A Critical Disconnect: Relying on Nuclear Energy in Decarbonization Models While Excluding It from Climate Finance Taxonomies

By **Dr. Matt Bowen** and **Kat Guanio**

The European Union agreed in July 2022 to a notable inclusion in its list of what constitutes "environmentally sustainable" economic activities: nuclear power. The published list, which aims to help companies and investors make sustainable investment decisions,[1] recognized that the technology will play a part in the energy transition to a low-carbon economy in Europe. Shortly after the EU decision, Ontario Power Generation in Canada issued a green bond that included nuclear energy in its use of proceeds, and demand reportedly exceeded the deal size by almost six times.[2]

These recent decisions to include nuclear energy in financing taxonomies meant to assist in mitigating climate change are consistent with the technology's presence in the energy mix in most models of net-zero scenarios. For example, the International Energy Agency (IEA) included a near doubling of nuclear power capacity by mid-century in its updated roadmap for net zero emissions by 2050.[3] At the first-ever nuclear-themed pavilion at a United Nations Climate Change Conference, at the Sharm el-Sheikh Conference of Parties (COP27) in November 2022, IEA executive director Dr. Fatih Birol made the case that nuclear power was making a comeback.[4] At the same time, though, he lamented that the international financial community had so far failed to provide a level playing field for nuclear energy to help tackle global development and environmental challenges.

Despite nuclear energy's anticipated role in achieving decarbonization, the EU decision is a bit of an outlier: many climate finance taxonomies either explicitly exclude nuclear power or are ambiguous on whether it is included. The authors reviewed green and sustainable bond frameworks of the 30 global systemically important banks and, as they later highlight, found that none explicitly includes nuclear energy in their sustainable finance taxonomies. This commentary will touch on the role that nuclear energy typically plays in decarbonization modeling, explain what climate finance taxonomies are meant to do, and highlight the general disconnect between the two.

Nuclear Energy's Role in Achieving Deep Decarbonization

As noted by the United Nations at COP27,[5] the world is not headed toward a low-emission future, and appears more likely to be veering into a potential climate disaster. While the global Covid-19 pandemic temporarily dampened global greenhouse gas emissions in 2020, they increased in 2022.[6] At COP27, nations lamented the lack of progress in reducing emissions and also discussed ways to finance clean energy for developing countries in particular.[7]

In a 2021 study,[8] the IEA estimated that nuclear power's contribution to the world energy supply would need to double by mid-century to achieve deep decarbonization. As part of that deployment, the IEA estimated the nuclear sector would need an average investment of around $90 billion per year from 2021 to 2030, $94 billion per year from 2031 to 2040, and $80 billion per year from 2041 to 2050—amounts that are more than double the global average investment of $36 billion per year from 2016 to 2020.

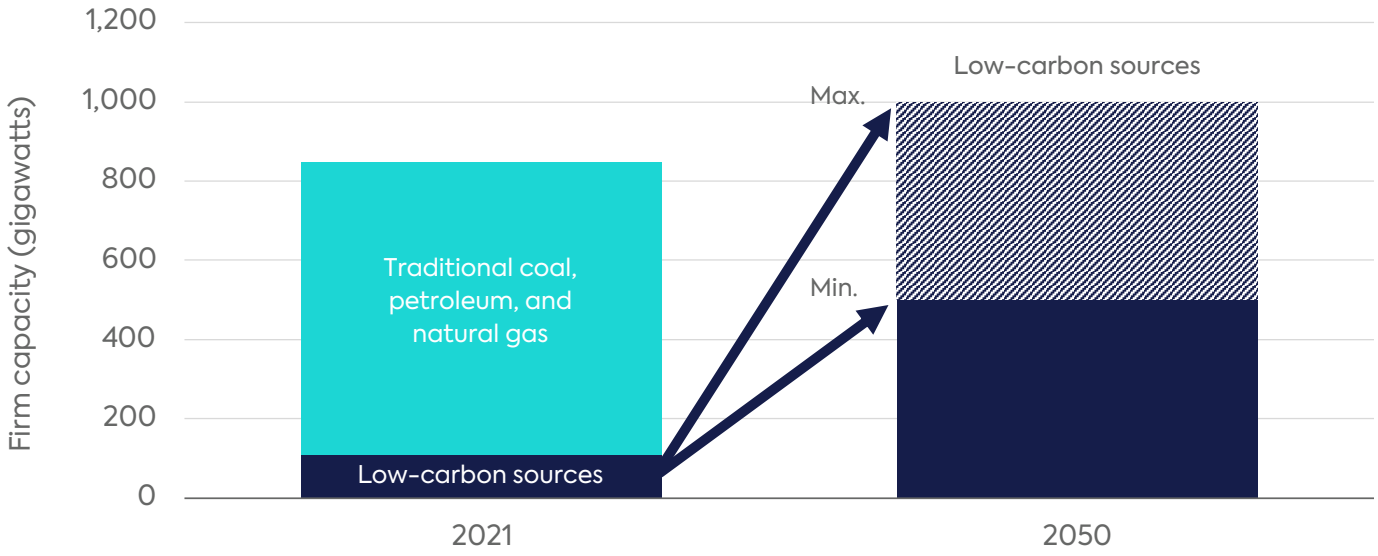
Nuclear power might grow as part of decarbonization efforts for various reasons. In particular, analysis has shown that the presence of "firm" low-carbon energy options—that is, technologies that can produce power upon customer demand at any time of year for as long as required, such as that from nuclear power plants—lowers the costs of transitioning to a reliable, low-carbon grid, in part by avoiding large overbuilds of storage and variable renewable energy sources. One study found that electricity costs were reduced by 10 to 62 percent across fully decarbonized cases when firm low-carbon options were available.[9]

Further, a recent Princeton study modeled total US electricity generation as more than doubling under all of the economy-wide decarbonization scenarios that were considered, given increased electrification of non-power sectors such as transportation.[10] In all of those scenarios, Princeton estimated that the US electrical grid would need between 500 and 1,000 gigawatts (GW) of low-carbon firm generating capacity. The US electrical grid has a comparable amount of firm power today—around 800 GW—but that power mostly comes from traditional fossil plants that are not

low-carbon. In the Princeton report, various combinations of different firm low-carbon energy sources—biomass, gas turbines using zero-carbon hydrogen, nuclear energy, and fossil energy plants equipped with carbon capture and sequestration—made up 500 to 1,000 GW of capacity in 2050. Princeton's estimated lowest overall cost scenario for the US reaching a decarbonized energy supply by mid-century involved a substantial nuclear build program, and the investment needed to support this level of nuclear deployment could total more than $1 trillion.[11]

In 2021, most US firm capacity was provided by traditional fossil fuel plants that emit greenhouse gases (see Figure 1). If the Princeton modeling is at least notionally correct, utilities would need to build hundreds of gigawatts of low-carbon firm power (or put in place retrofits at existing fossil energy sites) by 2050 to achieve decarbonization while maintaining affordable, reliable electricity supply. Nuclear energy is one candidate for that low-carbon firm capacity, and is the only one currently deployed at large scale—i.e., 93,000 megawatts (MW), compared with 15,000 MW for biomass and geothermal.

Figure 1: US firm capacity (2021) and estimated minimum and maximum low-carbon firm capacity needed for decarbonization in 2050



Note: In the Princeton study, hydro and storage are not considered "firm," and so are not included in either column. In 2050, combustion turbine and combined cycle gas turbine plants may run on a blend of hydrogen and methane, or in some cases be 100 percent powered by synthetic gas.

Source: US Energy Information Administration, "Electricity explained: Electricity generation, capacity, and sales in the United States," accessed June 22, 2023, https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacity-and-sales.php; for 2050 capacities, see: Eric Larson et al., "Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final Report Summary," Princeton University, October 29, 2021, https://netzeroamerica.princeton.edu/.

The US Congress recognized in the Inflation Reduction Act (IRA) of 2022 that a combination of low-carbon energy sources will be needed, and included in the law incentives such as a new technology-neutral investment tax credit that would apply to both new nuclear and new renewable energy projects. As a recent US Department of Energy (DOE) report noted, delays in deploying nuclear at scale could lead to missed decarbonization targets.[12]

The IRA followed the Infrastructure Investment and Jobs Act of 2021, which established a program to keep existing nuclear power plants in the United States running. In November 2022, the DOE conditionally awarded Diablo Canyon in California $1.1 billion to keep the power plant in operation.[13] Analyses consistently find that reaching zero emissions will be easier and happen earlier if existing nuclear plants stay on the grid longer.[14]

Nuclear Energy's Exclusion or Ambiguity in Climate Finance Taxonomies

Climate finance taxonomies are classification systems that identify activities considered to be within a climate-aligned or green economic category, usually when they are deemed to contribute to mitigation of or adaptation to climate-change-related impacts.[15] Taxonomies can guide investors and capital providers in identifying areas for investment and mobilizing capital toward sustainable activities—they are not meant to substitute fundamental credit analysis and risk management. Issuers of green or sustainable bonds may voluntarily choose to obtain a second party opinion (a commissioned review and assessment on its green or sustainable bond framework or issuance) to capture a broader range of investors who may require the external verification as an investment criterion.

As mentioned earlier, despite nuclear energy's potentially critical role in supporting deep decarbonization of the global economy, it is more commonly excluded from climate finance taxonomies, or the taxonomies are ambiguous on the issue. Thus, whether nuclear energy is considered green and sustainable or not varies widely across regions and institutions. For example, as shown in a review of the 30 global systemically important banks,[16] 57 percent have explicitly excluded nuclear energy from their respective green or sustainable financing frameworks' taxonomies, while 40 percent are silent on its inclusion or exclusion (see Table 1).

Table 1: Banks' green or sustainability bond framework positions on nuclear

	Explicit inclusion	Explicit exclusion	Silent (on inclusion and exclusion)	No green/ sustainable financing framework found
Banks		JP Morgan, Citi, HSBC, BNP Paribas, Bank of China, China Construction Bank, Deutsche Bank, Goldman Sachs, Industrial and Commercial Bank of China, Credit Suisse, Groupe BPCE, Mizuho FG, Santander, Société Général, Standard Chartered Bank, Sumitomo Mitsui FG, Wells Fargo	Bank of America, Barclays, Mitsubishi UFJ, Agricultural Bank of China, Crédit Agricole, ING Bank, Morgan Stanley, Royal Bank of Canada, State Street, Toronto-Dominion, UBS, UniCredit.	Bank of New York Mellon
Subtotals	0	17	12	1
Percent of total	0	57%	40%	3%
Total green and sustainable bond issuance	$0	$107 billion	$41 billion	$0

Note: Includes the 30 global systemically important banks (G-SIBs), as defined by the Financial Stability Board.
Source: The list of G-SIBs is from https://www.fsb.org/2021/11/2021-list-of-global-systemically-important-banks-g-sibs/. The 30 banks' green or sustainability bond framework positions on nuclear were derived from a review of the frameworks on the respective banks' websites, except in the case of Bank of New York Mellon, where a framework could not be found. The estimates of bond issuances are from: https://www.icmagroup.org/sustainable-finance/sustainable-bonds-database/ (as of May 28, 2023).

Even within a regional intergovernmental organization there may be a variation in views among sovereigns. For example, within the EU, France[17] and Germany[18] have excluded nuclear as a permissible use of proceeds from recent sovereign green bond issuances, despite nuclear's inclusion in the EU taxonomy.[19] In Asia, countries such as India[20] and Indonesia[21] have excluded nuclear, while China[22] and South Korea[23] have included it. South Korea updated its K-Taxonomy draft to include nuclear energy in September 2022,[24] while China included nuclear energy in its 2021 Industry Catalogue, which is a list of industries considered by its regulators as "green"; projects within these industries may be eligible to use proceeds from green bonds in China.[25]

The UK government's Green Financing Framework as of June 2021[26] explicitly excludes nuclear energy, citing recognition of exclusionary criteria for nuclear energy by many sustainable investors. Another notable set of capital providers that exclude nuclear energy are multilateral development banks, such as the World Bank.

The EU's taxonomy does stipulate conditions for labeling nuclear energy activities as "green," including requiring a new plant receive construction permit approval before 2045 and be located in a country with plans to dispose of radioactive waste by 2050, as well as associated funding provisions.[27] Life extension upgrades and modifications for existing nuclear power plants qualify only until 2040.[28]

Some utilities within countries that don't allow nuclear to qualify as green for their own sovereign bonds do allow it themselves, such as Électricité de France, which updated its green bond framework to include nuclear energy.[29]

Some financial sector groups have also expressed positions regarding nuclear energy. One example is the Principles for Responsible Investment (PRI), which has more than 5,300 investment management and asset owner signatories representing over $121 trillion in assets under management. PRI was critical[30] of the EU's inclusion of nuclear energy in its taxonomy, citing concerns related to safety, waste management, and proliferation.[31] A second example is the International Capital Market Association (ICMA), which defines the widely used Green Bond Principles. While ICMA caveats that it does not intend to fully prescribe a taxonomy, it provides a non-exhaustive ("includes but is not limited to") list of eligible green project categories that does not include nuclear energy.[32]

Taxonomy matters because sustainable investing assets under management were estimated to have reached $35 trillion at the end of 2021 and are expected to grow to $50 trillion by 2025.[33] Due to the tremendous growth and continued momentum projected for sustainable investment, nuclear energy would likely benefit from being able to access this pool of capital. A transaction involving Brookfield Renewable and Cameco jointly acquiring 100 percent of Westinghouse—a company that designs power reactors and provides nuclear equipment and services—for approximately $4.5 billion is a recent example of this. Brookfield Renewable executed the transaction through its energy-transition-focused fund, which is the largest of its kind in the world.[34] Apart from investments in new nuclear projects, capital will also be needed to keep the existing fleet of reactors in operation, including for safety equipment upgrades, new advanced nuclear fuels with greater safety margins, and replacing/refurbishing equipment as it ages.

(Of course, it's not just taxonomies that are keeping some money out of nuclear. During a recent Center on Global Energy Policy roundtable discussion on climate financing and nuclear energy, some individuals from the finance industry voiced the opinion that while the inclusion of nuclear

in climate taxonomies would be helpful in the long run for nuclear energy to contribute to decarbonization, other fundamental headwinds prevent more capital from flowing into nuclear, including the poor record of delivering projects on time and on budget and the lack of progress on spent nuclear fuel disposal.[35])

Bridging the Climate Model and Climate Finance Disconnect on Nuclear

The disconnect between modeled pathways for reaching deep decarbonization of the global energy system that include nuclear and the common exclusion of nuclear in climate finance taxonomies highlights a challenge to be addressed.

Groups that develop and publish climate taxonomies would likely find it useful to talk with utilities about the reliability metrics they are required to meet in providing electricity to their customers, how they go about meeting those metrics, and what it will take for carbon emissions to be eliminated from the power sector by mid-century while maintaining affordability and reliability. Utilities would be well positioned to explain in particular the role of firm low-carbon power in achieving those aims. Discussions with utilities and other experts from different regions of the United States and different parts of the world would also be useful, as some firm low-carbon options (including nuclear power) will have varying availabilities based on location.

Climate finance groups could also spend some time understanding the challenges to decarbonization outside of the power sector, where electricity from solar panels and wind turbines does not look as promising in replacing high-temperature heat currently made by burning fossil fuels as nuclear does.[36]

Additionally, environmental groups could consider prioritizing the elimination of energy sources with the most negative environmental and public health impacts first—like the traditional use of coal, oil, and gas, given their associated greenhouse gas intensities and air pollution. Even remaining neutral on nuclear power's inclusion in climate finance taxonomies could allay banks' and investment firms' concerns about being accused of "greenwashing" if they include nuclear power in their taxonomies.

At the end of the day, not many new reactors will be built if the nuclear industry cannot keep reactor construction reasonably close to planned schedules and costs and governments aren't making progress in the disposition of nuclear waste. But in the face of an existential threat, including nuclear power in climate taxonomies as a low-carbon, firm power source in a decarbonizing world would increase its access to a large pool of sustainable investment to help meet net zero emissions targets by mid-century.

Notes

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