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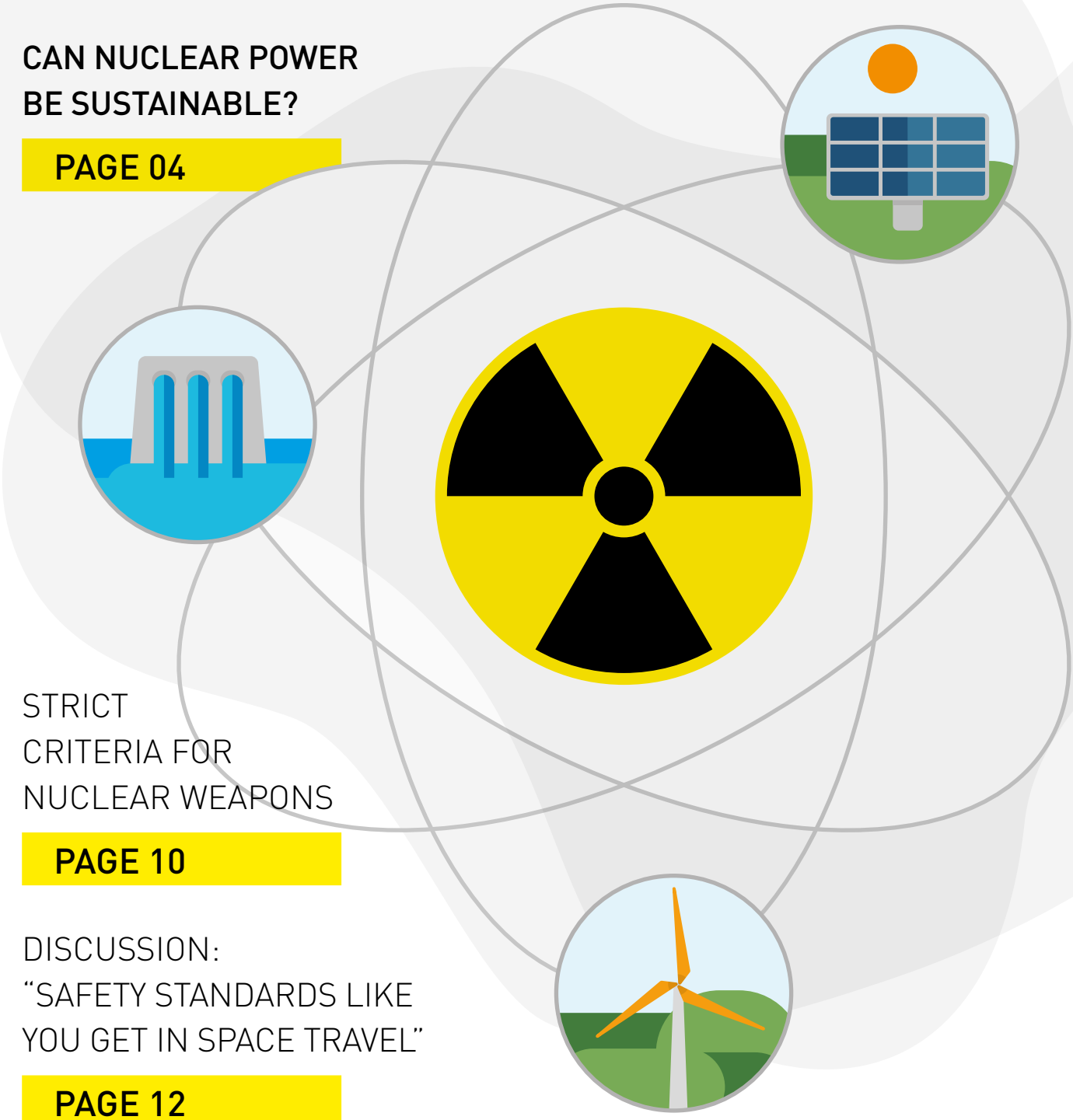
SUSTAINABLE INVESTMENT



CAN NUCLEAR POWER BE SUSTAINABLE?

PAGE 04

STRICT CRITERIA FOR NUCLEAR WEAPONS

PAGE 10

DISCUSSION: "SAFETY STANDARDS LIKE YOU GET IN SPACE TRAVEL"

PAGE 12

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CONTENTS

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EDITORIAL

Dieter Aigner
Managing Director of Raiffeisen KAG, responsible for fund management and sustainability

Dear Readers,

In February 2022, the EU Commission officially added nuclear power and gas to its taxonomy, which stipulates what financial investments can be classified as climate-friendly. As far as the Austrian federal government – but also sustainable investors – are concerned, however, this runs counter to the EU's climate action agenda. The move has prompted Raiffeisen Capital Management* to take a closer look at nuclear power in this issue and explore the arguments for and against its use from a sustainability perspective.

While supporters highlight its low carbon emissions as a key argument in favour of using nuclear power and, when questioned about nuclear waste, point to the technological advances made in waste disposal, opponents mention massive costs and equally significant risks. New power plants take decades to plan and build, they say, and would arrive much too late to be of any real benefit to the energy transition.

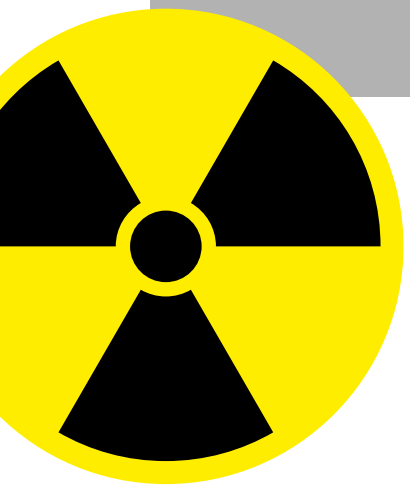
By introducing this new classification, is the EU Commission thus actually harming the sustainability cause by channelling urgently needed funds for the energy transition in the wrong directions? We believe that it is. This is because, conversely, renewables – wind and solar as well as hydropower – actually harbour huge potential for saving CO_2. Besides already being available, these technologies are also getting even better and cheaper year on year.

From a purely economic perspective, therefore, renewables are more attractive to investors than nuclear power. This raises the hope that, despite all the possibilities, most of the capital will ultimately be guided into the right channels – namely truly sustainable ones – enabling support for projects that can make a genuine contribution to the energy transition.

* Raiffeisen Capital Management stands for Raiffeisen Kapitalanlage-Gesellschaft m.b.H.

NUCLEAR POWER

CAN NUCLEAR POWER BE SUSTAINABLE?



The EU Commission has said that investments in new nuclear power plants can be climate-friendly under certain conditions. This makes them sustainable within the meaning of the EU taxonomy, the system used to classify the environmental sustainability of economic activities. This unexpected step has met with vociferous criticism in some quarters, and Austria has appealed to the European Court of Justice for it to be declared null and void.

Different countries are taking very different views on the future viability of nuclear power as an energy source. In those that generate much of their electricity from nuclear power, such as France and the Czech Republic, support for using this power for peaceful purposes is often high. By contrast, the "no" camp very clearly dominates in countries like Austria and Italy, which do not get any of their electricity from nuclear energy. Nevertheless, accidents at nuclear power plants can change both political priorities and people's minds. Although the Fukushima disaster prompted Germany and Switzerland to commit to phasing out nuclear technology, both countries have since repeatedly qualified the timing aspect of their objectives. The biggest problem in making an economic assessment of nuclear energy is calculating and factoring in the high external costs, also known as "externalities".

The terms "nuclear power", "nuclear energy", and "atomic energy" all mean energy that is released by nuclear fission, currently the only process that is used inside a nuclear power plant. The first such plant to produce enough energy to be used industrially came on stream near Moscow in 1954, with the UK's Sellafield following one year later. Nuclear power has been fed into the German grid since 1961 (from the Kahl nuclear power plant). Only gradually did the light-water reactors that had been favoured by the Americans from the outset win out over their heavy-water counterparts. Although the latter had been preferred by researchers, this was primarily for military applications. Whereas a light-water reactor uses normal groundwater for cooling, heavy-water technology replaces the hydrogen in the water with more massive substances (such as deuterium), thus significantly reducing the amount of uranium enrichment required. However, »

Wolfgang Pinner
Head of Responsible Investment
at Raiffeisen KAG

Herbert Perus
Fund Management –
Corporate Responsibility
at Raiffeisen KAG

this benefit is partially offset by extremely high water consumption.

Nuclear power plants began to spring up in greater numbers following the 1973 oil crisis in a bid to stave off a looming energy shortage. It was around the same time that the anti-nuclear movement emerged, which really took off in 1979 following the reactor accident in the US city of Harrisburg.

PINNING HOPES ON NUCLEAR FUSION

Although nuclear fusion technology is still at the research stage, researchers have recently reported breakthroughs – literally within the past few months. The most promising results were achieved by a team of scientists at the government-run National Ignition Facility (NIF) research institution at the Lawrence Livermore National Laboratory in California, which mainly serves military purposes. The researchers in California used the world's most powerful laser for their experiments in order to transform tiny quantities of two hydrogen isotopes, deuterium and tritium, into plasma at temperatures of around 60 million degrees Celsius. The isotopes fuse into helium, losing a small portion of their mass in the form of radiation in the process. Media reports suggest that 20% more energy was obtained than had been put in. Nuclear fusion is seen as a beacon of hope for the clean energy of the future as it theoretically allows a virtually unlimited amount of power to be generated in an environmentally friendly way.

THE DILEMMA OF FINAL STORAGE

In existing nuclear power plants, nuclear energy is converted into electrical energy in nuclear reactors using controlled nuclear fission chain reactions. The fuel elements are the most important part of the reactor's core, as they contain the nuclear fuel that triggers the fission process. The fuel elements have different forms and compositions depending on the reactor type, although ones made from uranium dioxide are almost always used. All types of nuclear power plant produce spent fuel elements, which can theoretically be reprocessed. If not, they have to be disposed of by being put into final storage.

Nuclear fission produces radioactive isotopes. Short-lived isotopes decay in interim storage facilities or cooling ponds. Nuclear waste containing long-lived isotopes is stored until the amount of heat it is giving off has dropped low enough for final storage to be an option – which takes a few decades. It can be as long as thousands or even hundreds of thousands of years before the radiation from some of the radioactive waste from a nuclear power plant has largely decayed. Since some of the elements contained in nuclear waste are also highly toxic, it is stored permanently so as to be kept away from the biosphere. Storage facilities to be set up for this purpose are known as repositories. There is currently not a single repository anywhere in the world for highly radioactive waste. The most advanced project can be found on the island of Olkiluoto in Finland, where the plan is to store highly radioactive waste in a cavern in the granite rock 400 metres underground. The waste is to be placed inside copper canisters that are themselves wrapped in the mineral bentonite, thus creating a multi-level protection system. If one of the man-made barriers were theoretically to develop a leak, the geological formations would spring into action in its place. However, the real question is whether these barriers will be able to withstand a new ice age, for instance. So far, humanity has never yet been able to build structures guaranteed to last forever.

SHARE OF THE ENERGY MIX

International Energy Agency calculations suggest that nuclear power accounts for some 10% of global electricity generation at present. As of January 2023, there were 440 reactor blocks in operation in »

NUCLEAR POWER

31 countries, supplying a total capacity of 415 GW. According to the World Nuclear Association (www.world-nuclear.org), 54 reactors (with a total capacity of 59 GW) are currently under construction worldwide, mainly in China, with a further 109 being planned. EU statistics* for Europe from 2019 revealed that nuclear power made up 70.58% of the national energy mix in France, 33.97% in Sweden, 53.86% in Slovakia, and 12.36% in Germany.

PROS AND CONS

Running a nuclear power plant emits no harmful carbon dioxide and only low levels of other common air pollutants. It therefore has only a small environmental footprint compared with fossil fuels such as coal and oil, but only if incidents and accidents during operation and unforeseen events during final storage are not taken into account.

Nuclear power produces energy constantly and steadily whether or not the sun is shining or the wind is blowing, so it is seen as a stable component of baseload supply.

The technologies associated with civilian nuclear power can often be used to develop and manufacture nuclear weapons, however, opening the door for civilian nuclear energy projects to serve as cover for a clandestine military programme of nuclear weapons.

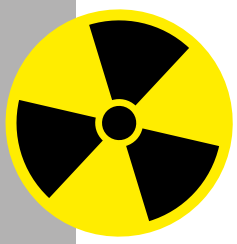
The strongest argument against the peaceful use of nuclear power is the risk of an accident, as highlighted by those at Chernobyl in 1986 and Fukushima in 2011. The abbreviation MCA stands for "maximum credible accident", while a "super MCA" would be an accident that goes beyond the standard definition of an MCA. Environmental pollution caused by the civilian use of nuclear power arises from uranium mining and from the day-to-day operation of nuclear power plants, which does not always go smoothly. Other counter-arguments include the unsolved question of disposal associated with final storage and the potential for making nuclear weapons. There is also the risk of terror attacks on nuclear facilities. These risks and the damage that they would cause cannot be insured due to the huge losses that could be expected (estimated at up to EUR 6 trillion). In 2011, financial mathematicians calculated that a liability insurance policy for a standard nuclear power plant would cost EUR 72 billion over its entire term. Blanket liability insurance would therefore increase current electricity prices in Germany by a factor of around 20.

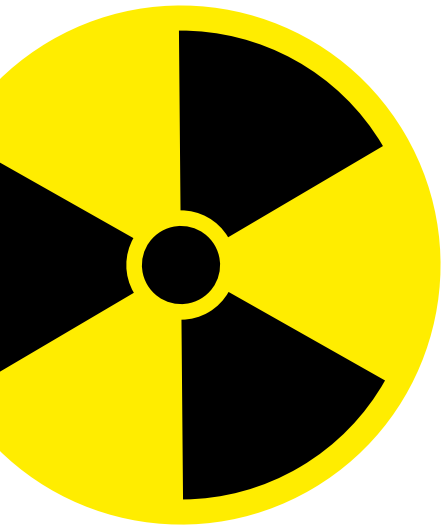
Proponents of nuclear power point to the role that it plays in grid stability and the high security of supply that it offers, mainly compared with renewable energy technologies in both cases. Higher demand and the general increase in the amount of electricity required coupled with the move away from fossil fuels such as oil and gas are also fuelling the argument that nuclear power can act as a "bridging technology". The final benefit cited is an end to reliance on oil and natural gas imports, although this argument has lost some of its force due to the shale gas and shale oil boom, particularly in the US.

The cost calculations for nuclear power do not include the "external costs", i.e. the potential social and environmental damage caused by a nuclear disaster. Neither do they factor in damage due to uranium mining or the costs of securing sites – such as the long-term protection of decommissioned nuclear power plants and the costs for transporting waste to reprocessing facilities – or the negative impacts of interim and final storage. Yet external costs are not the only argument against building new nuclear power plants, as modern ones are also expensive to run. The only way to ensure cost-effective operation of the new reactors at Hinkley Point in the UK was via government subsi- »

* Source: https://www.bmk.gv.at/themen/klima_umwelt/nuklearpolitik/euratom/eu.html%22

NUCLEAR POWER





dies in the form of a guaranteed purchase price for the electricity generated there.

URANIUM – ANYTHING BUT CLEAN

Currently, some 65,000 tonnes of uranium are extracted worldwide every year. Uranium mining is responsible for severe destruction of and damage to the environment. The greatest health risk is posed to miners in conventional mines. As uranium ore only contains a small amount of pure uranium, it is fairly harmless outside the human body. However, the mechanical process used to extract the ore from the rock exposes miners to fine particles of uranium as well as its by-product radon, a noble gas that emits radiation, in the air that they breathe. Inhaling uranium dust and radon can cause cancer, mainly lung cancer. As long ago as the 1920s, evidence showed that lung cancer among mineworkers was caused by contamination with radon. Leaking radioactivity poses an additional health risk in parts of the world where uranium is mined, while another problem in uranium mining is the massive amount of water required. According to a Greenpeace estimate, for instance, the activity has consumed 270 billion litres of water over the past 40 years in Niger alone. This water was discharged back into rivers and seas in its contaminated state.

Besides the direct health impact of water contamination, the large quantities of water consumed also causes environmental and economic damage in the regions affected. This also damages peoples' health, because removing the water lowers the groundwater level and causes desertification. Plants and animals die, and the population's traditional livelihoods disappear.

Having been mined extensively over the past few decades, ore deposits with a high uranium content are now largely exhausted. Instead, mining is now focusing on ores with a lower concentration, generating an increased amount of carbon emissions. »

NUCLEAR POLICY

Raiffeisen KAG does not believe that nuclear power is among the energy forms that should be supported with investments. Every euro that is invested in nuclear power could be invested in a more sustainable and forward-looking way in renewable forms of energy.

Read the Nuclear Policy at www.rcm.at/nachhaltigkeit

One argument against nuclear power is the availability of uranium across the world. Based on current mining activity, the reserves will last for another 20 years. By far the largest reserves that could be extracted cost-effectively at present are in Kazakhstan, followed by Canada, South Africa, Brazil, and China.

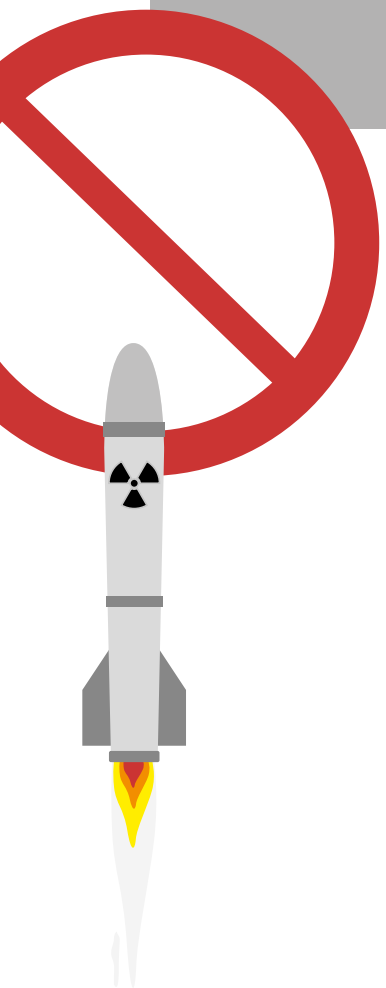
ESG ASSESSMENT

E (Environment):
Key aspects from an environmental perspective are the potential radiation given off by uranium mining or radiation accidents as well as environmental risks associated with interim and final storage.

S (Social):
Uranium mining and incidents can damage people's health.

G (Governance):
The issue of addressing or factoring in externalities remains unresolved. The possibility of the government in the country where a facility is located deciding to phase out nuclear power, especially following a nuclear accident, poses a latent risk to its operations.

STRICT CR!TERIA FOR NUCLEAR WEAP



Nuclear weapons make up a significant part of what is known as controversial weapons. Some weapons systems are controversial because the United Nations has deemed them inhumane. The associated self-imposed ban on using or agreement not to use certain weapons or ammunition in war is based on the socially motivated objective of limiting human suffering as well as on the fear of total mutual destruction, as in the case of nuclear weapons for instance.

Controversial weapons are forbidden by international conventions. For instance, the Geneva Protocol bans the use of asphyxiating, poisonous, or similar gases as well as bacteriological agents. It was adopted in 1925 based on experiences from the First World War. The 1972 Biological Weapons Convention and the 1993 Chemical Weapons Convention contain provisions on arms limitation and disarmament obligations, while there are also conventions on anti-personnel mines, nuclear weapons, and cluster munitions.

Data from sustainability research agencies suggest that, globally speaking, the highest number of breaches of the criterion of controversial weapons system production relates to cluster munitions, followed by anti-personnel mines, nuclear weapons, and uranium munitions.

The biggest difference between nuclear weapons and conventional weapons systems lies in the fact that the former work on the basis of nuclear reactions, i.e. nuclear fission or nuclear fusion, whilst the explosion triggered by the latter is caused by chemical reactions. In a nuclear weapon, the explosion sets off a chain reaction that releases a massive amount of energy in the form of heat, radiation, and a pressure wave.

NO TO CONTROVERSIAL WEAPONS

Investments in controversial weapons are not permitted at Raiffeisen Kapita- »

ONS

Leopold Salcher
Fund Manager
at Raiffeisen KAG

lanlage GmbH (trading under the Raiffeisen Capital Management umbrella brand). A company-wide exclusion criterion banning them was adopted and introduced many years ago. In terms of individual equities, we do not hold any shares of defence companies or companies with defence exposure in our funds either. Our in-house negative criteria thus ensure the exclusion of companies from the investable universe for controversial weapons and (with lower revenue thresholds for practicability reasons) military equipment and services.

Applying these negative criteria makes for a much smaller investable universe. Screening the listed companies from the global aviation and defence sectors with a market capitalisation of over USD 500 million produces a total of some 130 companies. Within this investment universe, the fund management team is currently permitted to invest in only four companies.

One problem when considering companies in this category is their product mix. None of these companies operate solely in a single segment, with most active in both military and non-military sectors, making it very hard to assign them unambiguously to a specific subsector. So how do we handle companies that sell a small proportion of weapons or similar products?

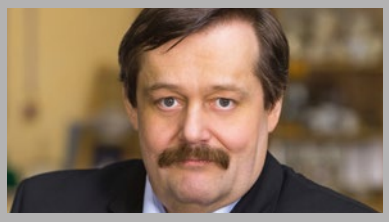
Using our investment process and thorough due diligence, we endeavour to identify any exposure to weapons and similar products and avoid or exclude the possibility of investing in a company of this kind right from the outset. If we ever become aware of a company's exposure to controversial weapons, for instance, we take immediate action.

For example, we were at one point invested in France's Veolia Environnement SA in some of our funds, a company that provides sustainable solutions for water, waste, and energy management. Unfortunately, however, it is also involved in a programme for ballistic submarines via a wholly owned subsidiary. This made it uninvestable for us. The shares were sold immediately from all the affected funds late last year, and we engaged the company in dialogue.

Moderated by
Dieter Aigner,
Managing Director
of Raiffeisen KAG

Round-table discussion on whether nuclear power can benefit the energy transition.

Werner Gruber
Physicist (formerly Science Busters), Vienna



Nikolaus Müllner
Institute of Safety and Risk Sciences, University of Natural Resources and Life Sciences, Vienna

Gabriel Panzenböck
Fund Manager, Bonds, Rates & FX, Raiffeisen KAG, Vienna

Stefan Sengelin
Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology, Vienna

Mr Gruber, we know you from the media as someone who's in favour of nuclear power plants from a sustainability perspective. Can you set out your arguments for us?

Werner Gruber: As well as cooking up sausages and roast pork as a former member of Science Busters on TV, my other field of work is neurophysics. I've also been very active in the area of environmental protection and public relations for around ten years. Plus, I'm the research coordinator for Burgenland. In that role, I'm also close to politicians and am quite familiar with people's preconceptions when it comes to nuclear technology. If you were to ask me "Nuclear technology – yes or no?", I'd say "No, what for?" However, we're not deciding in favour of or against something, but rather weighing up several possibilities and trying to keep the cost of that decision as low as possible.

What cost are we talking about?

Werner Gruber: In the case of carbon emissions, let's take Hainburg as an example. Many Austrians said we didn't need Hainburg. So Dürnrohr was built: a coal-fired power station that has emitted more CO_2 than anything else in Austria. If we'd had Hainburg, our energy problem would look somewhat different today. To get energy these days, we in Austria can choose between coal- and oil-fired power stations – hardly a good choice in view of climate change – plus natural gas, which is a bit cleaner but comes at a high environmental price in terms of the CO_2 burden, just like coal and oil. And we've got wind and solar power – fantastic for the environment, but with the major drawback that neither can be controlled. I can't simply call on them when demand surges. That means we need backup power plants, and there are only two carbon-neutral options left: hydroelectric or nuclear. We're very fortunate in Austria to have a lot of hydropower, but the Czech Republic, for example, isn't so lucky in that regard. So I'm not going to demonise nuclear power just like that.

But the high costs and the radioactive waste make the whole thing more expensive…

Werner Gruber: It's always the same question: What are we going to do with all the radioactive waste? But a lot of research has been done on that. Back in the early 1990s, the Italian physicist Carlo Rubbia, a Nobel Prize winner and the former head of CERN, presented his idea for turning extremely radioactive waste into less radioactive waste using neutrons. Although this waste would still need monitoring, it would only be for a very short time – about 50 years. Many European countries are already using systems driven by particle accelerators, such as Myrrha, a spallation facility that enables highly radioactive waste to be converted. »

"SAFETY STANDARDS LIKE YOU GET IN SPACE TRAVEL"

Although it's still in the experimental stages of operation, it does work, and there aren't any physical or technical issues. It'll soon be working under full load.

Mr Müllner, your work at your institute at the University of Natural Resources and Life Sciences involves the risks associated with nuclear power plants, amongst other things. Does nuclear power have the potential to do anything for the energy transition?

Nikolaus Müllner: If you look at the time needed to develop, build, and license nuclear power plants, you're talking decades. I can speak from experience here, because I worked on the licensing of the Atucha nuclear power plant in Argentina. People have no idea just how different a nuclear power plant is to a standard industrial plant, because the high level of radioactivity means that the requirements are simply extremely high from a technical perspective. No other industry has such stringent safety standards as nuclear technology. I'd say that the quality requirements in nuclear technology are roughly the same as you'd get in space travel, and nowhere else. And that makes the whole thing a slow process.

Might you be able to give us a specific example?

Nikolaus Müllner: The Czechs are currently planning a replacement for their Dukovany nuclear power plant, and the new plant is set to go on stream in the 2040s. Planning has been ongoing since 2015, so you're looking at around 25 years for a new power plant to go through planning, licensing, and construction before it's finally ready to use. But that's for a conventional power station, not for one of the new types of reactor that are currently all over the media and that can do everything better, or so they promise. The Czechs opted for a "proof of design", a reactor that had already been built somewhere in the world and that had shown it could work. 25 years is a long time, and you need to bear in mind that the Czech Republic is a country with the right technical infrastructure. It would be bound to take ten years longer in Austria.

Probably not an option for the energy transition, then.

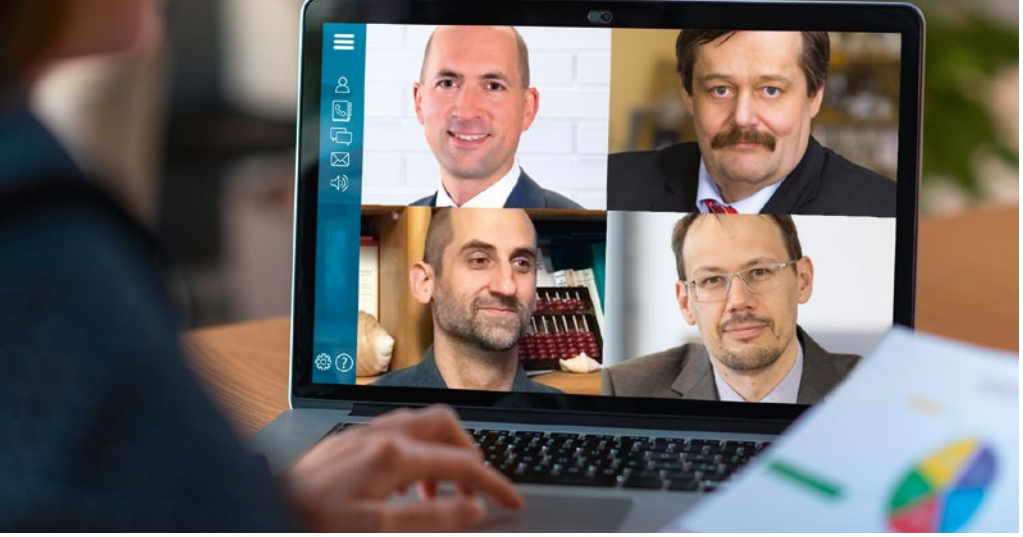
Nikolaus Müllner: No, because what's currently at the planning stage won't see the light of day before 2040. There's no other way to put it. And we're not talking about a great many projects either. Across the whole of Europe, you've got eight reactors being planned in France, plus the one in the Czech Republic I've just mentioned. Hungary is already building its power plant.

Does it make sense to extend the lifetime of nuclear power plants?

Nikolaus Müllner: In terms of their carbon emissions, yes it does. We're not talking zero emissions, but fewer emissions, definitely. It's a low-emission technology. But I've still got the cluster risk in mind in terms of safety. The reactors we've already got aren't 100% safe, and we're not going to get 100% safety with future technologies either. "Safe" here means having defined plant conditions and defined accident conditions. In other words, the plant must be capable of mastering a list of accidents and incidents. But no power plant in the world is protected against all conceivable eventualities, and that specifically includes natural disasters such as the tsunami in Fukushima. And this problem also affects lifetime extensions, of course. I can't get a power plant that was planned in the 1970s and built in the 1980s up to the technical standard that's demanded of power plants nowadays. That's another reason why I see the situation as being more problematic than Mr Gruber does. Needless to say, it's a balancing act: cluster risk versus carbon emissions.

And what do you think of Myrrha?

Nikolaus Müllner: We've taken a closer look at the idea as part of our work for »



In conversation with Stefan Sengelin, Werner Gruber, Nikolaus Müllner and Gabriel Panzenböck

Germany's Federal Office for the Safety of Nuclear Waste Management. Although the promises mentioned are of course good, implementation is still a long way off. It could be a sensible option for countries with an extensive nuclear power programme, such as France. The reactor, which needs a particle accelerator to reach criticality, transmutes some of the radioactive waste. That's a completely new technology. Whether it will really work like that under real-life operating conditions remains to be seen. Although France hasn't ruled out going down this route, it's moving more towards deep geological repositories. Even if it all works very well, we won't be able to manage without any repositories whatsoever, because the process generates long-lived fission products that are highly radioactive. So I haven't got a payback time of hundreds of thousands of years or a million years, but periods of 1,000 to 10,000 years for this all to degrade.

Mr Sengelin, all of this is now supposed to be sustainable according to the EU taxonomy. But your ministry is taking a different stance, as we all know.

Stefan Sengelin: Our view is that nuclear power is not a sustainable form of energy generation. With the taxonomy, the EU has created a system for classifying the environmental sustainability of economic activities. The EU taxonomy isn't a legal framework for pursuing the objective of security of supply or banning investments in nuclear power plants. Every member state is free to choose its own energy mix. At the same time, it's not OK for us at the ministry responsible for climate action to say "Nuclear power is environmentally sustainable." And that's why it doesn't deserve the incentivisation of having flows of investment steered in its direction. Nuclear power is highly capital-intensive and, naturally, it's in competition with other ways of producing energy. This means that capital is being directed away from these other forms, such as renewables.

So is it actually harming the energy transition?

Stefan Sengelin: As a framework, the taxonomy is a very sensible set of rules for making the financial market more standardised, more comparable, and more transparent in terms of environmentally sustainable and green activities. It has set out some very clear specifications in the text of the act as to what environmental sustainability criteria have to be met. But the European Commission has »

very clearly disregarded these criteria in a complementary delegated act, which classifies nuclear power and fossil gas activities as sustainable. If new nuclear power plants can't go on stream until 2050, for instance, there's no way they will be able to help achieve the objective of climate neutrality by 2050 as stipulated in the Green Deal. The other environmental targets, which are also contained within the taxonomy, will also be harmed, such as final storage or the risks we've already heard about. We see this as a very clear breach of the rules, and this is why we brought our much-publicised legal action against it.

But it doesn't mean that people now have to invest in nuclear power, does it? Investors are free to put their money elsewhere.

Stefan Sengelin: Yes, that's the regulatory aspect, which also requires investors to be told clearly what percentage of nuclear power and fossil gas is involved in an investment. Besides this regulatory aspect, however, there's also the issue of market acceptance. And if I look at the labels that are currently relevant in Europe as far as sustainability is concerned, and various frameworks of companies and government bonds, I know from the outset that many of them exclude nuclear power. These include labels like our own Austrian Ecolabel, the Nordic Swan Label, the FNG Seal in Germany, and the LuxFLAG label. Even France's GreenFin label excludes nuclear power. And then there are many government bonds such as Austria's government-issued green bond. So another question is whether investors even want to invest their money in nuclear power in the first place.

And do investors want to invest in nuclear power?

Gabriel Panzenböck: Investments like these are extremely unattractive from an economic perspective. And this is something I'd like to touch on at this point. Mr Gruber said right at the start that it's always a balancing act. What are we going to do, and what are the alternatives? And we've already mentioned wind and solar power, i.e. CO_2-free energy sources. We're facing a climate disaster, as we're all keenly aware by now. And there's also a consensus about the urgency with which we need to act. It would have been good to have done something as early as 20 years ago, but, even now, there are policy-related horizons and EU plans with specific targets that we need to meet. And, of course, this raises the question of what technologies we can use to get there.

…and whether these technologies are also attractive investment themes.

Gabriel Panzenböck: From a purely economic perspective, we've got a situation where solar, wind, and storage technologies are all following Moore's law – in other words, costs are falling in percentage terms year on year. It's incredible how rapidly technologies are becoming cheaper at the same time as progress is advancing. And these technologies are already available and cheap. With nuclear power, however, quite the opposite is the case: Power plants are getting increasingly costly, even after adjusting for inflation. Every kilowatt-hour of nuclear power is getting steadily more expensive. Plus, it's affected by the phenomenon known as externalities. This means that final storage, for instance, gets paid for out of the public purse. This presents an additional risk for investors, because there's a tendency to internalise these externalities. And that would make the whole thing even more expensive. So there are aspects on many cost levels that are arguments against nuclear power. So if I were an investor and had the choice between expensive space technology – I like Mr Müllner's comparison – and cheap renewables, it'd be quite clear what could generate higher returns and what I'd choose, a real no-brainer. »

ROUND-TABLE-DISCUSSION

You're also part of a working group for the energy transition, one of several key issues of the future that we're tackling and analysing in teams. What insights – from an investor's perspective – has this given you?

Gabriel Panzenböck: A great many, but one in particular that it's really important for me to mention. Energy supply is currently undergoing something of a paradigm shift. The approach that energy utilities – particularly electricity companies – used to take of simply reading off load profiles and charging consumers a flat rate every month will soon be a thing of the past. We're now moving very clearly towards a market-based system. This is because, with energy generation becoming more dynamic – you can't always draw on wind and solar power – energy prices are bound to fluctuate more. This will incentivise consumption and bring about market mechanisms that reflect that. That means that smart metering will be the future. Consumption will follow production, not the other way round. However, this also means that network effects will play a key role. After all, if the wind isn't blowing in Germany, then it might be in Poland, in Greece, or in Portugal. There are maps that give you a wonderful idea of the correlation between the various places the wind is likely to be blowing or not blowing. And if you compare the costs for a wind farm to those of a nuclear power plant, it's a very simple calculation.

Mr Gruber, you'd like to add something.

Werner Gruber: I know that wind and solar power are extremely sexy at the moment. The only problem is the battery storage system. We're currently setting up a 340-megawatt battery storage system in Burgenland, which has been home to a great many wind and solar farms for decades. This will allow us to power the whole of the province for four hours. Let me repeat that: four hours, no longer. In other words, if we get four days of fog and no wind, which happens maybe once a year, then we've got a problem. We need storage capacity, and this is a highly experimental field in technological terms. ETH Zurich has built a one-terrawatt storage system, but nobody knows yet whether it'll be a success or whether we'll have to dispose of it in five or ten years together with all the harmful substances it contains. The plan that Mr Panzenböck mentioned, whereby we buy in energy from parts of Europe where the wind is currently blowing or the sun shining, sounds good, but we don't have the grid for it. And even if we did manage it using electricity, we'd still be losing around 30%. Given the current energy crisis, however, we can't afford any losses at all – not even one single kilowatt. And building such a grid is likely to take ten years, twenty if we're also including the western and eastern edges of Europe. But it's an important plan for the more distant future. »

> "We need clear, uniform definitions and disclosure of what's green…"
>
> Stefan Sengelin

What's now on the agenda for Europe's politicians? Where do we need to pull the big levers?

Stefan Sengelin: There are currently a lot of measures for reducing CO_2 on the agenda. The political debate isn't easy, and some of those measures are hard to implement because they'll affect a great many people and the resistance is correspondingly high. But we're working on it nonetheless. One very important measure is carbon pricing. Austria has finally joined the list of countries that have adopted explicit carbon pricing. Needless to say, the economic dimension that Mr Panzenböck has mentioned is benefiting the energy transition significantly. We've got a clear cost advantage with all these technologies. If the talk is of deciding between nuclear energy and fossil energy sources, then the debate needs to be broadened. We need investments in load management, in technologies like networks, storage systems, and smart meters, that will enable us to replace the load profiles in their current form with other options and that will mean we no longer need power plants that have to be running all the time in that form. Let's direct financial flows towards these technologies that will help put us in a position where we can replace our old systems. What does this require from the politicians? Definitely financial incentives, but that's not all. Above all, we need clear, uniform definitions and disclosures of what's green and what investments will help achieve the objectives of the Green Deal. In this context, greenwashing – i.e. misleadingly designating investments as "green" even though they don't do enough to help meet environmental and climate targets – is an issue that's being closely monitored by the regulators. It's important that the issue of climate action is accorded the same importance as monetary indicators, and this is now being implemented at European level with the new corporate reporting requirements.

Nikolaus Müllner: There's one more issue that nobody has raised and that I'd just like to mention: energy savings. There's still a very great deal that can be done here. There's a very nice report from the Environment Agency Austria about how the country can meet its climate targets. The report's authors mainly recommend savings. Switching the economy to a circular economy, trying to slim down this abundance of products that we currently have, extending the lifecycles of individual products – at a stroke this gives me less transport, less waste. Encouraging more compact building when planning housing developments so I don't have as much transport, reducing soil sealing. Of course, this won't be done overnight either, but it strikes me as much easier to implement than the other options. In other words, simply dialling down energy consumption a bit.

Editorial revision by Pia Oberhauser

EU TAXONOMY

The EU taxonomy is a classification system that can be used to assess the environmental sustainability of economic activities and that is based on some ambitious technical criteria. In addition, no sustainable environmental objective may be significantly harmed, and a minimum level of social protection must be afforded. ESG funds disclose their share of taxonomy-related investments, although these disclosures are usually negligible or non-existent at present due to a lack of data and limited applicability.

WHICH AREAS OF NUCLEAR POWER ARE NOW ACTUALLY CONSIDERED SUSTAINABLE ACCORDING TO THE EU'S DEFINITION.

When the European Commission presented the Taxonomy Complementary Climate Delegated Act on climate change mitigation and adaptation, which has been in force since January 1, 2023, it provoked a strong reaction. This is because, amongst other things, it provides for certain nuclear power activities to be classed as sustainable within the meaning of the EU taxonomy. Particularly contentious is the assessment of whether and to what extent these activities cause considerable damage to the environment – most notably in terms of waste disposal and final storage – because the "do no significant harm" principle is embedded in the taxonomy and is thus an integral part of the EU's sustainability approach. However, virtually no sound scientific analyses have been produced on the long-term impact of disposing of highly radioactive waste.

Magdalena Quell
Product and Project Manager
at Raiffeisen KAG

The overarching aim of the EU taxonomy is to create enough transparency on the capital market to steer private investments, which will be needed in order to achieve climate neutrality by 2050, in the right direction and thus facilitate the decarbonisation that is required. The EU taxonomy distinguishes between several kinds of activity. These include what it terms transitional activities, i.e. "activities that cannot yet be replaced by technologically and economically feasible low-carbon alternatives, but do contribute to climate change mitigation and with the potential to play a major role in the transition to a climate-neutral economy, in line with EU climate goals and commitments, and subject to strict conditions, without crowding out investment in renewables".*

This term "transitional activities" now also includes certain nuclear power applications, although these must meet specific criteria in order to qualify as taxonomy-aligned. First and foremost, facilities must comply with the Euratom Treaty and thus meet the highest safety standards (currently "Generation III+" reactors) and have a strategy in place for final storage from 2050 onwards at the latest. The corresponding EU regulation covers the construction and operation of new nuclear power plants (for producing electricity and heat) as well as generating electricity from nuclear energy in existing ones – mainly renovation projects involving adapting the plants in line with modern technologies.

THE CRITERIA SET OUT FOR NUCLEAR POWER ACTIVITIES TO BE DEEMED SUSTAINABLE AS DEFINED BY THE EU INCLUDE:

- ✓ The nuclear power activities concerned must contribute to the transition to climate neutrality.
- ✓ They must meet nuclear and environmental safety requirements.
- ✓ Technical evaluation criteria are designed to ensure that no significant damage is caused to the environment:
  - Producers of radioactive waste must pay for its disposal (setting up funds for disposing of radioactive waste and shutting down nuclear facilities).
  - Operational repositories (near-surface for low- to intermediate-level waste; deep geological repositories for high-level waste and spent fuel elements by 2050) must be in place to prevent radioactive waste being exported for disposal in third countries.
  - The regulation stipulates detailed technical assessment criteria** that are regularly reviewed and adapted in line with the latest developments in technology.

Specific disclosure obligations were also introduced as part of this expansion of the Taxonomy Regulation. These mean that financial and non-financial companies are now required to disclose how much they have invested in gas and nuclear activities so that an extremely high level of transparency can be ensured and investors can make informed investment decisions.

* See https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_712
** See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R1214&from=EN

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CORPORATE ON THE TOPIC OF

The shareholder engagement activities of Raiffeisen Capital Management's fund management on the topic of nuclear power include dialogue with some of the largest producers and suppliers in this field. Roughly 50 companies all over the world were questioned about their attitude towards nuclear power as part of these engagement activities.

1 What role will nuclear power play in your energy mix in the medium to long term? Do you see nuclear power as a technology of the future, or will you increasingly be replacing it with other forms of energy? If the latter, what do you think are the best alternatives in economic and environmental terms?

2 What is your strategy for the final storage of radioactive waste? How are you guaranteeing minimal harm to people and the environment for future generations?

3 What do you think about the decision to add nuclear power to the sustainable category in the EU taxonomy?

4 The nuclear power plant in Zaporizhzhia has regularly been in the news in the context of the Ukraine conflict. How do you guarantee grid stability and the safety of nuclear power plants in general in the face of adverse impacts such as natural disasters or war?

VOICES
NUCLEAR POWER

1 (EnBW, EDF, Iberdrola)

"Nuclear power, no thanks!", or is it actually a sustainable energy source after all? It is not only in society that many different views are being voiced – the producers of nuclear power are also following some very different paths in their strategic management decisions. The energy crisis has prompted a significant number of companies to speak out in favour of abandoning or even boycotting the planned phase-out of nuclear power in Germany. The German government is sticking to its plan, however, partly because its nuclear power producers began planning the phase-out implemented by 2022 as long ago as 2008.

Energie Baden-Württemberg (EnBW) says that it has responded swiftly to the decision with a comprehensive decommissioning strategy, which is being pursued rigorously by its subsidiary EnBW Kernkraft. The fraught situation on the energy market and a further revision to Germany's Atomic Energy Act means that EnBW is able to operate its remaining three nuclear power plants until April 15, 2023. However, it is not allowed to use any new nuclear fuel rods. EnBW will thus stop generating nuclear power in mid-April 2023. To achieve energy neutrality by 2035, the company will replace its existing coal-fired power stations with gas-fired ones, invest more in hydrogen-based solutions, and generate up to half of its energy from renewable sources by 2025. It will double its wind farm output to 4 GW by 2025 and is also planning strong growth for its solar power.

The world's biggest nuclear producers are following a different strategy, however. Representing 78% of its revenues, nuclear power is the main source of business for Électricité de France (EDF). EDF sees expanding renewables as a way of offsetting coal-fired power and is planning to achieve a net capacity of 60 GW by 2030.

While difficulties with final storage and safety risks are powerful arguments against nuclear power, it is also a very expensive technology in relative terms from an economic perspective. Thus, the Spanish energy utility Iberdrola is planning to exit the nuclear power market from 2027 and sell its stakes in nuclear facilities. Compared with renewables, nuclear power is a cost-intensive business for Iberdrola, so the company is splitting its new investments 50/50 between renewable energy and grid stability. One of the main reasons why nuclear facilities are currently being kept going is because a contract is still in place with the Spanish government that is designed to ensure security of supply for the country.

CORPORATE VOICES ON THE TOPIC OF NUCLEAR POWER

Nuclear power is not a viable long-term option for Iberdrola from a purely economic point of view. »

2 (Southern Company, Entergy)
The final storage of radioactive waste is one of the main challenges posed by this energy source. A safe, long-term solution has to be found in order to protect future generations against potential hazards. A comprehensive final storage strategy should encompass an in-depth risk analysis, a careful selection of sites, and adequate monitoring systems in order to guarantee that radioactive waste is stored responsibly. Despite significant investment and research, the final storage of nuclear waste remains a contentious issue, because it takes 100,000 years for radioactive waste to stop posing a danger to people and the environment. This is why repositories are required that will withstand all possible natural disasters in the future.

The Dow Jones-listed Southern Company is opting for dry cask storage as a short-term solution. These facilities can store spent fuel elements for the entire lifetime of the individual power plants. When it comes to long-term storage, Southern Company believes that responsibility lies with the US Department of Energy (DOE). However, the department has yet to come up with a solution for the appropriate final storage of the radioactive material.

Another US company, Entergy, is facing similar challenges. It too is reliant on dry cask storage on facility premises, because the fuel ponds have reached capacity at all four of its nuclear power plants. Entergy likewise holds the DOE responsible. For instance, the government authorities have not approved the construction of a repository in the Yucca Mountains.

3 (Endesa)
In January 2022, the EU decided to add nuclear power to its list of investments classified as sustainable under the taxonomy. The consensus in Austria is that the negative consequences of nuclear power significantly outweigh the benefit of low carbon emissions.

Spain's Endesa is critical of the EU taxonomy. The regulation excludes nuclear power generation at existing facilities that have not requested a lifetime extension, but this applies to the vast majority of current nuclear plants. This renders these nuclear power plants ineligible for support, much to Endesa's regret.

4 (CEZ)
Nuclear power plants are controversial due to their ever-present safety risks. The danger posed by facilities is a subject of continual debate and requires energy producers to ensure a modern risk management system and cost-intensive safety standards. Over the past year, the Zaporizhzhia nuclear power plant in particular has raised the question of whether nuclear power plants and safety are even compatible. What is more, natural disasters are increasingly testing the limits of facilities' safety precautions.

The Temelín nuclear power plant lies only 50 km from the Austrian border, so the safety standards at this facility are also extremely relevant to Austria. The Czech Republic's largest electricity producer, CEZ, operates the plant and is thus responsible for its safety. CEZ's nuclear power plants have undergone various stress tests designed to simulate the impact of extreme natural events, amongst other things. Additional specific requirements for increasing nuclear power plant safety further have been identified based on the experience gained and lessons learned from the Fukushima disaster. CEZ is working tirelessly to improve its safety standards, which have to keep pace with the technological advances being made in this field.


FORTUM

COMPANY SUSTAINABILITY SPOTLIGHT

"We want to be driving the transformation towards a cleaner world. We are ensuring a rapid, reliable transition to a climate-neutral economy by supplying customers and communities with clean energy and sustainable solutions."

"Nuclear energy has a key role to play in producing clean power. As a reliable, zero-CO_2 energy source, it is helping to cover current electricity demand, improve security of supply, and curb the impact of climate change. Viewed across its entire lifecycle, nuclear power has a carbon footprint as small as that of wind, water, and solar."
Fortum website

In the centre of the southeastern Finnish town of Imatra can be found the Imatran Voima power plant, which draws its energy from the Vuoksi River. Put into operation back in 1929, it now supplies over 50,000 homes with electricity. A company named Imatran Voima had been set up to run the hydroelectric power station in 1932. Having focused initially on building more hydropower plants and expanding Finland's power grid, the state-owned concern brought what was then Northern Europe's largest coal-fired power station on stream in the 1960s. Imatran Voima built power lines between the Soviet Union and Finland and between Finland and Sweden and was involved in the electrification of Finland's railways. The company also began operating nuclear power plants from a very early stage, specifically in the 1970s. After 1990, Imatran Voima started to expand its plant design and operation activities in Finland as well as in Eastern Europe and Asia.

Another state-run company, Neste Oyj, emerged out of Finland's national oil reserve in Naantali in 1947. The newly founded company's tasks included importing, storing, processing, and trading in oil products as a way of making Finland's fuel supply less dependent on other countries. Neste opened the first oil refinery of its own in Naantali in 1958 before building a second not far from Porvoo in 1972. Neste became the main player in the Finnish petrochemicals industry in the 1970s. In the years that followed, it reduced its dependence on Soviet crude oil and secured new sources for imports from the Persian Gulf. As well as entering Finland's filling station market, Neste also began expanding into fuel supply in Eastern Europe after 1990.

In 1998, the Finnish government merged the two businesses under the name "Fortum" and privatised the new company via the Finnish stock exchange, although the Republic of Finland remains the majority shareholder. Fortum became more familiar in German-speaking countries in 2017, when it acquired nearly 48% of the German utility Uniper. The German government bought back all the shares in September 2022. Uniper was nationalised, in other words, because its financial situation had deteriorated rapidly and significantly as a result of the European gas crisis, meaning that supplies to many German households could no longer be guaranteed.

ONE OF THE LARGEST UTILITIES

With a market capitalisation of over EUR 13 billion (as of January 2023) and »

nearly 8,000 employees in total, Fortum is now one of the largest listed utilities in Europe, and nuclear power makes up more than 19% of its energy mix.

The final storage of the nuclear waste in particular creates problems to solve due to the extremely long time it needs to be stored for. For instance, how do you warn people about the risks 100,000 years down the line? Linguists and semiotics experts have been attempting to find solutions to this problem for many years now, so far without success.

In 2004, work was being done on a repository for highly radioactive waste that was intended for spent fuel from the reactors in Olkiluoto and the Loviisa nuclear power plant. Efforts to expand this part of the repository, called onkalo (cavity, cave, shelter) in Finnish, are also the subject of the documentary Into Eternity, which is well worth watching.

FINAL STORAGE 450 METRES UNDERGROUND

In November 2015, the Finnish government granted its approval for the operator Posiva, in which Fortum holds a significant stake, to build a repository »

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400 to 450 metres underground. This final storage facility would have capacity for 6,500 tonnes of nuclear waste encapsulated in copper canisters. To guard against the possibility of moisture getting in, the operator has promised to seal the storage areas with bentonite, a highly absorbent swelling rock composed of several clay materials.

Posiva submitted its application for an operating licence for the encapsulation facility and the repository to the Finnish Ministry of Economic Affairs and Employment on December 30, 2021. The permit is intended to be valid for 100 years and is based on the planned lifetime of the four nuclear power stations in Olkiluoto and Loviisa and the time still required after this to cool the fuel (radioactive decay) before putting it into final storage. A further extension for the third Olkiluoto power plant, which is currently under construction, will need to be applied for separately. The repository is to be sealed permanently after the operating licence has expired.

At a time when much of Europe is turning its back on nuclear power, it is being welcomed in Finland. The fact is that Finland is a good place for nuclear power. The country has a relatively low population, so not many nuclear reactors are required for supply purposes and thus the risks to which the country is exposed are lower too. Experts say that the success of Finland's nuclear power plants also reflects the country's unique cultural and political landscape: a high level of trust in institutions, community engagement, the fact that power is not centralised at government level, and a balance of power between industry and interest groups.

Finland has large rural areas, an extensive coastline, and, in Olkiluoto, an excellent place to base both reactors and the world's first-ever permanent nuclear repository. Situated off the coast of the village of Eurajoki, the tiny island of Olkiluoto has just enough people nearby to keep everything running smoothly. The nuclear waste repository is located inside this impervious rock and was deliberately placed in the middle, as far away as possible from two nearby earthquake faults (this is also one of the reasons why the nuclear power plants were built in Olkiluoto in the first place).

When the waste arrives on-site, it is first put inside a cast-iron container. A layer of inert argon gas is then added before everything is sealed inside a copper canister, which is welded shut. The only real concern is corrosion caused by oxygen – in this case oxygen that might hypothetically be dissolved inside the water itself. Fortum's experts argue that the dissolved oxygen would already have been consumed by bacteria and other media before the water could even get inside the sealed canisters containing the nuclear waste.

THE ISSUE OF SAFETY

As part of our latest engagement activities, one of the questions that we asked the company was about the safety of nuclear power plants and repositories in the face of natural disasters and under pressure from the ongoing war in Europe. Fortum gave us this answer, about which readers can make up their own minds: "Nuclear safety in the Nordic countries is amongst the best in the world. We do not experience earthquakes or other natural disasters, and war is unlikely (despite the highly improbable occurrence that is the war in Ukraine). We regard the risk of war as very low."

RAIFFEISEN-ESG-SOVEREIGN-INDICATOR

SECURITY ARCHITE AND GOVERNMENT

Russia's invasion of Ukraine has had a massive impact in all manner of different areas. Although we can currently only see the vague outlines of the geopolitical realignment that this is ushering in, it already seems clear that this "new" world order will be more polarised than what came before.

This poses several new questions as far as a sustainability assessment of countries is concerned, including:

- How can the issue of security architecture be integrated into a systematic sustainability assessment of countries?
- What do we understand by "militarisation", and how is it measured?
- How can militarisation be assessed at country level?

The Raiffeisen ESG sovereign indicator is a rating tool designed to assess countries' capacity for sustainability.

- Combined rating making use of in-house assessments and reputable external agencies
- Systematic evaluation on four levels
- Focus on quantitative assessment methods – currently more than 40 key performance indicators (KPIs) assigned to 12 core sustainability topics
- Within the sustainability rating, greater emphasis is placed on the E (environmental) element than on S (social) or G (governance)
- Annual rebalancing, ongoing monitoring

We have attempted to find answers to the most pertinent questions relating to security architecture in a country context. With regard to the Raiffeisen ESG sovereign indicator, it became clear fairly quickly that some fine-tuning is needed in order to incorporate the various issues in a logical and conclusive way.

Integrating the issue of security architecture in a systematic way begins at the roots (what are relevant KPIs?), before asking what belongs with which core topics and with what weighting and then finishing with the question of what role a qualitative assessment of this issue should play.

WHICH KPIS?

As a basic principle, we believe that highly militarised countries score worse on sustainability criteria than those with a low level of militarisation. This is mainly because financial or human resources used for military ends benefit the sustainability cause less than those provided for childcare, education, or health care, for example. One ratings model that takes this line of thought very much into account is the Global Militarisation Index (GMI), which has been calculated by the Bonn-based BICC* since 1990. This reflects the relative strength and importance of a country's military apparatus in relation to society as a whole.

The GMI is composed of six sub-indices covering the following three areas:

- Military spending in relation to gross domestic product (GDP) and public health care spending (as a percentage of GDP)
- Total number of (para-)military personnel and reservists in relation to doctor numbers and the total population
- Number of heavy weapons systems in relation to the total population

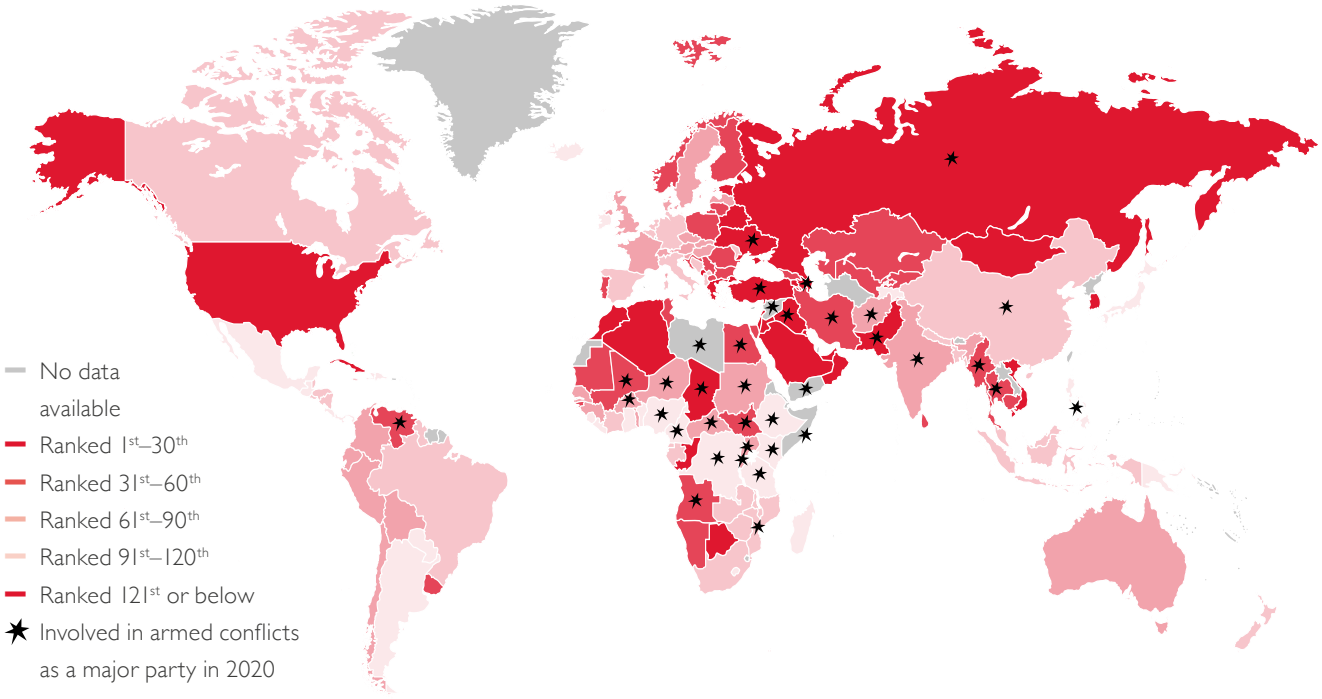
The GMI currently forms part of the governance element in the Raiffeisen ESG sovereign indicator.

* Bonn International Center for Conflict Studies (BICC) GmbH is a limited-liability company under German law that is headquartered in Bonn. It is committed to promoting peace and development and is one of Germany's five most important institutions for peace research alongside the Institut für Entwicklung und Frieden (Institute for Development and Peace), Forschungsstätte der Evangelischen Studiengemeinschaft e.V. (the Research Centre of the Protestant Student Community), the Institute for Peace Research and Security Policy at the University of Hamburg (IFSH) and the Peace Research Institute Frankfurt (HFSK).

CTURE BONDS

Andreas Riegler
Senior Fund Manager
at Raiffeisen KAG

Chart: Overview of the 2021 GMI rankings



Source for conflict data: UCDP/PRIO Armed Conflict Dataset; **source for administrative borders:** Natural Earth Dataset

WHAT ROLE DOES QUALITATIVE ASSESSMENT PLAY IN THIS AREA?

Quantitative assessments ultimately require careful scrutiny, particularly when it comes to a country's military security policy. Can one really blame countries like Israel, South Korea, or Ukraine for being in the world's top 20 most highly militarised countries back in 2020? Hardly! Thus, the quantitative ratings provided by the GMI form the basis of the sustainability assessment. For instance, being highly militarised will push a country's governance rating down as a basic principle, giving it a poorer sustainability rating overall. Nevertheless, the country's quantitative assessment at the second level (E, S, G) can be overridden if there is sufficient justification, generally in the event of ESG controversies. These are incidents or circumstances where countries exert a negative impact on sustainability issues through their own actions or a conscious acceptance of the situation. The scale of the qualitative reassessment depends on the severity of the incident and the quantitative score** assigned to the country in question. Within Raiffeisen's own rating system, the leeway for making qualitative adjustments to a score amounts to up to 50% of the points available for the quantitative rating, thus clearly emphasising the importance of careful scrutiny.

** As a basic principle, a country with a high score in a particular area of sustainability will have more to lose than one that performs very poorly in that area.

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