8 The political economy of coal in India

Evidence from expert interviews¹

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Introduction

Why does India rely on coal in the power sector? Economic and technological reasons alone cannot explain the large pipeline and the existing plants. The price of renewable energy (RE)² in India has reduced dramatically (Creutzig et al., 2017), and recent RE projects are cheaper than many existing coal power plants (Somanathan & Chakravarty, 2019). In addition, the health effects caused by local air pollution arising from power generation based on coal are substantial: coal combustion was responsible for almost 170,000 deaths in 2015 (GBD MAPS, 2018). This chapter analyzes the political factors that contribute to explaining the power sector developments.

Most of the literature focuses on the uptake of REs in India (e.g., Isoaho et al., 2016; Krishna et al., 2015; Ramamurthi, 2016; Shidore & Busby, 2019; Tagotra, 2017; Tongia, 2007), but only a few studies investigate the political drivers of coal in the power sector. Tongia & Gross (2019) find that coal mining is central to India's political economy because it is an essential revenue source for the Central government, the state governments, and state-owned enterprises, such as Indian Railways, the largest employer in the country (Kamboj & Tongia, 2018). Worrall et al. (2018) identify all government policies incentivizing the use of coal in the power sector.

We conducted semi-structured interviews with 28 energy experts and policymakers in Delhi. Using the "AOC" (actors, objectives, context) framework by Jakob et al. (2020) covered in Chapter 1, we systematically coded the interviews to classify actors, objectives, and contextual factors that influence coal-related policies. We cluster our results around three overarching objectives: providing sufficient and cheap electricity supply, promoting domestic industries and personal interests, and mitigating air pollution and climate change.

We find that India's focus on coal is driven by direct government intervention in the power sector to secure long-term electricity supply. Public sector undertakings (PSUs) along the coal supply chain are used to create regional employment and prosperity and strong vested interests also exist. Environmental concerns are more important now than in the past, but not significant enough to overcome powerful incumbents in polluting sectors such as coal generation.

The remainder of the chapter is structured as follows. The “India’s power sector” section describes the structure of the Indian power sector. The “Methodology” section describes our research design, while the “Results” section extensively describes our findings. We discuss broader implications for an Indian energy transition and conclude in the “Discussion and conclusion” section.

India’s power sector

The Indian power sector is governed by several ministries, associated PSUs, and government agencies. Figure 8.1 shows the organization of the Indian power sector and how it relates to coal mining, transport, and manufacturing of power plants.

The Central government has to approve most energy policies. Within the Central government, the Prime Minister Office (PMO) has a special role, as it decides the most important policy issues. Subordinate to the PMO are multiple specific ministries, which regulate different segments of the sector, but require the PMO’s approval for changes in regulations.

The Ministry of Coal is responsible for the production, supply, distribution, and pricing of coal and implements its regulations directly through the quasi-monopolist PSU Coal India Limited (CIL). Coal in India is transported via railways that are managed by the Ministry of Railways and operated by the PSU Indian Railways. Bharat Heavy Electricals Limited (BHEL), an engineering and manufacturing PSU under the Ministry of Heavy Industries, manufactures products for the power sector, such as turbines and boilers for thermal power plants and transmission lines. The Ministry of Power is in charge of the planning, policy formulation, and enactment of legislation concerning thermal and hydropower generation, transmission, and distribution. Furthermore, through the PSU National Thermal Power Corporation Limited (NTPCL), it controls 16% of the power capacity of the country. The Ministry of New and Renewable Energy regulates wind, small hydro, biogas, and solar power. Since 2014, it has been headed by the same minister as the Ministry of Power. Finally, the Ministry of Environment, Forestry, and Climate Change (MoEFCC) enacts environmental regulations and approves environmental clearances for power projects and new mines. However, these regulations are often not binding or weakly enforced by other ministries and PSUs (Stuligross, 1999).

Apart from the Central government, governmental agencies, state government, and the judiciary also influence the power sector. The Central Electricity Authority (CEA) advises the Ministry of power on development plans for the electricity sector. The Central Electricity Regulatory Commission (CERC) defines the guidelines for the Power Purchase Agreements (PPAs) between power generation companies and distribution companies (DISCOMs). NITI Aayog is a governmental think tank in charge of facilitating cross-ministerial cooperation. The state governments are responsible for fostering electrification and also have the largest influence on electricity distribution as they own

Figure 8.1 Power sector.

Note: CERC = Central Electricity Regulatory Commission, CEA = Central Electricity Authority, CIL = Coal India Limited, NTPCL = National Thermal Power Corporation, BHEL= Bharat Heavy Electricals Limited, DISCOMs = Distribution Companies, NGT = National Green Tribunal.

most DISCOMs. Finally, the Supreme Court and the National Green Tribunal (NGT) have been of particular relevance in the power sector by deciding about pollution regulation.

In recent decades, India's power sector has been through a number of reforms that have led to the liberalization and rapid expansion of total installed capacity (Figure 8.2). The power sector was liberalized in 2003 with the Electricity Act, which led to a sharp increase in power capacity additions, mostly from private investors. As of 2020, there are 228 GW of operating coal-fired power capacity (Shearer et al., 2020), generating 74% of total electricity. Since 2015, the government intensified its efforts to promote REs: it increased the national RE target to 175 by 2022, approved more stringent pollution regulations for thermal power plants, increased Renewable Purchase Obligations (RPOs) from 3% in 2006 to 8%, and adopted a program to improve the financial situation of DISCOMs. As a result, the RE capacity has increased substantially. In 2020, wind and solar capacity made up, respectively, 10% (38 GW) and 9.5% (36 GW) of the total installed capacity (CEA, 2020).

The sharp increase of coal capacity led to a situation of oversupply. However, the quality of electricity for Indian households remains low, as DISCOM's large budget deficits prevent them from serving all consumers. The dire financial situation of DISCOMs results from a long history of politically set electricity tariffs, allowing theft and unmetered consumption (Dubash et al., 2018).

Methodology

Our main data sources are semi-structured expert interviews that we complement with extensive desk research. In total, two authors conducted 28 semi-structured expert interviews in October and November 2018. The sample selection followed a snowballing process (O'Reilly & Parker, 2013). The final sample of 28 interviews includes at least one representative of most key actors in the Indian power sector.³ We interviewed twelve experts from national societal actors (nsa), including research institutions, journalists, and nongovernmental organizations, ten experts from national political actors (npa), including ministries and regulatory agencies, three experts from public-owned enterprises (pea), two experts from international societal actors (isa), and one expert from a privately owned enterprise (prea). In the remainder of the chapter, each interviewee is referenced by the type of actor plus a random number that has been assigned to each interview (e.g., nsa1).

Our semi-structured interviews followed an interview guideline that consisted of three parts. The first part asks which are the most important power sector policies, the second part which actors are relevant for political decisions, while the third part identifies contextual factors and asks follow-up questions. We clustered our results under three main overarching objectives, namely (i) provide sufficient and affordable electricity supply, (ii) promote domestic industries and personal interests, and (iii) mitigate air pollution and climate change. These objectives reflect the energy trilemma and are commonly

Figure 8.2 Annual capacity additions by source (including a timeline of relevant events).
 Note: RPOs = Renewable purchase obligations, UDAY = Ujjwal DISCOM Assurance Yojana.
 Sources: PLATTS (2017) until 2016. CEA (2020) until 2020.

identified in the energy transition literature as important (e.g., Jenkins, 2014; Schmidt et al., 2019). Each result section describes in detail how objectives and actors interact to explain India's reliance on coal in the power sector. Further information on the institutions covered and on the qualitative analysis of the interview material can be found in the online appendix.

Results

Provide sufficient and affordable electricity supply

Ensuring a sufficient and affordable electricity supply was frequently mentioned as a major objective in the power sectors [isa2, nsa3, nsa4, nsa5, nsa6, nsa9, nsa10, npa2, npa6, npa8, npa9]. As a domestically abundant and cheap resource, the Indian government perceives coal as the most favorable option to ensure a reliable electricity supply. The government has thus created a policy environment in the power sector favoring coal that largely remains today and, after the power sector liberalization, has attracted profit-driven private investors. Incentives for REs remained ineffective until 2016, largely due to the bad and unresolved financial situation of the DISCOMs. While private coal investments plummeted in the late 2010s, public coal investments remained to ensure uninterrupted availability of electricity in the future.

Sufficient supply

To satisfy the rapidly growing electricity demand and to ensure energy security, the Indian government has been incentivizing the use of coal [nsa5, nsa11] since independence. This particularly concerns large-scale coal-fired power projects [nsa2] financed by publicly owned institutions (Worrall et al., 2018). The Central government also implemented policies to incentivize private investments in the sector; most importantly, they encouraged long-term PPAs with a guaranteed payment of fixed costs (see the "India's power sector" section), minimizing their investment risk [isa2, nsa9, npa10, npa2].

Private profits

Since the liberalization, coal-fired power capacity has been the technology of choice for private investors, because the policy environment ensures high profits and low interest rates [isa2]. Furthermore, many private conglomerates that entered the electricity generation market after liberalization were able to complement previous business activities along the coal supply chain. For example, Adani, India's largest port developer, became the largest private power producer in the country (M&A Critique, 2014) and also acquired mines in Indonesia and Australia to import coal to India. Some of these private conglomerates also invested in domestic mining. Between 2005 and 2009, more than 100 blocks

(more than 20,000 MT of coal) were allotted to private actors at zero cost except for royalties [npa2, pea2, nsa10].

These investment incentives created carbon-intensive lock-ins and powerful incumbents. PPAs, ensuring the payment of fixed costs to thermal power plants, restricted the uptake of REs, despite their dramatic cost reduction [isa2, nsa9, npa2]. Furthermore, the incumbents oppose policies that would remove subsidies or impose additional costs for coal-fired power generation [nsa3]. For example, with the large fiscal reform of 2015, the tax burden for coal and coal-fired power was reduced, while the burden on solar and wind increased [nsa3]. Some independent power producers lobbied to renegotiate even more favorable terms for their PPAs (The Wire, 2018). Lobbying is often successful due to the strong leverage of private conglomerates over the current government lead by the Bharatiya Janata Party (BJP) [isa1, nsa3, nsa5, nsa6]. Adani and Tata even have direct personal relationships with the prime minister and allegedly contributed to financing his campaign [isa2, nsa4, nsa5].

However, the rapidly falling costs of REs have lead private energy incumbents to increase their investment in RE [nsa3]. The bad financial situation of many existing coal-fired power plants and difficulties in obtaining loans for new coal projects [nsa7] have both contributed to a significant decrease in private coal investment. The large conglomerates in the power sector are now competing for higher market shares in RE markets (Chawla et al., 2018). Despite this, the policy environment is still skewed in favor of coal and 11 GW of private coal capacity is in the pipeline and will possibly come online if electricity demand rises [prea1].

Low electricity prices

DISCOMs incur large losses because of the political will to maintain low electricity tariffs for consumers (Dubash et al., 2018). Local politicians, in exchange for political support, often promise to reduce electricity prices and to provide reliable grid connections (Dubash et al., 2018). They fulfill those promises by setting electricity tariffs at subsidized rates and by allowing theft and unmetered billing (Mahadevan, 2018; Min & Golden, 2014). These electricity tariffs set by politicians impose heavy financial losses on DISCOMs. Consequently, most DISCOMs do not recover their costs and have to be regularly bailed out by the Central government.

Our interviews confirm the finding from other studies (e.g., Tongia, 2007) that policy incentives for REs remain less effective because of the dire financial situation of DISCOMs [nsa11, nsa5, nsa3]. In 2006, the National Tariff Policy introduced a feed-in tariff, which guaranteed a return on investment of 15% on RE projects and required DISCOMs to partly procure power from RE sources (i.e., RPOs). However, DISCOMs have been reluctant to increase their share of REs as they fear their financial problems will worsen because of the higher REs tariffs and because of the required grid investments for the RE integration [nsa3].

Since 2016, the financial problems of DISCOMs have been addressed more successfully by the government. The UDAY scheme improved their financial situation,⁴ and the government has become more strict on the enforcement of RPOs [nsa3].

Long-term security of supply

The Ministry of Power considers coal-fired power capacity necessary to ensure the security of supply and is skeptical about the potential of REs to satisfy the fast-growing energy demand [npa4, npa6, npa8, nsa9]. Coal-fired power capacity is regarded as a reliable technology for baseload capacity [npa4, npa6], and as the only technology able to meet the peak demand in the evening (10–11 pm) (CEA, 2019) [isa1]. Given the large number of stressed assets in the power sector (see the section “India’s power sector”, private actors are reluctant to embark on new coal projects until PLFs begin to rise again [prea1]. While the relative share of public investment in coal-fired power plants has declined since liberalization, the coal pipeline in 2020 is 83% publicly owned (own calculation based on Shearer et al. (2020)).

For the Central government, NTPCL has been instrumental in ensuring energy security since liberalization. The government protected the dominant position of NTPCL during liberalization, despite the acceleration of private investment [npa2].⁵ For example, NTPCL was absolved by the Tariff Policy of 2006 from competitive bidding until 2011 [npa2]. In this period, NTPCL signed PPAs for more than 50 GW (Sreenivas, 2018). Public support for coal to ensure energy security via publicly owned power plants emerges as the main driver of Indian coal investments in the future.

Promote domestic energy industries and personal interests

The energy sector has often been used to promote economic growth and job creation [npa2, npa23 nsa5], two primary objectives of the national government [isa2, nsa3, nsa5, nsa11, npa8]. Indian PSUs satisfy those primary objectives and several more; CIL and Indian railways are large employers and contribute to regional development and redistribution goals (Chandra, 2018). Similarly, BHEL and NTPCL are large coal incumbents that manufacture and operate coal-fired power plants and thereby play a strategic role in providing the country’s energy security. Lastly, over time, vested interests along the whole coal supply chain have emerged.

Regional development and jobs

The relatively poor coal mining regions in the East strongly benefitted from, and still depend on, the coal industry [nsa10, npa2, pea2, nsa5]. The Central government used CIL to foster investment, create employment, and redistribute wealth in the coal mining regions (Chandra, 2018). In addition, CIL has built

houses, public infrastructure, and provides health-care services, contributing to the well-being of the entire region (Chandra, 2018). When large-scale coal mining began, formerly remote villages became business centers [pea2]. Coal mining also generated employment in further sectors, such as road construction, transport, hotels, domestic servants, and vegetable sellers [pea2] (Pai & Carr-Wilson, 2018).

Policymakers build on continued coal production to improve their chances of reelection. For example, state-level parties put pressure on the Central government to invest in large coal mining projects operated by CIL in their constituency [nsa5, pea2, isa1, nsa4]. Coal interests exist at multiple governance levels: locally, providing jobs; directly, as small amounts of coal maintain livelihoods; and at the state and the central level, through the allocation of coal mining rights.

Job opportunities

Whether new jobs from the RE sector can replace coal-related jobs is an important concern of the government [npa3, nsa3, pea2]. Jobs in the RE sector do not, to date, geographically overlap with coal jobs. Coal jobs are concentrated in Eastern India, while solar and wind jobs are concentrated in the West and the South.⁶ Given that Eastern regions have thus far not benefitted from new RE-related jobs, they persist in politically supporting coal [nsa10, nsa12, pea2, nsa5]. Developing adequate RE capacity to absorb coal-related jobs might even be technologically and economically unfeasible due to the low suitability of the Eastern region from wind and solar (Pai et al., 2020).

In addition, the total number of jobs in India may decrease by transitioning to REs. While thermal power plants are manufactured domestically, 80% of all solar cells are imported from China and Malaysia [nsa3] (ET Energy World, 2020). To protect and stimulate the domestic solar industry, in 2018 the Government of India introduced an import duty of 25% on foreign solar cells (Ministry of Finance, 2018). However, with its legal time span of only two years, the import duty is considered ineffective in fostering a domestic market and triggering large-scale investments (Dutt et al., 2019). In addition, it has adverse climate impacts by reducing the competitiveness of solar power relative to coal [nsa3] (Buckley & Garg, 2019).

Revenues

Indian Railways heavily relies on revenues from coal transport to ensure profitability [nsa12] and to maintain low passenger prices. It does this by overpricing freight transport, of which coal constitutes 44% (Kamboj & Tongia, 2018).

The increasing share of REs in the Western regions in the last decade, however, has put pressure on Indian Railways' business model. Coal power plants in Western regions, being far from coal mines,⁷ are beginning to be less competitive than the increasingly cheaper REs.⁸ This has reduced coal demand, which

has further decreased the coal revenues from freight transport. In response, Indian Railways set higher freight tariffs, making the remote coal-fired power plants even less competitive. This reinforcing feedback loop has led to a doubling of freight tariffs between 2012 and 2017 [nsa12].

Despite Indian Railways' partial dependency on coal revenues, we find no evidence that the company or the ministry of Railways exerts any pressure to delay an energy transition away from coal. In fact, Indian Railways seems to be actively seeking strategies to reduce its dependence on coal [nsa1, npa4].

Coal is also an important source of revenues for the Central government, which uses coal income to fund various regional development projects (IISD et al., n.d.). The "Clean Energy Cess", a tax on coal, was introduced in 2010 at USD 0.80 per ton of coal and raised to USD 3.20 per ton in 2015 (Garg et al., 2017). Unlike carbon taxes that are designed to reduce the use of a pollutant, the "Clean Energy Cess" was primarily established to raise revenues, assuming a low elasticity of coal demand [nsa4].

Energy independence and personal interests

BHEL strategically contributes to India's energy independence and is also a large employer. Coal-related business activities contributed to more than 80% of BHEL's annual revenues in 2017–18 (BHEL, 2018). Decreased orders for coal-fired power plants would thus threaten BHEL's main source of revenues [isa2]. From a strategic perspective, there are concerns that shutting down the domestic turbine production could increase India's dependence on other countries and international companies, as turbines for potential coal-fired power plants in the future would then need to be imported. One interviewee thus speculated that pressure from BHEL, in combination with concerns over energy security, might explain why the National Electricity Plan suggests a stable flow of 3–5 GW of new annual coal capacity [isa2]. In addition, BHEL provided legal and technical support to facilitate the approval of the environmental clearances for several proposed coal-fired power plants that ordered BHEL turbines.⁹

Lastly, the presence of large public monopolies along the coal supply chain has created multiple opportunities to extract rents. Local and national politicians have participated in businesses benefitting from coal, for example machinery suppliers, transport, or ash treatment [npa2, prea1].

Mitigate air pollution and climate change

Most of the interviewees mentioned that the mitigation of climate change and local air pollution are also important objectives [isa2, nsa3, nsa4, nsa5, nsa6, nsa9, npa8, npa10], especially since the COP21 in 2015. However, some explicitly emphasized that they are less relevant than the objectives previously described (see the "Provide sufficient and affordable electricity supply" and the "Promote domestic energy industries and personal interests" sections) [nsa3, nsa11, npa3].

Key objectives of the government are to foster its domestic and international reputation, which led to the approval of ambitious RE targets and antipollution regulations (see the “India’s power sector” section). However, the enforcement of environmental regulations remains limited, as actors profiting from coal have substantial influence over policymakers (see also the “Provide sufficient and affordable electricity supply” section).

International and domestic reputation

Higher RE targets and more ambitious pollution standards are two critical policies that have been promoted by Modi’s government. The RE targets are in line with India’s NDCs, which envisage a 40% share of REs in the installed capacity by 2030 and thus a substantial increase from the 24% in 2020 (CEA, 2020).¹⁰ Enforcing the pollution standards would potentially further reduce the price gap between renewables and coal¹¹ and may lead to the retirement of 6 GW of old power plants, which lack the physical space to be retrofitted (npa9).

Environmental policies helped to promote Modi’s international reputation and to establish better international relations [nsa3, nsa5, nsa11, npa2, npa8, nsa6, nsa12]. The COP21 was Modi’s first international event as prime minister and thus an occasion to establish diplomatic relationships [nsa3]. By promising efforts toward climate change mitigation, the Indian government could ensure international support in other strategic topics, such as geopolitical conflicts [nsa3].

Domestically, announcing ambitious targets for the expansion of RE energies helped Modi establish his image as a leader, innovator, and first mover, which later became instrumental in securing support for his reelection campaign (Shidore & Busby, 2019). Setting ambitious RE targets was a low-cost political strategy [nsa3, nsa5], given that the electricity grid was capable of integrating the thus far low shares of fluctuating wind and solar electricity [npa10]. With the setting of the RE targets, private investments significantly increased. In addition, Modi wanted to distance himself from coal, which, at the time of his first election, was linked to several corruption scandals [isa1, nsa11].

The reformed pollution regulations also addressed the requirement for reduced local pollution of the urban middle class [nsa12, nsa6]. The rapidly increasing urbanization since 2010 exacerbated transport pollution in large cities, which regularly led to “front page” newspaper articles and record-high pollution levels [nsa12]. Urbanization and rising average incomes have created a vocal and politically organized urban middle class, which has become increasingly visible through additional registered environmental NGOs that influence the policy process. The main channels of influence of the NGOs are the NGT and the Supreme Court. For example, Greenpeace criticized the lack of compliance with pollution standards by private power generation companies at the Supreme Court and the NGT (Sethi, 2019; The Economic Times, 2017).

Reduce regulations

Although the Indian government approved more stringent pollution regulations, they have only been weakly enforced due to successful lobbying of incumbents. For example, when the deadline for retrofitting set by the MoEFCC expired in December 2017, almost no coal-fired power plant had actually been retrofitted (Garg et al., 2019). Instead of fining noncompliant companies, the MoEFCC simply postponed the deadline to 2022 (Central Pollution Control Board, 2018). It was reported that the Association of Power Producers, an industry association for private power producers, having well-established contacts with the Ministry of Power and within the PMO [isa1], successfully argued for the technical infeasibility of the deadline in 2017 and obtained a postponement. This case is a concrete example of a common process in India's policymaking: societal actors are formally eligible to provide comments and inputs to policies before their approval. Yet, whether these comments actually influence the policy design depends in particular on the personal or institutional contacts with the decision makers [isa1, npa5, npa8, npa9, pea3]. In addition, private companies often directly hire former government officials to exploit their network.¹²

Discussion and conclusion

Since India's independence, satisfying the demand for sufficient and affordable electricity has been a key objective for the government. Energy policies favoring coal were established, while publicly owned companies primarily commissioned large-scale coal-fired power plants. With the power sector liberalization in the early 2000s, private actors also heavily invested in coal projects, not least because incentives for renewables were ineffective. In 2020, planned coal-fired power plants are again almost exclusively publicly funded and satisfy the objectives of ensuring long-term security of supply and energy independence. Besides, there are additional drivers for the ongoing coal deployment; in addition to power generation, we find that publicly owned companies in India, especially CIL, create regional employment and economic opportunities, which lead to stark regional dependencies on coal. In addition, local and national politicians personally benefit from established and additional coal infrastructure. Despite this, the increasingly important environmental problems and pressure from the international community have recently resulted in more ambitious environmental policies, such as substantial renewable targets and more stringent pollution standards. While the renewable targets have successfully attracted RE investments, the enforcement of the pollution regulation has been delayed by private actors in the power sector.

Disincentivizing ongoing private and public coal faces various obstacles. Despite the overcapacity and the financial distress of operating coal-fired power plants, the coal pipeline still includes 54 GW from public, and 11 GW from private companies (as of July 2020 from Shearer et al. (2020)). Reducing the regulatory incentives favoring coal investments, and in particular, removing

implicit and explicit coal subsidies, could effectively discourage additional private coal investments and potentially redirect financial flows toward renewables. However, redirecting public investment seems even more challenging, given that within the Central government coal is considered the main source of power generation to ensure long-term reliable electricity supply.

Furthermore, we identify a number of additional barriers to declining public coal investment. First, there is a prevailing belief in parts of the Indian administration that coal is a superior technology compared to renewables, and that there are perceived techno-economic constraints of RE-based electricity systems, such as high storage costs and lacking grid stability. To address fundamental technological doubts about the ability of REs to cover baseload electricity, it could be pivotal if industrialized countries showcase functioning electricity systems based on REs. Second, there is a regional reliance on coal for development, jobs, and fiscal revenues. An inclusive regional transition that creates new economic, cultural, and educational opportunities for Eastern India may prevent regional coalitions of actors from slowing down or hindering a phase-out. Finally, vested interests of public actors have to be addressed. International financial institutions may provide further entry points for an Indian energy transition by, for example, increasing the share of loans which are conditional on sustainability criteria. However, monitoring and enforcing environmental regulations against the interests of powerful vested interests would remain an important challenge.

The COVID-19 crisis hit coal-fired power generation particularly hard. The fall in demand following the strict lockdown measures was almost entirely born by the coal power plants, with a decreased output of 29% in 2020 compared to 2019 (Parray, 2020). This exacerbated their already precarious financial situation and further reduced the demand for new coal-fired power plants. However, the crisis might also delay needed investments in the RE sector (Bridge to India, 2020). It remains to be seen which of the two effects will prevail and despite these short-term developments, India's key objectives remain unchanged. It thus seems unlikely that the identified drivers for coal will disappear.

Appendix

This chapter contains supplementary online material at www.mcc-berlin.net/pecoal/ch08.

Notes

- 1 This chapter draws on the article Montrone et al. (2021). We gratefully acknowledge permission to reproduce parts of the content from Elsevier.
- 2 With RE, we imply wind and solar power, unless specified differently.
- 3 We focused our analysis at the level of the Central government. For a detailed analysis at the State and district level analysis see, for example, Bhushan et al. (2020).

- 4 The Central government changed course to increase its power over the state governments [nsa2, npa6]. It essentially reduced the ability of the state governments to use electricity subsidies before elections (see the section “India’s power sector”). Additionally, the Central government proposes switching to a system of centrally managed direct transfers, rather than the electricity subsidies managed by the states.
- 5 More details on the strategic role of other PSUs are presented in the “Promote domestic energy industries and personal interests” section.
- 6 The 80% of Indian coal reserves are concentrated in Jharkhand, Odisha, Chhattisgarh, and West Bengal. For more detail, see Figure A8.1 in the online Appendix.
- 7 Coal freight tariffs are calculated on a ton per km base. For power plants located far from a mine, coal transport costs can account for 50% of the total fuel cost [nsa5, nsa9] (Kamboj & Tongia, 2018).
- 8 These renewable plants (mostly solar PV) on the West coast (i.e. Gujarat) are particularly cheap because of the optimal location and policy incentives (mainly enforced RPOs and subsidized transmission charge) [nsa3, npa10].
- 9 For example, a 1080 MW project in Telangana was initially halted by the National Green Tribunal, but subsequently greenlighted by the Ministry of Environment after the intervention of BHEL (Mahajan, 2018; SourceWatch, 2019).
- 10 The renewable shares include: Small Hydro Project, Biomass Gasifier, Biomass Power, Urban & Industrial Waste Power, Solar and Wind Energy.
- 11 Retrofitting increases costs for coal power generation between 0.34 and 0.87 INR per kWh (Garg et al., 2019). With costs between 2.5 and 3 INR per kWh for recently deployed REs, pollution standards are a sizeable instrument to reduce the price gap between coal and REs.
- 12 For example, the current director general of APP was a former government official involved in the power sector development.

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