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IMPROVING TRANSMISSION FINANCING *in California*

Alternative Models and Policy Strategies to Increase Affordability

OCTOBER 2024

Policy Report

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OCTOBER 2024 | POLICY REPORT

IMPROVING TRANSMISSION FINANCING IN CALIFORNIA

Alternative Models and Policy Strategies to Increase Affordability

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I. THE NEED FOR AFFORDABLE TRANSMISSION FINANCING

California will need a significant build-out of new high-voltage transmission lines to meet state goals for renewable energy deployment and a decarbonized grid by 2045, which requires a quadrupling of its current in-state solar and wind capacity. Transmission will be needed to deliver offshore wind power from the North and Central Coast, large-scale solar from the Central Valley, and geothermal from the Salton Sea, among other regions.

But if this new infrastructure is paid for solely through electricity rates, it could increase those rates significantly and potentially undermine the economy-wide transition to clean energy. Rates have already increased roughly 50% over the past three years for investor-owned utility customers in the state, placing political and economic pressure on state leaders to build these lines with as little burden on ratepayers as possible.[1]

In response, UC Berkeley Law's Center for Law, Energy and the Environment (CLEE) presents in this summary policy report a variety of strategies available to policymakers for financing new high-voltage power transmission in California, with the dual goals of 1) reducing costs to ratepayers and 2) accelerating transmission development. With support from Net-Zero California (NZC) and Clean Air Task Force (CATF), CLEE developed these strategies based on a literature review, legal research, multiple interviews, and a convening of transmission experts and stakeholders from government, industry and nonprofit organizations, along with examples of alternative approaches used in other states. In addition, a separate financial analysis by DH Infrastructure and EE-Analysis (see Appendix 2) quantified the potential ratepayer savings of public transmission financing and development models compared to a business-as-usual investor-owned utility scenario, which further informed this report. A more detailed memo, including selected financing options and their specific challenges, can be found in Appendix 1 on page 16.

OVERVIEW: STATUS QUO FINANCING IN CALIFORNIA

Transmission financing strategies employed in California currently include:

- **Investor-owned utility financed and ratepayer funded:** When investor-owned utilities (IOUs) build transmission lines, they pass the cost to consumers through Transmission Access Charges on ratepayers' electricity bills. In California, these utilities include Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E), which recover the costs, along with a guaranteed rate of return, from ratepayers.[2]

- **Private developer funding:** Some transmission projects are funded entirely by private sources, such as when energy project developers finance the transmission they need in conjunction with their projects. These private transmission line owners then receive revenue through the same California Independent System Operator (CAISO) Transmission Access Charge that utilities use.

NOVEL FINANCING STRATEGIES FOR CALIFORNIA

As this report details below, the state could expand or adopt innovative transmission financing strategies to reduce costs, such as:

- **Public co-development:** Public-private partnerships (PPP, or "P3" as used in this report) arrangements, in which both public entities and private developers participate, can be structured in different ways, including:

    - A lease-type P3, in which a government-owned holding company or special purpose vehicle provides financing for the transmission asset but hires a private company to operate the assets.
    - A concession-type P3, in which a government-owned asset is designed, built, operated and financed by a private company over the life of the asset, and then ultimately returned to government at the end of the concession agreement.

- **Public ownership:** Some states have established public agencies that can finance and own transmission lines, including through bonding and other financing authority. These agencies can also participate in public-private partnerships.

As DH Infrastructure details (see Appendix 2), the use of these types of public sector financing, along with targeted institutional changes, can reduce the cost of California's needed transmission build-out by tens of billions of dollars over the next two decades.

KEY FINDINGS AND IMPLEMENTATION CONSIDERATIONS

CLEE convened expert participants to help identify which of these novel financing strategies would be most feasible for California to adopt. Participants included representatives from the California Public Utilities Commission (PUC), the California Independent System Operator, California Natural Resources Agency, non-governmental organizations (NGOs), ratepayer advocacy, the state legislature, and clean energy industry groups, among others.

The convening discussion, and follow-up research and outreach, yielded a number of key findings:

1. **Some form of public-private partnership could provide significant benefits to deploying lower-cost transmission, due to cost-savings potential and the ability to leverage existing institutions and structures**. Exactly which form such a partnership should take is not certain without more detailed evaluation. As noted above, a number of possibilities and considerations exist, and the form of P3 may depend on the particular transmission line, developers, and other project-specific circumstances. However, the basic components of public investment would remain consistent, such as bonding authority and a general P3 structure. Variation may exist in terms of which entity issues the bonds and which sub-elements of a P3 structure meet the needs of the projects and the State.

2. **An example of P3-type financing is the "Citizens-Morongo Model,"** named after the two companies involved, Citizens Energy (a non-profit that shares proceeds with communities) and Morongo Transmission (owned by the Morongo Band of Mission Indians). These groups partnered with utilities SDG&E and SCE to build transmission. The utilities agreed to sell a 30-year leasehold interest to Citizens-Morongo, making Citizens-Morongo a participating owner of transmission assets that the utilities continue to operate. The Federal Energy Regulatory Commission (FERC) approved the ability of Citizens-Morongo to finance with 100% debt rather than a combination of debt and equity, given that these entities do not otherwise have easy access to equity. The Federal Energy Regulatory Commission also approved a fixed, 30-year transmission rate, and Citizens-Morongo's ability to share proceeds with the community helps engender crucial local stakeholder support. Expanding this Citizens-Morongo option to apply more broadly across California will require better understanding of any possible tradeoffs, cost savings, limitations, risks, and streamlining benefits.

3. **Policymakers may endow an existing entity with transmission financing and related P3 authorities, rather than create a new entity.** Currently, California has multiple entities with at least some role in transmission, including the California Independent System Operator, California Public Utilities Commission, California Energy Commission (CEC), California Infrastructure and Economic Development Bank (IBank), and Department of Water Resources. Creating a wholly new public entity, or endowing an existing agency, in California to finance and oversee transmission would entail administrative and procedural changes, which may be more significant for a new public entity.

Any change in the status quo for transmission financing in California will face a number of implementation challenges. Notably, the following considerations are relevant regardless of the structure or entity that holds authority over transmission financing and oversight:

- **Impact on investor-owned utilities.** Under the current system, as noted, these utilities receive a guaranteed rate of return on investment from transmission construction. This return represents a key source of their revenue.

If a different approach to financing precludes or reduces that rate of return, policymakers will need to evaluate the impact on the financial viability of the investor-owned utilities.

- **Public-private partnership concerns in the California Legislature.** Legislators may have concerns about authorizing public-private partnership approaches, in part due to a perception that they require the government to assume private-sector risk while lacking private-sector expertise. However, legislators widely recognize the need to reduce both the cost of transmission and the implementation time. Public-private partnerships could potentially offer some relief for both, and these partnerships already exist in many forms.

- **Lack of clarity on which public entity would lead.** If a public or governmental entity is to have a significant role in transmission financing, policymakers will need to determine whether to create a new entity or if they should provide additional authority to an existing agency or department. In either case, legislators will need to determine the extent of the authorization and responsibilities.

- **Relationship of any new state authority to existing authority.** Agency review and control over transmission siting and related issues is complex and time-consuming, with significant roles for the California Independent System Operator, California Public Utilities Commission, California Energy Commission, and other entities. The role of a new governmental entity, or an existing entity with additional authority, will need to be integrated into the current framework in a manner ensuring clear authority, while not exacerbating current financial and governance challenges.

- **Asset ownership.** If the state is a key part of financing transmission, it will need to determine if it should own some part of the asset. Ownership could be determined through negotiation at various energy agencies, or directly among interested parties, for each transmission line or through legislation, which can also serve to limit public liability for any operational risks.

- **Liability ownership.** With ownership, the issue of liability becomes central, particularly given the role of transmission lines in catastrophic wildfires. Liability could be determined through negotiation or legislation, or a combination of the two. Liability can also be determined differently for specific harms, such as liability for fire versus for injuries from downed power lines.

- **Inverse condemnation**. If a governmental entity has an ownership interest in transmission lines and some form of liability for harm from the lines, policymakers could consider reforms to limit the scope or applicability of inverse condemnation claims for damage to property caused by fires resulting from the lines, as the IOUs currently face.

- **Possible opposition from organized labor.** Public utility unions are often closely tied to the IOUs, and different models of transmission ownership or financing could make the IOUs' financial position, and associated union jobs and pay, more uncertain. Legislative leaders would need to conduct ongoing

engagement and discussion with these unions to ensure their participation and recognition in new models.

- **Availability of engineers.** Most engineers are employed by private developers. Public entities could face challenges hiring engineers with the requisite experience and expertise, which may be a factor in the role of any government entity in overseeing transmission lines and systems.

- **Eminent domain authority.** Eminent domain authority is essential for building new transmission lines, so which entities have that authority, particularly in the P3 context, is a crucial element in determining agency authority and responsibility.

RECOMMENDATIONS

Based on the convening discussion and CLEE research, this report offers the following potential solutions to the identified challenges:

1. **Focus on demonstrating alternative financing arrangements for four to six key transmission regions** and lines in the California Independent System Operator's 20-year transmission outlook that most stakeholders agree are essential. Commonalities and differences among proposed locations, developer options, and other considerations for transmission lines will likely impact potential approaches to financing (see "next steps" below). For example, the potential large-scale solar development in the Westlands Water District area of Fresno County (approximately 110,000 acres with 15-20 gigawatts of solar) may be an ideal project to consider and evaluate, given the need for new transmission as part of the large-scale build-out and the current work to move forward with the project (see "next steps" below).

2. **Engage the Governor's Office to designate a coordinator for high priority lines and support a process to speed implementation and financing.** This approach worked well when Governor Schwarzenegger designated a coordinator for large-scale solar projects, making solar a statewide priority. The coordinator convened meetings with federal, state, and local government officials as well as stakeholders, coordinated state agency participation, and mediated disputes.

3. **Establish a liability backstop for the entity or entities owning new transmission.** As precedent, the California Legislature has established a liability backstop based on actions to reduce fire risk for the IOUs for the existing transmission system.

4. **Minimize risk through insurance, contract, indemnity, and first loss protection, and other mechanisms**, subject to negotiation and legislation, as New Mexico has done through its Renewable Transmission Authority (RETA), discussed in Appendix 1 on page 16.

5. **Modify California Independent System Operator rules to allow for an additional competitive bid process**, opening more transmission to

private development and private funding. Under existing California Independent System Operator rules, some (albeit few) potential transmission lines are already eligible for competitive bids by private developers. The operator has sufficient existing authority to expand the lines eligible for competitive bidding.

6. **Explore credit enhancements from the state or federal government.** Credit enhancements have encouraged investment and reduced borrowing costs in multiple contexts. Examples could include the establishment of a state loan loss reserve, loan guarantee, or loan loss insurance to improve the creditworthiness of private transmission developers seeking financing. The U.S. Department of Energy's Loan Programs Office can also issue credit enhancements to state-administered clean energy programs.

7. **Assess opportunities to finance some transmission lines through general obligation (GO) and revenue bonds**, the former funded by taxpayers through the budget process to build needed infrastructure while reducing transmission costs included on ratepayer bills. However, a GO bond approach should only be implemented after serious consideration because relying on budget and legislative processes for funding can be politically fraught. Legislators could also explore issuing revenue bonds, which do not require voter approval and are used to finance income-generating projects built with the proceeds of the bonds.

8. **Explore options for applying existing federal models to California.** Specifically, convening participants noted that the Western Area Power Administration (WAPA) could potentially finance transmission, or a state version of WAPA could be established (potentially within the Department of Water Resources) to finance transmission and provide electricity at a wholesale rate to municipal utility customers and community choice aggregators. This model is somewhat novel and warrants further evaluation.

CONCLUSION:

Reducing the cost of building needed transmission lines will only become more critical in the coming years, as electricity rates increase due to the strain of climate impacts on the grid and the large build-out required to electrify most energy needs. California policymakers can play a leading role in addressing this issue by exploring alternative options for transmission, potentially by starting with key, high-priority lines. Through an inclusive process, decisionmakers have an opportunity to meet the needs of various stakeholders while accelerating the urgent construction of these lines. Ongoing research, convening, and implementation efforts can lay down a foundation for future work in California, serving as a model for other states and regions interested in pursuing alternative financing.

REFERENCES

1 *See* "2024 Q2 Electric Rates Report," California Public Advocates Office. Available at: https://www.publicadvocates.cpuc.ca.gov/press-room/reports-and-analyses/2024-q2-electric-rates-report (accessed October 18, 2024).

2 Nationwide, electric utilities averaged a 9.71% rate of return in rate cases in the first quarter of 2023, up from an average of 9.54% in 2022. Dan Lowrey, "Electric Beats Gas in Exceeding Authorized Equity Returns over Past 15 Years," S&P Global, May 25, 2023. Available at: https://www.spglobal.com/marketintelligence/en/news-insights/research/electric-beats-gas-in-exceeding-authorized-equity-returns-over-past-15-years#:~:text=The%20average%20ROE%20authorized%20for,observed%20in%20full%20year%202022. (accessed September 9, 2024).

II. APPENDIX I: APPROACHES TO TRANSMISSION FINANCING

This appendix explores options to reduce the cost and time needed for expansion of the electric transmission system within the state of California, as well as the hurdles and challenges to the various options.

The report includes (1) information on the transmission development and financing process in California, (2) a survey and evaluation of financial instruments that may be used to finance transmission, and (3) an initial assessment of potential policy options for California, including options for public financing and public-private partnerships. Finally, the report sets out some initial legal and administrative considerations for various policy solutions.

The cost of transmission in California, currently borne primarily by utility ratepayers, is expected to increase by $45 to $60 billion over the next two decades, potentially spiking California's already high energy rates.[3] Key strategies for reducing this cost include public financing of transmission, public-private partnerships, green banks, credit enhancements (such as loan guarantees), and adoption of technologies that expand the capacity of existing transmission (such as reconductoring). In addition, moving some transmission costs from ratepayers to taxpayers could reduce the burden on electricity rates.

Each strategy has risks and benefits, so some mix of approaches may provide the most value. For example, a new government transmission agency may be best suited to finance major transmission lines that decision-makers have determined to be essential for California's energy grid and renewables deployment, while some form or combination of public and private financing and loan guarantee through the California Infrastructure and Economic Development Bank (IBank) or other state institution may make sense for a subset of transmission needs. This appendix details some of the key risks and benefits, including cost savings, cost to state agencies, need for ongoing expertise, relation of a new agency to existing agencies, state budget uncertainties, risks associated with loan guarantees, impact of loss of revenue for investor-owned utilities, and liability around public ownership of transmission lines, among other considerations.

In light of the cost burden to ratepayers of the current approach to transmission, reforms are essential, and forms of public finance and direct public participation, including some role for a state transmission agency, provide possible benefits and challenges worth exploring.

CALIFORNIA NEEDS MORE TRANSMISSION CAPACITY

In 2022, the California Independent System Operator (CAISO) approved 23 new transmission projects, with an estimated cost of approximately $3 billion.[4] In its 2022-2023 Transmission Plan, the California Independent System Operator identified a further need for $7.53 billion in transmission projects.[5] This figure was based on studies indicating that California will need to add 40 gigawatts to the grid within a decade and 70 gigawatts by 2032 in order to maximize economy-wide electrification, particularly in the transportation and building industries.[6] Looking even further into the future, the California Independent System Operator's 20-year Transmission Outlook estimated that approximately $45 to $60 billion in investment over the next two decades will be necessary for California to reach its greenhouse gas emission reduction targets.[7]

But because transmission development is capital-intensive, access to capital remains a hurdle for would-be developers of transmission infrastructure in California. Under the current system, most transmission is financed by investor-owned utilities (IOUs) and paid for by utility ratepayers. Ratepayers also pay for a rate of return for the IOUs for each project, which can average close to 10%.[8] This rate creates a significant and increasingly unsustainable burden on ratepayers as more necessary transmission lines are constructed. As a result, policymakers should consider and evaluate other options to transmission financing, including public financing, to meet California's objectives.[9]

At the same time, the monetary value of new transmission is increasing because it will help relieve more grid congestion.[10] In 2022, estimated savings from transmission expansion reached a decadal high of $200 to $300 million per 1000 MW of transmission capacity (or $23 to $34 per MWh), varying by region.[11]

PUBLIC FINANCING COULD HELP MEET CALIFORNIA'S TRANSMISSION NEEDS AFFORDABLY

In a recent analysis, the Public Advocates Office of the California Public Utilities Commission (CPUC) estimated that California ratepayers could save up to $28 billion over the coming decades "if California's transmission infrastructure is financed with public investment as opposed to traditional utility-financing."[12] These savings to ratepayers from public financing result from public sector access to lower interest rates, replacing equity in project financing, and reducing taxes owed. The State of California has a better credit rating than do California's IOUs, which makes it easier for the State to raise capital compared to IOUs.[13] In addition, as noted above, IOUs receive a significant rate of return that adds substantial cost and creates an incentive for IOUs to pursue full build-out of transmission projects when alternatives such as reconductoring could be more appropriate. Financing through public bonds can also be tax free, yielding additional savings. Public financing would therefore relieve some of the burden on utility ratepayers. Finally, public financing combined with legislative reform focused on transmission lines determined to be essential to California's clean energy needs

could also streamline build-out, resulting in additional cost savings and accelerating uptake of renewables.

Given the potential benefits of public and public-private financing, this report explores its various pros and cons and implementation considerations, including the creation of wholly new state agencies, expanded authorities for existing agencies, and leveraging municipal and federal agencies that have the potential to finance transmission.

TRANSMISSION OVERVIEW: A LENGTHY, EXPENSIVE, AND COMPARTMENTALIZED PROCESS

This section briefly surveys the transmission development process as context for discussion of transmission financing. Transmission development requires that a project survive an extensive and burdensome regulatory process before federal and state agencies.

Developing Transmission in California

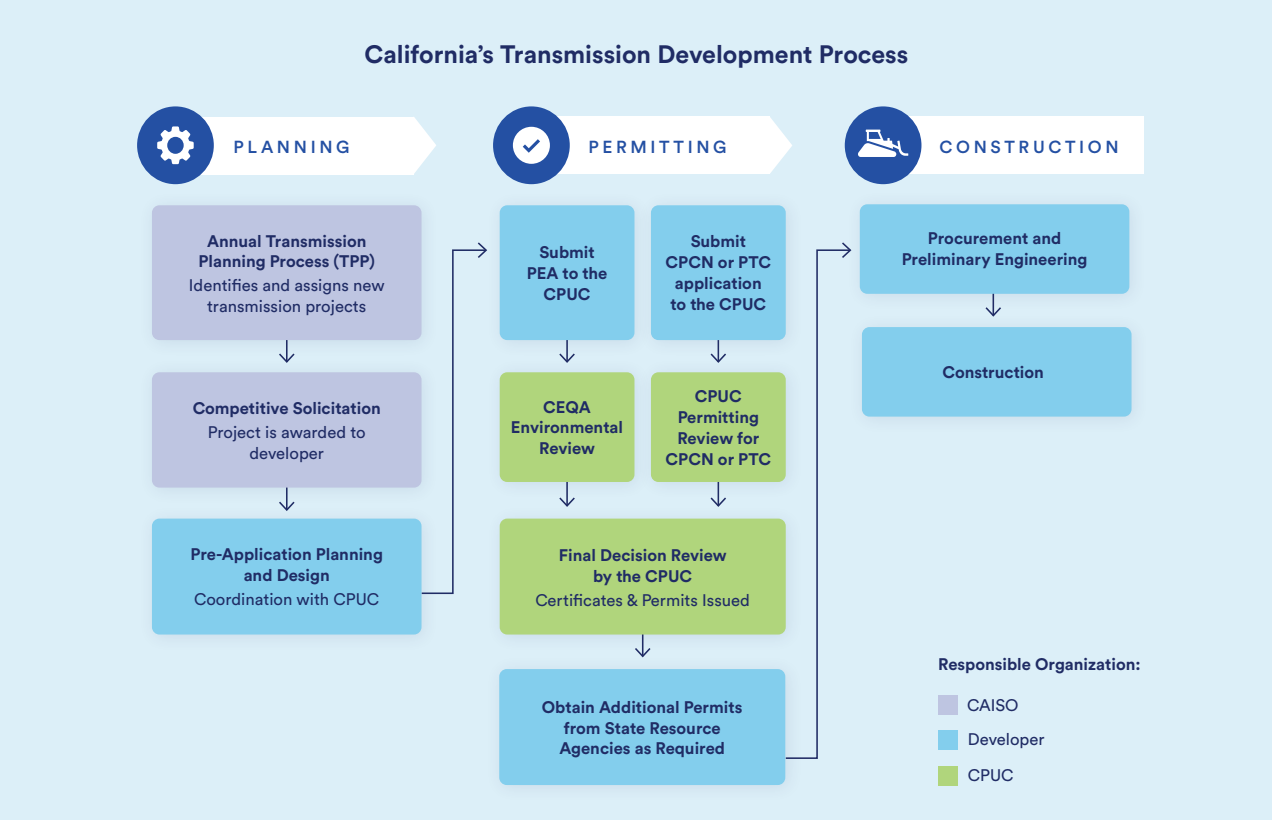

Figure 1: chart from the Clean Air Task Force (Transmission Development in California – What's the Slowdown [Jan 2023]) showing a simplified version of the transmission development process. This chart excludes the Federal Energy Regulatory Commission process for setting rates for interstate/high voltage transmission lines.

Transmission development in California is a lengthy, expensive, and historically "reactive and compartmentalized" process (see Figure 1).[14] It involves the participation of three primary parties: the transmission project developer, the California Public Utilities Commission, and the California Independent System Operator, plus the Federal Energy Regulatory Commission (FERC) when developing high-voltage interstate transmission lines.[15]

First, the California Independent System Operator performs its annual Transmission Planning Process (TPP) to determine which transmission projects are needed on the grid.[16] Through competitive solicitation, the operator awards a project to a particular developer.[17]

The developer coordinates with the California Public Utilities Commission on planning and design for its project before it officially submits its application.[18] Then the developer submits its application for a Certificate of Public Convenience and Necessity (CPCN) or for a Permit to Construct (PTC).[19] The developer also submits its Proponent's Environmental Assessment (PEA) to the California Public Utilities Commission.[20] After receiving the PEA, the commission performs environmental review pursuant to the California Environmental Quality Act (CEQA).[21]

Following its review of the developer's application and its environmental review under CEQA, the California Public Utilities Commission issues a final decision. If the commission decides to approve the project, it issues the relevant certificates and permits.[22] The developer obtains any other necessary permits from state natural resource agencies and then begins procurement, engineering, and construction.[23]

In addition to California state regulations, federal law also applies to transmission projects that implicate "the transmission of electric energy in interstate commerce," placing them within the reach of the Federal Power Act.[24] The Federal Energy Regulatory Commission (FERC) has jurisdiction "over all facilities for such transmission … of electric energy."[25] The Commission also has authority over the transmission revenue requirement, as the agency's jurisdiction covers the establishment of the transmission revenue requirement through the Transmission Access Charge. But the Commission does not have jurisdiction over facilities "only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter."[26] In other words, purely intrastate transmission projects that do not connect to the interstate grid are not subject to Federal Energy Regulatory Commission jurisdiction, but transmission projects that cross state lines or connect to the interstate grid are subject.[27]

Transmission Process Challenges

Beyond navigating the complex transmission permitting process, the transmission development process at both the federal and state levels encounters other legal and regulatory hurdles that can lengthen approval and development timelines and increase cost and risk for developers and ratepayers.

Federal Challenges

Where lines are subject to federal approvals, three primary obstacles can hinder transmission development. First, if lines travel between California and neighboring states, the siting and approval process for those interstate transmission lines is divided among various state and local jurisdictions, making it more difficult for developers to acquire all necessary approvals and increasing the likelihood that one jurisdiction will block transmission even if all the other jurisdictions support the project.[28] Second, the interconnection process is considered "speculative and opaque" because applicants are "unsure of the cost of interconnection until the [grid impact] studies are complete."[29] These studies and the energization process can create considerable uncertainty for and discourage developers. Third, where federal review is needed, lack of federal agency capacity to process permits can increase transmission development timelines.

California Challenges

As identified by the Clean Air Task Force in 2023, similar challenges for timely and cost-efficient transmission development exist for state-level approvals in California as well. Project dates "frequently stretch beyond completion dates anticipated by the California Independent System Operator."[30] Of thirteen projects reviewed in that publication, two were completed but delayed, two were canceled or put on hold by the California Independent System Operator, eight were delayed and incomplete, and one is incomplete but on schedule.[31] Moreover, between 2013 and 2017, estimated final costs of CAISO-approved projects were 33% higher on average than the original costs submitted to the California Public Utilities Commission for those projects.[32] In the California context, three key stages of the process that create most delays include preparation of the project application, California Public Utilities Commission environmental review, and federal agency review, when applicable.[33]

Recent agency coordination and legislation may help address delays and inefficiencies and drive down costs in the transmission development process. In December 2022, the California Independent System Operator, the California Public Utilities Commission, and the California Energy Commission (CEC) entered into a Memorandum of Understanding with the goal of better coordinating transmission and resource planning and implementation across the state.[34] For example, the California Independent System Operator committed that its transmission planning process would "consider and incorporate the scenarios and portfolios developed by the [California Public Utilities Commission] with input from the [California Energy Commission]," and the California Public Utilities Commission in turn agreed that its "siting/permitting process will then give substantial weight to project applications that are consistent with the [Independent System Operator's] final transmission plan."[35] Although it remains to be seen how the CAISO-CPUC-CEC Memorandum of Understanding will actually affect the transmission planning and development process over the medium- and long-term, better interagency coordination may help streamline the onerous approval and development process.

In October 2023, Governor Newsom signed Senate Bill 410 (Becker) to expedite interconnection.[36] The new law requires that the California Public Utilities Commission establish "reasonable average and maximum target energization time periods … and a procedure for customers to report energization delays to the PUC" by September 30, 2024.[37] SB 410 also mandates that the Commission require electrical corporations to

"take remedial actions necessary to achieve the [CPUC's] targets" and that "all reports … be publicly available[.]"[38] In light of recent supply chain bottlenecks that have slowed grid buildout, SB 410 mandates that the Commission formulate and follow "realistic standards" for supply chains and workforce development.[39]

TRANSMISSION FINANCE OVERVIEW

Who Finances Transmission Today

Transmission lines in the U.S. are primarily owned by private, for-profit companies including IOUs, although a minority are owned by public entities including the federal government, municipally-owned utilities, and member-owned electric cooperatives.[40] Most transmission development projects are taken on by incumbent transmission owners, rather than through competitive solicitation.[41] Accordingly, the development of transmission lines is primarily financed up-front by private parties, with IOUs.[42]

Utilities have accelerated their nationwide spending on transmission in recent years, a trend also reflected in California. The California Independent System Operator's 2022-2023 Transmission Plan proposed 45 new transmission projects for California at a combined estimated cost of $7.3 billion.[43] IOUs are already raising capital to build out new transmission lines. For example, in March 2024 PG&E filed a request to raise up to $1 billion for transmission "by leasing parts of its transmission assets to Citizens Energy, a non-profit power provider" with the California Public Utilities Commission.[44]

Public funding of transmission has begun to take on a more prominent role in recent years, particularly at the federal level. The U.S. Department of Energy (DOE) now offers a $2.5 billion Transmission Facilitation Program for revolving loans, a $2.3 billion Grid Resilience State and Tribal Formula Grant Program, and a $3.25 billion Western Area Power Administration Transmission Infrastructure Program.[45] On October 18, 2023, DOE also announced $3.5 billion in Grid Resilience and Innovation Partnerships Program investments, including substantial funds for transmission.[46]

Like the federal government, the state of California has also started to expand public financing options. For example, in 2020, the California Legislature created a $47 million Climate Catalyst Revolving Loan Fund within the California Infrastructure and Economic Development Bank (IBank).[47] The Climate Catalyst Revolving Loan Fund, discussed further below, is a "green bank" intended to support small-scale renewable energy projects and vested with authority to finance transmission.[48]

Transmission costs may also be reduced by innovative engineering approaches, which may inform policymakers' decisions regarding financing policies. For example, reconductoring, or replacing the conductors in existing transmission lines with newer conductors that carry more current, can be a cost-efficient way to increase overall transmission capacity. Reconductoring is eligible for federal loans from DOE under Section 1706 of the Inflation Reduction Act, which establishes the Energy Infrastructure Reinvestment loan program (discussed further below).[49] Notably, reconductoring has not yet been widely adopted nationwide as a strategy to increase transmission capacity, in part because of the dominance of the utilities in the transmission space. Utility companies "earn a guaranteed rate of return on the cost of capital investments such as trans-

mission projects, giving them no reason to strive to reduce those costs," according to the DOE.[50] And because the utilities "don't bear the costs of transmission line losses, which are passed on to customers," they have "little incentive to choose projects that emphasize those long-term savings."[51]

Studies show that reconductoring, along with other grid-enhancing technologies, has the ability to unlock capacity and facilitate interconnection without requiring the construction of entirely new transmission lines.[52] To address the challenge, Federal Energy Regulatory Commission Order 1920 now requires regional transmission planners to consider grid-enhancing technologies (GET) and other advanced grid technologies.[53] However, even if transmission planners pursue these options, the grid will require significant new transmission infrastructure to meet renewable energy deployment goals.

How Transmission is Financed Today

The following table summarizes current and potential instruments for financing transmission projects as well as their primary benefits and drawbacks.

MECHANISM	PROS	CONS
Ratepayer charges: When IOUs build transmission lines themselves, they pass the cost to consumers through Transmission Access Charges on ratepayers' electricity bills.	Currently enables utilities to play a leading role in transmission development with guaranteed profits that support utilities' continued financial viability as providers of electric service.	Results in high and increasing charges to ratepayers, and market distortions where ratepayers are disincentivized from investing in distribution grid assets that rely on less or no transmission.[54] For transmission projects outside of the CAISO planning process, utilities lack incentives to pursue lower-cost options like reconductoring because capital expenses are added to their rate base in ratemaking calculations. For transmission lines within the CAISO planning process, Transmission Access Charges create similar problems.
Private developer funding: Some transmission projects are funded entirely by private energy developers. As one example, a privately funded and operated TransWest wind project in Wyoming is building its own dedicated transmission line to California.	No direct taxpayer expense.	Limited capital and slow development of transmission. Could add high and increasing ratepayer costs.

MECHANISM	PROS	CONS
Public co-development: P3 arrangements, in which both public entities[55] and private developers participate, are an established means of transmission financing. For example, the New Mexico Renewable Energy Transmission Authority (RETA), discussed below, is a state agency that serves as "co-developer" with private development companies on a number of transmission lines.	Rapid deployment of investment. Some degree of public control over projects, depending on the government's ownership share.	Requires significant outlay of government funds.
Public loans: Public entities may issue direct loans to private transmission developers,[56] including by the federal government. For example, DOE is newly empowered to issue loans to transmission projects, through the Transmission Facility Financing program, under the Inflation Reduction Act. Likewise, DOE's Loan Programs Office has authority to issue loans to transmission projects.	Profit for issuing government agency.	Requires upfront outlay of government funds pending repayment.
Public bonds:[57] Public entities may issue bonds in order to raise capital for privately developed transmission projects.[58] For example, the New Mexico RETA issued $50 million in revenue bonds for transmission upgrades to the privately-operated High Lonesome Mesa wind farm.	Defers government and taxpayer expense across long timeframe.	Government and taxpayers must pay interest throughout the life of the bonds.
Credit enhancements: Private and public entities may issue[59] credit enhancements by providing a loan loss reserve, a loan guarantee, or loan loss insurance to improve the creditworthiness of private transmission developers seeking financing. DOE's Loan Programs Office can issue credit enhancements to state-administered clean energy programs "[t]hrough the State Energy Financing Institution (SEFI)-Supported category of the Title 17 Clean[60] Energy Financing Program."	Support private access to investment without directly involving public funds.	Outcomes are subject to private investment decisions outside government control.

MECHANISM	PROS	CONS
Federal funds	Substantial capital inde[61]pendent of state and private funds. Reconductoring projects are eligible for IRA Section 1706 loans.	Outcomes are subject to federal financing decisions outside state government control.

Summary of Financing Mechanisms for California Transmission

Ratepayer Charges

Ratepayers usually pay for transmission built by utilities, either through Transmission Access Charges (TAC) for projects within the California Independent System Operator jurisdiction or through regulator-approved rates for projects outside the operator's jurisdiction. A TAC is "a two-part rate for each megawatt hour of internal load and exports and is used to recover transmission revenue requirements."[62] Notably, "transmission operations and maintenance (O&M) costs account for almost 10 times more cost impact on ratepayers than the upfront costs of transmission infrastructure[.]"[63] These operations and management costs are assessed to ratepayers "for 50 years, the typical lifetime of transmission investments."[64]

In assessing TACs, the utilities do not just recoup their costs: they also turn a profit. Transmission is a capital expense, and the utility earns profits on these expenditures over a long period of time as the related asset depreciates.[65] For transmission lines not approved by the California Independent System Operator — the majority of transmission lines built in California — the capital cost of approved transmission construction is simply added to the utility's rate base for purposes of ratemaking before the California Public Utilities Commission.[66] As public utilities, IOUs earn a guaranteed rate of return on these expenses.

Ratepayer and distributed generation advocates have also criticized ratepayer charges, as currently structured, for creating market distortions that disincentivize local clean energy development.[67] Californians are charged for the transmission system even if they rely exclusively on locally generated electricity that may not require this infrastructure, therefore creating a potential disincentive to invest in the distribution grid.[68]

Bonds

Instead of passing costs directly to ratepayers, one particularly attractive option is to finance transmission by bonds issued by a government agency. These bonds can take two forms: general obligation (GO) bonds or revenue bonds.

GO bonds are paid out of the state general fund and are guaranteed by the full faith and credit of the state.[69] GO bonds must be approved by a majority of the electorate voting at a general election or direct primary.[70] By contrast, revenue bonds are used "to finance an income-generating project, such as water projects, higher education facilities or other public facilities built with the proceeds of the revenue bonds."[71] Income generated by the underlying project pays the principal and interest on its

related revenue bonds.[72] Unlike GO bonds, revenue bonds do not require voter approval, and the state's full faith and credit and taxing power are not pledged towards the repayment of revenue bonds.[73]

A lease revenue bond is a subtype of revenue bond where the "revenue stream paying the debt service on the bond is created from lease payments made by the occupying department to the governmental financing entity which constructs the facility or causes it to be constructed."[74] Regardless of whether the state agency in question issues revenue bonds or lease revenue bonds, it would not need a vote of the electorate to do so.[75] However, from the point of view of an investor, GO bonds have historically been considered "more secure" compared to revenue bonds "because they are backed by the full faith and credit" of the government.[76]

Additionally, the bonds issued by a state authority to support transmission projects may be classified as "green bonds." Green bonds can be unique from other governmental infrastructure bonds in that "(a) they finance projects that reduce/mitigate environmental impacts; (b) offer sufficient, if not robust, project detail in the Official Statement; and (c) ideally, offer an annual disclosure on the funded project's environmental impacts."

As compared to rate-based transmission funding, bonds have advantages and disadvantages. Historically, bonds have been used by government entities to finance large, capital-intensive infrastructure projects for two primary reasons: (1) the total sum is difficult to raise at once and (2) the paid-for project will provide benefits over a period of years, so policymakers consider it fair to make future generations of taxpayers pay their share.[77] Additionally, most state bonds are tax-exempt, meaning that bondholders do not have to pay federal and/or state taxes on the interest they earn.[78]

For energy projects specifically, bonds are often selected as a financing option "because they are familiar, offer low borrowing costs, and have longer terms."[79] Bonds offer "security (e.g., assurance repayment will occur)[.]"[80] If bonds are tax-exempt, their tax-exempt status "often translates to lower borrowing costs compared to alternative financing options."[81] In the transmission context, it may be easier for government agencies to issue bonds than to directly loan or appropriate the full sum it seeks to use to finance a transmission project.

Additionally, the long-term nature of transmission investments is consistent with common justifications for bond financing. Transmission projects are likely to be durable in the long-term, since they can last up to 100 years if properly maintained. This longevity is consistent with the idea that future generations of taxpayers will benefit from, and therefore should contribute to paying for, bonds.[82]

Because bond issuances involve relatively fixed transaction costs (ranging from 1-3% of bond proceeds depending on the size of the issuance), bonds are more cost-efficient "when used for larger dollar amount projects that can achieve economies of scale."[83] Individual transmission projects may be sufficiently large to benefit from relatively low transaction costs of bonding.[84] Or a "pooled" bond issuance comprising multiple issuances for multiple projects would "reduce the transaction cost per dollar of … renewable energy work financed[.]"[85]

When comparing state bonds to state loans, the state could directly loan funds to transmission developers rather than first issuing bonds to raise capital. This approach could be preferable because the government must pay interest on bond financing, but it does not have to pay interest on appropriations.[86]

Ratepayer Perspective: Rates v. Bonds

An important consideration for policymakers is the relative cost of ratepayer-funded transmission as compared to taxpayer-funded transmission to low-income Californians.

Electricity rates are subsidized for qualifying low-income California ratepayers. Under the California Alternative Rates for Energy (CARE) program, low-income ratepayers are entitled to a 30-35% discount on electric bills.[87] In order to qualify, ratepayers must have household incomes below certain thresholds or be enrolled in certain public assistance programs like Medical or SNAP.[88] In light of potential equity concerns, the relative burden of ratepayer financing versus bond financing to low-income Californians will likely be an important topic for future research and a key consideration for policymakers choosing between financing mechanisms. This issue is particularly important given that electricity prices rose 5% over the last year, faster than inflation and the price of any other single commodity, partly due to the costs of transmission. [89]

Credit Enhancements

A credit enhancement is any mechanism that "improves the chances that financing will be repaid."[90] For example, a credit enhancement can take the form of a loan loss reserve, a loan guarantee, or loan loss insurance.[91] Credit enhancements can be used by state governments, the federal government, and private entities.

According to the U.S. Environmental Protection Agency, state governments usually offer credit enhancements either through (1) loan loss reserves (LLR) or (2) interest rate buy-downs (IRB).[92] A LLR is a state government reserve of funds that "will cover a pre-specified amount of loan losses."[93] An IRB is a type of credit enhancement in which the government buys down the market interest rate of a loan by making a payment to the lender, making the loan easier to pay.[94]

MODELS FOR STATE TRANSMISSION FINANCE REFORM

This section of the report discusses various ways that California policymakers can either form new agencies, build out the capacities of existing agencies, or otherwise provide public support to accelerate transmission development. Potential institutional and policy solutions for public financing and other support of transmission in California are summarized as follows:

GOVERNMENT ENTITY	IMPLEMENTATION PATHWAY
A new California "Renewable Energy Transmission Authority"	Create authority to develop public transmission projects or co-develop private transmission projects. Create authority to issue bonds to raise revenue.

GOVERNMENT ENTITY	IMPLEMENTATION PATHWAY
A new California "Green Bank"	Create authority to issue loans.
New municipal-level "Green Banks"	Create authority to issue loans.
California Infrastructure and Economic Development Bank (IBank)	Expand existing authority to issue loans and credit enhancements.
California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA)	Expand existing authority to issue bonds and loans.
California Public Utilities Commission (CPUC)	Create authority to redirect AB 1373 funds from direct power procurement to transmission financing.
Department of Water Resources (DWR)	Expand authority to use transmission lines and establish clear authority to construct transmission lines.
Federal government	Coordinate state government support of public and private applications for strategic loans and project development assistance from the federal government.

Forming New or Expanding Existing Agencies

The California Legislature could consider forming new agencies, including a Renewable Energy Transmission Authority, that could serve as a public transmission developer or a statewide "Green Bank," or authorize municipalities to form their own local "Green Banks."

The creation of a new state agency, such as a Renewable Energy Transmission Authority or a California Green Bank, would raise important legal, budgetary, and governance considerations. Some of these include:

- **Enabling legislation.** A new state agency would require a new organic statute, as opposed to an amendment to an existing agency's organic statute.
- **Budget demands.** A new state agency would require appropriations to build up its staffing, capacity, and physical resources.[95]
- **Governance design.** Creating a new agency would require policymakers to consider how to allocate decision-making authority, for example by establishing a supervisory board or commission with members appointed by the governor or selected by the governor and legislature together.
- **Relationships with existing entities.** Creating a new agency with transmission mandates would require policymakers to consider how to eliminate duplication or avoid interference with the responsibilities of existing bodies such as the California Independent System Operator, the California Energy Commission, and the California Public Utilities Commission.[96]

1. A Renewable Energy Transmission Authority

California could establish a new Renewable Energy Transmission Authority (RETA), drawing inspiration from New Mexico's RETA[97] and the Colorado Electric Transmission Authority.[98] The Public Advocates Office of the California Public Utilities Commission recently recommended that California policymakers explore an infrastructure authority in the style of New Mexico's RETA as a transmission development option that would reduce ratepayer costs.[99]

a. New Mexico Renewable Transmission Authority

New Mexico's RETA was established by the state legislature in 2007 to "plan, finance, develop and acquire high voltage transmission lines and storage projects in order to promote economic development in New Mexico."[100] As of 2021, it was "one of seven state-level transmission authorities in the United States and only the second to have issued Bonds."[101] New Mexico RETA-sponsored projects must include 30% of their power from renewable resources, and current projects are planned to have 100% of their power originate from renewable resources.[102]

The Renewable Transmission Authority Act, which created New Mexico's RETA, may offer lessons for California legislators. The Act, created by House Bill 188 (2007), moved through the New Mexico legislative process with relative ease.[103] Governor Bill Richardson signed the RETA Act into law on March 5, 2007.[104]

The state's RETA is overseen by a mix of legislative and executive appointees.[105] Three members are appointed by the governor and confirmed by the state senate. One is the state treasurer or his designee, one is appointed by the speaker of the house of representatives, and one is appointed by the president pro tempore of the state senate.[106]

RETA has statutory authority to issue bonds and enter into contracts for the lease and operation of its facilities, provided that the agency deposit any revenue into a renewable energy transmission bonding fund.[107] Further, New Mexico RETA can collect payments of "reasonable rates, fees, interest or other charges" to finance the facilities and other services, with the similar deposit requirement. The agency can also borrow money and take out mortgages.[108] According to New Mexico RETA's website, the authority "derives its funding from developers based upon services provided by RETA."[109]

New Mexico RETA is not limited to financing and developing purely public projects — it also has the ability to collaborate with private developers. The organic statute specifically provides that New Mexico RETA may "enter into partnerships with public or private entities[.]"[110] New Mexico actively exercises this authority to partner with private entities on transmission lines, both as a co-developer and as a financier.

For example, the Western Spirit Transmission Line was developed jointly by the RETA and Pattern Energy Group LP, a private energy company.[111] New Mexico RETA is a "co-developer" with a private development company for each of the four transmission lines currently in development — Rio Sol, SunZia, North Path, and the Mora Line Project.[112] And New Mexico RETA provided only financial support — $50 million in revenue bonds — for transmission upgrades to the privately-operated High Lonesome Mesa wind farm.[113]

b. Colorado Electric Transmission Authority

In 2021, the Colorado Legislature created the Colorado Electric Transmission Authority (CETA) as an independent special purpose authority with Senate Bill 21-027.[114] Governor Jared Polis signed the bill into law on June 24, 2021.[115]

Opposition to SB 21-027 was primarily articulated as concern about increased costs to consumers. Xcel Energy-Colorado, the state's largest electric utility, claimed that the bill language "duplicates the existing well-established and transparent transmission planning processes" and raised "concern[] this would result in higher costs for our customers without oversight."[116] Although Xcel Energy phrased its concern about the bill in terms of cost to ratepayers, the bill would also increase potential competition for transmission development in the state. The utility had "recently proposed building a $1.7 billion, 560-mile corridor of transmission lines in mainly rural areas."[117]

Today, CETA is a "transmission builder of last resort" intended to step in where private developers are unable or unwilling to build transmission.[118] CETA has statutory authority to own property and enter into leases and contracts,[119] identify and establish transmission corridors,[120] participate in interstate transmission planning,[121] exercise eminent domain,[122] and issue and sell electric transmission bonds to raise revenue for transmission projects.[123] CETA is anticipated to receive "most of its funding from fees charged to developers and users of CETA-managed systems."[124]

Like New Mexico's RETA, CETA is governed by a mix of executive and legislative appointees, although power is shared more evenly between the two branches of government.[125] Two members of the board of directors are "appointed by the governor with the consent of the senate," one members is the "director of the Colorado energy office" or the "director's designee[,]" three members are "appointed by the speaker of the house of representatives[,]" and three members are "appointed by the president of the senate."[126]

c. Imagining a California RETA

California could implement a RETA with the same kind of flexibility that New Mexico RETA enjoys. Its enabling statute could ensure that the RETA is empowered not only to self-finance and develop transmission lines, but also to collaborate with private developers that can provide additional capital, capacity, and expertise.[127]

2. A state "Green Bank"

California could create a new, public "Green Bank" dedicated to financing transmission statewide. According to the Coalition for Green Capital, a "green bank" is a governmental, quasi-governmental, or nonprofit institution that provides financing for renewable energy and/or transmission projects.[128] A number of jurisdictions have already created freestanding public green banks.[129] Some examples of jurisdictions with green banks include Nevada,[130] Colorado,[131] Connecticut,[132] New York,[133] and Washington D.C.[134] The Connecticut Green Bank, formed in 2011, is the oldest and most established.[135]

An important choice policymakers face when establishing green banks is whether to form them as independent nonprofits or as agencies of the state government. Some green banks are nonprofits created by, but legally separate from, the state government. For example, the Nevada Clean Energy Fund was formed by Nevada's SB 407 (2017) as an independent nonprofit and launched in January 2022.[136] Likewise, Colorado Clean Energy Fund was created as a nonprofit in 2018 by Colorado Governor John Hickenlooper.[137] The Colorado Clean Energy Fund subsequently received a one-time $40 million appropriation from the Colorado Legislature in 2021, but otherwise remains separate from the state government.[138]

However, there are also examples of green banks created not as independent nonprofits but as government agencies. The D.C. Green Bank, for example, was created by the Green Finance Authority Establishment Act of 2018 (D.C. Law 22-155), which established a "Green Finance Authority" within the District government.[139] Likewise, the New York Green Bank is an entity of the New York state government — it is a division of the New York State Energy Research and Development Authority.[140]

In the view of the Coalition for Green Capital, California already has at least one green bank. The Coalition identifies the California Infrastructure and Economic Development Bank (IBank)'s Climate Catalyst Revolving Loan Fund, established in 2022 with $47 million in capital, as a green bank.[141] Therefore, the creation of a new, standalone California green bank could arguably be unnecessary and duplicative of IBank's existing Climate Catalyst Fund.

But there may be advantages to the Legislature creating a new green bank, either as a state government-supported nonprofit or as a state government authority or agency, dedicated to transmission finance rather than building off of the Climate Catalyst Fund. Benefits of a new, transmission-focused green bank may include a greater amount of capital available for projects and increased willingness on the part of a new green bank to fund large, institutional projects rather than smaller, riskier projects which the Climate Catalyst Fund was intended to support.[142]

3. Municipal-level Green Banks

Instead of (or in addition to) a single, statewide green bank, California might decide to allow municipalities to create their own green banks. Municipal green banks can increase the availability of local capital, but this capital would likely be less than a single statewide green bank, and potentially contribute to more piecemeal financing than a statewide green bank.

Municipal-level public banking is an emerging practice in California[143] since the passage of Assembly Bill 825 (2020), which created a process for a local agency to establish a public bank.[144] The text of AB 825 makes it clear that the Legislature intended municipal banks to serve the public interest: "achieving cost savings, strengthening local economies, supporting community economic development, and addressing infrastructure and housing needs for localities[.]"[145]

Because they are governmental and not private banks, municipal banks can be subject to the political priorities of the municipal constituency and directed to finance particular issues, which could include clean energy infrastructure. Therefore, some experts

have noted the potential for municipal banks in California to finance transmission[146] in addition to other renewable energy projects.[147] Municipal-level green banking might also lead to an increase in the community's engagement with, awareness of, and investment in transmission projects of local significance (recognizing that it could also engender additional local opposition).

In addition to generic municipal banks that can choose to support transmission projects — which is now possible under AB 825 — the California Legislature could go even further and explicitly authorize municipal green banking by providing statutory language directed towards the financing of renewable energy projects including transmission lines.

Virginia is already experimenting with this type of municipal-level "green" banking. In March 2021, Virginia passed a law allowing municipalities to create their own green banks.[148] Virginia municipal green banks may do the following:

- Finance investment or support of investment in clean energy technologies to foster the growth and development of renewable energy sources[149]
- Stimulate the demand for renewable energy and the deployment of clean energy technologies that serve end-use customers[150]
- Provide financing or financial support for clean energy technologies[151]

To date, municipal green banks have "focus[ed] on smaller-scale clean energy projects" and not larger projects like transmission.[152]

One model for a discrete municipal-level green bank can be found in the Philadelphia Green Bank,[153] the "nonprofit green bank affiliate" of the Philadelphia Energy Authority, an independent municipal authority focused on energy affordability and sustainability in the City of Philadelphia.[154] The Philadelphia Green Bank launched in 2021 with $250 million to invest.[155] Like Virginia's municipal-level green banking, the Philadelphia Green Bank is aimed mostly at smaller-scale projects: "providing financing solutions that focus mainly on areas that have not traditionally had easy access to capital for green projects including low-income homes, small and medium-sized businesses, nonprofits, and multifamily buildings."[156] Municipal-level green banking may therefore either be a supplementary (not primary) source of financing for transmission or a source of financing for smaller-scale projects.

Expanding Existing Agencies

Instead of creating a wholly new state agency, California policymakers could instead expand the capabilities and legal authorities of existing agencies like the California Infrastructure and Economic Development Bank (IBank), the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), the California Public Utilities Commission, and the Department of Water Resources (DWR).

1. Expanding IBank

California could expand IBank's current authority, including its new Climate Catalyst Revolving Loan Fund, and further tailor its authorities for transmission financing.[157]

IBank is a California state agency created in 1994 to finance public infrastructure and private development.[158] One of IBank's primary functions is offering traditional infrastructure loans for projects like street repairs and water treatment plants. These infrastructure loans are currently only available to state and local government entities, not private developers.[159]

a. Loans

The Climate Catalyst Revolving Loan Fund represents IBank's first major foray into renewables infrastructure financing. According to the Climate Catalyst Fund's guidelines, the Fund prioritizes "projects that advance the state's climate goals, covering both climate mitigation (the reduction of climate harms by addressing the root causes of climate change) and climate resiliency (infrastructure investments that improve our ability to withstand and manage the effects of a changing climate)."[160]

At present, the Climate Catalyst Fund supports three categories of projects.[161] These include (1) projects "that reduce wildfire threats through forest biomass management and utilization[,]" (2) projects "that increase access to zero-carbon resources through new clean energy transmission infrastructure[,]" and (3) projects that "promote climate-smart technologies and practices across the agricultural value chain[.]"[162]

Notably, IBank's Climate Catalyst Fund already has specific legal authority to finance transmission.[163] The operative statute provides that IBank shall establish a separate "Clean Energy Transmission Financing Account" within the Fund.[164] Eligible transmission projects must meet the following conditions to receive IBank funding:

- Has at least one interconnection point within a California balancing authority area.[165]
- Has a developer or associated applicant who has previously completed a transmission project in California.[166]
- Will primarily deliver electricity to the Independent System Operator balancing authority area from clean resources located in identified resource areas that do not have adequate deliverability to a California balancing authority area.[167]
- Will support new high-voltage (200 kilovolts or higher) transmission projects or upgrades of existing transmission lines and high-voltage substations that are consistent with the state's reliability and greenhouse gas policy objectives.[168]
- Must also have entered into a project labor agreement that meets the requirements of Section 2500 of the Public Contract Code (including a prevailing wage agreement), target hiring provisions for disadvantaged workers, and offer apprenticeship utilization provisions.[169]

Priority shall be given to transmission projects that have not already been approved through the Independent System Operator's transmission planning process or projects that have not been recently studied in the Independent System Operator's transmission planning process and found to be unneeded or uneconomical.[170]

Additionally, the funded Climate Catalyst project or projects can support new resources located in the Salton Sea region.[171] The 2022 Budget Act specifically "included $250 million for transmission line project financings with an initial focus in Lithium Valley, $200 million in 2022-2023 and $50 million in 2023-2024."[172]

Ultimately, IBank would need expanded staff capacity in order to support transmission financing on the necessary scale. As of report publication, IBank had a total of 37 employees, only two of whom are dedicated to the "Climate Financing" team.[173] But to the extent that IBank already has statutory authority to provide loans to transmission projects — and likely only needs an increase in available funds and staff capacity — it could be a strong contender to lead California's public financing of transmission.

b. Credit Enhancements

Separately from its lending powers, IBank could use its credit enhancement authorities to help private transmission developers seek non-state financing by boosting the creditworthiness of those developers.[174] IBank is empowered to make credit enhancements as "financial assistance for a project."[175]

IBank has issued credit enhancements in the context of its Small Business Loan Guarantee Program, which was intended to help small businesses qualify for a term loan or line of credit.[176] This credit enhancement, as the name of the program suggests, was a loan guarantee.

Compared to public loans, credit enhancements require less initial cost because the state would be guaranteeing a loan, reserving specified funds to cover partial loan losses, or making only an initial payment against loan interest, rather than issuing a loan in its entirety. However, because credit enhancements are not direct public financing, but rather public support for private financing, the underlying financing decisions are subject to the decisions of private investors. Potentially, the state or other credit enhancement provider could impose requirements as a condition for a credit enhancement, similar to conditions imposed on bonds. Additionally, IBank would need to decide which kinds of developers receive its credit enhancements. If IBank were simply subsidizing IOU-developed transmission lines with credit enhancements, this support would probably not address the problem of rising ratepayer expenses.

2. Expanding CAEATFA

California could build off of the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA),[177] which issues some bonds to green projects.[178]

CAEATFA is a state government authority sitting at the intersection of climate and finance policy. It has five members: the Director of Finance, the Chair of the California Energy Commission, the President of the California Public Utilities Commission, the State Controller, and the State Treasurer (who chairs the authority).[179]

As it currently exists, CAEATFA has a small staff of only 25 employees, with two vacant positions.[180] Of those, 15 employees and 1 vacancy are devoted to the "CHEEF" program for energy efficiency retrofits.[181] Therefore, if CAEATFA were to assume a larger role

in transmission financing, such a mandate would likely need to be accompanied with an increase in capacity and funding.

Compared to other renewable energy state agencies, CAEATFA is a relatively established authority, formed in 1980.[182] The agency was originally named the "California Alternative Energy Source Financing Authority"[183] and was renamed in 1995 to its current name to reflect its expanded mandate.[184]

Although it is a relatively small entity, CAEATFA's statutory mission statement suggests that, with minor statutory amendments, it could be well-suited to finance transmission.[185] CAEATFA's objective is to "advance the state's goals of reducing the levels of greenhouse gas emissions, increasing the deployment of sustainable and renewable energy sources, implementing measures that increase the efficiency of the use of energy, creating high quality employment opportunities, and lessening the state's dependence on fossil fuels[.]"[186]

To that end, CAEATFA is charged with providing "an alternative method of financing in providing and promoting the establishment of both of the following:

- Facilities utilizing alternative methods and sources of energy.[187]
- Facilities needed for the development and commercialization of advanced transportation technologies."[188]

CAEATFA has an expansive toolkit that it may use to financially support deserving projects, including both bonds and loans. First, CAEATFA has broad authority to issue bonds, notes, and other obligations.[189]

Second, CAEATFA can issue loans. CAEATFA's statutory authorities also enable it to "provide financial assistance to a participating party, to enter into loan agreements with a participating party for the financing of a project including creating a lien or security interest in the property, to construct, reconstruct, renovate, replace, lease, as lessor or lessee, and regulate the same, and to enter into contracts for the sale of a project, including installment sales or sales under conditional sales contracts."[190]

CAEATFA currently issues bonds for only two purposes, neither of which relates to transmission. First, CAEATFA issues "Qualified Energy Conservation Bonds," which are tax credit bonds that "can be used for projects that reduce energy consumption in publicly owned buildings, implementing green community programs, rural development involving the production of electricity from renewable energy resources, technologies that capture and sequestration of carbon dioxide produced by fossil fuels, technologies that reduce energy use, and more."[191] Second, CAEATFA issues private activity bonds to provide long-term financing for district heating and cooling.[192]

CAEATFA would likely require a statutory amendment in order to finance transmission, regardless of whether it uses bonds or loans. Nothing in CAEATFA's organic statute specifically references transmission projects. Rather, CAEATFA is generally empowered to support "project[s]," defined broadly as "land, building, improvement to the land or building, rehabilitation, work, property, or structure … [including] machinery and equipment utilized in the state … that utilizes, or is designed to utilize, an alternative source, or that is utilized for the design, technology transfer, manufacture, production, assembly, distribution, or service of advanced transportation technologies or alterna-

tive source components."[193] The CAEATFA's definition of "project" does not include transmission infrastructure. As a result, CAEATFA cannot currently fund "projects" that only constitute transmission lines. And under its present regulations, CAEATFA only actually finances residential and commercial clean energy upgrades.[194] But with additional funding, increased staff capacity, and an explicit statutory directive to fund transmission, CAEATFA could be an important source of public financing for transmission projects in California.

3. Department of Water Resources: Building off AB 1373

New legislation, building off of AB 1373, might permit the state to finance new transmission through revenues generated from direct power procurement. AB 1373 (Garcia, 2023) empowered the DWR, when directed by the California Public Utilities Commission, to directly procure renewable energy.[195] AB 1373 promotes resources like offshore wind and geothermal energy, because those sources "often carry higher maintenance, operation, or development costs, resulting in individual Load-Serving Entities (LSEs) – companies or agencies that provide electrical powers to everyday Californians – forgoing investment[.]"[196] The legislature could relatively straightforwardly add transmission financing to the Department's authority.

a. California Public Utilities Commission

Under AB 1373, the California Public Utilities Commission has authority to identify procurement needs through the existing Integrated Resource Planning (IRP) process and request that the Department of Water Resources procure needed resources after six months.[197] This six-month window is intended to allow other load-serving entities to procure their share of their load if they elect to do so, a long-held principle previously applied to community choice aggregators (CCAs).[198]

Importantly, AB 1373 contains two new financial authorities.[199] First, the bill gives the California Public Utilities Commission the authority to impose a non-bypassable charge to ratepayers to cover the Department of Water Resources' procurement costs, as long as the commission finds that the charge would not "unreasonably increase costs to customers[.]"[200] A new "Eligible Energy Resource Central Procurement Fund" will receive these customer charges and support the Department's procurement activities.[201] Second, AB 1373 gives the Department the authority to issue bonds, if necessary, to fund upfront costs for its central procurement activities.[202] These bonds will be repaid with the ratepayer charges received by the Clean Energy Procurement Fund.[203]

Through these authorities, the bill can provide a stepping-stone for the Department to play a prominent role in transmission development. In particular, AB 1373 direct procurement may provide a new revenue source for transmission financing. Direct procurement under AB 1373 empowers the California Public Utilities Commission to directly charge ratepayers on the Department's behalf, bypassing the IOUs entirely, and funnel the revenues into the Clean Energy Procurement Fund.[204]

AB 1373 alone will not funnel ratepayer charges to transmission financing. Under the current bill text, the Clean Energy Procurement Fund can only be used for limited purposes, which does not include financing for new transmission infrastructure.[205]

The bill authorized payments for the fund only to satisfy "bonds or other contractual obligations," "cost of energy and transmission, scheduling, and other related expenses," and administrative costs incurred through direct procurement.[206]

The legislature specifically provided that the Department of Water Resources is prohibited from "recovering funds pursuant to a nonbypassable charge on the ratepayers of a load-serving entity for purposes other than providing for the department's acquisition costs for eligible energy resources, including transmission, scheduling, financing, program administration, and other related costs[.]"[207]

However, if the Clean Energy Procurement Fund has sufficient revenue from direct procurement charges to ratepayers to cover its expenses with a surplus remaining (even though the California Public Utilities Commission's charges to ratepayers would be limited by the mandate that they not unreasonably increase costs to customers[208]), the fund could serve as a new revenue source for transmission finance in the future.[209] But this purpose would require a statutory change providing that charges could be assessed and withdrawals from the fund made for that purpose.[210]

b. Department of Water Resources

Although the Department has transmission-related authorities, some of which predated AB 1373, these powers are relatively limited. Since the 2000-2001 energy crisis, the Department has had the authority to purchase power on behalf of California's retail customers.[211] The relevant provisions of the Water Code grant the Department some limited powers with respect to transmission. The Department may "pay or provide for the payment of power or use of transmission" facilities related to its contracts to purchase power.[212] The agency may then contract with an electrical corporation "to transmit or provide for the transmission of" power made available by the Department.[213] In 2023, AB 1373 added one more state authority related to transmission; at the request of Department leaders, the California Public Utilities Commission may "order an electrical corporation… to transmit or provide for the transmission of… all electricity made available by the department[.]"[214]

The common thread through these statutory provisions is that the Department of Water Resources may "provide for" transmission and the use of transmission facilities. A conservative reading of this phrase suggests that the Department may make use of *existing* transmission facilities incidental to its power purchase and sale contracts but that it does not have clear authority to create new transmission lines as part of "provid[ing] for" transmission.

If the California Legislature wanted to empower the Department to not only use, but also create, transmission infrastructure, then it could easily do so by sharpening the language in these sections. For example, a revised Section 80102, subdivision (c) of the Water Code might read "[n]otwithstanding any other provision of law, the department may pay or provide for the payment of power, *or for the construction and/or* use of transmission or distribution facilities and other related services prior to the delivery or utilization thereof, provided that the department determines that prepayment is beneficial to ratepayers and that adequate provision has been made for the security of the department."[215]

OTHER OPTIONS FOR PUBLIC SUPPORT

1. Leveraging Federal Support

As the Public Advocates Office has proposed, California could leverage "federal financing programs such as the U.S. Department of Energy's Western Area Power Administration's (WAPA) transmission finance program."[216] According to the Roosevelt Institute, the federal government may be uniquely well-positioned to provide funding for transmission, since as compared to incumbent investor-owned utilities and independent system operators (ISO/regional transmission operators or non-utility private players), it is "a strong regional and interregional mandate, long-term planning horizons, and an ability to absorb the financial risks[.]"[217]

Western Area Power Administration's Transmission Infrastructure Program

California-based transmission projects could take advantage of the Western Area Power Administration's Transmission Infrastructure Program, which has a primary goal to leverage federal funds and attract private and other non-federal investment to support the development of critical transmission and related infrastructure.[218] The Transmission Infrastructure Program manages the Western Area Power Administration's $3.25 billion borrowing authority (referring to funds borrowed by the Administration from the Treasury).[219] The Western Area Power Administration can offer both strategic loans and project development assistance to transmission developers.[220]

In order to receive Administration support, prospective utility-scale transmission projects must demonstrate that they will, at minimum:

- Have at least one terminus in the Western Area Power Administration's 15-state service territory[221]
- Demonstrate a reasonable expectation of repayment[222]
- Facilitate the delivery of clean energy[223]
- Not adversely impact system reliability or operations[224]
- Serve the public interest.[225]

The Western Area Power Administration has previously supported transmission projects, including the 254 MW Electrical District 5 – Palo Verde Hub line in Arizona, which is in active repayment status, and the MATL line delivering wind energy from Montana, which received and fully repaid a $162 million construction loan.[226]

The state could leverage the Western Area Power Administration's Transmission Infrastructure Program through the following:

- Promoting private applications for Administration funding to the federal government and expressing the state government's support for those applications to the Western Area Power Administration.

- Applying, directly or through a private partner, for Administration funding for public-private partnership (P3) projects.

- Applying directly for Administration funding for purely public transmission projects. The U.S. Department of Energy's Western Area Power Administration regulation defines "Project Applicant" only as "an entity that submits a Project Proposal and Business Plan Proposal" and does not seem to distinguish between public and private applicants.[227] Therefore, state governments, if acting as transmission developers, may be eligible for Administration funds.

- Coordinating Administration funds with state government financing options, such as funds from IBank or CAEATFA.

2. Public-Private Partnerships

In addition to supporting purely private transmission projects, the state could enter into public-private partnerships (P3) with private entities, which could encompass virtually all of the institutional options listed above.

Defining P3

P3 commonly refers to long-term (typically 25 or more years) performance-based contracts with public-sector entities in which the private sector takes or shares responsibility and risk for the design-build-finance-operate-maintain (DBFOM) elements of a public infrastructure project.[228]

The state of California has ample experience with P3 development projects, albeit in other contexts. According to the Bay Area Council Economic Institute, in 1989 California was one of the first states to pass P3 legislation, and two of the nation's first P3 highway projects were built in Southern California under that legislation.[229] Potential models for state public-private partnerships may be found in Caltrans's P3 arrangements for transportation projects,[230] the University of California's privatized development projects,[231] and the state-private Hydrogen Fuel Cell Partnership.[232]

Supporters of P3 development argue that it provides an important option for public agencies, which may not have capacity or expertise to complete development projects on their own.[233] But critics argue that P3s may "not provide the transfer of risk that they promise" and that the public sector could ultimately be responsible for any cost overruns, which could result in higher costs for taxpayers and ratepayers.[234]

P3 Transmission

According to the Public Advocates Office, which has encouraged the state to explore public-private arrangements to finance transmission in addition to purely public financing approaches, public-private partnerships "would likely result in intermediate ratepayer savings between the bookends of pure public and pure private investment options."[235]

a. Section 1222: Federal Co-Ownership Model

A potentially illustrative model for public-private transmission development, albeit at the federal level, is the Department of Energy's Section 1222 Program.[236] Under Section 1222, part of the Energy Policy Act of 2005, the Secretary of Energy has authority to "design, develop, construct, operate, own, or participate with other entities in designing, developing, constructing, operating, maintaining, or owning two types of projects[.]"[237]

First, DOE can co-develop electric power transmission facilities and related facilities needed to upgrade existing transmission facilities owned by the Southwestern Power Administration (SWPA) or by the Western Area Power Administration.[238]

Second, DOE can co-develop new electric power transmission facilities and related facilities located within any state in which the Southwestern Power Administration or Western Area Power Administration operates."[239] Section 1222 represented "a broad expansion of federal involvement in electric transmission siting and development[.]"[240] But Section 1222 has been underutilized in the nearly 20 years since its enactment.

DOE issued its first request for proposals under Section 1222 in 2010.[241] In March 2016, DOE published its decision to partner with Clean Line Energy Partners via the Southwestern Power Administration.[242] But this Clean Line project fell apart due to "political and commercial" pressures, and Section 1222 has been neglected since.[243] Despite its underutilization in practice, however, Section 1222 is an important precedent and statutory model for P3 transmission development.

Whether or not a P3 program to encourage transmission development or provide financing requires an act of the California Legislature would depend on how such a program was structured. Not all public-private partnerships exist by virtue of statute.

For example, the Hydrogen Fuel Cell Partnership (H2FCP) is a "collaborative of auto manufacturers, energy companies, fuel cell technology companies and government agencies" that work to promote hydrogen fuel cells.[244] Among other public agencies, the Governor's Office, California Air Resources Board (CARB), and California Energy Commission are members of the H2FCP, which evolved out of 1999's California Fuel Cell Partnership.[245] The H2FCP is a nonprofit public benefit corporation.[246]

If a transmission-promotion P3 were similarly arranged as a nonprofit corporation or as an informal association of state agencies and private entities, then it is possible that, like the H2FCP, it would not require any enabling legislation, so long as the state agencies would act within their existing authorities.[247]

However, if a transmission P3 were to directly apply new state authority into the transmission development process, then enabling legislation, like the legislation that empowered Caltrans to build P3 transportation projects,[248] would be appropriate. For example, as previously discussed, a Renewable Energy Transit Authority (RETA) would need an organic statute before the RETA could enter into P3 arrangements with private developers.[249]

b. The "Citizens/Morongo" Public-Private Model

The "Citizens/Morongo" approach to transmission ownership, financing, and siting may provide a particularly useful model for public-private partnerships in situations where local communities are opposed to and/or will suffer uncompensated losses from transmission projects.

The "Citizens/Morongo" model, a term coined by former Federal Energy Regulatory Commissioner Suedeen Kelly,[250] refers to an ownership arrangement between Citizens Energy, the Morongo Band of Mission Indians, San Diego Gas & Electric, and Southern California Edison.[251] Citizens Energy and the Morongo Band, working as a joint venture, purchased a 30-year leasehold interest in a utility-operated transmission line running through Morongo land.[252] Following approval of the transaction by the Federal Energy Regulatory Commission, the Morongo Band became the first Native American Tribe to have an ownership interest in transmission in the United States.[253]

This "Citizens/Morongo" model is intended to better align the costs and benefits of transmission to local communities in order to accelerate the siting process. As joint owners of the transmission line, Citizens Energy and the Morongo Band distribute the profit made from transmission rates to nearby local governments and the Morongo Tribal government.[254] The Federal Energy Regulatory Commission's sign-off on three aspects of the arrangement were critical.

First, Citizens and Morongo can "raise the capital for the investment with 100% debt rather than a combination of debt and equity. This both lowers the cost of the investment and makes it possible for these entities, which do not have easy access to equity, to participate in the joint venture."[255] Since the Federal Energy Regulatory Commission usually prefers a roughly 50-50 ratio between debt and equity financing, in order to mitigate risk and confirm that transmission developers are capable of raising equity, the Commission's approval of a 100% debt and 0% equity formula is unusual.

Second, the Federal Energy Regulatory Commission approved an "essentially fixed, 30-year transmission rate rather than a stated or formula rate subject to change through a Federal Power Act Section 205 or 206 action."[256] This fixed transmission rate "provides the certainty needed by Citizens/Morongo to procure the long-term debt at the lowest possible rate."[257]

Third, Citizens and Morongo can charge the same rate as that charged by San Diego Gas & Electric and Southern California Edison.[258] Since the utilities' rates "recover costs which they incur but Citizens/Morongo do not (e.g., taxes and return on equity), Citizens/Morongo distributes this part of the revenue to the impacted communities to compensate for the intangible costs of transmission siting borne by them."[259]

The Citizens/Morongo joint venture appears to have been relatively uncontroversial. In addition to its partnerships with major IOUs, the project received support from the "US Department of the Interior, the Governor of California, the California Public Utilities Commission, the California Independent System Operator, Los Angeles Department of Water and Power, California lawmakers, and the Natural Resources Defense Council."[260]

The Citizens/Morongo model was relatively unique because it was financed entirely with long-term, tax-free debt, which may not be a feasible financing strategy for publicly

funded transmission lines such as those developed by a Renewable Energy Transmission Authority. But the Citizens/Morongo model could be replicated in situations where non-public actors seek to expedite siting and construction and are willing to enter into ownership arrangements with public entities that allow for payments to the affected local communities to that end.

As a result, the model might be most useful in situations where local opposition to siting is a major concern for the viability of a proposed transmission project, such as when alternate routes would be prohibitively expensive. Public partners could be federally recognized tribes like the Morongo Band or municipal governments of sufficient size and capacity.

CONCLUSION

The current system, cost, and timing for new transmission represent serious barriers to achieving California's clean energy goals. Some form of public financing and streamlining for at least some portion of new transmission will be needed, but the form and extent of the reform is an open question that needs further evaluation. The initial summary of conclusions in this document offers potential pathways for reform and the necessary steps needed to implement them. Future study could focus on priority transmission lines and assessments of optimal and practical financing options and the policies need to enable them.

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244 Hydrogen Fuel Cell Partnership.

245 Hydrogen Fuel Cell Partnership, *About Us*.

246 Hydrogen Fuel Cell Partnership, *Articles of Incorporation of Hydrogen Fuel Cell Partnership* (July 26, 2022), available at: https://h2fcp.org/sites/default/files/HFCP-Articles-of-Incorporation-2022.pdf; Hydrogen Fuel Cell Partnership, *Bylaws of Hydrogen Fuel Cell Partnership* (July 27, 2022), available at: https://h2fcp.org/sites/default/files/HFCP-Bylaws.pdf (accessed October 8, 2024).

247 *See* Hydrogen Fuel Cell Partnership, *About Us*.

248 *See* Assem. Bill 680 (1989-90 Reg. Sess.).

249 *See* New Mexico Renewable Energy Transmission Authority Act, N.M. Stat. § 62-16A-4 for the portion of the New Mexico RETA's organic statute providing P3 authority.

250 Kelly, an attorney at Jenner & Block, represented Morongo Transmission. Jenner & Block LLP, *Landmark FERC Decision Paves Way For Clean Energy Tribal-Private Partnerships* (Feb. 8, 2022), available at: https://www.mondaq.com/unitedstates/renewables/1159296/landmark-ferc-decision-paves-way-for-clean-energy-tribal-private-partnerships (accessed October 8, 2024).

251 Suedeen Kelly, *If Only A Transmission Line Were Like A Rose Bush*, WIRES (Nov. 29, 2023), available at: https://myemail.constantcontact.com/WIRES-Quarterly-Newsletter.html?soid=1102470513948&aid=QjZR3VHJqwE (accessed October 8, 2024).

252 Id.

253 Press Release, Morongo Band of Mission Indians, *Morongo Becomes First Native American Tribe to be Approved as a Participating Transmission Owner in Nation* (July 19, 2021), available at: https://morongo-nation.org/news/morongo-becomes-first-native-american-tribe-to-be-approved-as-a-participating-transmission-owner-in-nation/ (accessed October 8, 2024).

254 Suedeen Kelly.

255 Id.

256 Id.

257 Id.

258 Id.

259 Id.

260 Charles W. Galbraith & Suedeen G. Kelly, *Landmark FERC Decision Paves Way for Clean Energy Tribal-Private Partnerships*, Jenner & Block (Feb. 7, 2022), available at: https://www.jenner.com/en/news-insights/news/landmark-ferc-decision-paves-way-for-clean-energy-tribal-private-partnerships (accessed October 8, 2024).

III. APPENDIX II: PUBLIC SECTOR FINANCING OF ELECTRICITY TRANSMISSION LINES IN CALIFORNIA

Public Sector Financing of Electricity Transmission Lines in California

Financial and Institutional Options for Reducing Customer Costs

May, 2024

DH Infrastructure — ECONOMICS & FINANCE —

EE-Analysis
Economics and Energy

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EXECUTIVE SUMMARY

California has established ambitious clean energy deployment goals that require a rapid and extensive build-out of new transmission. A key barrier to this build-out is the high cost of new transmission, which has the potential to substantially increase electricity customer rates.

This report evaluates alternative approaches to financing and developing new transmission in California. We find that the use of public sector financing and targeted institutional changes can reduce the cost of California's needed transmission build-out by tens of billions of dollars over the next two decades. Public-private partnerships (PPPs) with public sector ownership and private sector operation are a promising and cost-effective alternative to the business-as-usual approach of having investor-owned utilities develop all new transmission lines.

Public financing strategies can reduce transmission costs

Transmission is a key and growing component of investor-owned utilities' costs of service. The way these assets are financed and developed has a major bearing on what is ultimately charged to ratepayers.

A public financing approach to deploying transmission can reduce costs in three key ways:

- The use of **low-cost public debt** (bonds) can *directly* reduce costs to ratepayers. Low-cost debt would result in lower debt servicing and therefore a lower transmission tariff. To the extent that such debt replaces equity in the capital structure, the costs to ratepayers would be further reduced, as the cost of equity is considerably higher than the cost of debt. Finally, taxes are also typically lower when returns on capital are lower, putting additional downward pressure on the cost of service.
- The need for **new institutional models** to facilitate public financing, including certain types of PPPs or a wholly public entity, can *indirectly* reduce costs to ratepayers. These models can help to increase competition for the development of new transmission (through more competitive solicitation) as well as reduce the tax obligations of the transmission owner through public ownership. PPPs offer the additional benefit of retaining private sector innovation and efficiency for operating and maintaining the transmission line, and—by using special purpose vehicles to implement projects—can shield the public owner from certain operational risks.
- Accompanying policies that seek to reduce the **length and risks of the pre-investment development phase** could deliver a third tranche of savings. As transmission development is high-risk and requires significant pre-investment capital, investors require a high-risk premium. As a result, policies that reduce the length and risk of this phase, such as clear and predictable siting and permitting processes, would generate *direct* cost reductions.[1]

Estimating the benefit of transmission public financing

We estimate the cost savings that could occur under alternative transmission financing and deployment approaches in California. We use the California Independent System Operator's (CAISO's) 20-Year Outlook as the basis for the analysis, which identifies the new high-voltage transmission lines (230 kV and 500 kV)

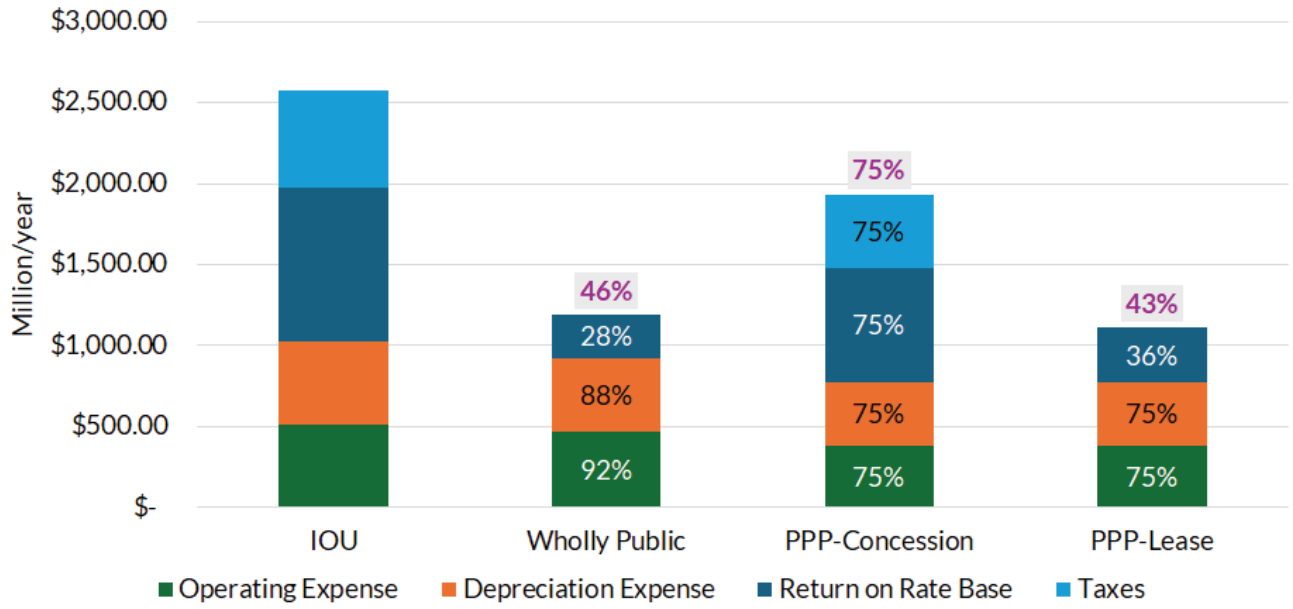
[1] This report evaluates transmission cost savings from the use of low-cost public debt and new institutional models only. We provide a separate and very rough estimate of the potential savings from de-risking pre-investment development further below.

and related upgrades necessary for the state to achieve its SB 100 power sector decarbonization goals. The total capital cost of this new infrastructure—including engineering and construction costs only and excluding all other financing and development costs—is estimated at $25.5 billion.[2]

We considered four alternative scenarios to financing and developing this new infrastructure:

1. A business-as-usual scenario of an investor-owned utility developing, financing, and operating the lines;
2. A wholly government-owned company developing, financing, and operating the lines;
3. A lease-type PPP, in which a government-owned holding company or special purpose vehicle provides financing for the transmission asset, but hires a private company to operate the assets; and
4. A concession-type PPP, in which the government-owned asset is designed, built, operated, and financed by a private company over the life of the asset, and then ultimately returned to the government at the end of the concession agreement.

We find that the business-as-usual approach to transmission development could—over 40 years—cost ratepayers $100 billion, more than twice the cost of alternative approaches. The difference is due primarily to the higher cost financing used by investor-owned utilities, and what other studies have found to be a lack of sufficient competition in procuring new transmission lines.[3] The use of public sector financing and accompanying institutional changes could reduce costs to ratepayers by as much as 57%—or nearly $60 billion—over the 40-year period (Figure ES.1). This is equivalent to savings of $1.5 billion per year.



[2] Note that this figure *excludes* interregional transmission for out-of-state wind that is already being developed. These projects add an additional $5 billion to the total to equal the $30.5 billion amount that is identified in CAISO's 20-Year Outlook. These costs will be paid by the line subscribers.

[3] See, for example: Pfeifenberger, J.P. et al. "Report by Brattle Economists Discusses the Benefits of Competitive Transmission." Prepared for LSP Transmission Holdings, Brattle, June 21, 2021. *https://www.brattle.com/insights-events/publications/report-by-brattle-economists-discusses-the-benefits-of-competitive-transmission/*.

***Figure ES.1**: Total revenue requirement (undiscounted) of four scenarios to develop, finance and operate the CAISO 20-Year Outlook transmission package. The percentages shown on the columns indicate the cost relative to the IOU scenario.*

Similar results can be seen for individual lines. For example, more recent and detailed capital cost estimates have been developed for North Coast offshore wind, where a $7.7 billion line is planned to accommodate 7.2 GW of development.[4] Under the investor-owned utility scenario, this line would have an annual average cost to ratepayers of $774 million. Under a lease-type PPP, this cost would fall to $332 million per year.

Pros and cons of alternative institutional models

Each of the alternative institutional models to facilitate public financing has its own pros and cons. A lease-type PPP could provide the lowest-cost approach to delivering California's transmission goal. A lease-type PPP has the advantage of using lower cost public debt, exemption from certain taxes, and the retention of private sector efficiency in operating and maintaining the transmission line. The contracts with the private sector can also shield the public entity from operational risks and allow for better control of costs.

A key advantage of the lease-type PPP over the concession-type PPP is that the latter relies on private sector financing and the return on equity and commercial debt that comes with that. The wholly public model provides a greater degree of public control but does not build in the participation of the private sector beyond the design and build stage and potentially exposes the state to additional financial and legal risk. The investor-owned utility approach is the most expensive to ratepayers and may forego institutional changes that could increase the speed of transmission deployment.

Discussion and next steps

California's ambitious climate goals require the build-out of a significant amount of new transmission. How this infrastructure is financed, developed, and operated could result in vastly different impacts on ratepayers. This analysis provides evidence that the use of public sector financing in the form of low-cost public debt that displaces equity and provides tax benefits and that is facilitated by either public-private partnership or wholly public models could deliver significant cost savings relative to investor-owned utility approaches.

We highlight three key limitations to this analysis that suggest the cost savings identified in this report may be conservative. The first is that the CAISO 20-Year Outlook capital costs exclude right-of-way acquisition costs.[5] The second is that additional cost savings could be achieved by de-risking the pre-investment project phase.[6] The third is that the cost estimates largely exclude the costs of undergrounding transmission. As

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[4] Zoellick, J. et al. "Northern California and Southern Oregon Offshore Wind Transmission Study." Schatz Energy Research Center, October 1, 2023. https://doi.org/10.2172/2205318.

[5] This is based upon Participating Transmission Owner (PTO) cost guides submitted to CAISO as part of the 20-Year Outlook report: https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/Participating-transmission-owner-per-unit-costs-2023. Right-of-way acquisition costs would be expected to increase the $25.5 billion base estimate and therefore cost savings from public financing.

[6] This report does not attempt to specifically identify policies to shorten the length or reduce the risk of transmission pre-investment development. However, as a simple, illustrative example, if we assume a 50% probability of project failure and pre-investment costs totaling 20% of the total, this would require a 10% risk premium. On a $1 billion project, this would add $100 million to the capital cost. Recent transmission projects in New Hampshire (Northern Pass) and Maine (Hydro-Quebec) with estimated total costs of approx. $1 billion both incurred pre-investment costs equal to 20% and 43%, respectively, of these totals. Overall, policies that provide stronger assurances to successful siting and approval would be expected to directly reduce transmission capital costs.

described in Section 5, if the costs of fire hardening by undergrounding are included, the total cost to customers would 8-10 times the cost of transmission without such measures.

To the extent that a public financing model is of interest and considered viable, an important next step would be to evaluate the legal and/or regulatory changes necessary to establish one or more of the institutional models within California state government. Colorado and New Mexico are two states with alternative transmission models that could be relevant to California. Internationally, tenders for transmission have most often been concession-type PPP contracts, but there is precedent in the United States in other infrastructure sectors with lease-type PPPs, including road and social infrastructure projects (e.g., schools, and hospitals).

SECTION 1 INTRODUCTION

California's electricity sector has a diverse mix of energy sources including natural gas, nuclear power, and renewable energy (solar, wind, hydroelectric power), and is the national leader in solar energy production.[7] California's energy policy framework emphasizes sustainability and environmental protection by transitioning away from fossil fuels, with ambitious goals to reduce greenhouse gas emissions to 40% below 1990 levels by 2030, reaching 90% electricity sector decarbonization by 2035, and achieving, by 2045, carbon neutrality and 100% clean electricity retail sales.[8] To achieve this, California must considerably increase its renewable generation capacity[9] and substantially expand its transmission infrastructure for generation to reach load centers at an estimated investment cost of $30 billion.[10] This is in line with the global trend. According to the International Energy Agency,[11] by 2030, global energy generation is expected to almost double, for which annual investments of around $600 billion will be required for transmission and distribution networks .[12]

Expanding and upgrading the electricity transmission infrastructure to accommodate the growing share of renewable energy poses regulatory, permitting, environmental, funding and debt rating challenges, including potential negative financial impact on consumers. Furthermore, California faces direct impacts from climate change, including increased frequency and severity of wildfires, droughts, and heatwaves that pose additional challenges to energy production, transmission, and distribution systems, requiring robust resilience and adaptation strategies.

California's energy sector operates under a mixed model that includes both publicly owned utilities and investor owned utilities (IOUs). The state has shown a preference for regulating rather than seeking ownership of the IOUs, focusing on oversight through the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

Transmission projects in California are governed by a complex regulatory framework that can significantly affect their development, operation, and expansion (See Appendix A:). The state's constitution and regulatory environment prioritize a competitive market structure to encourage efficiency and innovation. The CPUC and the Federal Energy Regulatory Commission (FERC) regulate California's electricity market, imposing rules that protect consumer interests and ensure competition, including transmission access charges and the allocation of transmission costs through transmission tariffs that meet the "just and reasonable" rate doctrine. This

[7] California Energy Commission, "Data Show Clean Power Increasing, Fossil Fuel Decreasing in California," California Energy Commission, current-date, https://www.energy.ca.gov/news/2023-08/data-show-clean-power-increasing-fossil-fuel-decreasing-california.

[8] "California Climate Policy Dashboard," Berkeley Law, accessed March 16, 2024, https://www.law.berkeley.edu/research/clee/research/climate/climate-policy-dashboard/.

[9] "2022 Scoping Plan Documents | California Air Resources Board," accessed March 16, 2024, https://ww2.arb.ca.gov/es/node/20106#.

[10] Darrell Proctor, "CAISO Plan Calls for $30.5 Billion for Transmission—and More Renewable Energy," POWER Magazine, February 3, 2022, https://www.powermag.com/caiso-plan-calls-for-30-5-billion-for-transmission-and-more-renewable-energy/.

[11] "World Energy Investment 2023 – Analysis," IEA, accessed March 16, 2024, https://www.iea.org/reports/world-energy-investment-2023.

[12] "Lack of Ambition and Attention Risks Making Electricity Grids the Weak Link in Clean Energy Transitions - News," IEA, accessed March 16, 2024, https://www.iea.org/news/lack-of-ambition-and-attention-risks-making-electricity-grids-the-weak-link-in-clean-energy-transitions.

regulatory oversight extends to transmission projects, where the aim is to balance the need for infrastructure development with the principles of a competitive market.

The permitting process for electricity transmission projects is complex due to the involvement of multiple regulatory bodies across local, state, and federal levels, stringent environmental regulations like the California Environmental Quality Act (CEQA),[13] and land use and right-of-way acquisition challenges. Projects must navigate through rigorous environmental impact assessments, extensive public and stakeholder engagement, and comply with strict land use and zoning regulations, all of which can significantly delay timelines and escalate costs.

The increasing ratepayer costs of transmission development motivated the CPUC's Public Advocate's Office to question whether the transmission costs could be brought down by replacing IOU investment with public investment. Their initial analysis suggested that a net ratepayer savings of 25% could be achieved (compared to current recovery mechanisms) through lower interest rates, elimination of shareholder returns, and tax benefits not available to private companies.[14]

Further reductions could be achieved by lowering the permitted rate of return for utilities, offering bond financing or other forms of securitization to cover some costs, or substituting financing with direct government spending.[15] With California's need for billions in annual investments to upgrade its power grid and meet clean energy targets, tapping into public financing could result in significant long-term savings for ratepayers. Changes to the ways in which transmission projects are procured, and the institutional models used to develop and operate them, may offer additional, indirect savings because of the impact they could have on the cost of financing, competition for, and taxation of transmission projects.

These initial insights on ways to reduce the ratepayer cost of transmission have motivated this report. The purpose of the report is to provide a more in-depth exploration of options to reduce ratepayer costs, focusing on increased public support in infrastructure development and the institutional models that could support the delivery of such financing. The remainder of the report is structured as follows:

- Section 2 describes the range of possible institutional options that could potentially be used to deliver public financing. These range from wholly public (government) ownership and operation, to wholly private, with mixed Public Private Partnership (PPP) models, in between.
- Section 3 describes the potential direct effects of public financing of transmission and the indirect impacts that could be associated with the use of the alternative institutional models described in Section 2.
- Section 4 identifies a set of transmission lines that could possibly be eligible for public sector financing under alternative institutional models.

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[13] "California Environmental Quality Act (CEQA)," accessed January 19, 2024, https://www.cpuc.ca.gov/ceqa/.

[14] California Public Advocates Office, "Public Investment in Infrastructure Is a Promising Option to Support California's Energy Transition and Reduce Ratepayer Costs," May 16, 2023, https://www.publicadvocates.cpuc.ca.gov/press-room/reports-and-analyses/public-investments-in-infrastructure.

[15] Conservation Strategy Group and Clean Air Task Force, "California Public Finance for Clean Energy Infrastructure: Concept Note," July 2023.

- Section 5 quantifies the possible impact on the cost of service of the direct and indirect effects identified in Section 3.

The evidence suggests that substantial direct cost savings could be achieved through the use of public sector financing, and additional savings could be achieved by delivering such financing through alternative institutional models.

SECTION 2 INSTITUTIONAL OPTIONS FOR PUBLIC FINANCING

Public financing of infrastructure is common throughout the world. State and local governments in the US, and governments internationally issue bonds or use general tax revenue to fund infrastructure investment. The advantages and disadvantages of using public financing are—to some extent—isolated from decisions about which institutions would be involved in providing the financing and developing the infrastructure project. The public sector will almost always be able to borrow at a lower cost than private companies in the same jurisdiction.

There are, however, important interdependencies between the use of public financing, and the institutional model chosen to deliver such financing. The choice of institutional model will determine the creditworthiness of the borrower and hence the cost at which they can borrow. The choice of institutional model may also bring other benefits, such as the introduction of operating efficiencies, or the reduction of tax obligations.

Section 2.1 describes the range of institutional models that have been used to develop electricity transmission infrastructure globally. Section 2.2 describes how rights, responsibilities, and risks are allocated under each of the institutional models.

2.1 THE RANGE OF INSTITUTIONAL OPTIONS

Infrastructure services, including electricity, water and sanitation, transportation, or telecommunications are delivered under a wide range of institutional arrangements that may involve public sector entities, private companies, or both.

Tradition in the United States is for electricity to be delivered by private companies for whom market entry, pricing, and service quality are regulated by state public service commissions or (for interstate service delivery) a federal regulatory agency (FERC).[16] Water supply and sanitation, in contrast, are more often delivered by municipalities and are thus fully publicly owned and operated and there is precedent in many states for the creation of wholly public "power authorities" or "transmission authorities" responsible for various aspects of transmission development and operation. The Colorado Electric Transmission Authority (CETA) and The New Mexico Renewable Energy Transmission Authority (RETA) are two of eight state-level transmission authorities in the United States (there are others in Utah, North Dakota, South Dakota, Wyoming, Kansas, and Idaho). CETA was modeled on New Mexico's RETA, but they differ in that Colorado has a higher population and considerably more internal demand for electricity than New Mexico. RETA is thus more focused on electricity exports.[17]

Box 1: The Colorado Electric Transmission Authority

The Colorado Electric Transmission Authority (CETA) is an independent, special purpose authority of Colorado established in 2021 by state legislators. CETA facilitates the development of electric transmission infrastructure for Colorado and neighboring states. Under sections 4 and 7 of Colorado General Assembly SB21-072, CETA is

[16] The extent and nature of regulation in the US electricity sector has changed substantially since the wave of power sector unbundling in the 1990s, but the transmission and distribution functions are still typically highly regulated.

[17] https://bigpivots.com/. "Colorado's 'Transmission Developer of Last Resort' - Big Pivots." Accessed April 12, 2024. https://bigpivots.com/colorados-transmission-developer-of-last-resort/.

authorized to select a qualified transmission operator to finance, plan, acquire, maintain, and operate eligible electric transmission and interconnected storage facilities.

CETA is entitled to issue revenue bonds, identify, and establish intrastate electric transmission corridors, and coordinate with other entities to establish interstate electric transmission corridors. The authority may also exercise the power of eminent domain to acquire eligible facilities, and collect payments of reasonable rates, fees, and interest from people using eligible facilities.

CETA operates within a strict set of guidelines from the Colorado legislature, which specify that the authority would only develop transmission necessary to achieve Colorado's decarbonization goals if unable to identify another party capable of doing so. Legislation prohibits CETA from competing directly with other transmission providers; it cannot plan, finance, or construct any transmission that another developer has pursued.

While CETA does not function as an active transmission developer, it encourages outside planning by identifying and publicizing projects that it views as necessary and allowing other utilities to take ownership of them. If another party pursues the project, CETA withdraws itself from its development. If no other entity shows interest, CETA may become the developer.

Sources:

"About CETA." Accessed April 12, 2024. https://www.cotransmissionauthority.com/about.
Catlin, Marc, Alex Valdez, Don Coram, and Chris Hansen. Public Utilities Commission Modernize Electric Transmission Infrastructure, Pub. L. No. SB21- 072 (n.d.).
https://bigpivots.com/. "Colorado's 'Transmission Developer of Last Resort' - Big Pivots." Accessed April 12, 2024. https://bigpivots.com/colorados-transmission-developer-of-last-resort/.

Box 2: The New Mexico Renewable Energy Transmission Authority

The New Mexico Renewable Energy Transmission Authority (RETA) was established in 2007 by state legislation to plan, finance, and acquire high voltage transmission lines and storage projects for the development of renewable resources across New Mexico. RETA sponsored projects must draw at least 30 percent of their energy from renewable sources. Currently, all projects plan to use 100 percent renewable energy.

RETA seeks a mutually beneficial collaboration with its private development partners. Their developers are expected to provide transmission design and construction expertise, as well as contributions to RETA administrative expenses via lease agreements. In turn, RETA offers tax exemptions (property, gross receipts, and compensating tax), high-level assistance with and streamlining on permitting and siting, and bond financing if necessary.

RETA has the authority to plan, finance, and acquire transmission; it currently has agreements with several developers to realize its goals. In 2010, the authority commissioned Los Alamos National Labs (LANL) to evaluate statewide transmission concepts and create a long-range infrastructure plan for the state. Today, RETA sponsors two projects that rely on the LANL report findings and recommendations, and as a result, has become the authority to act as a developer and potential owner of a merchant-based transmission project.

RETA's strides in both development and ownership reflect an effort to overcome the existing regulatory barriers to transmission development. RETA partnered with Clean Line Energy Partners (Clean Line) to develop the Western Spirit Project, which creates about 200 miles of construction before connecting with and drawing on the Public Service Company of New Mexico's (PNM) transmission system. To accelerate the project, RETA and PNM approached FERC to request a streamlined approval. Ultimately, FERC did not accept their request due to claims of harm from others in PNM's queue. To this date, none of the intervenors with claims have constructed a line and several intervenors have left the queue.

To date, RETA has completed two operational lines and established plans for four additional projects. Finishing its first project in 2010, the authority provided $50 million in revenue bonds to the upgrade of the High Lonesome Mesa line. In 2021, it completed its second line, a $150 million co-development of RETA and Pattern Energy named Western Spirit.

Currently, RETA is co-developing four lines, all under lease agreements: SunZia, Rio Sol, Mora, and North Path. Sunzia is set to be a $1.8 billion collaboration between RETA and SunZia, starting operation in 2025. The Rio Sol line is a $1.3 billion partnership between RETA and Rio Sol set to begin operating in 2028. Also in development, the Mora line is set to cost $83 million from the partnership of RETA and Lucky Corridor, and expects to start operation at the end of 2024. Finally, the North Path line, from RETA and Invenergy Transmission, remains in the early stages of planning and anticipates completion after 2030.

Sources:

RETA New Mexico. "Creating a Highway for Clean Energy - Transmission Lines NM RETA." Accessed April 12, 2024. https://nmreta.com/transmission-lines/.

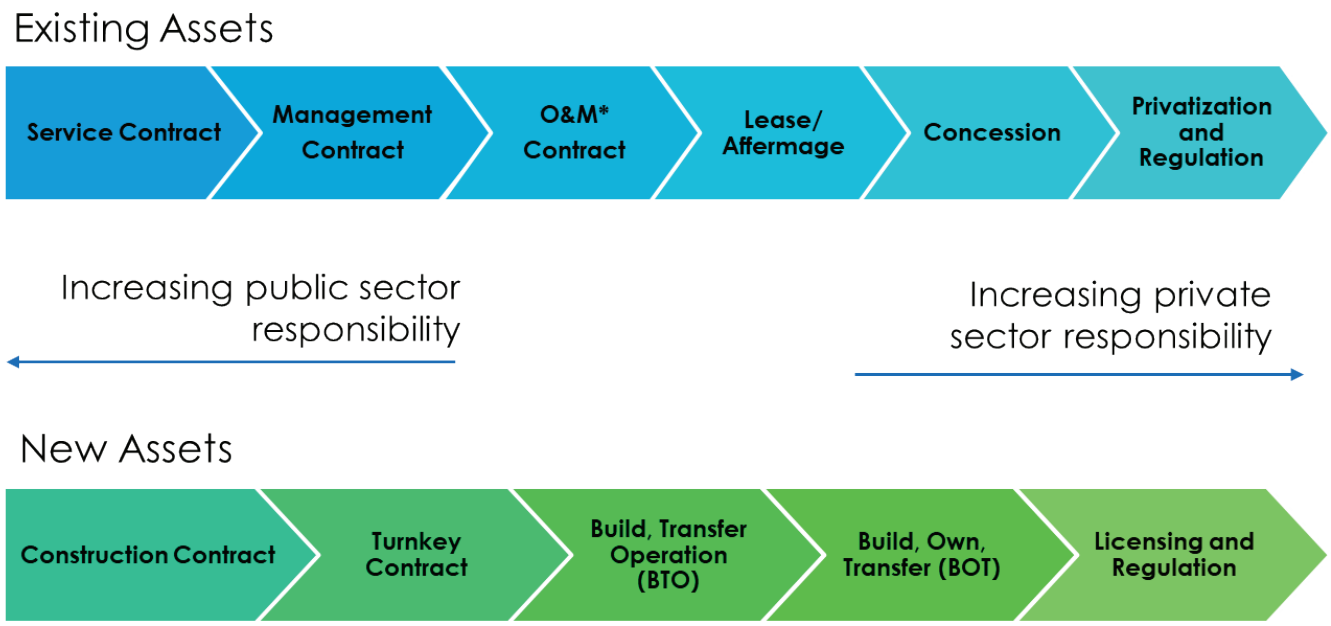
RETA New Mexico. "New Mexico Renewable Energy Transmission and Storage Study Update" February, 2022. Accessed April 12, 2024. *https://nmreta.com/wp-content/uploads/2022/03/010522-RETA-Executive-Summary-FINAL.pdf*.

RETA New Mexico. "New Mexico Renewable Energy Transmission Authority. Presentation to Science, Technology and Telecommunications Committee". September 1, 2023. Accessed April 12, 2024. *https://www.nmlegis.gov/handouts/STTC%20083123%20Item%2010%20%20RETA%20Presentation%2009-01-2023.pdf*.

Between these "wholly private" and "wholly public" institutional models are a range of PPP arrangements in which government has some responsibility for delivering service, and a private company has some responsibility. PPP arrangements are more common internationally than in the United States, but there are examples, especially in the roads sector, where PPP-type arrangements have proven more common than in other sectors.

Figure 2.1 shows the range of possible institutional options from wholly public (on the left of the figure) to wholly private (on the right of the figure), with varieties of PPPs in between. An important distinction shown in the figure is the one between institutional arrangements for existing assets and new assets. This report will focus primarily on PPPs that would involve the creation of new transmission assets.

Figure 2.1: Range of Institutional Options for Delivering Infrastructure Services



Source: Adapted from World Bank Group, ADB, EBRD, GI Hub, IADB, IsDB, OECD, UNECE, and UNESCAP, Public-Private Partnerships: Reference Guide, Version 3 (Washington DC: The World Bank Group, 2017), https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/documents/PPP%20Reference%20Guide%20Version%203.pdf
*Note: *Operations and maintenance*

2.2 ALLOCATION OF RIGHTS, RESPONSIBILITIES AND RISKS

An important feature of PPP arrangements is the existence of a contract between the public and private partners which details the allocation of rights and responsibilities between the parties, including pricing and the expected level of service. The types of contracts can be distinguished from one another by the allocation of functions between public and private partners. Figure 2.2 compares the allocation of functions between public an private partners for wholly public, wholly private, and three archetypal PPP arrangements.

Figure 2.2: Allocation of Rights and Responsibilities under Alternative Institutional Models

Functions	Public	Public Private Partnerships			Private
	Corporatized Public Entity	**Management Contract**	**Lease or Affermage Contract**	**Concession Contract**	**Divestiture (Privatization)**
Who owns the assets?	Public entity	Public entity	Public entity	Public entity	Private Company
What is the private operator's responsibility?	Managing the operating area	Managing the operating area	Providing utility service	Providing utility service	Providing utility service
Who receives the tariff revenue?	Public entity	Public entity	Private company receives part of tariff to cover O&M; Public entity receives part of tariff to cover capital costs	Private Company	Private Company
How is the private operator remunerated?	N/A	Fixed monthly or annual fee + incentive payments	Operating profit	Total profit	Total profit
Which risk does the private operator bear?	N/A	Loss of remuneration	Risk related to operations and/or demand†	Most risk of service provision (operations and investment)	All risk of service provision (operations and investment)
Who employs the staff?	Public entity	Public entity	Private Company	Private Company	Private Company
Who is responsible for capital expenditure?	Public entity	Public entity‡	Public entity‡	Private Company	Private Company
What is the typical term?	Perpetual	2-5 years	10-15 years	15-30 years	Perpetual

Source: Adapted from United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), A Primer to Public-Private Partnerships in Infrastructure Development (Bangkok: UNESCAP 2008), https://www.unescap.org/resources/public-private-partnerships-infrastructure-development-primer
Notes:
† Demand risk differs between lease and affermage contracts.
‡ The outside operator may manage implementation.

It is more important to understand the allocation of functions typical for different PPPs than it is to understand the "alphabet soup" of acronyms that are often used to describe different types of PPPs. The functions that matter the most are: designing and building the asset, operating the asset, and financing the asset. The table includes examples of acronyms used to describe projects with each allocation of functions. Table 2.1 summarizes how these functions are typically allocated in "greenfield" projects (i.e., projects that involve new construction).[18]

[18] "Brownfield" projects, on the other hand, involve investment (such as rehabilitation) in existing infrastructure.

Table 2.1: Allocation of Functions in Typical Greenfield PPP Arrangements

Who design and builds?	Who operates and maintains?	Who finances?	Examples of PPP acronyms
Private	Public	Public	Design-Bid-Build (DBB) Design-Build (DB) Build-Transfer (BT)
Private	Private	Public	▪ Design-Build-Lease (DBL) ▪ Build-Transfer-Lease (BTL) ▪ Built-Transfer-Operate (BTO)
Private	Private	Private	▪ Build-Operate-Transfer (BOT) ▪ Build-Own-Operate-Transfer or (BOOT) ▪ Design-Build-Finance-Operate (DBFO) ▪ Build-Own-Operate (BOO)

The allocation of functions is important because it determines which risks the public and private partners must bear, and how they are remunerated. Generally speaking:

- With design and build-type PPP contracts the private partner's revenues come from government payments for design and construction materials and services. These arrangements are often fixed-fee contracts: the public partner pays an agreed fee for the construction and then owns and operates the new asset. With fixed-fee arrangements, the private partner typically assumes the risks associated with construction, such as materials cost overruns or delays.
- With design, build, and operate-type PPP contracts, the private partner's revenues come from user fees (tariffs) or, if user fees cannot be charged, from monthly, quarterly, or annual government payments, sometimes referred to as availability payments. The user fees or government payments are intended to cover the private partner's operating and maintenance expenses. If user fees are charged for the infrastructure service, the private partner must transfer a portion of the user fees to the public partner, as compensation for the public partner's financing of the investment (this is sometimes referred to as a "lease fee"). The private partner assumes risks associated with operating the asset, and the public partner assumes risks related to financing the asset (for example, foreign exchange risk), and the overall asset condition and asset life.

- With design, build, operate and finance-type PPP contracts, the private partner collects user fees (or if user fees cannot be charged) a payment from government which covers all of its operating and maintenance, and financing costs. The private partner therefore assumes most if not all of the risks related to construction, operation and maintenance, financing, and the condition and life of the asset. Government ultimately owns the asset, but during the PPP contract period, the private partner has many rights of ownership, which may include the ability to pledge the assets as collateral for financing, or to dispose of some of the assets. They will also be required to hand over the assets in a certain agreed condition at the end of the contract period.

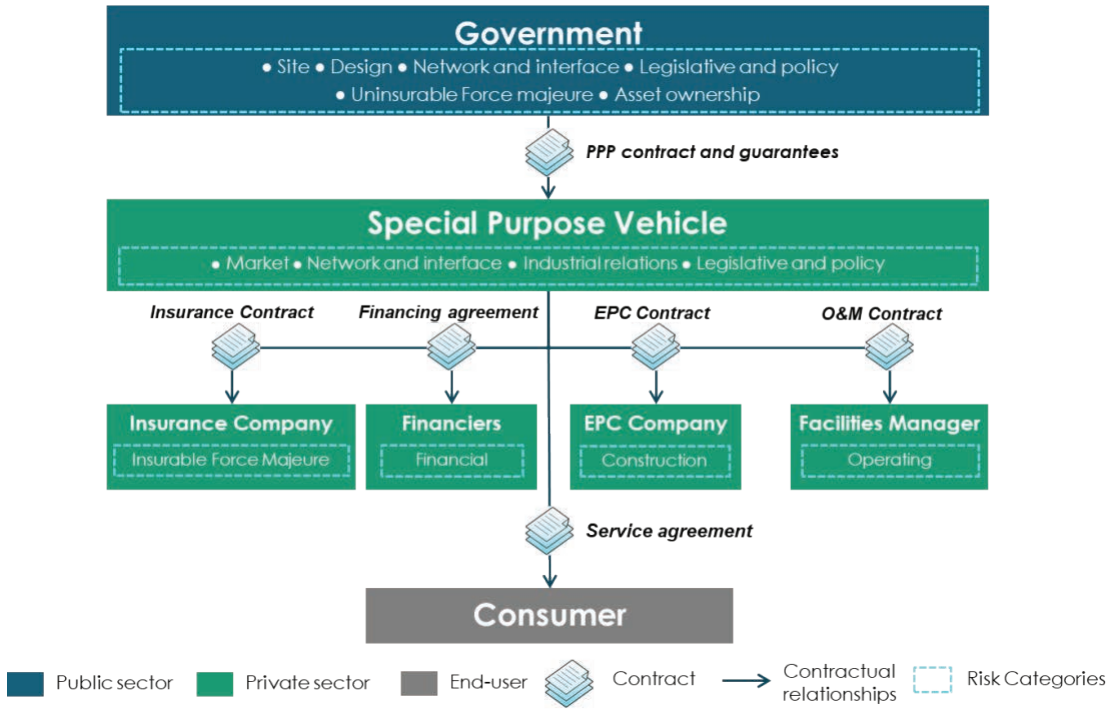
2.3 ADVANTAGES OF PPP ARRANGEMENTS

One of the principal advantages of PPPs is the existence of a contract in which risk allocation between the public and private partners can be made explicit; studies have shown that most of the cost advantages of PPPs are achieved through better risk allocation.[19] Moreover, at the heart of a PPP arrangement is as Special Purpose Vehicle (SPV) or Special Purpose Entity (SPE). The SPV is a separate legal entity created specifically for the PPP project. Its purpose is to isolate the project's assets, liabilities, and risks from those of the sponsoring entities (the public and private partners).

Another advantage of PPPs is the built-in allowance for competition for all aspects of development and operation. A single PPP contract is the binding instrument between the public and the principal private sector partner, but there are then multiple contracts between the principal private partner (the SPV) and its subcontractors for construction, operations, financing, insurance and other functions. Figure 2.3 is a stylized representation of a lease-type PPP contract, and the risks allocated between the various parties.

[19] Pauline Hovy and IMG Rebel, "Risk Allocation in Public-Private Partnerships: Maximizing Value for Money," Discussion Paper, August 2015, https://www.iisd.org/system/files/publications/risk-allocation-ppp-maximizing-value-for-money-discussion-paper.pdf.

Figure 2.3: Illustration of a Lease-Type PPP Arrangement



SECTION 3 PUBLIC FINANCING AND PPPS IN TRANSMISSION PROJECTS

Electricity customer rates or tariffs are determined in large part by the cost of providing service. Electricity sector regulators are concerned with ensuring that asset owners and operators recover the reasonable costs of delivering a given service. In the US, state regulatory commissions have authority only over IOUs. An IOU's cost of service is quantified by its "revenue requirement". The revenue requirement is the sum of a utility's costs, and typically includes operating costs (OPEX), capital costs (CAPEX), a return *of* capital invested (recovered through a depreciation charge or the principal component of debt service), a return *on* capital invested (interest payments to lenders and—if applicable—equity returns to the asset owners), and taxes.

Federal and state regulators in the United States predominantly use a "rate of return" approach to determine an asset owner's revenue requirement.[20] There are other methods (such as the "cash needs" approach used by some municipally owned utilities) but the rate of return approach predominates, and is the methodology FERC allows for determining the revenue requirements of transmission owners and operators who bid in transmission line tenders administered by the CAISO. In California, as with many Federally regulated transmission owners, the three IOUs use a variation of the standard "rate of return" method called "formula rates."[21] These rates are updated annually according to a formula rather than requiring a new rate case with a new test year.[22] A study by the National Association of Regulatory Utility Commissions (NARUC) explains them as "A ratemaking method in which the utility adjusts its base rates outside of a general rate case, usually annually, based on an actual or projected rate of return on rate base or equity that falls outside some commission defined band."[23]

Figure 3.1 is a stylized illustration of the components or "building blocks" of a transmission line owner's revenue requirement, using the rate of return approach. The RR is the sum of the asset owner's return *on* capital invested (a weighting of its borrowing costs and expected equity returns), depreciation (a return *of* the initial capital invested), OPEX costs, and taxes.

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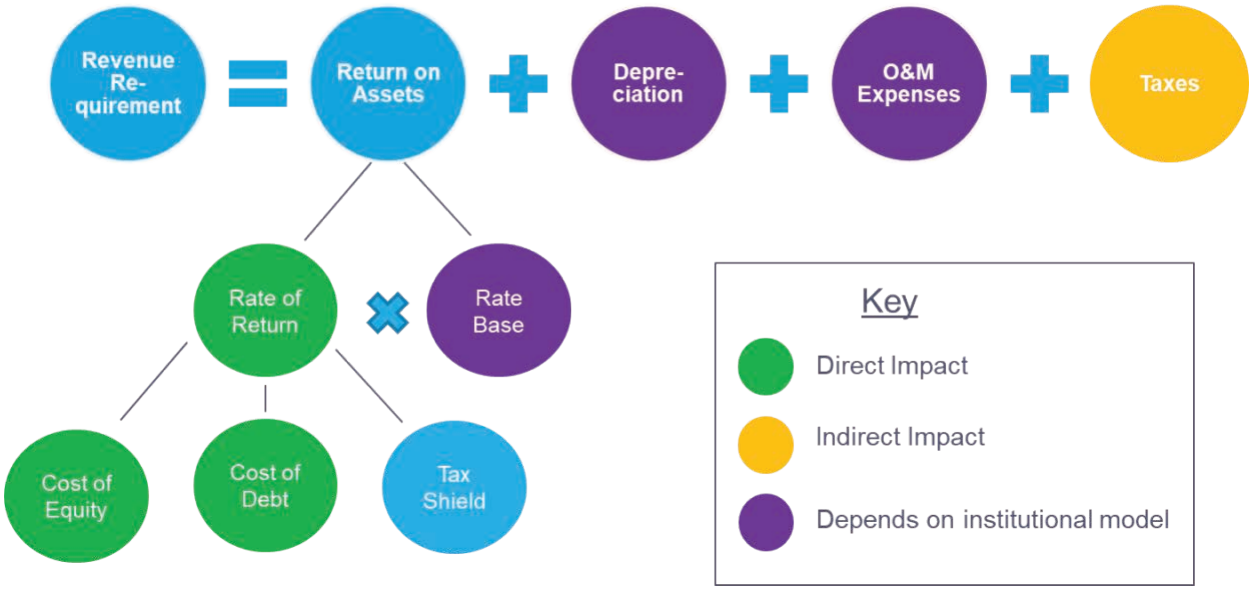
[20] The term "asset owner" is used instead of "utility" because some asset owners (e.g., merchant transmission owners) may not meet some readers' definitions of what is typically considered to be an "electric utility". Ther term "electric utility" is often reserved for IOUs.

[21] "Electric Transmission Rates and FERC Proceedings," accessed February 20, 2024, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/electric-transmission-rates-and-ferc-proceedings.

[22] WIRES Group, "Primer on Transmission Formula Rates," *Wires Group* (blog), February 16, 2023, https://wiresgroup.com/primer-on-transmission-formula-rates/; ELCON, "Formula Rates," *ELCON | Electricity Consumers Resource Council* (blog), accessed December 19, 2023, https://elcon.org/formula-rates/.

[23] Ken Costello, "Alternative Rate Mechanisms and Their Compatibility with State Utility Commission Objectives" (National Regulatory Research Institute (NRRI), April 2014), https://pubs.naruc.org/pub/FA86C519-AF31-D926-BE12-2AC7AE0CD8D6.

Figure 3.1: Building Blocks of the Revenue Requirement



As the figure indicates, some of the impacts of public financing are direct: Reducing the amount of equity in the capital structure and reducing the cost of debt would both reduce the revenue requirement. Other effects are indirect: Reducing the return on equity would—all else equal—reduce corporate taxes owed on that return. Section 3.1 describes these possible direct and indirect impacts.

A third set of possible impacts depends largely on the institutional model chosen for delivering the public financing. There are a range of possible institutional models that could capture the direct and indirect cost savings of public sector financing while also bringing other possible savings to consumers. These impacts are described in Section 3.2.

3.1 DIRECT AND INDIRECT IMPACTS OF PUBLIC FINANCING

Public financing would have a direct impact on a transmission line's rate of return, by reducing the cost of debt and reducing the need for higher cost equity in the capital structure. A reduction in return on equity could also mean lower corporate tax payments, further reducing the RR for a new transmission line.

3.1.1 RATE OF RETURN

The rate of return is—among the components of the revenue requirement—the most obviously and directly affected by public sector financing. The rate of return is a weighted average of the cost debt and cost of equity; it depends on the mix of debt and equity used to finance the transmission asset and the returns expected on debt and equity. In the case of debt, the returns are the interest payment required by lenders on loans; in the case of equity, the returns are what shareholders require in terms of dividend payments and changes in the value of the stock they own.

COST OF DEBT

Governments, and government agencies, are typically able to borrow at lower interest rates than private companies. Public sector borrowers are regarded as more creditworthy because they have the guarantee (explicit or implicit) of government, and government has access to recurring tax revenue. The public sector typically borrows by issuing bonds, with the interest rate determined by the bond "coupon". Public sector entities with better creditworthiness—as measured by their credit ratings—will typically have bonds with lower coupons than those that are viewed as less creditworthy.

Table 3.1: Comparison of State, Power Authority, and IOU Credit Ratings

State/ territory	State credit rating/outlook	Power Authority credit rating/ outlook	Biggest IOU credit rating/outlook
New York	AA+/Stable	AA/Stable	BBB-/Stable (national grid)
Long Island	N/A	A/positive	BBB+/Stable (KeySpan)
Colorado	AA/Stable	AA/Stable	BBB+/Stable (Xcel)
California	AA/Stable	AA/Stable	BB+/Stable (PG&E)

Sources:
"Credit Ratings & Analysis for Financial Markets." *Fitch Ratings*, www.fitchratings.com/#insights. Accessed 2 Apr. 2024. (used for all issuers except LADWP)
"KBRA: Credit Rating Analysis Agency: Bond Rating Agency." *Kroll Bond Rating Agency*, 28 Feb. 2024, www.kbra.com/publications/LVNmTQGn/kbra-assigns-aa-rating-to-the-department-of-water-and-power-of-the-city-of-los-angeles-power-system-revenue-bonds-outlook-is-stable. (used for LADWP)

Public corporations or agencies (such as a power authority) will have lower credit ratings than the state or local governments that own them. This can be seen in the table above by comparing the state of New York's credit rating to that of the New York Power Authority (NYPA) and the Long Island Power Authority (LIPA).

Bonds issued by state and local governments have the added advantage that they are often tax-free, meaning the bondholders (the lenders) do not pay taxes on the payments they receive from the bond issuers (the borrowers). This helps to further reduce the coupon relative to bonds that are not tax-free (e.g., corporate bonds). The IRS also allows a special kind of tax-free bonds for capital projects. IRS Rule 63-20 allows state

and local government to issue tax-exempt revenue bonds for a third party through a) established conduit issuers or b) the creation of nonprofit corporations applicable to IRS Revenue Ruling 63-20. Box 3 describes 63-20 financing and its perceived advantages.

Box 3: IRS 63-20 Alternative Project Delivery

63-20 financing involves a nonprofit corporation issuing tax-exempt bonds on behalf of a state or political subdivision. These bonds are used to finance governmental facilities. The name "63-20" originates from Revenue Ruling 63-20, which outlines the rules for this type of financing. The primary goal is not just tax-exempt financing but also an alternative development approach.

With 63-20 financing a nonprofit corporation issues bonds to finance the development of an asset on behalf of a state or municipal entity. The bond proceeds cover acquisition, construction, and equipping of the facility. The nonprofit issuer manages a private development team responsible for the project. The nonprofit issuer hires a private development team responsible for the project.

The perceived advantages of using 63-20 financing are often describe as the following:

- **Reduced project delivery time:** The approach circumvents the often protracted government financing and procurement processes, leading to faster project delivery.
- **Public assumption of responsibility for permitting.** The SPE secures the required project entitlements upfront, instead of leaving that to a private operator.
- **Operations & maintenance efficiency:** The utilization of private property management allows for improved lifecycle costing and the transfer of O&M risk to the private sector, reducing the likelihood of deferred maintenance.
- **Cost Transparency:** The use of tax-exempt financing results in debt service costs equivalent to traditional public financing options, ensuring transparency and predictability in project costs.
- **Protection from Risk:** The SPE is bankruptcy remote, protecting the public agency from construction and other risks.

Sources:

"Fifty Years of 63-20 Financing: Revisiting an Alternative ..." *MRSC*, mrsc.org/getmedia/530A597A-4D81-41AE-9279-3523D1BE0BAC/m58-63_20.aspx. Accessed 2 Apr. 2024.
Tax-Exempt Financing by Nonprofit Corporations ..., files.klgates.com/files/publication/d1586c6b-e6e4-42df-b131-919ed1d163cc/presentation/publicationattachment/ec29a420-819b-46ab-9e28-9479dc50ec26/tax_exempt_financing_by_nonprofit_corporations.pdf. Accessed 2 Apr. 2024.
63-20-PDB-Improving-upon-P3.Pdf - Public Facilities Group, 2020, publicfacilitiesgroup.org/wp-content/uploads/2020/09/63-20-PDB-Improving-upon-P3.pdf.
Public Facilities Group. *Four Principles: How to Maximize Public Benefits When Using P3 Delivery*, 2020 Public Facilities Group.

COST OF EQUITY

Equity typically has a higher cost than debt because shareholders have higher risks than lenders. Banks making loans to an infrastructure project will have legal rights, determined in loan agreements, which—if it does not receive the expected payments of principal and interest—give it recourse to the assets being financed. Equity owners have little or no such recourse and thus require higher returns to compensate them for the risk of their investments.

To the extent that debt is used instead of equity in the capital structure, it will reduce the overall cost of capital. Capital structures in US electric utilities are typically in the range of 40 to 60 percent debt and 40 to 60 percent equity. This is consistent with the ranges for California's major IOUs which CPUC authorizations ranged in 2021 from 43.00 to 47.50 percent Long-term Debt, 0.50 to 5.00 percent for Preferred Stock, and 52.00 percent Common Equity; actual capital structures in that time ranged from 44.00 to 56.44 percent Long-term Debt, 0.00 to 4.70 percent Preferred Stock, and 43.00 to 56.00 percent Common Equity.[24] Nationwide, annual average Return on Equity (ROE) for electric utilities have ranged from 9.63 percent to 10.81 percent since 2019.[25] Authorized ROEs for California's major IOUs ranged from 10.20 percent to 11.60 percent from 2006-2021, while actual ROE's ranged from -35.38 percent to 13.64 percent in that same period.[26]

Utilities' actual returns on equity can fluctuate for a variety of operational, financial, and regulatory factors, leading to differences between actual ROE and the authorized ROE, the latter of which is used for rate setting but is not a guarantee of any given level of return. For example, in 2021, though SCE was authorized to earn as much as 10.30 percent on equity ; but achieved only 3.45.[27] One of many contributing factors included material losses connected with wildfires in SCE territory in December 2017 and November 2018. Litigation costs, settlement activities, and damages in excess of available insurance resulted in significant losses exceeding $1.3 billion more than original estimates in the third quarter of 2021.[28]

3.1.2 TAXES

Public sector financing could have an indirect impact on taxes if it reduces the rate of return. A lower ROE will—all else equal—reduce the income tax obligations of a regulated transmission line.

3.2 INSTITUTIONAL FACTORS AFFECTING THE REVENUE REQUIREMENT

There are a range of institutional factors which—whereas not directly related to the source of financing—could have an impact on the revenue requirement of a new transmission line. These factors are:

- More competitive procurement, which can bring down CAPEX costs of transmission lines
- Accelerated clearance of pre-construction development, including permitting and regulatory approvals
- Private sector involvement in development and operations, which retains the efficiency advantages of having an experienced private sector operator.

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[24] CPUC, "Capital Structure," accessed 4/1/2024 at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/historical-electric-cost-data/capital-structure

[25] NARUC, "Cost of Capital and Capital Markets Primer for Utility Regulators," December 2019, https://pubs.naruc.org/pub.cfm?id=CAD801A0-155D-0A36-316A-B9E8C935EE4D

[26] CPUC, "Return on Equity," accessed 4/1/2024 at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/historical-electric-cost-data/return-of-equity

[27] California Public Utilities Commission. "Return of Equity." Accessed May 24, 2024, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/historical-electric-cost-data/return-of-equity

[28] Southern California Edison. "2021 Annual Report Edison International and Southern California Edison." 2021. https://download.edison.com/405/files/202210/2021-eix-sce-annual-report.pdf?Signature=bTLt6rslBQQD9tuFM70l7JXo%2BoU%3D&Expires=1716635813&AWSAccessKeyId=AKIAJX7XEOOELCYGIVDQ&versionId=J7O.wRg0NotvVA1WzSMV9w4b4oEXipVL&response-content-disposition=attachment

All of these factors could potentially reduce the RR of a new transmission line; whether they do depends heavily on the institutional model chosen.

3.2.1 MORE COMPETITION

There is evidence that increased competition in the procurement of transmission lines could reduce costs to end-users. Work by consultants at the Brattle Group indicates that more competitive processes in procuring transmission in the US could reduce capital costs by as much as 20-30%.[29] The Brattle Study looked at the results of competitive procurement in transmission in the US, Canada, the UK, Brazil, Chile, and Australia. Similar results can also be seen in competitive auctions in other countries. Box 4 shows, for example, the cost savings from competitive auctions for transmission lines in Peru when concession-type PPPs were used instead of letting the incumbent utility develop and operate the lines.

[29] Pfeifenberger, Johannes P., Judy Chang, Akarsh Sheilendranath, J. Michael Hagerty, Simon Levin, and Wren Jiang. "Report by Brattle Economists Discusses the Benefits of Competitive Transmission." Prepared for LSP Transmission Holdings, Brattle, June 21, 2021. *https://www.brattle.com/insights-events/publications/report-by-brattle-economists-discusses-the-benefits-of-competitive-transmission/*.

Box 4: Competitive Auctions for Transmission in Peru

Since 2002 in Peru, the private sector has competed in bids for 30-year operation and maintenance concession contracts guaranteeing fixed annual payments. PPP investments in electric transmission lines have exceeded 3,600 million Peruvian Sol (about 970K USD) from 2001 to 2020 and are steadily increasing. The successive competitive auctions have been tied to the system operator's biennial transmission expansion planning process since 2006, resulting in substantial whole-of-life cost reductions and increased competition for the investment of transmission systems.

- **Cost Reductions:** Winning bids for 15 projects between 1994 and 2013 were, on average, 36 percent lower than the estimated annual costs. One project developed in 2008 was a remarkable 58 percent lower. Private remuneration linked to 30 years of infrastructure operation ensured a long-term commitment to operational efficiency. This model promoted sustained growth, particularly in high and ultra-high voltage lines, with lower losses over long distances.
- **Increased Competition:** Competitive securities from bidders incentivized significant savings for the country. Competitive bidding led to bids averaging at least 40 percent lower than the government's maximum value in ten tenders from 2015 to 2021. The competitive nature of the auctions resulted in increased participation, fostering a healthier competitive environment. From 2015-2021, PROINVERSIÓN, the entity commissioned to award projects, saw five bidders on average per project in transmission line tenders.

Of the 27 projects awarded since 2008, 16 are operational. Once awarded, transmission projects in Peru cannot start the operational stage until they are granted all the needed permits, including environmental, technical and social approvals. Most of the awarded projects that are not yet operational are delayed in obtaining environmental certifications because of political conflict in the country, and because of delays in acquiring essential permits despite legal deadlines, the need for prior consultation with indigenous communities following recent legal changes, and bureaucratic hurdles in approving schedule extensions. Nonetheless, the overall perception of PPP transmission projects in Peru is positive. In 2023 alone, 14 projects were awarded, with investments totaling over US$ 2,330 million. Of these PPPs, 8 were transmission projects, for a total of US$1.2 billion, which represents more than 53% of the total awarded value. For 2024, 4 groups of transmission projects are expected to be awarded, with a value of more than US$ 900 million.

Beyond cost savings and increased competition, Peru's transmission PPPs have brought about additional benefits such as job creation, enhanced reliability, minimized service disruptions, improved efficiency, and balanced energy prices across regions.

To tackle some of the challenges of implementing PPP projects, recent legal and regulatory changes in Peru's PPP framework, highlighted by the implementation of Legislative Decree No. 1362, aim to streamline processes and enhance transparency, reduce bureaucratic delays and foster better public-private coordination. These reforms are designed to stabilize the investment environment, addressing chronic issues such as contract renegotiations and permit delays, to ensure the timely execution of infrastructure projects.

Sources:

Pedro E. Sanchez and Samuel Oguah, "Private Sector Participation in Transmission Systems: Making It Work," World Bank Group Livewire: A Knowledge Note Series for the Energy & Extractives Global Practice, 2015, *https://ppi.worldbank.org/content/dam/PPI/resources/ppi_publication/web_publication/100989-BRI-VC-PUBLIC-ADD-SERIES-Box393254B-Knowledge-Notes-LW52-OKR.pdf*

PROINVERSIÓN, "Investments in PPP Exceed $ 3,600 Million and Contribute to Sustaining Economic Activity," September 1, 2021, *https://www.investinperu.pe/en/ppp/detalle-noticia/investments-in-ppp-exceed-3600-million-and-contri*

Diana Briones Morey and Diego Morales Alferrano, "Proyectos de transmisión de electricidad: problemas recurrentes y agenda pendiente | IUS 360," April 3, 2023. *https://ius360.com/proyectos-de-transmision-de-electricidad-problemas-recurrentes-y-agenda-pendiente/*.

Cost savings from competitive procurement have an impact on the revenue requirement through the "rate base". The rate base for a transmission line is the asset value of that line at any given point in time. The value of the rate base is driven largely by the capital expenditure (CAPEX) cost of that asset and its age.[30] The CAPEX cost is the cost of building the line but may also include pre-construction project development costs, as FERC's Uniform System of Accounts considers construction costs to includes a wide range of development costs beyond materials & supplies. Some of the other costs include: contract work, labor, privileges and permits, engineering and supervision, legal expenditures, studies, training costs.[31] Financing costs are also allowed as an Allowance for Funds Used During Construction (AFUDC). All of these costs may be included in the rate base once the asset becomes operational.[32]

A reduction in rate base has the following cumulative impacts on a revenue requirement:

- The total dollar return on debt and (if applicable) equity will be lower because the WACC is applied to a lower asset value
- Corporate tax obligations will be lower, because the return is lower
- Depreciation charges will be lower, because the asset cost is lower
- OPEX may also be lower to the extent—as we assume in Section 5—that they are a percentage of CAPEX costs.

There are thus spillover effects of a reduction in rate base, potentially leading to a lower revenue requirement overall and lower tariffs.

3.2.2 ACCELERATED DEVELOPMENT

As noted above, non-construction development costs may be capitalized or "rolled-in" to a utility's rate base and may even be recovered (as Construction Work in Progress, CWIP) before an asset is operational. The longer development period, the higher the costs are likely to be. Moreover, the likelihood of a project going forward reflects risk, which also has a cost in terms of ROE (higher risk projects will typically have a higher ROE).

The extent to which regulators allow such development costs to be included in a rate base will differ by jurisdiction and circumstance. It is therefore difficult to know the magnitude of such costs, but evidence from canceled transmission projects indicates that they are substantial. The costs include expenses for financing arrangements, permitting, and regulatory compliance. Evidence of the magnitude of such expenditures can be seen where projects have been abandoned. As noted above, the Northern Pass project in New Hampshire incurred $318 million in sunk costs for pre-development activities, representing roughly 20% of its estimated total cost of $1.6 billion.[33] Similarly, the Hydro-Québec US transmission line project in Maine saw $450

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[30] The asset's age matters because assets deteriorate over time, and with that deterioration, lose value. See the discussion in Section **Error! Reference source not found.** on depreciation.

[31] "18 CFR Part 101 -- Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act." Accessed April 1, 2024. https://www.ecfr.gov/current/title-18/part-101.

[32] Utilities may also be able to recover some of them before the line is commissioned, as "Construction Work in Progress" or CWIP.

33 Michael Cousineau, "Eversource giving away land bought for failed Northern Pass project," New Hampshire Union Leader, June 26, 2023, https://news.yahoo.com/eversource-giving-away-land-bought-225400675.html

million (43% of the estimated total project costs) spent in pre-development.[34] If there is a 50% probability of failure and a 20% cost for failure, then every developer has to build in a minimum 10% risk adder to the CAPEX.

The potential savings to ratepayers is in reducing the window of time for permitting and regulatory approval as well as reducing the development risk that extended review implies. This could reduce development costs that later enter into the rate base. The savings would come first from reducing the number of years and level of effort utility staff have to work on pre-construction project development. Second, it would come from early termination for projects rejected by regulatory agencies as in the case of Northern Pass. The early termination limits the amount spent on failed projects and thus the risk premium for development.

3.2.3 PRIVATE SECTOR EXPERTISE AND EFFICIENCY

There is an extensive body of literature devoted to analyzing the efficiency and effectiveness of public sector institutions versus private. The literature is—as a whole—largely inconclusive, in part because the results are so often highly dependent on context.

Without entering into specific arguments on either side, there is at least anecdotal evidence that the private sector can be given incentives to operate more efficiently than the public sector in delivering infrastructure services. In the Peru example in Box 4, it is apparent that the private transmission concessionaires helped to reduce whole-of-life costs of transmission and not just CAPEX costs. Common sense also suggests that:

- There are advantages in having a specialized private sector developer and operator who can bring the right skills to a project.
- Giving a developer/operator a profit incentive can be a powerful performance motivator.
- Making potential developers/operators compete *for* a market (i.e., for the exclusive right to earn revenue from a transmission asset) has the potential to reduce costs.

What is clear is that supply chain challenges and skilled labor shortages are one important factor in the delays experienced in developing new transmission lines. The creation of a public sector entity responsible for transmission development would be competing with long-established, experienced private developers and IOUs for materials and labor.

3.2.4 TAXATION

One possible advantage of having a public asset owner—such as Power Authority—is that these public entities are not typically required to pay income taxes and may be exempt from some other taxes, including sales or property tax.[35] NYPA, for example, is exempt from income taxes and properties acquired for its projects.[36] PRPA is similarly exempt from income and property taxes.[37] LIPA is not obliged to pay income tax, but its status for property and sales tax have been the subject of a series of disputes over the years.

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34 "Hydro-Quebec scores legal victory in Maine over $1B US transmission line project," CBC News, April 20, 2023, https://www.cbc.ca/news/canada/montreal/hydro-quebec-1.6816752

35 A utility may, in some circumstances, make "payments in lieu of taxes" to reimburse local governments for foregone property taxes.

36 Tu, Kailin. "Proposed 2023 Budget and 2023–2026 Financial Plan," 2023.

37 https://www.prpa.org/wp-content/uploads/2021/04/Organization-Governance-April-2020.pdf

3.3 COMPATIBLE INSTITUTIONAL MODELS

The discussion above suggests that the most appropriate institutional models will be those that:

- Allow for the use of public debt in financing transmission lines and facilitate savings in other areas, such as taxes.
- Foster competition among bidders in ways that reduce project costs.
- Allow for private sector involvement in development and/or operations.
- Accelerate the transmission development process, especially the period before construction which is the riskiest from an investor perspective.

Table 3.2 summarizes how four possible institutional models, ranging from wholly public to wholly private rank against these criteria.

Table 3.2: How Alternative Institutional Models Can Reduce Costs

	Facilitates Savings from the Use of Public Financing?	Facilitates Competition?	Facilitates Private Sector Involvement?	Accelerates Development?
Wholly Public	Yes	Would likely involve a competitive tender for design and build functions only	Limited to design and build functions	Possibly, but would likely require substantial institutional, legal, and regulatory changes
Lease Contract	Yes, the government is an asset owner	Yes, would involve competitive tender for the design, build, and operate functions over short-term (typically 3-5 years)	Yes, a private sector operator is hired as a lessee	
Concession Contract	Typically, privately financed	Yes, would involve competitive tender for the design, build, and operate functions over the life of the asset	Yes, private sector operator is hired as concessionaire	
Wholly Private (IOUs)	Typically, privately financed	Depends on the type of tender, but for many lines tendered by CAISO, incumbent utilities already have access to property or rights-of-way	Yes, utility is private company	No. Current process takes 5-15 years

A lease contract-type PPP offers—in our view—the best mix of ability to inject public financing, harness other possible benefits of public ownership (e.g., some degree of tax-exempt status and the ability to issue tax-exempt bonds), and involve private sector expertise. Any of the models could conceivably help to accelerate the development process—for example, the creation of a "one stop shop" for expedited regulatory approvals—but would require substantial institutional, legal, and regulatory changes in any case.

The principal disadvantages of other models are:

- The wholly public model does not build in the participation of the private sector beyond the design and build stage.
- The concession-type PPP would mean private sector financing, and the ROE and commercial debt that comes with it. It is conceivable, however, that the public sector could provide some concessional financing (or even grants) to reduce the cost of capital.
- The wholly private model is "business-as-usual", with private sector financing costs, and no solution to the long delays in project development.

As noted in the table, none of the models offers an easy solution to accelerating project development without substantial institutional, legal, and regulatory changes. These would be required, regardless of the model chosen.

Most international tenders for transmission have been concession-type PPP contracts, but there is precedent in the US, and in other infrastructure sectors, with lease-type PPPs. Lease-type contracts have been used, for example, in the development of road projects. Such leases are longer-term than those typically seen for other infrastructure projects, but the principles of upfront public financing and private operation are the same. Box 5 describes some of the projects. In the case of the Pocahontas Parkway, tax-exempt IRS 63-20 financing was used.

Box 5: Lease-type Roads Contracts in the United States

PPPs for infrastructure are more common internationally than in the United States; they have been more common in the US roads sector than in other sectors. The following are examples of lease-type PPPs used in US roads sectors:

- **Chicago Skyway:** In 2004, the Chicago Skyway toll road's lease was awarded to Cintra and Macquarie for $1.83 billion, marking the first long-term lease of an existing toll road in the United States. In 2015, they sold their interest to Calumet Concession Partners LLC, a consortium of Canadian pension funds, for $2.8 billion. Calumet now operates the Skyway, collecting tolls until the lease expires in 2104, ensuring its continued functionality as a crucial transportation link.
- **Indiana Toll Road:** In 2006, the Indiana Finance Authority (IFA) leased the Indiana Toll Road to the Indiana Toll Road Concessions Company (ITRCC) for 75 years, with ITRCC assuming authority in June of the same year. The lease mandated a $200 million investment in capital improvements within the first three years and a total of $4.4 billion over its duration. However, in 2015, ITRCC filed for bankruptcy, leading to the IFA awarding a new 66-year lease to IFM Investors for $5.725 billion.
- **Northwest Parkway:** The Northwest Parkway connects E-470 in Denver to US Route 36 in Broomfield Colorado. It was initially opened in 2003 and financed through toll revenue bonds. The project faced financial challenges due to lower-than-expected traffic volume by 2007, leading to its lease to a private consortium, Northwest Parkway LLC, for 99 years. The agreement entailed an upfront cash payment, the takeover of existing debt, and an annual administrative fee to the Authority over the lease's duration. A portion of the debt was held in escrow pending issuance of notices to proceed by the end of 2018, aiming to extend the parkway's operations.
- **Pocahontas Parkway/Richmond Airport Connector:** The Pocahontas Parkway was primarily financed by tax-exempt revenue bonds totaling $354 million issued by the Pocahontas Parkway Association in 1998 under Virginia's Public Private Transportation Act of 1995. Financing also included a State Infrastructure Bank loan of $18 million and $9 million from the federal government for roadway design. In 2006, a 99-year lease of the Parkway was granted to Transurban, a private Australian toll road operator with US subsidiaries. In exchange for assuming exclusive rights to enhance, manage, operate, maintain, and collect tolls on the Parkway, Transurban committed to constructing the Richmond Airport Connector, a 1.58-mile extension linking the toll road to Richmond International Airport.

Sources:

"Project Profile: Chicago Skyway." *FHWA*, US Department of Transportation Federal Highway Administration, www.fhwa.dot.gov/ipd/project_profiles/il_chicago_skyway.aspx. Accessed 2 Apr. 2024.
"Project Profile: Indiana Toll Road." *FHWA*, US Department of Transportation Federal Highway Administration, www.fhwa.dot.gov/ipd/project_profiles/in_indiana_toll.aspx. Accessed 2 Apr. 2024.
"Project Profile: Northwest Parkway." *FHWA*, US Department of Transportation Federal Highway Administration, www.fhwa.dot.gov/ipd/project_profiles/co_northwest_parkway.aspx. Accessed 2 Apr. 2024.
"Project Profile: Pocahontas Parkway / Richmond Airport Connector." *FHWA*, US Department of Transportation Federal Highway Administration, www.fhwa.dot.gov/ipd/project_profiles/va_pocahontas.aspx. Accessed 2 Apr. 2024.

Lease-type contracts have also been used in social infrastructure projects, including educational facilities, civic buildings, and healthcare facilities. The nonprofit "Grow America" (formerly the National Development

Council) pioneered the approach and an organization called the Public Facilities Group has been involved in disseminating it, and advising on transactions.[38] Box 6 summarizes the principles behind the approach.

Box 6: The "New American" Approach to PPPs

The "New American Approach" involves the following steps:

1. A public agency hires a not-for-profit partner through competitive tender to lead development of the project. The not-for-profit partner will issue the debt and own the facility on behalf of the public agency. The not-for-profit partner is remunerated through a portion of the bond proceeds.
2. The public agency and not-for-profit partner select (again through competitive tender) a development team consisting of a lead developer, general contractor, and architect.
3. The development team works with the public agency and not-for-profit partner to design the project. The not-for-profit partner also secures approval of all project entitlements required to develop the project. The public agency and not-for-profit partner negotiate a long-term lease between themselves for the planned facility.
4. The not-for-profit partner creates a special purpose entity (SPE) to own and finance the asset. The SPE issues bonds (working with a bond underwriter) to sell to investors. The bond proceeds are held by a separate agency appointed as a trustee.
5. The not-for-profit partner staffs the SPE and manages construction and contractor payments. A private property management firm is selected through competitive tender to operate the facility once it is completed.
6. Once construction is completed, the public agency (or the intended beneficiaries) move into the building and the lease takes effect. The public agency makes lease payments (as rent) to the SPE which cover debt service, operating costs, and contributions to a repair and replacement reserve. Repair and replacement reserves are held by the trustee.
7. The property management firm works for the SPE, taking responsibility for managing the facility and undertaking routine operations and maintenance. The management agreement is re-tendered every 3-5 years.
8. Once the public agency has made its last lease payment, the debt is retired and excess funds from the repair and replacement reserve return to the public agency. The public agency may then take on responsibility for property management and ownership of the project.

Sources:

Public Facilities Group. "Our Approach." Public Facilities Group (blog). Accessed April 1, 2024. https://publicfacilitiesgroup.org/our-approach/.

A number of non-IOU companies specialize in owning, operating, and maintaining high-voltage transmission lines and related infrastructure. These are just examples of some of the private partners who may potentially be interested in additional transmission projects in California. Some independent power transmission companies in North America including the ITC Holdings Corp (operating assets in Michigan, Illinois, Iowa, Kansas, Minnesota, Missouri, Oklahoma, and Wisconsin), NextEra Energy Transmission (subsidiaries

[38] Public Facilities Group, "Our Approach," Public Facilities Group (blog), accessed January 12, 2024, https://publicfacilitiesgroup.org/our-approach/.

operating assets in California, Illinois, Indiana, Kansas, Kentucky, Nevada, New Hampshire, New York, Oklahoma, Texas and Ontario, Canada), and Sharyland Utilities LLC (operating assets in Texas and Mexico).[39] Other energy infrastructure companies whose business has been traditionally focused on natural gas pipelines or energy generation assets have also begun entering partnerships to develop transmission capabilities, such as Enbridge's recent partnership with NextEra Energy Canada and OMERS Infrastructure to build and operate the East-West Tie (EWT) Transmission Project, now operational in northern Ontario.[40]

Specialized investment funds that focus on acquiring and managing infrastructure assets, such as Meridiam and Boundless Energy, have also teamed up with grid operators to develop, construct, and operate large-scale transmission assets. Private equity firms also sometimes invest in or acquire and manage electricity transmission assets, either directly or through portfolio companies. For example, Atlantic Power Transmission, LLC. is a Blackstone Infrastructure Partners Portfolio Company, constructing and operating planned transmission systems along the US East Coast.

3.4 CALIFORNIA TRANSMISSION PPP EXAMPLES

Some transmission projects in California can also be classified as PPP projects. Three examples are summarized in Appendix A: a) the Path 15 project completed in 2004, b) the Trans-Bay Cable completed in 2010, and c) the West of Devers Upgrade Project completed in 2021.

In each case, although there was a partnership with a public entity, the tariff included a ROE. In the case of Path 15 and Trans-Bay Cable (catalogued as a critical transmission asset), an initial ROE of 13.5% was granted by FERC as part of a policy to stimulate construction of transmission.[43] The rates for Path 15 and the Trans-Bay Cable were contested, but only the Path 15 ROE was reduced to 10.6%.[44] In the case of the West of

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[39] ITC Holdings Corp. "Home." Accessed May 24, 2024, *https://www.itc-holdings.com/*; Sharyland Utilities. "About." Accessed May 24, 2024, *http://www.sharyland.com/about.aspx*; NextEra Energy Transmission. "Home." Accessed May 24, 2024, https://www.nexteraenergytransmission.com/

[40] Enbridge. "Power transmission." Accessed May 24, 2024 https://www.enbridge.com/about-us/renewable-energy/power-transmission

[41] Shumkov, Ivan. "Italy's Terna, France's Meridiam team up in US to build power links." October 25, 2022. Renewables New. Accessed May 24, 2024. *https://renewablesnow.com/news/italys-terna-frances-meridiam-team-up-in-us-to-build-power-links-802246/*

[42] Chirhart, Paula. "Atlantic Power Transmission LLC, a Blackstone Infrastructure Partners Portfolio Company, Announces $50 Million Commitment to New Jersey Workforce Development." April 22, 2022. Blackstone. Accessed May 24, 2024 *https://www.blackstone.com/news/press/atlantic-power-transmission-llc-a-blackstone-infrastructure-partners-portfolio-company-announces-50-million-commitment-to-new-jersey-workforce-development/*

[43] "Analysis of FERC's Notice of Proposed Rulemaking on Electric Transmission Incentives," Steptoe, accessed March 25, 2024, https://www.steptoe.com/en/news-publications/analysis-of-fercs-notice-of-proposed-rulemaking-on-electric-transmission-incentives.html.

[44] "E-6 ER20-1006-001 | Federal Energy Regulatory Commission," accessed March 24, 2024, https://www.ferc.gov/media/e-6-er20-1006-001.

Devers Upgrade Project, the Morongo Tribe partnered with Southern California Edison (SCE). The Morongo Tribe was granted an ROE of 10.8% based on the approved SCE rate of 10.3% plus a 0.5% premium.[45]

[45] FERC, "Order on Rehearing, Morongo Transmission LLC Transmission Owner Tariff," FERC Docket ER21-669-001, May 5, 2021, https://elibrary.ferc.gov/eLibrary/filedownload?fileid=15786960.

SECTION 4 IDENTIFYING TRANSMISSION PROJECTS FOR PUBLIC FINANCING STUDY

The objective of this study is to estimate possible ratepayer savings that could be achieved through public financing and new institutional arrangements. This is motivated by the increasing costs driven by the renewable buildout.

The California ISO 20-Year Transmission Outlook is the benchmark study for cost savings because it is the longest-term plan and is designed to meet the needs of the renewable generation buildout of Senate Bill 100.[46] The 20-Year Transmission Outlook identifies $30.5 Billion of transmission infrastructure buildout deemed necessary to meet the goals of Senate Bill 100.

However, perhaps not all projects in the 20-Year Transmission Outlook would benefit from the new institutional arrangements. There may also be additional transmission projects outside the 20-Year Transmission Outlook that we should consider as potential candidates.

This section identifies the scope of transmission projects that could take advantage of the new approach. There are two questions:

1. Which source of planned projects should form the set of transmission improvements to examine in the cost savings analysis?
2. Of all the possible transmission projects, which projects could adopt the new institutional arrangement? Some projects are IOU-financed by law and the law cannot be changed quickly or easily.

4.1 TRANSMISSION PROJECTS FOR CONSIDERATION

EXISTING TRANSMISSION MAINTENANCE AND UPGRADES

Existing transmission can and does cause significant cost increases. IOUs have the authority to replace existing equipment and recover the cost under their existing tariffs. This is allowed under the use of existing formula rates. State regulators both in and outside California have identified this activity as a major cause of increasing rates. The CPUC noted that in California:[47]

> …a majority of transmission projects have received no review and approval by the CAISO or the Commission, and in years 2019-2021, these Utility Self-Approved ("self-approved") Projects represented over 63% (i.e., $4.2 billion) of the $6.6 billion of capital additions added to the three TOs' transmission rate bases.

[46] CAISO, "20-Year Transmission Outlook," May 2022, https://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf.

[47] CPUC, "Resolution Establishing the Transmission Project Review Process," Final Resolution E-5252, May 2, 2023, https://webprod103.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/transmission-project-review-process.

Outside California the same issue has been raised through a FERC complaint by the Ohio Consumers' Counsel.[48] The underlying problem is that FERC jurisdictional utilities may replace transmission assets as part of on-going business, and this may only "incidentally" increase transmission capacity.

While these replacement activities that incidentally increase transmission capacity are costly, their regulatory treatment is an area of active litigation. Furthermore, the transmission maintenance and upgrades are a core IOU activity. Transferring those assets and investments to a public or nonprofit entity would face high legal hurdles. *We will not include these projects in our cost analysis.*

CAISO 2022-2023 TRANSMISSION PLAN PROJECTS

The CAISO proposes transmission projects for grid expansion. These are—in theory—eligible to participate in the competitive tender. Any type of entity, including the PPPs proposed here, may participate in the tender.

The CAISO has a tariff-required annual transmission planning process that examines transmission needs over the next ten years. The CAISO 2022-2023 Transmission Plan identified $7.3 Billion of projects. Of these projects the majority were improvements to existing infrastructure such as upgrading transformers from 230 kV to 500 kV, or reconductoring existing lines to allow for a higher thermal limit.

Three projects identified in the 2022-2023 Transmission Plan were eligible for competitive procurement. They amounted to an estimated $3.1 Billion or approximately 43% of the $7.3 Billion total.

The 2022-2023 Transmission Plan included expanded electrification as part of the base case and this partially led to the $1.3 Billion of "Reliability-Driven" projects associated with the higher load.

The distinction of what is and is not eligible to be part of a competitive tender determines the size of the savings that can be achieved. The 2022-2023 Transmission Plan is essential to reverse engineering the criteria used by the CAISO in determining what should be eligible for a competitive tender, and what not. These criteria will be discussed at more length below in Section 4.2.

The CAISO 2022-2023 Transmission Plan does not fulfill the needs imposed by Senate Bill 100 as the 20-Year Outlook does. It also includes many projects that the CAISO has not identified as eligible for competitive tender. These are "reliability-driven" and reflect increased demand from electrification.

While the CAISO 2022-2023 Transmission Plan does not represent the full set of projects required for Senate Bill 100, it *does provide detail that can be used to confirm the criteria the CAISO uses to identify which projects can be submitted to a competitive tender*.

PROJECTS IN THE CALIFORNIA ENERGY COMMISSION OFF-SHORE WIND STUDY

The CEC was charged by Assembly Bill (AB) 525 (Chiu, Chapter 231, Statutes 2021) to produce a strategic for floating offshore wind energy development in federal waters off the California coast. The resulting report estimated the cost of transmission to support off-shore wind turbines on the north coast of California at $7.51-$41.35 Billon.

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[48] Ohio Consumers Counsel, "Ohio Consumers' Counsel Complaint Re Local Transmission Planning Oversight," FERC Docket No. EL23-105-000 (Office of the Ohio Consumers' Counsel, September 28, 2023), https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20231205-5021&optimized=false.

This report only looked at transmission for off-shore wind and did not examine the cost of meeting Senate Bill 100. However, *the supporting analysis provides additional details, such as the length of useful life for transmission assets, that will be used in the cost analysis*.

BEST CANDIDATE: CAISO 20-YEAR TRANSMISSION OUTLOOK

The CAISO 20-Year Transmission Outlook provides the best set of proposed transmission projects to evaluate in the cost analysis. However, the CAISO 2022-2023 transmission plan provides details that are useful in determining what criteria determine eligibility for competitive tenders, and the CEC Off-Shore Wind Study provides useful cost modeling details.

4.2 CRITERIA FOR DETERMINING PROJECT ELIGIBILITY

The potential for savings depends on the scope of transmission projects that can use innovative public financing structures. The competitive tenders run by CAISO for new projects provide a straightforward application scenario. These would not require challenging IOU rights or current CAISO practices.

This section will review the regulatory framework supporting—and limiting—competitive tenders.

FERC ORDER 1000

FERC Order 1000 eliminated transmission owners' right of first refusal, the right to build any required new transmission in their area.[49] The existing transmission owners were strongly opposed to the rule and FERC's final rule included text that limited the scope of the change. Incumbent transmission owners maintain control over their existing infrastructure:[50]

> [Order 1000 reforms] do not affect the right of an incumbent transmission provider to build, own, and recover costs for upgrades to its own transmission facilities, such as in the case of tower change outs or reconductoring, regardless of whether or not an upgrade has been selected in the regional transmission plan for purposes of cost allocation.

Further, Order 1000 did not remove the right of rest refusal from "local" transmission, defined as:[51]

> "..a transmission facility located solely within a public utility transmission provider's retail distribution service territory or footprint that is not selected in the regional transmission plan for purposes of cost allocation."

Over time the implementation of FERC Order 1000 has interpreted the competitive solicitation requirement as applying when:

a) The transmission project is an expansion of the grid.

b) The project is not part of "local" transmission.

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[49] FERC, "FERC Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities," FERC Docket Docket No. RM10-23-000 (FERC, July 21, 2011), https://www.ferc.gov/sites/default/files/2020-04/OrderNo.1000.pdf.

[50] FERC, at 319.

[51] FERC, at 63.

c) The project is not an upgrade of the transmission owners' facilities.

APPLICATION OF FERC ORDER 1000 IN CALIFORNIA

As the California Public Advocate noted, the application of the FERC criteria in California depends on an arbitrary definition of local transmission as all equipment below 200 kV. The CAISO tariff defines a Local Transmission Facility as:[52]

a) Under the CAISO Operational Control,
b) Is owned by a Participating TO [Transmission Owner or equivalent],
c) Operates at a voltage below 200 kilovolts, and… is located entirely within a Participating Transmission Owner's [PTO] footprint or PTO Service Territory.

As the Public Advocate further pointed out other RTOs have more permissive limits (Southwest Power Pool and ISO-NE have limits of 100 kV, NYISO does not use a kV limit).

The second benchmark test is whether a project can be classified as "upgrade" or an "expansion." An expansion falls under FERC Order 1000 transmission planning and would be subject to competitive procurement, an upgrade does not.

The distinction between "upgrade" and "expansion" does not have a basis in electric power; an increase of 500 MW transfer capacity between two points has the same result however it is categorized. However, if one category is applied the incumbent has an exclusive right, in the other a competitive tender is held.

This second benchmark test is not defined. The next section examines how this has been implemented in practice by the CAISO as part of determining which projects are eligible for competition, and hence innovative financing structures such as PPPs.

ORDER 1000 CRITERIA IMPLICIT IN CAISO DETERMINATION OF COMPETITION ELIGIBILITY IN CAISO 2022-2023 TRANSMISSION PLAN

The CAISO 2022-2023 Transmission Plan approved 46 new transmission projects. Of these only three projects were identified as eligible for competitive procurement, although they were large projects and accounted for 43% of the total cost[53]. These three (numbers 13, 14, and 16) are circled in red in Figure 4.1.

[52] CAISO, "California Independent System Operator Corporation: Fifth Replacement FERC Electric Tariff," Open Access Transmission Tariff, January 1, 2023, https://www.caiso.com/rules/Pages/Regulatory/eTariff.aspx, Appendix A; California Public Advocates Office, "Competitive Solicitation in Transmission Line Development Lowers Ratepayer Costs and Decreases Delays," June 9, 2023, https://www.publicadvocates.cpuc.ca.gov/-/media/cal-advocates-website/files/press-room/reports-and-analyses/230609-caladvocates-increasing-competitive-solicitation-in-transmission.pdf.

[53] CAISO, "2022-2023 Transmission Plan," May 18, 2023, https://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=13E8A7DF-2D59-4BAE-9794-C99CC5945FA5.

Figure 4.1: CAISO 2022-2023 Transmission Plan

No.	Project Name	PTO Area	Geographic Area	Cost ($M)
11	Vista-Etiwanda 230 kV 1 Line Upgrade	SCE	SCE Eastern	13
12	Mira Loma-Mesa 500 kV Underground Third Cable	SCE	SCE Metro	35
13	Imperial Valley–North of SONGS 500 kV Line and Substation	SDG&E	SDG&E	2,288
14	North of SONGS–Serrano 500 kV line	SDG&E / SCE	SDG&E and SCE Metro	503
15	Serrano–Del Amo–Mesa 500 kV Transmission Reinforcement	SCE	SCE Metro	1,125
16	North Gila–Imperial Valley 500 kV line	SDG&E	SDG&E (Potential Joint Project with IID)	340
17	Upgrade series capacitors on HW-NG and HA-NG to 2739 MVA	APS	APS	27

Source: Jeff Billinton, "Decision on ISO 2022-2023 Transmission Plan" (ISO Board of Governors Meeting, California ISO, May 18, 2023), http://www.caiso.com/Documents/Decisionon2022-2023TransmisisonPlan-Presentation-May2023.pdf.

The three competitive projects are all in the Imperial Valley region and are all *new lines*. In contrast, project 15 is classified as a reinforcement although its cost is $1,125 Million.

It appears that only *new lines* are eligible for competitive procurement. The bright line test appears whether the project requires new land, i.e., is a *greenfield* project. Simply replacing the conductors and the towers would not constitute a *new line*. As noted above, FERC specified that tower replacement and reconductoring would be seen as an upgrade to existing facilities owned by the incumbent. Brownfield projects that use existing property and right-of-way, such as adding a third underground cable in project 12 or reconductoring, are not eligible for competitive procurement.

4.3 APPLYING ORDER 1000 CRITERIA TO CAISO 20-YEAR TRANSMISSION OUTLOOK

Here we extend the greenfield/brownfield test to the CAISO 20-Year Transmission Outlook. The following two projects provide an example of how the test is applied. Both are estimated at a $0.5 B cost. Both are 500 kV lines. However, the competitive project is a new line while the second, the IOU project replaces an existing 230 kV line with a 500 kV line. The replacement uses existing property but requires tower replacement.

Table4.1: Sample Classification of Projects

Project Classification	Project	Description	Estimated Cost
Competitive Procurement	North Gila – Imperial Valley 500 kV line	- 85 mi of 500 kV line. - Series compensation.	$0.5 B
IOU Upgrade	Westland 500/230 kV station	- 50 mi of 500 kV line (replacement of 230 kV). - New 500/230 kV substation with two transformers ($200M)	$0.5 B

Using this greenfield/brownfield criteria to identify projects eligible for competitive procurement, we find that approximately 83% of the total estimated costs are eligible for competitive procurement (Table 4.2).

Table 4.2: Summary of Projects Eligible for Competitive Procurement

Type of Project	20-Year Outlook Total ($ B)	Competition Eligible ($ B)	Comments
Changes to Existing Footprint	10.74	10.4	Excludes upgrades to existing infrastructure
Off-Shore Wind	8.11	8.11	Lower total cost than in CEC off-shore wind report[54]
Out-of-State Wind	11.65	6.95	Excludes subscriber lines already under construction (Sunzia and Transwest Express)
Total	30.5	25.46	
Percent of Total	100%	83%	

There were four projects that were deemed not eligible for competitive procurement. These are shown in Table 4.3.

[54] California Energy Commission, "California Energy Commission Draft Commission Report, Volume I: Overview of AB 525 Strategic Plan," CEC Docket Number 17-MISC-01, January 19, 2024, https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-MISC-01.

Table 4.3: Projects Ineligible for Competitive Procurement

Project	Description	Cost ($ B)
Westland 500/230 kV station	50 mi of 500 kV line (replacement of 230 kV). New 500/230 kV substation with two transformers ($200M)	0.5
Third Collinsville – Pittsburg 230 kV cable	230 kV cable	0.14
Round Mountain 500/230 kV Transformer	Add one 500/230 kV transformer	0.1
Lugo 500/230 kV Transformers	Add one 500/230 kV transformer	0.1

Box 7 Fire Hardening Measures: Costs and Tradeoffs

"Fire-hardening" refers to a series of measures and improvements designed to enhance the resilience of electric transmission and distribution systems against wildfires. The most effective way to reduce wildfire risk is a process known as "undergrounding." This involves placing power lines and related electrical equipment below the ground, rather than using overhead lines strung on poles or towers. Placing new transmission lines underground is about eight to ten times the cost of building overhead lines; placing new distribution lines underground is typically four to six times more expensive.

Other examples of fire-hardening measures include covering conductors to eliminate line slap arcing, using alternative materials (e.g. composite, steel, concrete, or fire-resistive protection) on or instead of wood poles, and establishing other physical barriers to reduce possible contact with animals or vegetation.

Fire-hardening measures vary in risk-mitigation effectiveness and associated costs per mile when rehabilitating an existing system. Undergrounding reportedly eliminates close to 99 percent of fire risk. Covering conductors, however, may be implemented in half the time, at a third of the cost of undergrounding, and mitigate about 60 percent of fire risks.

There are also tradeoffs to system reliability to consider. Some comparisons suggest underground systems see 50 percent fewer outages, yet the average duration of an underground outage may be up to 58 percent longer. Long-term reliability is also a trade-off. One Maryland utility observed that customers served by a 40-year-old overhead line had better reliability than a 20-year-old underground line.

Sources:

Baker, Matt. "Why We Support the Levels of Undergrounding Approved in PG&E's General Rate Case." California Public Advocates Office. Accessed May 21, 2024. https://www.publicadvocates.cpuc.ca.gov/press-room/commentary/231117-undergrounding-pge-grc

SCE&G. "Underground vs. Overhead Power Lines." ND. https://pdi2.org/wp-content/uploads/2021/03/130-SC-SCANA-Undergroundvs1.pdf

Apparatus & Standards Engineering Group. "Covered Conductor - Everything You Need To Know (Compendium)." Southern California Edison. October 8, 2018. https://www.sce.com/sites/default/files/AEM/Supporting%20Documents/2023-2025/Covered%20Conductor%20Compendium.pdf

California Department of Forestry & Fire Protection, CPUC, PG&E, SCE, SDGE., "California Power Line Fire Prevention Field Guide." 2020. https://www.osfm.fire.ca.gov/media/11015/2020-power-line-fire-prevention-field-guide_20200818.pdf

4.4 FURTHER OBSERVATIONS ON COMPETITION ELIGIBILITY

The projects listed in the CAISO 20-Year Transmission Outlook do not include projects to address electrification demand increases or what CAISO identifies as "reliability-driven" projects rather than driven by the need to access renewable generation. These projects are not competition eligible and amounted to approximately 57% of the total cost. This suggests both that the 20-Year Transmission Outlook represents less than half of the total energy transition cost and that the IOUs will capture 50%-60% of the total new transmission construction.

The implicit greenfield requirement for competitive procurement is a significant barrier to entry for non-incumbent transmission providers. This is especially true in urban areas where permitting and siting is especially difficult.

Workarounds for this issue are beyond the scope of this report. However, it is worth noting that sharing of the right-of-way between incumbents and non-incumbents may be a worthwhile area for investigation. FERC noted in Order 1000 that the order does not change existing right-of-way laws.[55]

[55] FERC, "FERC Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities", at 319.

SECTION 5 REVENUE REQUIREMENT MODEL

Section 3 identified possible cost savings to customers from the use of public sector financing in transmission, and the use of alternative institutional models (from Section 2) to deliver such financing. Section 4 identified the lines that could conceivably be eligible for competitive tender and hence alternative modes of procurement and financing. This section attempts to quantify the possible cost savings—as a change in revenue requirement—on the lines in Table 4.2 that are competition-eligible.[56]

5.1 ASSUMPTIONS

Sensitivity analysis was first used to understand the possible impact on the transmission lines' revenue requirements of changes to the magnitudes of the building blocks shown in Table 5.1. Scenario analysis was then used to simulate a collection of sensitivities that seemed reasonable under alternative institutional models. The "business-as-usual" or base case is an IOU. In this scenario, IOUs are assumed to win CAISO competitive tenders to own and operate the lines. Table 5.1 shows the input assumptions used for the IOU Scenario. We used CAISO's assumptions that the new investments have a 50-year asset life; upgrades have 40-year lives.[57]

Table 5.1: Input Assumptions for IOU Scenario (Business-As-Usual)

Assumption	Assumptions	Value
Cost of equity (%)	Average of PG&E, SCE, SDG&E cost of equity*	10.37
Cost of debt (%)	Average of PG&E, SCE, SDG&E cost of debt*	5.33
Equity participation (%)	Average of PG&E, SCE, SDG&E capital structures*	53.27
Tax rate (%)	Federal = 21%; State = 8.84%	27.98
CAPEX Cost (US$ bln)	As per Table 4.2 (above)	25.46
Depreciation (US$ mln/year)[58]	2%/year for new assets; 2.5%/year for upgrades	513.97
Operating Cost (US$ mln/year)[59]	2% of CAPEX per year	512.80

*Assumptions about cost of equity, cost of debt and capital structure were taken from: (i) Pacific Gas and Electric Company, 2022 Joint Annual Report to Shareholders; (ii) Edison International and Southern California Edison, 2022 Financial & Statistical Report; (iii) Sempra, 2022 Statistical Report, (iv) San Diego Gas and Electric, "Test Year 2023 Cost of Capital Application", California docket A.22-04-12.

Other scenarios were then developed based to include:

[56] Lines not tendered by CAISO may be subject to different regulatory treatment and therefore may have different cost savings potential.

[57] California ISO, 2018-2019 Transmission Plan.

[58] California ISO, 2018-2019 Transmission Plan.

[59] California ISO, 2018-2019 Transmission Plan.

- A "Public Sector" scenario in which a public entity—such as the power authorities or transmission authorities found in some other states—owns and operates the transmission lines
- Two PPP scenarios which include:
    - A lease-type PPP case for this analysis assumes a public sector owner (such as an asset holding company) would—through competitive tender—hire a private contractor to operate and maintain the transmission lines for a period of time (for example, 3-5 years). The public sector entity provides financing and is generally responsible for managing design and construction.
    - A concession-type PPP in which a public sector entity would—through competitive tender—grant a private company (and SPE or SPV) the right to build, finance, own and operate the new transmission lines for a fixed period of time (for example, 40 years) after which time, the line would revert to the public sector.[60]

Table 5.2 summarizes the assumptions of each Scenario.

Table 5.2: Summary of Scenario Assumptions

Variable	IOU Scenario	Wholly Public Scenario	PPP-Lease Scenario	PPP-Concession Scenario
Cost of equity (%)	10.37	N/A	N/A	10.37
Cost of debt (%)	5.33	2.75	4.04	5.33
Equity (%)	53.27	0	0	53.27
Tax rate (%)	27.98	0	0	27.98
CAPEX Cost (US$ bln)	25.64	22.43	19.23	19.23
Operating cost (% of CAPEX)	2	2.1	2	2

The rationale behind the assumptions is as follows:

- A publicly owned entity would finance the transmission lines with 100% public debt. This is why no cost of equity is included in the Public Scenario or the Lease-type PPP Scenario, where the owners of the assets would be public entities (either a power authority or an asset holding company).

[60] The public sector entity may then choose to re-tender the line for refurbishment.

- A publicly owned entity (whether a power authority or an asset holding company) would be able to borrow at rates that the State of California is currently able to borrow at (in the case of a power authority) or at slightly higher rates (as in the case of an asset holding company, but still lower than commercial borrowing rates.
- A publicly owned entity (whether a power authority or an asset holding company) would not pay income taxes and would therefore not have taxes as part of its revenue requirement.
- Transmission lines tendered under the Public Scenario or PPP Scenarios would have lower CAPEX costs than transmission lines tendered by CAISO to the IOUs. This is based on:
    - The Brattle Group report that indicates more competitive processes in procuring transmission in the US could reduce capital costs by 20-30 percent.[61]
    - Evidence from elsewhere in the world that successive competitive tenders for transmission lines under a PPP arrangement can bring down whole-of-life costs substantially, especially under a concession model, because of competitive bidding and because of more efficient risk allocation between the public and private partners.
- An assumption that publicly owned and operated transmission lines would have slightly higher operating costs than privately owned and/or operated lines, because of the absence of a private sector profit incentive and because PPP arrangements typically have lower whole-of-life costs than transmission built by incumbent utilities.

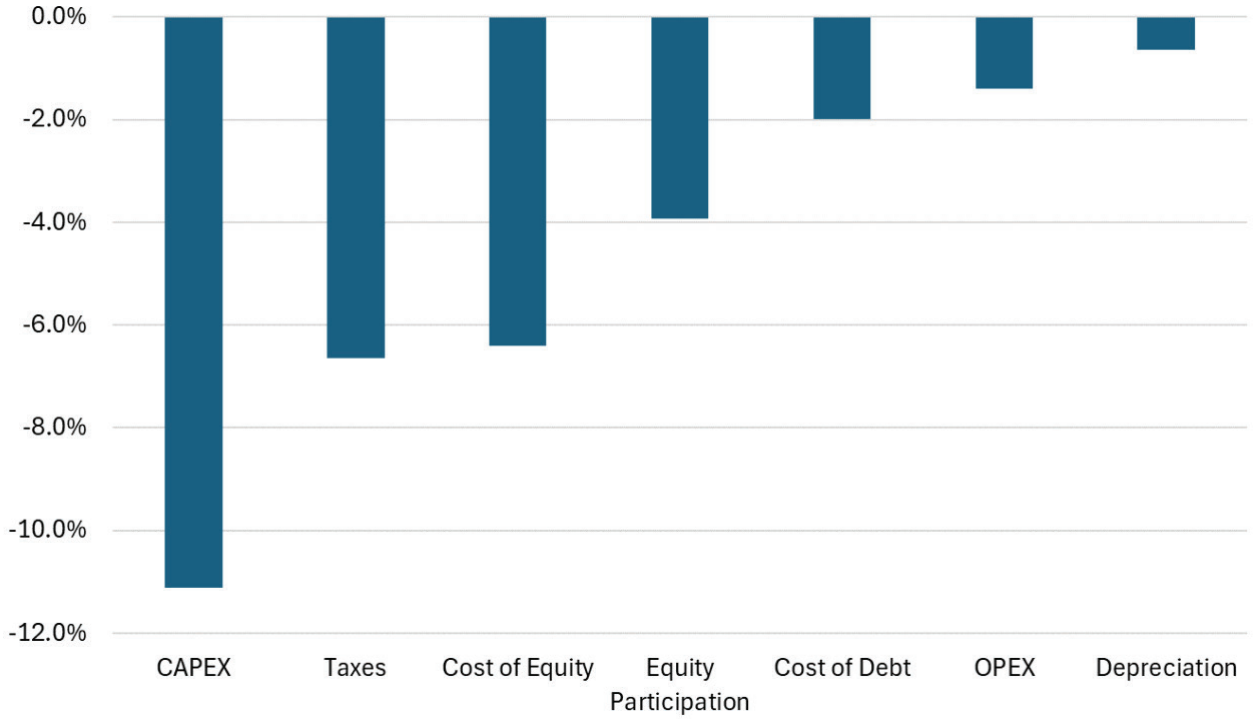
As described in Section 3 many of the input assumptions depend heavily on the detailed design of the institutional options.

5.2 SENSITIVITIES

Figure 5.1 shows the impact of a 10% reduction in the principal inputs to the revenue requirement calculation. This is useful in understanding the biggest drivers of cost in the revenue requirement. As the figures show, the capital cost itself, which makes up the rate base, is the single most influential driver of the RR, followed by taxes, the cost of equity, capital structure and the cost of debt; the impacts on the RR of reductions in OPEX and depreciation are considerably lower.

[61] Pfeifenberger, Johannes P., Judy Chang, Akarsh Sheilendranath, J. Michael Hagerty, Simon Levin, and Wren Jiang. "Report by Brattle Economists Discusses the Benefits of Competitive Transmission." Prepared for LSP Transmission Holdings, Brattle, June 21, 2021. *https://www.brattle.com/insights-events/publications/report-by-brattle-economists-discusses-the-benefits-of-competitive-transmission/*.

Figure 5.1: Impact on RR of a 10% Reduction in Principal Input Variables[62]



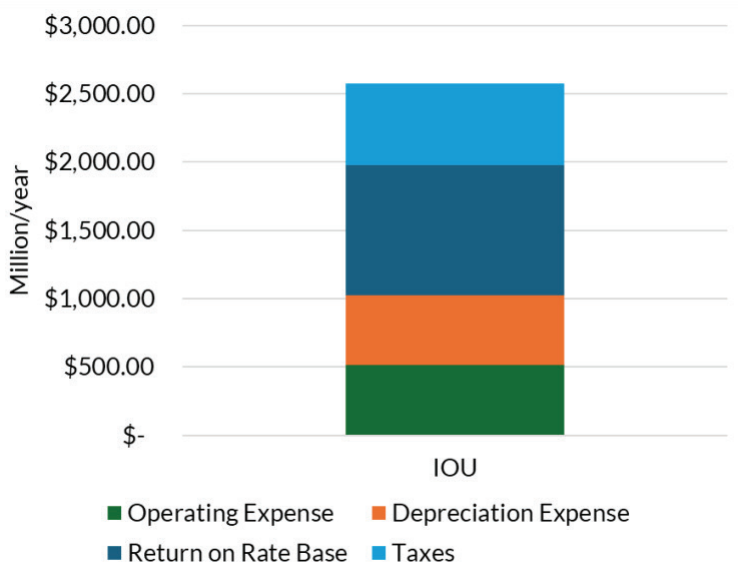
5.3 SCENARIOS

Figure 5.2 shows the revenue requirement under the IOU Scenario defined in Section 5.1. The package of transmission lines would have an average annual revenue requirement of roughly $2.5 billion, or $100 billion over 40 years. If the costs of undergrounding are included (See Box 7), the average annual revenue requirement would be nearly $21 billion, or $825 billion over 40 years.[63]

[62] Based on an estimate of the transmission line's first full-year revenue requirement.

[63] Undergrounding is estimated to increase the capital costs of transmission projects by 8-10 times.

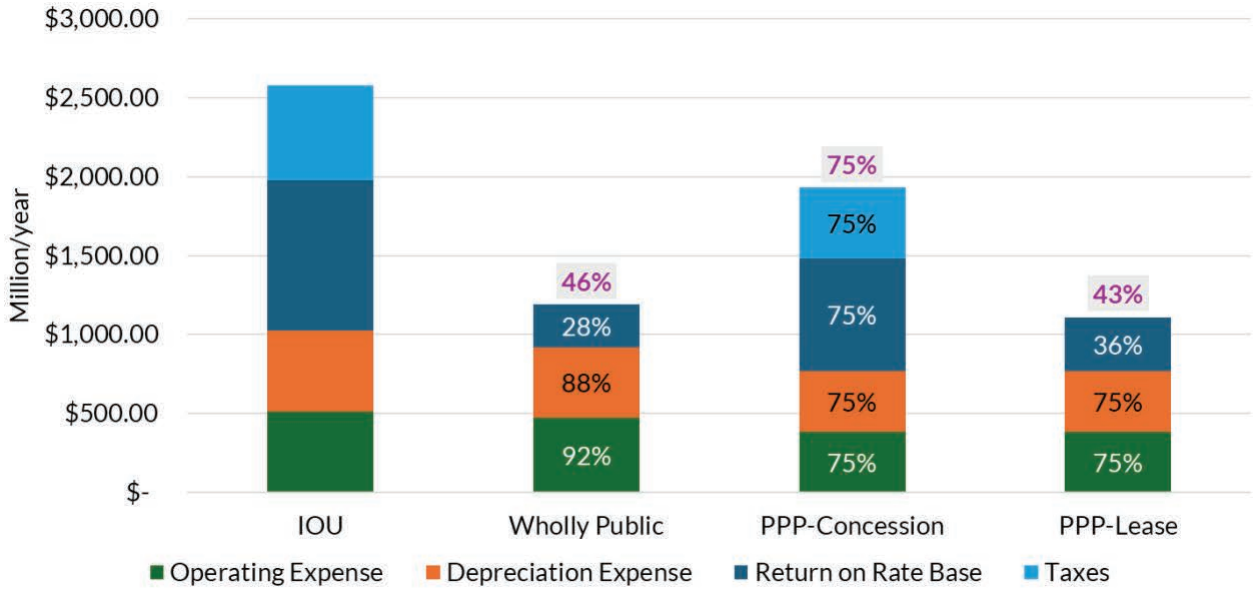
Figure 5.2: Revenue Requirement for Eligible Transmission Lines—Business-as-Usual (BAU) Case[64]



As the figure shows, the return on rate base is the largest cost component under this scenario. It is based on an average of costs of debt, equity, and capital structures of Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDGE), and SCE. The next largest component is income taxes, followed by depreciation and OPEX.

Figure 5.3 compares the IOU Scenario to the other scenarios described in Section 5.1. Sections 5.3.1 through 5.3.2 describe the most important differences between the scenarios, and their results.

Figure 5.3: Comparison of Scenarios—Average Annual Revenue Requirement



[64] Taken as the average over 40 years. Revenue requirements change over time as the rate base is depreciated and the nominal return on the rate base is also reduced. The average assumes, for the simplicity of comparison, that all lines are built at the same time.

5.3.1 PUBLIC SECTOR SCENARIO

The public sector case for this analysis assumes a public entity (for example, a power authority) would own and operate the new transmission lines. The transmission lines would have an average annual revenue requirement of roughly $1.2 billion over 40 years, less than half of the average annual revenue requirement under the wholly public case. Table 5.3 shows the average annual revenue requirement for all lines, disaggregated by cost component, as well as the input assumptions used.

Table 5.3: Comparison of Input Assumptions and RR Components (Public Sector Scenario)

Variable	Average value in Revenue Requirement (US$ million)	Assumption
Return on Rate Base	269.49	100% public debt financing; public sector financing costs
Income Taxes	0	N/A
Depreciation	449.72	2%/year for new assets; 2.5%/year for upgrades
OPEX	471.4	2% of CAPEX per year

As the table shows, OPEX is the largest cost component under this scenario, followed by depreciation, the return on rate base, and taxes. The biggest differences between this Scenario and the IOU Scenario are:

- **Rate base.** It is assumed that CAPEX costs would be 12.5% lower than under the IOU Scenario, based on the assumption that there are more opportunities to introduce competition in procurement under the PPP models than under the Public Sector Scenario.[65]
- **Return on rate base.** The return on rate base is lower because the rate base is lower and it is assumed that the public entity would use 100% debt financing (no equity) at the cost of public sector debt.
- **Taxes.** It is assumed that a public sector entity would not be required to pay state or federal income tax.
- **Operating Costs.** It is assumed that the public sector entity would have slightly higher OPEX costs than a private sector entity. We have assumed OPEX costs of 2.1% of CAPEX instead of (in the IOU case) 2%. PPP arrangements have the benefit of specifying risk allocations upfront, in a contract. This optimization of risk allocation is one of the most important sources of potential cost savings in a lease- or concession-type contract. Moreover, an SPV or SPE is at the heart of a PPP arrangement; this further protects the public owner from liability beyond the project itself.
- **Depreciation.** Depreciation is lower because the value of the rate base is lower.

These differences collectively put the Public Sector Scenario at less than half of the cost of the IOU Scenario.

[65] The basis for these assumptions will be detailed in the forthcoming report which includes this memo as a chapter.

5.3.2 CONCESSION-TYPE PPP

The concession-type PPP case for this analysis assumes a public sector entity would—through competitive tender—grant a private company the right to own and operate the new transmission lines for a fixed period of time (e.g., 40 years) after which time, the lines would revert to the public sector. The transmission lines would have an average revenue requirement of roughly $1.9 billion over 40 years. Table 5.4 shows the average revenue requirement for all lines, disaggregated by cost component, as well as the input assumptions used.

Table 5.4: Comparison of Input Assumptions and RR Components (Concession-Type PPP Scenario)

Variable	Average value in Revenue Requirement (US$ million)	Assumption
Return on Rate Base	710.33	Same financing structure and costs as IOU case but with 25% reduced CAPEX
Income Taxes	451.43	Same as for IOU Case
Depreciation	385.48	Same as for IOU Case
OPEX	384.60	Same as for IOU Case

As the table shows, return on rate base is the largest cost components under this scenario, followed by the taxes, OPEX and depreciation. The differences between this Scenario and the IOU Scenario are:

- **Rate base.** It is assumed that CAPEX costs would be 25% lower than under the IOU Scenario because of the benefits of greater competition in procurement per the Brattle study.[66]
- **Return on rate base.** The return on rate base is lower because the rate base is lower and it is assumed that the public entity would use 100% debt financing. The costs of debt and equity financing, and capital structure are assumed to be the same as in the IOU case as both commercial debt and equity would be needed by the developer.
- **Depreciation.** Depreciation is lower because the value of the rate base is lower.

5.3.3 LEASE-TYPE PPP

The lease-type PPP case for this analysis assumes a public entity would own and operate the new transmission lines and hire a private company to operate and maintain the lines. The transmission lines would have an average revenue requirement of $1.1 billion over 40 years. Table 5.5 shows the annual average revenue requirement for all lines, disaggregated by cost component, as well as the input assumptions used.

[66] Brattle, 2021

Table 5.5: Comparison of Input Assumptions and RR Components (Lease-Type PPP Scenario)

Variable	Average value in Revenue Requirement (US$ million)	Assumption
Return on Rate Base	339.28	100% public debt financing; public sector financing costs
Income Taxes	0	N/A
Depreciation	385.48	2%/year for new assets; 2.5%/year for upgrades
OPEX	384.60	2% of CAPEX per year

As the table shows, OPEX and depreciation are the largest cost components under this scenario, followed by the return on rate base, and taxes. As noted in Section 5.3.1, OPEX with a PPP arrangement is assumed to be lower than a wholly public arrangement because PPP arrangements have the benefit of specifying risk allocations upfront, optimizing risk allocation in a way that reduces costs, and protecting the public owner from liability by virtue of the establishment of an SPV.

The differences between this Scenario and the IOU Scenario are:

- **Rate base.** It is assumed that CAPEX costs would be 25% lower than under the IOU Scenario because of the benefits of greater competition in procurement per the Brattle study.[67]
- **Return on rate base.** The return on rate base is lower because the rate base is lower and it is assumed that the public entity would use 100% debt financing (no equity) and at the cost of public sector debt.
- **Taxes.** It is assumed that a public sector holding company would not be required to pay state or federal income tax.
- **Depreciation.** Depreciation is lower because the value of the rate base is lower.

5.4 CONCLUSION

The estimates above show that substantial possible savings to customers are achievable by using public sector financing for transmission projects. A wholly public delivery model or a lease-type PPP—both of which assume 100% financing with tax free bonds—could cut the annual revenue requirements of transmission lines by more than half. The average annual savings to customers could be as much as nearly $1.5 billion, or a total of $58 billion over a 40-year operation of the transmission lines.[68]

Much of the potential savings are directly related to the removal of equity from the financing structure and the use of lower cost public debt. Other potential savings relate to the institutional model chosen and their potential impact on competition for developing transmission lines; competition which—according to other studies—can reduce capital costs over time. The choice of institutional model also has tax implications: a

[67] Brattle, 2021.

[68] Estimates are not discounted for the time value of money and exclude the costs of fire hardening.

publicly owned transmission line may be liable for less income (and possibly other) taxes than a privately owned line.

Whereas this section uses estimates of the revenue requirement for all lines foreseen to be eligible for competition under the CAISO plan, it is important to note that the opportunities for cost savings depend very little on which transmission line is chosen for analysis. The potential percentage savings would be similar for any line tendered by CAISO. For example, more recent and more detailed CAPEX cost estimates have been developed for a package of transmission investments foreseen to evacuate offshore wind from the North Coast.[69] The $7.7 billion line (referred to as "Alternative 7.2a") is planned to accommodate 7.2 GW of offshore wind development; this will include 480 wind turbines with 9 HVAC floating platforms. The transmission investments will include (i) radial connections via 500kV AC export cables between the proposed offshore wind farms and nearby onshore substations, and (ii) A connection to the planned Fern Road substation in Central Valley, connecting to the main 500 kV transmission line running along the I-5 corridor. Under the IOU scenario, this line would have an annual average revenue requirement of $774 million over 40 years; the same investments would have an annual average revenue requirement of $358 million under the wholly public scenario.

[69] Zoellick, J., G. Adams, A. Mustafa, Aubryn Cooperman, R. Anilkumar, Patrick Duffy, A. Sparks, et al. "Northern California and Southern Oregon Offshore Wind Transmission Study." Schatz Energy Research Center, October 1, 2023. https://doi.org/10.2172/2205318.

APPENDIX A: THE CONTEXT FOR TRANSMISSION DEVELOPMENT IN CALIFORNIA

In general terms, transmission projects are considered as low risk assets due to their predictable performance, "easy" operation and simplicity in their rate of return mechanism,[70] despite conveying intrinsic complications or barriers resulting from their capital-intensive nature, with long payback periods, potential public opposition[71] and their difficulty in assigning costs (public goods dilemma).

While development cost reduction and permitting reform are not the primary focus of this report, we review some key points here.

Regulatory Complexity

The regulation of high voltage transmission in the United States is highly intricate due to several jurisdictions' overlaps between federal, state, district, and territorial authorities.[72] FERC oversees stand-alone transmission services, rates, and infrastructure, including regional wholesale power markets that utilize the transmission grid ("interstate commerce") (excluding certain publicly owned utilities, federal power marketing agencies, and unsynchronized single-state power grids).[73] In contrast, state and local authorities are in charge of generation and distribution (infrastructure and operation), including retail electricity services, and usually oversee transmission lines' siting, permitting, construction, and retail costs within their jurisdictions (intrastate).

All market participants shall have non-discriminatory/open access to the transmission system,[74] through Independent System Operators ("ISOs") and Regional Transmission Operators ("RTOs"),[75] allowing competitive interstate trading and ensuring grid reliability.

Permitting Delays for Transmission on Federal Land

At a federal level, energy transition efforts and the impacts of climate change have brought to light, more than ever, the permitting delays in energy projects and grid infrastructure[76] which have resulted in several

[70] Crédit Agricole Securities, "Project Bond Focus Power Transmission Lines," May 2019, https://www.ca-cib.com/sites/default/files/2020-03/Project-Bond-Focus-2019-Transmission-Lines.pdf.

[71] "Trouble at the End of the Line: Local Activism and Social Acceptance in Low-Carbon Electricity Transmission in Lower Franconia, Germany - ScienceDirect," accessed March 20, 2024, https://www.sciencedirect.com/science/article/abs/pii/S2214629618301233?via%3Dihub.

[72] Joe III DeLosa, Johannes P. Pfeifenberger, and Paul Joskow, "Regulation of Access, Pricing, and Planning of High Voltage Transmission in the U.S.," Working Paper Series, March 5, 2024, https://ceepr.mit.edu/workingpaper/regulation-of-access-pricing-and-planning-of-high-voltage-transmission-in-the-u-s/.

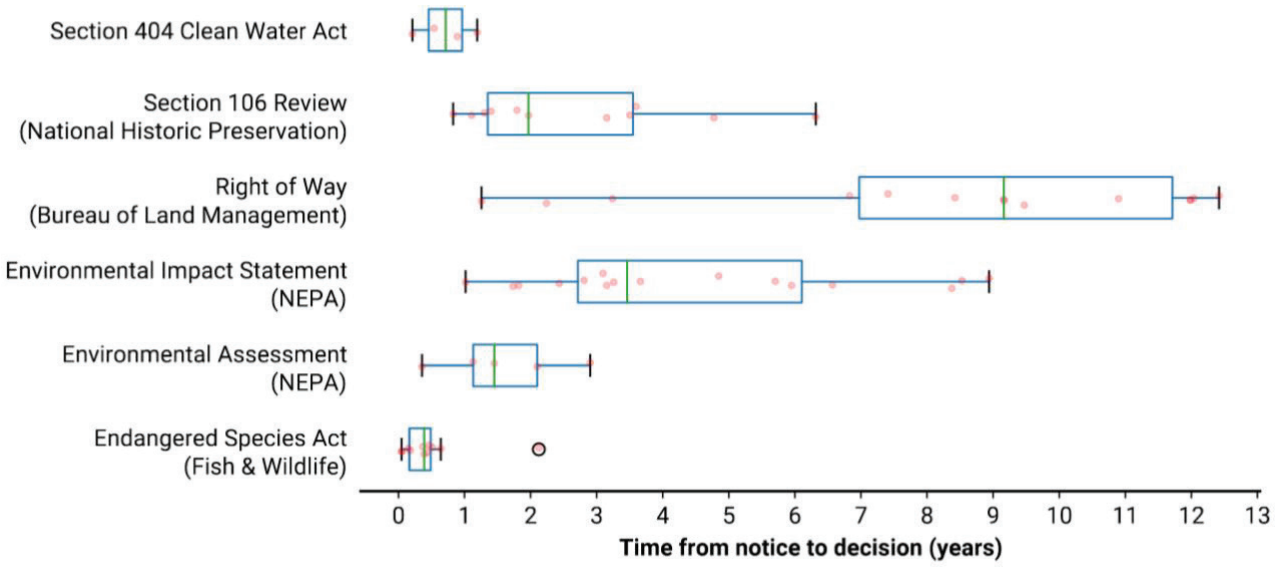
[73] "What FERC Does | Federal Energy Regulatory Commission," accessed March 18, 2024, https://www.ferc.gov/what-ferc-does.

[74] "Order No. 888 | Federal Energy Regulatory Commission," accessed March 18, 2024, https://www.ferc.gov/industries-data/electric/industry-activities/open-access-transmission-tariff-oatt-reform/history-oatt-reform/order-no-888.

[75] "OrderNo.2000-A | Federal Energy Regulatory Commission," accessed March 18, 2024, https://www.ferc.gov/sites/default/files/2020-06/OrderNo.2000-A.pdf.

[76] "Congressional Action on Energy Permitting Remains Stuck, but States, Developers Are Finding Solutions," Utility Dive, accessed March 21, 2024, https://www.utilitydive.com/news/federal-energy-permitting-reform-doe-ferc-congress/705818/.

energy permitting reform bills in Congress[77] and further analysis of potential reforms to the "federal permitting process for clean energy infrastructure."[78] A study by the Brookings Institute[79] reveals that reviews under the National Environmental Policy Act (NEPA) and permitting processes from the Bureau of Land Management (BLM) represent the most significant bottlenecks in permitting delays, particularly for transmission lines and wind projects.[80] The figure below highlights the duration of each permitting phase for 13 projects analyzed (red dots). The preparation of Environmental Impact Statements under NEPA is identified as one of the lengthiest steps in federal permitting, taking a median of 3.5 years, and up to nine years in some instances. However, the process of obtaining right-of-way (ROW) authorization from BLM is even more protracted, with a median duration of over nine years from application submission to BLM approval, largely because it encompasses an NEPA review. This lengthy duration is partly due to the additional layers of review and bureaucratic processes involved.



Source: From Sud, Rayan, Sanjay Patnaik, and Robert Glicksman. "How to Reform Federal Permitting to Accelerate Clean Energy Infrastructure." Brookings Institute, February 2023.

Another example of significant delays is illustrated by New York's Champlain Hudson Power Express Project. This $6 billion 1,250 Megawatts (MW) renewable power transmission initiative, which began its permitting

[77] "Permitting Reform Bills in Congress," Citizens' Climate Lobby, accessed March 21, 2024, https://citizensclimatelobby.org/clean-energy-permitting-reform-in-congress/.

[78] Rayan Sud, Sanjay Patnaik, and Robert Glicksman, "How to Reform Federal Permitting to Accelerate Clean Energy Infrastructure" (Brookings Institute, February 2023), https://www.brookings.edu/wp-content/uploads/2023/02/20230213_CRM_Patnaik_Permitting_FINAL.pdf.

[79] Sud, Patnaik, and Glicksman.

[80] This insight comes from examining a non-representative sample of 13 large and nationally significant projects listed on the Federal Permitting Dashboard, focusing on completed renewable energy and electric transmission projects.

phase in 2010, only received its final permits to commence construction in 2022 and is anticipated to be fully functional by the spring of 2026.[81]

Delays in the Transmission Development Process in California

In California, the process of developing transmission projects is intricate and long-lasting, involving continuous coordination among the California Independent System Operator (CAISO), the CPUC, and utilities for the planning, permitting, and construction phases, which usually result in considerable delays[82,83,84] that tend to increase the costs of projects.

Slow transmission deployment in California is largely due to delays in CAISO's projects' approval and subsequent permit application submissions by IOUs to the CPUC (compounded by lengthy permitting processes). California's transmission permitting process is notably slower than those in New York or Texas, and even other Western states.[85] A study conducted by Southern California Edison concluded that CPUC's average review and approval time across 28 applications was 836 days (about 2.3 years) and for some applications over 1,000 days (about 2.7 years).[86] The figure below[87] shows the considerable delays for a sample of transmission projects in California. Delays within transmission permitting in California are well documented and increasingly high profile. There have been recent efforts within the state to reform the transmission permitting process to reach policy and climate goals.[88]

[81] Champlain Hudson Power Express Project, "Champlain Hudson Power Express Project: Regulatory Documents," TDI CHPExpress, accessed March 18, 2024, https://chpexpress.com/overview-of-public-documents/regulatory-documents/.

[82] "Transmission Development in California – What's the Slowdown?," Clean Air Task Force, accessed March 20, 2024, https://www.catf.us/resource/transmission-development-california-slowdown/.

[83] Alex Breckel et al., "Growing the Grid: A Plan to Accelerate California's Clean Energy Transition" (Clean Air Task Force and Environmental Defense Fund, October 2022), https://www.catf.us/resource/growing-grid-plan-accelerate-californias-clean-energy-transition/.

[84] GridLab and CEERT, "California's Progress in Advancing Transmission Planning and Permitting: A 2023 Review," 2023, https://ceert.org/wp-content/uploads/2023/pdf/231207_CA-progress-in-advancing-transmission-planning-permitting.pdf.

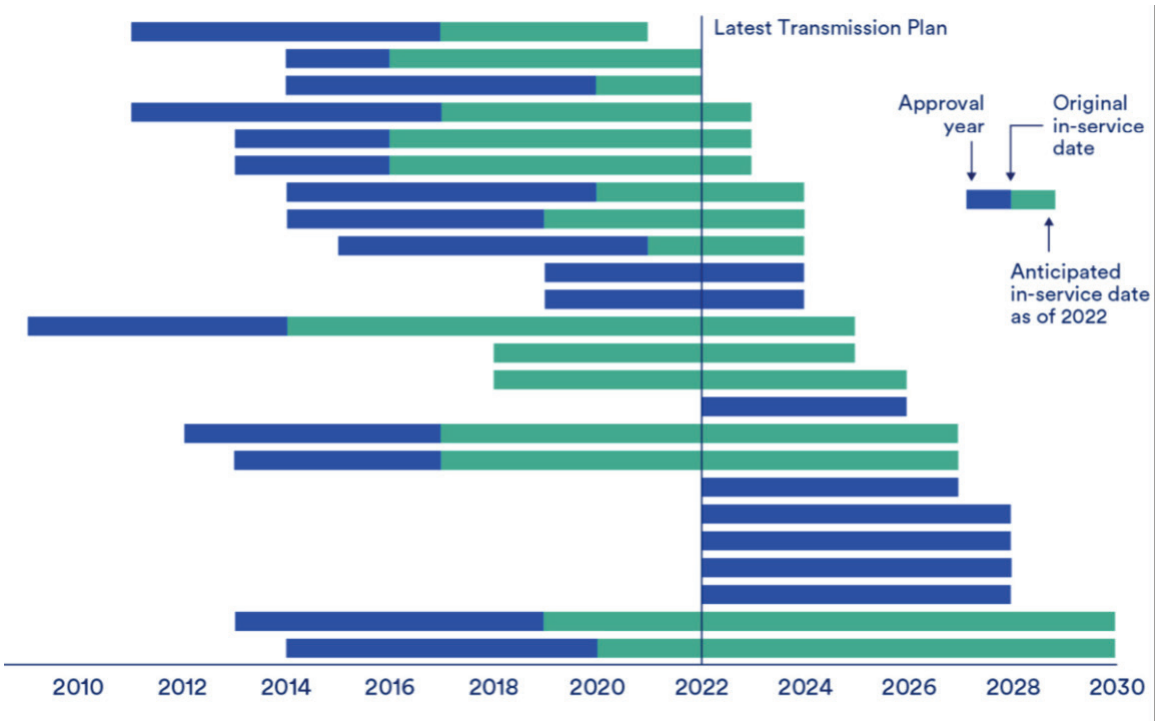
[85] Kara Hunt, "California's Transmission Permitting: Slowest in the West?," Clean Air Task Force, May 30, 2023, https://www.catf.us/2023/05/californias-transmission-permitting-slowest-in-the-west/.

[86] GridLab and CEERT, "California's Progress in Advancing Transmission Planning and Permitting: A 2023 Review."

[87] Breckel et al., "Growing the Grid."

[88] GridLab and CEERT, "California's Progress in Advancing Transmission Planning and Permitting: A 2023 Review."

Figure 5.4: Timelines for Mayor Electricity Transmission Projects in California



Source: Breckel, Alex, Michael Covin, John Herter, Armond Cohen, and Julia Souder. "Growing the Grid: A Plan to Accelerate California's Clean Energy Transition." Clean Air Task Force and Environmental Defense Fund, October 2022.

These delay barriers are found before and during the permitting process stage in California. The delays and risk of rejection during the development phase make transmission development a high-risk business.

While permitting and siting risks are not the focus of this study, we note that the risk and delays significantly increase the cost of transmission. The costs include expenses for financing arrangements (working capital, at a minimum), permitting, and regulatory compliance. For example, the Northern Pass project in New Hampshire incurred $318 million in sunk costs for pre-development activities, representing roughly 20% of its estimated total cost of $1.6 billion.[89] Similarly, the Hydro-Québec US transmission line project in Maine saw $450 million (43% of the estimated total project costs) spent in pre-development.[90] If there is a 50% probability of failure and a 20% cost for failure, then every developer has to build in a minimum 10% risk adder to the CAPEX.

[89] Michael Cousineau, "Eversource giving away land bought for failed Northern Pass project," *New Hampshire Union Leader*, June 26, 2023, https://news.yahoo.com/eversource-giving-away-land-bought-225400675.html

[90] "Hydro-Quebec scores legal victory in Maine over $1B US transmission line project," *CBC News*, April 20, 2023, https://www.cbc.ca/news/canada/montreal/hydro-quebec-1.6816752

Transmission Planning and Tendering Parameters

FERC's Order 1000[91] required that transmission planning cover reliability, economic and public policy needs. It introduced proactive involvement from transmission providers in crafting regional plans, encouraging stakeholder engagement and choosing the most cost-effective solutions for meeting regional transmission requirements, demanding that transmission plans consider both state and federal public policy objectives. Additionally, it stipulated that the expenses for these projects be distributed among transmission customers across the planning region and allowed competitive transmission developers to propose bids for transmission expansions with regional cost allocation, challenging incumbent owners.[92] In this sense, competitive bidding is encouraged for transmission projects but is limited to regional transmission facilities. Specifically, in California, any regional transmission facility that is 200 kV or higher and identified for reliability, policy, or economic reasons must go through competitive solicitation within the CAISO region. Projects under 200 kV that cross more than two transmission service areas or exceed CAISO's jurisdiction are also eligible for competitive bidding. However, upgrades to existing facilities, whether they meet or fall outside these criteria, and projects that are locally funded, do not require solicitation.[93]

[91] FERC, "FERC Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities."

[92] DeLosa, Pfeifenberger, and Joskow, "Regulation of Access, Pricing, and Planning of High Voltage Transmission in the U.S."

[93] "Transmission Development in California – What's the Slowdown?"

APPENDIX B: EXAMPLES OF CALIFORNIA TRANSMISSION PPPS

Path 15 Project

The Path 15 Project is an upgrade of an existing transmission path. It started operations in 2004 (18 months after the beginning of construction), upgrading an existing line and adding an extra 500 kV line over approximately 84 miles, which significantly increased the corridor's capacity (5,400 MW).[94]

Path 15 is an electricity transmission corridor in California, linking the northern and southern parts of the state's power grid (Los Banos and Gates), and part of the Western Electricity Coordinating Council's (WECC) network of transmission paths. The upgrade project was initiated after the California Energy Crisis of 2000-2001 in which Path 15 was identified as a contributing factor to blackouts, reliability issues, and high market prices.

Economic incentives were approved for the development of this Project (that were later contested),[95] that included higher rates of return and accelerated depreciation that would allow better cashflow provision.[96]

The Western Area Power Authority (WAPA) is the public partner and owns the physical transmission line and the associated land, it was also assigned as the project manager and had the role of the lead Federal Agency for the NEPA process, and was also in charge of procuring the required land rights (at an estimated cost of 10% of the project's budget), in exchange of a 10% interest in the rights to the Project. PG&E oversaw construction/refurbishment of substations of existing transmission lines, in exchange for an interest payment and retained ownership of the substations. The primary entity investor was Trans-Elect with ownership of 72% of the transmission system rights entitled to the transmission tariff revenues (today owned by Duke-American Transmission Co. – DATC). PG&E received 18% and WAPA 10%.[97, 98,99]

The new line of Path 15 was subject to a competitive tender (managed by WAPA), structured as a design-build project, with a sole contractor in charge of engineering, procurement, and construction (EPC).[100] The project manager at WAPA claims that this mechanism derived in overall cost reductions of the Project and an

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[94] Anne Warren, "Transmission Infrastructure By Public-Private Model - Law360," November 6, 2009, https://www.law360.com/articles/130713/transmission-infrastructure-by-public-private-model.

[95] "Public Utilities Commission of the State of California, Petitioner v. Federal Energy Regulatory Commission, Respondent Trans-Elect, Inc., et al., Intervenors, 367 F.3d 925 (D.C. Cir. 2004)," Justia Law, January 31, 2024, https://law.justia.com/cases/federal/appellate-courts/F3/367/925/495858/.

[96] WAPA, Transelect, and PGE, "Letter Agreement Filing," FERC Docket No. ER02-11672-000, April 30, 2002, https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20020507-0016&optimized=false.

[97] WAPA, Transelect, and PGE.

[98] WAPA and PGE, "Construction And Coordination Agreement," December 30, 2002, https://web.archive.org/web/20130324172556/http://www.wapa.gov/sn/ops/transmission/path15/ConstructionAndCoordinationAgreement.pdf.

[99] Duke Energy, "DATC to Purchase Interest in California's Path 15 Transmission Line," Duke Energy | News Center, 2013, https://news.duke-energy.com/releases/datc-to-purchase-interest-in-california-s-path-15-transmission-line.

[100] "20 Years of Path 15 T-Line – Western Area Power Administration," October 8, 2023, https://www.wapa.gov/20-years-of-path-15-t-line/.

accelerated *mise-en-service* (18 months) than originally anticipated, and that the Project resulted in reduced congestion costs.[101]

Initial funding for this Path 15 upgrade Project was estimated at $306 million USD and it was partly funded by the federal government, but its final cost was approximately $50 million USD below the initial project estimate.[102]

The total financing for the Project (facilitated by four banks: Citigroup, Macquarie, DZ Bank, and Société Générale) reached $220 million USD by September 2003, comprising four key components:

1. Around $95.5 million in takedown bonds to the Trans-Elect NTD Path 15 operating company,
2. $56 million in bonds to the Trans-Elect NTD Holdings Path 15 holding company,
3. a $19.5 million construction overrun facility, and
4. a $38.3 million equity bridge facility provided by Energy Investors Funds Group, ArcLight Energy Partners Fund, and KB Transmission.[103]

In this Project, rates set by Trans-Elect and PG&E are regulated by FERC. The Transmission Revenue Requirement (TRR) was originally estimated by Trans-Elect at around $50 million per year.[104] Under this model, and with CAISO in charge of the operation of the line, FERC authorized revenues based on the cost of service model, granting Trans-Elect a 13.5% ROE, a 50%/50% debt/equity target capital structure, and a fixed revenue requirement (TRR) and a rate moratorium for 36 months following the effective date of the rates (start of operations). FERC approved that PG&E could obtain full recovery of its costs derived from the Project and granted a 200 basis point increase in ROE, allowing accelerated depreciation for facilities constructed (10 years of useful life).[105]

This rate structure and its incentives were contested by the CPUC. Ultimately, the petition for judicial review was denied, with the Court of Appeal recognizing FERC's authority to approve rate incentives for projects like Path 15 that seek to enhance energy supply and address significant transmission bottlenecks. It also concurred with FERC's rationale, emphasizing the need for incentives to stimulate project development and increase energy availability, despite CPUC's objections to the costs and methodology of the incentives.[106] In 2021 a reduction to 10.6% ROE for the new owner Duke-American Transmission Company (DATC) was

[101] "Path 15: A to Z," Electric Energy Online, accessed March 24, 2024, https://electricenergyonline.com/energy/magazine/206/article/path-15-a-to-z.htm.

[102] "Path 15."

[103] Warren, "Transmission Infrastructure By Public-Private Model - Law360."

[104] Trans-Elect, "Trans-Elect NTD Path 15, LLC Application For Participating Transmission Owner Status," March 3, 2003, https://www.caiso.com/Documents/RevisedTrans-ElectNTDPath15_LLCPTOApplication.pdf.

[105] WAPA, Transelect, and PGE, "Letter Agreement Filing."

[106] "Public Utilities Commission of the State of California, Petitioner v. Federal Energy Regulatory Commission, Respondenttrans-Elect, Inc., et al., Intervenors, 367 F.3d 925 (D.C. Cir. 2004)."

ordered by FERC.[107, 108] Furthermore, following these FERC's orders, in February 2023 the CAISO updated the wheeling access charge rates for DATC.[109]

Trans Bay Cable

The Trans Bay Cable (TBC) Project is a high voltage transmission line with a 400 megawatts (MW) capacity (able to provide over 40% of power to San Francisco), running 53 miles from Pittsburg, California, in the East Bay to San Francisco, with a significant portion submerged underwater across the San Francisco Bay, which reduced risks from landing acquisition rights and wildfires. The project, considered as a critical transmission asset, was completed and operational in November 2010.

The TBC project is a PPP that covered development, financing, construction, and operation, between the city of Pittsburg, the Pittsburg Power Company, and Steel River Infrastructure Partners (who acquired Babcock & Brown, the original constructor of the project).[110] It included a $515 million financing package, that closed in August 2007.[111] Its transmission tariff is set by the FERC and revenues are paid by the CAISO.

The Pittsburg Power Company owns the transmission line and equipment, while Trans Bay Cable LLC acquired the transmission system rights for 99 years (before needing to revert them to the City of Pittsburg), with operational control by the CAISO. In 2019, NextEra Energy Transmission acquired TBC from Steel River Infrastructure Partners for about $1 billion.[112]

Following the same incentives model initially approved by FERC in the Path 15 Project, TBC proposed a 13.5% ROE, with a three-year rate moratorium, a 50/50 debt/equity capital structure, and a 30-year depreciation period for the project.[113] A TRR of around $134 million was approved, of which 99.9% corresponds to the Base TRR and the rest to the Transmission Revenue Balancing Account Adjustment. In 2019 TBC requested an increase of its TRR to over $157 million and to maintain the enhanced 13.5% ROE, which was contested by the CAISO and other parties. FERC stated that TBC's "rates may yield substantially excessive revenues." FERC ordered a hearing and settlement judge procedures for a full evaluation of TBC's proposed ROE and overall TRR for final determination.[114] A settlement was reached in 2020 increasing TBC's

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[107] "Analysis of FERC's Notice of Proposed Rulemaking on Electric Transmission Incentives."

[108] DATC Path 15, LLC, "DATC Path 15, LLC, Unopposed Offer of Settlement," FERC Docket Nos. ER20-1006-000 and EL20-43-000, June 17, 2021, https://elibrary.ferc.gov/eLibrary/search.

[109] "Updated Wheeling Access Charge Rates Effective 6/13/22 and 1/1/23," accessed March 24, 2024, http://www.caiso.com/Documents/updated-wheeling-access-charge-rates-effective-61322-and-1123.html.

[110] "Babcock & Brown Infrastructure Fund Gets Acquired," *Reuters*, May 17, 2009, sec. Funds, https://www.reuters.com/article/idUSN17287902/.

[111] Warren, "Transmission Infrastructure By Public-Private Model - Law360."

[112] Umesh Ellichipuram, "NextEra Energy Transmission to Acquire TBC for Nearly $1bn," *Power Technology* (blog), November 21, 2018, https://www.power-technology.com/news/nextera-energy-tbc/; "NextEra Energy Transmission Completes Acquisition of Underwater Transmission Cable System," NextEra Energy Newsroom, accessed March 25, 2024, https://newsroom.nexteraenergy.com/2019-07-16-NextEra-Energy-Transmission-completes-acquisition-of-underwater-transmission-cable-system.

[113] FERC, "Order Accepting Operating Memorandum," FERC Docket No. ER05-985-000, July 22, 2005, https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20050722-3056&optimized=false.

[114] FERC, Order Accepting and Suspending Proposed Tariff Revisions and Establishing Hearing and Settlement Judge Procedures, No. ER19-2846-000 (FERC November 21, 2019).

tariffs (to a TRR of around $136.5 million) but also TBC had to refund the CAISO for the excess charged after the previous provisional approval from FERC, the 13.5% ROE was maintained.[115]

West of Devers Project - Morongo Transmission

The West of Devers Project is a $1 billion Southern California Edison Co. (SCE) initiative to upgrade existing transmission lines enhancing capacity by 3.2 GW between Riverside County and areas east of Los Angeles.[116] This project crosses Morongo Reservation land, for which the Morongo Native American Tribe granted SCE a 50-year right-of-way through its reservation. The approval of this arrangement enables the avoidance of an estimated $500 million cost to reroute transmission lines around the Reservation.[117]

In exchange for this right-of-way, the Morongo Tribe received the right to invest in the transmission with debt and receive a FERC transmission tariff, including an ROE. Morongo Transmission LLC (Morongo Transmission) received the right to invest up to $400 million (or 50% of the project's final cost) in the project. Morongo Transmission was allowed to finance its investment entirely with debt. Approved in 2021 by the CAISO, Morongo Transmission became the first Native American tribe as a participating transmission owner,[118]

Profits from transmission rates were to be distributed to impacted communities. The arrangement was outlined in the Development and Coordination Agreement (DCA).[119] This was an innovative PPP agreement between SCE and Morongo to finance a part of the project, marking a pioneering arrangement between a utility and a Native American tribe.

In 2014 FERC approved Morongo Transmission's capital cost recovery methodology, including a hypothetical capital structure and a formula rate for operating costs recovery. The DCA was later amended to allow Morongo Transmission additional investment options.[120]

In December 2020, Morongo filed a request with the FERC (Docket No. ER21-669) for a transmission formula rate related to its investment in the West of Devers Upgrade Project. Morongo's revenue requirement consisted of capital and operating costs, with a proposal of a TRR of over $40 million, a base ROE of 10.3% (SCE's authorized ROE), and an RTO Participation Adder of 100 basis points, and its commitment to transfer

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[115] Trans Bay Cable LLC, "Uncontested Offer of Settlement," FERC Docket ER19-2846-001, September 4, 2020, https://www.ferc.gov/.

[116] "CAISO Board Approves Native American Tribe as Transmission Owner," accessed December 12, 2023, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/caiso-board-approves-native-american-tribe-as-transmission-owner-62499840.

[117] "Landmark FERC Decision Paves Way for Clean Energy Tribal-Private Partnerships," Jenner & Block LLP | Law Firm - Jenner & Block | Landmark FERC Decision Paves Way for Clean Energy Tribal-Private Partnerships, accessed March 25, 2024, https://www.jenner.com/en/news-insights/news/landmark-ferc-decision-paves-way-for-clean-energy-tribal-private-partnerships.

[118] "Morongo Becomes First Native American Tribe to Be Approved as a Participating Transmission Owner in Nation – Morongo," accessed March 25, 2024, https://morongonation.org/news/morongo-becomes-first-native-american-tribe-to-be-approved-as-a-participating-transmission-owner-in-nation/.

[119] "West of Devers Upgrade Row Agreement.Pdf," accessed March 25, 2024, https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M080/K274/80274785.PDF.

[120] "Notational Order 2021-05-05 | Federal Energy Regulatory Commission," accessed March 25, 2024, https://www.ferc.gov/news-events/events/notational-order-2021-05-05-05052021.

operational control to CAISO.[121] FERC approved the proposed TRR and adjusted the RTO Participation Adder to 50 basis points.

With approval of Morongo Transmission's tariff, FERC granted a unique ratemaking methodology, featuring 100 percent debt financing, a fixed 30-year transmission rate, and parity with the rates charged by utilities, benefitting landowners by honoring their contribution, simplifying regulatory decisions by reducing local contention, ensuring transmission customers are not financially disadvantaged, and supporting transmission developers by facilitating easier siting approval and reducing litigation risks.[122]

SCE updates yearly the Morongo West of Devers Rate Year Cost, which by the end of 2023 was of $7.59 million, compared to $11.5 million in the previous update, a decrease of $3.9 million, mainly attributable to property taxes.[123]

[121] "Morongo Transmission Requests a 100 BP ROE Incentive from FERC," Energy Central, January 21, 2021, https://energycentral.com/c/tr/morongo-transmission-requests-100-bp-roe-incentive-ferc.

[122] Suedeen Kelly, "If Only Transmission Lines Were like Rose Bushes," November 29, 2023, https://www.jenner.com/en/news-insights/publications/if-only-a-transmission-line-were-like-a-rose-bush-wires-quarterly-newsletter.

[123] "2024 Annual Update WOD Filing Letter.Pdf," accessed March 25, 2024, https://www.sce.com/sites/default/files/Regulatory/OpenAccessInformation/MorongoWOD/2024%20Annual%20Update%20WOD%20Filing%20Letter.pdf.

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