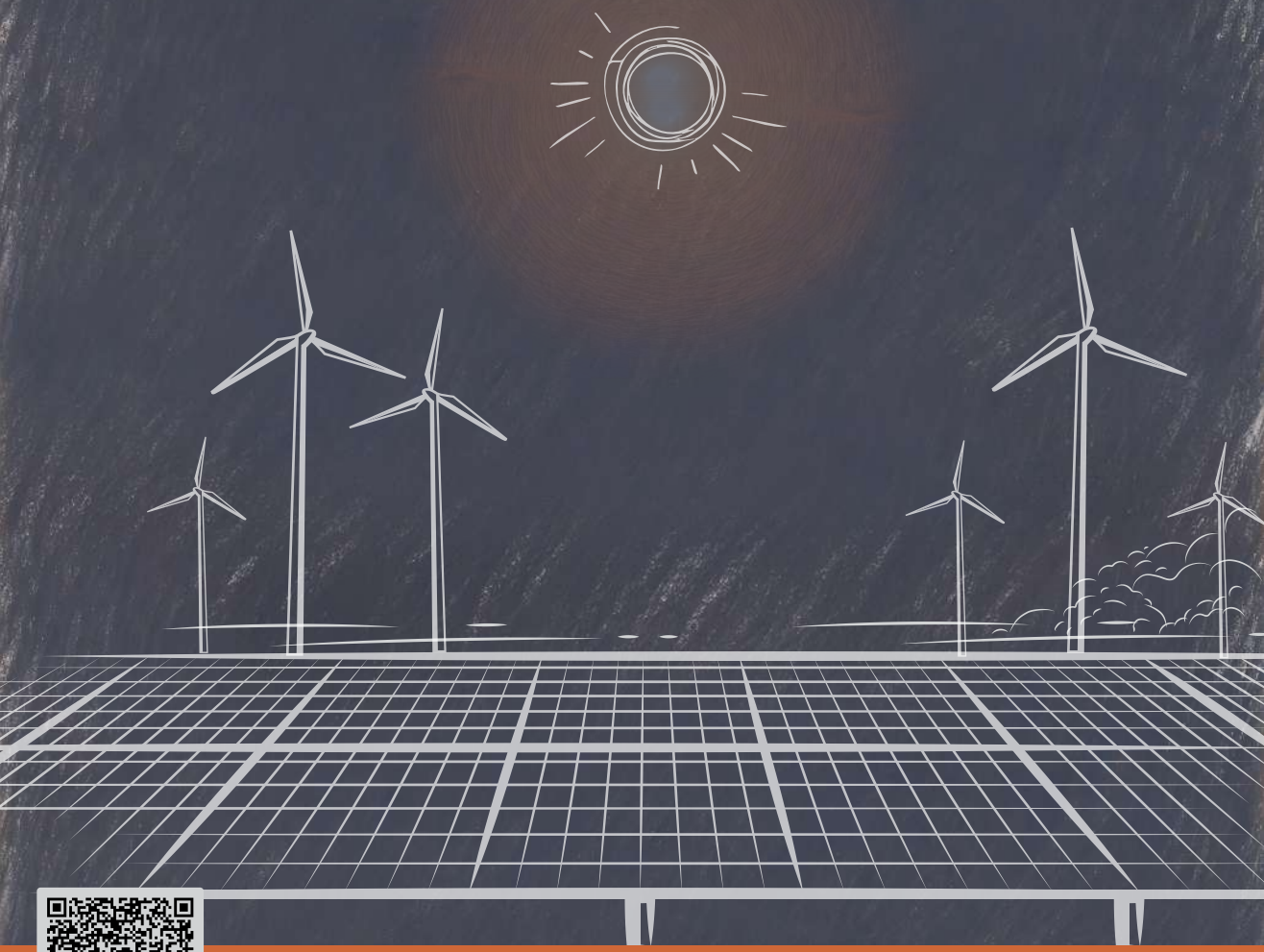
Financing Energy Transition

Private Gains or Public Risk

CEEP's chapter contribution to ***Financing Climate Action***

(Published by Routledge India)



Scan for open access version

October 2025

Financing Climate Action: India in a Global Context
Edited by Mritiunjoy Mohanty and Runa Sarkar
Published by Routledge India

Financing Energy Transition: Private Gains or Public Risk

Originally published as Chapter 24, Page no. 389-405

Authors: Simran Grover, Priyanka Goel, Manish Kumar Mahto, and Anuj Goyal (Centre for Energy, Environment & People)

October 2025

Suggested citation: Grover, S., Goel, P., Mahto, M. K., & Goyal, A. (2025). Financing Energy Transition. In M. Mohanty & R. Sarkar (Eds.), *Financing Climate Action: India in a Global Context*. Routledge India. https://doi.org/10.4324/9781003589709

24 Financing Energy Transition

Private Gains or Public Risk

Simran Grover, Priyanka Goel, Manish Kumar Mahto and Anuj Goyal

24.1 Introduction

Historically, state-owned generation companies (SoGs) played a foundational role in meeting India's energy demands, establishing an infrastructure backbone and delivering energy access across the country. However, their share in the energy generation landscape is diminishing, with private players dominating the renewable energy (RE) sector due to a favourable policy environment and robust financial mechanisms designed to attract private investments (PowerLine, 2024).

India has a cumulative installed RE capacity of 154 GW till September 2024 (National Power Portal, 2024), of which, the cumulative installed capacity of RE sources for public entities was a mere 4 GW. While the RE sector has attracted major investments, it is stymied by the market and non-market risks due in an evolving markets and policy environment, the intertwining of socio-political and economic development with electricity, and the high economic cost of inadequate supply of power. These risks have resulted in slower adoption of RE, continued investment in environmentally harmful sources of power like coal, and compromised energy security.

We argue that SoGs are uniquely placed to manage these risks due to higher risk appetite, political acceptance, ability to prioritise long-term goals over short-term profits, and as a risk mitigation instrument. Therefore, the state governments should actively encourage SoGs to plan energy transitions and become active players in RE markets. Further, strengthening SoGs will also help the state governments to navigate their unique challenges of balancing energy transition with energy affordability, security and sustainability in a just and equitable manner.

The next section explores the journey of SoGs in energy transition, traversing factors that have inhibited them from playing a significant role in the process. Section 24.3 analyses the risk posed by the energy transition in the light of socio-technical and economic complexity of the power sectors. The next section demonstrates how SoGs can alleviate some of the risks posed by energy transition. The last section concludes the chapter by making a case for the public sector in a paradigm defined by the assumptions of private sector's efficiency.

24.2 State-owned Gencos Muddling through Energy Transition

Electricity is intrinsically linked with economic growth and equitable social development (Kela, 2019; Singh & Srinivasan, 2006). It is appropriately placed in the concurrent list of the Constitution as both central and State governments are responsible for promoting

DOI: 10.4324/9781003589709-31

economic growth and development. Hence, both central and state governments have key roles in governing and regulating the generation, transmission and distribution of electricity. Historically, they have had a strong market presence through various public sector undertakings. However, electricity distribution is solely under the purview of the state government (Michael et al., 2024).

Central government-owned public sector enterprises, such as NTPC, NHPC, Damodar Valley Corporation, etc. and state government-owned entities incorporated under the Indian Companies Act, 1956 (now governed by the Companies Act, 2013) and State Electricity Boards (SEBs) have played a significant role in developing the sector. The state government-owned entities are particularly responsible for electricity generation, transmission, and distribution for their respective states. For this chapter, we are defining state government-owned electricity generation companies (Gencos) and generation assets under State Electricity Boards as 'State-owned Gencos (SoGs)'. The primary objective of a State Genco is to generate electricity and supply it to the state electricity grid (Gandhi et al., 2022).

Even though SoGs have a very low share in the RE sector at present, as early movers they piloted RE generation plants, especially solar and wind-based power plants, in many states. Karnataka Power Corporation Limited (KPCL) commissioned its first wind project of 0.225MW in 1996 (Karnataka Power Corporation Limited, 2021). KPCL has commissioned six solar plants with a cumulative capacity of 35MW in the period FY 2010–2018. Similarly, Gujarat State Electricity Corporation Limited (GSECL) commissioned 8 windmills each of 1.25 MW in FY 2008 and commissioned around 18 solar plants of around 671 MW since FY 2012 (Gujarat State Electricity Corporation Limited, 2024). Maharashtra State Power Generation Corporation Limited (MSPGCL) commissioned its first 1 MW solar plant in FY 2010–2011 (Maharashtra State Electricity Distribution Co. Ltd., 2010), followed by a 4 MW plant in FY 2012 and a 125 MW additional capacity in FY 2013 (Maharashtra State Electricity Distribution Co. Ltd., 2020). Andhra Pradesh Power Generation Corporation Limited (APGENCO) installed its first solar plant of 5 MW capacity in FY 2015–2016, followed by a much larger 400 MW facility at Talaricheruvu, completed in four stages between FY 2018 and FY 2019 (APGENCO, n.d.). Despite this, SoGs have an abysmally low share of 1.7%, representing a mere 2.6 GW of the 154.2 GW of RE installed nationwide by September 2024 against a share of 35.4% representing 105.6 GW of 298 GW of non-RE generation[2] as of September 2024 (National Power Portal, 2024).

The state and central governments financed the early RE projects through budgetary support to develop the market and infrastructure for RE. However, SOGs didn't sustain the momentum to scale up their RE portfolios, while private companies, riding the wave of global green finance, invested heavily in RE as policy and regulatory environment addressed much of their risks. The domination of the private sector in RE came concurrently with the fiscally stressed state governments, who refrained from any capital investments in the sector. While the capital expenditure rate by the state government from 2015–16 to 2023–24 has declined from 2.6% to 2.1% of GDP, subsidies on electricity have increased from 8% to 9% of revenue expenditure during the same period (PRS, 2024). The declining capital expenditure has left state governments with no choice other than preferring private players for investments in RE in keeping with the discourse of neoliberalism (Dunleavy & Hood, 1994).

SoGs face the dual challenge of balancing social obligations and managing existing legacy generation assets that are primarily coal-powered. Keeping fossil-fuel-based assets, particularly coal plants, is becoming financially unsustainable (Ministry of Power, 2023).

These assets, along with other factors, weigh heavily on the balance sheets of SoGs, forcing them to borrow from financial markets. The liquidity crisis, exacerbated by unpaid dues from state electricity distribution companies (DISCOMs), further limits their financial capacity to support the transition to cleaner energy sources (Kumar & Jairaj, 2020). Electricity has become a politically contested issue during the last few years, and most state governments provide substantial electricity subsidies. However, state governments often do not pay back the subsidies to distribution companies, and they subsequently fail to pay SoGs on time stressing the balance sheet and adversely affecting their credit rating, and hence, the capacity to borrow (Kumar & Jairaj, 2020; Prag et al., 2018).

Most state-owned enterprises must obtain multi-level and time-consuming approval for business decisions and also be accountable to multiple agencies with varying mandates, barring a few Maharatnas and Navratnas (Khanna, 2015), that reduces their managerial autonomy. Managerial autonomy gets restricted further in the case of SOGs with weak balance sheets and high dependence on budgetary support from the state governments and geographical restrictions (Bose, 2011). These restrictions create an inertia among managers to take on new projects and often do not spatially optimise their investments. Private companies and central government undertakings such as NTPC can invest in favourable regions for RE deployment such as Gujarat, Rajasthan and Tamil Nadu. However, SoGs cannot invest in these states due to geographical limitations. State-level political bureaucracy does not favour investments outside the state as politicians are concerned with transfer of jobs to other states (The Hindu, 2022).

Despite being early movers, SoGs are muddling through energy transition at present. They are facing the threat of becoming a marginal player in electricity generation soon unless they navigate the current structural barriers. In our view, the shrinking share of SoGs in electricity generation due to their inability to invest in RE deployment may have far-reaching implications for energy security, welfare, risk management, and political power of state governments.

24.3 Electricity Sector Transition Risks and Complexities

Energy transition is shaping a paradigm shift in energy generation and consumption, which has brought new challenges and risks to the sector (Debnath et al., 2022; Saraji & Streimikiene, 2023). Traditionally, electricity generation was designed to follow electricity demand. The energy transition is increasing variability and uncertainties on demand and supply side (Fodstad et al., 2022). The calls for decarbonisation of industrial production followed by massive electrification of industries and emerging shifts towards electric mobility have increased uncertainties about future demand patterns. On the other hand, increased integration of RE sources such as wind and solar has weakened the capacity of grid management in comparison to traditional fossil-fuel-based power plants. Further, the adoption of decentralised RE has made the electricity supply-demand equation more complex. In this context, energy transition has posed significant structural, socioeconomic, and political risks that need to be addressed.

24.3.1 Market and Non-Market Risks

The RE ecosystem needs new kinds of ancillary services such as energy storage, frequency control, demand side management, energy efficiency, grid modernisation and smart grids (Banshwar et al., 2017). However, these services are in the nascent stage of development and will require a long incubation period. The growth and maturation of markets of

these essential services further stumbled as there is no clarity about policies and regulations in the absence of reliable pilot studies and business models (Banshwar et al., 2017). Therefore, most of the private investment is limited to the generation of RE due to public procurement, leaving out these essential ancillary services. Underinvestment in these essential services is a structural risk to energy transition and can pose a threat to energy reliability and affordability.

India has adopted an approach to energy transition that is led by the deployment of large RE-based plants (Yenneti et al., 2016). These plants are no different from the traditional developmental projects that attract significant resistance from the communities and local power structures as they create haves and have-nots. For example, scholars have highlighted that large RE projects in India have resulted in a loss of access to common pool resources and livelihoods and the dispossession of land and other natural resources by local communities (Sovacool & Stock, 2024). It has resulted in on-ground conflicts with RE companies, delaying their projects and increasing costs. Such delays result in a significant reduction in investor confidence and investment in the energy transitions.

Energy transition or shift to RE is not benevolent for all without safeguarding the livelihoods of existing workers employed in fossil-fuel-based power plants (Davidson, 2023). For example, the South African government reserved the RE sector for Independent power producers exclusively to attract global investments in 2011 (Box-I). A decade later, the Just Energy Transition Plan focused on decommissioning existing coal power plants, most of which are owned by the public utility ESKOM. It drew strong reservations from civil society and labour unions like the National Union of Mineworkers (NUM) and the National Union of Metalworkers of South Africa (NUMSA) due to potential risks to the job security of ESKOM's employees and livelihoods of nearby communities. In South Africa's case, exclusion of ESKOM from participating in RE development added a political risk to energy transition. It must be noted that the long-term progress of energy transition is subservient to the ability of state to navigate such political risks.

Box 24.1 Eskom in South Africa's Energy Transition

In 2011, the South African government launched the RE Independent Power Producer Procurement Programme (REIPPPP) to attract foreign private investment in RE through long-term power purchase agreements (PPAs) (Department of Mineral Resource and Energy, n.d.). By inviting Independent Power Producers (IPPs) into the market, the programme aimed to diversify South Africa's coal-heavy energy mix. At the same time, Eskom, the state-owned utility responsible for over 90% of the country's generation capacity was barred from investing in RE to promote investments from the private sector (Todd & McCauley, 2021).

A decade later, at COP26, the Just Energy Transition Partnership (JETP) was announced with developed countries pledging financial support to accelerate South Africa's energy transition. The partnership deal between South Africa and the governments of the United Kingdom (U.K.), United States (U.S.), France, Germany, and the European Union (EU) pledged $8.5 billion between 2023 and 2027, to facilitate South Africa's transition from coal to RE (European Union, 2011). In November 2022, the government introduced the Just Energy Transition Investment

Plan (JET-IP) for five years (2023–2027) calling for an investment requirement of over $80 billion (1.5 trillion South African rand) and outlined utilisation of the funds (The Presidency Republic of South Africa, 2022). Amongst other things, the plan focused on the decommissioning of the coal power plants.

With the JET-P pushing for the decommissioning of coal plants, Eskom's share in the country's energy mix was set to shrink substantially, raising concerns about its future viability. The dual decision of barring Eskom from RE investments and commitments to coal phase-out threatened to eliminate Eskom's role in power generation, paving the way for eventual privatisation of the energy sector. This shift drew fierce opposition from civil society groups and labour unions including the National Union of Mineworkers (NUM) and the National Union of Metalworkers of South Africa (NUMSA), particularly over the potential risks of privatisation. They argued that the state utility should continue to play a leading role in the energy transition (Global Energy Justice Workshop Collective, 2023; Lenferna, 2023; Sweeney, 2024), anticipating that allowing IPPs to dominate the renewable sector shall result in higher tariffs, deepen energy inequality, reduced job security, and profit-driven approach rather than socially driven energy policies (Geddes et al., 2020; Global Energy Justice Workshop Collective, 2023).

In response to mounting pressure from unions and ongoing challenges in implementing the JET-P, the South African government has recently indicated a shift in its position regarding Eskom's involvement in renewables (Eskom, 2024). The state administration has acknowledged the need for Eskom to have a more prominent role in the energy transition, especially in the deployment of renewable projects (DMRE et al., 2022). The state utility is planning to repurpose its decommissioned coal plants into RE hubs, thus allowing the utility to remain central to the energy sector while transitioning to cleaner sources (Eskom, 2022, 2024).

The energy transition is not just a technical transition but also deeply intersects the lives and livelihoods of impacted communities and workers. When this transition triggers systemic shifts such as ownership of the sector moving from the public sector to the private sector, it is natural that fears and apprehensions of stakeholders that are adversely impacted by the transition shall deepen further. It must be noted here that South Africa chose an implicit roadmap for privatisation wherein a gradual phase-out of the public sector was designed by barring them from investing in the RE sector.

It is not surprising that government of South Africa, in October 2024, announced that Eskom shall not be precluded from participating in RE projects and indicated the Eskom's plans to invest in 2 GW of RE projects over the next two-three years (Kemp, 2024).

24.3.2 Developmental Risks

Consumption of electricity has a positive effect on economic growth (Aneja & Mathpal, 2021) and overall development (Lipscomb et al., 2013) in India as well as in other countries. Electrification even has spread effect to those houses which do not undergo electrification (in the area which underwent electrification) (van de Walle et al., 2013). It is a strong determinant in access to healthcare services with positive causal links between

reliable electricity and usage of maternal health services (Koroglu et al., 2019) and operational capacity of primary health centres (PHCs) (Chen et al., 2019). The causal nexus between electricity and education, livelihood and healthcare implies that a disruption in the supply of electricity will have a detrimental effect on them (Obolensky et al., 2019). The disruptions in electricity supply are also linked with a 'substantial drag' on manufacturing (Allcott et al., 2016), which inadvertently proves to be the 'highest hurdle' for investment and economic development in the State (Fukumi, 2022). Varigonda (2013) found that a combination of inadequate and unreliable electricity supply and tariff hikes could cause social instability.

However, the privatisation of essential utilities or withdrawal of public institutions from the provision of essential utilities can result in the deterioration of services, increase in tariffs, and developmental risks (Hall, 2022). For example, the UK privatised their water utility to improve its efficiency, reduce the fiscal burden on the public exchequer, and attract investments in 1989 (Box-II). However, private companies were driven by profits rather than ensuring water for all, which has ultimately resulted in increased tariffs for water, increasing cost of living for the poor. In our view, the complexities and uncertainties in the private sector-led energy transition can result in increased disruptions and higher prices due to its inherent incapability to prioritise long-term social and economic development over short-term profits.

Box 24.2 Privatisation of Water Utilities in the UK

The UK government undertook privatisation of several state-owned utilities in the 80s to achieve its fiscal and political objectives of reducing public sector borrowing (Bakker, 2005). The water sector underwent drastic restructuring in 1973 when virtually all the water authorities were consolidated into 10 Regional Water Authorities (RWAs) and put under the direct control of the central government (S. G. Ogden, 1995). The privatisation of the water and waste-water sector in the UK in 1989 was driven by three key objectives: reducing fiscal burden on the country's finances, attracting much-needed investment for the utilities and improving their efficiency (Lobina & Hall, 2001; S. Ogden & Anderson, 1995).

The Water Act of 1989 transferred all the assets of the 10 RWAs to 10 newly formed water utilities. The government incentivised private participation by waiving off long-term debts owed by the RWAs (Pratley, 2024) and under-pricing their assets at the time of their listing on the stock markets (Portes, 2022). To assure returns on investments, these companies were also granted exclusive rights to operate in their respective regions (Ofwat & Department for Environment Food and Rural Affairs, 2006). An independent economic regulator, the Water Services Regulation Authority (Ofwat), was established under the Act to offset the resulting lack of competition (Water Services Regulation Authority, 2006). The regulator was to be responsible for protecting consumer interests, securing long-term resilience in water supply and ensuring that the companies carry out their functions (CAG, 2015).

Over the years, the impact of privatisation on the sector and its stakeholders has been rigorously assessed. Only three of the 10 initial companies are still listed on the stock exchange as of July 2024 (Pratley, 2024) and their ownership is primarily

being held by large foreign institutional investors (Almeida, 2024; Leach et al., 2022). As the long-term exclusive licenses of the companies, due for expiry in 2014, were extended by another 25 years in 2002, these companies continue to operate without any real competition (Pratley, 2024).

Investment in the sector remains underwhelming, with only 0.05% of existing pipe networks being replaced per year in the UK against an average rate of 0.5% in Europe (Horton, 2022). This poses serious health concerns for consumers as nearly three million lead pipes, which comprise a substantial share of the existing network, were yet to be replaced in 2023 (Jeraj, 2023). Reports suggest that most of the GBP 123 billion spent as capital expenditure between 1989 and 2021 has been financed by the increasing tariffs (Hall, 2021, p. 13) which have increased by nearly 360% – nearly twice the rate of inflation (Almeida, 2024). Despite the companies being debt-free at the time of privatisation, a debt of nearly GBP 52 billion has been amassed by them (Hall, 2021, p. 13; Plimmer & Hollowood, 2021) with speculations that the debts have ultimately been used for paying GBP 57 billion as dividends to the shareholders between 1991 and 2019 (Armitage, 2012; Hall, 2021, p. 14). Environment concerns such as leakages in the network resulting in nearly a trillion litres of water being wasted annually in FY 2022 (Horton, 2022) and untreated sewage being dumped into the rivers and waterbodies (Kollewe, 2024; Plimmer & Hollowood, 2021) have also been highlighted.

The more concerning aspect of the case of privatisation in England is a reversal of the role of the regulator in the sector. Hall (2021) argues that Ofwat has become a 'captured regulator' and is more concerned with the well-being of the water companies instead of serving public interests. This has been exacerbated by the regulator being outside the scope of political supervision as it is a 'non-ministerial government department' (Hall, 2021, p. 4).

For critical utility sectors, it is pertinent that companies need to balance concerns of public services, environment compliance, security (energy or water security for instance), affordability, and sustainability. Since private sector is naturally driven by profits, their observance or appetite for balancing different concerns may be lacking. This may especially be true where regulatory bodies are weak.

Further, this case serves to challenge the notion of the ability of the private sector to mobilise private capital. On the contrary, the case serves to substantiate that private sector further drains capital by rewarding dividends to shareholders despite precarious fiscal health and debt burden.

24.3.3 High Costs of Failure

Essential utilities, like electricity, have a critical role in sustaining social development and economic growth, ensuring security, and maintaining peace necessitating adequate planning and regulatory framework to mitigate potential risks (ILO, n.d.). The cardinal role of electricity in maintaining these essential services restricts the scope of 'failure', and the State does not have the option to let these utilities fail. Hence, the private provision of essential public services does not shield governments from market risks such as massive currency devaluation, increased prices in international markets, and global financial crises (Kessler & Alexander, 2004). The state must put its precious public resources into

keeping these services running in case of failure (Kessler & Alexander, 2004), irrespective of whether they are private or public, making the state as the ultimate bearer of risk irrespective of ownership of any critical utility sector.

The cost of such failures is not only financial but also results in deterioration of sovereign ratings and international reputation, which are ultimately borne by the State. For instance, the Brazilian government was forced to call upon its public finance company BNDES to provide loans to the privatised distribution companies to cover their financial losses (Tankha, 2009), to ensure energy availability and reliability. Further, these loans were treated as income rather than liability, and the cost was passed to the consumers (Box 24.3).

Although the government has to bear the financial cost, it also needs technical capabilities to intervene in times of crisis in the utility sector to manage such high risks. Without this capacity, the state governments would be dependent on external agents to manage the risk at a time of crisis. Especially, in the context of energy transitions which are technically complex and intertwined with technological, socioeconomic, and environmental changes (Castrejon-Campos et al., 2020; Pearson, 2018), accounting for the non-market risks associated with these changes becomes necessary. The transition to RE therefore poses multiple challenges and uncertainties along with legitimate concerns about energy security[3] and energy equity[4] (Graylee, 2012; Saraji & Streimikiene, 2023). Hence, the diminishing share of SoGs in energy production and their near absence in the RE sector pose a serious threat of shrinking human capital and state's ability to intervene in times of crisis.

Box 24.3 Privatisation of Brazil's Power Sector in 1990s

Brazil's power sector underwent significant changes in the 1990s against a backdrop of macroeconomic instability and fiscal challenges (Balza et al., 2020; World Bank, 2002). These shifts were driven by the broader neo-liberal philosophy of the time, which advocated for the reduction of state involvement in the productive sectors of the economy. Privatisation, in this context, was seen as a remedy for fiscal deficits, underinvestment, and inefficiencies that plagued the power sector. By privatising state-owned enterprises (SOEs), the government aimed to alleviate national debt, reduce interest rates, and stimulate economic growth, with the belief that market forces would drive efficiency and modernisation in the power industry (Brown, 2002; Pinheiro & Giambiagi, 1999; Tankha, 2005).

Historically, Brazil's power sector was dominated by hydroelectric power, accounting for over 90% of the country's energy generation (Brown, 2002; World Bank, 2002). The sector was managed by federally owned companies like Furnas, Chesf, Eletrosul, and Eletronorte, under the federal utility Eletrobras (Brown, 2002). Distribution was largely managed by state-owned utilities, with each state operating its own electricity distribution company (World Bank, 2002). Wealthier states operated vertically integrated companies that combined generation, transmission, and distribution functions (Tankha, 2005).

The process began in 1995 with a focus on unbundling vertically integrated power companies and introducing competition where feasible (Muller & Rego, 2021). By 1998, most discoms had been privatised, achieving sale prices significantly above their minimum reserve values (Tankha, 2005). The second phase aimed at privatising generating and transmission companies (Tankha, 2009). However, these efforts faced major challenges following the Asian and Russian financial crises in 1999, which devalued Brazil's currency and led to substantial financial losses for privatised discoms (De Oliveira et al., 2005; Tankha, 2009). Many of these companies had large foreign-currency debts and sought tariff hikes to mitigate their losses. Although Brazil's electricity regulatory agency Agência Nacional de Energia Elétrica (ANEEL) allowed tariff hikes, they were insufficient to counteract the currency devaluation. Investor disinterest (Tankha, 2005), political opposition (World Bank, 2002), and macroeconomic instability (Arbache, 2006; Tankha, 2005; World Bank, 2002) further stalled the privatisation of Gencos, leaving the electricity system vulnerable to supply shortages and inefficiencies.

By 2001, Brazil's hydroelectric reservoirs were nearly depleted, and the Operador Nacional do Sistema Eléctrico (ONS) issued warnings about insufficient energy reserves (Tankha, 2009). In response, the government imposed a 10-month electricity rationing, cutting consumption by 20% (ESMAP, 2005; Tankha, 2009), causing $5 billion in economic losses and an estimated1.5% to 2% loss of GDP (Tankha, 2009). In 1996, the Brazilian Development Bank (BNDES) study and consultants for the Ministry of Mines and Energy (MME) warned that Brazil faced an increased risk of electricity rationing after 2000 if investment in generating capacity was delayed (Tankha, 2005). Despite warnings of rationing risks and the improved financial health of Gencos, the federal government limited their ability to invest in capacity expansion in preparation for privatisation. This left Brazil vulnerable as hydroelectric reserves dwindled without sufficient new capacity (Arbache, 2006; Mendes et al., 2017; Tankha, 2009).

Privatisation relied heavily on public financing, primarily through BNDES, which provided up to 50% of the reserve price as loans to winning bidders and extended additional financing for infrastructure, effectively ensuring that state resources underpinned the privatisation process (Brown, 2002; Tankha, 2009). While this strategy inflated asset sale prices and strengthened the government's balance sheet, it shifted significant commercial and financial risks to the public sector financial ecosystem. As the privatisation efforts faltered, particularly post 1999, BNDES was again called upon to provide loans to cover the financial losses of privatised utilities (Tankha, 2009). In return for waiving future legal claims, these companies received loans treated as income, while the costs were passed to consumers through a 10-year surcharge on electricity rates (Tankha, 2005).

Brazil's privatisation journey underlines some critical learnings, especially in the context of energy transition. Foremost, it is evident that given its social, economic and political consequences, the power sector is an essential utility sector wherein failure is not an option. It is evident that private sector drivers are not aligned to bear unforeseen risks, nor are they capable of taking a long-term position on fiscal turnaround.

Even though the failure of the energy sector may be an option for private utilities, the ultimate costs of failure lie with the political party in power and the people of the region. Hence, the role of the State is critical from the perspective of resilience and energy security. There have been cases where a bailout has not been an option, and the state can navigate such adversities only if it has a substantive public sector capacity.

Lastly, in the case of Brazil, privatisation was deemed successful only because of the financial support of public banks and later underwriting of the losses through increased tariffs. This raises significant concerns about the private sector's ability to navigate sectoral risks, their efficiencies in financing new investments or their ability to take long-term positions for building return on investments. If such burdens are to be inevitably borne by public exchequer and banks, it shall consume state's resources meant for social development and public welfare.

24.3.4 Disempowerment of the State Governments

While financial and technical risks are inevitable for the power sector, State governments have a critical stake in it as affordability and reliability of electricity have serious political consequences (Michael et al., 2024). These risks are particularly concentrated with state governments as electricity distribution is a state (provincial) subject. Consequently, the central government's decision-making may not be aligned with the needs of different states, and the state has to play a big role in the power sector is necessary to balance federal dynamics.

Navigating such risks shall become even more challenging in the backdrop of energy transition as it demands investment in grid modernisation, new infrastructure, and phasing out legacy infrastructure. The state may navigate these risks through timely investments that optimise system-level costs and mitigate the impact on electricity tariffs.

For the mitigating impact of electricity tariffs, state governments may resort to formal instruments such as consumer subsidies and building regulatory assets, or informal instruments such as foregoing return on equity for state-owned power utilities or taking losses onto their books. While these mechanisms may not be ideal, they are critical to navigating short to medium-term sectoral risks. These capabilities may as well define the political viability of energy transitions given is social-economic risks.

24.4 The Role of SoGs in Navigating Energy Transition

Energy transition demands large investments in clean energy and grid modernisation and also needs to navigate the trilemma of energy affordability, security, and sustainability (World Energy Council, 2024). It is in this context that we must evaluate the role of SoGs and their relevance in the future energy landscape.

24.4.1 Enabling New and High-Risk Investments

Formulating policies and regulations in India can be a long and complex process due to multiple agencies, inter-ministerial contestations, and federal politics (Gupta & Bhattacharya, 2024). Policy formulation for new technologies, solutions, and business models

enabling energy transition is almost always playing catch-up with the rapidly changing technology and evolving needs for grid-balancing services. Delays in policy formulation and nascent markets in such dynamic environment become a substantial hurdle for new investments and clean energy transition. It delays phase-out of fossil fuel-based power generation. On one hand, private investments demand a stable policy environment to mobilise investments (Haas et al., 2023; Polzin et al., 2019), and on the other, policymakers need established standards and norms to regulate markets.

SoGs are uniquely positioned to make early-stage high-risk investments to set standards and norms of energy affordability, security, and sustainability. They can leverage Section 62 of the Electricity Act 2003 which allows State Electricity Regulatory Commissions (SERCs) to approve investments and determine tariffs through a cost-plus regime and make the electricity market more competitive.

For instance, the importance of energy storage for large-scale renewable integration was deliberated by policymakers as early as 2010 in India (Powergrid, 2012), whereas early-stage pilots were deployed only towards the end of the last decade. This included initiating stakeholder discussions on storage technologies and pilot projects such as Powergrid's 1MW/500kWh BESS in Puducherry in 2019 (Power Line, 2021) and Tata Power commissioning India's first grid-scale BESS (10MW/10MWh) in Delhi in the same year (Proctor, 2019). The Ministry of Power published the 'National Framework for Promoting Energy Storage Systems' to create 'an ecosystem for development of ESS' and encourage its adoption as early as 2023. Despite recent progress, the adoption rate is still to pick up with installed BESS capacity reaching 219.1 MWh by March 2024 (Gupta, 2024). Consequently, the momentum of the energy transition may reduce while its cost increases.

24.4.2 Navigating Non-market Risks

Conflicts around land, livelihoods, and access to commons are the root cause of non-market risks, which are known to delay the implementation of large RE projects (Gupta, 2023; Stock, 2022). RE projects in India are exempted from existing legal frameworks that address these concerns for large infrastructure projects, resulting in exposure to non-market risks for the public and private sector RE investments (Yenneti et al., 2016). The capability and public perception to manage non-market conflicts around land acquisition including displacement, compensation, access to commons, and environmental concerns, differs significantly between private and public companies. Public sector companies adhere to the legal provisions to provide compensation, provide opportunities for public consultation, and engage in comprehensive environmental assessment. On the other hand, private companies prioritise cost minimisation, speedy mitigation, and avoiding comprehensive community consultations to drive accumulation by dispossessions (Hall, 2013; Levien, 2011), despite available legal frameworks. Negotiations led by private companies are more prone to conflicts compared to public sector initiatives. If the government extends the existing safeguards to the local communities, the SoGs can play an important role in alleviating the non-market risks as a public company and can be instrumental in accelerating the adoption of RE and fostering a just energy transition.

24.4.3 Accelerating Clean Energy Transition

India has around 211 GW of coal capacity, and SoGs own 33% of the total capacity (National Power Portal, 2024). However, the unfortunate aspect of it is that SoGs are

continuing to invest in coal-based thermal power plants. National Power Portal data and the Ministry of Power's Notification on the expansion of thermal power capacity, SoGs have invested close to 50,000 crore in coal-based thermal power capacity during 2019–2024. Thus, encouraging SoG participation in energy transition can shift the ongoing investment in fossils to clean energy. It will not only reduce their dependence on fossils but will also increase the pace of energy transition significantly.

Central and state governments have committed to decarbonisation of the economy to mitigate climate change. However, governments have failed to devolve these goals and plan energy transition pathways for state-owned enterprises, including SoGs. Further, current regimes of SoGs often resist investments in clean power due to deeply entrenched interests in the coal economy.

24.4.4 Empowering State Governments

Unrecovered dues, pilferage, and inefficiencies in planning are inevitable realities of the electricity sector in a developing country context. Energy transition has further complicated the power sector in different states as it presents different opportunities, challenges, and complexities due to geospatial and other factors (Doh et al., 2021). For instance, energy transition may result in loss of livelihoods in coal-bearing states such as Odisha, Jharkhand, and Chhattisgarh, and it may create additional jobs in states like Rajasthan, Gujarat, and Tamil Nadu. The increasing complexity of the sector requires an empowered state government with the financial and instrumental capacity to manage both legacy and transition challenges.

The state governments often provide subsidies to ensure energy equity and access to electricity for the socio-economically weaker sections of society for their holistic development. However, these subsidies often create an additional burden on the public exchequer, straining state finances further. The state governments manage their finances by delaying payments to SoGs, reducing their return on equity, and creating regulatory assets[5] to steer through strained finances and ensure energy availability and affordability for economic growth, social welfare, and human development. However, most of these instruments will become defunct for the state governments with their reduced direct presence in the power sector. Further, it will reduce their ability to provide subsidies and manage their state finances in the absence of these instruments, further skewing the federal power structure, which has the potential to commence a deep political crisis in the country. Therefore, it is in the interest of state governments to mandate SoGs in energy transition and ensure that they do not become irrelevant in the sector.

24.5 Conclusion

RE deployment in India continues to be dominated by large investments from private players aided by cheap global green finance. We argue for a critical rethink on the discourse favouring the private sector's role in energy transition, which, while critical, only portrays the public sector's role as an instrument to mitigate risks for the private capital. The private or public capital invested through private players does not foster capabilities to navigate certain market and most non-market risks discussed in this chapter.

In our understanding, SOGs are among the least understood agents in the transition landscape in India despite being perhaps the most critical to enabling a successful and just transition, as the international examples in the chapter demonstrate. They have

capabilities that neither the private sector nor central PSUs have and unfortunately are the most hamstrung both institutionally and financially. Enabling them would create space for more competition and a better transition.

Notes

1 https://unctad.org/system/files/official-document/gdsmdpbg2420047_en.pdf
2 Includes thermal, nuclear and large hydro power generation assets
3 The concept of energy security is evolving and is becoming more dynamic in the context of clean energy transition (International Energy Agency, 2021). It includes reliability of fuel supplies and the stability of critical energy-related commodities necessary for renewable energy technologies *(ibid)*.
4 Energy equity, meanwhile, includes affordability and accessibility of energy supplies to all communities (Kamali Saraji & Streimikiene, 2023).
5 It is evident that private sector drivers are not aligned to bear unforeseen risks, nor are they capable of taking a long-term position on fiscal turnaround. Despite this World Bank's push for privatisation through conditional loans in Africa for green transition raises several concerns. While India's privatisation journey may not be dictated by the World Bank's conditionalities, it is likely to impact the resilience of the sector (Chitnis, 2024).

References

Allcott, H., Collard-Wexler, A., & O'Connell, S. D. (2016). How Do Electricity Shortages Affect Industry? Evidence from India. *American Economic Review*, *106*(3), 587–624. https://doi.org/10.1257/AER.20140389

Almeida, A. (2024, March 28). England's ludicrous experiment in privatised water is coming to a messy end | Adam Almeida | The Guardian. *The Guardian*. www.theguardian.com/commentisfree/2024/mar/28/thames-water-privatised-public-ownership

Aneja, R., & Mathpal, M. (2021). Economic growth and electricity consumption in India: An econometric analysis. *The Indian Economic Journal*, *70*(1), 22–33. https://doi.org/10.1177/00194662211062428

APGENCO. (n.d.). *APGENCO non conventional power stations*.

Arbache, J. S. (2006). Has macroeconomic policy been pro-poor in Brazil? In *Pro-poor macroeconomics* (pp. 326–348). Palgrave Macmillan UK. https://doi.org/10.1057/9780230627901_14

Armitage, S. (2012). Demand for dividends: The case of UK water companies. *Journal of Business Finance & Accounting*, *39*(3–4), 464–499. https://doi.org/10.1111/j.1468-5957.2011.02277.x

Bakker, K. (2005). Neoliberalizing nature? Market environmentalism in water supply in England and Wales. *Annals of the Association of American Geographers*, *95*(3), 542–565. https://doi.org/10.1111/J.1467-8306.2005.00474.X

Balza, L. H., Jimenez Mori, R., Macedo, D., & Mercado, J. (2020). Revisiting private participation, governance and electricity sector performance in Latin America. *The Electricity Journal*, *33*(7), 106798. https://doi.org/10.1016/j.tej.2020.106798

Banshwar, A., Sharma, N. K., Sood, Y. R., & Shrivastava, R. (2017). Renewable energy sources as a new participant in ancillary service markets. *Energy Strategy Reviews*, *18*, 106–120. https://doi.org/10.1016/j.esr.2017.09.009

Bose, S. (2011). Restructuring state-owned enterprises of a state government of India: Problems, prospects, and lessons learnt. *Vikalpa: The Journal for Decision Makers*, *36*(3), 47–60. https://doi.org/10.1177/0256090920110304

Brown, C. A. (2002). *The privatization of Brazil's electricity industry: Sector reform or restatement of the government's balance sheet?* Harvard University Press.

CAG. (2015). *The economic regulation of the water sector*. www.nao.org.uk/reports/the-economic-regulation-of-the-water-sector/

Castrejon-Campos, O., Aye, L., & Hui, F. K. P. (2020). Making policy mixes more robust: An integrative and interdisciplinary approach for clean energy transitions. *Energy Research & Social Science*, *64*, 101425. https://doi.org/10.1016/J.ERSS.2020.101425

Chen, Y. J., Chindarkar, N., & Xiao, Y. (2019). Effect of reliable electricity on health facilities, health information, and child and maternal health services utilization: Evidence from rural

Gujarat, India. *Journal of Health Population and Nutrition*, *38*(1), 7. https://doi.org/10.1186/S41043-019-0164-6

Chitnis, A. (2024). *Rethinking Franchisee Efficacy in India's Power Sector: A Critique of Input-Based Distribution Models* (70; CSEP Working Paper).

Davidson, B. (2023). Labour on the leading edge: A critical review of labour rights and standards in renewable energy. *Energy Research & Social Science*, *97*, 102928. https://doi.org/10.1016/j.erss.2022.102928

De Oliveira, A., Woodhouse, E. J., Losekann, L., & Araujo, F. V. S. (2005). *The IPP experience in the Brazilian electricity market*. http://pesd.stanford.edu

Debnath, R., Mittal, V., & Jindal, A. (2022). A review of challenges from increasing renewable generation in the Indian Power Sector: Way forward for Electricity (Amendment) Bill 2020. *Energy & Environment*, *33*(1), 3–40. https://doi.org/10.1177/0958305X20986246

Department of Mineral Resource and Energy. (n.d.). *REIPPP programme*.

DMRE, DTIC, & DSI. (2022). *Draft South African renewable energy masterplan*.

Doh, J., Budhwar, P., & Wood, G. (2021). Long-term energy transitions and international business: Concepts, theory, methods, and a research agenda. *Journal of International Business Studies*, *52*(5), 951–970. https://doi.org/10.1057/s41267-021-00405-6

Dunleavy, P., & Hood, C. (1994). From old public administration to new public management. *Public Money & Management*, *14*(3), 9–16. https://doi.org/10.1080/09540969409387823

Eskom. (2022, October 31). *As Komati coal-fired power station reaches end of life, renewable energy project takes shape*. https://www.eskom.co.za/as-komati-coal-fired-power-station-reaches-end-of-life-renewable-energy-project-takes-shape/

Eskom. (2024). *JET projects underway*. https://www.eskom.co.za/about-eskom/just-energy-transition-jet/jet-projects-underway/

ESMAP. (2005). *Implementing power rationing in a sensible way: Lessons learned and international best practices energy sector management assistance program*. www.esmap.org.

European Union. (2011, November 2). *France, Germany, UK, US and EU launch ground-breaking international just energy transition partnership with South Africa*. European Union.

Fodstad, M., Crespo del Granado, P., Hellemo, L., Knudsen, B. R., Pisciella, P., Silvast, A., Bordin, C., Schmidt, S., & Straus, J. (2022). Next frontiers in energy system modelling: A review on challenges and the state of the art. *Renewable and Sustainable Energy Reviews*, *160*, 112246. https://doi.org/10.1016/j.rser.2022.112246

Fukumi, A. (2022). Power sector reform and blackouts in India. In T. Mizushima (Ed.), *The rural-urban nexus in India's economic transformation* (1st ed., pp. 184–207). Taylor and Francis. https://doi.org/10.4324/9781003311898-10/power-sector-reform-blackouts-india-atsushi-fukumi

Gandhi, H. H., Hoex, B., & Hallam, B. J. (2022). Strategic investment risks threatening India's renewable energy ambition. *Energy Strategy Reviews*, *43*, 100921. https://doi.org/10.1016/j.esr.2022.100921

Geddes, A., Bridle, R., Mostafa, M., Roth, J., Sanchez, L., Garg, V., Scholtz, L., & Fakir, S. (2020). *Rethinking Eskom: Lessons from electricity sector reform in India and Mexico*. International Institute for Sustainable Development. https://www.iisd.org/system/files/publications/rethinking-eskom.pdf

Global Energy Justice Workshop Collective. (2023). *Change the system, not the climate: What is wrong with the Just Energy Transition Partnership (JETP)?* Global Partnership Network. https://www.uni-kassel.de/forschung/files/Global_Partnership_Network/Downloads/JETP_Pamphlet.pdf

Graylee, K. (2012). *Beyond the debate: The role of government in renewable energy finance*. SITN, Harvard Graduate School of the Arts and Sciences.

Gujarat State Electricity Corporation Limited. (2024). *Power generation*. https://www.gsecl.in/business/power-generation

Gupta, P., & Bhattacharya, R. (2024). 'Go-No-Go': Anticommons and Inter-ministerial conflict in India's Forest and Mineral Governance. *Land Use Policy*, *140*, 107095. https://doi.org/10.1016/j.landusepol.2024.107095

Gupta, U. (2024, July 10). India's battery storage capacity hits 219.1 MWh – pv magazine International. *PV Magazine*. www.pv-magazine.com/2024/07/10/indias-battery-storage-capacity-hits-219-1-mwh/

Gupta, V. (2023, July 4). Are environmental, social concerns being considered in India's rapid solar energy expansion. *The Wire*. https://science.thewire.in/economy/energy/are-environmental-social-concerns-being-considered-in-indias-rapid-solar-energy-expansion/

Haas, C., Jahns, H., Kempa, K., & Moslener, U. (2023). Deep uncertainty and the transition to a low-carbon economy. *Energy Research & Social Science*, *100*, 103060. https://doi.org/10.1016/j.erss.2023.103060

Hall, D. (2013). Primitive accumulation, accumulation by dispossession and the global land grab. *Third World Quarterly*, *34*(9), 1582–1604. https://doi.org/10.1080/01436597.2013.843854

Hall, D. (2021). *Water and sewerage company finances 2021: Dividends and investment*. Public Services International Research Unit (PSIRU).

Hall, D. (2022). There's no chance of cutting bills while the private sector runs the UK energy market. *The Guardian*.

Horton, H. (2022, August 23). Water companies in England 'will take 2,000 years to replace pipe network' | Water | The Guardian. *The Guardian*. www.theguardian.com/environment/2022/aug/23/water-companies-in-england-expecting-sewers-to-last-2000-years

ILO. (n.d.). *Utilities (water, gas, electricity) sector*.

International Energy Agency. (2021). *Security of clean energy transitions*. IEA.

Jeraj, S. (2023, June 30). Exclusive: UK water companies haven't replaced over three million toxic lead pipes – New Statesman. *The New Statesman*. www.newstatesman.com/spotlight/healthcare/2023/06/revealed-uk-water-companies-replaced-3-million-toxic-lead-pipes

Saraji, M. K., & Streimikiene, D. (2023). Challenges to the low carbon energy transition: A systematic literature review and research agenda. *Energy Strategy Reviews*, *49*, 101163. https://doi.org/10.1016/j.esr.2023.101163

Karnataka Power Corporation Limited. (2021). *Performance review of KPCL power stations*. https://kpcl.karnataka.gov.in/storage/pdf-files/YearBook.pdf

Kela, S. (2019, February 1). *Federalism and its discontents: The doctrine of states' rights in India*. The Caravan. https://caravanmagazine.in/literature/doctrine-state-rights-india

Kemp, Y. (2024, October 14). Eskom: 2 GW renewable energy plan, 200 no loadshedding days. *ESI Africa*.

Kessler, T., & Alexander, N. (2004). *Assessing the risks in the private provision of essential services* (G24 Discussion Paper Series, 31). United Nations Conference on Trade and Development. https://unctad.org/publication/assessing-risks-private-provision-essential-services

Khanna, S. (2015). The Transformation of India's Public Sector: Political Economy of Growth and Change. *Economic and Political Weekly*, *50*(5), 47–60.

Kollewe, J. (2024, July 16). Every water firm in England and Wales under investigation over sewage spills | Water industry | The Guardian. *The Guardian*. www.theguardian.com/business/article/2024/jul/16/water-suppliers-england-wales-investigated-sewage-severn-trent-bill-rises

Koroglu, M., Irwin, B. R., & Grépin, K. A. (2019). Effect of power outages on the use of maternal health services: Evidence from Maharashtra, India. *BMJ Global Health*, *4*(3), e001372. https://doi.org/10.1136/bmjgh-2018-001372

Kumar, P., & Jairaj, B. (2020). India's energy transition: The challenge with decision-making at a time of rapid change. *Energy Future*.

Leach, A., García, C. A., & Laville, S. (2022, November 30). Revealed: More than 70% of English water industry is in foreign ownership | Water | The Guardian. *The Guardian*. www.theguardian.com/environment/2022/nov/30/more-than-70-per-cent-english-water-industry-foreign-ownership

Lenferna, A. (2023). South Africa's unjust climate reparations: A critique of the Just Energy Transition Partnership. *Review of African Political Economy*, *50*(177–178), 491–501. https://doi.org/10.1080/03056244.2023.2278953

Levien, M. (2011). Special economic zones and accumulation by dispossession in India. *Journal of Agrarian Change*, *11*(4), 454–483. https://doi.org/10.1111/j.1471-0366.2011.00329.x

Lipscomb, M., Mushfiq Mobarak, A., & Barham, T. (2013). Development effects of electrification: Evidence from the topographic placement of hydropower plants in Brazil. *American Economic Journal: Applied Economics*, *5*(2), 200–231. https://doi.org/10.1257/APP.5.2.200

Lobina, E., & Hall, D. (2001). *UK water privatisation – a briefing*. Public Services International Research Unit (PSIRU). https://www.archives.gov.on.ca/en/e_records/walkerton/part2info/partieswithstanding/pdf/CUPE18UKwater.pdf

Maharashtra State Electricity Distribution Co. Ltd. (2010). *Tariff for solar based power generation projects within Maharashtra under MNRE scheme*. https://www.mahadiscom.in/consumer/wp-content/uploads/2018/03/Comm_Cir_122-12Oct.pdf

Maharashtra State Electricity Distribution Co. Ltd. (2020). List of PPA executed by MSEDCL for purchase of solar power as on 31.01.2020. In *MSEDCL*.

Mendes, C. A. B., Beluco, A., & Canales, F. A. (2017). Some important uncertainties related to climate change in projections for the Brazilian hydropower expansion in the Amazon. *Energy*, *141*, 123–138. https://doi.org/10.1016/j.energy.2017.09.071

Michael, S. S., Rana, T., & Rodrigues, N. (2024). *Indian states electricity transition SET: 2024*. The Institute for Energy Economics and Financial Analysis. https://ieefa.org/resources/indian-states-electricity-transition-set-2024

Ministry of Power. (2023). *Advisory to all States/GENCOs regarding participation in CIRP of NCLT for taking over of stressed Thermal Power Assets*. https://powermin.gov.in/en/content/policies-and-publications

Muller, R. B., & Rego, E. E. (2021). Privatization of electricity distribution in Brazil: Long-term effects on service quality and financial indicators. *Energy Policy*, *159*, 112602. https://doi.org/10.1016/j.enpol.2021.112602

National Power Portal. (2024). *Location wise regional summary of all India installed capacity (IN MW) of power stations as on 30.09.2024*.

Obolensky, M. A. B., Erman, A. E., Rozenberg, J., Maruyama Rentschler, J. E., Avner, P., & Hallegatte, S. (2019). *Infrastructure disruptions: How instability breeds household vulnerability* (8902; World Bank Policy Research Working Paper No. 8902). https://papers.ssrn.com/abstract=3430512

Ogden, S., & Anderson, F. (1995). Representing customers' interests: The case of the privatized water industry in England and Wales. *Public Administration*, *73*(4), 535–559. https://doi.org/10.1111/j.1467-9299.1995.tb00843.x

Ogden, S. G. (1995). Transforming frameworks of accountability: The case of water privatization. *Accounting, Organizations and Society*, *20*(2–3), 193–218. https://doi.org/10.1016/0361-3682(95)95745-I

Pearson, P. J. G. (2018). Journal of Energy History Revue d'histoire de l'énergie Past, present and prospective energy transitions: An invitation to historians Résumé. *Journal of Energy History*. www.energy-history.eu/en/special-issue/past-present-and-prospective-energy-transitions-invitation-historians

Pinheiro, A. C., & Giambiagi, F. (1999). The macroeconomic background and institutional framework of Brazilian privatisation. In Pinheiro, A. C. and Fukasaku, K. (eds.), *Privatization in Brazil: The case of public utilities*. BNDES-OECD.

Plimmer, G., & Hollowood, E. (2021, December 28). Sewage spills highlight decades of under-investment at England's water companies. *Financial Times*. www.ft.com/content/b2314ae0-9e17-425d-8e3f-066270388331

Polzin, F., Egli, F., Steffen, B., & Schmidt, T. S. (2019). How do policies mobilize private finance for renewable energy? – A systematic review with an investor perspective. *Applied Energy*, *236*, 1249–1268. https://doi.org/10.1016/j.apenergy.2018.11.098

Portes, J. (2022, August 16). I worked on the privatisation of England's water in 1989. It was an organised rip-off | Jonathan Portes | The Guardian. *The Guardian*. www.theguardian.com/commentisfree/2022/aug/16/i-worked-on-privatisation-england-water-1989-failed-regime

Power Line. (2021, January 5). Powergrid's battery energy storage system pilot goes live at Puducherry plant – Power Line Magazine. *Power Line*. https://powerline.net.in/2021/01/05/powergrids-battery-energy-storage-system-pilot-goes-live-at-puducherry-plant/

Powergrid Corporation of India Limited. (2012). *Report on green energy corridors: Transmission plan for envisaged renewable capacity (Volume I)*. https://forumofregulators.gov.in/Data/study/Report-Green-Energy-Tr.-corridor.pdf

PowerLine. (2024, July 1). *Scaling Up: Renewable energy financing landscape in India*. https://powerline.net.in/2024/07/01/scaling-up-renewable-energy-financing-landscape-in-india/

Prag, A., Röttgers, D., & Scherrer, I. (2018). *State-owned enterprises and the low-carbon transition* (OECD Environment Working Papers, No. 129). OECD Publishing. https://doi.org/10.1787/06ff826b-en

Pratley, N. (2024, July 10). Cheap sales, debt and foreign takeovers: How privatisation changed the water industry | Water industry | The Guardian. *The Guardian*. www.theguardian.com/business/article/2024/jul/10/cheap-sales-debt-and-foreign-takeovers-how-privatisation-changed-the-water-industry

Proctor, D. (2019, April 1). India installs its first grid-scale battery storage system. *Power Magazine*. www.powermag.com/india-installs-its-first-grid-scale-battery-storage-system/

PRS. (2024). *State of state finances: 2023–24*. https://prsindia.org/budgets/states/policy/state-of-state-finances-2023-24#:~:text=In%202023%2D24%2C%20the%20Centre,81%2C195%20crore%20in%202022%2D23.&text=Sources%3A%20State%20Budget%20Documents%3B%20PRS.&text=Committed%20expenditure%20of%20a%20state,%2C%20pensions%2C%20and%20interest%20payments

Singh, N., & Srinivasan, T. N. (2006). *Federalism and economic development in India: An assessment* (Working Paper Series). Department of Economics, UC Santa Cruz, Santa Cruz Department of Economics. http://doi.org/10.2139/ssrn.950309

Sovacool, B. K., & Stock, R. (2024). "We struggle to survive": Exploring the whole systems energy injustices of solar photovoltaics in India. *The Electricity Journal*, *37*(6), 107426. https://doi.org/10.1016/j.tej.2024.107426

Stock, R. (2022). Triggering resistance: Contesting the injustices of solar park development in India. *Energy Research & Social Science*, *86*, 102464. https://doi.org/10.1016/j.erss.2021.102464

Sweeney, S. (2024, May 5). "The Fad is Dead: Why Just Energy Partnerships" are failing. *New Labour Forum*, *33*(2). https://newlaborforum.cuny.edu/2024/04/16/the-fad-is-dead-why-just-energy-transition-partnerships-are-failing/

Tankha, S. (2005). *The risk of reform: Privatisation and liberalisation in the Brazilian electric power industry* (Doctoral dissertation). Massachusetts Institute of Technology. https://dspace.mit.edu/handle/1721.1/36287

Tankha, S. (2009). Lost in translation: Interpreting the failure of privatisation in the Brazilian electric power industry. *Journal of Latin American Studies*, *41*(1), 59–90. https://doi.org/10.1017/S0022216X08005117

The Hindu. (2022, November 3). Vedanta-Foxconn row | Opposition MVA casts aspersions over RTI response accusing erstwhile regime of tardiness over mega-project. *The Hindu*. www.thehindu.com/news/cities/mumbai/vedanta-foxconn-row-opposition-mva-casts-aspersions-over-rti-response-accusing-erstwhile-regime-of-tardiness-over-mega-project/article66087262.ece

The Presidency Republic of South Africa. (2022). *South Africa's just energy transition investment plan (2023–2027)*. https://www.stateofthenation.gov.za/assets/downloads/JET%20Implementation%20Plan%202023-2027.pdf

Todd, I., & McCauley, D. (2021). Assessing policy barriers to the energy transition in South Africa. *Energy Policy*, *158*, 112529. https://doi.org/10.1016/j.enpol.2021.112529

van de Walle, D., Ravallion, M., Mendiratta, V., & Koolwal, G. (2013). *Long-term impacts of household electrification in rural India* (6527; Policy Research Working Papers). World Bank, Washington, DC. https://doi.org/10.1596/1813-9450-6527

Varigonda, K. C. (2013). An assessment of the impact of energy insecurity on state stability in India. *Energy Policy*, *62*, 1110–1119. https://doi.org/10.1016/J.ENPOL.2013.06.091

Water Services Regulation Authority (Ofwat), & Department for Environment Food and Rural Affairs. (2006). *The development of the water industry in England and Wales – Ofwat*. www.ofwat.gov.uk/publication/the-development-of-the-water-industry-in-england-and-wales/

World Bank. (2002). *Brazil – Regulatory power sector technical assistance project (English)*. Washington, DC: World Bank Group. http://documents.worldbank.org/curated/en/222831468769839369

World Energy Council. (2024). *World energy trilemma 2024: Evolving with resilience and justice*. https://www.worldenergy.org/publications/entry/world-energy-trilemma-report-2024

Yenneti, K., Day, R., & Golubchikov, O. (2016). Spatial justice and the land politics of renewables: Dispossessing vulnerable communities through solar energy mega-projects. *Geoforum*, *76*, 90–99. https://doi.org/10.1016/j.geoforum.2016.09.004