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Green Bonds and Sustainable Finance
in the Electric Power Industry

WHITEPAPER

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Capital Turns Green

The Role of Sustainable Finance in U.S. Power Sector Transformation

The energy transition in the United States is increasingly defined not only by technological innovation but also by the development of financial tools that support low-carbon infrastructure. As the urgency to decarbonize the electric power sector grows, sustainable finance—particularly through green bonds and similar instruments—has become a key element in raising capital. These financing methods give utilities and energy developers access to significant funding linked directly to environmental results, and they are transforming how capital markets engage with climate policy priorities.

By the first half of 2025, global issuance of labeled sustainable debt instruments had fallen sharply compared to the previous year. Green bonds, which make up the largest category in this market, saw a year-over-year decrease of about 32 percent. Total labeled issuance—including green, social, sustainability-linked, and transition bonds—dropped to levels last seen in 2019. This trend was especially strong in the United States, where green bond issuance fell to USD 24.4 billion by May 2025, down from USD 43.3 billion during the same period in 2024.

This slowdown reflects a combination of political, regulatory, and market factors. ESG-related financial products have faced increased scrutiny under the current U.S. administration, with institutional resistance leading to lower demand for green-labeled instruments. Additionally, the declining financial premium traditionally linked to green bonds—the so-called greenium"—has reduced the financial incentive for issuers to take on the extra verification and reporting requirements associated with sustainable labels.

A notable behavioral response to these pressures has been the emergence of greenhushing." This term describes the practice where issuers finance environmentally beneficial projects without explicitly labeling the debt as green. Although the projects stay consistent with sustainable investment principles, the absence of public labeling reflects an effort to avoid political visibility. The trend shows a shift in how ESG commitments are communicated, implying a more cautious and internally managed approach to sustainability disclosures in debt markets.

Nevertheless, several U.S. utilities continue to show leadership by using sustainable finance methods to support clean energy investment. Duke Energy, for example, issued a USD 1 billion green bond through its Duke Energy Carolinas subsidiary in 2018 to fund solar and battery storage projects across North and South Carolina. This was followed in 2019 by a USD 600 million green bond from Duke Energy Progress, aimed at increasing solar capacity in the area. Both issues were structured according to the Green Bond Principles and included external review processes to ensure they met use-of-proceeds standards.

Beyond traditional bonds, the growth of hybrid capital structures further shows the sector's financial adaptation. In 2024, U.S. corporate hybrid bond issuance—especially among energy and utility companies—reached nearly USD 28 billion, almost doubling the previous year's volume. Hybrid bonds, often seen as part-equity by credit rating agencies, enable issuers to raise substantial capital without losing balance sheet flexibility. These instruments are increasingly used to support grid modernization, clean generation portfolios, and related infrastructure upgrades.

Investor preferences continue to influence the development and structure of sustainable finance options. Asset managers, pension funds, and insurers are increasingly tying their capital investments to verifiable environmental performance and adherence to established climate frameworks. Although the pricing advantages of green bonds may have decreased, the ability to access long-term, ESG-focused capital markets remains a primary incentive for utilities aiming to fund the energy transition.

At the same time, the regulatory and political environment in the U.S. has made sustainability labeling a more complex strategic choice. While issuing a green bond was once widely seen as a positive signal of climate commitment, it now involves reputational and legal risks in certain areas. As a result, some issuers prefer to structure debt using internal sustainability frameworks without publicly branding it as green.

Public-sector entities and municipal authorities are also increasingly exploring green debt issuance, especially for transmission expansion, system resilience, and distributed energy integration. Although these issuances remain limited in volume, they help establish legal and procedural norms for subnational participation in climate-related finance.

Sustainable finance has become essential to the changing landscape of electric utility funding in the United States. Despite recent drops in public issuance of green-labeled debt, the core integration of environmental criteria into financing strategies stays strong.

Innovations like hybrid bonds, internal sustainability frameworks, and shifting investor mandates continue to shape capital flows. As regulatory expectations and climate risk disclosure requirements develop, sustainable finance will remain a key method for driving power-sector transformation in financial markets.

Decoding the Instruments

Green Bonds, Transition Bonds, & Sustainability Linked Loans

The set of sustainable finance instruments available to issuers includes various types of bonds, each designed to achieve specific environmental goals while offering different risk profiles and reporting features. Green bonds are often the first step in project-level environmental finance, but sustainability-linked bonds, transition bonds, and hybrid instruments are becoming increasingly important for enabling utility-scale decarbonization.

Green bonds allocate proceeds solely to fund or refinance projects that provide environmental benefits. Common eligible uses include large-scale renewable energy generation, energy efficiency improvements, grid resilience, and climate adaptation infrastructure. Issuers typically follow the Green Bond Principles (GBP), which focus on four main parts: use of proceeds, project evaluation and selection process, proceeds management, and reporting. They also often hire external

reviewers to verify frameworks and disclose post-issuance information.

Sustainability-linked bonds (SLBs) have a different structure, tying financial terms—most often coupon adjustments—to the issuer's performance on specific sustainability Key Performance Indicators (KPIs). These include metrics like emissions reduction, renewable energy targets, or reliability improvements. The Sustainability-Linked Bond Principles (SLBP) offer binding guidance on selecting KPIs, setting Sustainability Performance Targets (SPTs), bond features, reporting, and external verification. Unlike green bonds, SLB proceeds are generally used for broad corporate purposes, with accountability based on performance outcomes rather than project eligibility.

Transition bonds are hybrid instruments aimed at entities undergoing decarbonization. Often issued by utilities with fossil asset portfolios, they combine features of use-of-proceeds bonds and performance-linked commitments. Proceeds fund transition-supporting projects, and performance metrics may be linked to emissions reductions or milestones in clean energy deployment. While transition bonds are still emerging in the U.S., European examples and ICMA's Climate Transition Finance Handbook provide frameworks aligned with the Paris Agreement.

Hybrid bonds, although not explicitly labeled as ESG, serve a financial role in sustainable investment strategies. These subordinated securities—often structured with equity-like features such as coupon deferral and extended maturities—are considered partially as equity by rating agencies. In the U.S. corporate market in 2024, hybrid bond volume in the energy and utilities sector approached USD 28 billion, partly due to credit rating methodologies that assigned 50% equity credit to qualifying instruments. Hybrids offer financial flexibility to fund grid modernization and renewable deployment simultaneously while maintaining favorable capital structure metrics.

Compared to green bonds, which are directly linked to projects with measurable environmental results, SLBs offer forward-looking accountability at the company level by integrating ESG performance into financial costs. Hybrid instruments support broader financing goals but are less directly linked to environmental impact. Transition bonds serve as a middle ground—connecting financing and performance through transition-focused capital while allowing flexibility in how proceeds are used and how performance is aligned.

Global issuance trends show SLBs grew rapidly from about USD 9 billion in 2019 to over USD 100 billion by 2021, but declined sharply during 2023 and 2024, decreasing by more than 50% worldwide. Analysts partly blame this on modest penalty provisions in bond structures and less ambitious target-setting, which erodes investor confidence in the enforceability of environmental commitments. Green bond issuance also shrank in early 2025: global green bond volume fell by roughly 32%, and labeled issuance—including SLBs and transition bonds—dropped to around USD 440 billion, the lowest since 2019.

Investor scrutiny continues to shape instrument selection. Investors are increasingly demanding clear KPIs, external verification, and alignment with established principles like those upheld by ICMA and second-party opinion providers. As price differences shrink—shown by a decreasing greenium"—issuers pay more attention to reputational signaling, stakeholder alignment, and long-term investor access rather than just yield advantage.

Within the U.S. electric power sector, green bonds have become the primary tool for financing

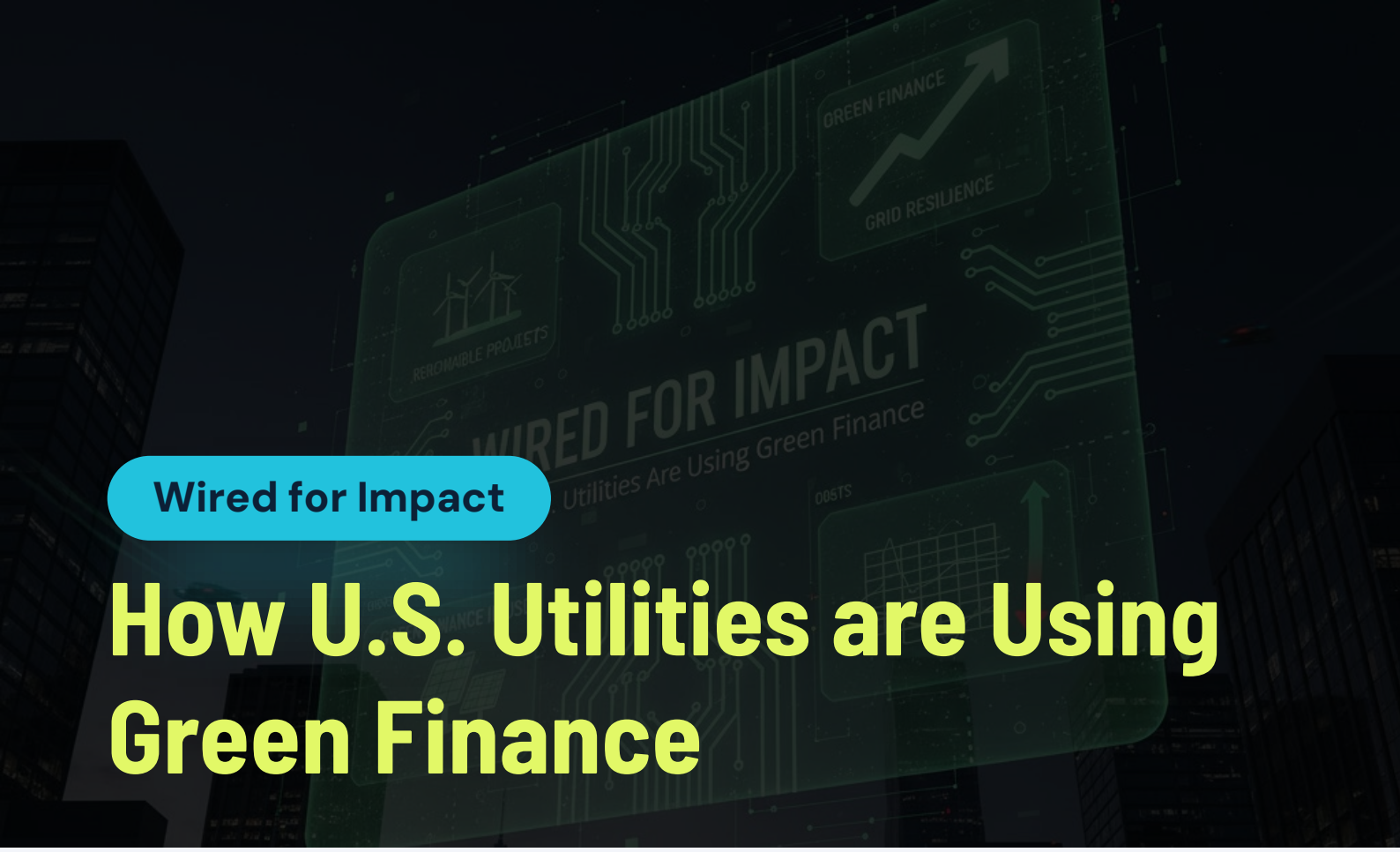
asset-level investments like utility-scale solar projects, grid hardening, and energy storage. SLBs have seen limited issuance among utilities, often because of conservative coupon step-up provisions and investor hesitations about KPI ambition. Transition bonds remain infrequent, although several utilities in mature, carbon-intensive markets are considering frameworks aligned with ICMA's climate transition guidance. Hybrid issuance has increased as a structural complement, allowing both labeled and unlabeled financing with minimal impact on ratings.

Regulatory and sector-specific frameworks bolster these instruments' credibility. The GBP and SLBP are widely used benchmarks for proceeds and performance-linked structures, respectively. The ICMA Climate Transition Finance Handbook guides transition bond frameworks, while credit rating methodologies influence the attractiveness of hybrid bonds. For U.S. issuers, following voluntary principles and obtaining external verification are essential for signaling ESG integrity amid political and regulatory uncertainties surrounding ESG labels like green."

In conclusion, each type of instrument offers financial and strategic value: green bonds provide transparency and a clear link to environmental goals; SLBs encourage performance improvements; transition bonds connect legacy operations with decarbonization efforts; and hybrid securities offer capital flexibility. A mature sustainable finance strategy for utilities may combine these instruments, leveraging each one's strengths to align the capital structure with climate mitigation and operational resilience, while also managing investor expectations and regulatory risks.

Sustainable finance tools—green, sustainability-linked, transition, and hybrid bonds—offer different ways to fund decarbonization through project funding, performance targets, or flexible capital.

Issuance has declined due to weak targets and investor concerns, making clear KPIs and verification more important for credibility.



Wired for Impact

How U.S. Utilities are Using Green Finance

U.S. utilities are increasingly integrating sustainability into their financial structures. Green-labeled instruments are no longer isolated one-time transactions; they are now part of lasting financing frameworks regulated through formal internal procedures and external reporting standards. These instruments are becoming key components of capital strategies for renewable energy projects, grid resilience, and broader infrastructure upgrades.

One of the earliest and most notable examples is Duke Energy. In November 2018, Duke Energy Carolinas issued a USD 1 billion green bond to fund solar and energy storage projects in the Carolinas. The issuance included multiple maturity tranches, with a weighted average coupon of around 3.74 percent, and it was structured under the company's Sustainable Financing Framework. Proceeds were dedicated solely to qualified environmental investments, overseen by a Sustainable Financing Committee and reported annually with validation from independent reviewers.

Duke Energy Progress issued a $600 million green bond in early 2019 to expand solar capacity. This ten-year note had an approximate coupon rate of 3.45 percent. Both issuances set important benchmarks in scale, governance, and transparency for labeled debt in the U.S. utility sector. Duke's Sustainable Financing Framework defines eligible project categories—such as renewables, energy storage, grid modernization, and climate adaptation—and establishes procedures for project selection, proceeds allocation, and external review.

Beyond Duke, wider adoption becomes clear. In March 2024, Constellation Energy issued the first corporate green bond in the United States that qualified for financing nuclear power assets. The USD 900 million bond had a 30-year term and was structured under Constellation's Green Financing Framework. Proceeds were allocated for investments in clean generation, including nuclear uprates and life extensions of existing nuclear plants, and were certified by independent agencies for compliance with international standards.

The growth of green-labeled financing extends to grid-focused and resilience projects. Utilities more frequently use green bond proceeds to fund smart infrastructure upgrades, vegetation management, storm hardening, and transmission capacity expansion. These capital projects address both climate adaptation and system reliability, meeting regulatory requirements in states with advanced resilience standards.

Complementing labeled instruments, utilities have adopted hybrid bonds to address liquidity and capital structure needs while advancing environmental investments. In 2024, U.S. utility hybrid bond issuance exceeded USD 28 billion, driven by updated rating agency policies that allow qualifying hybrids to receive equity credit. These subordinated bonds generally feature longer maturities, optional coupon deferral, and higher yields—while offering partial equity treatment that maintains debt capacity and supports long-term decarbonization financing.

Capital markets are responding by favoring issuers that demonstrate strong governance, credible quantitative frameworks, and ongoing transparency. Green bonds attract ESG-conscious investors and institutional capital looking for clarity on impact allocation, while hybrid instruments offer structural flexibility. Together, these financing options enable utilities to diversify funding sources and stay aligned with climate goals while managing their credit profiles.

Meanwhile, internal practices have advanced to formalize sustainable finance among issuers. Duke Energy's framework defines eligible green and social project categories. A dedicated committee oversees selection, fund allocation, and compliance. Annual reports with external verification ensure ongoing accountability. These mechanisms support repeated issuance, boost investor confidence, and establish environmental finance as a core part of corporate governance.

Public branding of green debt still faces political scrutiny. Some utilities prefer to finance clean infrastructure using internal ESG frameworks instead of issuing publicly labeled green bonds. This approach shows their commitment to environmental goals while avoiding politicized debates over ESG branding.

The combined impact of these trends shows that sustainable finance in the U.S. power sector has advanced. Companies like Duke Energy and Constellation exemplify how institutional frameworks, green bond issuance, hybrid instruments, and internal governance come together to direct capital flows toward climate-aligned investments. As disclosure standards develop and investor demands grow stronger, utilities using complex financing strategies will be better equipped to fulfill both climate commitments and credit requirements.

Investor Influence

ESG Expectations and the New Rules of Engagement

Investor behavior and regulatory mandates are transforming how U.S. utilities handle capital structuring, climate disclosure, and ESG strategies. Institutional investors—including pension funds, insurers, asset managers, and sovereign wealth funds—are increasingly demanding transparent, decision-useful information about climate-related financial risks and sustainability performance. These expectations are rooted in frameworks like the Task Force on Climate-related Financial Disclosures (TCFD) and recent Securities and Exchange Commission (SEC) rules, which strengthen the call for climate-aligned capital strategies.

The TCFD framework, established by the Financial Stability Board, outlines four pillars: governance, strategy, risk management, and metrics & targets. It was created to help investors and public companies understand and disclose climate-related financial risks and opportunities consistently. In recent years, support for TCFD adoption has increased: nearly 5,000 organizations across over 100 jurisdictions have endorsed the recommendations, indicating widespread investor demand for climate disclosure aligned with financial governance. The TCFD status reports, including the 2023 edition, show significant progress in forward-looking disclosures among large issuers, although there are still gaps in scenario analysis and quantitative risk assessment.

In March 2024, the SEC adopted standardized climate-related disclosure rules. These final rules require registrants to disclose material information about greenhouse gas emissions (Scope 1 and 2), climate risk governance, risk management processes, and scenario planning where climate events are likely to impact business strategy or financial condition. Companies are required to provide assurance over emissions data and incorporate climate risk into financial statements. The reporting requirements are phased in based on company size, with full compliance expected starting in fiscal year 2026 for large accelerated filers. Although the SEC later voted in March 2025 to cease defending these rules pending legal challenges, the frameworks continue to influence investor decisions, and many companies voluntarily disclose information to meet stakeholder expectations.

These developments align with the growth of ESG investing. Asset managers increasingly assess utility issuers based on climate risk disclosures, decarbonization paths, and governance frameworks. Investors include TCFD-aligned disclosures and emissions data in credit evaluation, portfolio management, and engagement discussions. The trustworthiness, comparability, and consistency of ESG reporting are becoming essential for securing capital from sustainability-focused funds and insurers.

U.S. utilities are responding by adopting TCFD-aligned frameworks into investor communications and sustainable finance strategies. Many now publish climate risk disclosures that follow the four TCFD pillars, including descriptions of board oversight, climate scenario planning, emissions strategies, and adaptation measures. These disclosures often support green bond frameworks and

sustainability-linked instruments, adding credibility for investors seeking clear environmental outcomes and governance transparency.

The evolving SEC regulation has strengthened the expectation that utilities disclose their climate-related financial risks in an organized way. Investors now assess companies not only based on their emissions footprint but also on how climate events—such as severe weather or regulatory changes—could affect operations, capital requirements, and stranded asset risks. Focus is placed on board-level oversight, physical and transition risk evaluation, and scenario analysis aligned with Paris goals. These elements have become essential to investor due diligence and impact assessment.

Investor engagement also focuses on performance-linked instruments. In sustainability-linked bonds, capital providers seek clear, ambitious targets aligned with broader climate objectives and enforceable through coupon adjustment mechanisms. Investors examine KPI selection, target calibration, verification, and the enforceability of penalties. Weak or symbolic metrics may disqualify both utilities and frameworks from ESG-focused funds. Similarly, transition bonds and hybrid structures are assessed for credibility through alignment with climate transition roadmaps, asset-level impact, and governance standards.

ESG-aligned investors are also advocating for governance reforms in utilities. Some investors are now submitting shareholder resolutions calling for improved climate governance, increased board diversity, or commitments to net-zero emissions. This involvement encourages utilities to establish formal sustainability committees, link executive pay to climate performance, and incorporate ESG risks into board oversight.

A global trend toward standardized ESG reporting shapes investor expectations. The TCFD recommendations have been incorporated into the International Sustainability Standards Board (ISSB) framework, offering a universally accepted structure. Many institutional investors anticipate utilities to include SASB/ISSB-aligned disclosures in their annual reports and SEC filings, promoting comparability across sectors and regions.

Investor influence is further shaped by changing policy environments. Even with the SEC's regulatory uncertainty, several U.S. states have enacted their own climate disclosure laws requiring large companies to report emissions and climate risks. These state-level rules increase investor demand for consistency across reporting systems, reinforcing expectations for transparent, actionable sustainability disclosures—especially for power-sector issuers facing physical and transition risks.

Overall, investor influence on U.S. utility financing strategies is growing. Capital providers now expect clear climate risk management, credible performance-linked tools, and strong governance structures. These expectations impact decisions on issuing debt—whether to designate it as green, the choice of instrument, and how to develop governance frameworks that withstand scrutiny. Utilities that adapt their capital strategies to meet investor demands—and adopt disclosure frameworks like TCFD and ISSB—are more likely to access broader, sustainability-focused capital, preserve investor trust, and better handle regulatory uncertainty with stronger financial and reputational stability.

Money Talks

Pricing, Yield, and the Financial Case for Sustainable Bonds

The financial basis for sustainable bonds largely depends on yield trends, market segmentation, and investor interest. Essentially, the main issue is whether green bonds or similar instruments provide a borrowing cost benefit—known as the greenium"—and if investors are willing to accept lower yields in return for confirmed environmental benefits.

Academic and policy-oriented research shows that green bonds issued in U.S. markets, especially municipal offerings, often have small yield discounts compared to nongreen equivalents. Evidence from U.S. municipal markets indicates that green bonds were priced about six basis points lower than comparable ordinary bonds when issued between 2010 and 2016. These results are strongest for bonds with external certification and repeated issuance from the same issuers. Smaller, nearly risk-free issuers experienced even larger premiums, driven by investor demand for ESG-aligned securities based on non-pecuniary preferences.

Global evidence further supports a modest greenium among investment-grade issuers. A working paper from the U.S. Federal Reserve in 2019 found that, on average, dollar- and euro-denominated green corporate bonds offered a primary market yield spread about eight basis points lower than comparable conventional bonds. This advantage appeared around 2019 and was most significant when issuance demand exceeded supply or when bonds were included in recognized sustainable bond indexes.

Secondary-market studies confirm that this greenium persists among well-rated, externally reviewed claims, although it has gradually diminished as supply scales and market maturity increase. Research finds that while initial green issuance may have attracted scarcity premiums, these have moderated over time, especially within developed markets where green bond issuance is no longer new.

The investor base is crucial. Sustainable and ESG-aligned portfolios—including pension funds, asset managers, and insurers—invest in labeled bonds to achieve environmental impact and maintain reputational alignment. When bond features include thorough external reviews, clear impact reporting, and adherence to recognized standards, investor interest grows, raising the risk of oversubscription and giving issuers a pricing advantage.

In the realm of U.S. utilities, green bond yield benefits usually go to investment-grade issuers with a history of repeated issuance. For example, Duke Energy—under its Sustainable Financing Framework—has issued green bonds multiple times and maintained high standards for external review and project eligibility, which likely attracted institutional ESG demand and contributed to pricing advantages.

However, as sustainable debt markets develop and investor demand becomes more evenly spread across sectors, the size of the greenium is expected to keep shrinking. Larger and repeat issuers may still gain some borrowing advantages, but new entrants or issuers in less liquid segments might see little financial benefit at issuance.

Given the minor yield advantage, the choice to issue green bonds often depends on factors beyond just immediate cost savings. Reputation signals, access to long-term ESG capital, alignment with internal governance, and compliance with regulatory expectations all hold considerable value—especially for utilities facing climate disclosure requirements and stakeholder pressure.

Ultimately, issuing sustainable bonds is just one part of a broader financing toolkit. Instead of relying only on yield benefits, utilities often use green bonds to build credibility and access climate-aligned liquidity, while employing hybrid and sustainability-linked instruments to improve their overall capital structure. Operationally, using both labeled bonds for project-specific funding and performance-linked instruments for enterprise accountability can deliver reputational and financial gains, even if the immediate yield benefits are modest.

> Sustainable bonds sometimes offer issuers a small cost advantage (a "greenium") because ESG-minded investors accept slightly lower yields. This benefit—typically 6-8 basis points—appears mainly for certified, investment-grade, or repeat issuers but is shrinking as the market grows. Today, companies issue green bonds less for savings and more for reputation, regulatory alignment, and access to long-term ESG capital.

Case Studies in Action

Real World Applications of Green Finance by U.S. Power Players

- **Duke Energy Carolinas**
  Implementation of a Green Bond Program

- **Constellation Energy**
  Green Bond Financing for Nuclear Generation Assets

CASE STUDY # 1

Duke Energy Carolinas

Implementation of a Green Bond Program

Duke Energy Carolinas, a utility serving nearly 3 million customers across North and South Carolina, issued USD 1 billion in green bonds in November 2018. Structured into a USD 300 million three-year tranche and a USD 700 million ten-year tranche, the blended coupon was approximately 3.74 percent. Proceeds funded solar photovoltaic installations with a total capacity of 600 MW and battery storage projects totaling 200 MW—representing roughly 1.1 gigawatts of clean energy infrastructure.

The issuance was guided by an internal Sustainable Financing Framework that outlined strict project eligibility standards, oversight by a Sustainable Financing Committee, tracking of allocations through dedicated accounts, and annual third-party verification of reported outcomes. These governance components aligned with internationally recognized green finance standards and offered structured oversight for measuring impact.

A follow-up green bond issued in March 2019 by Duke Energy Progress raised USD 600 million, with a ten-year maturity and a coupon in the mid-3 percent range. This issuance included minority-owned financial institutions among underwriters and funded an additional 350 MW of solar capacity. Both bonds secured significant estimated oversubscription—approximately 2.5 times the book size—demonstrating investor confidence in Duke's framework and ESG criteria.

Operational impact included installing about 950 MW of solar capacity paired with 160 MW of energy storage, resulting in an estimated annual reduction of 1.2 million metric tons of CO_2 emissions. Independent reviewers verified impact metrics covering avoided emissions, renewable energy generation, and allocation timelines. Annual impact reports provided detailed data, including total funds spent versus budget, project performance metrics, and alignment with state decarbonization mandates.

Market pricing signals indicated modest yield improvements—generally 5–8 basis points tighter compared to conventional corporate bonds of similar credit quality and maturity. Investor demand favored institutional ESG funds, pension plans, and specialized climate asset managers. Repeated issuance using the same framework lowered structuring costs and improved procedural efficiency, allowing Duke finance teams to quickly file documentation and increase issuance with minimal extra internal effort.

The framework became institutionalized as a recurring protocol: the Financing Committee met quarterly to review eligible projects, monitor allocation performance, and commission annual assurance audits. Internal templates and governance checklists were standardized across debt issuance teams. The result: capital markets began to anticipate subsequent green bond announcements with thorough due diligence. For regional regulators and stakeholders, the issuance demonstrated Duke's ability to integrate sustainable finance into corporate capital planning with documented transparency and consistent environmental impact alignment.

CASE STUDY # 2

Constellation Energy

Green Bond Financing for Nuclear Generation Assets

Constellation Energy, a major nuclear power producer with over 33 gigawatts of capacity across the country, issued a USD 900 million green bond in March 2024. This significant issuance, with a 30-year maturity, specifically directed funds toward nuclear plant upgrades, extending operational lifespans, resilience projects, and early investments in hydrogen-compatible infrastructure.

The bond was arranged under a dedicated Green Financing Framework that identified nuclear and related infrastructure as eligible project categories. It included provisions for allocation monitoring through a project registry, transparent reporting of each investment's expected annual energy output, and estimates of avoided CO_2 emissions compared to traditional thermal generation. A second-party opinion verified alignment with the Green Bond Principles and Green Loan Principles, highlighting strong governance and verification.

Proceeds funded resilience improvements and uprate projects at three existing nuclear facilities, extending each unit's operational life by an estimated total of 25 years. The projected annual increase in generation capacity was approximately 5 TWh, leading to estimated CO_2 reductions of 2 million metric tons annually. The 30-year term aligned financial obligations with asset lifecycles, reducing refinancing risk compared to shorter bonds.

Investor interest was high, with estimated oversubscriptions exceeding three times the book size. Institutional investors—particularly infrastructure-focused funds and ESG-aligned portfolios—comprised the majority of the investor base. Pricing resulted in a mid-2 percent coupon, reflecting strong credit metrics and investor confidence in including nuclear assets within a clear governance framework.

Annual reporting—including operational performance data such as increased nuclear output, uptime improvements, and annual emissions avoided—was verified independently and disclosed publicly. Allocation categories were published with detailed granularity, tracking capital flows to designated nuclear resilience and uprate projects. Governance protocols mandated periodic reviews of project eligibility and reporting practices by an internal oversight director, ensuring compliance with framework standards and market expectations.

This financing established a documented precedent for labeled instruments supporting firm clean generation assets. It provided structural and procedural guidance for utilities considering similar financing for hydrogen-ready infrastructure, carbon capture, or geothermal projects. The framework served as a reference for investment committees and rating agencies evaluating labeled debt tied to long-term, baseload technologies. For regulators and financial stakeholders, the bond offered documented assurance that nuclear investments could be credibly financed under sustainability criteria when supported by comprehensive governance and transparency.

Policy & Regulation

Emerging Rules and Incentives Shaping Sustainable Finance in the U.S. Power Sector

Recent developments in U.S. policy and regulation have increasingly shaped the landscape for sustainable finance in the electric power sector. Disclosure mandates, tax incentives, market rules, and long-term transmission planning have begun to exert significant influence on how utilities structure capital strategies and access ESG-linked financial instruments.

A key regulatory milestone occurred in March 2024 when the U.S. Securities and Exchange Commission implemented its first climate-related disclosure rule. The regulation mandates public companies to provide comprehensive reports on material climate-related risks, including board governance, risk management procedures, and Scope 1 and Scope 2 greenhouse gas emissions. It also requires the disclosure of transition plans and climate-related financial metrics in annual reports and registration statements. Although initially planned to be phased in gradually over several years, the rule faced legal challenges, and in early 2025, the SEC announced it would no longer defend the rule in court. This withdrawal has introduced some uncertainty regarding long-term enforcement, although many companies had already begun voluntary compliance with international standards.

At the state level, policies have adopted a more assertive approach. California has passed several laws requiring mandatory climate risk and emissions disclosures for large businesses operating within the state. Senate Bill 253 requires companies with annual revenues over $1 billion to report Scope 1, 2, and eventually Scope three emissions. Senate Bill 261 mandates disclosure of climate-related financial risks in line with the Task Force on Climate-related Financial Disclosures (TCFD) recommendations. These policies are expected to shape market behavior across various industries, including investor expectations for utility issuers seeking green or sustainability-linked capital.

Federal spending legislation has continued to shape investment conditions. The Inflation Reduction Act of 2022 allocated over $825 billion to climate and energy programs, making it the most extensive climate-related funding package in U.S. history. It includes long-term extensions of investment and production tax credits, support for stand-alone energy storage, clean hydrogen incentives, and financial support for existing nuclear plants. At the same time, the Infrastructure Investment and Jobs Act allocated about $10.5 billion to modernize the grid, with additional investments aimed at transmission line upgrades, resilience measures, and clean energy deployment.

The Federal Energy Regulatory Commission (FERC) policy has also started to influence investment priorities. Order 1920, finalized in May 2024, mandates regional transmission organizations and independent system operators to create 20-year transmission planning roadmaps. These requirements aim to guide system-level investments in bulk transmission to support increasing renewable energy integration. Implementation is expected to direct tens of billions of dollars toward long-term infrastructure investments in grid regions like MISO, PJM, and SPP. These

infrastructure needs are likely to boost demand for labeled bonds and sustainability-linked financial products as utilities seek funding for long-term projects aligned with these mandated plans.

Alongside federal efforts, nearly every U.S. state and territory has enacted or proposed some form of grid modernization initiative. These policies include performance-based rate regulation, integration of distributed energy resources, utility data access standards, and electric vehicle infrastructure planning. Many of these initiatives aim to attract private-sector investment in grid and clean energy projects, primarily through the issuance of green bonds or sustainability-linked loans. By early 2025, 47 states, Washington D.C., and Puerto Rico had active proceedings related to smart grid investment, non-wires alternatives, and interconnection reforms.

Despite policy momentum, some rollbacks have added complexity. In June 2025, the SEC paused several pending ESG fund disclosure reforms, including proposed guidelines for fund naming conventions and shareholder proposal thresholds. These measures were initially designed to reduce greenwashing and enhance ESG fund transparency. Their withdrawal indicates a possible shift in enforcement priorities, which could slow the harmonization of ESG metrics across capital markets. Nonetheless, many institutional investors still push for voluntary adherence to global disclosure frameworks like the Sustainability Accounting Standards Board (SASB) and the International Sustainability Standards Board (ISSB).

Credit rating agencies have observed that the regulatory environment—while evolving—is fueling consistent growth in ESG-linked debt issuance. Recent forecasts suggest that global issuance of green, social, and sustainability-linked bonds will surpass USD 1 trillion by 2025. U.S. utilities are well-positioned to gain a larger share of this market as public financing incentives and infrastructure mandates align with private-sector interest in climate-related assets.

Ultimately, the U.S. regulatory environment combines market-based expectations with legal mandates to shape sustainable finance. Requirements for disclosure, access to tax-advantaged financing, and alignment with grid modernization strategies encourage utilities to include ESG considerations in financial planning. Although political dynamics may influence the speed and consistency of implementation, the overall trend points toward greater integration of climate criteria into utility capital markets.

The Road Ahead

Future Trends in Renewable Energy & Climate Finance

As U.S. utilities deepen their involvement in sustainable finance, a new wave of innovations is expected to transform how capital is organized, distributed, and verified. Over the next five years, climate finance is likely to become more complex, data-driven, and technologically advanced.

One prominent trend is the increasing role of transition finance. Utilities that still depend on natural gas or nuclear energy are starting to issue transition-labeled debt to fund decarbonization projects that are not covered by traditional green bond categories. These instruments may support hydrogen-ready upgrades, carbon capture methods, or methane reduction programs. Creating credible emissions pathways will be crucial to preserving investor trust, especially in markets where verification systems are still developing.

Meanwhile, blockchain technology and tokenized instruments are emerging as tools to improve transparency in ESG reporting. Tokenized green bonds can provide real-time tracking of capital flows, unchangeable environmental impact records, and programmable features like smart contracts that automatically modify interest payments based on sustainability performance. Several central banks and financial institutions have trialed blockchain-based green bond platforms, highlighting benefits such as faster transactions and automatic verification.

Climate scenario reporting is set to become a standard part of utility risk disclosure. Power companies are starting to incorporate scenario-based projections into financial planning, examining how 1.5 °C or 2 °C pathways could impact asset values, regulatory risks, and access to capital. These reports are not just compliance documents; they are increasingly used to inform board decisions and shape investor expectations regarding resilience, transition readiness, and long-term, risk-adjusted returns.

Artificial intelligence is likely to become a key element in ESG analytics. Machine learning tools can model how distributed energy assets perform under extreme weather, evaluate physical climate risks, and predict regulatory effects on revenue streams. AI is also used to identify inconsistencies in ESG disclosures, classify project eligibility for labeled finance, and simulate emissions-reduction paths across asset portfolios.

Finally, hybrid financial structures like sustainability-linked securitizations are gaining popularity. Utilities might bundle renewable assets—such as distributed solar, community storage, or microgrids—into asset-backed securities with payment schemes connected to verified emissions data or operational KPIs. These instruments are especially relevant for mid-sized issuers looking for scale and standardization in climate-focused financing.

Throughout these developments, U.S. utilities will need to develop technical skills, incorporate flexible risk frameworks, and implement transparent governance systems to align capital markets with energy transition goals. Regulators are expected to adjust disclosure standards and eligibility criteria in response to these changing instruments. Investors, in turn, will need to update their due diligence practices to account for digitized, automated, and performance-based structures.

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