The electricity chokepoint in Tamil Nadu public finance

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Abstract

Indian electricity utilities face significant financial stress on account of unfunded subsidies. This paper places the problem of electricity subsidies in the context of a debt sustainability analysis (DSA) for Tamil Nadu. We find the state fails on five out of six indicators for debt sustainability. We integrate the electricity sector into the conventional DSA, giving a "corrected DSA". These modifications are material in changing our sense of the fiscal situation in the state. There are concerns about the extent to which the current fiscal path is sustainable. Fiscal stress harms investibility in electricity. Resolving the problems of electricity policy are a critical component of the development of the medium-term fiscal strategy for the state government.

***JEL Codes**: H2, H3, H7, Q4, Q5*

***Keywords**: public finance, electricity, subsidies, political economy, debt sustainability analysis, state government.*

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1 Introduction

Many states in India face fiscal distress and many states in India have difficulties in the electricity system. In this paper, we bring the two streams of knowledge together for the state of Tamil Nadu, and offer fresh insights for fiscal policy and for electricity policy.

At the outset, we bring the formal toolkit of a 'debt sustainability analysis' (DSA) to the standard Tamil Nadu fiscal data. This involves a first stage of comparing a group of fiscal indicators against normative benchmarks, and a second stage of forecasting the debt/GSDP ratio and the interest payments to revenue receipts ratio ("IP/RR ratio") for five years; till FY 2028.[1] These results, which we term the 'baseline' DSA translate the mainstream intuition towards Tamil Nadu's fiscal difficulties into tangible numbers and forecasts.

We go on to estimate the consolidated financial picture with the two electricity sector utilities – TANGEDCO and TANTRANSCO – fused into the Government of Tamil Nadu. This yields a modified DSA that we term a 'Corrected' DSA. This yields a significantly modified picture. We argue that this modified picture is a more correct depiction of the fiscal problems of the state.

The fact that large debt servicing expenditures were successfully achieved for the last decade has helped create a confidence that the fiscal strategy of Tamil Nadu is deplorable but feasible. Of essence in the fiscal outlook of every highly indebted entity is the problem of sustainability. There are three concerns about sustainability:

1. Sustained large scale borrowing, from the financial system, may potentially face difficulties through the risk appetite of lenders, changes in regulations, systemic crises in the financial system, etc.
2. The most important assumptions that shape the results of this paper are the interest rate, estimated at 7%, and nominal GSDP growth rate, estimated at 9%. This has a $r - g$ of -2: it is a very positive environment from the viewpoint of fundamental fiscal dynamics. In the future, if $r - g$ becomes less benign, the debt dynamics could change significantly.
3. The conventional notion of fiscal stress is phrased in terms of bond default. In India, fiscal distress is known to manifest itself as unplanned budget cuts (that disrupt the working of the government), defaults on payments to private firms (which create conditions for fewer private vendors and higher prices in future purchases) and even the failure of pay salaries or pensions. We look back into three anecdotes for state governments that had high fiscal stress, in 2001, and find that the present projections for Tamil Nadu for FY 2028 are partially similar to these values.

[1]The term FY is used to denote a "financial year", which runs from 1 April - 31 March in India. A financial year is marked by the year in which it ends, eg. FY 2023 indicates the period of 1 April 2022 - 31 March 2023.

The fiscal knowledge of this paper has implications for electricity policy. The electricity system requires two large blocks of investment. A big block of capital is required to rebuild the grid for the post-carbon world. And, a big block of capital is required for the investment in renewables and storage that are required to sustain economic growth in the post-carbon world. Of particular importance is the economic upside from exploiting that remarkable natural resource which is found off the coast of Tamil Nadu in the form of offshore wind generation. These investments will not arise in the environment of chronic fiscal stress in the electricity system.

The electricity knowledge of this paper has implications for fiscal policy. Through simulations where electricity subsidies remain constant or they are completely eliminated, we find that the electricity system is material in solving the fiscal problem. A complete electricity sector reform versus business-as-usual thus translates into an FY 2028 outcome for the debt/GSDP ratio of 32.47% vs. 43.53%, and an IP/RR ratio outcome of 19.71% vs. 26.12%. These are large differences. They encourage us to prioritise electricity sector reform as a part of the medium-term fiscal strategy.

2 Public finance conditions in Tamil Nadu

In India, the Fiscal Responsibility and Budget Management Act, 2003 is the primary legislation for establishing borrowing limits for the government. This legislation imposed limits on union government borrowings, acceptable debt and deficits, and sought to bring in greater transparency in the fiscal operations of the union government. Individual states were encouraged to legislate fiscal responsibility acts of their own based on the Union law, but varied on the specific targets and thresholds. This was aimed at containing borrowings by the state governments within reasonable limits (Datta et al., 2023).

The Fiscal Responsibility and Budget Management (FRBM) Review Committee headed by N. K. Singh suggested that a debt/GDP ratio of 60% is sustainable for India (with 40% for the Union alone). This essentially leaves all the states with a combined space of 20% for borrowing within sustainable limits (KR Shanmugham and Shanmugham, 2022). General Government Debt (union and states put together) in FY 2022 amounted to 83.3% of the GDP (Department of Economic Affairs, 2022), which shows the fiscal stress in the overall Indian state. Tamil Nadu legislated the Tamil Nadu Fiscal Responsibility Act, 2003 (TN FRA) that sets targets for the state. The Act has timelines for achieving targets up until FY 2015. This Act has not been revisited after 2015.

Table 1 presents the fiscal deficit (total revenue − total expenditure), and the Gross fiscal debt (GFD)/Gross state domestic product (GSDP) ratio. The GFD of Tamil Nadu doubled from INR 39,840 crore in FY 2018 to INR 93,983 crore in FY 2021. It was at INR 74,525 crore in FY 2023. The nominal compound growth rate of GSDP

Table 1 The fiscal deficit in Tamil Nadu

This table presents facts about the fiscal deficit, the GSDP and the deficit/GSDP ratio are presented here.

Year	GFD	GSDP	GFD/ GSDP
	(INR Cr.)		(%)
FY 2018 AE	39,840	14,65,051	2.72
FY 2019 AE	47,335	16,30,209	2.90
FY 2020 AE	60,177	17,43,144	3.45
FY 2021 AE	93,983	18,08,239	5.20
FY 2022 AE	81,835	20,71,286	3.95
FY 2023 RE	74,525	23,49,143	3.17

Source: CMIE States of India
AE = Actual Estimates; RE = Revised Estimates

Table 2 Debt indicators for Tamil Nadu

This table presents facts about the total outstanding debt of Tamil Nadu, and the ratio of interest payments (IP) and revenue receipts (RR).

Year	Debt	Debt growth	Debt/GSDP	IP/RR	PD	PD/GSDP
	(INR Cr.)	(%)	(%)	(%)	(INR Cr.)	(%)
FY 2018 AE	3,26,636	15.17	22.30	17.78	13,827	0.94
FY 2019 AE	4,01,504	22.92	24.63	16.55	18,577	1.14
FY 2020 AE	4,62,202	15.12	26.52	18.32	28,196	1.62
FY 2021 AE	5,68,893	23.08	31.82	20.97	57,487	3.22
FY 2022 AE	6,67,975	17.42	32.25	20.03	40,270	1.94
FY 2023 RE	7,41,498	11.01	31.56	19.09	27,629	1.18
FY 2021 Union AE	61,55,000	15.03		14.96	4,17,538	2.11

Source: CMIE States of India
AE = Actual Estimates; RE = Revised Estimates

over a decade was 9.5%.

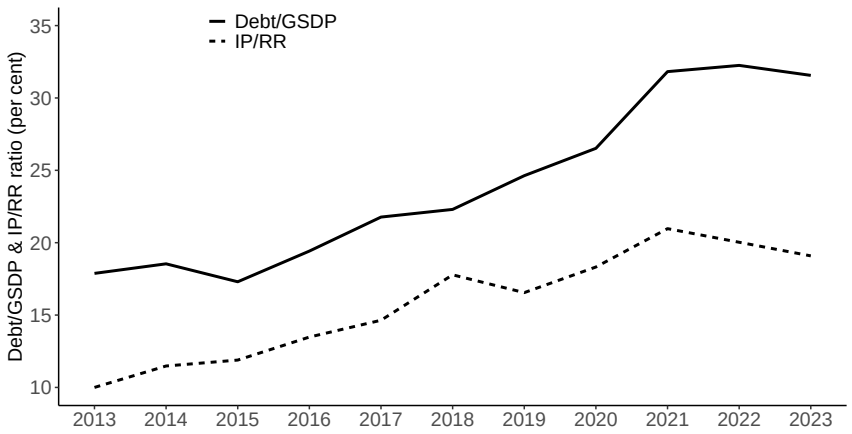
Table 2 shows how total outstanding debt doubled in a span of 4 years, from FY 2018 to FY 2022. The debt/GSDP ratio for FY 2023 stood at 31.56%, well beyond normative estimates (KR Shanmugham and Shanmugham, 2022).[2] This was not always the case - the state had a debt/GSDP ratio of 17.88% in FY 2013.

The primary deficit (PD) has grown almost three-fold in a span of 6 years. The PD/GSDP ratio went from 0.94% in FY 2018 to 3.22% in FY 2021. Interest payments consumed over 20% of Tamil Nadu's revenue receipts in FY 2022. As of FY 2023, Tamil Nadu is the largest open-market borrower amongst all states in India (Hindu, 2023b).

Figure 1 shows the evolution of the IP/RR and debt/GSDP ratios from 2013 to 2023. The baseline IP/RR ratio crossed the normative 10% mark proposed by the Four-

[2]The Tamil Nadu Fiscal Responsibility Act (TN FRA) set a target to achieve a debt/GSDP ratio of 25% by FY 2015.

Figure 1 The IP/RR & debt/GSDP ratios for the Government of Tamil Nadu



Source: CMIE, States of India

teenth Finance Commission (2015-2020) in FY 2014 itself and has reached 21% in FY 2021. The baseline debt/GSDP ratio crossed the normative 25% limit in FY 2020 and thereafter.

How does Tamil Nadu compare against other states? Figure 2 juxtaposes the worsening of the Tamil Nadu IP/RR ratio against the distribution. Between 2013 and 2023, Tamil Nadu moved from being a median state to go beyond the 75th percentile.

These broad fiscal facts suggest that Tamil Nadu has a significant public finance problem, both in absolute terms, and when compared with the states of India.

3 A debt sustainability analysis of Tamil Nadu

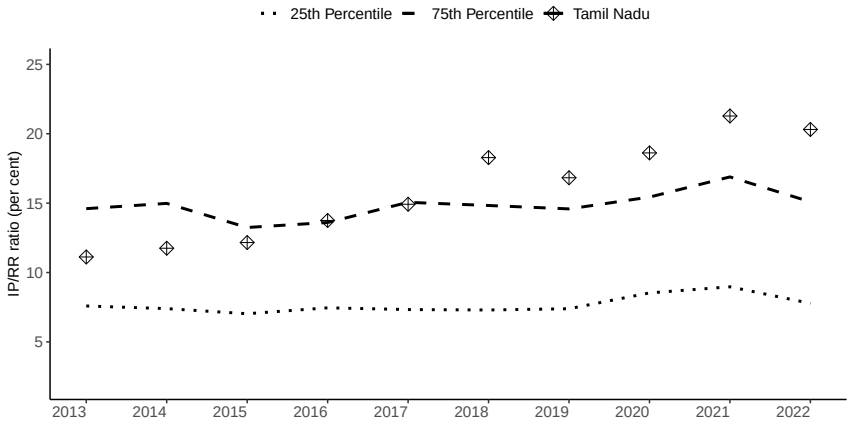
Debt Sustainability Analysis (DSA) is a tool used to assess existing debt levels of an economy, the extent to which an economy's fiscal parameters are impacted on account of growing debt, and the economy's ability to service and repay this debt. It is a formal, institutionalised public finance toolkit, used to guide borrowing decisions and assess levels of debt. Examples of its usage are seen across high income countries such as the EU (Pamies, 2023), Italy and Germany (Greiner and Kauermann, 2008), middle-income countries such as India (Misra et al., 2020) and China (Ferrarini and Hinojales, 2018), and low-income countries such as Bangladesh (World Bank, 2023a) and Ghana (World Bank, 2023b).

The DSA process generally works in three stages:

1. We assess the present situation using multiple fiscal indicators, where each is compared

Figure 2 The Tamil Nadu IP/RR ratio vs. the distribution

At each point in time, we show the 25th and 75th percentile value, for the IP/RR ratio, across the cross-section of all Indian states. Alongside this, the value for Tamil Nadu is shown. Tamil Nadu started out as a median state and is now much worse than the 75th percentile.



Source: CMIE, States of India

against normative desired values.

2. We establish baseline assumptions and work through the debt dynamic equations, making projections for the future. Modifications of the assumptions helps assess the vulnerability to future possibilities around the three key inputs: deficits, GSDP growth and the interest rate.

3. The third stage consists of medium term fiscal planning, where a fiscal crisis is staved off, under reasonable assumptions, choosing projected values for the primary balance that deliver the desired level of safety under multiple scenarios. This involves a balancing act between the political economy of deficits and the rigour of the debt dynamic equations.

3.1 Indicator-based DSA

This analysis is done using a set of indicators that represent the creditworthiness of the borrower state (Kaur et al., 2017). Table 3 shows the six indicators and their normative values. Table 4 examines Tamil Nadu from this point of view. We now turn to looking each of the six indicators in more detail.

Indicator 1: $r - g$ The 'Domar stability condition' shows that debt stability requires $r - g < 0$: if the nominal interest rate exceeds the nominal GSDP growth rate, then debt management rapidly spirals out of control.

The interest rate at which state governments borrow is reasonably modest. This reflects the Indian financial repression system, and the present borrowing arrangements,

Table 3 Indicators used in the debt sustainability analysis

Indicator-based DSA involves comparing these six indicators against their normative values. The notation used here is:

r	Nominal interest rate
g	Nominal GSDP growth rate
D	Nominal debt stock growth rate
IP	Interest payment
RR	Revenue receipts
PB	Primary balance
GSDP	Gross state domestic product
Debt	Public debt
Aug. Debt	Augmented Debt: Debt + Guarantees

Indicator	Desired
1. Nominal interest rate (r) − nominal GSDP growth rate (g)	$r - g < 0$
2. Nominal debt growth (D) − nominal GSDP growth rate (g)	$\text{D} - g < 0$
3. Primary balance (PB) / GSDP	$\text{PB/GSDP} \geq 0$
4. Interest payments (IP) / revenue receipts (RR)	$< 10\%$[1]
5. Debt/GSDP	$< 25\%$[2]
6. Augmented Debt / GSDP	$< 25\%$[3]

[1] Precedent: 14th Finance Commission, RBI.

[2] Precedent: The target of 25% was set by the Tamil Nadu Fiscal Responsibility Act, 2003 for FY 2015. It was intended to decline thereafter.

[3] Precedent: The Debt/GSDP ratio is used as the benchmark for this indicator also.

Table 4 Indicator-based DSA of Tamil Nadu (Baseline)

This table displays the results of the DSA across all six indicators. All numbers marked in boldface are in violation of the thresholds outlined in Table 3. The term 'baseline' is used to emphasise that this is based on the basic fiscal data for the Government of Tamil Nadu, and diverges from the 'corrected' DSA later in this paper which will bring the electricity sector fully into the analysis.

Year	$r - g < 0$	$\text{D} - g < 0$	$\text{PB/GSDP} \geq 0$	IP/RR	DEBT/GSDP	AUG.DEBT/GSDP
FY 2013 AE	-5.4	**1.8**	**-0.7**	10.0	17.88	20.69
FY 2014 AE	-5.2	**3.2**	**-0.8**	**11.5**	18.54	23.65
FY 2015 AE	-2.3	**2.3**	**-1.2**	**11.9**	17.30	22.31
FY 2016 AE	-1.4	**13.0**	**-1.3**	**13.5**	19.42	23.81
FY 2017 AE	-2.9	**19.1**	**-2.7**	**14.6**	21.77	24.01
FY 2018 AE	-5.3	**2.1**	**-0.9**	**17.8**	22.30	24.66
FY 2019 AE	-4.0	**0.1**	**-1.1**	**16.5**	**24.63**	**27.31**
FY 2020 AE	-0.1	**8.3**	**-1.6**	**18.3**	**26.52**	**29.23**
FY 2021 AE	**3.78**	**20.8**	**-3.2**	**21.0**	**31.82**	**35.49**
FY 2022 AE	-9.46	**2.6**	**-1.9**	**20.0**	**32.25**	**36.69**
FY 2023 RE	-6.82	**3.1**	**-1.2**	**19.0**	**31.56**	**35.48**

AE = Actual Estimates; RE = Revised Estimates

where bondholders have a senior claim on shared tax revenue. As a consequence, Indicator 1 has largely remained in the safe zone, except one year (FY 2021).

Indicator 2: $D - g$ Indicator 2 says that the debt stock should not grow faster than GSDP. Tamil Nadu's debt has grown faster than its nominal GSDP in the last decade. In only one year (2019), was this indicator almost in the correct zone.

Indicator 3: PB/GSDP The primary balance (PB) is the fiscal balance excluding interest payments ($PD = FD - IP$). When there is a small primary surplus, the debt/GSDP ratio declines. A positive primary balance indicates that the government's revenues exceed its non-interest expenditures, allowing it reduce debt. This condition was violated across the last ten years.

Indicator 4: IP/RR Interest payments to revenue receipts reflect the degree of financial leverage. Debt distress is a period where the IP/RR rises sharply and achieves bad values. The Fourteenth Finance Commission (FC-XIV) prescribed a normative limit of 10% for state governments. In Tamil Nadu, the baseline IP/RR ratio was 10% in FY 2013. This doubled over 10 years.

Indicator 5: Debt/GSDP This indicator compares the stock of debt against the flow of annual output of the economy. As prescribed by the TN FRA, the debt/GSDP ratio should be less than 25%.

Tamil Nadu crossed this threshold in FY 2020. This indicator stands at 31.56% in FY 2023.

Indicator 6: Augmented Debt/GSDP When markets and institutions measure debt, a common escape valve is to issue guarantees. These create the full liability in terms of the credit risk exposure, but leave the debt unchanged. Hence, guarantees are added back into the notion of 'augmented debt' (Misra et al., 2020).

The Augmented debt/GSDP has grown from 20.69% in FY 2013 to 36.69% in FY 2022. This ratio is now 11.69 percentage points above the TN FRA threshold of 25%.

The boldface values in Table 4 show a substantial deterioration of the fiscal soundness of Tamil Nadu over the last decade. This depiction is consistent with other alarm bells. The outstanding debt nearly doubled in five years. In FY 2023, the state was the highest market borrower for a third year in a row, and had the highest amount of outstanding debt among all Indian States and Union Territories (Business Line, 2023).

3.2 Projections for the next five years

We now construct projections for the debt dynamics. These reflect the interplay of two phenomena. The history matters through the interaction of the debt stock with the two rates (the interest rate and the GSDP growth rate). The present matters through the level of today's primary balance. The precise formula (Acosta-Ormaechea and Martinez, 2021) is:

Table 5 Assumptions for developing indicator projections (baseline)

This table presents the assumptions used to make projections for the next five years on certain key DSA indicators, for the state budget.

Variable	Assumption	Rationale
Nominal Interest Rate	7%	Tamil Nadu's 10-year bond yield
Inflation (CPI)	4%	The inflation target that RBI must uphold
Nominal GSDP growth rate	9%	CAGR over the last 10 years: 9.26%
Total Expenditure growth rate	10%	CAGR over the last 10 years: 9.54%
Total Revenue growth rate	9%	CAGR over the last 10 years: 8.65%

CAGR= Compound Annual Growth Rate

$$D_N = (1+r)^N D_0 - \sum_{j=1}^{N} (1+r)^{N-j} PB_j$$

where

D	Stock of Debt
r	Nominal interest rate
PB	Primary balance

The process of making projections involves five assumptions about the macroeconomic environment and about the fiscal strategy in Tamil Nadu. One of these assumptions – inflation – is largely locked down by the legal framework of inflation targeting where RBI is now obliged to deliver CPI inflation of 4%. The other four values involve judgement. For the purpose of this paper, we work with only one set of business-as-usual growth rates, with values drawn from the trend growth of the last 10 years. Our assumptions and their rationale are summarised in Table 5.

These assumptions imply the projections shown in Table 6. Under the assumptions of Table 5, we may expect a deterioration of the debt/GSDP ratio by 4.5 percentage points over the coming five years.

A traditional DSA would go on to explore the sensitivity of the projections to modified assumptions on GSDP growth and fiscal strategy. In the formulation of economic policy strategy, there would be an analytical strategy where these projections are made repeatedly while modifying some of these assumptions. In this paper, however, the DSA was undertaken in order to arrive at these baseline projections and the associated analytical toolkit. We now turn to the main subject of this paper, the electricity sector and its interactions with the fiscal problem.

Table 6 Baseline projections for the debt/GSDP ratio over 2024–2028

This table projects Tamil Nadu's debt/GSDP ratios over a period of five years. These values are 'the baseline projection' for the fiscal dynamics of Tamil Nadu, which combine familiar fiscal facts with the assumptions of Table 5.
In the remainder of this paper, we will construct modified values for these projections, reflecting our exploration of the electricity sector.

		(in %)
Year	DEBT/GSDP	IP/RR
FY 2023 (RE)	31.56	19.09
FY 2024 (PE)	32.27	19.38
FY 2025 (PE)	33.07	19.82
FY 2026 (PE)	33.96	20.31
FY 2027 (PE)	34.95	20.86
FY 2028 (PE)	36.03	21.46

RE = Revised Estimates; PE = Projected Estimates

4 The electricity dimension of Tamil Nadu's public finance problem

There are two kinds of price distortions in the Indian electricity system:

1. There is a *within*-electricity tax-and-subsidise system, where some buyers are charged too much (which is effectively a tax) and other buyers are given a lower price (which is effectively a subsidy). To some extent, such a tax-and-subsidy scheme can be in play purely *within* the electricity sector with no implications for the exchequer.
2. The electricity system, in the aggregate, has a shortfall which is met through two means: present resources (i.e. transfers from the exchequer) and future resources (i.e. borrowing by the electricity system).

All deviations from a single market price are associated with misallocation of resources. For the purpose of this paper, which explores the connections between public finance and electricity policy in Tamil Nadu, we only focus on the second kind: the aggregate shortfall of the electricity system that is paid for by contemporaneous fiscal transfers and by borrowing.

4.1 The operating loss from selling electricity

By the 1980s, financial discipline at Tamil Nadu Electricity Board (TNEB) had deteriorated, with free electricity for irrigation, introduction of flat-rate meters, and growing electricity theft. This resulted in low quality of supply and even more cross subsidies for certain consumer categories (Ramakrishnan, 2018). The TNEB was unbundled into two entities: one for transmission (TANTRANSCO), and another for generation and distribution (TANGEDCO). Both are subsidiaries of the Tamil Nadu Electricity Board, and wholly owned by Government of Tamil Nadu.

Table 7 Consumer category-wise tariffs in Tamil Nadu (FY 2021)

This table shows the different tariffs paid by different consumer categories. While the average cost of supply remains constant for all categories consuming electricity, the tariffs differ on account of subsidies and cross-subsidies.
These facts are the summary statistics about electricity in Tamil Nadu. Energy is sold for INR 3.95 per unit, and there are some on-budget subsidies which bring up the revenue to INR 6.14 per unit, which is much below the cost of INR 8.58 per unit.

Category	ACS	Tariff
Agriculture	8.58	nil
Domestic	8.58	2.26
Commercial	8.58	9.58
Industrial	8.58	6.21
Others	8.58	8.26
Average (by revenue on units sold)	8.58	**3.95**
Average (by revenue on units sold including tariff subsidy)	8.58	**6.14**

Source: Report on Performance of Power Utilities 2020-21, Power Finance Corporation.

Alongside the fiscal dimension of the electricity system – the overall shortfall within the electricity system – there is an important phenomenon of multiple prices which is associated with economic inefficiency. Table 7 shows the range of difference between tariffs for different consumer categories. All of the values presented in Table 7 and 8 present the actual shares of consumption and revenue earned from consumption (which also factors in inefficiencies in recovery, collection, etc., over and above the tariff-induced shortfalls) and are hence only uptil FY 2021.

This creates shortfalls in revenue generated which must then be made-up through tariff subsidies that the government then provides. Table 8 helps obtain insights into consumers that are subsidised vs. consumers that are over-charged. Domestic consumers consume 41.81% of the electricity sold in return for 18.61% of the revenue. Agriculture consumes 19% of the electricity in return for no revenue at all. The subsidy by the government (shown on a tariff-basis) accounts for nearly 23% of the revenue earned from sale of electricity in FY 2021. Electricity subsidies are also growing at a CAGR of $\approx 15\%$ annually (Table 9).

Categories such as commercial and industrial face remarkably high prices for electricity. This gives them an incentive to exit the system, by (a) electricity purchase from third parties (through 'open access'), (b) setting up captive generation plants, or (c) shifting their operations to other states (Garg et al., 2022; Hindu, 2023a). Purchases from private producers through open access account for about half of HT consumption, and are a growing share.

Table 8 Consumer category-wise break up of units, and revenue earned (on energy sold basis) in Tamil Nadu

This table shows the disparity between units of energy consumed and contribution to revenue for the energy consumed. This is calculated on 'energy sold basis' meaning these shares are calculated on the basis of energy sold, as compared with tariffs set (or revenue required). Notably, the revenue from agriculture is nil, and the tariff subsidy provided seems to fully account for agricultural consumption yielding no revenue.

Years	MU sold (units)	Share of MU (%)	Tariff (INR/kWh)	Revenue (INR cr.)	Share of Rev. (%)
Domestic					
FY 2021	30,781	41.81	2.26	6,945	18.61
FY 2020	29,140	37.65	2.26	6,719	15.96
FY 2019	27,420	36.02	2.26	6,020	13.79
Agriculture					
FY 2021	13,973	18.98	nil	nil	nil
FY 2020	13,830	17.87	nil	nil	nil
FY 2019	13,079	17.18	nil	nil	nil
Commercial					
FY 2021	10,418	14.15	9.58	9,982	26.75
FY 2020	13,484	17.42	9.58	12,339	29.31
FY 2019	12,698	16.68	9.58	10,773	24.68
Industrial					
FY 2021	15,203	20.65	6.21	9,404	25.20
FY 2020	17,376	22.45	6.21	12,661	28.90
FY 2019	18,346	24.10	6.21	15,714	36.00
Others					
FY 2021	3,347	4.41	8.26	2,627	7.04
FY 2020	3,561	4.61	8.26	2,821	6.7
FY 2019	4,583	6.02	8.26	3,447	7.9
Tariff subsidy					
FY 2021	-	-	-	8,359	22.40
FY 2020	-	-	-	8,053	19.13
FY 2019	-	-	-	7,695	17.63
Total					
FY 2021	73,622	100		37,316	100
FY 2020	77,391	100		42,098	100
FY 2019	76,126	100		43,649	100

Source: Report on Performance of Power Utilities 2020-21, Power Finance Corporation.

Table 9 Subsidies from Government of Tamil Nadu to the electricity sector

This table lists out subsidies from the Energy Department, Government of Tamil Nadu towards TANGEDCO and other heads under the electricity sector. These budget lines are obtained from the Demand for Grants.

Major head: POWER	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Reduction in tariff to Dom. Consumers	2944	4780	4484	3304	3230	3535	3693	3620
Reduced tariff rates for Places of Worship	25	18	21	17	18	16	16	16
Take over - UDAY Scheme	0	0	0	2975	1255	4266	7108	13108
Grants to TANGEDCO under UDAY Scheme	0	0	4563	4563	4563	4563	4563	0
Assistance to the ERC	4	4	6	6	6	6	6	6
Assistance to Elec board - Hydel Swing Scheme	125	125	125	125	125			
Assistance to TNEB	200	200						
ISTS under Green Energy Corridor (MNRE grant)	382	255						
Total	5481	6928	9199	8312	9196	12385	15386	16750

Source: Demands for Grants 2021-2022, Government of Tamil Nadu.

4.2 The subsidy burden on the state

The overall revenue shortfall in the electricity system is funded through two components. The first is explicit on-budget transfers from the Government of Tamil Nadu. The second is borrowing by TANGEDCO and TANTRANSCO to fill the funding gap in the electricity system.

The direct payments by the exchequer are documented in Table 9. The magnitude of this transfer has tripled in nominal terms over the period under examination. This table is based on scanning the Demand for Grants for one department, the Energy Department. There may be some other mechanisms of resource flow from the exchequer to TANGEDCO also.

Table 10 places the on-budget electricity subsidy in the context of the overall fiscal flows. A rough fact that emerges from this table is that there is an approximate parity between revenue expenditure and revenue receipts, if two heads were excluded: the electricity subsidy and interest payments. In 2022, the on-budget electricity subsidy (INR 15,386 crore) was 7.4% of revenue receipts.

The second path to financing the electricity shortfall consists of postponing the expenditure, by borrowing at the electricity utilities. This has also taken on considerable magnitudes. Between 2017 and 2023, 70-90% of the outstanding guarantees on the state's books were on account of electricity sector debt (CAG, 2023).

Table 10 Electricity sector subsidies and interest payments as a share of total RE

The on-budget electricity subsidy, documented in Table 9 is located in the context of the overall fiscal situation here. The share of on-budget electricity subsidies to revenue receipts is increasing year-on-year.

(INR Cr.)

	FY2019	FY2020	FY2021	FY2022
Revenue Receipts (RR)	1,73,741	1,74, 526	1,74, 076	2,07,492
Revenue Expenditure (RE)	1,97,201	2,10,435	2,36,402	2,54,030
Interest payments (IP)	28,757	31,980	36,497	41,564
Electricity subsidies (ES)	8,312	9,196	12,385	15,386
ES/RR	4.7%	5.3%	7.1%	7.42%
(RE - IP - ES) as a share of RR	92.16%	96.98%	107.72%	94.98%

Source: State Budget, Government of Tamil Nadu

Table 11 Comparing four industrialised states in FY 2021.

We compare four industrialised states: Gujarat, Maharashtra, Karnataka, and Tamil Nadu on electricity sector parameters. While other states also perform badly on AT&C losses, Tamil Nadu is the highest borrower across all DISCOMs in India.

Particulars	Unit	Gujarat	Maharashtra	Tamil Nadu	Karnataka	India
Units sold	MU	79,758	1,05,484	73,622	54,783	9,24,788
ACOS	INR/kWh	6.11	7.97	**8.58**	8.45	7.61
Avg. revenue	INR/kWh	6.19	7.45	**6.14**	7.63	6.90
Avg. Rev. - ACOS	INR/kWh	(+)0.08	0.52	**2.44**	0.82	0.71
AT&C losses	%	11.91	26.55	13.81	15.36	23.01

Note: The average revenue and cost of supply are on energy sold basis.
The average revenue includes any tariff subsidy received.
Source: Power Finance Corporation Report on DISCOMs (2021-22).

4.3 Is the situation in Tamil Nadu unusual when compared with other states?

Across the states of India, TANGEDCO ranks 49/51 of all utilities ranked on overall performance (PFC, 2023).[3] Four states (Tamil Nadu, Uttar Pradesh, Rajasthan and Madhya Pradesh) account for 57% of electricity sector debt. The situation in five states improved considerably in 2022 when compared with 2020 in five states: Maharashtra, Karnataka, Madhya Pradesh, West Bengal and Rajasthan.

A comparison of distribution company performance is presented in Table 11. Tamil Nadu stands out as facing difficulties. The average cost of supply, at INR 8.58 per unit, is much higher than the Indian average (INR 7.61) or Gujarat's (INR 6.11).

[3]Eight states are the hotspot for the shortfall in the electricity sector. TANGEDCO (Tamil Nadu), TSSPDCL, TSNPDCL (Telangana), MVVNL, PUVVNL, DVVNL (Uttar Pradesh), SBPDCL (Bihar), APSPDCL (Andhra Pradesh) together account for nearly 74% of the overall absolute cash-adjusted gap in the country.

Table 12 Decadal trend of losses at TANGEDCO

This table presents a snapshot of indicators from TANGEDCO's balance sheet that represent the growing volumes of losses and accumulated debt.

(INR Cr.)

Details	FY 2012	FY 2021	Change	% change
Net annual loss	15,055.34	32,553.19	17,497.85	116.22%
Accumulated loss	53,696.25	1,11,084.50	57,388.25	106.88%

Source: (Govenment of Tamil Nadu, 2021)

The average price at which electricity is sold, at INR 6.14, is lower than the Indian average (INR 6.90) or Gujarat (INR 6.19). The gap between the two prices, a deficit of INR 2.44 per unit, is out of line when compared with the Indian average of just INR 0.71.

From the viewpoint of Tamil Nadu's economic strategy, there are three problems in play. First, divergent prices for electricity to different kinds of consumers imposes an economic inefficiency. Second, users at a whole pay a high price for electricity, which is a tax on the consumers who cannot move, and creates incentives for firms to relocate out of Tamil Nadu. Third, the exchequer is burdened with the net loss of the electricity system, directly and indirectly.

4.4 Borrowing by electricity sector utilities

Losses in the electricity are partly on-budget: they are partly funded by subsidies that are paid by the exchequer to the electricity sector utilities, and have been documented above. We now turn to the unfunded losses in electricity, which are financed by borrowing at electricity sector utilities. The government of Tamil Nadu is the owner of both the electricity utilities. As a result of revenue shortfalls, TANGEDCO's accumulated losses grew from INR 53,696.25 crore to INR 1,11,084 crore from FY 2012 to FY 2021. Table 12 presents the stock and flow of losses at TANGEDCO.

These losses have partly been financed by drawing down the equity capital of TANGEDCO, and through borrowing.[4] A snapshot of TANGEDCO's liabilities (Table 13) presents its non-current (long-term) and current (short-term) liabilities. The jump from FY 2021 to FY 2022 in current liabilities indicates that TANGEDCO is borrowing to service its day to day operations as well. In the case of TANTRANSCO (Table 13), it is seen that about 14% of the total liabilities are on account of current liabilities.

A key fact that emerges from Table 13 is that a substantial pool of debt – INR 2,01,401.61 crore – is sitting at TANGEDCO and TANTRANSCO. At a legal level, these

[4]See Appendix 8 in Devaguptapu and Tongia (2023).

Table 13 Borrowings: TANGEDCO and TANTRANSCO in FY 2021 and FY 2022

This table shows the split of long-term and short-term borrowings across both electricity utilities - TANGEDCO and TANTRANSCO.

(INR Cr.)

		FY 2021	FY 2022	FY 2023
TANGEDCO	Total long-term borrowings	1,24,757.51	1,40,374.29	1,57,766.73
	Total short-term borrowings	1,02,062.05	1,02,864.96	1,37,533.06
	Equity	(69,575.07)	(78,890.32)	(1,41,815.03)
	Total liabilities	1,57,244.48	1,64, 258.93	1,53,484.76
TANTRANSCO	Total long-term borrowings	33,962.79	NA	NA
	Total short-term borrowings	15,441.42	NA	NA
	Equity	(1487.36)	NA	NA
	Total liabilities	47,916.85	NA	NA

Source: Annual reports of TANGEDCO and TANTRANSCO (FY 2021-2022)

are bankruptcy-remote from the state government. However, at a practical level, while these organisations are known to fail on payments to operational creditors, the state government is likely to ensure that there will be no failures on payments to financial creditors. In this case, for the purpose of the debt sustainability analysis, it is useful to consolidate these two organisations into the state government.

4.5 A corrected debt sustainability analysis

A default to financial creditors could have adverse consequences for the state government. For an example, there was one instance of a minor delay in debt servicing by TANGEDCO to TNPFC in FY 2021 (ICRA, 2023). Failure on debt servicing to financial creditors could interfere with the refinancing process at the utilities, and may create concerns about the financial soundness of the Government of Tamil Nadu, even under conditions where the borrowing by GoTN has a super senior claim on the union-to-state government fiscal transfers to GoTN.

To help understand the complete fiscal situation of GoTN, we undertake a modified debt sustainability analysis which quantifies and integrates the debt of the two electricity sector utilities into the "baseline" debt sustainability analysis presented in Section 3.

Other pathways to borrowing by state government organisations may also exist, which could further attenuate the DSA. However, it appears that in FY 2022, TANGEDCO raised 96% (INR 14,700 crore) of the state's total off-budget borrowings of INR 15,396 crore (Gupta and James, 2023) (see Table 21). Hence, consolidating TANGEDCO and TANTRANSCO into the GoTN is important and it largely gets us to the true picture. Our "corrected DSA" focuses on the corrected values and future projections for the debt/GSDP ratio and for the IP/RR ratio.

Table 14 Corrected DSA for Tamil Nadu: Indicator-based

This table shows indicators for the corrected DSA. The term "corrected" refers to the fuller picture obtained by consolidation of debt across TN + TANGEDCO + TANTRANSCO. This table is the counterpart to Table 6 which reflects the baseline, and those values are imported here for convenient comparison. The observed values in the corrected DSA are shown in boldface when they breach the thresholds shown in Table 3.

(in %)

Year	Baseline DEBT/GSDP	Corrected DEBT/GSDP	Baseline IP/RR	Corrected IP/RR
FY 2013 AE	17.9	**26.8**	10	**16**
FY 2014 AE	18.5	**28.2**	**11**	**18**
FY 2015 AE	17.3	**27.9**	**12**	**19**
FY 2016 AE	19.4	**34.3**	**13**	**21**
FY 2017 AE	21.8	**34.9**	**15**	**21**
FY 2018 AE	22.3	**32.1**	**18**	**24**
FY 2019 AE	24.6	**32.6**	**17**	**22**
FY 2020 AE	**26.5**	**33.0**	**18**	**24**
FY 2021 AE	**31.8**	**39.0**	**21**	**28**
FY 2022 AE	**32.3**	**38.8**	**20**	**26**
FY 2023 RE	**31.6**	**39.7**	**19**	**24**

AE = Actual Estimates; RE = Revised Estimates.

The consolidated debt estimation adds the latest available long-term borrowings figures at TANGEDCO and TANTRANSCO (as shown in Table 13) to the total outstanding debt of the Government of Tamil Nadu (as shown in Table 2). This gives us a consolidated debt of INR 9,33,227 crore (as of FY 2023). Interest payments for each year are calculated at an interest rate of 7% on the total outstanding debt of the preceding year. In baseline scenarios the baseline debt is used; in corrected scenarios, the consolidated debt figures are used.

We first make a conservative estimation of the consolidated debt for FY 2023, using only long-term (non-current) borrowings from the two utilities, with the assumption that short-term (current) borrowings will be paid earlier rather than later. Thereafter, total revenue and total expenditure for all three entities (Government of Tamil Nadu, TANGEDCO and TANTRANSCO) are grown as per a 10-year average CAGR, giving us the expected primary balance for each forthcoming year. This is used to estimate the expected debt over the next five years, enabling us to derive debt/GSDP projections. The true state of leverage at both the electricity utilities could be worse when short-term borrowings are also taken into account.

There is an element of double-counting in consolidating the balance sheet of GoTN with that of (say) TANGEDCO, to the extent that GoTN is also one of the lender's to TANGEDCO and TANTRANSCO. Our detailed examinations of the lenders to the electricity utilities, presented in Tables 16 and 17, show that these magnitudes are small and can be safely ignored.

The time-series of the corrected indicators is shown in Table 14. For both the debt/GSDP ratio and for the IP/RR, we show both the baseline values (for the

Table 15 Projected DEBT/GSDP ratios; four scenarios for FY 2024 - FY 2028

The second part of a DSA involves making fiscal projections. This table juxtaposes the baseline projections (from Table 6) against the 'corrected' projections which consolidate in the electricity sector. Two additional scenarios are also presented: (a) Where the electricity subsidy does not grow and (b) Where the electricity subsidy vanishes.
The gap between the 'Corrected' projections and the scenario without the electricity subsidy (the four values shown in boldface) measures the extent to which the problems of electricity policy modify the fiscal situation.

(in %)

	FY23	FY24	FY25	FY26	FY27	FY28
Baseline						
DEBT/GSDP	31.56	32.27	33.07	33.96	34.95	36.03
IP/RR	19.09	19.38	19.82	20.31	20.86	21.46
Corrected						
DEBT/GSDP	39.73	40.35	41.05	41.81	42.63	**43.53**
IP/RR	24.27	24.40	24.74	25.14	25.60	**26.12**
Scenario: Electricity subsidy stays constant						
DEBT/GSDP	31.56	31.65	31.93	32.39	33.04	33.86
IP/RR	19.09	19.38	19.44	19.61	19.89	20.29
Scenario: Baseline − electricity subsidy						
DEBT/GSDP	31.56	31.55	31.64	31.82	32.10	**32.47**
IP/RR	19.09	19.38	19.38	19.43	19.54	**19.71**

GoTN only) vs. the corrected values (after consolidating in TANGEDCO and TANTRANSCO).

By these measures, the normative thresholds for both these indicators were violated in all the years. At FY 2023, the baseline debt/GSDP ratio was 31.6% but the corrected value was 39.7%, which represents a substantial modification. Similarly, at FY 2023, the IP/RR ratio was at 19% in the baseline, but 24% in the corrected value. This also represents a substantial modification.

The second part of the DSA involves making the projections into the future five years. In the conventional DSA, based on the reported fiscal data, the debt/GSDP ratio is projected to grow from 31.6% to 36%. Once the electricity sector is consolidated into the analysis, the debt/GSDP ratio is projected to grow to 43.53% by FY 2028.

How can we attribute the extent to which the overall fiscal situation is caused by the problems of the electricity sector? We use the value of electricity subsidies committed for FY 2023 (Table 9) and project electricity subsidies for the next five years based on the CAGR for the last 8 years, which is 15 %. This value is subtracted from the total expenditure for the next five years to derive a new total expenditure. This then gives us a lower primary balance than the baseline scenario, which is used to estimate the debt/GSDP in this scenario. The projected debt/GSDP value for FY 2028 in this scenario is $\approx 4\%$ lower than the baseline, and $\approx 11\%$ lower than the

"corrected debt/GSDP values for the same year.

We also simulate a fourth scenario, where electricity subsidies are not completely eliminated, but they are constant at the present FY 2023 value. This scenario also brings the debt/GSDP ratio down by 2.5% compared to the baseline, indicating the benefits of making incremental reforms in the electricity subsidy regime.

5 Sustainability of this fiscal strategy

Many in the policy community have become used to chronic difficulties in the electricity sector, and chronic primary deficits, and are comfortable that such policy approaches can be sustained into the next decade as they were in the past decade. This incrementalist view thinks of the frailties of policy as regrettable but survivable. There are three aspects through which concerns about sustainability arise:

1. Can the borrowing from the financial system be sustained?
2. Will r and g stay at the present benign values?
3. Can fiscal stress manifest itself in harmful forms, even if not in default?

5.1 Can the borrowing from the financial system be sustained?

A large and growing borrowing practice at the electricity utilities will be required to keep the two electricity utilities functioning. To help fix intuition, if the average maturity of borrowing is 5 years, and if the interest rate is 7%, then a stock of debt of INR 200,000 crore plus requires a resourcing of INR 54,000 crore every year for debt servicing. In other words, even if all the electricity subsidies are stopped, a large borrowing operation needs to be sustained continuously. In practice, the requirement for borrowing each year is pushed up by an unfunded subsidy that is in operation.

This raises questions of sustainability. Could such a large-scale borrowing program be sustained into the future? We examine the borrowing mechanisms of TANGEDCO and TANTRANSCO in Tables 16 and 17.

We see that 84% of TANGEDCOs borrowings are from financial institutions such as Tamil Nadu Power Finance Corporation (TNPFC), Power Finance Corporation (PFC) and Rural Electrification Corporation (REC). Over 30% alone is from TNPFC (known as Tamil Nadu Power Finance and Infrastructure Development Corporation Ltd. (TNPFIDCL)). Similarly, Table 17 shows the lenders to TANTRANSCO. Over 90% of the borrowing is from TNPFC and REC.

Sustaining the present fiscal/electricity strategy requires a continuously growing scale of borrowing by these two firms (and, to some extent, by the Tamil Nadu sources of lending such as Tamil Nadu Power Finance Corporation). In the coming

Table 16 TANGEDCO's long-term borrowings profile

This table presents the stock of TANGEDCO's accumulated long-term borrowings, from financial institutions and schemes for FY 2021 and FY 2022

(INR Cr.)

Source	FY2021	FY2022
Financial Institutions	92,990	1,16,641
Of which		
Tamil Nadu Power Finance Corporation	29,171	42,072
Rural Electrification Corporation Ltd.	27,620	36,530
Power Finance Corporation	31,031	33,562
Housing and Urban Development Corporation	3,708	3,416
Indian Renewable Energy Development Agency	1,293	812
National Bank for Agriculture and Rural Development	167	49
Tamil Nadu Industrial Investment Corporation	0	200
Schemes	3,298	2,963
Of which		
Rstd.-Accelerated Power Development & Reforms Programme B	2,311	2,130
Integrated Power Development Scheme	518	483
Deen Dayal Upadhayay Grameen Jyoti Yojana	305	318
Rstd.-Accelerated Power Development & Reforms Programme A	117	0
Accelerated Power Development and Reforms Programme	38	25
Pradhan Mantri Gram Sadak Yojana	8	6
Rajiv Gandhi Vidyutikaran Yojana	1	1
Medium-term loans	14,015	11,766
Bonds and debentures	3,851	2,963
Government of Tamil Nadu	9,145	4,583
Other borrowings	1,458	1,458
Total	1,24,757	1,40,374

Source: TANGEDCO Annual Report: 2021-22.

Table 17 TANTRANSCO's long-term borrowings profile

This table shows the detailed profile of TANTRANSCO's borrowings for two recent years. PFC and REC stand out as its largest lenders.

(INR Cr.)

Source	FY 2020	FY 2021
Financial Institutions	21,814	23,185
Of which		
Rural Electrification Corporation Ltd.	10,472	10,997
Power Finance Corporation Ltd.	7,225	7,446
National Bank for Agriculture and Rural Development	136	122
Housing and Urban Development Corporation	475	357
Other banks	764	862
Indian Renewable Energy Development Agency	0	176
Life Insurance Corporation	108	58
Foreign institutions	2,634	3,167
Government of Tamil Nadu	20.45	20.45
Provisions and others	9,408	10,757
Total	31,242	33,963

Source: TANTRANSCO Annual Report: 2021-2022.

years, there may be difficulties in this borrowing. These may arise through changes in regulation, through loss of confidence in the credit risk of Tamil Nadu government corporations, through changes of strategy at important lending organisations, through crises at important lending organisations or through systemic financial crises such as the bond market crisis that took place after the IL&FS default in August 2018. If such events arise, they could interfere with the sustenance of the present electricity/fiscal policy strategy.

5.2 Will $r - g$ stay at the present benign values?

The projections undertaken in Section 4.5 assume that the Tamil Nadu electricity utilities will be able to borrow at 7%, which is the average value of the 10-year bond yield. Another critical assumption is about the GSDP growth, where a 9% growth rate was assumed based on the performance of the last 10 years.

The healthy value of $r - g = -2$ is a central feature holding down debt stability for Tamil Nadu. In the future, these values will change. As an example, the estimated FY 2023 nominal value for GSDP growth was 8.1%.[5]

Earlier in this paper, a key result shown was in Table 15, where the assumption of

[5]We may also point out the distinction between measurement and reality. Even if faulty measurement mechanisms result in certain numbers, from the viewpoint of debt dynamics, that does not help; the economic logic runs through the unobserved true GSDP growth rate and not the claims of a statistical office.

Table 18 Projected corrected debt/GSDP estimates at alternate scenarios for FY 2028

This table is a modified look at the projections shown in Table 15 where the 'Corrected DSA' was shown, with the electricity sector consolidated in, with the assumptions $r = 7, g = 9$, that is, with a nominal interest rate of 7% and a nominal GSDP growth rate of 9%. Here, we show how the debt/GSDP ratio would work out by FY 2028 under small changes to r and g. The value in boldface is the main estimate of this paper, with $r = 7, g = 9, r - g = -2$.

Interest rate	GSDP growth rate		
	8%	9%	10%
7%	45.59	**43.53**	41.59
8%	47.53	45.39	43.36
9%	49.54	47.31	45.19

$r = 7, g = 9$ had yielded a projected debt/GSDP ratio for FY 2028 of 43.53%. In Table 18, we show the sensitivity of this main value to small changes in r and g. Under the happiest scenario (10% GSDP growth, 7% interest), the FY 2028 value comes out lower at 41.59%. Under the most pessimistic scenario (8% GSDP growth and 9% interest), the FY 2028 value comes out as 49.54%. This emphasises that the standard public finance intuition where debt dynamics is contingent on the value of $r - g$, and in the future, this value may not be as benign as it was in the last decade.

5.3 Can fiscal stress manifest itself in harmful forms, even if not in default?

In conventional public finance thinking, fiscal stress manifests itself in a debt default. Default by a state government under Indian conditions is, however, an unlikely event owing to an unusual design of the mechanism for inter-governmental resource flows. The flow of tax revenues from the union government to the state governments, reflecting the states' share in taxes collected at the national level, goes through the RBI. The RBI implements a concept where the bond holders have first claims on the pipeline of cash going from the union government to the state government. Regardless of the level of resource distress in a state government, the state government then does not have the choice of defaulting on its bondholders.

As a consequence, fiscal stress in a state government in India does not manifest itself as a bond default. It gets manifested as a shortage of cash for implementing budgeted expenses. State governments are known to fail to pay private vendors and pull back from budgeted expenditure plans late in the year. This unpredictability, this gap between *de jure* budgeting and *de facto* budgeting, hinders the ability of government organisations to spend effectively. Sometimes, state governments have defaulted on overdraft payments to the RBI, and even faced difficulties in paying pensions and salaries (Mohanty, 2014).

Table 19 Comparing key fiscal indicators from Odisha, Bihar and West Bengal (2001) to Tamil Nadu (2023 and 2028)

This table recollects fiscal parameters from Odisha, West Bengal and Bihar that had episodes of near-default in the late 1990's and early 2000s. The debt/GSDP ratio and IP/RR ratio in these episodes are compared against present and projected values for Tamil Nadu. The median value across the three states is shown in boldface; we may think of it as a threshold value that is associated with fiscal distress that is comparable with that experienced in the three states in 2001.
Direct comparison is feasible for the baseline values for Tamil Nadu against the three anecdotes. Off-balance sheet borrowing may have been present in Odisha, West Bengal and Bihar in 2001. To this extent, these values are not comparable against the 'Corrected' values for Tamil Nadu where one fiscal problem (the electricity sector) has been consolidated into the state government.

(INR Cr.)

State (year)	DEBT/GSDP	IP/RR
Odisha (FY 2001)	38.09	**33**
West Bengal (FY 2001)	30.40	37
Bihar (FY 2001)	**37.76**	21
Tamil Nadu		
Baseline		
Present(FY 2023)	31.56	19
Projected (FY 2028)	36.03	21
Corrected		
Present (FY 2023)	39.73	24
Projected (FY 2028)	43.53	26

Source: CMIE, States of India

In the absence of bond defaults, it is not meaningful to ask whether the observed or predicted debt/GSDP or IP/RR ratios for Tamil Nadu are comparable with the values observed in state governments that defaulted. We turn, instead, to some episodes from living memory about states that experienced high fiscal stress:

1. In 2001, Odisha experienced a shortfall in revenue collection due to various reasons, including inefficient tax administration, low tax compliance, and economic slowdown. This resulted in a situation where Odisha struggled to meet its financial commitments, including payments towards salaries, pensions, and servicing of debts.
2. Bihar also faced a financial crisis and default scenario around the late 1990s and early 2000s.
3. Similar difficulties were observed in West Bengal in 2001.

We treat these anecdotes about states and their fiscal stress as opportunities to identify the numerical values for the debt/GSDP ratio and IP/RR ratio that are associated with high levels of fiscal stress. Table 19 juxtaposes Tamil Nadu's debt/GSDP ratios - both with baseline assumptions and with the addition of electricity sector liabilities. The median value for the debt/GSDP ratio, in the three stressed states of 2001, was 37.76%, and the median value for the IP/RR ratio was 33%. Thus we consider these values as reflecting substantial fiscal stress.

The corrected debt/GSDP ratio for Tamil Nadu – at 39.73 – exceeds 37.76% today. The IP/RR values seen in the Tamil Nadu are not projected to reach the value of 33% even five years into the future. Thus we see a partial resemblance between Tamil Nadu today and the experiences of some of the greatest fiscal stress at the state level in the past.

6 Fiscal knowledge for electricity policy

There is a feedback loop from fiscal difficulties into investment for the electricity sector.

6.1 Impact on investments for a post-carbon grid

Substantial investments are required for converting a carbon-intensive grid into a net zero grid. The financial difficulties at TANGEDCO and TANTRANSCO hinder these investments. This leaves the Tamil Nadu electricity sector in an awkward position where carbon-intensive generation investments have subsided, but the grid is not ready for a substantial increase in renewables. In particular, there is a tremendous natural resource available off the coast of Tamil Nadu, in the form of offshore wind generation, but harnessing this potential requires commensurate improvements in the grid.

6.2 Consequences of payment indiscipline

Vast resources must move in a predictable way to make an electricity system work. These include five groups of payments:

1. Consumers to DISCOM: tariffs approved by the regulator for various consumer categories
2. DISCOMS to GENCOS: tariffs set by the PPAs due every month, taxes, cross-subsidy charges and other surcharges;
3. DISCOMS to TRANSCOS: transmission charges, wheeling charges, and other surcharges;
4. DISCOM to consumers: feed-in tariffs;
5. other charges such as open access charges, etc. are also to be regularly paid.

When some of these payments falter, this creates complexities for other players in the system. When one part of the system malfunctions, others have to hold greater working capital, and face difficulties in performing on their obligations to equity and debt holders. Financial health and investibility is attenuated all across the system when TANGEDCO declines in its payment efficiency.

Many states in India have chronic payment delays in the electricity sector (CEF, 2020), but Tamil Nadu has among the highest overdue amounts (till date), at INR

Table 20 Energy pipeline

This table shows that TANGEDCO continues to rely heavily on coal-based electricity until 2027.

(in MU)

	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Coal-based	18,764	21,423	24,749	27,370	29,635	32,323
Gas-based	1,378	1,725	1,730	1,716	1,725	1,725
Hydro stations	5057	5042	5072	5057	5057	5057
Windmills	4	4	4	4	4	4
Total	25,204	28,194	31,555	34,148	36,421	39,110

*values for solar not identified.

Source: (TNERC, 2022), Tamil Nadu Electricity Regulatory Commission.

4333 crores.[6] The average payment delay period in the state has improved from 12 months in 2020 to 2 months in 2023.[7]

Payment delays are sensitive to the generation technology. Tamil Nadu and Andhra Pradesh have been delaying payments to renewable energy (RE) developers by 18 and 17 months, respectively, whereas their payment delays to conventional independent power producers (IPPs) are between 2-6 months. TANGEDCO has also been consistently delaying payments to wind energy generators by 15-20 months on average (TNERC, 2017). This behaviour hampers decarbonisation.

Overall, of the INR 1,02,864 crore current liability at TANGEDCO, INR 54,608 crore are trade payable dues.

In the regulatory process, the energy availability through PPAs is quantified by TANGEDCO and approved by TNERC. In the absence of large renewable energy capacity addition, there are limited avenues for energy purchasing and the pipeline is likely to remain coal-dependent. The new renewable energy generation in the state is largely for captive consumption.

Table 20 presents the energy supply and purchase pipeline of TANGEDCO, which has been approved by TNERC. The surprising feature of this table is that coal-based energy is projected to grow from 74% in 2022 to 82% in 2027. This may possibly be related to the difficulties faced by TANGEDCO in finding private generators (who are almost entirely renewables) who would enter into long-term contracts.

The dominant force in investment in the electricity sector is the private sector. When TANGEDCO achieves a poor reputation for contract performance, this deters private investment. It reduces the ability of the grid to enter into long-term purchase agreements – as it is not trusted by private persons – and enhances the cost of electricity for the grid as more is purchased through the spot market.

[6]Data on payment delays is accessed from the PRAAPTI portal

[7]Data from 2020 (CEF (2020)) is compared with Feb 2024 data from the PRAAPTI portal.

7 Electricity knowledge for fiscal policy

Table 15 offers important insights into the fiscal strategy for Tamil Nadu.

If the conventional fiscal statements were used, the present trajectory is likely to lead to a debt/GSDP ratio of 36.03% and an IP/RR ratio of 21.46%, in FY 2028. Once the electricity sector is correctly taken into account, these two values worsen materially to 43.53% and 26.12% respectively. Conversely, if the problem of electricity were to end, then the two values become 32.47% and 19.71% respectively.

A complete electricity sector reform versus business-as-usual thus translates into an FY 2028 outcome for the debt/GSDP ratio of 32.47% vs. 43.53%, and an IP/RR ratio of 19.71% vs. 26.12%. These are large differences. They encourage us to prioritise electricity sector reform as a part of the medium-term fiscal strategy.

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A Appendices

A.1 Definitions

Gross Fiscal Deficit (GFD) It is the gap between expenditure and revenue, which gives an estimate of the additional borrowing that would be undertaken in that year.

Fiscal deficit = Total expenditure - Total receipts (excluding borrowings)

Fiscal deficit = (Revenue expenditure + Capital expenditure) - (Revenue receipts + Capital receipts excluding borrowings).

Primary Deficit (PD) This is the difference between the fiscal deficit and the interest paid. It shows the amount that the Government needs to borrow to meet its current year's expenses.

Outstanding Debt (DO) The total debt on the government balance sheet.

Guarantees provided by the state (GO) A guarantee is an agreement between a financial institution and a government agency. If the borrower were to default on the payment schedule, the government would make the financial institution whole on its exposure. Guarantees are contingent liabilities (Misra et al., 2020).

Augmented debt : This is an enhanced measure of debt derived by adding the GO to the DO.

Augmented Debt = Outstanding liabilities + Outstanding Guarantees

Interest Payments (IP) This is the interest paid on borrowings.

Gross State Domestic Product (GSDP) The magnitude of goods and services produced during a given period of time, usually a year, within the geographical boundaries of the state, accounted without duplication.

A.2 Data Sources

CMIE States of India States of India is a database of macro-economic indicators for the 37 states and union territories and 724 districts of India.

RBI States Finances: A Study of Budgets This is RBI's annual publication that provides data and analysis of the fiscal position of State governments in India. This report is prepared by the Division of State Finances (DSF) of the Department of Economic and Policy Research (DEPR)

Others Documents from the Government of Tamil Nadu (GoTN), Comptroller and Auditor General of India, etc.

A.3 Off-budget borrowings

Table 21 Tamil Nadu's off-budget borrowings

This table presents the off-budget borrowings recorded for the Tamil Nadu Government. The tables is based on data from Gupta and James (2023) which uses CAG State Finances Audit Reports (2021, 2022).

	(INR Cr.)
Year	Off-Budget Borrowings
FY 2016	684.63
FY 2017	929.00
FY 2018	3754.00
FY 2019	774.52
FY 2020	703.78
FY 2021	15368.91

Source: Gupta and James (2023)