ENERGY INDUSTRY GROUP

A New Deal for Clean Firm Power

A PPA Framework for AI-Era Energy Infrastructure

The U.S. power system is under pressure. Surging electricity demand, driven by AI, industrial growth and electrification, is overwhelming planning timelines and clean energy deployment. States face a painful tradeoff: build new gas capacity now or risk missed investment and reliability failures. But defaulting to long-lived fossil plants could strand assets and put decarbonization targets out of reach for decades to come.

The Clean Bridge power purchase agreement (PPA) offers a third path: a flexible contracting framework that allows fast deployment of firm power today, while embedding a governed transition to zero-carbon operation tomorrow. This article builds directly on Alvarez & Marsal's *Power to Compete* framework, which laid out the risk of economic stagnation and climate backsliding absent new public-private mechanisms.[1] Developed by A&M, the Clean Bridge PPA model aligns investor returns with public climate goals, making it a pragmatic tool for navigating the era of AI-powered load growth.

The Power Crossroads: Meeting Demand While Honoring Climate Commitments

In states like Virginia, Georgia and Arizona, data center and industrial expansion plans are placing enormous strain on the grid. Dominion Energy, for instance, reported in late 2024 that contracted data center load in northern Virginia had surged past 40 gigawatts, more than doubling in less than two years. In Arizona, new semiconductor fabs are requesting hundreds of megawatts each, with tight timelines and 24/7 reliability requirements. These aren't edge cases; they are early signals of a structural shift. The pace of this shift isn't fully certain — debates continue about the ultimate magnitude of energy new data centers will require, for example — but the direction of travel is clear.

This transformation presents both a generational opportunity and a looming crisis. The states that can deliver reliable, competitively priced and clean electricity will win the race for next-generation economic development. But many are caught in a bind: They've set ambitious decarbonization targets, yet lack firm, scalable, clean capacity options that can be deployed quickly. In the absence of new approaches, they risk falling back on uncoordinated or carbon-intensive stopgap measures — or worse, watching critical investments move elsewhere.

A&M's pragmatic Clean Bridge PPA model aligns investor returns with public climate goals, while meeting the dual challenges of explosive AI-driven load growth and accelerating climate impacts.

The market is already reacting. Consider four recent announcements:

- Meta is investing $10 billion in a data center in Louisiana, with Entergy planning to initially meet expected demand with natural gas and ultimately add 1,500 MW of new renewables and explore advanced nuclear options to achieve a virtual zero-carbon outcome.[2]
- The Homer City site in Pennsylvania is being redeveloped into a $10 billion natural gas–powered AI data center campus, expected to deliver up to 4.5 GW of new capacity, the largest gas buildout in the U.S. in decades.[3]
- Google, in partnership with Intersect Power and TPG Rise Climate, will invest $20 billion in co-located data centers and a portfolio of renewables, storage and gas engines in West Texas.[4]
- Microsoft has signed a 20-year deal to support the $1.6 billion restart of the Three Mile Island Unit 1 nuclear reactor, closed since 2019, to secure carbon-free baseload power for its data operations.[5]

These disparate approaches underscore a broader reality: Meeting the dual challenges of explosive load growth and accelerating climate impacts will require more creative and innovative state involvement in energy infrastructure development. States can no longer rely solely on market forces or federal policy to align investment with climate goals. They must become active participants in structuring the transition. The Clean Bridge PPA represents one such innovation: a state-enabled mechanism that harnesses private capital and market efficiency while ensuring public climate commitments are met.

The Clean Bridge Framework: A Practical Bargain for the Energy Transition

At its heart, the Clean Bridge PPA represents a fundamentally new bargain between investors, energy users and climate goals. Rather than forcing an impossible choice between reliable power today and decarbonization tomorrow, it creates a governed pathway that delivers both.

The Core Exchange: Returns for Decision Rights

The Clean Bridge PPA begins with a straightforward trade-off that rebalances the traditional power development model. Investors receive financial certainty through contractual return guarantees, typically a 6–8 percent IRR over the project life, in exchange for relinquishing control over the facility's future once financial targets are met.

This simple but powerful realignment is the foundation of the entire framework. Instead of developers maintaining perpetual control over assets, potentially operating fossil plants for decades regardless of climate impacts, the Clean Bridge model sets clear conditions for transition from the outset.

How the Clean Bridge PPA Unfolds: A Practical Timeline

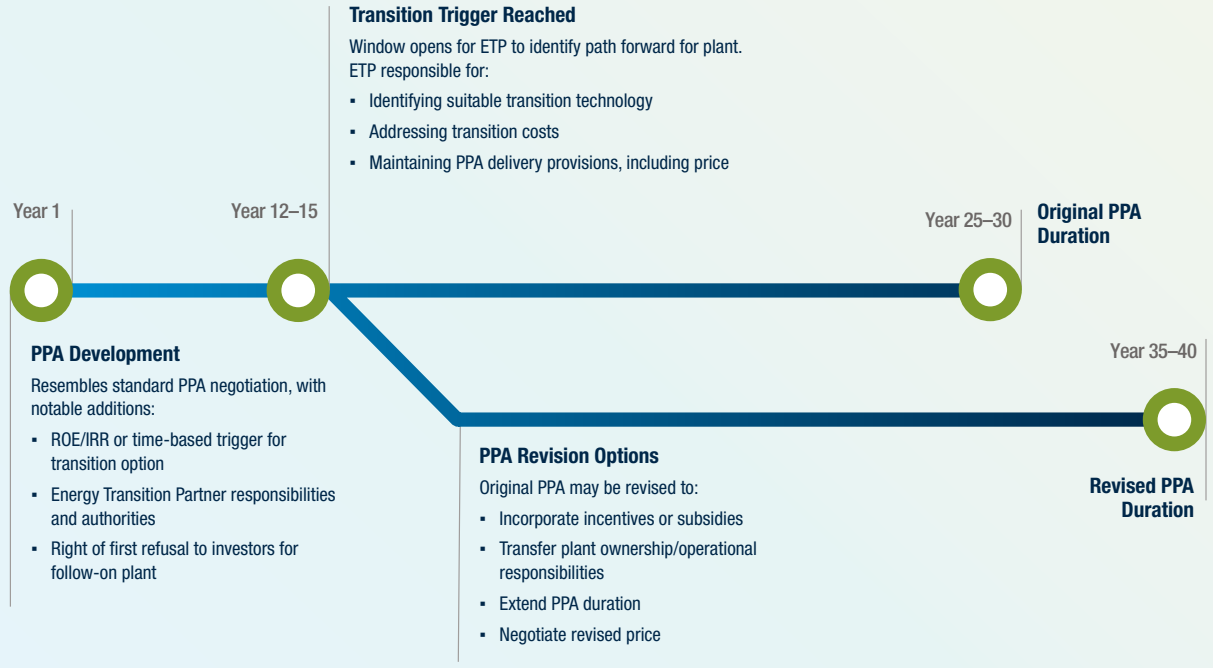
The Clean Bridge PPA essentially creates a call option — the option to buy an asset under specified conditions — for an Energy Transition Partner (ETP). The lifecycle of a Clean Bridge project would follow a predictable path:

1. **Initial development and financing:** A natural gas plant (or other dispatchable generation) is built to meet immediate grid needs. The project secures financing based on the contractual certainty of the Clean Bridge PPA, which includes specific provisions for minimum returns and transition governance.
2. **Operational period:** During regular operation, the facility provides dispatchable energy and reliable capacity while generating returns for investors. The plant operates normally, meeting grid needs while tracking financial performance against the agreed-upon return thresholds.
3. **Trigger activation:** After financial return thresholds are met, decision rights transfer to an ETP. This entity, which may be a state agency, public-private partnership or even the off-taker, now controls the facility's decarbonization pathway.
4. **Transition implementation:** Once decision rights are activated, the ETP has the authority and responsibility for selecting and securing project finance for the clean replacement, including transition costs.

Throughout this process, all parties maintain the certainty they need: Investors receive their expected returns, off-takers get reliable power, and the public interest in decarbonization is contractually protected.

> **Investors gain financial certainty with return guarantees but give up future control of the facility after financial targets are met.**

Figure 1 – Notional Timeline for a Clean Bridge PPA project



Governance: Making the Transition Real

The effectiveness of the Clean Bridge PPA framework depends on the presence of a credible, capable institutional entity: the Energy Transition Partner (ETP). This entity plays a central role in ensuring that the transition from fossil to clean generation occurs in accordance with the contractual terms. The ETP monitors project financial performance, activates transition rights when specified triggers are met, and oversees the planning and implementation of the replacement clean resource. Its function is not to operate assets, but to provide the governance, accountability and coordination needed to make the Clean Bridge model operational in practice.

What the ETP Does

At its core, the ETP is a steward of public interest, investor accountability and decarbonization integrity. It ensures that once investors have received their agreed return (typically a 6–8 percent IRR), the project transitions — on time and on terms that preserve reliability and cost-effectiveness. The ETP's mandate spans three phases:

1. **Oversight and Monitoring:** Tracks project financials and performance to determine when return-based or time-based triggers are hit
2. **Transition Execution:** Initiates the decarbonization process, selects replacement technologies, structures new procurement and secures funding
3. **Governance and Compliance:** Manages disputes, verifies technology performance and enforces climate-aligned conversion within fiduciary and operational guardrails

The ETP does not need to build or own the new assets; it governs the transition process, ensuring that it aligns with public goals and market conditions.

Who Can Be an ETP?

There's no one-size-fits-all model. What matters is institutional capability, credibility and staying power. Proven structures already exist:

- **State Energy Authorities** like NYSERDA and the Connecticut Green Bank bring regulatory experience, market insight and financial sophistication.
- **Hybrid Models** such as the Colorado Clean Energy Fund or Michigan's Energy Independence Fund blend public mandates with private-sector investment discipline.
- **Regulated Utility Subsidiaries** can serve as ring-fenced ETPs when properly governed and incentivized.
- **Multistate or RTO-linked Entities** may serve broader regions where grid operations are shared.

Even hyperscale energy buyers, like Microsoft, Meta or Google, could serve as ETPs for projects tied to their own infrastructure growth. With internal energy expertise, capital and long-term stakes in performance, these firms are already functioning as de facto grid planners. In some cases, they may be best positioned to manage the decarbonization timeline and procurement strategy.

Where no suitable entity exists, states can stand up a dedicated ETP through legislation, a public-private partnership, or as an affiliate of an existing finance or infrastructure agency.

Governance Principles That Matter

To maintain market confidence and ensure outcomes, the ETP must operate under strong governance. That includes:

- **Independent technical boards** to vet replacement technologies
- **Transparent audits and reporting** on fund performance and project milestones
- **Stakeholder governance** that includes utilities, developers, regulators and communities
- **Clear dispute resolution processes** and escalation paths when transition terms are contested

The ETP is not just a financial middleman; it's the backbone that ensures decarbonization actually happens, under terms that are operationally sound and fiscally responsible.

Done right, the ETP transforms the Clean Bridge PPA from a clever contract into an enforceable public-private architecture for climate-aligned infrastructure.

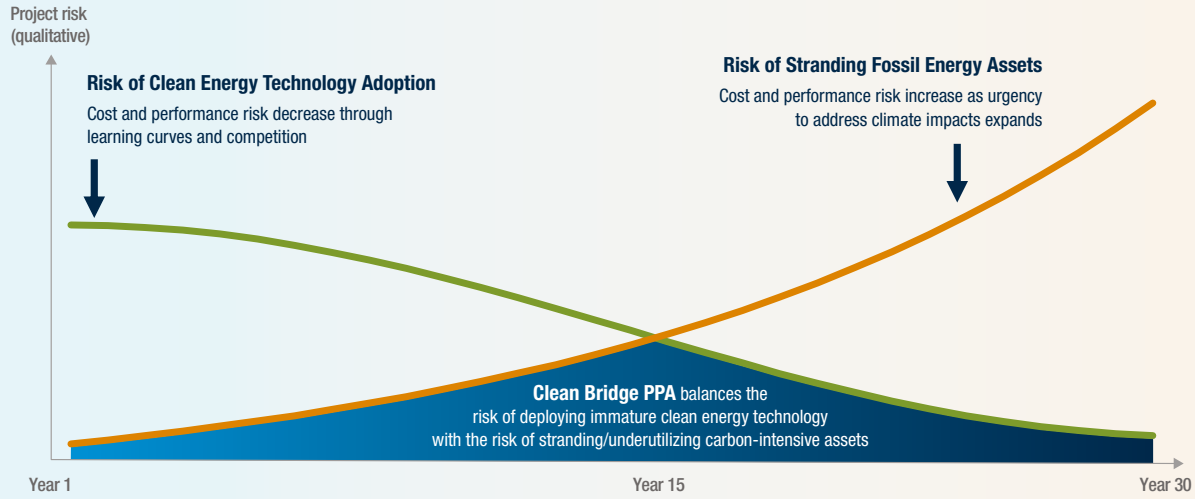
Financial Mechanisms That Make It Work

The Clean Bridge PPA is an adaptable construct. It could accommodate several different financial structures, while retaining the core bargain that ensures both bankability and accountability:

- **Trigger mechanism:** As envisioned, the Clean Bridge PPA would have a return-based mechanism for determining when an ETP takes control of a project's decarbonization pathway. Independent verification would determine when investors have achieved their minimum agreed return (typically 6–8 percent IRR), initiating the transition window. However, the ETP and investor/developers could also specify a fixed backstop date, a predetermined timeline (often 10–15 years post-commercial operation) that ensures transition planning begins regardless of financial performance (but still carrying the lifetime IRR guarantee).
- **Flexible financing for the transition:** When triggers are activated, the ETP can utilize various approaches to finance the clean replacement:
  - Competitive solicitations or auctions for replacement technologies
  - Bond issuances or budget allocations if public sector involvement is needed
  - Market-based mechanisms such as cap and trade to generate funding
  - Public-private partnerships to leverage multiple funding sources
- **Optional elements that can be incorporated:**
  - Capacity payments for reliability services, if the original plant is a gas-peaker, reciprocating engine or diesel backup generator
  - Energy price floors or ceilings to manage volatility
  - Carbon price pass-through provisions to accelerate transition if emissions costs rise

This framework balances project risks inherent to new gas projects, creating the financial certainty that infrastructure investors demand, while providing the governable transition pathway that climate goals require.

Figure 2 – Clean Bridge PPA Balances Project Risks Over Typical PPA Duration



Where the Clean Bridge PPA Could Fit: Complementing the Innovation Landscape

The surge in data center load has sparked a wave of innovation, from demand-side strategies and virtual power plants to behind-the-meter generation and storage. These efforts are vital, but they mostly optimize how existing resources are used, not how new capacity is built. With data center power density rising sharply and electricity demand expected to reach as much as 12 percent of U.S. load by 2028,[6] the grid needs more than operational efficiency; it needs scalable, financeable generation solutions.

Clean Bridge PPAs would fill this gap by offering a firm, dispatchable baseload option with a built-in pathway to clean energy. They complement demand response and curtailment programs, which can shift load but still rely on underlying capacity. They support behind-the-meter resources by providing foundational reliability in a regulatory environment where FERC rulings have cast uncertainty over co-located interconnection. And they buy time for advanced technologies like SMRs and next-gen nuclear, which are promising but unlikely to scale before the 2030s.

In this way, Clean Bridge PPAs could provide a structural backbone that allows other innovations to flourish without shouldering the entire reliability burden.

What sets the Clean Bridge PPA apart is its system-level approach. Rather than optimizing a single site or betting on a specific technology, it creates a replicable framework that aligns developers, utilities, offtakers and policymakers. It enables near-term deployment of capacity while embedding accountability for decarbonization. In an innovation landscape filled with specialized tools, the Clean Bridge PPA offers something broader: a way to grow the grid responsibly while maintaining momentum toward climate goals.

While the Clean Bridge PPA's strategic value is clear conceptually, its practical viability depends on real-world economics. Can the framework actually deliver competitive returns for investors while maintaining affordable power for offtakers? Do the transition costs and timelines make financial sense?

> **The Clean Bridge PPA doesn't compete with emerging solutions. It complements them by addressing a fundamental challenge: how to rapidly deploy the massive amounts of new firm capacity needed while ensuring eventual decarbonization.**

Modeled Case Study: From Concept to Implementation

To answer these questions and validate the model's bankability, we tested the concept using detailed financial projections across illustrative scenario.

"Hydrogen-ready" New CCGT

In the early stages of building new generation to address load growth, natural gas features prominently. We modeled a new 1 GW Combined Cycle Plant being constructed to support a manufacturing or data center load, and being installed with the most efficient hydrogen-capable turbines available. This follows the example of the Homer City redevelopment example cited above, which is employing GE Vernova 7HA.02 turbines, designed to operate on a fuel mix that is an equal blend of natural gas and hydrogen. Homer City Redevelopment indicates a possibility of shifting to a hydrogen fuel mix over time, but with no initial commitment to do so.

Using relatively recent data from actual projects, the construction cost of our modeled plant is likely to be $1.8–$2.8 billion (in 2025 dollars), with a modeled 40/60 equity-to-debt split. If a 30-year Clean Bridge PPA were negotiated with a guaranteed 6–8 percent IRR over the project lifetime, the plant's strong operational performance — generating 11–14 percent annual return on equity — would enable investors to reach their target IRR threshold between Years 12 to 15, triggering the transition to ETP control. We further modeled a likely cost scenario for transitioning the plant in Year 16 to using a fuel mix consisting of 50 percent green hydrogen by energy. A post-combustion carbon capture (PCCC) process is also retrofitted during this transition using solvents to absorb CO2 from flue gas, removing 97 percent of the GHG emissions.

A new PPA initiates in Year 16 for the clean generation plant that accounts for remaining debt from the original plant, new debt + equity considerations related to the transition project costs, and updated costs for fuel and operations. The emissions reduction from this transition would be substantial, at around 2.2 million metric tons of CO2e (MMT CO2e) per year. Assuming another 30-year PPA (extending the entire site life to approximately 45 years), these new capital costs would range from $0.9–1.2 billion (in 2025 dollars).

While a $1 billion transition capital cost is substantial, it is important to consider how much may change in the 12–15-year runway before capital deployment is required. By that time, a mature ETP could access diverse funding sources, including federally backed green infrastructure financing, public bond issuances, low-interest loans from green banks, or rate-based recovery mechanisms approved by public utility commissions.

While current federal support for clean energy tax credits faces political headwinds, the long lead time allows for potential policy shifts that could reinstate or introduce new incentives. Technology itself may advance more quickly than anticipated, or wholly new developments (e.g., geologic hydrogen) may emerge. Importantly, the decision to initiate the transition remains contingent on economic viability: If the costs associated with transitioning to cleaner technologies remain prohibitively high, the ETP is not obligated to proceed. This flexibility ensures that the transition aligns with both environmental goals and fiscal responsibility.

> **A&M has developed model Clean Bridge PPA templates that define roles, responsibilities and trigger conditions in ready-to-adapt language for utilities, corporate off-takers, developers and states seeking to pilot this approach.**

In addition to the hydrogen-ready CCGT example outlined above, we have modeled the Clean Bridge PPA framework across a range of project types and decarbonization pathways. These include new-build peaker plants, reciprocating engine installations for municipal utilities, and brownfield repowerings of legacy fossil sites. We've also tested a variety of replacement strategies, from battery storage and demand-flexibility solutions to advanced nuclear and renewable hybrids. Across these scenarios, the Clean Bridge structure has consistently demonstrated the ability to preserve investor returns while enabling enforceable, cost-aware transitions to cleaner technologies. These results underscore the model's adaptability to different geographies, load profiles and policy environments, reinforcing its value as a replicable tool for energy system transformation.

We have developed prototype contract structures that embed the Clean Bridge PPA's key principles. These model PPAs define roles, responsibilities and trigger conditions in legal language, offering a ready-to-adapt template for utilities, developers and regulators seeking to pilot this approach.

Systemwide Benefits: Scaling the Energy Transition Through Smarter Infrastructure

The Clean Bridge PPA delivers clear project-level value, providing firm energy today with a built-in path to zero emissions, but its broader strength lies in creating powerful systemwide effects that accelerate and govern the entire energy transition.

Affordability Protection Through Performance-Based Transitions

The Clean Bridge model creates intrinsic consumer protection by establishing transparent performance benchmarks that replacement technologies must meet for cost, reliability and operational capability. The Energy Transition Partner is not required to force a transition if no cost-effective clean alternative exists, providing natural safeguards against premature or economically harmful conversions.

This performance-based approach replaces political speculation with market discipline. Once trigger thresholds are reached, the ETP gains full authority over the facility's future, creating healthy pressure to select technologies that are both clean and affordable. Different regions can optimize for their local conditions — CCS in the Midwest, hydrogen in the Southwest, geothermal where feasible — without sacrificing consistency in climate outcomes.

Accelerated Innovation Through Guaranteed Market Demand

Unlike aspirational procurement targets, Clean Bridge PPAs create contractual certainty for clean technology markets. The structure doesn't just suggest a transition is possible; it guarantees market opportunities for technologies that can compete on performance and cost when transition windows open.

This gives emerging technologies a tangible commercialization target, accelerating the shift from pilot projects to bankable, full-scale deployment. Technologies compete based on deliverability and economics rather than policy preferences, fostering innovation across conventional and unconventional solutions — whether SMRs, fuel-flexible turbines, thermal storage, or advanced demand-side resources — without picking winners in advance.

Infrastructure Optimization and Strategic Site Selection

The framework optimizes physical infrastructure by favoring "drop-in" solutions — hydrogen, CCS, renewable fuels — that preserve valuable interconnection rights, grid infrastructure and community tax base. This means fewer land use battles, faster implementation and reduced environmental impacts by concentrating generation on previously developed sites.

By enabling immediate deployment of needed firm capacity while establishing governance structures for managed transition, Clean Bridge PPAs avoid the false choice between building long-lived fossil plants or waiting for clean technologies that may not scale in time. The result: a systematic pathway that aligns near-term reliability with long-term climate commitments under a single, accountable framework.

Adapting Regulatory Frameworks for Clean Bridge PPAs

While existing regulatory structures in most states can accommodate Clean Bridge PPAs, targeted adaptations may be necessary to maximize their effectiveness and ensure broad applicability. State utility commissions and energy offices will need to develop clear guidelines for evaluating transition mechanisms, including criteria for assessing ETP qualifications and protocols for monitoring compliance with decarbonization commitments. Regulatory frameworks may benefit from streamlined permitting processes for transition-ready generation assets, potentially including preclearance mechanisms for projects with embedded clean conversion pathways.

Key regulatory adaptations may include:

- Prudency standards that recognize the long-term value of contractual decarbonization commitments in rate recovery decisions
- Integrated resource planning modifications to account for transition option value when evaluating new generation resources
- Clean energy standard revisions to provide credit for assets with defined transition pathways, potentially on a time-weighted basis
- Cost recovery mechanisms that allow utilities to recover transition-related investments while protecting ratepayers from stranded costs

Recent precedents, such as Nevada's approval of the Clean Transition Tariff framework, demonstrate that existing regulatory processes can be adapted to accommodate innovative transition financing structures. However, broader adoption may require model regulations or guidance from state utility commissions to provide consistency and reduce transaction costs for developers and Energy Transition Partners operating across multiple jurisdictions. States pursuing Clean Bridge PPA frameworks should also consider alignment with federal policies that can improve the economics of clean replacement technologies, ensuring that regulatory frameworks are designed to capture the full value of federal support mechanisms.

Actionable Steps: How to Begin Implementing the Clean Bridge Approach

Stakeholder	Recommended Actions
States	■ Assess applicability of Clean Bridge PPA based on load, climate and development goals ■ Convene stakeholders to explore pilot use cases ■ Direct planners to model Clean Bridge in IRPs or reliability studies ■ Identify/designate an Energy Transition Partner ■ Explore legislative/regulatory paths to enable transition fund structures ■ Review siting/permitting frameworks for applicability to time-bound fossil assets
Offtakers (Utilities, Corporates, Aggregators)	■ Evaluate load profiles for Clean Bridge applicability ■ Explore Clean Bridge PPA adoption in upcoming solicitations ■ Participate in fund governance design discussions ■ Model cost, emissions and timing scenarios ■ Build coalitions for aggregated procurement ■ Engage early with regulators on review/treatment of Clean Bridge terms
Investors	■ Conduct due diligence on Clean Bridge mechanics and triggers ■ Model risk-adjusted returns across bridge and transition phases ■ Engage ESG/sustainable finance ratings groups ■ Partner with public/mission-aligned capital for early deals ■ Evaluate roles in managing transition funds or replacement phases
Project Developers	■ Identify/adapt candidate projects to Clean Bridge structure ■ Build financial models incorporating return thresholds and transition funds ■ Initiate discussions with ETPs, offtakers and regulators ■ Develop and test prototype contract terms ■ Partner with clean tech providers to validate transition options ■ Position Clean Bridge as part of broader ESG/innovation strategy

How A&M Can Help

The collision of surging electricity demand and escalating climate commitments is forcing a reckoning in U.S. energy strategy. For states, utilities, investors and energy-intensive industries, the stakes are high: Failure to act decisively risks missed economic opportunity, unreliable power systems, and stalled climate progress. But with the right tools and leadership, this moment of tension can become a launchpad for long-term competitive advantage.

Conclusion: Competitive Advantage Through Clean Energy Innovation

The Clean Bridge PPA offers one such tool — an emerging model designed not to delay decarbonization, but to govern it. It acknowledges today's realities: Firm capacity is still needed, clean firm technologies are not yet widely available, and investors require durable revenue structures.

But rather than accepting these constraints as excuses for inaction, it transforms them into a structured pathway forward, aligning short-term reliability with long-term emissions reduction under a single, accountable framework.

What is needed now is not another round of aspirational targets, but actionable mechanisms that align capital, policy and infrastructure with the dual imperatives of growth and decarbonization. Clean Bridge PPAs won't solve every challenge, but they can unlock a new category of climate-aligned investment, accelerate commercialization of clean firm power, and give states a strategic edge in the race to attract next-generation industries.

The energy transition cannot afford false trade-offs. We need to build reliable power while staying on course for deep decarbonization. The Clean Bridge PPA deserves a place in the toolkit of every energy policymaker, developer and large-scale energy buyer committed to this dual imperative.

The future of clean economic development belongs to those willing to embrace this challenge and engage in the hard work of reimagining how we power our economy.

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