Off the Books: Understanding and Mitigating the Fiscal Risks of the Power Sector

The bottom line. This Live Wire—based on Off the Books: Understanding and Mitigating the Fiscal Risks of Infrastructure (2023)—presents a systematic assessment of the magnitude and prevalence of fiscal risks from power investments and their root causes across a range of low- and middle-income countries. Drawing on important new sources of evidence, it shows just how much is at stake in the good governance of the power sector, how fiscal risks vary across contexts, and how they can be mitigated.

What are the fiscal risks from the power sector and why are they important?

However power infrastructure is provided, there are risks of fiscal surprises—that is, infrastructure costing more than projected—depleting scarce fiscal resources. Numerous governance challenges undermine the efficiency of spending on infrastructure and absorb scarce fiscal space. Whether governments spend directly on budget, spend at arm’s length through state-owned enterprises (SOEs), or delegate spending via public-private partnerships (PPPs), the risk of fiscal surprises is high. Because of these risks, infrastructure service delivery may end up costing significantly more than initially expected, eroding limited fiscal space for productive spending.

If policymakers are to make reforms where they can have the greatest impact, they must understand the potential fiscal risks of different provision modalities, how the magnitude and frequency of those risks varies across modalities, what their root causes are, and how they can be mitigated. This note—based on Off the Books: Understanding and Mitigating the Fiscal Risks of Infrastructure (Herrera Dappe and others 2023)—aims to improve our understanding of these issues, drawing on important new sources of evidence, including the World Bank Infrastructure SOEs Database, which was built for the report on which this Live Wire is based.
Fiscal risks from power infrastructure manifest themselves in different ways, depending on how that infrastructure is provided (figure 1).

Direct public provision of electricity can lead to fiscal surprises through unanticipated additional spending caused by cost overruns or the need to repair deteriorated assets (because of neglect or natural disasters, including extreme weather events).

Power SOEs can create substantial risks for public finances. These risks arise from explicit guarantees and public insurance schemes—such as insurance against disasters and extreme weather events—as well as cashflow and bailout risk. Cashflow risk stems from the volatility of the SOE’s net income, which requires fiscal transfers to cover occasional and modest losses associated with exogenous shocks and inefficiencies related to soft budget constraints. Bailout risk refers to the risk associated with having to recapitalize an SOE, help it avoid default or bankruptcy, or cancel a large SOE’s liabilities because it has insufficient capital buffers to deal with large, unexpected shocks and continuous write-offs.

PPPs entail fiscal commitments of a different nature that can also lead to fiscal surprises. Liabilities such as upfront capital subsidies and availability payments arise even if the PPP proceeds according to plan. These direct liabilities can lead to fiscal surprises if PPPs are kept off the fiscal balance sheet and off the budget. In addition, PPPs create contingent liabilities. Explicit contingent liabilities arise from contractual guarantees provided by the government to ensure the commercial feasibility and bankability (for example, minimum revenue or demand guarantees, foreign exchange rate guarantees, and debt guarantees). Implicit contingent liabilities result from the risks of contract renegotiation and early termination.

The power sector tends to rely more heavily on SOEs and PPPs than on budget spending. For the 19 countries covered by the World Bank Infrastructure SOEs Database in 2009–18,1 direct public provision represents on average just 9 percent of capital spending in electricity, while SOEs represent 60 percent and PPPs 31 percent of total capital spending (figure 2).

1. The countries included are Albania, Argentina, Bhutan, Brazil, Bulgaria, Burundi, Croatia, Ethiopia, Georgia, Ghana, Indonesia, Kenya, Kosovo, Peru, Romania, the Solomon Islands, South Africa, Ukraine, and Uruguay.

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**Figure 1. Sources of fiscal costs and risks associated with the provision of power infrastructure**

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<th>Modality-specific sources of risk</th>
<th>Fiscal risk</th>
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<td>• Asset impairment risk</td>
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Source: Herrera Dappe and others (2023).
How important are the fiscal risks from direct public provision of electricity?

The fiscal risks of direct public provision materialize over different time horizons—near, medium, and long term—with varied prevalence

On-budget public investment in power infrastructure has been low in recent years. According to the World Bank’s BOOST database, total public investment in infrastructure (defined throughout to include the power and transport sectors) has been low and declining, falling from 1.8 percent of GDP in 2011 to 1.2 percent in 2020.2 Public investment in electricity has been particularly low, oscillating around 0.2–0.3 percent of GDP, with no clear trend (figure 3). Overall, low- and lower-middle-income countries have tended to devote slightly larger budgetary shares to public investment in electricity than upper-middle-income countries.

The near term, and most direct, fiscal risk is that the construction phase of the infrastructure project may cost the government more to deliver than it had anticipated. Underexecution of the budget may signify delays in project implementation, which usually translate into cost overruns. Therefore, the prevalence of the near-term risk manifests itself in budget data as underexecution of infrastructure capital spending.

Underexecution of planned infrastructure investment budgets is observed in more than 80 percent of the 65 developing countries studied using the World Bank’s BOOST database (Foster, Rana, and Gorgulu 2022). Budget execution ratios are much lower for the power sector (37 percent) than the roads sector (69 percent). The difference may reflect the fact that electricity projects tend to be larger and more idiosyncratic than road projects.

The medium-term risk is that even after the initial investment phase of the project has been completed, the infrastructure may continue to make further unplanned calls on the government’s capital budget during its lifetime to sustain the asset’s capacity to deliver the intended stream of services.

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The extent of capital bias—that is, the relative preference for capital spending over maintenance spending—indicates the prevalence of the medium-term risk. In the power sector, SOEs usually handle maintenance. Therefore, to assess the extent to which undermaintenance can lead to unexpected capital costs, on-budget and off-budget spending must be combined. The analysis shows a pattern of capital bias in the power sector, where countries spend about four times as much on investment as on maintenance.

Over the longer term, the vulnerability of infrastructure spending to budget cuts and its pronounced procyclicality raise the risk that infrastructure sectors may bear the brunt of fiscal adjustment. Such adjustment can squeeze spending below the levels needed for maintenance and investments to support long-term economic growth.

On-budget spending on infrastructure was procyclical between 2005 and 2020, suggesting that public infrastructure spending is a soft target for budget cuts. The decline in public investments in infrastructure between 2011 and 2020 reflects a lower priority for infrastructure rather than a decline in total government expenditure. In times of economic downturn, on-budget infrastructure spending is particularly vulnerable to cuts, given that it is less socially sensitive than other budget items and the damage caused by underinvestment may take some time to materialize.

**How important are the fiscal risks from power SOEs?**

_Fiscal risks from SOEs tend to take the form of a series of small to medium fiscal injections—punctuated by the occasional large one_

Power SOEs perform relatively well in the 19 countries covered by the World Bank Infrastructure SOEs Database in 2009–18, providing a modest positive rate of return on average assets. The average return for power SOEs is 1.9 percent. It drops to just 1.0 percent, however, once operations subsidies from the government are stripped out of the accounts. Although...
these returns are low, they still compare favorably with the average negative return of transport sector SOEs. Overall, around a third of power SOEs lose money after netting out subsidies, about half the share in the transport sector.

**Average annual fiscal injections to power SOEs represent 0.25 percent of GDP, equivalent to 10 percent of average assets.**

The fiscal risk of SOEs is often thought of as stemming from extreme events (so-called tail risk). The evidence from our analysis indicates that fiscal risks are actually a series of small to medium-size deviations from budgeted figures—with occasional large events. The 180 country-year observations captured for the power sector include 59 instances of fiscal injections (a third of all observations). While two-thirds of these fiscal injections were under 0.2 percent of GDP, 17 percent exceeded 0.6 percent. As a result, average annual fiscal injections to power SOEs represent 0.25 percent of GDP (figure 4), equivalent to 10 percent of average assets.

**Figure 4. Fiscal injections to state-owned enterprises in the power and transport sectors as a percentage of GDP**

Governments use numerous instruments to deliver fiscal injections to SOEs. Aside from operations subsidies, they use equity injections and loans from the government and other SOEs. On average, SOE loans, including loans from state-owned banks, are more widely used in the power sector than in the transport sector.

The financials of power SOEs are highly exposed to fuel price volatility and to tariffs that are too low to recover costs. Power SOEs have manageable payroll costs (17 percent of revenues on average), but they are highly exposed to fluctuations in fuel prices, which account for a substantial share of revenues (40 percent on average). They are also subject to unpredictable movements, which rapidly affect their profitability. Several governments cap electricity tariffs at below cost-recovery levels and in many cases do not properly compensate SOEs.

Far from acting as countercyclical spending vehicles during a crisis, SOEs amplify negative macroeconomic shocks. Because infrastructure SOEs use most of their revenues to cover payroll, fuel, and maintenance expenses, they have little left over that can be posted as retained earnings or reserves to buffer negative shocks. As a result, a significant negative shock that leads to a deterioration in financial performance prompts affected SOEs to ask for sizable fiscal injections and cut their capital spending. Our analysis shows that following a negative macroeconomic shock SOEs receive an increase in total fiscal injections (as a percentage of average assets) of about 3.5 percentage points the year after the shock—equivalent to a significant recapitalization. SOEs need fiscal injections precisely when governments are under pressure from the decline in total tax revenues. Furthermore, capital spending as a percentage of average assets in fully owned infrastructure SOEs decreases by 3.5 percentage points the year after the negative shock—equivalent to about 40 percent of average capital expenditure in the sample studied.

Case studies compiled for the report on which this Live Wire is based show that in response to adverse demand and fuel cost shocks, power distribution SOEs respond with a more than proportional decline in profitability. If demand declines by 5 percent, the Indonesian vertically integrated utility Perusahaan Listrik Negara (PLN) and the Kenyan power distributor Kenya Power and Lighting Company (KPLC) are projected to lose an additional 8 percent and 20 percent,
respectively, of their earnings before interest and taxes. The decline in profitability is even sharper in the case of a fuel cost shock. In response to a 5 percent increase in fuel costs, the two companies’ earnings before interest and taxes are projected to fall by 27 percent and 55 percent, respectively.

How important are the fiscal risks from power PPPs?

PPPs in the power sector present relatively low levels of fiscal risk, in part because electricity tariffs can be adjusted to preserve profitability, though the risks of early termination increase significantly in times of macroeconomic crisis.

The power sector has been relatively successful in attracting private capital through PPPs. Just over half of all PPP projects and associated investments in 1990–2021 were in the sector. Cumulative investments in the power sector through PPPs have grown steadily since the 1990s, reaching $927 billion in the developing world in 2021 (figure 5, panel a). Cumulative investments as a percentage of the developing world’s GDP grew rapidly during the 1990s, reaching 3 percent in 2002. After falling in the mid-2000s, they started growing again, remaining at 2.5–3 percent of developing world GDP between 2015 and 2021 (figure 5, panel b).

PPPs in the power sector present significantly lower levels of fiscal risk than in the transport sector, because the probability of contract renegotiation and early termination is much lower. Moreover, even when these events occur, the resulting fiscal demands are more manageable for power PPPs than for transport concessions.

Power PPPs are less likely to be renegotiated than transport PPPs; 24–41 percent are renegotiated (depending on the country), about half as many as in the transport sector. Even when renegotiation does take place in power PPPs, it takes longer to materialize, occurring on average about 1.7 years after contract signature, compared with just one year for transport PPPs. Renegotiation of power PPPs also leads to lower fiscal transfers because electricity tariffs paid by final consumers are regulated and can be readily adjusted.

Figure 5. Total investment in public-private partnerships in the power sector in the developing world, 1990–2021

a. In billions of dollars

b. As percentage of GDP

Source: Herrera Dappe and others (2023).

GDP = gross domestic product; PPP = public-private partnership.
to retain the profitability of electricity PPPs, including PPPs in the transmission and generation segments. In Peru, for example, even though transmission projects are awarded on the basis of required payments for investment and maintenance of the infrastructure, concessionaires are compensated through electricity tariffs that are routinely adjusted to make them whole (Marchesi 2022). In contrast, the revenues of transport PPPs are more likely to come from government payments, and it is usually more challenging politically to increase tolls or railways fares.

**PPPs in the power sector present significantly lower levels of fiscal risk than in the transport sector because the probability of contract renegotiation and early termination is much lower.**

Power PPPs represent much less of a potential fiscal drain when it comes to early termination. The risk of early termination of a power PPP is only a fifth that of road or rail PPPs. The average fiscal risk of early termination is 2–4 percent of the size of the PPP portfolio in the power sector, depending on the scenario considered—substantially less than the 6–14 percent in the transport sector. If early termination does take place, the capital at risk is also relatively small, given that the average size of an energy PPP is $288 million.

Early terminations of PPPs are procyclical, as negative macro-financial shocks increase the probability of early termination, which increases fiscal risks. A profound macroeconomic crisis would increase the fiscal risks from early termination of PPPs by an order of magnitude in the immediate aftermath of the shock. Simulation of a representative profound macroeconomic crisis—comprising a near 50 percent currency devaluation combined with both a banking and debt crisis—shows that the year after the shock, the fiscal risks would be 12–19 times the fiscal risks without a shock, depending on the country, with an average multiple of 16.

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**How can fiscal risks of the power sector be mitigated?**

**Alleviating fiscal risks requires integrated management of public investment, strong fiscal and corporate governance of SOEs, robust PPP governance, and integrated risk management**

All modalities of public infrastructure service provision are susceptible to significant fiscal risks, particularly during economic downturns. A combination of vulnerability to exogenous shocks and the perverse incentives faced by all actors explains the prevalence of fiscal risks in infrastructure service provision.

Off-budget forms of provision, like SOEs and PPPs, call on public finances more often and more deeply than is generally assumed. Moreover, when it rains, it pours. During bad times, on-budget spending on infrastructure tends to be cut, and the impact on SOEs and PPPs can further weaken the overall fiscal situation, amplifying the negative macroeconomic shock.

Weaknesses in public investment management can lead to fiscal risks. Because of lack of coordination in planning and budgeting across and within levels of government, many projects are only partially implemented. The political benefit of new infrastructure and low capacity often create incentives to prioritize capital spending over maintenance spending (so-called capital bias) and underestimate the likelihood and impact of possible adverse shocks. Flaws in management of contracts and assets can lead to inefficient spending. All these weaknesses can lead to inadequate maintenance and poor-quality construction, eventually requiring additional spending to avoid asset impairment, which disaster and extreme weather events can exacerbate. The fact that public spending on infrastructure tends to be the first victim of fiscal crises adds to the risk of asset impairment.

**A combination of vulnerability to exogenous shocks and the perverse incentives faced by all actors explains the prevalence of fiscal risks in infrastructure service provision.**
Flaws in fiscal and corporate governance that soften budget constraints, encourage SOEs to take excessive risks, and erode the incentive to be efficient are the main SOE-specific source of fiscal risks. The imposition of public policy objectives and practices on SOEs is common, notably the pricing of electricity at levels that do not allow cost recovery and the failure to update prices often enough. In many instances, SOEs are not fully or timely compensated by the government for the losses resulting from unrealistic tariffs. These policies are generally motivated by governments’ desire to moderate headline inflation or avoid social discontent and the fact that the costs of such policies are disguised—at least for a time. But they weaken the incentives of SOE managers and boards.

Access to financing that is unrelated to the creditworthiness of SOEs also softens budget constraints, distorting the incentives to take reasonable risks and be efficient. Other causes of soft budget constraints are information asymmetries between SOEs and their owners and flaws in corporate governance that exacerbate those asymmetries and allow government interference in the selection of SOE boards and management.

Flaws in PPP governance (including keeping PPPs off the fiscal balance sheet and off the budget), the uncertainty around infrastructure, and the long-term contractual nature of PPPs can give public authorities and private partners incentives to behave opportunistically, creating fiscal risks. Governments often have incentives to deliver projects through PPPs rather than directly because doing so allows them to obscure the fiscal implications (and risks) of the project. In making such decisions, efficiency gains take a back seat. Moreover, the off-budget nature and information asymmetries between different government authorities may give awarding authorities the incentive to behave strategically and to use renegotiations to fulfill political objectives. Similarly, the private partner may be inclined to behave strategically or opportunistically if the government is unable to make a commitment not to renegotiate a PPP or where there is significant uncertainty regarding the return on investment of a PPP, triggering renegotiations or even early termination.

A reform agenda to mitigate the fiscal risks from infrastructure should remove the flaws in governance that create perverse incentives and build adequate capacity in government to mitigate those fiscal risks that cannot be eliminated or that the government is best placed to deal with. All countries are different; the content and pace of implementation of each reform agenda therefore need to be tailored to the sources of risk and the institutional and socio-political characteristics of each country, as well as to the government’s capacity. Country-specific strategies will involve different mixes of preventive and corrective actions.

All reform agendas, however, must include the following four building blocks—integrated public investment management; effective fiscal and corporate governance of SOEs; robust PPP preparation, procurement, and contract management; and integrated fiscal risk management—and be grounded in efforts to build adequate government capacity.

Robust integrated public investment management leads to projects being selected because they are aligned with a country’s development goals and yield the highest net benefits and to provision modalities being selected based on value for money and fiscal affordability. Robust integrated public investment management requires consistent assessment of all potential projects and consistent fiscal treatment of all projects implemented through direct public provision, PPPs, and, in some cases, SOEs. Such management is needed to ensure that projects and modalities are not selected because of differential fiscal treatment. Countries should also adopt rolling medium-term fiscal frameworks that include PPPs in order to ensure alignment of investment plans with available funding. The effectiveness of integrated public investment management rests on granting the ministry of finance final authority to approve projects and contract renegotiations and modifications.
Effective fiscal and corporate governance of SOEs allows and incentivizes boards and managers to operate SOEs efficiently, thereby mitigating fiscal risks. It requires clearly specifying SOEs’ mandates and avoiding government interference in their operations, particularly through the imposition of policy mandates or quasi-fiscal operations. If interference cannot be avoided, SOEs should be compensated in a commensurate, timely, and transparent manner. Where an independent sector regulator exists, it should work with the ministry of finance to determine appropriate compensation. SOEs’ access to financing should be based on their debt-servicing capacity and approved by the ministry of finance in a nondiscretionary manner. To mitigate the need for fiscal injections, the government should establish clear requirements for financial management and monitoring.

A robust PPP preparation, procurement, and contract management framework that allocates risk optimally and limits opportunistic behavior is needed to mitigate the risks from renegotiation and early termination of PPPs. A robust framework should avoid allocating demand risk to the private partner when it has no or minimal control over demand. Flexible-term contracts, such as present-value-of-revenue contracts, are a good option for allocating the demand risk to the government in such cases. Measures to reduce financing risk can help reduce the risk of early termination. Clearly regulating contract renegotiations, modifications, and early terminations and establishing alternative dispute-resolution mechanisms are important measures for mitigating fiscal risks.

Integrated fiscal risk management leads to the most efficient outcomes because it can handle potential interactions among different risks and portfolio effects. Integrated risk management requires a central institutional structure within the ministry of finance (or chaired by the minister) that is responsible for managing all fiscal risks. It also requires comprehensive disclosure of fiscal information. A risk-mitigation strategy should start with sound macroeconomic and debt management. Risks from natural disasters, for example, particularly disasters related to extreme weather events, affect different types of infrastructure and noninfrastructure assets, requiring integrated approaches to mitigate those risks.

Off the Books: Understanding and Mitigating the Fiscal Risks of Infrastructure, upon which this Live Wire is based, was peer reviewed by Ani Balabanyan (practice manager, World Bank); Sudarshan Gooptu (senior director, Millennium Challenge Corporation); Fernanda Ruiz Nunez (senior economist, World Bank); Binyam Reja (practice manager, World Bank); and Eivind Tandberg (technical assistance officer, International Monetary Fund). The authors thank them for their insights, advice, and contributions.

References


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