demand for fossil fuels should be thought-provoking for all of us. Although there is a relative decline due to the global slowdown this year, major international banks predict that fossil fuel demand will increase by 8-10% in the next 10 years.

Leaving the pre-pandemic period aside for many years, oil production and consumption in the world has been around 99 to 100 million barrels. In order to maintain this level of production, the oil industry must invest 600 billion dollars every year. If there will be a 10% increase in demand, this means 110 million barrels in the next 8-10 years. Even if we find the reserves, there is no problem but it means an increase of at least 10% in the investment amount and this sector is not a sector that we can say I discovered today, let's produce tomorrow and I'm ready. There, too, you need a minimum of 5-6 years to prepare an oil and gas field for production, but can they be overcome? How we will do it: we will use our resources more efficiently. We will produce a lot of work with less energy, in the case of efficiency and renewable, we look at the investments you will make, the more investments are made, the more benefits and contributions are made. In a study conducted in the European Union, we also see that consumers still choose the cheapest product, not the most efficient because it shows a general behavior as there is less cash out of their pocket when buying. Of course, this determination may not be true for everyone. There is such a consumer tendency. Changing these consumer behaviors will be one of the most important challenges. While we could not convince industrialists to produce their own electricity until last year, there is now a serious increase in demand for solar energy due to global energy prices. Again, we anticipate that an average of 3000 MW of installed power will be added to the grid, especially

on the unlicensed side. This trend that our industrialists have now made towards this solar panel to produce their own electricity, the efforts and moves were actually very smart and I think they have fixed some of the energy costs for at least 15-20 years. Because I know that the predictability of prices rather than high or low prices motivates the industrialists more and relaxes them. In that respect, don't just look at the issue as producing their own electricity. It can be in the solar power plant or wind as long as it Works. You have made your costs predictable and you have fixed it. Now, we have to do the same with efficiency. This year, we see a great interest in efficiency projects due to the increasing prices.

We see that applications are made especially to the energy efficiency department of our Ministry for these efficiency increasing projects. I can also say that almost all of this budget has been distributed. However, these investments could have been made in the past years but unfortunately, we are a little late in these matters. Especially in the checkup of our industrialists, that is, in reviewing their businesses frequently. In particular, it is necessary to look at whether it uses the energy used efficiently or effectively. Of course, please get this done to the third person. In other words, we may have staff and experts who understand this business within the institution. If possible, you have the opportunity to certify energy consumption from these companies, such as energy efficiency consultancy firms that provide independent services in this regard. On the other hand, increases in commodity prices also increase the interest in productivity. We observe this as well.

Efficiency of fixed capital investment with fastest return.
When we look today, we can easily say that the investments made in 5-6 years have returned.
Maybe there are some of us who have tried this job.
In which field you will invest, it will return in 5-6 years so it probably depends on the sector you are in but when they see 8-10 years, everyone intends to say that this investment can be made.

A 5-year investment should be one of the priority jobs to be done. We want to popularize energy efficiency especially in households. For this, of course, we have works such as raising awareness first. From time to time, we convey these to our

people with public service ads, but at the end of the day, when it comes to the design and supply of this work, we could not reach the speed we wanted in the transformation especially in this insulation work since some money would be spent up front especially for families with middle and low income budgets. I can roughly say today that probably half of our housing stock is uninsulated. For this reason, we continue our negotiations with the Ministry of Treasury and Finance to be able to provide loans to households under favorable terms and with the Ministry of Environment, Urbanization and Climate Change regarding the situation and planning in housing stocks. As soon as these works are completed, we will share them with the public. As part of our national energy efficiency action plan, we invested $1.33 billion in 2021 and saved $372 million in return. This is of course savings in one year. This year, approximately 1.06 million toe-equivalent petroleum has exceeded the 1 million-toe limit for the first time with primary energy savings. 2021 was recorded as the year in which the highest investment and highest savings were achieved in energy efficiency. Again, last year, we prevented 15 million tons of carbon dioxide emissions with energy efficiency practices.When we look at the last 5 years, we have made an investment of 6.45 billion dollars in total with energy efficiency. The public and private investment we make together. In return, we saved 1.56 billion dollars. Thanks to these savings, oil consumption has also decreased, which is equivalent to 850 thousand tons. We also prevented the import of petroleum, crude oil and 5.4 billion cubic meters of natural gas. Again, as new business areas are created, we have created 12000 new employments both on the production side and on the side of those who implement these jobs. Due to the increase in productivity, it is generally perceived as to work with fewer people in the public and industrial facilities but in total, productivity-enhancing projects in the labor market reduce employment on one side, but we also bring new investment opportunities and new employment opportunities in another field. We have provided employment opportunities to 12000 people. We have also added a gross added value of $3.91 billion to our economy. Perhaps more importantly, we have prevented the release of 43 million tons of carbon dioxide into the environment in the last 5 years.

There is only one issue in the world and also for us is commodity prices which will be on the agenda this year. We live in an environment where there is not enough supply and demand is very high. The side of these crises turned into opportunities is that they started a new energy period. After the 2008 crisis, the United States quickly brought oil and gas production to a very important point. They had developed shale oil and shale gas production techniques before, but they were not very common. Today, they produ-

ce almost a significant amount using this technique. While it had a production that was not sufficient for itself before, today it has reached a point where it can export to the world. We have also taken very important steps in terms of efficiency and the market.

The development of electric cars has accelerated. Next year, with the centennial of our republic, we will be able to see our own domestic electric car on our roads.

In addition, unlicensed electricity generation has become widespread, especially with rooftop solar applications. As of today, we have solar applications exceeding 8000 MW, and we are talking about facilities, which we call almost 7000 MW of which are unlicensed, that is, used to produce their own electricity.

There is an issue that has come to us from our citizens about the electric stoves used in the kitchen, which has attracted our attention, especially in the newly constructed buildings, where most of the stoves are currently working on electricity. It should be known that electricity is a secondary product in this market and it has to be produced by a second source, that is, by another source. We use natural gas to produce that electricity, either we use coal or other renewable resources but you never have the opportunity to compare primary sources to secondary sources in terms of both efficiency and costs.

It is like that all over the world and It is the same in Turkey. My engineer friends will understand better. If you are using a resource, using the first resource in your facility as much as possible helps you to use that resource more efficiently and effectively. Constructing cooking methods in new buildings especially in kitchens in a way that is suitable for cooking with natural gas but not electricity, will allow us to use our resources more efficiently. We want to return to natural gas from our citizens, but we receive many requests that our installation is not suitable for this. Therefore, while you are projecting your new constructions, if there is natural gas, you should design the heating system accordingly in your city, in our neighborhood and in our Street. We want our construction companies, contractors and project companies to construct the installation line that will carry natural gas to the flats and I would like to announce this to the construction sector in particular. If we can't make any progress here, we can make an arrangement about it.

Prof. Dr. Kerem ALKIN
T.R. OECD Permanent Representative

The Future is in “Sustainable Energy Economy”

It constitutes one of the most important conditions for realizing the Sustainable Development Goals (SDGs) of the United Nations (UN) gathered under 17 main headings. It is also that; What a sincere struggle the world’s leading economies have put up to protect and improve the earth, the global ecological system, the climate and the environment. Because, in the name of “sustainability”, one of the most indispensable global trends of the 21st century, a dark future awaits us. Because, if comprehensive policies, strategies and practices for climate and environmental security, to protect all the riches of the global ecological system, and to efficiently use all the underground and aboveground resources offered by the earth, cannot be established, a very “dark” future again awaits us all.

It is also possible to express it as a concrete reality, in the sense of the risk of losing the energy necessary for modern life, while we can use the word “darkness” as a metaphor. For this reason, it is among the priorities of the scientific world that the inputs we use in the production of all goods and services to meet the needs of more than 8 billion world citizens are suitable for recycling, and technological progress towards “zero waste” in the real sense. A technological leap in which the inputs used in all strategic sectors, from food to textile, from construction materials to automotive, from electronic products to energy, will be reintroduced to nature and completely free from waste, will only bring us to a “sustainable future”.

In the universe that will make the world livabl for future generations, it will protect the world as a source of life. One of the most indispensable pillars of a sustainable future is “sustainable energy economy”.

Sustainable energy economy, on the other hand, rests on 3 pillars: The first is “sustainable energy production” based on future solar and wind technologies. Secondly, “fixed battery units, fixed battery battery systems” as an important technological breakthrough and discovery of the near future. Third, any vehicle that runs entirely on electricity. That is, “all-electric transport and logistics vehicles”. We are not just talking about cars, land vehicles; as well as all-electric sea and air vehicles. A very long and arduous R&D struggle awaits us for rockets and spacecraft.

The Sustainable Power Generation means creating a power generation composition based on hydro, geothermal and nuclear by prioritizing “solar” and “wind”. Sustainable energy production is also an important requirement for the “self-sufficiency in energy” condition, which has gained even more priority for countries. The fact that countries design their energy supply security in a way that will achieve the “net-zero carbon” target while preserving the environment and ecological balance stands out as the most fundamental challenge for the next 10 to 25 years. For this reason, developing technology for solar and wind-based energy production, building facilities and power plants based on new technologies, as well as developing “storage” technologies, especially for electricity produced by renewable energy derivatives, is just as important.

The Most Challenging Process is the “Next Generation” Battery Cell.

In this process, the most challenging process, the one that must be overcome, is to produce a new generation “battery cell”. Because the new generation battery cell represents an indispensable stage in terms of large-scale storage of electricity produced with renewable energy possibilities. Bunun yanı sıra “sürdürülebilir enerji ekonomisi” devriminin üçüncü ayağını oluşturan tam elektrikli araçların ve lojistik araçların geliştirilmesi için vazgeçilmez bir aşamayı temsil ediyor.

Progress in next-generation battery cell technology will be the most fundamental factor determining the pace of transformatio in the “sustainable energy economy” revolution.

The key element of this process is the lithium-ion battery cell supply chain. The full realization of a sustainable energy economy requires a battery unit with a capacity of 300 terawatt-hours around the world.

By 2020, the world’s demand for lithium-ion battery capacity is 526-530 gigawatt-hours. While China produces 558-560 gigawatts annually, Tesla alone is the most important actor, reaching 100 gigawatts, bringing the USA to the second place in the world ranking. South Korea and Japan share 35 gigawatts by almost half,

while Europe barely reaches 70 gigabytes. Australia, in 10th place, can produce only 1 gigawatt-hour per year. Annual production barely approaches 0.9 terawatt-hours, while even 1 terawatt-hour of annual production means that 300 terawatt-hours of capacity can only be reached in 300 years. However, the world has indispensable priorities for the 2030-2040 period. Therefore, even for its annual production to reach 10 terawatt-hours in 2030, it will have to wait until 2050-2060!

However, we need to act very quickly to slow down and stop climate change and protect our planet. For this reason, it is equally important for the net-zero carbon target to transform all transportation and logistics vehicles running on “fossil fuels” into fully electric transportation and logistics vehicles, vehicles. Because, if the electrical energy need of residences and all commercial enterprises worldwide represents 1 unit, the energy required for heating all the built units in the world represents at least 1 more unit of energy. In addition, all global transportation and logistics operations represent 1 more unit of energy.

For this reason that , it is necessary to reach renewable and sustainable energy opportunities and technologies only in order to meet the world’s electrical energy needs. At the same time, it will be necessary to provide all buildings in the world, the air conditioning of all living units and all transportation and logistics operations to renewable and sustainable energy opportunities and technologies against temperature changes caused by the seasons.

“ The Sustainable energy economy” will also remove energy from being a critical production cost item. Therefore, in the global competition, choices that neglect the environment and the climate and move away from the target of “net-zero carbon” in order to reach cheap energy will also lose their meaning. The world will focus on competition based on clean energy instead of competition based on dirty energy.

Two “Black Swans” and Challenges to the Global Energy Equation

The definition of “black swan” in the field of economy is used for events that cause irreversible changes on the world economy and global trade, together with the sudden realization of a “risk” whose probability of occurrence is perceived as low. It is also used for events that lead to the start of a brand new era for global economy actors. The two “black swans” “Covid-19” global virus epidemic (pandemic) and the

Russia-Ukraine War have triggered great debates and searches in the global energy equation, depending on the main and aftershocks they caused. While the “green energy transition” and the “zero-carbon target” are the top priorities of the global energy agenda, the issue of “energy supply security” is at the top of the agenda today.

Especially, with the tension between Russia and Ukraine, natural gas and oil experienced one of the fastest price increases in history. It once again reminded the economies that import a large amount of oil and natural gas, how indispensable it is to develop energy derivatives and technologies based on renewable energy, the “green energy revolution”, both in electricity generation and in heating and cooling of buildings. For this reason the world needs all kinds of opportunities that the earth provides with its own natural conditions, all kinds of “energy transformation” that will protect nature, prevent the world from warming, and slow down climate change. Even, from wind to solar, from hydro to geothermal, from biomass to current and wave action.

For this reason, both the UN and OECD, the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA), the European Union (EU) want to point out that. They do not want the concepts of “green energy transformation” and “green development revolution” to be overshadowed by the “energy supply security” concerns prioritized by the Russia-Ukraine tensions and the uncertainty caused by price fluctuations in the global fossil fuels market.

Because Afghanistan, the Balkans, the Caucasus many times, Iraq, Syria, Libya, Lebanon, the Middle East and the Gulf, North Africa, Sub-Saharan Africa, including the last link of the Russian-Ukrainian tension, are constantly living. On the one hand, a great humanitarian operation against human tragedies and the struggle to make peace permanent was waged relentlessly. We should not forget that the increase in the air temperature in the world’s land and oceans from 1.5 degrees to 3, even 5 degrees, or even 8 degrees, which will mean the disappearance of the world, with the effect of carbon emissions and greenhouse gas, may trigger a severe ecological breakdown that will endanger the existence of all humanity on earth.

Effective Solutions from the International Energy Agency (IEA)

Dealing with the rising natural gas and oil prices due to the Russia-Ukraine tension, which is uncertain under what conditions and when it will end, is the common problem of the whole world.

The IEA has quickly completed a study that will reduce the dependence of Europe, which is the world’s largest natural gas consumer, on the single market for natural gas, and even on natural gas itself. The 10 suggestions and measures that stand out in the detailed study of the IEA show that new methods and new technologies that will increase the efficiency of energy efficiency and energy derivatives in terms of global energy balances will be prioritized without going back. As a result, February 24, 2022, the date when the Russia-Ukraine War started, will set a milestone not only in terms of global transportation and logistics corridors, but also in terms of global energy balances.

The IEA’s recommendations include putting more emphasis on renewable energy possibilities from energy efficiency; There are simple, comprehensive and permanent solutions ranging from heat pumps to energy resource diversification and even to 10 billion cubic meters of natural gas savings by reducing only the heat thermostat by 1 degree in homes and buildings. In addition to this, it has been suggested that Europe keep the amount of gas storage to a minimum for a certain period of time in order to break the high price resistance and panic in the market. Another important topic in the 4th place in the measures section of the report is the acceleration of new wind and solar energy projects. It should be noted that this includes the geothermal energy potential of Turkey and Italy very strongly, partly also owned by Spain.

It will be necessary to accelerate the renewable energy production capacity increase with new facility investments. The EU side brough the electricity produced from its renewable energy generation capacity 100 terawatt-hours (twh) in 2021, an increase of 15 percent compared to 2020. The IEA wants to mobilize resources to increase production by another 20 percent to 100 terawatt-hours by 2022.

For this reason, it is recommended to mobilize support for new renewable energy installations and capacity increases without delay. In terms of another possibility, it is stated that investments in solar panels in residences and workplaces, factories, roofs can contribute another 15 terawatt hours to the annual electrical energy output of the EU. This is thanks to a financial support that will cost 3 billion euros for the EU and will provide grants for 20 percent of solar panel investments on the roof. The comprehensive projects for energy efficiency and the inclusion of nuclear and biofuels in the energy balance are among the recommendations of the report. The

analysis of the IEA for oil shows that the global oil demand, which contracted severely in 2020, the first year of the global pandemic, increased even more in the part of 2022 until now, even exceeding the pre-pandemic period, reaching 99.7 million barrels per day.

Therefore, in order to rein in and partially reduce the rising global oil prices, the IEA has defined 10 measures and recommendations that will be implemented in the short term and reduce daily consumption by 2.7 million barrels:

1. Reducing highway speeds by 10 km/h all over the world,
2. Encouraging working from home for 3 days for a while,
3. The ban on the use of cars in cities on Sundays,
4. Encouraging all kinds of micromobility and cycling in cities,
5. Making it difficult for private vehicles to enter city centers,
6. Encouraging the use of shared vehicles,
7. More effective planning for large trucks and distribution vehicles,
8. Encouraging high-speed train travel at night,
9. Companies reduce private jet flights,
10. More promotion of electric and hybrid vehicles.

Daily barrel oil savings are calculated for each of these 10 items. We will see together in time whether the leading 45 countries of the world will be able to produce a global common attitude.

Fatih BIROL
The President of the International Energy Agency (IEA)

Today, our world is going through the first global energy crisis. Before that, we had oil crises in the 70s, however this time the situation is quite different. The events that developed after Russia's invasion of Ukraine caused very serious price increases in both oil, natural gas and coal. The reason for this is that Russia was the number one oil exporter in the world, the number one natural gas exporter and one of the most important players in the coal markets until a few weeks ago. Now, if we look at the volatility in current energy prices, high prices and the development of geopolitical events around us, I think this crisis will not end in a short time.

We all need to think about getting used to living with volatile and high energy prices for a certain period of time.

This period seems to be an extremely troublesome period for the economy all over the world, especially in terms of inflationary pressures. If we look at the oil crises in the 70s, the world faced both serious inflation and a recession in the economies. Now, if we look at this period, inflationary pressures, contractions in the economies, and even the risk of recession are extremely high, but the oil crises in the 70s did not only cause recession and an increase in inflation. The measures taken against the crisis in many countries caused serious innovations and leaps in the energy world. I want to give you 2 examples.

The first is the amount of oil consumed in cars. In the 1970s, a car needed about 20 liters of gasoline to travel 100 km on average. However, this decreased to 10 liters in a very short time instead of 20 liters as a result of the policies changed by the countries right after the oil crisis. In the past, when there was a crisis, 20 liters were required for 100 km until then, as a result of the measures taken, this decreased to 10 liters and there was a great leap forward in the cars we call fuel efficiency. The second is in another area, that is nuclear energy. Again, as a response to the oil crises, many countries built nuclear power plants one after another in Asia, Europe and North America. In fact, 40% of the nuclear power plants used in the world today are nuclear power plants built after the oil crisis.

The reason why I say this may be that the global energy crisis we are going through right now may not only be caused by inflationary pressures slowing down economic growth, but also by countries responding to this crisis with different energy policies.

Before looking long-term, I want to take a short-term look, because I think that these summer months in oil markets and winter months in natural gas markets can be quite difficult. Because, on the one hand, there are serious problems in oil supply, which we all know. Oil demand typically rises during the summer months when demand is normal, while people use cars and planes more, and if there is no supply from producing countries and no nice surprises, dwindling supply and rising demand could push current oil prices even higher.

When we look at natural gas, there may be serious problems in the natural gas market as the natural gas demand will increase in the winter months, especially in the northern hemisphere. In fact, it is necessary to consider that there may be supply restrictions in some countries in Europe and Asia, unless there is a pleasant surprise for natural gas and urgent measures are not taken.

By considering these situations, we, as the International Energy Agency, have taken some measures. In the oil markets, we have supplied and are supplying oil from the existing oil stocks to the markets, including to Turkey, two times in a row, and this has largely prevented the prices from increasing further. We presented 2 very large supply waves to the markets. Despite this, nearly 90% of our oil stock supply is still in our stocks, in the stocks of countries. If there are big problems in supply, we can put them on the market. We also made a series of suggestions on the urgent measures that countries can take on natural gas and oil. We call this a 10-point action plan. We have presented the measures that can be taken to prevent a crisis that we may experience in Europe and Asia, especially in this winter, for the information of the countries.

Let me tell you briefly what is included in these measures; The first is supply diversification in the short run. We think that especially LNG will play an important role here. In addition, many countries will be able to help by increasing production there, especially with the oil lines of Norway, Azerbaijan and Algeria. This is the first group of measures.

The second group of measures is the acceleration of renewable energy, which means the granting of licenses, the issuance of permits, the faster the bureaucratic steps here and the faster growth of renewable energy. The third package of measures we propose is related to energy efficiency, here I can give you two examples, one of which is to speed up the isolation of buildings urgently. We think that governments can give incentives in this regard and that we can achieve a serious decrease in heating

demand thanks to insulation. Another suggestion for efficiency is to increase the heating rates in the buildings 1-2 degrees lower. This is also extremely important. Let me give you an example of how important it is. If we reduce the heating by two degrees from 21-22 degrees in Europe, we can save about 20 billion cubic meters of gas, which is equal to the gas a north current one gives to Europe in the winter.

Fourth, there are some countries in Europe had decided to shut down their nuclear power plants prematurely. We suggested that they review these decisions and, if possible, postpone their decision to close. In addition, some countries, for example, the Belgian government, considering this proposal, postponed the decision to close for 10 years. These are important, in fact, measures that do not seem easy, but measures that can be taken. If these measures are not taken, not only high prices but also natural gas supply restrictions may come to the fore this winter. As in the 70s, the current situation can cause serious changes in the energy policies of countries, and let's say it actually happens.

I think that the investments in technology for some types of energy are increasing rapidly. In fact, we have a lots of data on this. One of them is renewable energy. We see that a big record will be broken in renewable energy this year. There will be an additional capacity increase of approximately 322 GigaWatts, the largest increase ever. Secondly, we observe that there will be a serious improvement in energy efficiency, especially in buildings and cars. Third, there is a comeback in nuclear energy, I said 6-7 months ago that nuclear energy will make a comeback, and recent events have actually accelerated it. Many countries in Europe, Canada, America, Japan, Korea and India have accelerated their nuclear energy projects, which I think is an extremely positive development.

I can say that the change in these energy policies, the cheaper prices of many clean and domestic energy technologies, and the fact that these technologies can play an important role in combating climate change. I can also say that national security is because the concept of national security leaves its mark on energy policies. Because when these three come together, it's a powerful combination of being low in costs, being environmentally friendly, and contributing positively to national security at the same time. In the coming years, I think that the fight against the energy crisis will be the most important agenda item of all countries, as it is in our country. However, I think we should not forget the climate crisis, which is also an important crisis along with the energy crisis.

Francesco LA CAMERA
The President of the International Renewable Energy Agency (IRENA)

IRENA has recently released its annual flagship report, World Energy Transitions Overview WETO 2022.

WETO outlines priority actions to reach the 2030 milestone and drive the energy transition towards the 1.50C climate target.

As IRENA, we believe that an energy transition based on renewable sources is the most realistic way to achieve greater energy security, national resilience and a more inclusive, equitable and climate-resilient global economy.

Renewable resources are available in all countries and are currently is the cheapest energy option in most regions and is the only way to ensure real-world energy security. However the energy transformation is still far from being on the right track.

Any activity devoid of radical and immediate action will reduce and even eliminate the 1.50C target and even the chances of staying on the 20C path.

Although the technologies we need are available; What is needed now is predictive elections, holistic policy frameworks, smart investments and, above all, an extraordinary level of political will and international cooperation.

As IRENA, we see electrification and energy efficiency as the main drivers of decarbonisation provided by renewable energy, green hydrogen and sustainable biomass.
We also see grid upgrade, modernization and expansion as a high priority over the next decade.

However, despite the many positive developments we have witnessed in recent years, the rate of renewable dispersal needs to triple if we are to have the slightest chance of meeting the climate target.

Renewable energy sources, including wind and solar energy, must grow faster than energy demand.

We are on the threshold of an era where renewable energy, green hydrogen and bioenergy will dominate.

Decarbonization of end-uses is the next step in the energy transition, with many solutions, especially by green hydrogen.

As an increasing number of countries and industries compete over the widespread use of hydrogen, hydrogen is today a central focus of decarbonisation strategies for sectors that are difficult to reduce carbon.

Green hydrogen will move from niche to mainstream by 2030.

We must also ensure that the transition to this new energy system is fair and sustainable. Our analysis significantly measures the distribution of energy transformation benefits from forward-thinking policies shows how much it can improve. Overall, more countries will benefit more from business as usual during the energy transition. Of course, the imperative of a fair transformation remains.

In our pursuit of a more inclusive and equitable world, we must carefully manage this systemic change to minimize risks.

Today, governments face the challenge of striving for energy security, resilience and affordable energy for all.We call on governments to take immediate action to make their strategy an important reality for the world. And with its global capacity, IRENA is ready to collaborate and support to help pave the way for a fully renewable future.

Omer Cihad VARDAN
4th Term Chairman of MUSIAD / Chairman of DOSİDER Board of Directors

Who is DOSİDER and who does it represent?

Our association DOSİDER (Natural Gas Equipment Manufacturers and Businessmen Association) is a sectoral association established in 1993, where companies that manufacture or import natural gas-burning appliances in our country come together. It represents 95% of the heating sector. It provides service with thousands of dealers and service organizations throughout the country. Since its establishment, it has been involved in every activity aimed at the reliable use of natural gas in our country.

Usage of Natural Gas in Turkey

If we talk about the point of natural gas in Turkey; As of 2021, we can say that natural gas has reached 81 provinces and 600 districts. We see that this corresponds to 68.5 million (81% of the population) in terms of population, while the population that actively uses natural gas reaches 57.1 million (83%). As of 2021, we can say that there are over 30,000 natural gas installation and maintenance masters, and an authorized service that provides after-sales service to more than 3,000 natural gas burning devices. In addition, 18.5 million subscribers, more than 10,000 natural gas installations, devices, etc. We can also add that it is a selling point.

Natural gas consumption by years; In 2019; It has reached 44.88 billion cubic meters, 47.74 billion cubic meters in 2020 and 58.87 billion cubic meters in 2021. By looking at these amounts, we can see the size and ongoing nature of investments in natural gas. It should also be noted that with these investments, our country has turned into a very important natural gas transmission line. On the one hand, while our natural gas distribution network grows with the investments made, the amount of natural gas consumed increases accordingly. After all the investments already made, the increase in usage is a very natural and necessary development. Ultimately, this situation brings with it the need to use a resource that we depend on foreign sources as efficiently as possible.

High Efficiency Device Usage

As it is known that, a significant part of natural gas-burning appliances are manufactured in our country. Even Turkey, combi boiler, radiator, boiler and so on. We can say that it has become the production base of Europe for many products. Our companies both meet the needs of the country and export at significant rates with this production capacity.

Of course, there have been serious developments in terms of efficiency in natural gas-burning devices over time with the increase in the use of natural gas. In our country, the ERP (ecodesign) regulation entered into force in 2018. Within the scope of the ErP regulation, gas burning devices below 400 KW are required to provide a certain efficiency class (seasonal efficiency) and to have an energy label for appliances below 70 kW. In this way, condensing devices with higher efficiency and lower NOX emission values than conventional devices, that is, high efficiency and green technology, have been started to be used.

The use of high-efficiency devices also Paris Climate Agreement to which our country is a party, and İt also serves the environmental goals desired to be achieved with the European Green Consensus.

In this context; Our member companies, which have 13 approved R&D centers, make very serious investments in R&D. Thanks to these investments, products with high energy efficiency are produced and existing products are further developed. In addition, serious studies are carried out in order to produce the components we import in our country. While some product groups can be produced entirely with our own resources, various components required for some products are outsourced. However, the localization rate of these products is increasing day by day.

Heat Pumps

In terms of new energy efficient products, the widespread use of heat pumps, which are included in the product range of our members and are rapidly developing and growing in the European market, is also on the agenda as a prominent issue in terms of environmental impacts.

However, for our country, this market cannot grow very fast at the moment because the cost of these products is quite high and support mechanisms have not been formed yet.

Use of Hydrogen

Another issue on our agenda is the use of hydrogen in heating devices.

In Europe, the studies are carried out to make it compulsory to use renewable energy sources in heating systems at rates that vary from country to country, and laws are enacted for this purpose.

In our country, GAZBİR/GAZMER started an R&D project in Konya for the use of natural gas and hydrogen mixture. A 2050 roadmap has been published for 100% hydrogen use in selected regions/cities. In the coming days, as part of a pilot project, trials of up to 20% hydrogen mixture on the live line will be started. With the successful use of hydrogen in devices; acquisition, transportation, storage, etc. problems need time to be resolved.

Conclusion

Considering the investments made in our country in the short and medium term, natural gas will remain on our country's agenda. Our new natural gas reserves in the Black Sea will be included in the system in the near future. The use and consumption of natural gas will increase, and green transformation projects will be implemented in line with the determined targets. In this context, we can say that the infrastructure and capacity established in our country are our biggest advantage for the developments in the coming period. It should also be underlined that the global companies in our country follow the developments in the world and especially in the EU countries and implement their investments simultaneously. As always, we will make every effort to manage this important change process in a way that will achieve the most positive results for our environment, our country and our users as the whole sector.

Altug KARATAS
The President of MUSIAD Energy and Environment Sector Board

The industrial revolution and its pursuit The technology revolution, which started at the end of the 20th century, is increasing the world's energy needs.

There is an increase in energy consumption per capita, especially in developed countries. Although there are geographies in the world where electricity still does not reach, and fair use of energy is unfair, the only truth is that it needs more energy. With the increasing need, instability and wars in all geographies where energy is present are disrupting the political balance of the world. In recent years, a completely different agenda has entered our agenda: Climate Crisis.

Anymore we must not only reach energy, but also eliminate the climate risks that our world is facing by obtaining it with clean energy.

In this context, the steps that everyone agrees on are clear;

- Energy supply security,
- Production of energy from environmentally friendly clean sources and energy conversion,
- Financial infrastructure and human resources required for energy transformation,
- Fair and sustainable energy policies,
- Digitalization in energy.

The roads in these titles, which every country tries to reach, are a bit rough. First of all, the concept of justice in energy has become important, just as the world needs political justice. Most of the energy source countries have problems of foreign intervention, political instability and poverty.

The great financial power is required for the energy transformation that will occur with production with clean energy resources. But the world is also passing through an economic downturn. How undeveloped countries will reach these financial resources is a big unknown.

The need for qualified and competent manpower required for the transformation in energy is another problem, primarily in developing and underdeveloped countries.

In the transition to clean energy, wind, solar, etc. to produce the energy. The production of equipment and the minerals required for them is another problem of the world.

This transformation requires new technologies in energy. For example, the production of hydrogen requires time and finance in technology as gas and liquid.

With all this, it is developing rapidly in digital transformation from production to end-use. The digital transformation marks a great evolution from the networks of the states to the individual user.

In the sub-headings, there are subjects that will interact with electrification, electric vehicles, energy efficiency and behavior change for energy use in societies, up to the sociology and habits of the society. Even the necessary infrastructure and modern need for the production of the advantages of battery technology alone is the subject of a doctorate.

I would like to explain the transformation of energy and the world together with a simple formula which is catchy. Notice, Feel, Claim, Monitor and Manage

The world needs to realize that the transformation in energy with the climate crisis and start with this awareness. Realizing the problem, the world will begin to feel it and see the danger. Currently, a part of humanity is feeling this danger, however some are struggling for life. The third stage in the formula is to be demanding. Demanding transformation makes it possible to produce and use renewable energy and carbon-neutral energy technologies. The final stage is the “watch and manage” stage. It is not enough to implement the first 3 steps, it is necessary to monitor and manage the digital transformation of states, companies from energy generation and transmission, individual production facilities and individual users. A sustainable transformation can only come into being with these 4 steps.

Energy can be the cause of peace just as it is the cause of wars. It is not possible to give up energy, even our addiction is increasing.

At that time, we must take responsibility and be ready for transformation, and as Turkey, we must be one of the most important stakeholders of transformation.

Dr. Cihad TERZIOGLU
Secretary General of MUSIAD

A Suggestion for a Solution to the Global Energy Problem: Digitalization and Blockchain Technology

Is a solution possible that for the energy crisis that shook the whole world? Will the injustice in energy resources come to an end? Is there a future for the millions of people who cannot access energy?

The energy sector, like all sectors, experienced a process that it had not experienced before with the Covid-19 epidemic. Quarantine practices, which started in China and then covered all developed and developing countries, caused a great economic recession. Developments that reduced economic activity, such as the closure of businesses and industries, and the cessation of inter-city and inter-country logistics activities, also reduced energy demand. In addition, developments that reduce economic activity, such as the inability of people to come together due to social distance rules and the inability to use transportation vehicles, are among those that reduce energy demand. The decrease in energy demand and the excess supply in a short time caused the prices of energy commodities to decline. The similar problems experienced in critical mines and minerals, as well as energy commodities, caused an energy crisis that has not been seen for many years, as well as the economic crisis all over the world.

In the last 100 years, when fossil resources such as oil, coal and natural gas were widely used, energy demand had a direct correlation with economic activity. While increasing economic prosperity increased the need for energy, any economic contraction caused a decline in energy demand. While the Covid-19 outbreak caused the biggest economic recession in recent years, it also subjected the energy sector to a major stress test. The supply-demand imbalance in the energy sector caused investments in this sector to stop in the short term and serious employment losses were experienced. While the loss of investment appetite in all service items from production to transmission, from transmission to distribution and from there to the end user resulted in a loss of employment, sector stakeholders were also in great pessimism.

Another point that should not be overlooked is this; This was when the crisis coincided with the era of electrification. Today, humanity is more dependent on electricity than ever before, as electronic devices that need charging are increasing day by

day and every sector from health to transportation, from automotive to food and agriculture needs more electrical solutions. In this sense, electricity is considered as a part of well-being and happiness.

As of the point we have reached, we can summarize the global energy crisis in two stages. The first is the low demand in energy caused by Covid-19, the historical decline in oil prices and the decrease in carbon emissions; In the second stage, the energy demand, which recovered together with the transportation sector, after Covid-19, the fragile market structure and unusual political authority problems and the failure to provide the supply-demand balance economically.

The Impact of the Energy Crisis on Combating Climate Chang

Especially in Europe, renewable energy use has been encouraged, within the scope of efforts to combat climate change, which has come to the fore again with the Paris Climate Agreement. In addition to this, medium and long-term regulations were announced for the use of electric vehicles instead of fossil fuel vehicles. In addition to these, research and development activities were increased in innovative topics such as battery, hydrogen and carbon capture technologies, and studies were carried out to encourage digital applications. The quarantines implemented together with the Covid-19 epidemic affected transportation and logistics, while reducing energy demand. The decrease in demand naturally led to a decrease in carbon emissions. Even for a short time, the whole world woke up to a rehearsal for a clean future.

It was remembered what a green and clean climate means, while carbon emissions decreased with the decrease in industrial activities. Contrary to these short-term effects, the second side of the coin was encountered in the medium term. While renewable energy investments, which can be summarized as clean energy transformation, have decreased, carbon capture, battery and clean hydrogen studies have been interrupted. Declining investments limited the resources allocated to renewable energy, and it was started to be talked about that fossil-based electricity supply in the global sense is a topic that is not easy to give up. Decreased supports,

employment losses and mineral/mineral constraints slowed down the clean energy transformation and opened the door to a period in which the targets set within the scope of combating climate change were strayed away.

Can New Technologies and Digitization Be the Solution?

The current high investment costs of new technologies in the energy sector are bearable when the long-term benefits are considered. While battery and storage technology increase the compatibility, flexibility and operational efficiency of renewable energy sources with the grid, hydrogen technology paves the way for the use of cleaner natural gas, just like renewable energy.

On the other hand, the carbon capture technology is the storage of carbon from the carbon mixture gases discharged from the chimneys of thermal power plants. With the development of these technologies and the increase in renewable energy installations, a network (grid) that will become difficult to manage will be encountered. The world that wants to bypass the energy crisis must overcome this challenge. Here is the solution; we will encounter the use of digitalization, which increased oil and natural gas production after the 1960s, to manage electrification, which is now a more complex problem.

The digitalization is a summary of the process of analyzing the technologies developing in the energy sector with digital computer applications.

We can interpret that the process of dissemination of computer-based applications needed to solve producer and consumer demands in a decentralized and even distributed structure of electricity supply, which was central until yesterday, as digitalization. The digitalization applications in the energy sector; We can list examples such as eliminating supply and demand imbalances, maintaining network flexibility, making price forecasts, developing consumption-side demand forecasts, organizing predictive maintenance and repair activities.

The summarized in 4D in modern literature; distributed, digitalized, carbonless (decarbonization) and pluralistic (democratization) energy solutions draw attention.

Along with digital applications, decentralized and distributed electricity generation, carbon-free renewable energy solutions (water, wind, solar, etc.) can eliminate injustice in energy. Each consumer's process of producing their own electricity (with solar on the roof, wind power plants in the garden) and managing it centrally with digital applications will make it easier for everyone to access electricity.
Another benefit of digital applications is the value-added employment that they will create, thanks to their ability to cover lots of areas from engineering to project development, from installation to service delivery. The new investments brought by digitalization will increase employment and high-tech applications will pave the way for qualified employment, while decreasing energy investments will cause employment loss.

The digital applications, which have led to disruptive developments in every field with artificial intelligence technology, have also caused many effects in the energy sector.

The practices that ensured the spread of clean energy transformation to the base also enabled the fight against climate change to be sustainable. Right here, with digitalization studies, data in many sectors are made meaningful and energy management is facilitated.
The digitalization applications that we propose as a solution to the energy crisis also contain problems that await solutions. While the realization of digitalization applications requires a certain infrastructure and qualified employment, it brings cyber security

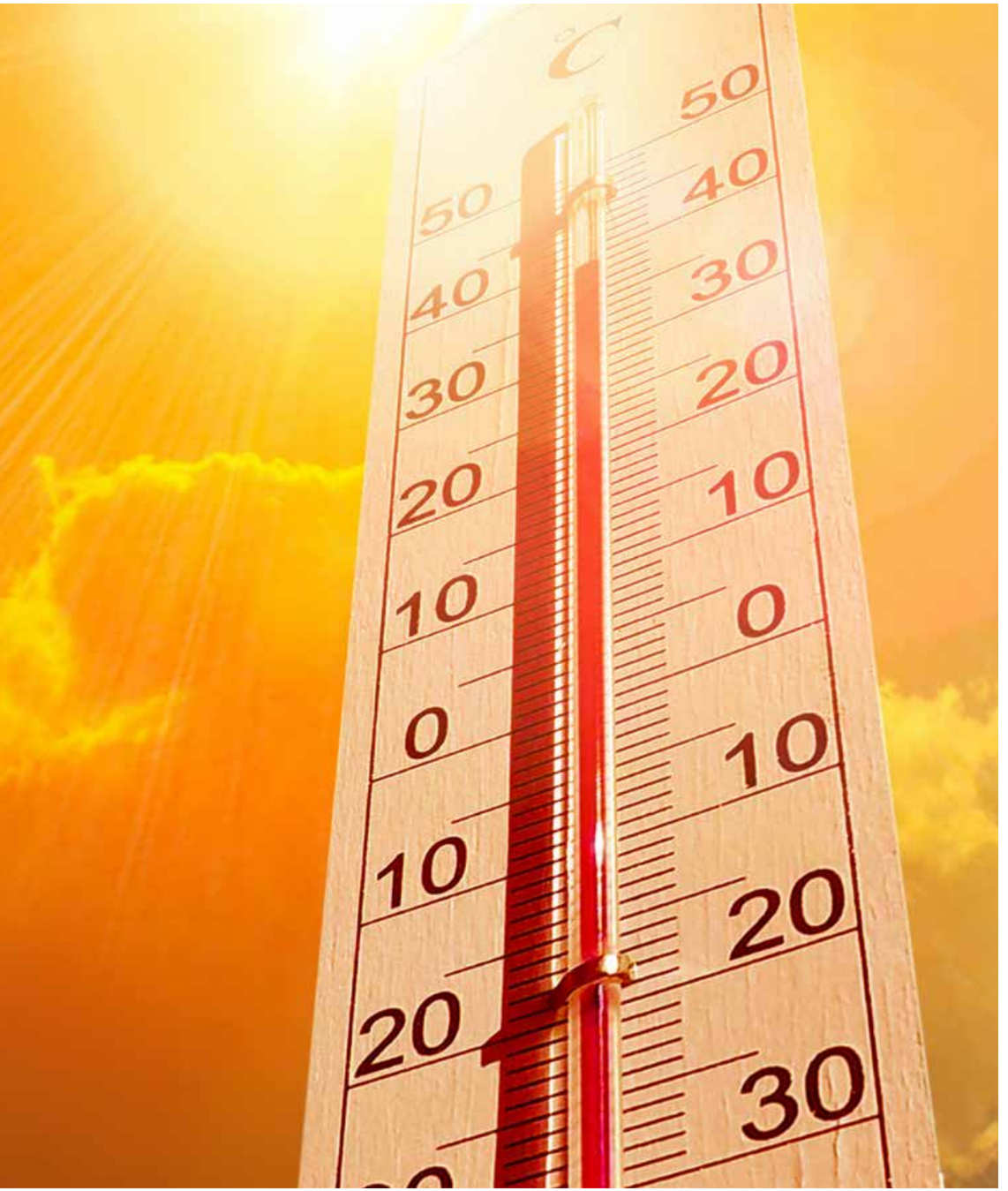
and similar risks; The use of high-technology products also creates a time and cost burden. At the same time, the serious steps are required in the digital world in the areas of security, law, regulation and similar topics.

In this context, it is thought that (blockchain) technology will have very permanent and sustainable effects in the energy sector. Although blockchain technology is not as well known as crypto assets, it is the technology behind them.

We can summarize that blockchain technology as a chain of decentralized but distributed structures that act as a center at each point, and in the form of blocks of records that cannot be changed. Blockchain technology, which finds application areas in finance, health and food sectors, also has wide application areas in the energy sector.

Especially in today's world where clean energy transformation has become widespread, the applications such as peer-to-peer energy trading (p2p), carbon certification process, crowdfunding tools, establishment of clean energy platforms are available in our country as well as all over the world. As a matter of fact, blockchain applications in electricity-gas distribution and supply companies in Turkey are evaluated by EMRA as an R&D project, and these research and development activities are supported on a national scale. The "cost and time" advantage comes to the fore thanks to developments such as the elimination of intermediaries, the prevention of duplicate records, and the acceleration of reconciliation processes through smart contracts with this technology.

Consequently; Advanced digitalization applications, supported by data that can make sense, appear as a solution to the global energy crisis. With these applications, it is seen that investments and employment in the energy sector will increase, access to energy will be easier, and a distributed and effective network management will be realized with self-consumption models. The cost and time burden of these solutions can be overcome with blockchain technology. The potential that new applications to be developed on blockchain technology can prevent energy injustice should not be ignored. If this potential is developed for the sake of right ambitions, the way to a sustainable future will be opened.



Bulent SEN
Head of Architect Engineers Group

What will investments be like for global energy expectations in 2050?

In the today's world, high energy prices, abnormal increase in natural gas and coal prices, climate change, and the inability of renewable energy to meet the demand will increase the demand for nuclear. In the US, China, the UK and Eastern Europe also increased demand for nuclear.

The total installed power of Turkey as of the end of December is 99,819 MW. In that case, how is the distribution of Turkey's electricity generation in 2021?

Turkey's electricity production, 32.71 percent is natural gas, 18.34 percent is imported coal, 16.80 percent is HEPP, 16.65 percent is WPP, SPP, GPP and 13.69 percent is domestic. obtained from lignite. Others are 2.40 percent. 40% of the total production capacity has been provided from renewable energy sources. Due to this year being particularly dry, the production in HEPPS decreased from 33 percent to 17 percent.

Unfortunately, we had to balance this deficit with electricity generation from imported natural gas. Turkey ranks 5th among European countries in renewable energy installed power; It has risen to 12th place among the countries of the world. When we Look at the countries of the world, thousands of MWs are expected to be commissioned in the next quarter. 10,000 MW of wind, solar and other renewable energy sources will be commissioned in Turkey.

The developing technology in renewable energy resources, along with rapidly falling costs in the world, makes it easier to invest in these resources.

Now, let's look at what has changed in green energy with the Paris Agreement.

We know that 80% of climate change is caused by energy. The remaining 20 percent comes from other sectors. If the world warms up by 1.5 degrees, we will see the drought and fires experienced last year more frequently and severely.

Looking at the targets now, to reduce the carbon footprint by 50 percent by 2030 and achieve net zero emissions by 2050 (we are even now 1.1 degrees above past average temperatures) we actually have some homework to do. Let's gather them under 5 headings:

1. Renewable Energy, Clean Energy: Such as solar, wind, biomass and GPP. We should increase them at least 3 times compared to the past.

2. Energy Efficiency: We have to use our energy efficiently. For this, we need to invest in energy traceable technologies.

3. Using New Technologies in Renewable Energy: Such as hydrogen, carbon capture, data storage technologies.

4. Accelerating Nuclear Reactors

5. Like Decreases in Consumption of Fossil Fuels.

The above are essential for a 50 percent decline in 2030 and net zero emissions in 2050. Henceforwards we have to make a choice or endure the disasters we experience.

The Paris Climate Agreement was signed among the countries.The targets for how to reduce emissions to zero by 2050 have been set. One of the topics discussed in Glasgow was; Some investments are risky. Coal investments can be made, however they can no longer get the loan easily. The 90% of the power plants built in the world in 2020 are clean energy. On the other hand, other investments, remained at 10 percent. Investments in clean energy are at the rate of 90 percent. In this ratio, the ratio of the Sun is increasing and the Sun will be the star of this period. While the transition from one source of energy to another is 50/100 years in the world, isn't the transition from coal, gas and nuclear to renewables in the last 20 years a great technological change and break?

Doesn't electric vehicles come behind the sun? In 2019, 2 out of 100 vehicles in the world, 7 out of 100 vehicles in 2020, and 9 out of 100 vehicles by the end of 2021 are electric. 1.4 trillion USD has been invested in electric vehicles in America.

In the current world, high energy prices, abnormal increase in natural gas and coal prices, climate change, and the inability of renewable energy to meet the deman will increase the demand for nuclear.

In the US, China, the UK and Eastern Europe have also increased demand for nuclear, and I think mini nuclear power plants are now on the way. The world economy is growing by 6%. SPPs are the leading actors of the energy of the future. Especially with the increasing energy prices, its star will also shine with roof/facade systems in the industry. 100 billion USD poor countries need financing. Poor countries say, "climate change is okay, but we need clean water". This desired figure is not only for emissions but also for providing climatic conditions. At 1 trillion USD, developing countries especially need renewable energy investments.

The extremely clear messages emerged with the COP26 Summit. One of the sayings is that "if you still invest in fossil fuels, but consider the risks". In fact, the competition in the world is in pursuit of technologies. While hydrogen is 3 times more expensive, investors can say "I produce from coal and natural gas".

At the present time , developing countries such as China, India, Brazil, Indonesia are rapidly transitioning to renewable energy. But this does not indicate a complete exit from fossil fuels.

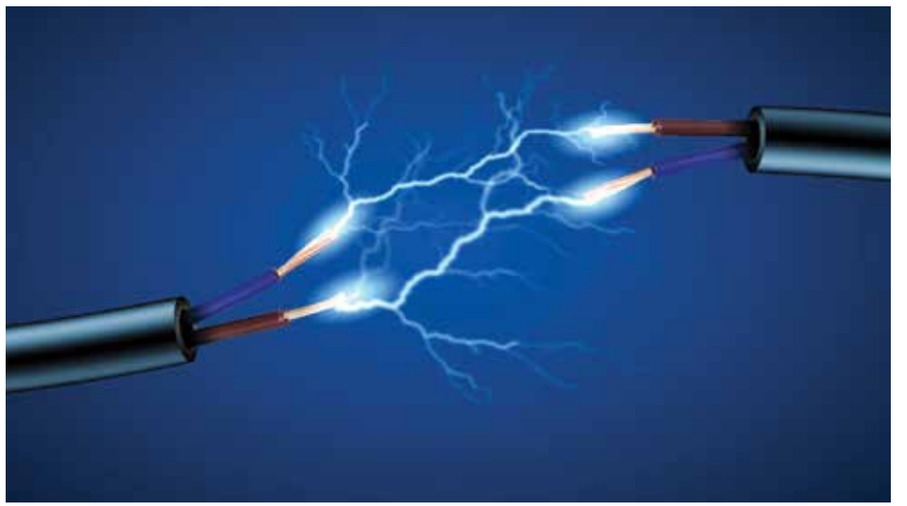
We must plan how we will further develop national energy policies and with which financing we will support this technology as Turkey.

The mine used in electric vehicles and renewable energy at 1 MW is 6 times more than a 1 MW power plant using fossil fuels.

The minerals such as critical minerals, lithium, cobalt, magnesium, copper are in a few countries and these countries are concentrated in these mines. It seems that the problems in oil will also occur in the mine in the future. Now, the trouble in the mine could increase prices with the demand for renewable energy and slow down the renewable energy utilities. It can increase that geopolitical risk factors in countries. Due to the increasing prices and the difficulties in accessing energy due to the pandemic, the countries are seeking to provide convenience in accessing energy with economic packages. Indeed, if clean energy is not supported, the demand for fossil fuels will skyrocket and emission values will not hold it.The countries have put the 17 trillion USD economic package into effect, however the share of renewables is 3%. The demand for energy has increased in the world with the economic growth. In addition to this, drought was experienced in many parts of the world due to cli-

matic conditions in 2020/21. In countries such as China and Brazil, serious droughts began to be experienced; countries showed interest in fossil fuels and LNG.

These countries imported 6 times more energy than their needs. Due to the neglect of natural gas power plants and their postponed maintenance, most of them went into idle state. In fact, there is no shortage of natural gas and oil, but the important thing is whether it comes to the market. Natural gas prices are related to whether Russia increases its natural gas exports. And gas prices will be determined by Russia and the weather. In carbon emissions, 1% of the world's population accounts for 15% of the emissions, while the poorest 50% constitutes 7% of the emissions, that is, the rich population creates 100 times more emissions than the poor population.



As a conclusion, in 2050, according to the net zero emission scenario,

1. Coal energy production will fall to 1 in 9.
2. 1 in 4 in oil
3. It is predicted that it will decrease from 2 to 1 in natural gas.

According to the International Energy Agency (IEA), we can collect that what needs to be done to achieve zero emissions under 7 headings:

1. Energy Efficiency
2. Clean Energy
3. Hydrogen-based fuels
4. Carbon retention
5. Bioenergy
6. Electrification
7. Behavior changes

These are the factors that will determine the energy projection of world for 2050.

Barış SANLI
T.R. OECD Permanent Representation Energy Consultant

Dynamics of Technology Development in Energy

How does energy technology develop?[1] Everyone has an answer. However, one of the most correct answers is that there is no single recipe for it. Developing and producing these technologies is undoubtedly a development policy. When it comes to development, there are many different views such as giving money, building institutions, strengthening markets, strengthening the state. However, is development really such a prescription issue? What needs to be done to develop energy technology?

Elon Musk is undoubtedly one of the most talked about people lately. It has made a name for itself in many developments from electric cars to space projects. Some of Elon Musk's tweets are worth considering.

"Prototypes are easy, producing is difficult. Making an electric car was not the hard part for Tesla, dozens of companies did it"[2]. This saying actually contains one of the most important lessons to be learned from the past periods.

Another important statement (related to batteries) is that "It is not properly understood how difficult the new technology is to scale. It's 1000%-10000% harder than making a few prototypes in reality. Making the machine that makes the machine is much more difficult than making the machine itself.[4]

Development Perspective

There are many different approaches in the development literature. Although this is not the subject of this article, it may be necessary to draw attention to an interesting approach recently. "Gambling on Development" by Oxford University Professor Stefan Dercon, who is also a Chief Economist at the UK's Ministry of International Development, has revealed an unusual approach.[4]

As an expert who has worked in African countries for years and worked with economists in these regions, Dercon states that there is no recipe for this, but the markets and the state are important points. But it highlights two important things.

1. The ruling elite really wants to develop
2. Not giving up on trying

While doing all this, he claims that knowing the state's capacity and limits and making a plan that is not the most perfect but can implement brings more benefits. It is normal to understand it ideologically in very political discussion environments, when it comes to the market. However, even before there were ideologies, people were selling what they produced in the markets. There was no state logic that decided what they could and could not produce. The most important reason that why markets are essential is that they allow more people to race minds and skills. However, we can not say that the market or state model is the only successful one. In other words, according to Dercon's point of view, it is essential to have a common and strong consensus of opinion and to be wanted, not to be afraid to experiment, and to use the right tools in order to develop energy technology.

Who will develop the technology?

Although academics have a share in many technologies that we see around us now, academics alone cannot go beyond the prototype for many times. In general, problems such as not being able to find funds come first. Although some academicians want to continue by establishing a "startup", the commercial side operates with very different rules than the academic side.

For this reason that, a lot of technologies have been matured or commercialized by dropouts. The founding story of all the most high-value tech companies in the US runs through the garage, not the school. However, the share of research centers of universities in the technologies they use is very large. However, the commercial product is a very different product from the prototype.

For this reason that, it is very important to understand the roles correctly. Because the path from technology development to product is multi-layered. There is a distance that academics can bring, startups have a contribution, companies also have a contribution. Actually, it looks more like a game that should be played like a relay race. However, you will have hundreds of competitors so that it is possible to finish that race. To start the competition with those hundreds of competitors (not for commercial products), much more funding needs to be given to scientific research and universities.

The discussion of what is R&D has gone to strange points over time. Weird approaches such as the solar cell has been found, solar cell R&D is not innovation, misses a fundamental point. The nature of technology development is about experimentation, and the government's reducing the risk of those who want to try increases participation. However, it should be known that it is the nature of the business that after years of support, nothing may appear in sight.

For instance, years of money have been spent on space travel, moon travel programs, but what happened? Many of the technologies which we use today are based on space programs. In other words, the state's transformation of the system may not produce an output on its own, but may only serve a political purpose. However, the production of human resources, knowledge and skills spreads with a multiplier effect and turns into an added value in many other areas.

Shortly, saying "technology will be developed, let's give it to the university, to the research center" will get us nowhere. These structures also do not say "no" to funding, and in some cases, they can provide complete customer service until "how to open the door of your electric car". However, people who have stayed in universities for a long time do not have the ability to do this. It is there to produce people and knowledge. The product is something else.

Product

In many R&D projects over the years,even the impossible, the highly educated people have promised everything. When we look back at the results, it is not surprising to encounter many prototypes, one-off facilities, and non-repeatable results. It is not known that whether it is useful. But it turns into the process of dividing a "fund" rather than the development of technology.

Today, a great success is mentioned in the headline of a newspaper once or twice a year. Usually the pictures are full of sentences with a scientist in the lab and unbelievable numbers. Here is what Elon Musk emphasizes, the prototype is easy, the product is difficult to understand here.

Today, even high school dropouts can make wind turbines, solar panels, electrical systems on documentary channels and online sites and share how they do it. For example, dozens of videos can be accessed for making a lithium battery cell at

home[5]. Indeed, many people can easily make lithium cells with a small amount of material. But if these people were given $1 billion, would they be able to produce cells with high production quality?

If you ask them, why not? Who does not want to do research with someone else's money, especially the state's money. But if they are so self-confident, it is necessary that they first establish a company with their own money and enter this path with a startup. This is another point Musk who is made. Scaling is another matter.

It should not be understood that R&D cannot be done with research centers and universities. However, technology development is not something that can be delegated to universities or R&D centers. Actually, we directly see SEEs, that is, operators, in the first steps in domestic energy technology development of Turkey. They can also have received the services from universities to consult.

It was a period in which the state advanced with the strongest players of that period,[6] formed teams with people who had experience in operating that technology, and left the cooperation with universities to them from the domestic turbines of the Hirfans to the establishment of TEMSAN. Later then, with the weight of research centers, technology took on a structure that was transferred to these centers. On the other hand, there can be no outputs other than prototypes that are not likely to turn into products, if the centers have chosen to get more funds and keep the funds within the academic structure.

Whereas, the state should try to integrate all intelligence in society. But not every one who says "I can do it". Giving projects to people who are under a financial risk or those who are in the balance of burden and blessing, and encouraging their cooperation with the academy can be a method.

Differences in Detail

This philosophical debate can have its right and wrong sides. For this reason that, it would be useful to look at the dynamics on the technology side. How is the development especially in clean energy technologies?

From the book of Daniel Yergin "The Quest" suggests that among solar, wind, oil fracturing technology, the newest technologies are on the oil side.[7] Hence, the solar,

lithium battery, hybrid vehicles and many other technologies that we are talking about in the field of clean energy today are more than 40 years old.

There is a narrative in the example of the sun. In the narrative, it is explained that PV technology has been known for years, and while it was thought to be given for small hydros in Germany, the purchase guarantee,[8] which includes the sun, rapidly expanded the market. Then, it is explained that the success of the Germans in production is scaled back by China (there are two scalings, first Germany and then China), rapid price decreases and productivity increases. In the third stage, it is known that after China prioritized this as an export and industrial strategy, it went to price decreases with subsidies.

There is another side to this story as well. A lot of different solar technologies were being developed in the US and Europe before China lowered prices. The price of China drops were the end of all these products. We are talking about a nearly uniform solar technology in the markets now.[9] Therefore, price drops have blocked many technological developments.

If we look at the academic side of the event, the price decline in the sun continued first rapidly,after then slowed down towards the record oil prices in 2008. When oil prices are rising rapidly, the solar prices are almost constant during the period. However after that, it witnessed a much faster price decrease.[10] Perhaps the higher oil prices highlight more renewable resources, perhaps catching the average.

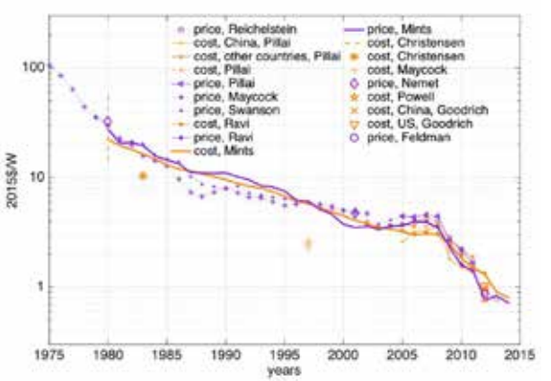


Figure 1
Decline in solar module prices
(Kavlak et al.)

There are many reasons for this decline. We cannot say that there was a decrease for only one reason. In the graphic in the same article, the contribution of the parameters of the price decreases to the price decrease according to the periods is also given.

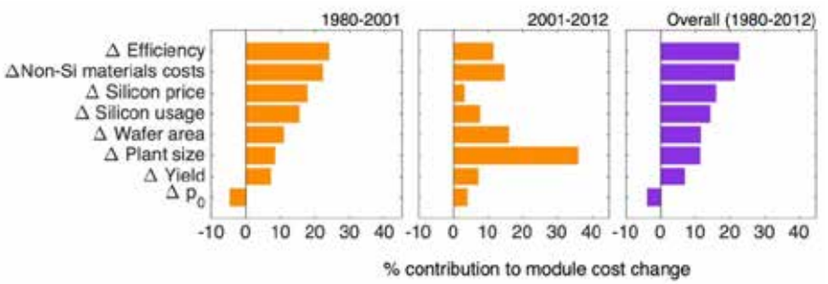
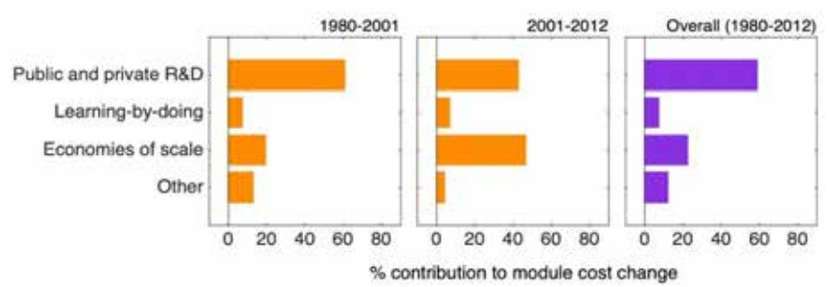


Figure 2 - Parameters affecting the decrease in solar module prices (Kavlak et al)

Module productivity increase, decrease in silicon material prices, decrease in non-silicone material prices, sheet area, scale of the production factory and efficiency are affected in different ways in different ways and in different periods. All this progress actually calls us an "ecosystem", in which it is thought that factory operators have a great contribution to a significant part of the progress parameters.

From a higher point of view, market-forming mechanisms (purchase guarantees), public and private R&D, learning by doing and economies of scale also have important effects.



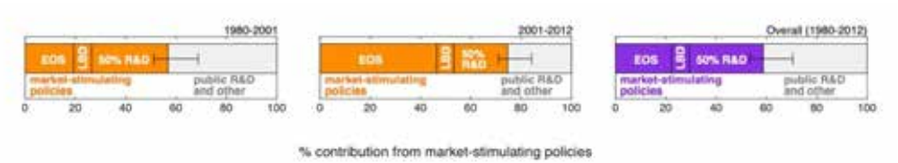


Figure 5: Percent contribution of market-stimulating policies (e.g. feed-in-tariffs, renewable portfolio standards) to module cost reduction in 1980-2001 (left), 2001-2012 (middle), and 1980-2012 (right). R&D = Research and development, LBD = Learning-by-doing, EOS = Economies of scale, Other = other mechanisms such as spillovers. Scale economies, learning-by-doing, and private R&D were all catalyzed by market-stimulating policies. Our data does not let us separate the effects of private and

Figure 3 - Parameters affecting the decrease in solar module prices (Kavlak et al)

A lot of factors also contributed to the decrease in lithium-ion battery prices[12]**.**

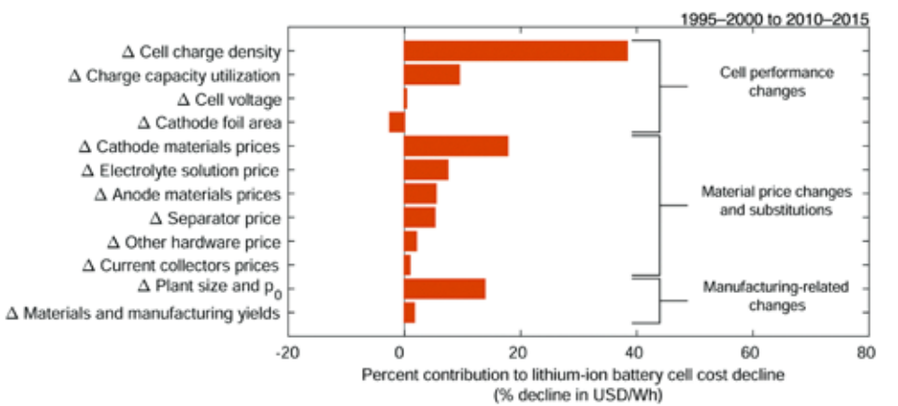


Figure 4 - Parameters of the fall in lithium-ion battery prices (Ziegler et al)

Therefore, the development of a technology goes far beyond having an academician or researcher make a prototype. In order for development to occur at many points, the state will also need to provide funds, raise people, create an ecosystem, and make people talk to each other, together with many subsidiary branches.

Here, the state may also need to operate a national energy laboratory infrastructure. Because the laboratory infrastructure given to an academician sometimes turns into an obligation that is avoided from being shared. But how the state can run a laboratory is another matter.

The reason for Tesla's further price decline and pioneering for today is that beyond a chemical discussion in battery price reduction, it can provide total development with small or big improvements at every point. In other words, a chemistry teacher should have the knowledge and experience of 1000s of people in a whole product for it to be a commercial product, beyond the logic of "sir, make us a lithium battery".

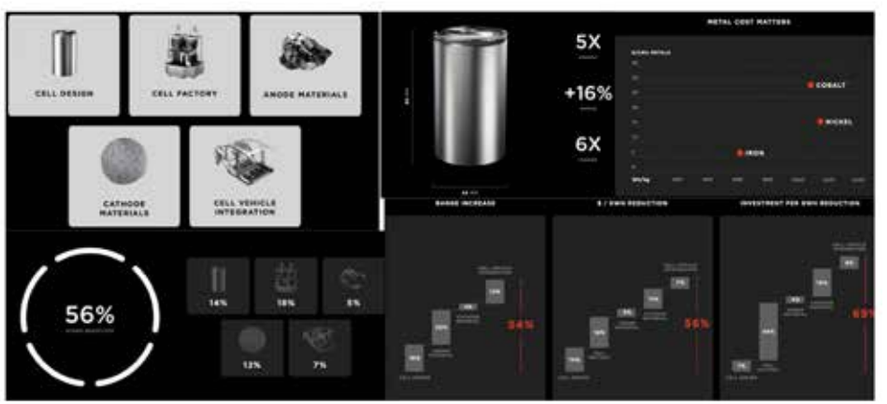


Figure 5 - Tesla battery day presentation (Ref: Tesla)

In the Tesla battery day presentation, of the 56% price reduction, 14% comes from cell design, 18% from cell factory, 5% from anode materials, 12% from cathode materials, and 7% from cell-vehicle integration.

Argumentation

Technology advancement is not a price drop. Technology development can be a big and messy game to be played. Because with one parameter, lithium battery display is not something that happens with solar panel production. A globally competitive product can be developed with the continuous improvement of all processes.

R&D also means trying again and again, doing the same things differently. If not, no one should produce chips or even research them, because doing the same thing again is not R&D or even innovation. Nobody should make cars, do research, or even get into the electric car business because it is a huge mistake to think that it is not R&D. In R&D, developed economies have 10 participants inspect and develop a hydrogen, a storage, and a smart grid technology, but then make them talk to each other -conferences etc.

We see this effect in the development of computer technologies in the USA, and in the story of the Apple computer. In the evenings, young people who "do the same projects" (microcomputer) explain their projects to each other in their electronic clubs, meet and establish joint companies. They take the business risk and learn by doing.

It needs that to be given to academia more funding. However, they are vital, because they train people with field and product experience, build knowledge and have a multiplier effect during the project and prototype stages, not for them to develop commercial products. But if they are going to develop products, instead of direct funding from the state, they should be expected to compete with startups and prove that their products and ideas are good.

While making a prototype product is appreciated, it is far far from the commercial product. The repeatability and control of parameters in the commercial product is a world apart. It requires business experience, factory knowledge and more. Therefore, one should not expect that commercial products from the academy.

Technology development depends on dozens of parameters. That's why without hundreds of startups, dozens of academics, researchers, maybe hundreds of projects even on a single issue, progress on that issue is temporary. The state cannot gain anything in this game in the short run. But in the medium-term, it will bring out winners. Since there

is no recipe for success, it has to try, and for this it must set out with the right goals, the right and measured expectations. It must not only clearly say what it wants, but also prove it, and let him know that he is willing to lose in this way.

First of all, we should not take the easy way out. People who cannot think in detail try to solve all problems by transferring everything to the state. "Will a solar power plant be built? The state should. Tomorrow Turkey Güneş A.Ş. should be installed. Do we need a battery? The state should do it" statements are simply a facilitation that is incompatible with the facts. Without the state, these things cannot happen. With the "Defense Production Law", the state in the USA has created a protection umbrella for companies not to make clean technologies themselves, but to have them made in the USA.[13]

The role of the state is clear. Identify basic science laboratories and flow of funds, track results. It tries to integrate all the intelligence in the country, that is, it does not create constraints.

If we want to be an important technology producer in the clean energy revolution, we need to take a good look at the EU examples. An EU struggling against China announced a €300 billion package in May 2022.[14] If we compare it to the population, this means that Turkey only spends 52 billion € within the scope of the last energy package. Almost all of this money will be given to private individuals and companies. This development game is as big as the money. At a point where even China is trying to develop with all its manpower, it is important to re-understand the role of government policies, academia and corporations.

[1] http://barissanli.com/calismalar/2022/20220520-tek.pdf

[2] https://twitter.com/elonmusk/status/1504932146166874125?lang=en

[3] https://twitter.com/elonmusk/status/1308284091142266881?ref_src=twsrc%5Etfw

[4] https://www.hurstpublishers.com/book/gambling-on-development/

[5] https://www.youtube.com/results?search_query=diy+lithium+cell

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[13] https://www.energy.gov/articles/president-biden-invokes-defense-production-act-accelerate-domestic-manufacturing-clean

[14] https://www.dw.com/en/eu-unveils-300-billion-plan-to-reduce-its-energy-dependency-on-russia/a-61838801

Dr. Oguz CAN
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Current Paradigms in Energy Policies for Zero Carbon Target

Even though policies that prioritize purely economic development in the pursuit of a welfare society and encourage sparkling consumption due to bringing production to target markets are redefined on the axis of "Sustainability and Climate Change", it still has not been able to get out of the "Faustian" bargains.

When we trace the historical development of the concepts of sustainability and climate change; 1824's J. Fourier, 1896 We see that S. Arrhenius entered the agenda of the scientific world in his articles, and the first milestone was set with the 1972 Stockholm "Man and Environment" conference. When we came to 1987 years, the definition of Sustainability in the Brundtland Report was: "Meeting the needs of the present without threatening the needs of future generations".

In 1988, the establishment of the IPCC- Intergovernmental panel on climate change, scientific, technical and socio-economic studies began to be carried out systematically. The Kyoto Protocol in 1997 within the scope of the United Nations Framework Convention on Climate Change, which was adopted with the Rio de Janeiro Conference on Environment and Development in 1992, and the Paris Agreement in 2015, which came into effect with the end of the protocol period, forms the basis of international efforts to combat climate change.

SThe sustainability includes economy, ecology and highly interactive energy with both technical, technological, social and cultural capabilities. It is the solution set of an optimization/optimization problem. The sustainability is the basic parameter of today's change and transformation efforts in energy and economy.

It is possible that to portray the climate change dimension with the budget approach. The accumulation of greenhouse gases in the atmosphere, within the framework of human-induced activities, and it increases the global average temperature on the one hand, and triggers adverse climate and weather events with increasing severity and frequency, on the other hand. It is accepted that as the irreversible threshold value for the effects of temperature increase of2 1,5^{0}C.

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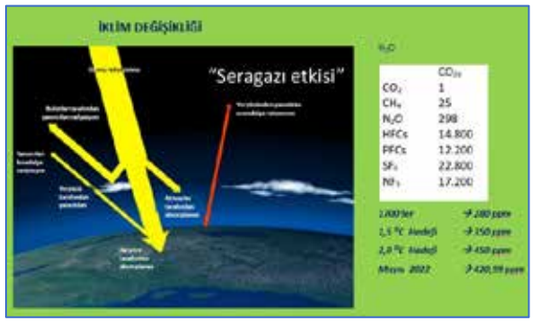

Figure 1 - The effect of Sera Gas

In its details, there is a complex problem involving the interaction of evaporation, condensation, heat and gas transfers, carbon cycles on land and sea, water vapor, clouds, air and water currents.

Paris Agreement 1850 The target, which is described as "well below 20C" compared to the average temperature in the 1900s, is now pronounced as limiting it to 1.50C. However, the fact that the 350 ppm limit has already been exceeded and an atmospheric accumulation of 420 ppm has been reached, the global temperature average reaching 1,190C as of February 2022, warns that the 1.50C target is no longer practical. Even if the 450 ppm budget is taken into account, it corresponds to 300 billion tons of CO2 equivalent emissions that we can release into the atmosphere in the next 7 to 10 years. According to the report published by the World Meteorological Organization, the probability of reaching an average temperature increase of 1.5 degrees by 2026 is 48%. With another numerical data; As of 2019 global greenhouse gas inventory, we need to reduce our emissions of 33 giga tons to 24 giga tons by 2030 and to 9.3 giga tons by 2050, in line with the 1.5 and a half degree target.

International renewable energy agency analyzes indicate that renewable energy and energy efficiency investments should be increased 4 to 6 times for this purpose.

This situation reveals the need for a rapid and radical change and transformation. The studies for the transition from linear economy to circular economy and then to the sharing economy are intensified in the economy dimension. The linear economy represents today's disposable culture. At the same time, the linear economy includes the

principles of efficiency, reusability and recyclability at every stage from circular economy design to production and consumption. Repairability is another design principle that has been recalled decades later. We can actually address them as "imece", which has deep traces in our culture, while the sharing economy aims to use assets more efficiently and rationally, Transformation in energy represents an important part of policies to combat climate change, since 80% of global greenhouse gases originate from energy production/consumption. 72% of Turkey's greenhouse gas inventory originates from energy use. (Table 1)

Sektörler	**Enerji Kullanımı Kaynaklı Emisyonların Dağılımı [%]**	**Sektörün Doğrudan Emisyonları [%]**	**Toplam [%]**
Elektrik ve Isı Dönüşümü (iletim/dağıtım dahil)	27,5	-	27,5
İmalat Sanayi ve İnşaat	10,8	11,2	22
Ulaştırma	16,3	-	16,3
Orman, Balıkçılık ve Tarım	2,15	13,4	15,55
Binalar (konut ve ticari)	11,5	-	11,5
Diğer Enerji Kaynaklı Emisyonlar	3,75	-	3,75
Atık	-	3,4	3,4
Toplam	**72**	**28**	**100**

Table 1 - Emission Distribution of Turkey in 2019 (excluding AKADO)

According to TUIK data, the greenhouse gas emissions of Turkey in 2019 decreased by 2.8% compared to the previous year (2018: 520.9 million tons of CO2-e) and were calculated as 506.1 million tons of CO2-e. Of these emissions, 364.4 mt of CO2-e is energy and energy-related emissions.

Considering land use, land use change and forestry – AKADO-related emissions (-84 CO2-e), net emissions in 2019 were 422.1 million CO2-e (TUIK, 2021).

In practical terms, greenhouse gases consisting of anthropogenic, that is, human-induced activities; Combustion, Agriculture, Livestock (fertilizer, animal waste), refinery, natural gas transmission. In practical terms, greenhouse gases consisting of anthropogenic, that is, human-induced activities; Combustion, Agriculture Livestock

(fertilizer, animal waste), refinery, natural gas transmission, distribution, chemicals, adipic acid, nitric acid, coolers, aerosols, solvents, forest and swamp fires, waste landfill, magnesium processing used in semiconductors, aluminum production, electricity transmission lines circuit breakers etc. accumulates in the atmosphere as a result of activities. While the zeroing of greenhouse gases through fuel conversion, energy efficiency (EV), carbon capture and storage (CCS), land use, land use change and forestry (LULUCF) activities" defined as "net zero", the absence of any greenhouse gas emissions during these activities is defined as "absolute zero".

Being "carbon neutral", on the other hand, includes negotiating with the purchase of verified and validated abatement certificates of other emission reduction projects while achieving the net zero target. (Figure 2)

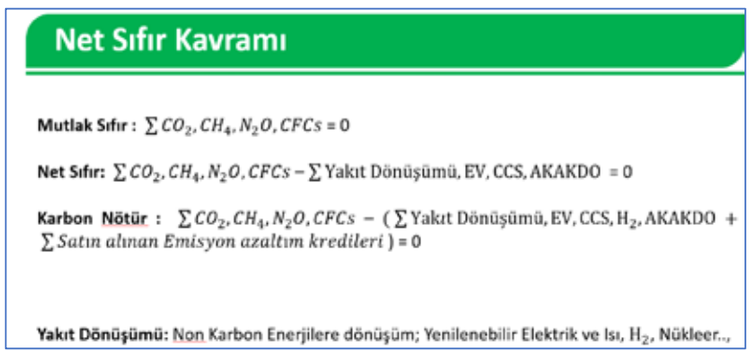

Figure 2 - The Concept of Net Zero

In this context, many countries, including our country, have published a "net zero" target. While the European Union declared 2050 as the target date for the USA, Turkey addressed 2053 and China 2060.

Turkey, which became a party to the Paris Agreement on 7/10/2020, was preparing the "Green Reconciliation Action Plan" on the one hand. On the other hand, Turkey held a Climate Council between 21-25 February with the main theme of "2053 net zero carbon emission target: Turkey's green development revolution".

In line with the EU Green Accord, "Climate Change, Environment and Biodiversity", "Circular Economy and New Industrial Strategy", "Clean, Cost-Effective and Secure Energy Supply", Actions were taken under 5 main themes: "Sustainable Agriculture", "Sustainable and Intelligent Transportation".

The global economic crisis that emerged in the pandemic and post-pandemic period, supply/demand imbalance, increases in logistics, commodity and energy costs have revealed the negativities. On the other hand, Russia-Ukraine conflict and the multidimensional effect of sanctions on the inflationary market brought about by monetary expansion played a negative and retarding role in tax-based policies on the net zero target. In addition, fuel conversion is an accelerating factor in terms of efficiency and decarbonisation. It is important for our country to maintain the planning competence with the execution capability in the zero carbon target. Both the Green Agreement document and its basic approaches, as well as the outputs of the climate council contain many opportunities for our country that can be reached through dynamic and focused work.

Increasing the share of renewable electricity in energy transformation day by day, generatingconsumer and distributed energy production as in roof SPP applications, digitalization as in energy management, demand-side management applications, digitalization, widespread use of electric mobility, storage, renewable heat applications, energy productivity practices are among the timely and successful examples of our country.

The changebility and instability have their effects on stocks and commodity prices. The fact that 40% of the technologies that will carry hydrogen etc. to the net zero target are in the development stage, the uncertainty of technological solutions in terms of economics, the complexity of the effects of futures and derivatives markets today, the difficulty in supply chains, the flexible market with multiple and new market players, the difficulty of network operation, the difficulty in financial markets and the ambiguity in the legislation appear as risks that need to be managed. Those who can manage risks and threats will emerge from the transformation with new opportunities. Also included is VUCA (volatile: unstable, ambiguous: ambiguous, complex: complex, ambiguity: ambiguous).

Assoc. Dr. Sohbet KARBUZ
Mediterranean Countries Energy Companies Association OME Oil and Gas Director

The Future of Fossil Fuels

The course of energy, which is an indispensable element of human life and economic activities, is connected with the history of the transition from carbohydrate economy to hydrocarbon economy. Hydrocarbons, whose central role has gradually increased with the industrial revolution, have been one of the basic building blocks of modern society and life. Widespread use of hydrocarbons, generally known that as fossil fuels, has improved living conditions and played an important role in bringing our civilization to its present level. The fossil fuels are indispensable for the production of cement, steel, plastic, that are the building blocks of the modern world, and ammonia, which is the main raw material of fertilizer, which is the most talked about nowadays. The energy system of today is based on fossil fuels and therefore carbon intensity. The future of fossil fuels, which currently provides more than 80% of the world's energy supply, has great economic, geopolitical and environmental importance as in the past.

Even though the increasing pressure to move away from fossil fuels due to environmental risks or geopolitical concerns, fossil fuels still maintain thei importance in the energy mix of the world.

The fossil fuel consumption is expected to increase in absolute value, if not relative in the foreseeable future. The main reason for this is; growing population, economic growth and improving living standards will require more energy in the coming decades. It will require energy, especially in developing countries.

Their highly concentrated structures, reliability, versatility of use, ease of transport and storage, abundance provide competitive advantage when needed. In addition, their availability in all weather conditions and their relatively low cost provide a competitive advantage over fossil fuel alternatives.

Despite all this, the way fossil fuels are used will change significantly: the area of use of coal will shrink and be reduced to the industrial sector. The monopoly of oil use in air, sea and freight transportation will begin to be broken and oil use will be limited to the petrochemical sector as much as possible. As human beings, we have

committed a chemical crime by using petroleum, which is formed over hundreds of millions of years and used as a raw material in many products such as aspirin, by burning it in vehicles weighing tons more than water from time to time, and using, it so brutally that we can even go to the toilet by car. This is changing, albeit slowly. Natural gas which the cleanest of fossil fuels, will be an integral part of the future energy mix.

However, instead of the natural gas, we will use a concept that has not yet been named. This concept will include both "natural" and "unnatural" gases. Maybe we'll be talking about a term like gaseous fuels. Included in this term gaseous fuels will be natural gas as well as renewable and possibly decarbonized gases such as biogas, biomethane, hydrogen gas and synthetic methane.

On the other hand, new and developing technologies in electricity generation and storage, smart technologies in demand management, electric vehicles, digitalization, and finally new electricitybased products will increase the demand for electricity.

Undoubtedly, renewable energy sources such as wind, solar, geothermal and water will play a crucial role in powering our future.

However, if breakthrough technological innovations do not occur, they will need to be supplemented as much as possible with decarbonized fossil fuels to provide enough energy to meet our needs. Therefore, carbon capture, transport, storage and use will become increasingly popular.

The facts that sometimes seem hard to accept indicate that our dependence on fossil fuels will continue to be the backbone of the global economy for at least another quarter of a century, despite its adverse climate and environmental impacts. Despite the war against fossil fuels and smear campaigns by a group of countries led by the European Union.

It was discarded 50 years ago seeds of war on fossil fuels, including natural gas. These seeds grew over time with climate change conferences.

With the Paris Climate Agreement, The Green Agreement, the resurgent Hydrogen frenzy, accounting gymnastics such as Net Zero emissions, the war against fossil fuels started to spread around the world in various forms, with regulations such as carbon taxes at the border. Beside this, a largely decarbonised, electricity based, integrated, and digitized global energy market and energy future, such as the green agreement of the European Union, is being imposed on developing countries by some countries.

For this purpose, the fossil fuel industry, which is the artery that feeds the world economy, began to be surrounded by lots of branches. Hydrocarbon exploration and production activities and infrastructure investments are requested to be stopped. In order to force this, the sector's access to financial resources is made difficult. As a result of, exploration and production investments have decreased by 50 percent in the last 8 years. A lot of fossil fuel powered power plants and facilities are forced to close. Trying to continue its activities under these conditions, the fossil fuel sector started to struggle for survival in lots of areas.

The massive decline in fossil fuel use during the pandemic has exaggerated claims that an energy future based on renewable energy sources is possible. The slogans of renewable energy sources, electrification and the hydrogen economy, if any, have become so on the global agenda with unrealistic goals that it has become almost taboo to defend fossil fuels. While the energy consumption started to increase rapidly as we emerged from the pandemic, the distinction between dreams and reality began to show itself. Questions that are not taken into consideration, such as what would happen if the wind did not blow, the sun did not shine, and it did not rain, have finally started to be voiced in these days when we entered global energy. The strange thing is that the goals set aside from taking lessons have started to be enlarged. The global energy crisis, which is deepening day by day, seems to be happening on another planet with the effect of the geopolitical war in Ukraine.

There have been global energy crises in the past, however, these often involved a single fossil fuel. At present, we are witnessing the fossil fuel crisis for the first time, that is, both the oil, coal and gas crisis, happening at the same time on a global scale, let alone a global natural gas crisis. As a reflection of this, there are electricity crises. These crises have gained the title of crisis because of the fact that they are

man-made rather than the decrease of scarce fossil resources, that is, the wrong policies are followed.

We all yearn that to leave a world free from fossil fuels as much as possible for future generations. In an increasingly deepening crisis environment, it rightly raises that the question of whether imposing an ideology adorned with political obsessions is preparing the ground for a new order of exploitation instead of pragmatic approaches to balance environmental concerns in line with economic and social realities.

The cliche slogans like “we are all in the same boat” have become meaningless in today’s realities. When we say green economy or hydrogen economy, country characteristics and the costs required by the big sectoral change in the economy are ignored. At the same time, the questions such as how to finance these costs and access to technology are always ignored for some reason. The answers to these questions are easier in rich countries. For example, the European Commission will spend at least 1 trillion Euros to realize the plan it has outlined under the green agreement. It is not possible for developing and underdeveloped countries to approach this amount of incentive, which we call subsidy. In many developing countries, people’s priority is to try to survive. Not the climate ‘crisis’ or the green economy! It is enough to look at a few statistics to understand this. More than half of the world’s population lives in nonrich countries, and living conditions are very different from those in developed countries.

For example, an estimated 5 million children under the age of 5 die each year, mostly from preventable and treatable causes. More than 200 million people get malaria each year, and more than 400,000 people die from malaria. 11% of the world’s population does not have enough food to meet their daily needs. 30% of the world’s population does not have access to clean water and close to a billion people do not have access to electricity. However, the preferences of a minority of the world’s population are prioritized and their voices are heard.

More than half of the world’s fossil fuel reserves are in developing countries. It is estimated that more than half of the fossil fuel reserves expected to be discovered are in developing countries.

At the present time, more than half of the world’s oil, coal and natural gas production takes place in developing countries. In the coming years, world population growth will intensify in developing countries. These countries are expected to grow faster and increase their living standards in the future. All of these will lead to more energy consumption. As in developed countries. The simplest; Reaching the per capita energy consumption in developed countries means doubling the per capita energy consumption in developing countries.

The sad thing is that these countries, which will need more energy in the future, are considered as follows; away from fossil fuels, ending fossil fuel production, and leaving fossil fuel sources under the ground in the name of climate ‘crisis’ or transition to a green economy.

Actually, no one has any objection to a clean energy future.Everyone’s desire that more use of renewable energy sources. However, this energy transformation needs to be fair and just. Under the various guises, underground resources and human resources, including fossil fuels, have been exploited by some developed countries for years, and the desire of today’s developing countries is that the repetition of fossil exploitation is not experienced as green exploitation. Listening to the voice of the silent majority. Therefore, the future of fossil fuels will depend on how much developing countries make their voices heard and how much developed countries hear and care about it.

Sabahattin ER
Eksim Holding General Manager

Renewable energy is at the center of the energy transition

The global energy system is undergoing a major transformation. Renewable energy and energy efficiency are at the center of this transformation.

The reasons for this transformation may differ according to the conditions in the countries. Among these, it is possible that to count reducing the current account deficit, ensuring energy supply security, and creating new industry and business areas.

There is another reason for this transformation for both our country and other countries in the world. That is the environment and climate change. We still have a long way to go in renewable energy. As Eksim Energy, we currently operate 8 wind power plants with a total installed power of 465 MW. We have 63 MW hydroelectric power plants in Rize and 2 hydroelectric power plants with 100 MW power in Georgia. We started the 9th wind farm investment in Ukraine. Our work on renewable energy investments abroad continues in many countries.

Today, I would like to share with you an expression that makes me happy. In his speech, Mr. Fatih Birol said that they gave advice to the countries of the world by saying “Reduce the bureaucracy a little in the permit processes” “Accelerate a little in the renewable energy permit processes”. A similar situation exists in our country. Fatih Bey, the President of the International Energy Agency (IEA), is our pride as a country. It is very true and appropriate that he gave this message to the world. In the meantime, let’s not ignore this.

We have made a lot of progress in bureaucratic permits in our country. I would like to thank both our Ministry of Energy and other ministries. Progress has been made here, but we still have a long way to go. If our institutions are a little more facilitating, we will be able to put our energy investments into operation much faster. We currently have a portfolio of over 1000 MW with our licenses.

The private sector is the hero of this transformation, the private sector is the hero of this transformation. As long as the state paves the way for the private sector with

effective policies, investments continue. As a matter of fact, we all experienced this together. In 2007, for example, Turkey's installed wind power was only around 100 MW. We have now exceeded 11,000 MW.

We have the capacity to go much further than this, however the public needs to pave the way for the private sector with effective policies. When wind investments were started, the YEKDEM mechanism was established. This incentive mechanism has been the driving force of development. Of course, on the other hand, our industrialists complained a lot about the cost of YEKDEM.

YIn renewable energy conversion; security of supply, sustainability and it is important that it is economically accessible.

Of course, the transition from fossil fuels such as oil and natural gas to renewable energy such as wind, solar and biomass has a certain cost. These include the purchase of new equipment, the installation of transmission and distribution infrastructure. Let's not be afraid of renewable energy investment. In the short term, these costs actually seem a bit tedious. But we have seen that it is certainly feasible in the medium and long term. As of 2022, there is no YEKDEM cost. Since the beginning of the year, no one bears the cost of YEKDEM. In fact, these power plants are paying a plus price to the system today. For example, as Eksim Energy, two of our power plants were excluded from YEKDEM. Because the purchase warranty period has expired. They have been selling on the free market since the beginning of this year.

Let's not be afraid of renewable energy investment. The public should not be afraid of the incentives it will give to these investments. YEKDEM costs, which have been criticized for years, have turned into a plus today. Today these power plants support the system. Let's maintain our determination in renewable energy, and continue these investments by maintaining our courage.

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