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Bankability of Large-Scale US Electricity Infrastructure Projects: A Review of Lender Requirements Credit Risks and Financing Structures

Mr. Tolulope Samuel Osunsina

Student, Energy Finance and Strategy, SMU Cox School of Business

Abstract

Large-scale electricity infrastructure is capital intensive, long lived, technically interdependent, and exposed to market, policy, construction, and counterparty risk. These features make bankability central to the conversion of an announced project into an operating asset. This critical narrative review synthesizes the project-finance, energy-economics, infrastructure-finance, and electricity-policy literature to explain how lenders assess United States generation, transmission, and storage projects. It distinguishes economic viability from credit bankability; examines development, completion, operating, merchant, regulatory, interconnection, and technology risks; and compares power-purchase agreements, tolling, regulated recovery, hedges, merchant exposure, tax-credit monetization, municipal finance, and federal credit support. The literature shows that project finance can reduce agency problems and isolate risk, but only when contracts and governance improve verifiability and control enough to justify substantial transaction costs. Contracted revenues tend to increase debt capacity, yet payer quality, tenor, termination, curtailment, and basis exposure matter as much as the contract label. Transmission differs from generation because repayment often rests on regulatory cost recovery and cost allocation rather than a single offtake agreement. Storage is a hybrid: stacked revenues may diversify income but make dispatch, degradation, and market assumptions harder to verify. The review concludes with a stage-gated lender-readiness framework and research priorities concerning correlated stress, tax-credit transfer markets, supply chains, and rapid load growth.

Keywords: project finance; bankability; electricity infrastructure; power purchase agreement; transmission; energy storage; credit risk; debt service coverage; limited recourse

1 Introduction

The United States electricity sector is entering a large investment cycle. Electrification, manufacturing, data centers, reliability needs, aging equipment, and decarbonization policies are expanding demand for generation, transmission, storage, and interconnection facilities. Yet a socially valuable or technically feasible project is not automatically financeable. Capital is committed only when lenders can identify a credible source of repayment, quantify plausible downside exposure, and obtain protections that remain effective when forecasts fail. Bankability is therefore the bridge between an infrastructure need and financial close.

No single academic discipline owns the concept. Corporate-finance research describes project finance as a governance and contracting technology that separates project cash flows and assets from a sponsor's wider balance sheet (Brealey, Cooper, and Habib, 1996; Esty, 2004; Subramanian and Tung, 2016). Energy-finance research emphasizes capital-cost sensitivity to policy stability, revenue design, and technology risk (Wiser and Pickle, 1998; Steffen, 2018; Egli, Steffen, and Schmidt, 2018). Infrastructure research studies how lenders price construction, demand, political, and contractual exposures (Blanc-Brude and Strange, 2007; Engel, Fischer, and Galetovic, 2014). Together these literatures define bankability as a lender judgment that cash flow can service debt under credible downside cases and that material residual risks are assigned to parties able to manage or absorb them. This definition separates bankability from profitability. A project may have positive expected net present value but remain unbankable because its downside is unbounded, its permits are uncertain, or its revenue cannot be pledged. Conversely, an asset with modest upside may support substantial debt when revenue is contractually stable. Public support can close part of the gap through procurement, regulated recovery, tax credits, grants, or guarantees, but support redistributes risk rather than eliminating it.

2 Review Scope and Method

This is a critical narrative review, not a statistical meta-analysis. It integrates peer-reviewed research in finance, energy economics, law, policy, and infrastructure management with primary guidance from U.S. agencies. Its core concern is limited-recourse financing of utility-scale assets, while corporate utility finance and public finance are included as competing or complementary structures. Sources were selected for their ability to explain mechanisms: how a contract, policy, covenant, or capital instrument changes the probability and severity of debt-service failure. The synthesis uses three questions. What must a lender verify before committing long-tenor capital? Which risks can be transferred contractually, which must be retained and capitalized, and which cannot be credibly priced? How do financing structures redistribute risk among sponsors, lenders, contractors, offtakers, tax investors, customers, and government? The analysis follows the project from development through construction, operations, refinancing, and decommissioning.

3 Bankability as Contracting and Governance

A project-finance special-purpose vehicle permits lenders to look primarily to project cash flow and collateral. The structure can ring-fence risk, permit higher leverage, and concentrate monitoring on a discrete asset. Brealey, Cooper, and Habib (1996) connect infrastructure characteristics—large sunk costs, long lives, and contractual interfaces—to the usefulness of project finance. Esty (2004) emphasizes that concentrated ownership, extensive contracts, and nonrecourse debt make responses to risk unusually visible. Subramanian and Tung (2016) show that legal and contractual architecture shapes the availability of project finance across institutional settings.

The structure is expensive. Independent engineering, legal documentation, insurance review, intercreditor agreements, reserve accounts, and continuing reporting impose high fixed costs. These costs are justified when ring-fencing and contractual control materially improve repayment certainty. Power assets often meet this condition because construction, operations, and revenue can be separately contracted. Project finance is less effective when value depends on volatile merchant prices, unproven technology, unsettled regulation, or assets with little transferable value.

Lenders underwrite the reliability and priority of debt service rather than the sponsor's base-case equity return. Attention shifts from average outcomes to downside cash flow, from upside optionality to contractual floors, and from enterprise value to enforceable controls. Two projects using identical equipment may consequently have different leverage and pricing. A solar project with a long utility PPA, completed interconnection, fixed-price construction contract, and proven modules presents a different credit from a merchant project exposed to nodal-price erosion and curtailment. Bankability belongs to the whole contractual system, not the technology alone.



Figure 1. Six interdependent dimensions of electricity-project bankability. Source: author synthesis of the literature.

4 Core Lender Requirements

4.1 Development maturity and critical rights

Lenders require evidence that the project controls its site, permits, interconnection position, access, material contracts, and intellectual property. Development uncertainty cannot be cured simply by a higher interest margin because an unpermitted or disconnected asset may never generate cash. Conditions precedent commonly require final permits, executed interconnection documents, environmental review, land rights extending beyond debt maturity, and a fully funded sources-and-uses plan. If financing closes earlier, lenders usually require sponsor support, reserves, or restricted draws.

4.2 Capital cost and completion

Completion converts development and construction risk into operating risk. Lenders examine design maturity, procurement, contractor experience, schedule logic, contingency, liquidated damages, and performance testing. Flyvbjerg, Holm, and Buhl (2002) and Flyvbjerg (2009) document persistent optimism and cost underestimation in major infrastructure, supporting lender use of independent engineering and reference-class thinking. Delay raises interest during construction and may also destroy value by missing PPA, tax-credit, capacity-market, or interconnection milestones. A fixed-price, date-certain EPC contract helps only to the extent its scope, caps, contractor credit, bonding, and remedies are credible.

4.3 Revenue durability

Revenue analysis covers price, volume, tenor, escalation, dispatch, curtailment, congestion, basis, and termination. A fixed price may leave quantity risk; a physical PPA may leave nodal basis risk; and a hedge may create collateral calls despite acceptable long-run economics. Lenders therefore examine settlement mechanics rather than relying on commercial labels. Offtaker credit and replacement value also matter. If a favorable contract terminates during a low-price period, the project may lose the asset that supported its debt.

4.4 Technical and operating resilience

Independent engineers review expected output, resource studies, degradation, availability, maintenance, warranties, spares, insurance, safety, and decommissioning. Wind and solar diligence focuses on resource variability, component failure, congestion, curtailment, and degradation. Thermal projects add fuel deliverability, heat rate, emissions, and forced outages. Storage adds usable capacity, cycle profile, augmentation, round-trip efficiency, warranty throughput, fire safety, and end-of-life obligations. Novel technologies typically need stronger sponsor support or public risk sharing because operating distributions are not well established.

4.5 Model integrity and debt capacity

The financial model integrates engineering, contracts, tax, and debt. It must be auditable and consistent with transaction documents. Debt is usually sized to the most constraining of a leverage limit, minimum debt-service coverage ratio, and loan-life or debt-yield test. DSCR equals cash flow available for debt service divided by scheduled principal and interest, but its meaning depends on consistent cash-flow definitions and credible stresses. Contracted assets can often support longer tenor and more leverage; merchant projects usually face conservative lender curves, revenue haircuts, and shorter amortization.

4.6 Security and remedies

Lenders require security over assets, accounts, project agreements, and equity interests, together with notice, cure, and step-in rights under direct agreements. The practical value of foreclosure depends on transferability of permits and contracts and the availability of a capable operator. Cash waterfalls, debt-service reserves, distribution lockups, and cash sweeps reduce leakage and create time to cure deterioration. Governance is thus part of credit quality, not an administrative afterthought.

Table 1. Lender diligence domains and typical credit responses

Domain	Evidence sought	Principal downside	Credit response
Revenue	Executed contract or rate entitlement; payer credit	Price, volume, basis, curtailment, termination	Haircuts, tenor limits, termination analysis
Construction	Mature design, committed budget, executable schedule	Delay, overrun, interfaces, performance	Contingency, LDs, bonds, completion support
Operations	Proven technology, O&M, warranties, insurance	Availability, degradation, fuel, safety	Engineer cases, reserves, warranty review
Legal	Permits, site, interconnection, enforceable security	Appeal, tariff change, disallowance, lien risk	Opinions, conditions, covenants, direct agreements
Financial	Integrated model, coverage, funded reserves	Rates, inflation, tax, refinancing	DSCR and LLCR, hedging, cash sweep
Governance	Experienced sponsor, controls,	Agency conflict, weak	Consent rights, reporting,

Domain	Evidence sought	Principal downside	Credit response
	reporting	monitoring	controlled accounts

5 Credit Risks Across the Project Life Cycle

5.1 Permitting and interconnection

Interconnection is both a technical dependency and a financial option on scarce network capacity. Queue position does not assure a commercially useful connection. Network-upgrade cost, restudies, neighboring withdrawals, deliverability status, and milestone security can change economics. Permission to interconnect must be distinguished from the ability to deliver output at the modeled node and price. Permitting has a similar asymmetry: delay consumes development capital and contract time without creating an offsetting asset. Bankability rises when material permits, land rights, and challenges are resolved before full debt funding.

5.2 Construction and supply chains

Construction risk is a network of correlated exposures. Equipment delay can trigger contractor claims, extend financing costs, breach offtake milestones, and postpone tax benefits. Inflation, tariffs, and shortages affect both original and replacement cost. Force majeure may excuse a contractor without compensating the project. Lenders therefore assess contractual interfaces and causal pathways, not only aggregate contingency. When contractors refuse a full wrap, lenders seek larger contingency, multiple guarantees, stronger interface management, or lower initial leverage.

5.3 Merchant revenue and basis

Merchant electricity revenue depends on the joint distribution of output and price. Variable generation can depress prices in the hours it produces, creating capture-price erosion (Hirth, 2013; Mills and Wiser, 2015). Congestion can widen hub-to-node differentials. Storage can arbitrage spreads and provide ancillary services, but the same physical capacity cannot always deliver all modeled services simultaneously. Long-term contracts reduce risk without eliminating it: fixed-volume obligations create shape risk, contracts for differences retain basis exposure, and hedges introduce collateral and termination risk.

5.4 Counterparty concentration

A contract is only as durable as its payer and remedies. Lenders assess ratings, cash flow, regulatory status, parent support, collateral, termination rights, and replacement markets. One utility offtaker creates concentration but may be strong; multiple corporate buyers diversify exposure while adding heterogeneous settlement and credit risks. A short corporate PPA also creates tail exposure when debt extends beyond contract tenor, usually leading to conservative residual values or faster amortization.

5.5 Regulatory and policy risk

Wholesale rules, transmission tariffs, resource adequacy, environmental standards, tax eligibility, utility regulation, and siting decisions can alter cash flows. Polzin et al. (2019) show that policy design affects private capital mobilization; credibility and durability matter alongside generosity. For regulated transmission, confidence rests on rate-base eligibility, allowed returns, construction-work-in-progress treatment, abandonment recovery, prudence review, and cost allocation. This is fundamentally different from relying on a bilateral generator PPA.

5.6 Technology climate cyber and tail risk

Technology risk changes availability, lifecycle capex, warranty value, and residual value. First-of-a-kind projects combine scale-up uncertainty with contractor scarcity and long repair times. Cyber incidents can

interrupt operation or market participation. Climate hazards affect flood exposure, cooling, wildfire, storm hardening, and network reliability. Decommissioning and recycling create tail liabilities. These risks are often reviewed separately even though they can be correlated: one extreme event may cause damage, price spikes, and counterparty stress together.

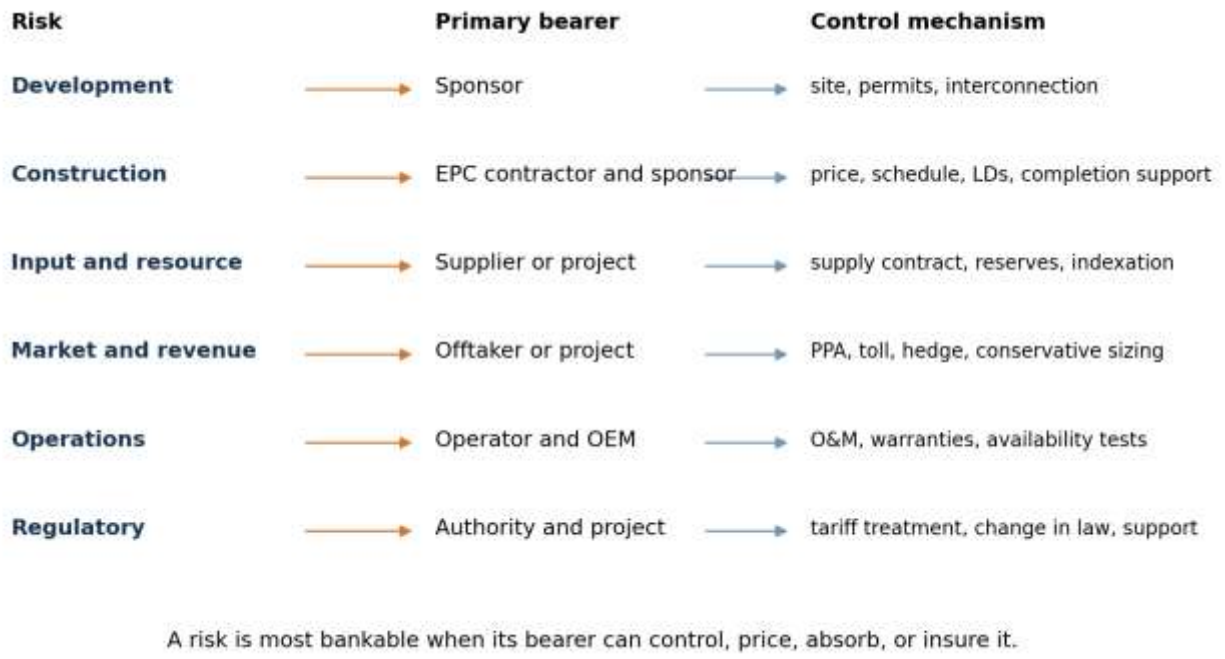


Figure 2. Risk allocation logic in a bankable project structure. Source: author synthesis.

6 Revenue and Financing Structures

6.1 Contracted project finance

The classical independent-power structure combines sponsor equity, senior secured debt, and a long-term PPA. It maps construction, operating, and revenue duties into a closed contractual system and permits debt amortization during the contracted period. Its weakness is rigidity: amendments and new commercial opportunities may require lender consent, while contract tenor is often shorter than physical asset life.

6.2 Merchant and hedged finance

Merchant projects retain wholesale-price exposure and therefore need lower leverage, stronger sponsors, more liquidity, or hedges. A hedge stabilizes only its defined settlement exposure and adds hedge-provider credit, collateral, basis, shape, and termination risk. The 2021 Texas winter event demonstrated that financial and physical positions can diverge sharply under extreme conditions. Bankability therefore rests on precise terms and compound stress testing rather than one forward curve.

6.3 Regulated utility and transmission finance

Utilities commonly finance portfolios through corporate bonds, retained earnings, and equity while recovering prudent investment through regulated rates. Diversification lowers asset-specific risk but leaves regulatory lag and disallowance. Transmission is distinctive because network benefits are dispersed. Incumbent projects may use formula rates and authorized recovery; competitive projects require a credible revenue contract or cost-allocation decision. Planning and allocation are consequently financing mechanisms, not peripheral policy processes.

6.4 Storage finance

Storage uses capacity contracts, tolling agreements, utility ownership, merchant revenue, or hybrids. A toll transfers much dispatch and market risk to the toller while leaving availability and lifecycle performance with the project. Merchant batteries depend on spreads, ancillary services, capacity, and evolving rules. Revenue diversification helps only if services are technically compatible and not double counted. Lenders focus on cycling, augmentation, warranty limits, and whether the dispatch assumed for revenue matches the degradation assumed for cost.

6.5 Tax incentives

Federal credits have long shaped renewable finance. Traditional tax equity transfers benefits to investors able to use them but creates partnership, indemnity, buyout, and intercreditor complexity. Transferability can separate credit monetization from long-term tax-equity ownership, but buyers still diligence eligibility, registration, recapture, and indemnity. A credit's financing value is its expected net proceeds after timing, discount, transaction cost, and compliance risk—not its statutory face amount.

6.6 Federal and public credit

DOE loans and guarantees, USDA programs, state green banks, grants, tax-exempt bonds, and public-power finance can lengthen tenor or absorb risks that private markets cannot bear at scale. Support is most effective when it targets a defined market failure such as first-of-a-kind technology, long construction, or uncompensated network benefits. It is less effective when it masks weak fundamentals or places poorly bounded downside on taxpayers or ratepayers.

Table 2. Major revenue and financing structures

Structure	Repayment anchor	Contribution	Residual risks	Fit
Utility PPA	Contract price and output	Revenue visibility; sculpted debt	Payer, curtailment, basis, termination	Generation
Corporate PPA or CfD	Corporate settlement	Procurement and diversification	Credit, basis, shape, collateral	Generation
Tolling	Capacity or availability payment	Separates commodity and operations	Performance and toller credit	Thermal, storage
Merchant plus hedge	Market and hedge cash flow	Flexibility and upside	Basis, volume, collateral, tail	Generation, storage
Regulated recovery	Authorized rates	Long life and broad customer base	Prudence, lag, allocation	Utility, transmission
Federal credit	Cash flow with public support	Long tenor and additionality	Compliance and milestone risk	Innovative assets
Municipal bonds	System or project revenues	Potential tax-exempt long tenor	Governance and rate-setting	Public power
Credit transfer or tax equity	Monetized tax benefits	Reduces net capital need	Eligibility, recapture, indemnity	Clean energy

7 Debt Sizing Pricing and Covenants

Interest margin and leverage are linked but distinct. Pricing compensates for expected loss, unexpected loss, liquidity, capital use, and complexity; leverage decides how much risk debt rather than equity bears. Binary risks are often not priceable. A missing permit, unresolved interconnection obligation, or unbounded completion exposure produces a condition precedent or sponsor guarantee rather than a small increase in spread.

Lenders examine minimum and average DSCR, loan-life coverage, project-life coverage, debt yield, break-even variables, and refinancing exposure. They sensitize delay, capex, resource, degradation, availability, price, inflation, and rates. Compound cases are more informative than isolated shocks when congestion reduces both price and delivered volume or delay simultaneously increases cost and shortens contracted tenor.

Covenants adapt the credit after closing. Distribution tests preserve cash; reserves buy time; cash sweeps accelerate deleveraging; reporting makes deterioration visible; and consent rights prevent material project changes. Direct agreements provide notice and cure before termination. Security is valuable only if permits, contracts, and operational capability can be transferred in distress.

8 Technology Specific Bankability

Mature solar and wind benefit from standardized equipment and operating data, but their bankability challenges increasingly concern congestion, curtailment, negative prices, capture-price erosion, supply-chain compliance, and contract basis. Egli, Steffen, and Schmidt (2018) show that lower financing costs contributed materially to renewable cost reductions, while Steffen (2018) demonstrates the importance of project finance to renewable deployment.

Gas-fired generation combines dispatch value with fuel and emissions exposure. Tolling can transfer fuel-price and dispatch risk, but pipeline availability, flexibility, permits, carbon exposure, and capacity-market rules remain. Merchant plants face spark-spread volatility and transition risk, encouraging shorter tenor and higher coverage.

Nuclear and other first-of-a-kind assets present exceptional licensing, completion, supply-chain, and duration risk. High capital intensity magnifies delay, and few comparables weaken statistical estimation. Bankability may require regulated recovery during construction, public credit, standardized design, milestone risk sharing, and sponsors able to absorb overruns.

Long-duration storage and advanced grid assets can create system value that existing markets do not fully pay for. The gap is often revenue adequacy rather than engineering. Procurement, regulated treatment, or new market products must translate reliability and congestion benefits into collectible cash flow.

9 Transmission as a Distinct Case

Transmission benefits are dispersed across place, time, and market participants. Generation can often identify a buyer and delivered product; transmission changes the feasible network and affects reliability, congestion, generation entry, and trade. Benefit measurement and cost allocation are therefore inseparable from finance. A lender asks not only whether a line is useful, but whether an authorized revenue requirement will remain collectible despite disputes over beneficiaries.

Key risks include multijurisdictional siting, rights of way, environmental review, interconnection, network-upgrade responsibility, cost caps, abandonment recovery, formula rates, and specialized

equipment. Competitive procurement can discipline cost but may allocate risks developers cannot control. A credible regime must match risk-bearing duties with authority over route, permits, interconnection, and recovery.

Merchant transmission relies on congestion rents or capacity contracts and is sensitive to market redesign and later network expansion. Regulated or contracted structures usually support greater leverage because repayment does not depend solely on volatile congestion differentials. Weak planning coordination thus raises capital costs even when engineering need is clear.

10 Storage and Revenue Stacking

Storage illustrates the tension between system flexibility and credit simplicity. A battery may earn arbitrage, ancillary-service, capacity, congestion-relief, and contract revenues. Diversification can reduce reliance on one market, but stacked services create dispatch conflicts and double-counting risk. Models must apply state-of-charge, degradation, interconnection, and warranty constraints consistently.

A tolling structure simplifies credit by paying for availability while the buyer controls dispatch within operating limits. The project retains performance and lifecycle cost; the buyer bears much market risk. Merchant debt depends on conservative curves and recognition that high-margin ancillary services may decline as storage penetration rises. Historical prices are therefore not necessarily durable repayment evidence.

11 Integrated Lender Readiness Framework

The literature supports a stage-gated assessment rather than a single score. A project should first pass fatal-flaw tests for site, permits, interconnection, legal authority, and feasibility. It should then demonstrate a complete funding and completion plan. Only after those conditions are satisfied should leverage be optimized against coverage. Scoring can improve consistency but should never allow strengths in one domain to average away a binary weakness.

Table 3. Stage-gated lender-readiness framework

Stage	Evidence	Decision question	Credit action
Fatal flaws	Site, permits, interconnection, authority	Can the asset legally and physically operate?	Reject, defer, or resolve
Completion	Design, EPC, supply chain, budget, support	Can it finish on time and budget?	Contingency, guarantees, draw stops
Revenue	Contract, payer, market, curtailment, basis	Will downside cash flow repay debt?	Haircuts, tenor, reserves, amortization
Operations	Technology, O&M, warranty, lifecycle capex	Will output and cost remain credible?	Engineer case, covenants, reserves
Capital	DSCR, LLCR, leverage, rates, refinancing	How much debt is safe?	Size, sculpt, hedge, cash sweep
Documentation	Security, direct agreements, cure, reporting	Can value be preserved in distress?	Consents, collateral, controls

Three conclusions emerge. First, bankability is relational: it depends on fit among technology, revenues, counterparties, regulation, and capital structure. Second, risk transfer is credible only when the receiver

has both control and financial capacity. A fixed-price promise from an undercapitalized contractor can be weaker than transparent cost sharing backed by a strong sponsor. Third, capital cost is partly an institutional outcome. Clear market rules, timely interconnection, durable permits, credible recovery, and standardized contracts can lower financing cost without altering the physical asset. A standardized diagnostic can make dependencies visible and prevent premature focus on headline leverage. Yet standardization should guide judgment, not replace it. Any readiness score should preserve fatal-flaw thresholds, disclose assumptions, and show interactions. Its useful output is not merely a rank; it is a traceable account of who bears each downside, how that party will perform, and what remedies apply if it does not.

Conclusion

Large-scale U.S. electricity projects become bankable when lenders can connect an enforceable revenue stream to an asset capable of completion and operation within bounded risk. Contracted revenue, regulated recovery, experienced sponsors, mature technology, adequate contingency, and strong documentation increase debt capacity. Merchant exposure, uncertain interconnection, novel technology, unresolved permits, weak counterparties, and correlated construction risk reduce it. Financing structures do not remove these risks; they distribute them among sponsors, lenders, contractors, offtakers, tax-credit buyers, customers, and government.

Capital mobilization therefore begins before financing. Project selection, permitting, procurement, interconnection, market design, and cost allocation determine whether debt can be raised and at what cost. The decisive lender question remains simple: after realistic stresses and contractual failures are considered, is there still a durable and controllable path to repayment?

References

1. Blanc-Brude, F., and Strange, R. (2007). How banks price loans to public-private partnerships: Evidence from the European markets. Journal of Applied Corporate Finance, 19(4), 94–106. https://doi.org/10.1111/j.1745-6622.2007.00163.x
2. Bolinger, M. (2009). Financing non-residential photovoltaic projects: Options and implications. Lawrence Berkeley National Laboratory. https://doi.org/10.2172/951494
3. Brealey, R. A., Cooper, I. A., and Habib, M. A. (1996). Using project finance to fund infrastructure investments. Journal of Applied Corporate Finance, 9(3), 25–39. https://doi.org/10.1111/j.1745-6622.1996.tb00299.x
4. Couture, T., and Gagnon, Y. (2010). An analysis of feed-in tariff remuneration models. Energy Policy, 38(2), 955–965. https://doi.org/10.1016/j.enpol.2009.10.047
5. Egli, F., Steffen, B., and Schmidt, T. S. (2018). A dynamic analysis of financing conditions for renewable energy technologies. Nature Energy, 3, 1084–1092. https://doi.org/10.1038/s41560-018-0277-y
6. Engel, E., Fischer, R., and Galetovic, A. (2014). The Economics of Public-Private Partnerships. Cambridge University Press. https://doi.org/10.1017/CBO9781139565615
7. Esty, B. C. (2004). Why study large projects? European Financial Management, 10(2), 213–224. https://doi.org/10.1111/j.1354-7798.2004.00247.x
8. Federal Energy Regulatory Commission. (2011). Order No. 1000: Transmission planning and cost allocation. https://www.ferc.gov

9. Federal Energy Regulatory Commission. (2018). Order No. 841: Electric storage participation in organized wholesale markets. https://www.ferc.gov
10. Federal Energy Regulatory Commission. (2023). Order No. 2023: Improvements to generator interconnection procedures and agreements. https://www.ferc.gov
11. Federal Energy Regulatory Commission. (2024). Order No. 1920: Electric regional transmission planning and cost allocation. https://www.ferc.gov
12. Flyvbjerg, B. (2009). Survival of the unfittest. Oxford Review of Economic Policy, 25(3), 344–367. https://doi.org/10.1093/oxrep/grp024
13. Flyvbjerg, B., Holm, M. S., and Buhl, S. (2002). Underestimating costs in public works projects. Journal of the American Planning Association, 68(3), 279–295. https://doi.org/10.1080/01944360208976273
14. Gatti, S. (2018). Project Finance in Theory and Practice (3rd ed.). Academic Press.
15. Gatzert, N., and Kosub, T. (2016). Risks and risk management of renewable energy projects. Renewable and Sustainable Energy Reviews, 60, 982–998. https://doi.org/10.1016/j.rser.2016.01.103
16. Hainz, C., and Kleimeier, S. (2012). Political risk, project finance, and development banks. Journal of Financial Intermediation, 21(2), 287–314. https://doi.org/10.1016/j.jfi.2011.10.002
17. Hirth, L. (2013). The market value of variable renewables. Energy Economics, 38, 218–236. https://doi.org/10.1016/j.eneco.2013.02.004
18. Hirth, L., Ueckerdt, F., and Edenhofer, O. (2015). Integration costs revisited. Renewable Energy, 74, 925–939. https://doi.org/10.1016/j.renene.2014.08.065
19. International Energy Agency. (2024). World Energy Investment 2024. https://www.iea.org/reports/world-energy-investment-2024
20. International Renewable Energy Agency. (2016). Unlocking Renewable Energy Investment. https://www.irena.org
21. Jensen, M. C., and Meckling, W. H. (1976). Theory of the firm. Journal of Financial Economics, 3(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X
22. Kleimeier, S., and Megginson, W. L. (2000). Are project finance loans different? Journal of Applied Corporate Finance, 13(1), 75–87. https://doi.org/10.1111/j.1745-6622.2000.tb00043.x
23. Mills, A. D., and Wiser, R. H. (2015). Strategies to mitigate declines in wind and solar value. Applied Energy, 147, 269–278. https://doi.org/10.1016/j.apenergy.2015.03.014
24. Mills, A., Wiser, R., and Porter, K. (2009). The Cost of Transmission for Wind Energy. Lawrence Berkeley National Laboratory. https://doi.org/10.2172/948131
25. National Academies of Sciences, Engineering, and Medicine. (2021). The Future of Electric Power in the United States. https://doi.org/10.17226/25968
26. Newbery, D. (2016). Missing money and missing markets. Energy Policy, 94, 401–410. https://doi.org/10.1016/j.enpol.2015.10.028
27. OECD. (2015). Infrastructure Financing Instruments and Incentives. https://www.oecd.org/finance/private-pensions/Infrastructure-Financing-Instruments-and-Incentives.pdf
28. Polzin, F., Egli, F., Steffen, B., and Schmidt, T. S. (2019). How do policies mobilize private finance for renewable energy? Applied Energy, 236, 1249–1268. https://doi.org/10.1016/j.apenergy.2018.11.098

29. Sadorsky, P. (2012). Modeling renewable energy company risk. Energy Policy, 40, 39–48. https://doi.org/10.1016/j.enpol.2010.06.064
30. Sorge, M. (2004). The nature of credit risk in project finance. BIS Quarterly Review, December, 91–101. https://www.bis.org/publ/qtrpdf/r_qt0412h.pdf
31. Steffen, B. (2018). The importance of project finance for renewable energy projects. Energy Economics, 69, 280–294. https://doi.org/10.1016/j.eneco.2017.11.006
32. Steffen, B., and Waidelich, P. (2022). Determinants of cost of capital in the electricity sector. Progress in Energy, 4, 033001. https://doi.org/10.1088/2516-1083/ac7936
33. Subramanian, K. V., and Tung, F. (2016). Law and project finance. Journal of Financial Intermediation, 25, 154–177. https://doi.org/10.1016/j.jfi.2014.01.001
34. U.S. Department of Energy Loan Programs Office. (2023). Title 17 Clean Energy Financing Program Guidance. https://www.energy.gov/lpo/title-17-clean-energy-financing
35. U.S. Energy Information Administration. (2024). Capital Cost and Performance Characteristics for Utility-Scale Technologies. https://www.eia.gov/analysis/studies/powerplants/capitalcost/
36. Wiser, R., and Pickle, S. (1998). Financing investments in renewable energy: The impacts of policy design. Renewable and Sustainable Energy Reviews, 2(4), 361–386. https://doi.org/10.1016/S1364-0321(98)00007-0
37. Yescombe, E. R. (2014). Principles of Project Finance (2nd ed.). Academic Press.