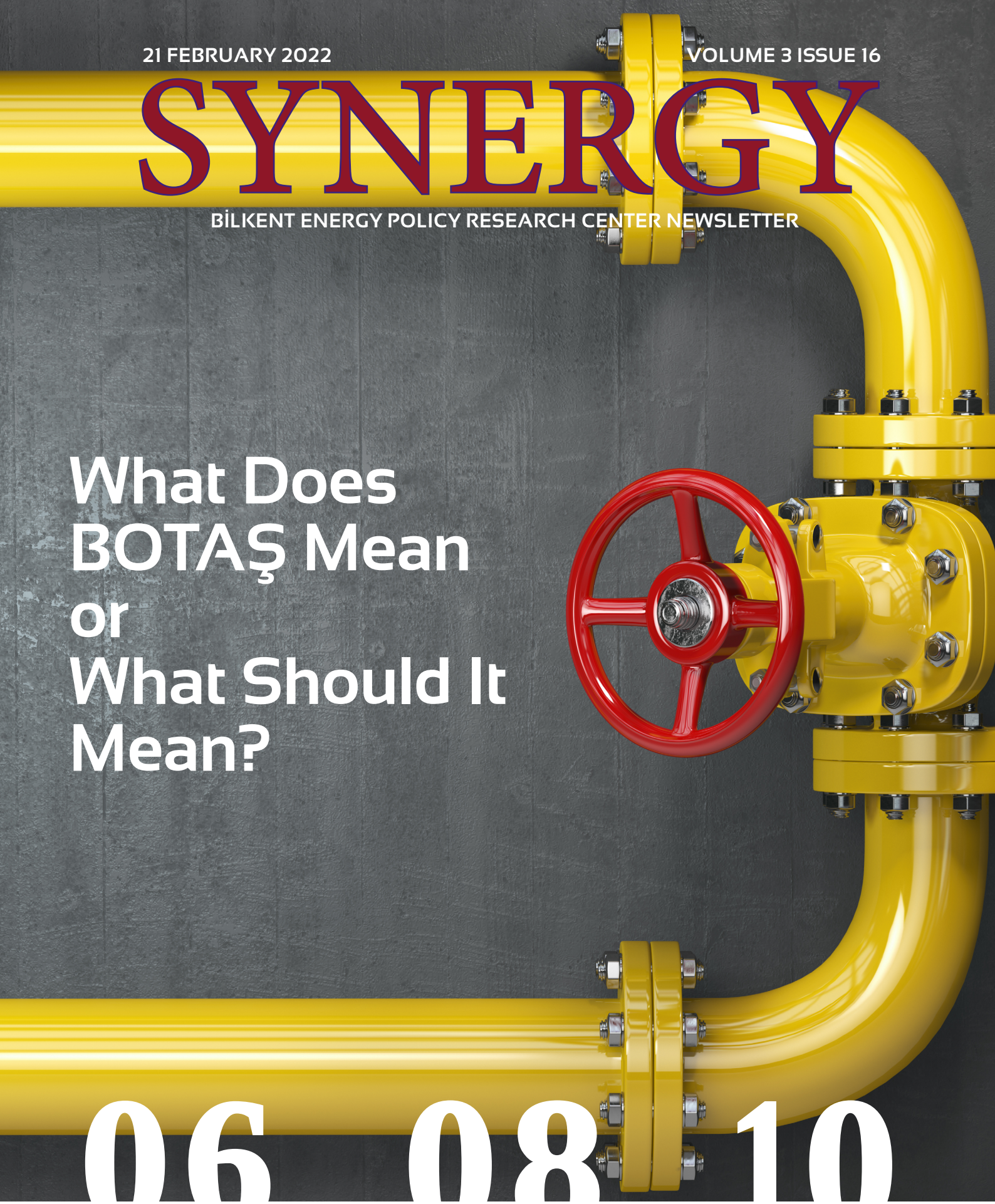
21 FEBRUARY 2022 VOLUME 3 ISSUE 16

SYNERGY

BİLKENT ENERGY POLICY RESEARCH CENTER NEWSLETTER



What Does BOTAŞ Mean or What Should It Mean?

SYNERGY
21 FEBRUARY 2022 **VOLUME 3 ISSUE 16**
#77

In This Issue...

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

ABOUT US

Energy Policy Research Center

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

BRENT OIL	91.27 $/BL	GASOLINE	15.24 ₺/LT
USD/TRY	13.63	DIESEL	15.60 ₺/LT
EUR/TRY	15.49	FUEL OIL	11.72

What Does BOTAŞ Mean or What Should It Mean?

Sohbet Karbuz

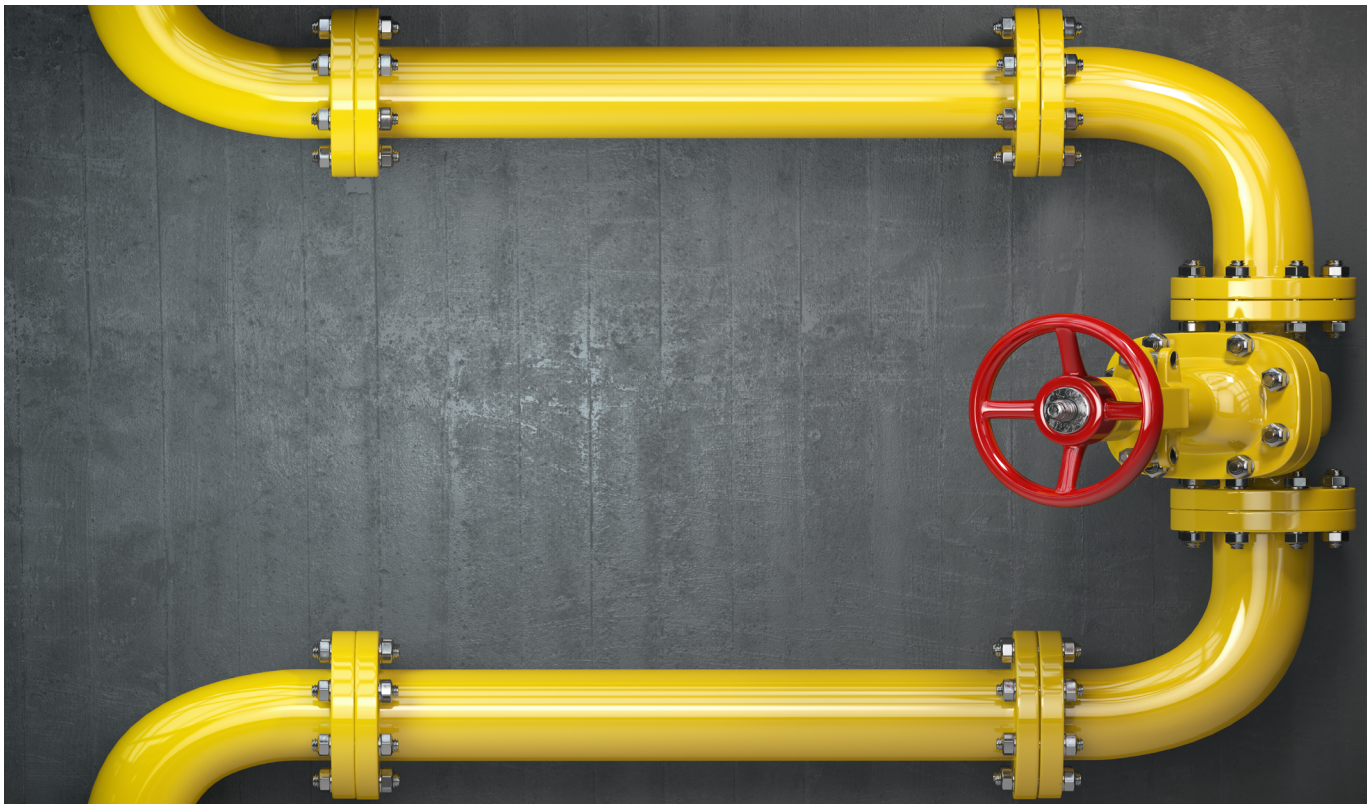
BOTAŞ was established on August 15, 1974, to transport Iraqi crude oil to the Gulf of Iskenderun, within the Crude Oil Pipeline Agreement framework signed on August 27, 1973, between the Governments of the Republic of Turkey and the Republic of Iraq. BOTAŞ, which initially only transported oil through pipelines, has also started its activities related to the trade and transportation of natural gas in 1986 to meet the increasing energy needs of our country.

BOTAŞ currently carries out the following activities.
1. Oil and Natural Gas Pipeline Management
2. LNG/FSRU Terminal Management
3. Port Services
4. Expropriation and Construction Works for Oil and Natural Gas Pipelines, Compressor Stations
5. Natural Gas and LNG Trade
6. Natural Gas and LNG Storage Activities
7. International Natural Gas and Oil Transportation Projects

The liberalization of the natural gas market by increasing the private sector's share by reducing the role of the public sector came into question 10 years after the Natural Gas Market Law dated April 18, 2001, and numbered 4646. In this context, the restructuring and privatization of BOTAŞ are also envisaged. During the restructuring process, it has been suggested that BOTAŞ will be divided into three to carry out transmission activities, operation of LNG facilities, and storage activities and other activities no change in the name of BOTAŞ has been considered.

After another ten years, the restructuring of BOTAŞ came to the fore again last year. There was no mention of any change in the name of BOTAŞ in the news about the establishment of different companies operating mainly in the fields of operation and trade.

What does BOTAŞ stand for? Many people who answer this question will not right away say Petroleum Pipeline



Corporation. When we look at the 125 Megabyte sized 2020 Annual Report, we cannot find an answer to the share of the pipeline and oil transportation activities of BOTAŞ, which has many fields of activity. However, when we say BOTAŞ, most of us think of natural gas. The most important reason is probably the 87% share of BOTAŞ' natural gas sales in Turkey's natural gas consumption. The share of BOTAŞ in pipe gas and LNG imports are similarly very high.

When BOTAŞ is mentioned in international markets, natural gas comes to mind immediately. The main reason for this is that Turkey has been in the top 10 in the world natural gas and LNG trade in recent years, rather than being a large gas market. It is undeniable that Turkey's name is increasingly prominent in LNG trade, especially in spot LNG trade. For example, Turkey was the third largest US LNG importer last December, after the UK and South Korea. The first institution that comes to mind when Turkey is mentioned is BOTAŞ, in other words, Petroleum Pipeline Corporation.

So, shouldn't BOTAŞ be restructured under a new name at a time when even international giant companies are changing their names in parallel with the changes in their activities? Also, as BOTAŞ, which is at the top of the world LNG trade, is an international player, shouldn't it be only limited to LNG imports and but also engage in trading? Or at least shouldn't it join forces with leading companies in the market such as JERA and EDF Trading Limited did for LNG optimization and trading?

Would not it be even stronger if it went public as the next step? Time will tell us the answers to these questions, but it can be useful to brainstorm now.

The Dark Side of the Energy Crisis

Barış Sanlı

During big events, like a crisis, experts and their narratives are amplified to educate the public. Then an informed discussion starts and results in good policies. This is the theory. Reality can not be more different. This is the dark side of the energy crisis.

Generally, an energy crisis creates a very polarized political discussion. Nixon's price controls didn't end up in favor of the free market for the 73-74 crisis. The interventions due to public pressure created a much worse environment until the 79-80 crisis. During that time, environmental movements called for ending the growth, material growth, and population growth. The presidents mostly paved the way for these ideas in a controlled manner. But election winners were not the ones listening to the popular voices, but they were neoliberals.

This is fascinating since the politicians have tried to do whatever the public(or the dominant voices in public), press, and opposition asked them to do. On the other hand, their visions stemmed from the informed-scientific discussions that most electors have not bought. Electors reveal a more realistic side of the polls.

One very important parameter is the loss of purchasing power for all consumers. Inflation is taxation in a hidden way. In the 70s, traders earned a lot, so did the companies. The environmental push then and net-zero push now has helped fossil guys earn "embarrassingly high" profits, in Tellurian Chief Charif Souki's words. In the 70s, we see the rise of trading houses and Marc Rich. They earned excessive profits and financed an interesting third-world vision.

Mining companies are no different. Due to ESG limitations, mining became ever more profitable. Since there are not too many spots, you can dig for particular materials. If some of them are limited due to host countries' ESG concerns, the rest will be more profitable. This week we will see the

mining companies in far-flung parts of the world posting record profits.

So what is happening? The theory is written in good faith. But the loss of purchasing power due to energy and material inflation and foods creates more short-sighted political discussion than informed discussion. Energy and mining are complex subjects. Journalists can not get the big picture easily, so they switch to political narratives with cherry-picked numbers. This is why during the timber famine, instead of switching to new materials public pressed rail companies for more tree planting. And it didn't work.

The other issue is about how sudden and deep policies change. The loss of purchasing power increases the workers' movement. They have a point, and they are right. The lowest income level is the worst affected income group. They rise with concern. But just like the green-statist agenda strengthened the neoliberal-fossil agenda, the rise of workers increases the anti-unionist policies. Such an example is Thatcher's dealing with coal workers.

This time there is a twist. Employers' have automation and artificial intelligence at their disposal. This may be extended with drones or automated driving. The workers' strikes may increase the innovation speed. According to Daron Acemoglu, automation has replaced lots of jobs already. Why not more?

The worst thing to happen to an energy transition is a messy transition, just like Jason Bordoff from Columbia SIPA mentions in an interview. You can lose public support. Automation is another one. The unhealthiest is the pseudo-informed discussion leading to many inferior equilibria. In the past, not the wisdom but the madness of the crowds headed the energy discussion. But this generation is different.

Africa's Energy Paradox

F. Yaren Öztürk

Even though Africa is often expressed with many challenges, it is a continent that has a diversity of renewable energy sources. Because the sun's rays reach the earth at a right angle, the solar energy potential in Africa is relatively high. North Africa and East Africa have a high wind potential, which provides an excellent opportunity to benefit from wind energy. Also, the continent has a significant potential for hydroelectric energy with its large river basins. Its renewable energy potential is higher than the energy consumption of the entire continent of Africa. Especially the energy resources in North Africa and the Sahara Desert are considered among the enormous energy resources in the world. Its renewable energy potential is higher than the energy consumption of the entire continent of Africa.

Particularly, North Africa and the Sahara Desert's energy resources are considered among the enormous energy resources in the world. It is possible to cover the whole world's energy needs with the sun's rays arriving at the surface of the Sahara Desert. A solar panel placed in the Sahara Desert produces more electricity than three solar panels placed in any region of Germany. While it is expected that Africa with great energy potential should develop in fields of energy and economy, Africa still leads a poor life with limited access to energy.

There are approximately 600 million people living in Sub-Saharan Africa who do not have access to electricity today, and 900 million people do not have access to clean cooking. Compared to the other struggles experienced in today's world, this situation in the African continent painfully reveals the facts. The limited access to electricity and clean cooking, among the basic socio-economic needs, is the most obvious reason for Africa's backwardness. Whereas the renewable energy potential on the continent has the chance to overcome these difficulties, Africa is experiencing an energy paradox. One of the main reasons for not having significant progress in the energy sector is political obstacles in Africa. Unsteady governments, uncertainties in policies and political corruption have caused the lack of importance on energy policies. Insufficiencies in infrastructure resources and deficiencies in grids have made the situation poorer. The lack of financial resources and deficiency of urban planning are significant obstacles to development. Most municipalities in Africa have never had sufficient financial resources. It is also challenging to have the necessary public support for renewable energy sources because of the lack of financial resources experienced by governments.

The African continent population accounts for about 17% of the world's population. On the other hand, the African continent holds only 4% of the world's energy resource investment. At this point, there is a need for investors in order to fully utilize and benefit the renewable energy potential of Africa and solve the people's energy access problem. The number of foreign investors who have

hesitated to invest in Africa due to corruption and risks that happened in the past is not negligible. African governments should pursue more transparent and sustainable policies to overcome investors hesitation. Developing more feasible energy policies and making reforms focusing on electricity and energy subsidies is also essential for investment. Investments in Africa are substantial to identify systems for the reliable distribution of energy and enhance energy infrastructure and urban policies. Multilateral financial institutions and foreign public investors can encourage more investors by giving weight to these investments for solving the energy problem in Africa. Another point is that a society that realizes the use of renewable energy can make a difference in Africa's social and economic situation and understands its value should be formed in Africa. This is a perspective that neither multilateral financial institutions nor investors can provide to people. African peoples and governments should notice, adopt and take action to make this feasible.

Many African countries have established policies to promote and increase renewable energy sources in their countries over the past decade. Including in Rwanda, Ghana and Ethiopia, significant strides have been made in renewable energy. Under the Paris Agreement, 45 African countries have set targets for promoting renewable energy usage in Africa under Nationally Determined Contributions. In many African countries, including Senegal, Morocco, Kenya, and Egypt, governments policies have increased, which encourage and support the usage of renewable energy. Egypt, one of the most populated countries in Africa with a population of approximately 102 million, stated that it targets to produce 42% of the electricity produced in the country from renewable energy sources by 2035. Benban solar park, named with a settlement near the Nile River and boasting 41 power plants, indicates that African countries like Egypt are trying to reach their targets. Benban Solar Park, the fourth-largest solar power plant globally, is a project that costs approximately 4 billion dollars, and the World Bank partially financed its cost.

As the world strives to minimize the effects of the climate crisis, reduce carbon emissions and discover more advanced ways of producing clean energy, the African continent is facing different challenges. Even in megacities like Lagos and Kinshasa, people have to cope with constant power cuts, while half of the continent's population lacks access to energy sources. In spite of being a continent with extensive energy resources, it is a fact that local people have still serious problems in accessing energy. In the past years, although countries have made progress in solving the problem of access to energy resources, there has not been a sufficient level yet. With a high potential for renewable energy, Africa can play a prominent role in resolving this paradox if it can receive the requisite investments in line with the correct policies and legal frameworks.

"Peak Oil" Term

Büşra Öztürk

Even though the transition to renewable energy sources is sourced by reducing carbon emissions and limiting the world's temperature increase to 1.5˚C degrees, which are the target of the Paris Climate Agreement, there may be another reason behind this world's transition: the possibility of fossil fuel depletion. In this article, I would like to clarify the reality of this possibility with mathematical concepts. Afterwards, what can be done in case it happens will be discussed.

Fossil fuels are composite mixtures of fossilized plant and animal remains that have been buried in the ground for millions of years. Fossil fuels, which have a high carbon content due to their origin, require tens of millions of years to form. For this reason, fossil fuels are classified as non-renewable energy sources. There are three main sources of fossil energy: oil, coal and natural gas. We are fully and utterly reliant on fossil fuels, even more than most of us know. Everything we use in our daily life is made up of oil or contains oil. Automobiles, steel, cement, roads, farm machinery, food, health care item, even Starbucks paper cups which are lined with a thin layer of oil-based polyethene plastic, are a limited list of the oil products. As we consider the produced product then by now, we have burnt a lot of oil and we will. Since oil is the product we use most, I will continue to evaluate the depletion of fossil fuels over oil.

According to Alice Friedemann's notes, the era of cheap and easy oil ended in 2005 when conventional oil plateaued. This also means that just being discovered an oil reservoir is not enough for an oil well drilling to be put into process. Reservoirs are evaluated considering whether they will bring economic profit when the system is built on it. Again Friedemann states that the cost and difficulty of obtaining oil will increase from now on. The analysis of geologic and engineering data with reasonable certainty under existing economic and operating conditions demonstrates that total proved world oil reserves are estimated to be a little over 1.6 trillion barrels. The Worldometer also shows lively how much oil is left in the world based on the sources of British Petroleum (BP) and Energy Information Administration (EIA). Therefore, unless a crunch discovery will be made, we

may agree right here that oil is a finite energy source. (Or presumably, let's assume the oil is finite.)

In mathematics, a real sequence $<x_n>$ is a sequence whose codomain is the set of real numbers. $<x_n>$ is called bounded if and only if there exist elements of real numbers, m and M, such that $m \leq x_i$ and $x_i \leq M$ for every i that are elements of natural numbers. Here, let x_i denote the total oil reservoir size in the world per year, i denote the years, and let $<x_n>$ be a sequence of oil reservoir sizes. Since we assumed the oil is finite, the $<x_n>$ is bounded by the zero-amount of oil and maximum amount of oil. Let us order the elements of sequences and put it a set T. A theorem states that an ordered, non-empty, finte set T has always a maximal (M) and a minimal element (m). This is to say that we will reach the maximum reservoir size at any year undoubtedly. We will call that "peak oil" when $x_j = M$ for a j that is an element of natural numbers.

Peak oil does not imply that oil will run out. It signifies that world oil production has peaked, and there will be less available in the future. Peak oil means that some current uses of oil will no longer be possible. If we consider the current 7.8 billion people burn one cubic mile of oil every year and the increasing population over the years, the peak point points out the problem that the oil will be insufficient but does not imply it will run out. In other words, we could not prove that oil will run out, but we have proven that oil will be insufficient after a while.

If we are nearing or past of the peak oil, a fossil free alternative should be commercialized in a nutshell. However, to create new energy systems and related infrastructure, massive volumes of oil will be required. It is impossible to build without oil, whether it is nuclear, photovoltaics, wind, hydro, or batteries. Therefore, we urgently need to comprehend that now is the moment to redeploy the remaining oil by allocating it solely to purposes where there are no easy substitutes and transitioning to a simpler world utilizing other fossil fuels.

Nuclear Reactor Accidents

Halil Öztürk

The word “nuclear” can be used in different meanings in English, for example, to describe something relating to the nucleus of an atom in physics or to describe a type of family in daily life. No matter the context of the word, we can observe that people become cautious when they hear the word. To see the reason, commonly, some accidents in the past are the answer. At this point, it ought to note that we shall discuss neither the necessity nor the dangers of nuclear reactors in this paper, but try to summarise some well-known accidents in the history of nuclear reactors. Having mentioned the accidents, it is worth introducing the International Nuclear and Radiological Event Scale by International Atomic Energy Agency (INES). INES is a tool for communicating the safety significance of nuclear and radiological events to the public, consisting of 7 levels, each of which is important.

Throughout this paper, there are some accidents from the most dangerous 3 levels, 5-6-7, including the Chernobyl disaster, Fukushima Daiichi nuclear disaster, and Three Mile Island accident.

As summarising the incidents of the 5th-6th-7th level, to be more obvious and direct, we will go with subheadings:

Chernobyl Disaster

Date/Location: April 26, 1986 / Pripyat-Ukraine-the Soviet Union

INES Level: 7

Human Health: According to the predictions of the UN, about 4,000 people died due to the disaster, and in total, about 600,000 people were subjected to a high dose of radiation, having caused radiation-induced cancer and leukemia.

Reason: A flawed reactor, No.4 reactor, design operated with inadequately trained personnel.

Total Production: The plant consisted of 4 RBMK-1000 reactors; the total energy production was 3,200 x 4 = 12,800 MWt (megawatt thermal).

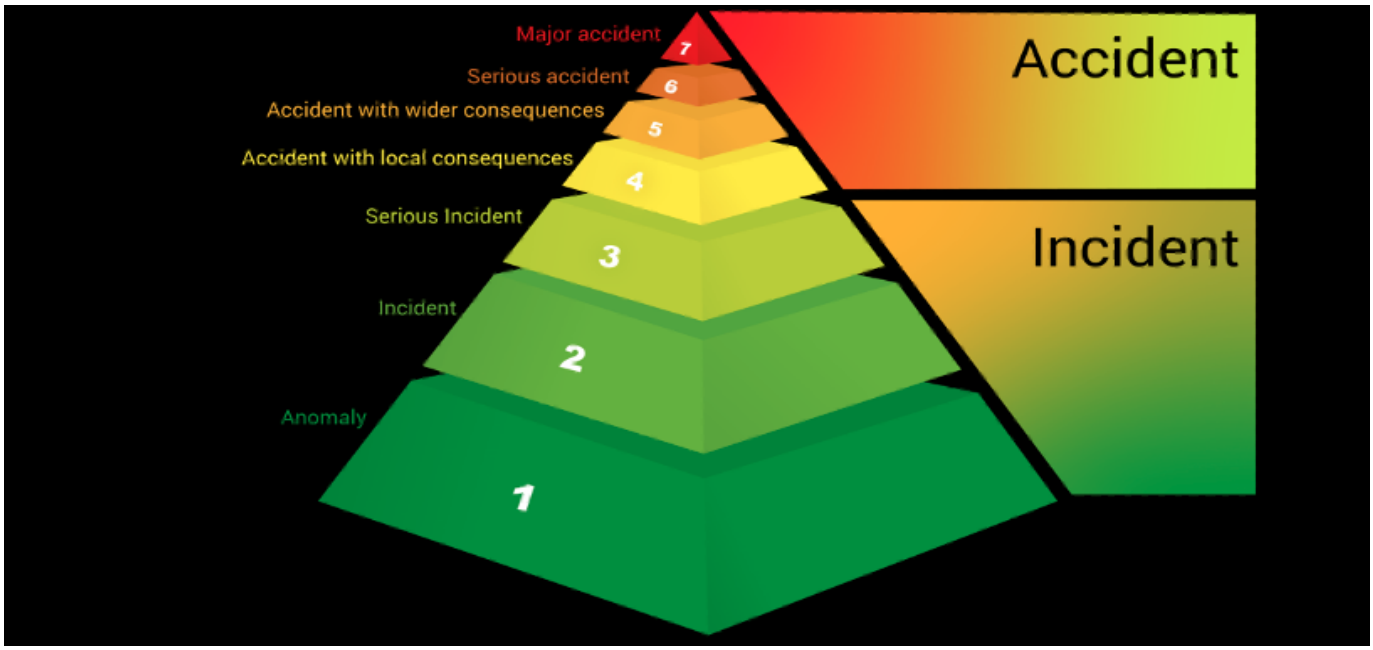
Comments: Due to its great impact and usages in popular culture, such as TV series, journals, etc., about the disaster, it is probably by far the most frightening example people think when they hear something about nuclear. For OECD-Nuclear Energy Agency, the accident is owing to the lack of "safety culture," which is also highlighted by the World Nuclear Association. It is not the reactor itself that caused such an incident, but how safe it was kept.

Some Facts:

-The Chornobyl Nuclear Power Plant continued to generate electricity till December 15, 2000, when it was finally stopped.

-Today, the zone is visited by tourists with a “protective” route.

-Because the city of Pripyat had been abandoned, different wild animals have populated the city.



Source: **IAEA**

Fukushima Daiichi Nuclear Disaster

Date/Location: March 11, 2011 / Fukushima-Japan

INES Level: 7

Human Health: 1 death was announced by the Japanese government; according to the UN, there had been no adverse, direct health effect among Fukushima prefecture residents. It is still an ongoing discussion.

Reason: 9.0 (9.1) magnitude earthquake triggering a tsunami. Also, 'tis still said that better preparation could have made a big difference, pointing out the human factor.

Total Production: The plant has six boiling water reactors, which together have a power generation capacity of 4.60 GW.

Comments: Because of its recent occurrence, it 'tis possible to see reports news about the incident, still. For Britannica, it is the second-worst nuclear accident in the history of nuclear power generation. Also, an independent investigation set up by Japan's parliament concluded that it was a profoundly man-made disaster".

Some Facts:

- Authorities are still working to clean up the area.
- All four Fukushima Daiichi reactors were written off due to damage in the accident.
- The negative image surrounding food produced in Japan has heavily impacted the Japanese economy and local producers who still find it difficult to make a living from their production, which nevertheless fully complies with consumption standards.

Three Mile Island Accident

Date/Location: March 28, 1979 / Pennsylvania, United States

INES Level: 5

Human Health: Hitherto, There have been no injuries or adverse health effects from the Three Mile Island accident.

Reason: Mistakenly close of an automatically operated valve in the Unit 2 reactor, shutting off the water supply to the main feedwater system.

Total Production: TMI-2, the reactors accident, was 906 MWe (net: 880).

Comments: Based upon Britannica, it was the most serious in the American nuclear power industry history. According to the United States Nuclear Regulatory Commission, a combination of equipment malfunctions, design-related problems, and worker errors led to TMI-2's partial meltdown and very small off-site releases of radioactivity.

Some Facts:

-TMI-1 had continued to generate electricity till September 20, 2019, despite the accident in TMI-2.

-The clean-up effort cost about 1 billion dollars.

All in all, in this paper, we have tried to show and summarise some historical nuclear reactor incidents to inform by categorizing some dimensions of them.

Energy
Policy
Research
Center

bilkenteprc.com