

National governments and global leaders are pushing for carbon neutral economies by 2050, principally by reducing greenhouse gas (GHG) emissions and fossil fuel consumption. G7 leaders recently pledged to end public financing of unabated coal funding by the end of 2021. Yet how to define what is and is not green energy is still open to debate, and is a major issue, as retreating from fossil fuels and going green is now a major part of investors' environmental, social and governmental (ESG) activities. Other terms in use include sustainability and climate risk. Yet at the heart of these issues is the impact of economic activities in terms of GHG emissions and the consumption of fossil fuels.

Green Deal taxonomy

Tempers have already flared in Brussels as the bureaucrats try to decide what counts as "green." The definition is important, as the EU will earmark considerable funds for the greenification of economies. It will also affect the financial markets as investors hunt for green assets that will command a premium to "brown" assets. In 2019 as the Green Deal plan was being drawn up a row broke out between France and Germany over the "green finance" taxonomy, which is designed to identify which economic activities are eligible to receive funds that have a specific mandate to make sustainable investments. Six pre-defined environmental objectives must be met in order for a "green certificate" to be issued. The use of any technology that undermines one of these six goals leads to automatic disqualification from access to this capital.

For example, the trouble is that the unknowns of the environmental impact of disposing of nuclear waste mean that it has been disqualified from getting a green certification: the very technology that the EC is looking to use to make Europe carbon neutral by 2050 has been cut off from green financing by the EU's own rules.

Although nuclear energy largely meets the low-carbon emissions objective, "it was not possible to include nuclear power because there is no scientific evidence for waste treatment. This means that the sector does not meet both requirements," explained Jochen Krimphoff, World Wide Fund for Nature deputy director for green finance.

The failure to give the nuclear power business a green certification caused uproar in France, which is by far the most dependent of Europe's countries on nuclear power, using nuclear power stations to generate some 80% of its power. On the other hand, German Chancellor Angela Merkel was elected on a promise to phase out nuclear power completely and although Germany leads Europe in its reliance on renewable energy - just under half of Germany's power is from green sources - she quickly reneged on her promise to shutter Germany's nuclear power stations. Nevertheless, Germany remains against promoting the

use of nuclear power and has clashed with France.

The situation is made more complicated as Germany says it is not against labelling gas as green, despite the fact that burning gas produces CO₂, whereas nuclear power produces none. This preference may be partly explained because Germany has signed off on the Nord Stream 2 55bn cubic metre per year gas pipeline from Russia, which will significantly boost its energy security, reduce its costs and make Germany a European energy hub.

Sustainable Finance Disclosure Regulations

Defining green as opposed to “brown” assets is also at the heart of the EU’s Sustainable Finance Disclosure Regulations (SFDR), which it launched in March 2021. These require fund managers to provide information about the ESG risks and negative impact of their investment. The rules aim to tackle greenwashing, whereby companies claim that their investment products or their corporate activities are sustainable and green, but in practice are not. Put simply, the rules require fund managers to disclose information to potential investors about how green the economic activities that the fund finances are. The SFDR defines so-called Article 8 investment funds at light green, which means they promote ESG objectives. The dark green Article 9 funds have stricter sustainable objectives. The new regulations matter, as ESG funds are becoming more and more popular with European investors. In the first quarter of 2021, European ESG fund flows reached record-high levels of €120bn, 20% up on the previous quarter, Morningstar said. ESG funds accounted more than half of total European fund flows in the first quarter of 2021 and in the year to March 2021, fund assets have grown to over €1 trillion. Overall, around 23-24% of funds in Europe consider themselves as green.

However, in emerging economies in Eastern Europe, financial institutions are finding it hard to adopt comprehensive climate risk management and disclosures, the EBRD noted this week at its annual meeting.

An EBRD survey found that financial institutions across Eastern Europe had a low level of awareness of climate risk management and do not yet tap sufficiently into knowledge offered by international best practice initiatives. The survey said that only 43% of financial institutions consider the impact of their portfolio on climate change as a potential source of risk. The institutions were worried about a lack of clarity on how to implement risk management and disclosure processes. The survey also found that by far the biggest driver of stronger climate risk management was the influence and supervisory expectations by governments, policymakers or regulators.

Put simply, many banks and investors in Eastern Europe are being forced to beef up their

climate risk activities but they have too little knowledge or expertise on the subject.

Nuclear

One of the most hotly debated issues is whether or not nuclear power is green. It is certainly carbon free and produces no GHGs at all. However, as part of the Green Deal the EU has refused to class nuclear power as green, as there are no long-term studies of the impact on the environment of storing nuclear waste. That has left nuclear power in limbo between dirty fossil fuels and emission-free solar and wind power.

In the short term the distinction may be lost as countries scramble to solve the practical problem of how to rapidly bring down GHG emissions and at the same time generate large and growing amounts of power on demand. On this score it is hard to beat nuclear, and the waste storage issue is a long-term problem but that also means it is a problem that can be put off for a long time. Russia is the world's nuclear champion and Russia's nuclear technology exports are booming. Rosatom, the state-run nuclear monopoly, is already responsible for 76% of global nuclear technology exports and now it is also looking to become a leader in the global energy transition, first deputy director Kirill Komarov told the Financial Times in a recent interview.

Rosatom already operates 36 reactors in 12 countries and has another 40-plus reactors in Russia itself. The technology has been upgraded from the ill-fated RBMK-type reactors and replaced by the third-generation VVER 1200 (water-water energetic reactor) that are compliant with the IAEA's International Nuclear Safety Group (INSAG) recommendations and are generally considered to be safe.

More recently Rosatom has rolled out its new small modular reactor (SMR), a sort of mini-reactor that is suitable for generating power in remote locations to supply a big factory or a small town. They can also be used to complement existing renewable power locations and cover demand when there is no wind or sunshine.

Komarov said that small nuclear reactors are perfect for providing the "baseload" of carbon-free electricity at times when weather conditions disrupt renewables. "With all due respect to renewables, and we are involved in this business as well, we understand someone has to ensure the baseload," Komarov told the FT.

China and the US are both intending to rely heavily on nuclear power to meet their emissions targets and the EU is set to decide later this year on whether to classify nuclear power as a "green investment." However, regardless of the taxonomy, Brussels has already admitted to itself that there is no way to reduce emissions without significantly increasing its reliance on nuclear power.

“The European Parliament believes that nuclear energy can play a role in meeting climate objectives because it does not emit greenhouse gases, and can also ensure a significant share of electricity production in Europe,” the EU said in a statement two years ago when launching its Green Deal.

The Chernobyl legacy and the threat of accidents will always undermine the popularity of nuclear power and Rosatom is hoping to use its expertise in power generation to branch out into less problematic sources of electricity. Rosatom opened Russia’s two biggest wind farms last year and is also planning at least two large green hydrogen projects in the country. The group expects its revenue to triple to RUB4 trillion (\$56bn) by 2030, 40% of which will come from new non-nuclear business lines.

Hydropower

Hydropower currently provides about one-third of the EU’s green energy; however, elderly infrastructure and large dams contrast with the EU’s increasingly strong actions to promote biodiversity and to protect nature.

As a result, hydro’s green credentials are constantly under examination, with environmentalists and the EU’s biodiversity policies both opposing further developments.

In the EU-28 countries, hydro accounts for over 14% of all electricity and 70% of all hydropower is from five main countries – Sweden, France, Italy, Austria and Spain.

Impressively Norway gets 99% of its electrical energy from hydro.

A recent report from the UN found that 3,000 of Europe’s 21,300 dams were built between 50 and 100 years ago. This makes them increasingly likely to damage their local environment, have a negative impact on the local water supply system and to be vulnerable to the effects of climate change failure.

The result is that plans for small-scale run-of-the-river hydropower plants (HPPs), which typically have up to 10 MW of capacity, are being opposed across by Europe by environmental groups as they threaten fish stocks and the well-being of other aquatic life, while also threatening the wider diversity of the continent’s river basins. A crucial issue is that many proposed small hydro dams are located in environmentally sensitive areas, the vast majority in national parks and Natura 2000 sites.

A report from the Worldwide Fund for Nature found that Europe had 21,387 HPPs, with 8,785 planned or under construction. 91% of these plants had under 10 MW of capacity. Furthermore, 28% of all planned plants are in protected areas.

The study said that small hydropower (below 10 MW) wreaks environmental havoc whilst producing very little energy by comparison.

In terms of biodiversity, more than a third of European freshwater fish species are currently threatened with extinction – of which hydropower dams are a key driver – European rivers and their biodiversity cannot cope with the pressure of more hydropower.

In Western Europe countries, hydropower expansion is dominated by pumped storage plants and the upgrade of existing HPPs.

However, the Balkans, Eastern Europe and Turkey boast the most dynamic development, with a number of both run-of-the-river plants and larger dam-based projects being built or proposed each year.

Indeed, the WWF terms hydropower a transitional energy source and cannot be relied on to promote the energy transition beyond the medium term. Solar, wind improved energy efficiency and lower demand are needed instead.

The worst impacts of dams, such as the disruption to river life, changes to river beds and coastal erosion potential have driven mitigation efforts or stopped certain hydroprojects from their inception.

The key issue is the Commission's 2030 Biodiversity Strategy, which aims to protect 25,000 km of free-flowing rivers within the next decade to protect biodiversity.

Hydropower is traditionally known as the cheapest, most flexible form of power, and is often used as peak-shaving capacity, especially pumped storage plants.

Back in 2016, the levelised costs of energy (LCOE) for hydro was \$0.046 per kWh, against \$0.06 for onshore wind and \$0.126 for solar. However, falling solar and wind prices are now undercutting hydro.

Meanwhile, in global terms, a recent IRENA report showed that the LCOE for hydro actually rose slightly to \$0.044 in 2020, while the LCOE for onshore wind was \$0.039 and 0.057 for solar.

Put simply, onshore wind, currently the cheapest form of renewables, is now cheaper than hydro, while solar is not far behind. While solar and wind are set to fall further, the costs of hydro are unlikely to do so.

As hydro is losing the race on price with solar and wind, and its prospects are curbed by environmental opposition because of its threat to biodiversity, it is increasingly becoming a less attractive option for policymakers and investors.

Backlash against Western Balkans hydropower investment

The wave of investment into new hydropower capacity in the Western Balkans, including hundreds of small HPPs, has sparked a backlash of protests and campaigns by environmental groups. They argue that many of the projects will harm the local environment

and are both unsustainable in light of the expected warming of the region and economically unviable. The sheer number of hydropower installations built or announced has raised further questions about oversight of the sector.

Among the many campaigns, the efforts by a group of women protesters in Kruscica, Bosnia captured public imagination when they blocked a bridge providing access to the village where two HPPs were planned for more than a year, defying efforts by both the investor and the police to remove them.

There has also been an international campaign against plans to dam the Vjosa river in Albania, considered to be Europe's last major 'wild river', as it has not yet been exploited for hydropower. In the latest development, campaigners backed by President Ilir Meta are seeking to force Prime Minister Edi Rama to follow through with his pre-election pledge to set up a national park around the Vjosa, which would block dam construction.

The campaigns are already having an effect. After thousand-strong protests, several local authorities in Serbia have already banned new HPPs, and Mining and Energy Minister Zorana Mihajlovic has announced plans to ban new HPPs in environmentally protected areas across the country. Legislation on the same issue has been initiated in both Bosnian entities, the Bosnian Federation and Republika Srpska.

Solar and wind

While nuclear and hydro both have their backers for being low-carbon, non-carbon, sustainable and so on, they cannot compete with solar and wind in terms of dynamic growth, falling costs and technical flexibility.

IRENA found recently that in 2020 the costs of concentrating solar power (CSP) fell by 16%, onshore wind by 13%, offshore wind by 9% and solar PV by 7%. This meant that 62% of the new green capacity, or 162 GW, proved to be cheaper than new fossil fuel-fired power generation in 2020.

From 2010 to 2020, the cost of electricity generated by utility-scale solar PV fell by 85%, that of CSP by 68%, onshore wind by 56% and offshore wind by 48%.

The IEA's Roadmap towards net zero, which was published in May, called for annual additions of solar PV capacity to reach 630 GW by 2030, and those of wind to reach 390 GW. It also called for renewables to provide almost 90% of electricity by 2050, and that one-fifth of that electricity will be used to produce hydrogen.

Crucially, the Roadmap called for global investment in fossil fuel supply to fall from \$575bn on average over the past five years to \$110bn in 2050.

Geothermal

The European Geothermal Energy Council said in its recent European Geothermal Market Report 2020 that Europe had 3.5 GW of installed geothermal electricity capacity at 139 power plants, with Turkey (1,688 MW), Italy (916 MW) and Iceland (754 MW) leading the way. Turkey was the most dynamic country in 2020, with 165 MW of new capacity.

Geothermal can also provide district heating, with 350 geothermal district heating systems in operation, and a further 232 in various stages of development. Hungary has a developed geothermal heating sector, with 250 MW, but it is still concentrated in certain areas with suitable underground geothermal resources. It has 22 systems in operations and another 20 under development. To expand from its small and niche base, EGEC said geothermal energy needed supportive policies, fair competition, carbon pricing and the end of fossil fuel subsidies. Most countries showed considerable uncertainty in 2020, and support for geothermal power lacks stability.

2050

The IEA said in its Roadmap that to reach net-zero emissions by 2050, annual clean energy investment worldwide will need to more than triple by 2030 to around \$4 trillion. As such, gaining access to these investment flows will be crucial for investors and fund managers. They will need to have better knowledge about what is and is not green, clear oversight and regulation and supportive government policies if both public and private investors are to provide the cash needed to achieve net zero by 2050 and to meet the Paris Agreement temperature targets.

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