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EU Taxonomy and Nuclear Energy

How to Fix Europe's Energy Crisis while also Achieving Climate Neutrality

Abstract:

Never waste a good crisis. As gas prices spike and European citizens face dramatic increases in electricity bills – or even the threat of energy shortages and blackouts – there has never been a better time to ask why things have gone so wrong and how they can be put right. For too long, European energy policy has been ideological, unscientific, expensive, undemocratic, and risky. With the climate crisis and the energy crisis now converging, we have only one chance to change the game before it is too late.

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What is the EU taxonomy?

The EU taxonomy is a classification system defining economic activities that are environmentally sustainable. Following in the wake of the EU Taxonomy Regulation that came into force in 2020, it aims to provide security for investors and policymakers to help them drive investment into the EU green deal, without each investment having to be considered separately.[1]

The EU taxonomy codifies what is considered sustainable in any future financing of energy. However, there is ongoing debate about what it should and should not include. The taxonomy necessarily includes renewables, for which there is a broad political consensus. Unabated gas is unlikely to be included since it is a fossil fuel, and even if it produces fewer emissions than coal it will prevent Europe from attaining its climate targets if it remains in use after the net zero date of 2050.[2]

Nuclear fission, on the other hand, is sustainable and must qualify if the taxonomy is to have any scientific integrity. Yet objections to nuclear abound. Often ideological rather than evidence-based, anti-nuclear arguments date back to the origin of the Green Movement in the 1970s. To explore current political disagreements about whether nuclear can be qualified as sustainable, in 2020 the Commission launched in-depth expert research to gather the latest facts. In March this year, the Joint Research Centre (JRC), the Commission's in-house science and knowledge service, issued a technical report on nuclear energy.

The JCR report detailed all the familiar objections to nuclear and provides the scientific evidence on which the taxonomy should be based.[3] It concluded that anti-nuclear beliefs, however strongly held, should not be allowed to derail Europe's progress towards its zero-carbon targets, which are fundamentally unachievable without dramatically extended use of nuclear power. There are many reasons for this, but, first and foremost, renewables by themselves cannot provide a stable power resource because of intermittency. This means that, without nuclear, fossil fuels will always remain essential for backup.[4]

1 European Commission, 'EU taxonomy for sustainable activities', https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.
2 European Commission, 'Climate strategies & targets', https://ec.europa.eu/clima/eu-action/climate-strategies-targets_en.
3 European Commission, 'EU taxonomy for sustainable activities'.
4 T. Nordhaus (2021), 'In Global Energy Crisis, Anti-Nuclear Chickens Come Home to Roost', *Foreign Policy*, https://foreignpolicy.com/2021/10/08/energy-crisis-nuclear-natural-gas-renewable-climate/.

Don't follow Germany

If nuclear is outside the taxonomy, it will be too expensive and will not get built: investors will not put money into a technology that carries high political risk. In turn, Europe will miss its carbon targets, continue to drive the world into a worsening climate emergency and remain utterly dependent on Russian gas. A recent study suggests that 12 gigawatts of new gas would be needed to replace coal and nuclear in Germany by 2030,[5] the majority of which will flow down the new Nordstream 2 pipeline, which has conveniently just been finished, as if for this very purpose.

> If nuclear is outside the taxonomy, investors will not put money into a technology that carries high political risk

This, for want of a better way of putting it, is the 'German option'. In Germany an ideologically blinkered *Energiewende*, i.e., Germany's plan for transition to low carbon, sustainable energy, has privileged nuclear shutdown over coal reduction, leading to a billion tonnes more CO_2 being emitted than would have been the case had coal been shut down first.[6] Meanwhile, a huge investment in renewables has been a figleaf for the building of Nordstream 2, without which the operation of intermittent wind and solar cannot provide reliable energy, even on a daily basis.

Meanwhile, dirty coal will remain on the German grid until 2038 following the coal phase-out agreement struck in 2019 between Angela Merkel, industry, and the Greens.[7] Consider that Europe, which talks a good game on climate, is actually the worst kind of climate criminal: we still burn 250 million tonnes annually of coal for power.[8] According to a recent scientific paper on the mortality cost of carbon, each 4,400 tonnes of CO_2 emitted equates to approximately one death.[9] Germany's additional billion *Energiewende* carbon from coal will add up to 226,000 additional deaths, according to this metric. This is in addition to

5 J. Starn (2021), 'Phasing out coal will require Germany to build new gas plants', *Bloomberg Green*, https://www.bloomberg.com/news/articles/2021-06-21/phasing-out-coal-will-require-germany-to-build-new-gas-plants.

6 S. Evans (2019), 'Analysis: How far would Germany's 2038 coal phaseout breach Paris climate goals?', *Carbon Brief*, https://www.carbonbrief.org/analysis-how-far-would-germanys-2038-coal-phaseout-breach-paris-climate-goals.

7 M. Wacket (2019), 'Germany to phase out coal by 2038 in move away from fossil fuels', *Reuters*, https://www.reuters.com/article/us-germany-energy-coal-idUSKCN1PK04L.

8 K. Kallemets (2021), 'Viewpoint: energy crisis demands quickly-scalable SMRs', *World Nuclear News*, https://www.world-nuclear-news.org/Articles/Viewpoint-Energy-crisis-demands-quickly-scalable-S.

9 R. Daniel Bressler (2021), 'The mortality cost of carbon', Nature Communications, 12: 4467.

the many thousands who die from coal-related air pollution. Overall, Europe's coal consumption equates to a death toll of 57,000 per year – this is like a Chernobyl disaster every two weeks. Germany's anti-nuclear lobby talks a lot about Chernobyl but says very little about the mortality cost of carbon.

Alternative routes

A cleaner energy policy would balance intermittent renewables with another zero-carbon energy source. So what candidates are there? Hydroelectricity is fundamentally limited by geography and has damaging impacts on river ecosystems.[10] Biofuels are simply not scalable: running national electricity systems on woodchips means huge land-take and the destruction of forests, either in Europe itself or abroad.[11]

Batteries are orders of magnitude too small: they can balance grids for seconds or minutes, but certainly not for months, and, given the costs and shortages of rare earth materials, probably never will.[12] For example, the largest grid-scale battery in the UK (planned but yet to be built), will have a capacity of 100MW/107MWh, enough to meet the needs of 100,000 homes for one hour at peak demand.[13] Furthermore, the scarce minerals necessary for battery manufacture simply won't be available: they will be allocated, as a priority, to the manufacture of electric vehicles – because to get oil out of transport there is no other viable solution.

Another contender, hydrogen, can be discounted too: not only will it be essential in other sectors such as steel, cement, and aviation, but it is a long way from being able to balance electricity grids, and using it for this purpose will always be extremely inefficient due to the laws of thermodynamics.[14]

A reality check

Let's be brutally honest. Apart from nuclear, Europe has only three choices to balance wind and solar while keeping the lights on. That is because these three options are 'dispatchable' power, that can be ramped up and down to balance intermittent renewables as the weather and seasons change.

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10 E. Moran et al. (2018), 'Sustainable hydropower in the 21st century', *PNAS*, 115(47): 11891–11898.
11 S. Elbein (2019), 'Europe's renewable energy policy is built on burning American trees', *Vox*, https://www.vox.com/science-and-health/2019/3/4/18216045/renewable-energy-wood-pellets-biomass.
12 P. Patel (2021), 'Could sucking up the seafloor solve battery shortage?', *IEEE Spectrum*, https://spectrum.ieee.org/mine-ocean-battery-metal-shortage.
13 S. George (2021), '"UK's first" grid-scale battery storage system comes online in Oxford', *EUACTIV*, https://www.euractiv.com/section/electricity/news/uks-first-grid-scale-battery-storage-system-comes-online-in-oxford/.
14 G. Meyer and N. Thomas (2021), 'Hydrogen: the future of electricity storage?', *Financial Times*, https://www.ft.com/content/c3526a2e-cdc5-444f-940c-0b3376f38069.

1. Burning imported biomass (woodchips from other countries' forests)
2. Burning Russian gas (Nordstream 2 or LNG imports exposed to volatile markets)
3. Burning European coal

None of these options should be on the table, for obvious reasons. But without nuclear on the taxonomy, these will be the only choices.

What EU scientists say about nuclear power

What is the point of asking for expert reviews if the evidence produced by the scientists is rejected for ideological or political reasons? This is what is implied if the JRC's findings about nuclear are not adopted as the basis for inclusion in the EU taxonomy. The JRC categorically rejects the myths advanced by anti-nuclear campaigners and anti-nuclear Member States.

Key finding of the JRC:

> The analyses did not reveal any science-based evidence that nuclear energy does more harm to human health or to the environment than other electricity production technologies already included in the Taxonomy as activities supporting climate change mitigation.[15] (p. 7)

Some other common myths busted by JRC report:

> ***Myth: Nuclear is not low-carbon***
> JRC: Average lifecycle GHG emissions determined for electricity production from nuclear energy are comparable to the values characteristic to hydropower and wind. (p. 9)
>
> ***Myth: Nuclear produces other pollution***
> JRC: Nuclear energy has very low NOx (nitrous oxides), SO2 (sulphur dioxide), PM (particulate matter) and NMVOC (non-methane volatile organic compounds) emissions. With regard to acidification and eutrophication potentials, nuclear energy is also comparable to or better than solar PV and wind. (p. 9)

15 European Commission Joint Research Centre, Petten, 2021, 'Technical assessment of nuclear energy with respect to the "do no significant harm" criteria of Regulation (EU) 2020/852 ("Taxonomy Regulation"), JRC124193', https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/210329-jrc-report-nuclear-energy-assessment_en.pdf.

Myth: Nuclear uses too much land
JRC: Land occupation of nuclear energy generation is about the same as for an equivalent capacity gas-fired power plant, but significantly smaller than wind or solar PV. (p. 9)

Myth: Nuclear produces huge amounts of waste
JRC: In volumetric terms, the amount of radioactive waste produced by nuclear energy operated on the basis of PWRs [pressurised water reactors] is comparable with (slightly higher than) the amount of chemical waste from some solar PV technologies. (p. 52)

Myth: Nuclear releases dangerous radiation which puts the public in danger
JRC: The average annual exposure to a member of the public, due to effects attributable to nuclear energy-based electricity production is about 0.2 microsievert, which is ten thousand times less than the average annual dose due to the natural background radiation. (p. 9)

Myth: Nuclear stations often cause cancer in people living nearby
The probability of dying from long-term cancer for a member of the public living within 10 miles of the [nuclear] plant is in all cases less than 1 in 1 billion per reactor-year. (p. 178)

Myth: Nuclear is a uniquely dangerous technology
JRC: The total impact on human health of both the radiological and non-radiological emissions from the nuclear energy chain are comparable with the human health impact from offshore wind energy (p. 9)

Myth: Nuclear is far more dangerous than renewables or fossil fuels
JRC: The current Western Gen II NPPs [nuclear power plants] have a very low fatality rate (≈5·10-7 fatalities/GWh). This value is much smaller than that characterizing any form of fossil fuel-based electricity production technology and comparable with hydropower in OECD countries and wind power (only solar power has significantly lower fatality rate). (pp. 9–10)

Myth: No one knows what to do with the waste
JRC: For high-level radioactive waste and spent fuel, there is a broad consensus amongst the scientific, technological and regulatory communities that final disposal in deep geological repositories is the most effective and safest feasible solution which can ensure that no significant harm is caused to human life and the environment for the required timespan. (p. 11)

When the wind stops blowing

Europe has plenty of climate targets. What it lacks is a realistic energy policy that includes a deliverable plan for abandoning fossil fuels. This failure was fully exposed during the lull period of September 2021, when the winds stopped blowing for weeks across virtually the entire continent and the UK due to slack pressure systems and an inactive jet stream – possibly exacerbated by climate change.[16] Europe's renewables are mostly wind power (excluding hydro, wind makes up 35% of renewables, solar 13%, and biofuels 8%),[17] and there is no large-scale backup other than coal and gas. Coal was brought back, while gas prices increased dramatically, along with prices for electricity (much of which is fired by gas). Industry had to shut down, while the public faced soaring bills.

> Europe has plenty of climate targets. What it lacks is a realistic energy policy.

This was also a perfect time for Putin to turn down the gas taps, refusing to let Gazprom pump more gas via Ukraine in order to force the expedited approval for the startup of Nordstream 2. Nordstream 2 fully exposes the hypocrisy and short-termism of European renewables policy: it claims to be about 100% renewable, but in reality it means dependence on Russian gas, and not just now or next year but indefinitely.[18] Without significant investment in new nuclear, whenever the wind stops blowing EU Member States will need to go cap in hand to Mr Putin to beg for more gas. With coal out of the picture, there is simply no alternative.

Fission in the future

Nuclear is finally beginning to see a resurgence, even in Europe. The Czech Republic is seeking to use nuclear to attain its climate goals, while Poland is looking to nuclear as a way to repower its coal facilities in a zero-carbon way. For this reason, ministers from both countries wrote last year to the EU Commission supporting the inclusion of nuclear in the EU taxonomy.[19] Finland is building new plants, as is the UK.

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16 S. Bernard (2021), 'Europe's electricity generation from wind blown off course', *Financial Times*, https://www.ft.com/content/d53b5843-dbe0-4724-8adf-75c66127ea80.

17 Eurostat (2020), 'Renewable energy statistics'. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics.

18 A. Sabadus (2021), 'Europe's energy crisis highlights dangers of reliance on Russia', *Atlantic Council*, https://www.atlanticcouncil.org/blogs/ukrainealert/europes-energy-crisis-highlights-dangers-of-reliance-on-russia/.

19 World Nuclear News (2021), 'Help coal-dependent countries switch to nuclear, ministers tell EU', *World Nuclear News*, https://www.world-nuclear-news.org/Articles/Help-coal-dependent-countries-switch-to-nuclear-mi.

The next generation of nuclear reactors

Most existing nuclear power plants are referred to as second generation, or Gen II. The EPR plants under construction in Finland, France, and the UK are considered Gen III, due to more advanced safety systems and streamlined operation. Gen IV includes newer designs that do not use water in the reactor core, even in gas-cooled and liquid metal reactors. Most small modular reactors (SMRs) are considered Gen IV: these are designed to be modular and scalable, being built in factories and shipped to sites rather than laboriously put together in situ. Gen IV reactor designs include high-temperature reactors that can produce clean hydrogen for transportation fuels (probably via conversion to ammonia) and the decarbonisation of steel. Advanced reactors now include full passive safety and can even recycle used spent fuel. There is no realistic prospect of fuel limitations: there are tens of thousands of years' worth of nuclear fuel available if breeder and thorium options are utilised.

Advanced reactors include molten salt storage options that allow electricity production to be quickly ramped up and down to support and complement intermittent renewables, much as gas currently does. Gigafactories of SMRs could be employed to produce hydrogen, with the reactors acting as a reserve option that can be diverted to serve the electrical grid during extended periods of low wind. Nuclear fuel can easily be stored, thus addressing energy security concerns. Zero-carbon targets can be achieved economically and on time, protecting jobs and keeping heavy industry alive in Europe.

Conclusion

To protect the integrity of the taxonomy, the criteria for inclusion must be based on scientific evidence. Carbon capture and storage is included in the taxonomy, despite this being an unproven technology at scale. Gas is being considered for inclusion, despite its being a fossil fuel. *The facts are clear: nuclear is the only large-scale dispatchable source of zero-carbon electricity available without geographical restriction across Europe*. If nuclear fission is excluded, Europe will be less sustainable and we will miss our climate targets, while sending a signal that evidence-based policymaking no longer exists in Brussels. If we are to face the climate emergency squarely, everything must change, including some nations' long-standing cultural aversion to nuclear power. There really is no alternative.

REFERENCES

Bernard, S. (2021). 'Europe's electricity generation from wind blown off course'. *Financial Times,* https://www.ft.com/content/d53b5843-dbe0-4724-8adf-75c66127ea80.

Daniel Bressler, R. (2021). 'The mortality cost of carbon'. *Nature Communications,* 12: 4467.

Elbein, S. (2019). 'Europe's renewable energy policy is built on burning American trees'. *Vox*, https://www.vox.com/science-and-health/2019/3/4/18216045/renewable-energy-wood-pellets-biomass.

European Commission, 'Climate strategies & targets'. https://ec.europa.eu/clima/eu-action/climate-strategies-targets_en.

European Commission, 'EU taxonomy for sustainable activities'. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.

European Commission Joint Research Centre, Petten (2021). 'Technical assessment of nuclear energy with respect to the "do no significant harm" criteria of Regulation (EU) 2020/852 ("Taxonomy Regulation"), JRC124193'. https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/210329-jrc-report-nuclear-energy-assessment_en.pdf.

Eurostat (2020). 'Renewable energy statistics'. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics.

Evans, S. (2019). 'Analysis: how far would Germany's 2038 coal phaseout breach Paris climate goals?'. Carbon Brief, https://www.carbonbrief.org/analysis-how-far-would-germanys-2038-coal-phaseout-breach-paris-climate-goals.

George, S. (2021). '"UK's first" grid-scale battery storage system comes online in Oxford'. *EUACTIV*, https://www.euractiv.com/section/electricity/news/uks-first-grid-scale-battery-storage-system-comes-online-in-oxford/.

Kallemets, K. (2021). 'Viewpoint: energy crisis demands quickly-scalable SMRs'. *World Nuclear News*, https://www.world-nuclear-news.org/Articles/Viewpoint-Energy-crisis-demands-quickly-scalable-S.

Meyer, G., & Thomas, N. (2021). 'Hydrogen: the future of electricity storage?'. *Financial Times,* https://www.ft.com/content/c3526a2e-cdc5-444f-940c-0b3376f38069.

Moran, E. et al. (2018). 'Sustainable hydropower in the 21st century'. *PNAS*, 115(47): 11891–11898.

Nordhaus, T. (2021). 'In global energy crisis, anti-nuclear chickens come home to roost'. *Foreign Policy*, https://foreignpolicy.com/2021/10/08/energy-crisis-nuclear-natural-gas-renewable-climate/.

Patel, P. (2021). 'Could sucking up the seafloor solve battery shortage?'. *IEEE Spectrum*, https://spectrum.ieee.org/mine-ocean-battery-metal-shortage.

Sabadus, A. (2021). 'Europe's energy crisis highlights dangers of reliance on Russia'. *Atlantic Council*, https://www.atlanticcouncil.org/blogs/ukrainealert/europes-energy-crisis-highlights-dangers-of-reliance-on-russia/.

Starn, J. (2021). 'Phasing out coal will require Germany to build new gas plants'. *Bloomberg Green*, https://www.bloomberg.com/news/articles/2021-06-21/phasing-out-coal-will-require-germany-to-build-new-gas-plants.

Wacket, M. (2019). 'Germany to phase out coal by 2038 in move away from fossil fuels'. *Reuters*, https://www.reuters.com/article/us-germany-energy-coal-idUSKCN1PK04L.

World Nuclear News (2021). 'Help coal-dependent countries switch to nuclear, ministers tell EU'. *World Nuclear News*, https://www.world-nuclear-news.org/Articles/Help-coal-dependent-countries-switch-to-nuclear-mi.

Author bio

Mark Lynas is the author of several books on the environment, including High Tide, Six Degrees, The God Species, Nuclear 2.0 and Seeds of Science. His most recent publication, in June 2020, was 'Our Final Warning: Six Degrees of Climate Emergency'. This is an entirely new update of the original 2007 Six Degrees which won the prestigious Royal Society science books prize. The original Six Degrees was translated into 22 languages and was also adapted into a documentary broadcast on the National Geographic Channel. He also received the Breakthrough Paradigm Award in 2012. He advises former Maldives president Mohamed Nasheed on climate, and works with the 48-member Climate Vulnerable Forum in this capacity. Mark is currently a visiting fellow with the Cornell Alliance for Science at Cornell University, which engages in pro-science advocacy and research around the world on issues ranging from GMOs to vaccines to climate. He has written for numerous publications, including the New York Times, the Washington Post, the Wall Street Journal, the Guardian and CNN.com.

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