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Buffeted or Energized? India's Dynamic Energy Transition

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1 Introduction

India is booming economically. Speaking in January 2018, Indian PM Narendra Modi set a target for the size of the economy to double in just seven years, by 2025 (Rachman, 2018).

As India's economy grows, so does its appetite for energy. Writing in November 2017, Tim Buckley and Kashish Shah of the Institute for Energy Economics and Financial Affairs predicted the same time horizon for the doubling of India's GDP announced by Modi three months later and forecast that electricity demand would '*nearly double*' over the same time period too (Buckley and Shah, 2017: 6); the difference being accounted for in a (moderate) reduction of Indian energy intensity. Achieving reductions in energy intensity are easier to promise than actually deliver as the following figures for 2017 indicate, when, according to a joint report of the Organisation for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA) India experienced "*electricity demand growth of over 12% (or 180 TWh)*, (which) *outpaced the 7% growth in* (overall) *economic activity*" (OECD/IEA, 2018: 11).

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Significant drivers of this growth in energy demand include: export-led economic growth; urbanisation; the wealth effects of India's growing middle class; and increases in the overall population reach of the nation's regional electricity grids—targeted by the Government of India (GoI) to reach all Indian homes, all of the time, by 2022 (IEA, 2017a: 46). Alongside mandating increased power supply, the GoI is also targeting the achievement of a reduction in at least one third in India's greenhouse gas (GHG) energy emissions, as compared to a 2005 baseline, by 2030 (IEA, 2017a: 46); the seriousness of this target is underscored by GoI policies in support of a (steady) Indian clean energy transition, in particular from coal to renewable sources.

These are ambitious "green" targets for India, albeit many caveats apply—caveats that amount to far more than quibbling, not least with respect to thermal coal consumption. The instincts of the "old" post-war and post-Independence India would, surely, be as they ever were: to solely concentrate on increasing power generation, and not to dilute that focus through concessions made to *international* environmental concerns—noting that the domestic concern of protecting Indian forestry from coal mining (*inter alia*) incursion has long been a matter of GoI policy, for instance as articulated by National Forest Policy of 1988, published by the country's Ministry of Environment and Forests (MoEF 1988). One thing that has not changed, however, is the dichotomy between international and national environmental impact: the choking impact of Indian coal-origin air pollution is felt primarily in-country; the GoI policy response against yet more-and-more thermal power reliance can be seen, admittedly, in the context of GHG and global climate change responsibility, but also in light of Indians' need to breathe tolerably clean air.

According to Abraham Maslow's Theory of Human Motivation (Maslow, 1943: 370), a precondition of humans prioritising our higher needs (from safety right up to '*self-actualization*'), is that we first fulfill the fundamental physiological needs, such as the need for food, clothing and shelter. This mirrors the traditional GoI focus on Indian human development needs over anything else. But those old policy assumptions are no longer reliable, perhaps even tenable.

The critical analysis of the salient and diverse (inter)national drivers for Indian power sector consumption, not least regarding price of generation regardless of source, and the emerging rebalancing of thermal/renewable power generation that is increasingly apparent, is key to making informed forward projections even in the sense of conditions-as-they-are, *ceteris paribus*, and also in the context of different possible future global scenarios.

For instance, the answers to questions such as 'Is GoI policy change primarily driven by a preference for clean and sustainable energy as a good thing in its own right; or is India's clean energy transition driven by more by economic self-interest?' imply different outcomes should economic comparative advantage "switchback" to coal in the future, as it did in during the first half of the 1980s globally due to significant increases in the price of competitor fuels oil and gas (i.e. petroleum), or as a result of increasingly urgent, critical and immediate climate change concern. In scenario planning, it is important to allow for more cynical interpretations too, e.g. that the GoI, in its policy-making, is making a virtue out of economic opportunity and necessity combined, rather than pursuing green energy transition policies for any reasons of altruism; indeed, and whether or not that is in fact true, such balanced thinking provides an antidote to the often fawning international coverage of GoI energy policies—acclamation that avoids the awkward fact of massive ongoing thermal power production in the country. After all, "*coal is not an obsession for India, it's a compulsion*" (quoting Harjeet Singh, a New Delhi-based international climate policy manager for international NGO *ActionAid*) (Adler, 2015).

At the time of writing, in 2018, India's position is encouraging regardless of (evolving) motivation: it is clear that, and irrespective of ultimate cause, altruism and economic self-interest are increasingly aligned in India when it comes to clean energy. Long has the reverse been the case; the sea change has come about through the fast emergence of a dynamic and highly competitive renewable energy (RE) sector in India. Unlike India's previous renewable energy champion of its early years of Independence, the now firmly eclipsed hydroelectric sector, this time its solar that is lighting up the way, both literally and figuratively.

But this Chapter is not primarily about Indian renewable energy. Rather, it takes that sector as an exogenous development, one of huge significance that is the subject of current and ongoing research by other, specialist, authors and institutes. Exogenous to what?: exogenous to coal.

The 'long goodbye' to Indian coal is the focus of this Chapter, the justification for which are manifold, notably that: it remains the incumbent, dominant, primary energy source in India; the duration and speed of that 'goodbye' is highly uncertain, and with it India's energy transition; its governance travails are such that they may not be limited to its own confines and could afflict the renewable energy sector too; and that without it pushed aside and

crowded out, renewable energy will remain, for all its gloss and policy appeal, at the comparative sidelines.

A final reason is that it is now so unfashionable a topic that it has become markedly under-studied and researched compared not just to solar energy, but indeed to petroleum in its many forms, nuclear, biofuels, wind and pretty much any other form of primary energy source. We hope to at least partly redress that balance in this Chapter; love it or hate it, coal matters, and energy transitions, in common with transitions in general, result from a mix of both push and pull factors.

India's energy transition pitches solar energy against, and alongside, coal—the hydrocarbon primary source of energy that is the scourge of climate science, but which still dominates Indian electricity generation as the nation's one primary energy source. This Chapter asks: is India's energy transition, in headline terms from coal to solar energy, likely to be buffeted or energised given current horizons and knowledge? It asks that question by examining this Chapter's endogenous locale: coal in India, its mining, import and combustion. Having done so, it then considers the following proposition: 'Advent of the Sun King', i.e. the eclipse of Indian coal by Indian solar energy, in particular, and renewables, in general. Importantly, critical analysis of that proposition is firmly rooted in the conclusions reached regarding the incumbent monarch, since if the foundations of that reign were not so uncertain then surely Indian renewable energy development would indeed have been buffeted not energised.

Section 2, below, considers the *status quo ante*, namely the ongoing dominant position within India's energy (electricity) sector; Sect. 3 references the concept of a paradigm shift and how it may be applicable to the subject at hand; Sects. 4 and 5 consider 'push' factors weakening coal's Indian energy primacy sector, and putting it under threat of competitive substitution; subsequent sections are titled: International Push Factor: India and Climate Change Politics (Sect. 6); Coal Threat: Review of Domestic and International Push Factors (Sect. 7); and then, lastly, the Conclusions (Sect. 8).

Simply for reasons of space, considerations of 'clean coal' technologies, and how they might impact on India's energy transition, are explicitly out-with the scope of this chapter is; instead these factors are suggested as topics of future research.

2 An Incumbent Enthroned: King Coal

In the Indian Supreme Court coal block allocations ruling *Manohar Lal Sharma v The Principal Secretary & Ors*. (Indian Supreme Court, 2012: 1), the apex court reckoned: "*Coal is king and paramount Lord of industry is an old saying in the industrial world… In India, coal is the most important indigenous energy resource and remains the dominant fuel for power generation and many industrial applications… It is no exaggeration that coal is regarded by many as the black diamond*."

The (British) East India Company commenced Indian coal mining in 1774 at the Ranjigang coalfield, located along the western bank of river Damodar in the modern state of West Bengal. Looking forward nearly two-and-a-half centuries to 2018, this coalfield is still worked, but now by Eastern Coalfields Limited, a subsidiary of Coal India Limited (CIL), India's national coal-mining company. Large-scale coal mining in India has been undertaken throughout this long time period, even as the British Raj in Indian came (1858) and went (1947), forming an integral part of the India's economy.

According to the Central Electricity Authority (CEA, 2018a: 1), nearly two-thirds of the installed capacity of Indian power stations are accounted for by thermal power generation, as of January 2018. In more detail: of 334.40 GW total installed capacity, coal accounted for a majority (57.96%) of the total, at 193.82 GW (2018a: 1). Critically, coal's 58% of installed capacity translates into 76% of actual power generation (Shahi, 2018).

The past historic trend is for more and more coal-burning nationally. India's estimated total consumption of raw coal by industry increased from 462.35 MT during 2006–2007 to 832.46 MMT during 2015–2016 and consumption of brown coal/lignite increased from 30.81 MMT in 2006–2007 to 42.52 MT in 2015–2016 (Financial Express, 2017: 41). India's greatest consumption of raw coal is by its electricity generation sector, followed by steel industries. Industry-wise estimates of consumption of coal shows that during 2015–2016, electricity generating units consumed 508.25 MT of coal, followed by steel and (coal) washery industries (56.45 MT), cement industries (8.93 MT) and sponge iron industries (7.76 MT) (Financial Express, 2017: 41). According to the CEA, as on January 31, 2018, thermal power projects, with a capacity of 64,861.15 MW, were under construction in the country (CEA, 2018b: 23), adding yet more coal burning capacity.

In the context of Indian energy, coal has long reigned, and continues to reign. When and who will call time on this monarchy?

3 The Dynamics of a Paradigm Shift: India's Energy Transition

The concept of a paradigm shift is well established, as theorised by Thomas Kuhn (Kuhn, 1996). For Kuhn (1996: 5–6), paradigms are ways of interpreting the world and dominant paradigms for any particular topic are the norm, occur in periods of '*normal science*' during which understanding is collectively refined through new empirical experimentation and discovery, and articulated on the implicit or explicit assumption of the ongoing, underlying, paradigm being correct. Paradigms, however, are not immune to attack by evidence that undermines them, albeit they are often resilient for a period of time even after, rationally, there is no objective basis for them to retain their primacy. Whereas the exogenous 'pull' for an Indian energy transition (here: considered as a paradigm shift), can be identified as a mix of (perhaps) climate change politics and (certainly) the low-cost competitiveness, dynamism, and growth of India's renewable energy sector, the 'push' factor is a composite of wicked problems endogenous to India's coal sector, at the pithead, import terminal and thermal power station.

Section 4, below, begins an enquiry into these push factors domestically; and Sect. 5 considers a key international push factor: Indian and climate change politics.

4 King Coal, Vulnerability Begins at Home

Sometimes it is not just charity that 'begins at home'. Indeed, there are a number of longstanding weaknesses of coal's position in the Indian marketplace, both with regards to coal mining and to thermal power generation. These are outlined below in this Sect. 4.

4.1 Indian Coal Quality

An important dynamic in GoI policy-making is an inherent weakness in 'king' coal's armour—and one of the primary reasons why coal is imported into India in the first place, one that is quality-related. Indeed, not only has India suffered historically from shortages of domestically mined coal in absolute terms, there is also a quality deficit too: generally Indian coal is of low calorific value, contains relatively high levels of ash content (i.e. the remaining non-combusted constituents of the coal, post-thermal power generation),

reducing both its efficiency on combustion and also the attendant levels of air pollution—Indians are all too often 'short of breath', just as CIL could be said to be 'short (of) tons'. That available foreign imported coal is of higher quality, with regards to (lower) ash content, is of little benefit to coal's overall popularity given that foreign imports are thereby highlighted as superior to domestic production. One important environmental positive for Indian coal quality, compared to many imported coal sources, is that it is comparatively low in sulfur content.

The dirtiest and lowest calorific value coal, and hence the most inefficient to burn, is brown coal, also known as lignite. Lignite is mined in both southern India, especially the state of Tamil Nadu, and in the north, in particular in Gujarat. It is primarily used by the electricity generation sector, which accounts for 90% of consumption, and its total use by that industry and others (e.g. cement) is increasing, notably from just 31 MMT in 2006–2007 up by nearly 40% to 43 MMT in 2015–2016 (Ministry of Statistics and Programme Implementation, 2017: 41). However, the poor quality of Indian coal is not limited to its lignite: Indian 'hard' coal is of comparatively dirty and of low calorific value too.

Indian coal can and is 'washed' to improve its quality, both in terms of the removal of ash/other debris and in order to increase its calorific value per tonne by between 10 and 20% (NITI Aayog, 2017a: 100). This is achieved through the use of coal washeries. If washing takes place prior to transportation then there is an added benefit of a reduction in tonnage to be shifted, for the same overall calorific value of coal; a reduction in ash content also reduces fouling/slagging deposits on power station boiler surfaces, deposits which in turn reduce the efficiency of thermal power production.

Seeking positive action on coal ash content, India's Three-Year Action Agenda (NITI Aayog, 2017a: 100), 2017/8 to 2019/20 calls for "*15 new Coal Washeries, including 6 Coking Coal washeries with a capacity of 18.60 MTPA and 9 non-coking Coal washeries with a capacity of 94 (MMT per annum to) be commissioned to meet Ministry of Environment, Forest and Climate Change guidelines*". Levels of coal washing demand are likely to increase significantly if the GoI implements the 2015 recommendation of its environment ministry's Expert Appraisal Committee allowing for coal with an ash content of up to 25% to be imported, more than doubling the ceiling of 12% set in 2013 (Cornot-Gandolphe, 2016: 14). However, implementation could be challenging and goes beyond simple regulatory promulgation; speaking in February 2018, N. Gautam noted that coal washeries in India were only operating at 50% capacity and that high-ash content coal being, burnt "*raw* (untreated)… *on some pretext or another*", and a resulting failure of Indian

thermal power sector ("*and that by very proper good companies*") to consistently meet the 1997 requirement that "*all power plants located in sensitive areas, metropolitan cities and in areas distant from the coalfields, must use coal with less than 34% ash* [content]" (Mathur et al., 2003: 319). Moreover, the question of washing high ash content coal is complicated yet further by policy contestation centered on national content aspirations relating to those washeries themselves, for example Venugopal et al. (2016: 196) lament that "*the existing situation of Indian coal washing Industry is a resultant of gross negligence of the industries to strengthen R&D for development of indigenous technologies*". In an argument that combines a call for greater national content with a scientific rationale supporting such a policy outcome, Venugopal et al. (2016: 196) argue that, "*indigenous technology designed for difficult washing characteristics of Indian Coal be used, instead of foreign coal washing technology… with little or no modification*". Hence it is the contention of Venugopal, Patel and Bhar that coal washeries in India operate at suboptimal levels not just due to underutilisation but also as a result of technological issues too.

Whilst cost-control is an incentive for power companies for non-compliance of coal washeries, regular water shortages in coal and thermal power rich states such as Bihar is an inhibiting factor in capacity utilisation for what is a very water-hungry process (insert reference). Indeed, not only are washeries major consumers of water, the Indian experience is that they can and do, when poorly managed, lead to significant groundwater pollution, providing an additional compelling human health reason to transition away from coal. The figures regarding air pollution, specifically, are appalling in their human toll: Dockery and Evans (Dockery and Evans, 2017: 1863) report a range of 0.94 to 1.25 million early deaths in India in 2015 that were attributable to air pollution (central estimate: 1.09 million), much of it produced by coal-fired power. Coal washing and coal blending, namely of domestic high ash content coal with lower ash content imports, has the same, State regulated, aim of reducing overall ash content of combusted coal, in particular for reasons of human health and wider environmental protection. Even so, air pollution reduction and environmental safeguarding of groundwater remain highly salient political issues in India—not least, as is discussed below, adherence to the applicable regulations is less than complete; together, they constitute important twin environmental drivers in favour of a cleaner energy transition.

4.2 Indian Coal Importation, Exploration, Transportation & Production

Indian coal, or rather coal in India since much of it is non-Indian in origin, faces an additional broad range of challenges due to its relatively low quality, as measured by an unwelcome combination of low calorific value and high ash content. The sector continues to experience significant travails unrelated to the quality of its output, these range from shortcomings in exploration, production and transportation, and the necessity of coal imports to complement domestic production for purposes of achieving necessary coal quantity, not just overall blended quality.

Indeed, one nuance to the concept of "Indian king coal" is that, like so many monarchies, it is of mixed national origins. During the financial year 2015/2016, India mined 536.5 MMT of coal (NITI Aayog, 2017a: 99), and for 2016 as a whole it was ranked by the IEA as the world's second largest producer (IEA, 2017b: 17); however, such is India's demand for the mineral that it is also a very significant coal importer—over the same time period, India imported a further 200 MMT of the mineral (Dogra, 2016). This reliance on coal imports has the effect of providing a further chink in the armour of King Coal in an Indian context since: many of the coal mining jobs India's thermal power sector support are not, in fact, Indian; India is exposed to foreign pricing/coal availability risk; and the coal trade has a negative net impact on the nation's balance of trade. Travails and related weakness to King Coal's reign in India also relates to exploration, transportation and production; see below.

Exploration and production of Indian coal has often failed to keep pace with GoI expectations and targets, resulting in well publicised shortcomings to, admittedly very high and perhaps unrealistic, GoI expectations. This failure in expectations management provides a further weakness in King Coal's position within the Indian polity.

With respect to coal exploration, in 2013 Greenpeace (2013: 13) warned that "*at targeted growth rates, CIL's extractable coal reserves could be exhausted within 17 years*" leading to enhanced levels of coal imports, noting that "*reserve levels as of April 2011, (were) at 16% below (the) levels cited in… documents of 2010*"; noting, by way of explanation, that CIL's '*exploration efforts*' were falling short (and by 65%) of its targets, and that if CIL could improve its performance in this respect then future supply shortages could be avoided. CIL performance in this regard did subsequently improve, success that can be observed in an annual increase, despite ongoing extraction, of more than 7

Billion Metric Tonnes (BMT) to 302 BMT in total estimated coal reserves of as of 1.4.14 (Ministry of Coal, 2014: 1). As of April 01, 2017, India's officially estimated reserves of coal, as reported by the Press Information Bureau (PIB), had increased yet further, to over 315 BMT (PIB, 2018).

Nor has GoI's push for CIL to make new discoveries has abated since; India's Three Year Action Agenda (NITI Aayog, 2017a: 99), specifically calls for: exploration of a quarter "*of the untapped 5,100 sq km balance coal bearing area to ensure availability of more coal mining blocks*"; and conversion of a quarter "*of the 139.15 billion tonnes of coal reserves as on 31st March, 2016 in the 'Indicated' category into 'Proved' category by engaging top exploration companies with attractive contractual provisions*".

Just as exploration results are both impressive in absolute terms, but sometimes well below the stretching targets set by the GoI, such is also the case for CIL production. Current CIL production targets remain challenging, as per the Three-Year Action Agenda, 2017/8 to 2019/20: "*CIL has to raise its production from the current level of 536.5 MMTs in 2015–2016 to 1 BBT by 2019–2020*", albeit "*depending on coal demand*" (NITI Aayog, 2017b: 99). Whether or not this 81% increase in production is achievable is possible, but open to doubt; as illustrated by data for financial year 2017/2018 which shows a continuation of this pattern: total CIL production was up from the previous year, but only by 2.39%, to 567.37 MMT (Cuddihy, 2018), and therefore well short of its 600 MMT annual target for that year. Any ongoing failure by CIL to meet its production targets increases the likelihood of additional coal imports being required to meet demand; the other key variable, of course, being the actual level of aggregate demand for coal in India.

India's draft (2017) National Energy Policy (NEP) appears weak in its prediction (wish?) that increases in coal demand by the Indian power sector that it expects "*is likely to be first met by domestic coal*" (NITI Aayog, 2017b: 34), not least since the same document acknowledges that ensuring requisite increases in domestic supply "*will require quick exploitation of our reserves*" (2017b: 34). An obvious, but undesired by GoI policymakers, alternative scenario is that a substantial amount of any such supply gap is met through coal imports.

In fact, the commercial dynamics behind Indian coal imports are complex, combining coal quality, pricing and reliability of supply drivers, and interact with political, dynamics such as those laid bare in the form of demanding (in both senses) GoI targets for domestic coal production above. Both regarding the inherent risks of relying on large-scale coal imports (including from Indonesia, which has brought additional above ground risk), and with regards to other high-salience factors including the extreme and fatal levels of air

pollution in India in very large part due to coal burning, the resilience of a dominant coal-fired thermal power sector in India may be undermined by its seeming inability to meet the twin challenges self-sufficiency in coal production and acceptably clean air for the public to breathe, further to combustion.

One such maximalist projection of imports was provided in 2014 by Rio Tinto, which forecast that Indian coal imports would more than double to approximately *c.*225 MMT by 2025, extrapolating from an observed (2007–2012) annual rate of increase of *c.*11 MMT p.a. from the base, 2007, figure of 25 MMT, and implying a *c.*800% increase over this 18 year time period (Rio Tinto, 2014, p. 34). Starting from the same base year of 2007, Chikkatur et al. (2007: 3745) suggests a more conservative rate of annual increase in thermal coal imports of 5.5%; over an 18 year period, compounded, this implies an overall 150% increase in coal imports by 2025. Whether the increase is 150%, 800%, or somewhere within this range, the level of increase is highly significant and substantial—and a challenge to India's prospective energy transition towards clean and sustainable energy.

Additionally, there is the question of the cost of these imports, and their (financial, as opposed to human) price. The higher cost of foreign imports was implicitly accepted by large-scale, power sector, consumers of foreign coal who collectively built an extensive thermal fleet in littoral locations close to coal terminal ports; these locations saved time and money by limiting to the minimum onshore transportation, reducing the impact of the price differential to domestically mined coal, and provided additional benefits in terms of both supply quality and reliability. However, the choice to rely so heavily on imports, in particular from Indonesia led to the introduction of an additional, exogenous, above ground risk.

Indonesian coal price changes were an important catalyst in the evolution of India's coal governance, as explored below in the context of the GoI's 'SHAKTI' scheme. Alongside Indonesian imports, India has also relied, in particular, on South African and Australian coal too. The situation is highly dynamic between these suppliers. Traditionally Indonesian coal has dominated Indian thermal coal imports; this was the case even after the Government of Indonesia introduced regulatory changes in 2010 that led to increased export prices for the nation's coal. Indonesian coal has the benefit of both low sulfur and ash content (typically below 15% ash, compared to up to 50% for Indian coal), but unfortunately it is also low in calorific value too—a looming vulnerability yet to be fully exploited in FY 2014, when Indonesia retained a 78% market share of Indian thermal coal imports (Cornot-Gandolphe, 2016: 13). However, and presaging an ongoing trend away from Indonesian coal imports, the following year saw a significant drop in international prices for

thermal coal, in particular for higher grades, hence "*higher-grade coal therefore became more competitive than Indonesian low-rank coal*" and imports of thermal coal above the calorific value 5,831 kcal/kg "*jumped from 5 Mt in FY2014 to 18.7 Mt in FY2015*" crowding out Indonesian imports as Australian imports doubled in a single year and those from South Africa increased by 54% (Cornot-Gandolphe, 2016: 13).

India's Three-Year Action Agenda of 2017 calls for this momentum in coal import diversification to be maintained, alongside a reduction in overall levels of imports: "*it is important that India increases its domestic coal production to provide energy security and reduce its dependence on imports. The energy security may be further enhanced through diversification of the import sources*" (NITI Aayog, 2017a: 99). In the same year, 2017, India's Energy Minister, Piyush Goyal noted recent successes already achieved in reducing coal imports, including a 25% reduction year on year as of the previous December, and stated that he "*aims to eliminate coal dependency in the next few years*" (Goyal, 2017), a succinct statement of the same policy.

India's Three-Year Action Agenda (NITI Aayog, 2017a) emphasises energy security alongside the policy imperative of crowding out imports in favor of national content. Indeed, energy security remains a challenge for India. Despite all attempts to reduce any holdups in coal supply, coal supply shortages continue to afflict the power sector—this time born out of logistical constraints rather than production impediments. There is an ongoing need to improve Indian port coal capacity, as specifically identified in 2014: "*Indian ports cannot take capsize vessels which carry more cargo (can get only panamax freight: which are smaller and expensive) and reduce the cost. Moreover the average time taken by ships to load/unload at India ports is almost 96 hours, 10 times longer than in Hong Kong*" (Bose, 2014). India has responded with sustained and at-scale port investment, including the $123bn, GoI, '*Sagarmala Programme*' which, spread across 415 different projects, aims to develop new ports, modernise existing ones, increase port connectivity and industrial linkages, and provide support to local community development (Invest India, 2018).

Even when the coal has reached India, transportation of coal over long distance is proving to be a bottleneck and "…*coal stocks at operational thermal power plants have remained low at only 10 days of requirement. Importantly, the number of plants with critical-level coal stock has zoomed to 28 as of March 2018, with distant plants in western and northern India witnessing greater shortage*" (IIFL, 2018). In response, the GoI and CIL have proposed significant investment in rail freight infrastructure, including both new railway lines, not least

a dedicated eastern freight corridor to be in service as of 2021, and improvements to existing lines (IIFL, 2018).

However, such railway investment does not address the constraining factor of cross-subsidy that coal freight in Indian is burdened with: Indian Railway (IR)'s 'explicitly over-prices coal freight by about 31 per cent to offset its 'social obligation' or coaching losses', amounting to an "*'overcharge' from coal… in FY 2017*" of approximately 108bn INR, comprising "*over 85 per cent of costs for transporting coal to thermal power plants*" or, on average, an extra 0.21 INR/kWh of cost rising up to threefold "*for power plants in distant states, which inherently rely on railways for coal*" (Kamboj and Tongia, 2018: 9). That this business model will be hard to break is evident from a quick review of, FY 2017, statistics: 60% of coal consumed in India was transported by rail, indicating a high degree of dependency on IR by the sector; and 44% of IR's revenues are derived from coal freight, and an even greater proportion of its profitability (2018: 9), completing a circle of coal sector-IR interdependency.

5 Indian Coal (Mis)Governance

A further weakness to the pre-eminence in Indian coal is its apparent widespread and longstanding mis-governance.

The World Bank defines '*governance*' as the "*manner through which power is exercised in the management of a country's economic and social resources for development*" (World Bank, 1992: 1). The United Nations Development Programme (UNDP) defines governance as "*the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences*" (UNDP, 1997: 56).

In both these definitions, there is an emphasis on development and management of the country's affairs with good governance an enabling precursor, or 'hygiene factor'. In the context of private sector participation in the energy sector, public policy is not simply concerned with objective setting and management of resources, but also has a legitimate focus on ensuring good governance. In practical terms this includes that for-profit activity is not conducted at the expense of the public weal—in such circumstances there is a need to ensure (e.g. via laws, regulations and enforcement mechanisms) that, *inter alia*, consumers, the general public and the investors are all protected from oligopolistic profiteering and collusion, environmental pollution/public

safety, and insider share dealing. If the assets are largely under the control/under the ownership of the State, the issue of governance is more direct since the State exerts controls, including directly as the beneficial owner. These concerns have led, in India, to an elevated level of alert, both up and downstream. Perceptions of suboptimal levels of governance combined with a degree of fatalism lead to low-bar targets of achieving 'good enough governance' that tolerates graft and mismanagement alike.

India's coal sector has proven highly problematic for successive GoIs to manage; many of the issues encountered are fundamentally ones of (mis)governance of the sector.

There is a longstanding and ongoing debate between whether mining (e.g. coal mining) is part of a global "resource curse" or whether the 'extractive industries' (*viz*. oil, gas and mining) are of developmental benefit to host countries; certainly, whilst India's history of economic development has been powered, primarily, by goal, the fact of a violent and illegal side to Indian coal mining (Bhattacharjee, 2017) speaks to a different, and more uncomfortable, truth. For instance, in the Dhanbad-Jharia coal basin of Jharkhand state boasts both a formalised coal mining sector and a mafia subculture linked to illegal mining, theft and trading that is linked to both corruption and a Maoist/'Naxalite' violent insurgency drawing economic rent from local, illegal, coal mining operations (Mukherjee and Choudhuri, 2013).

Illegality in Indian coal mining, which was not limited to Jharkhand, manifests itself in two ways: (i) illegal mining of the mines, typically small mines, mostly abandoned by the public sector companies when, for example, they have become uneconomical, and (ii) illegal marketing and distribution of the coal, scavenged from trucks, rail wagons, or even legal mines (Lahiri-Dutt, 2007). The mafia "*emerged as a quasi-outsourced economical and political department of the now centralised state-industry, becoming an intrinsic part of the mining regime during the 1970s to 1990s*"; by the 1990s, however, illegal coal mining/trading had assimilated even to the extent of being seen as '*normal business*' (Sanhati, 2011).

5.1 From Crisis, Comes Change

By mid-1991, change was coming, born of economic stagnation and crisis. India's currency crisis of the time was severe and the GoI sought loans from the International Monetary Fund and the World Bank. As a by-product of receiving such aid, sought to steadily liberalise the nation's economy, including privatisations of state assets, and the restructuring of assets retained under

public ownership (Hiro, 2016). The coal-mining sector was not to escape untouched by this policy drive.

At the pithead, the first round of resulting structural changes in the coal industry were initiated through amendments to the applicable legal framework. In the context of coal shortages and electricity load shedding/power outages, the power sector was permitted as a designated, i.e. protected, end use for coal consumption, a legislative change effected by 1993 amendment to the Coal Mines (Nationalisation) Act (CMNA)1973; the cement gained the same benefit in 1996, through further legislative amendment (Ministry of Coal, 1993). These changes facilitated captive coal mining, i.e. extraction for consumption by a designated end user, by the private sector.

Downstream, India's Electricity Act of 2003 consolidated previous legislations governing electricity, and among other things and promoted competition in the power purchase costs, and efficiency in the provision of services. This was imperative given the poor financial health of the State Electricity Boards (SEBs). The coal-hungry SEBs, accountable for the supply of electricity to Indian consumers, both residential and industrial, had become "*bastions of political patronage rather than true business enterprises*" (Tongia, 2003: 6–7). The SEBs, at the time of writing, met the responsibilities of distribution and supply of power to the customers, but their massive and growing losses and frequent power thefts constrained their growth with state budgets being unable to cope up; "*in some states, SEBs had become the single largest drain on state finances and had eroded the states' ability to supply other social services such as health care and water infrastructure*" (Tongia, 2003: 7). Therefore, the measured reforms were intended to ease the pressure on the (i) coal industry by promoting captive mining by power generators and (ii) SEBs/distribution licensees by promoting competitive (potentially lower) prices to the end users.

However, the legacy issues in the coal industry also exposed a weakness within the GoI's governance and regulation of the power sector: a procurement driver for achieving value for money is that pursuit of low prices from power sector generators through competitive auction. However, this begs the question of what happens when the power generator fails to supply power at agreed low prices and instead seeks relief from its obligations; implying pass-on prices increases payable by the purchasing electricity distribution company (Discom), and finally, onto consumers. If the Discom refuses to pass through the increased cost, the project becomes unviable and 'stressed', or 'non-performing'—with knock on effects for the banking sector that provided the necessary finance. Management of this risk remains a governance challenge: the GoI's Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India (SHAKTI) policy, discussed below, can be seen as a pragmatic policy

response that is dressed up, as evidenced by the choice of name, as an accountability and transparency measure.

The introduction of the New Coal Distribution Policy (NCDP) in 2007 (Ministry of Coal, 2007) served as a major structural change in the coal industry; consolidated GoI policy and mandates on coal allocation, and remained an important point of reference, including through its regular GoI updating and amendment, for a decade after it was first issued. However, and as evidenced below, the structural changes between 1991 and 2010 did not eliminate the embedded arbitrariness, ambiguity and corruption, and human nature's inherent bias towards status quo.

5.2 Coal Mis-Governance Dénouement?: Coalgate and SHAKTI

In 2010 the GoI sought to steadily reform the coal sector in an evolutionary rather than a revolutionary manner, responding to the perception that the system of coal allocation, based on the concept of 'linkages' to the rest of the economy, led to arbitrary decision-making and needed to be opened up to more competition and transparency. The law governing the regulation of mines and developments of minerals—the Mines and Minerals (Development & Regulation) (MMDR) Act, 1957 (Ministry of Mines, 1957) was subsequently amended (in 2010 and again in 2015), to mandate the allocation of coal blocks by auction through the process of competitive bidding, e.g. see Ministry of Law and Justice (2015a).

This evolution approach to reform, whereby competition was allowed to coexist with previous forms of state-allocation, faced disruptive change with the breaking of the so-called 'Coalgate' scandal in 2012. The scandal's genesis was long-term mis-governance of the coal sector in India. Its spark was a 2012 report by the Comptroller and Auditor General (CAG) of India, specifically Report No. 7 of 2012–2013, Performance Audit of Allocation of Coal Blocks and Augmentation of Coal Production of the Ministry of Coal, also known as the 'CAG Report' (Comptroller and Auditor General of India, 2012). The report concluded (2012: 43–45) that there was a lack of transparency and objectivity in the allocation of coal blocks, recommended that the Indian Ministry of Coal should urgently consider remedial next steps, and made apparent to the Indian public how arbitrary previous the making coal allocations had often been prior to 2010. Further to national outcry, the scandal was popularly labeled as 'Coalgate' (Indian Express, 2017).

Responding to popular pressure, India's Central Bureau of Investigation initiating a probe into alleged corruption in the allocation of coal blocks. Coalgate also became the subject matter of a group of writ petitions filed in the nature of Public Interest Litigation, wherein it was alleged that these allocations were illegal and unconstitutional. Amongst many other commentators, former Ministry Coal Secretary P.C. Parakh was scathing in his criticism of the '*policy paralysis*' that he identified as being a key factor in its genesis, and is equally critical of the litigious outcome to the scandal: "*litigation will further delay production of coal from captive blocks and force the country to import more coal and add to inflationary pressures and worsen the already adverse trade balance*" (Parakh, 2014). The dénouement duly arrived in the same year of 2014 when the Supreme Court, in its order dated September 24 regarding *Manohar Lal Sharma v The Principal Secretary & Ors*. (Indian Supreme Court, 2012), cancelled 214 of 218 allocations made prior to 2010 and held that these allocations not only amounted to largesse, but were also both arbitrary and illegal.

Forced by circumstances and to minimise any impact on designated end use sectors (sponge iron, steel, cement and power utilities), the Government swiftly brought in ordinances and then legislation—the Coal Mines (Special Provisions) Act, 2015 (Ministry of Law and Justice, 2015b)—to allocate coal blocks (regarding these specified sectors) through either public auction or government allotment. Public opinion and pressure clearly favoured the former route. Through legislative reforms, which began in 2010 and continue at the time of writing, spurred on by practical difficulties that continue to affect the coal industry, the Government removed discretion in grant of mineral concessions and provided for all mineral concessions to now be granted only through auctions.

In many ways the catalyst for SHAKTI also occurred in 2010, the year when Indonesia's Ministry of Energy and Mineral Resources (MEMR) promulgated Regulation 17, 2010, which regulation (MEMR, 2010) had the effect of significantly elevating Indonesian coal export prices, to the extent that one author (Ghoshal, 2013) considered that in terms of "*Indian impact… may well be the end of the road for cheap Indonesian coal*." Responding to this price hike, Adani Power Limited (APL), and several other power generators reliant on Indonesian coal, requested that the regulator allow them to pass through their increased cost to consumers through higher prices. The Central Electricity Regulatory Commission, as regulator, and supported at appeal by the appellate tribunal for electricity, indeed allowed for a higher, compensatory tariff to be granted. But that decision was then challenged in the Indian Supreme Court, which apex court set aside the decisions of the regulators and

held that the PPAs do not contain any clause that coal is to be procured only from Indonesia at a particular price and therefore, the price payable for the supply of coal is entirely for the risk-taking electricity generator to bear. The Supreme Court directed for any relief to be granted to the power generators to be restricted to the terms of the PPAs and the competitive bidding guidelines. The result was effectively an impasse and pushed many power projects to the brink of financial non-viability (Chatterjee, 2017).

The SHAKTI Policy was released barely a month later by the GoI; in May 2017, the GoI's Cabinet Committee on Economic Affairs approved the replacement of both the existing regime applicable to non-designated industrial coal sector consumers, and the NCDP-mandated arrangements applicable to designated sectors such as for electricity generation and based on coal linkages, with SHAKTI. The new policy had the effect of financially rescuing a wider range of non-performing thermal power plants—irrespective of whether there is a PPA or not or where PPAs have been signed based on supply of domestic coal or imported coal.

SHAKTI did more than bail-out struggling thermal power projects, it also presaged a major change in GoI coal mining policy aimed at delivering domestically mined coal reliably—in terms of both quality and quantity—affordably and on time to India's power sector, and hence avoiding the need for future measures to rescue that sector from the impacts of unexpected foreign coal price hikes. That change came ten months after SHAKTI's launch, in February 2018, when the Cabinet Committee on Economic Affairs, chaired by Prime Minister Narendra Modi approved the methodology for auction of coal mines/blocks for sale of coal under the Coal Mines (Special Provisions) Act, 2015 (Ministry of Law and Justice, 2015b) and the MMDR Amendment Act (Ministry of Law and Justice, 2015a). The following high salience changes resulting from these policy and legislative changes: (i) that there will be no restriction on the sale or utilisation of coal from the coal mine; and (ii) the end of the monopoly of the public sector competition and will encourage CIL and its subsidiaries to become more efficient and able to better compete in the energy marketplace (Cabinet Committee on Economic Affairs, 2018).

Regardless of this criticism, it is important to recognise that for some commentators, the GoI has now achieved its SHAKTI objective of ensuring transparency in coal allocation, for instance this is the view of S. K. Srivastava (Srivastava, 2018).

Whilst it is far too early to judge the efficacy of this policy change, and readers of this Chapter can make up their own minds regarding the efficacy of the SHAKTI scheme in terms of coal sector transparency, what can be concluded is that the mis-governance of India's coal sector has been publicly and

cruelly exposed through, most recently, Coalgate and SHAKTI, and—over a longer time period—the mafia-rife illegal coal mining/theft taking place in peninsular northeast Indian as highlighted above with respect to the Dhanbad-Jharia coal basin. By exposing the need for fundamental reform of India's coal sector, both at pithead and thermal power station, these public failures of coal governance further undermine the pre-eminent position of King Coal in India, providing further space for an upstart pretender to dethrone the sitting (reigning) incumbent.

In sum, coal sector wider dynamics and of the coal and governance failings are, perhaps counter-intuitively, a significant driver in India's energy transition away from coal *in toto* and towards cleaner energy, in particular renewable energy; perhaps it is true that "*coal always curses the land in which it lies*" (Caudill, 1963: 37), certainly India is abundant with supporting evidence of this claim. Another political arena to test this veracity of any paradigm shift away from coal to renewables in India, and hence an energised rather than buffeted energy transition, is that of climate change politics and India' stance therein. Indeed, the domestic push factors providing febrile ground for any energy transition from coal to renewable energy in India do not, in fact, tell the whole story: international push factors are pertinent too.

Section 6, below, focuses on one such push factor that is of critical importance: India and international climate change politics.

6 International Push Factor: India and Climate Change Politics

Notably, one key political driver enabling India's reign by 'king coal' is the degree to which the sector was, previously, seemingly uninhibited by any domestic public policy concerns regarding global climate change. If coal is really to be left behind by India's paradigm-shifting energy transition, then India's positioning on climate change issues is a valid place to seek evidence either consistent or inconsistent with that hypothesis.

The impact of any evidence is likely to be non-symmetrical in the sense that an Indian climate change policy of denial or refusal to meaningfully engage in necessary GHG measures does not prove that India's energy transition will not take place anyway, for instance as a result of the comparative economic advantages of renewables over coal, whereas serious and binding commitments to tackle GHG emissions by the GoI surely do necessitate a significant

and deep energy transition to sustainable primary sources and away from fossil fuels, if those commitments are credible.

Even in the former case, that is of denial/refusal to meaningfully engage in international climate change politics, that finding would be significant since it would suggest that any observed energy transition, e.g. from coal to renewable energy, was contingent on the vagaries of economics given an absence of demonstrated political commitment to significant GHG reductions. Of course, that commitment could emerge at a later date or alternatively the economics or renewables could continue to outdo those of coal, either way resulting in no stymieing (or 'buffeting') of India's clean energy transition but for different reasons. Or the opposite set of circumstances may occur, leading to a startling switchback to Indian coal-fired thermal power generation. Section 6.1 below starts the process of examining the available evidence.

6.1 The Salience of India's Climate Change Policy to the Nation's Energy Transition

Because of the scientifically-established link between coal-combustion, GHG emissions and anthropomorphic climate change, Indian policy on climate change has implications for its policy on domestic coal-consumption—until recently (see below) national policy decisions on climate change have been devised such that there has been no noticeable, substantive, inhibition on domestic coal fired power generation. However, presaging an important change of global and not just national significance, this is no longer the case—and the evolution of the GoI's climate change policy positions are of potentially highly significant to the nation's energy transition, and hence highly salient to any posited 'long goodbye' to fossil fuels in the country.

6.2 Climate Change Policy: Status Quo Ante

India's climate change policy, and its unbending restatement even in the face of international pressure to relent, was described as recently as 2009 as a "*salutary case study in the failure to build North/South trust*" in multilateral negotiations (Dubash, 2009: 1). As related by Mahr (2013), India "*has argued for years that developing economies should not be held to the same standards of reducing carbon emissions as developed countries, and that the imperative to develop and reduce poverty should trump India's committing to emissions targets*." No change, i.e. continuity, in terms of India's climate change policy evolution also

meant, figuratively, the giving of 'no change' to anyone foolish enough to expect Indian policy concessions on its GHG emissions. India's position "*reflected a very traditional developing country position, tinged with neocolonial rhetoric*", the "*two most important and partly interrelated arguments behind (this) traditional Indian position (being) (a) the historic responsibility of the North and (b) per capita rights to global environmental resources*", according to Vihma (2011: 78). India's policy stance is significant not just in its own right, but in light of the fact of its "*leadership role in the developing world makes the country currently one of the key actors in global climate governance*" (Vihma, 2011: 70) a role it has specifically courted and sought to defend (e.g. Rajan, 1997 and Rajamani, 2008, both cited in Vihma, 2011: 70).

Outwardly determined and seemingly unchanging in its policy-making on climate change, this policy of no behavioral change was facilitated and underpinned by a resilient, tight-knit, relatively-closed climate change policymaking elite (2011: 81), perceived as such by authors writing many years apart, e.g. M.K. Rajan (1997, cited in Vihma, 2011: 81). Since the policy was settled, large numbers of experts were not required to debate or negotiate it—internally or externally, leading to the Indian negotiating team consisting of just a quarter of the size of Indonesia's at the 2009 United Nations Climate Change Conference 15th Conference of the Parties (COP) 15 and criticism of this fact, and similarly (relatively) small Indian negotiation teams in other global climate governance negotiation forums, a fact criticised in 2013 by N.K. Dubash (Dubash, 2013) amongst others.

6.3 Climate Change Policy: Pre-2014 Attempts at Change

Contemporaneous attempts at challenging the above orthodoxy had met with comparative failure, even when led by a Government Minister. Vhima notes the policy reorientation work of India's Minister of Environment and Forests for the period 2009—2011, Jairam Ramesh, advocated for revised Indian positions on climate change offering "*some degree of credibility internationally*" such that India could convincingly and genuinely demonstrate its desire for a meaningful climate change agreement at COP 15, "*even if this meant compromising on some aspects of the traditional position*", quoting as evidence for this policy activism a leaked letter to the Indian Prime Minister (Vihma, 2011: 76). However, COP 15 was widely seen as a failure, and India's negotiating position cited by many commentators (e.g. Rapp et al., 2010), including

citations of "*secret recordings… reveal(ing) how China and India prevented an agreement on tackling climate change at the crucial meeting*" of COP 15.

Writing in 2011 two years after COP 15, former Indian Ambassador to the European Union and former Indian negotiator on climate change issues, Chandrashekhar Dasgupta, charged Ramesh with "*turn(ing) India's climate change policy on its head*" by calling, in 2010, for "*all countries (to) take on binding (climate change) commitments under appropriate legal forms*", including India, a volte face for which, according to Dasgupta (2011), he faced "*a barrage of criticism at home*"; instead, Dasgupta argues (2011) for a return to the former, consistent, policy GoI policy objective, namely that "*India must ensure that the outcome of the negotiations does not unjustly constrain its energy options or facilitate disguised protectionism directed against emerging economies… (lest) its development prospects will be imperilled if it fails to bring its climate change policy back on track*". In 2011 this battle between advocates of Dasgupta's traditional Indian policy perspective, and policy innovators such as Ramesh, remained undecided and the long-term outcome of Indian policy uncertain. Three years later, India held a general election that has provided far greater clarity on the nation's future climate change policy trajectory, albeit contingent with ongoing indeterminacies regarding extent and rate of policy change.

6.4 Climate Change Policy: 2014/5, Two Years of Sustainable Change

However, following the 2014 All-India general election and the election of a majority BJP government, disruptive change came to India. Whilst Ramesh was considered a '*maverick*', e.g. by Scrutton (2011) or worse (e.g. see Dasgupta, 2011), a government Minister whose activities were both enjoyed and constrained by the limited "*level of support from his party and the prime minister's office*" (Vihma, 2011: 75), climate change policymaking change was now to come from the very top and supported by new institutional structures and key policymaking personnel, as encompassed below. In short, it became "sustainable" in the sense of durability as well as environmentally. 2015 saw the adoption of the multilateral "Paris Agreement" on climate change, see below, and it is the year identified as the '*watershed year*' for Indian sustainable energy sector policy both, using the same exact phrase for the same year, by:

- Krisahn Dhawan, CEO of Indian NGO the Shakti Sustainable Energy Foundation (Shakti Sustainable Energy Foundation, 2016), citing both

national and international policy developments of the '*new Government*' (2016: 1); and

- Anil Razdan, Mr. Anil Razdan, Former GoI Secretary of Power, who in 2018 cited global agreement on the Paris Agreement, the global Sustainable Development Goals, and the constructive role in the GoI facilitating the negotiation of both of these multilateral agreements (Razdan, 2018).

6.5 Climate Change Policy: The Paris Agreement

Under Prime Minister Modi, India helped to negotiate the United Nations Climate Change Conference 21st COP 21 ('Paris Agreement'), which ratified, and specified India's following Nationally Determined Contribution (NDC) targets for 2030: to lower the emissions intensity of GDP by between 33%–35% below 2005 levels; increase the share of non-fossil based power generation capacity to 40% (equivalent to 26–30% of generation); and to create an additional (cumulative) carbon sink of 2.5–3 gigatonnes of equivalent carbon dioxide through additional forest and tree (United Nations Framework Convention on Climate Change (UNFCC), 2016).

Moreover, and according to the international-in-remit Climate Action Tracker (2017) , India is delivering on its COP 21 commitments: "*India's current climate policies will see it reaching its 2030 non-fossil capacity target, and overachieving its emissions intensity target submitted under the Paris Agreement*" (Climate Action Tracker, 2017).

It would be of significance here to note that the NITI Aayog (see below) authored draft NEP (NITI Aayog, 2017b) and Three-Year Action Agenda, running from 2017/8 to 2019/20 (NITI Aayog, 2017a), has accorded importance to coal. In particular, this meant and means: BJP Leader and Indian Prime Minister Narendra Modi, and the National Institution for Transforming India (NITI, the acronym being a pun on "Planning") Aayog (Commission), which Modi's government established (in 2015) and which he is also Chairman of (Modi abolished in 2014 Independent India's original Planning Commission, established in 1950, three years post-Independence) has approved such this position.

Understanding the dynamics of this shift is important in order to better predict the future of Indian climate change politics. However, it is vital to note that this shift is not as all-consuming and revolutionary as it may first appear. India's accompanying statement (i.e. caveat) to its deposition of COP 21 ratification is as follows:

> The Government of India declares its understanding that, as per its national laws; keeping in view its development agenda, particularly the eradication of poverty and provision of basic needs for all its citizens, coupled with its commitment to following the low carbon path to progress, and on the assumption of unencumbered availability of cleaner sources of energy and technologies and financial resources from around the world; and based on a fair and ambitious assessment of global commitment to combating climate change, it is ratifying the Paris Agreement. (UNFCC, 2018).

The above effectively makes contingent India's climate change policy on, inter alia, poverty reduction, and thus provides a line of continuity back to 1974, at least, when Indian Prime Minister Indira Gandhi made clear to the 1972 Stockholm U.N. Conference on Human Environment that "*on the one hand, the rich look askance at our continuing poverty—on the other, they warn us against our own methods. We do not wish to impoverish the environment any further and yet we cannot for a moment forget the grim poverty of large numbers of people. Are not poverty and need the greatest polluters?*" (Indira Gandhi Memorial Trust, 1992: 15). Indeed, "there is a tradition in Indian foreign environmental policy that frames environmental stewardship and socioeconomic development as contrasting priorities" (Vihma, 2011: 74).

The prognosis herein would be: India both pursuing policies, such as energy transition towards renewables and away from coal, that genuinely do advance global climate change policy goals, whilst also including caveats in Indian COP depositions, such as for COP 21. It is consistent with India seeking *national* benefits from pursuing such policies, e.g. low-cost clean-Indian air power generation, primarily for *national* benefit, and its realism/cynicism that thermal coal-fired power's replacement will indeed be a 'long goodbye' and not anything quicker than that—as per the NITI Aayog documents criticised by the Climate Action Tracker above. Furthermore, since the stated objective is *national* benefits and not *international* collaboration nor good faith *per se: 'progressive realism*', i.e. arguing for a shift in India's growth strategy in favour of more environmental sustainability and internal equity by pursuing 'co-benefits', at home—strategies that are shaped by domestic priorities but also bring climate gains, would be consistent with the application of the concept of '*dual politics*', identified by Vihma as prevalent (Vihma, 2011: 75), whereby Indian politicians aim "*at giving conciliatory (climate change) signals to international audience, and a strident, sometimes populist message for domestic audience(s)*". The what-works pragmatism of '*progressive realism*' also allows for combined and complementary factors to be considered alongside this brief analysis of international climate change diplomacy drivers,

in particular: the opportunity of cheap, clean renewable power; and the need to radically improve Indian air quality (a factor alluded to above) and save millions of Indian lives thereby.

Data points in support of this perspective include well-publicised GoI commitments on renewable energy and climate change, for example, and domestically, in late 2014 the new BJP-run GoI established a stretching national target for the country of increasing its solar power installed capacity by a factor of 40 by 2022, from just 2.5 Gigawatts (GW) to 100 GW (Ross, 2016). Even more powerful, the purpose of testing the concept of progressive internationalism as applied to GoI climate change policy and practice, is India's commitment to funding overseas climate change economic development, seeking to collaboratively deliver as part of the International Solar Alliance (ISA) a 1,000 GW target to be met by 2030 (Mohani, 2017) in solar energy of installed capacity across 121 nations, in particular developing nation "solar resource rich countries located between the Tropic of Cancer and the Tropic of Capricorn" (ISA, undated).

6.6 Indian Climate Change Politics: Conclusions

Regardless of the excellent public relations work of Modi's government regarding, *inter alia*, environmental policy (Economist, 2017), the GoI's widely-heralded and internationally-welcomed shift on climate change policy, which is itself hedged by significant small-print caveats, needs to be critically unpacked and examined with regards to its dynamics and the possible, or even likely, unfolding of policy implications into actual change in the make-up of the nation's primary, power sector, energy supply. These insights, recognising positive change on climate change policy and implementation, but critical in its analysis of countervailing factors, is consistent with the conclusion of Progressive Realism as applied to Indian climate change politics.

This represents a change, over a short time period, from the previously identified dominant ethos, namely that of '*Growth-first Stonewallers*', but the evidence is not (yet) there to conclude that the primacy of Progressive Internationalism is imminent in a GoI context. That may come later, perhaps when the accusation of '*dual politics*' has fully lost its validity. These categorisations only matter to the degree that they shed light on India's approach to climate change politics and the reliability and genuineness of any GHG reduction commitments it makes thereby.

The implication of the doctrine of '*Growth-first Stonewallers*' is for India simply not to make any binding commitments or concessions since, as per

that doctrine, why should it? The apparent replacement of that ethos by that of progressive realism, as the dominant GoI position on GHG and climate change, implies a nuanced commitment to Indian GHG reduction action. Such nuances are apparent in the contrasting, on the one hand, high public ambition of the GoI on climate change politics, its claim to global political leadership regarding climate change, and the championing of its burgeoning renewable energy sector; and, on the other, the continuing and planned future importance/centrality of its coal sector within Indian downstream energy, the contingent nature of its Paris Agreement commitments on GHG reduction, and the accusation of '*dual politics*', essentially that of telling foreigners what they want to hear whilst carrying on in India's best interests. A complicating factor to this analysis (another nuance) is that a switch to renewable energy from coal may, in fact, be to India's economic advantage; however, the pragmatism of making virtue out of economic necessity is fully consistent with the somewhat cynical DNA of progressive realism, a cynicism that considers international GHG reduction politics and diplomacy not in the highest of regard, and perhaps more akin to a win/lose game.

Even so, and regardless of exact motivation, a progressive realist approach to GHG reduction, such as taken by the current GoI and, to a reducing degree, recent past governments, is consistent with a major push effect on Indian coal with the effect of its increasing crowding out should a serious competitor energy source become available. Should GoI policy pass onto the stage of Progressive Internationalism, this push factor would become yet stronger, and India's energy transition would be (even) more) energised rather than buffeted.

7 Coal Threat: Review of Domestic and International Push Factors

The combination of domestic (see Sect. 4 above) and international (see Sect. 5 above, the discussion focussed in on India and climate change politics) provides a combined force, or overall 'push', against coal's continuing dominance of Indian downstream energy (electricity).

The individual push factors include a Progressive Realist positioning in international climate change diplomacy, the relatively poor quality of Indian mines coal in terms of both ash content (high) and calorific value (low), the ongoing requirement for coal washeries and imports, the experience of (in particular) the Indonesian imported coal price shock, coal mafia and illegality,

coal mis-governance (especially as evidenced by Coalgate and SHAKTI), the logistical challenges facing coal's transportation, and the fatal impact of air pollution, in particular as caused by lignite combustion and as felt in India's massive and growing cities.

Overall, these push factors seriously and significantly undermine the primacy of coal in India's downstream energy mix.

7.1 The Emperor's New Clothes?

However, the game isn't up yet for coal in India; it is too early to reliably call the bluff on India's coal emperor and his new clothes. However, the situation is dynamic and fast moving, so watch this space. As recently as 2014, it was observed that "*many policymakers and analysts believe that (coal) must remain the primary source of (Indian) electricity generation for at least the next three to four decades, … (consistent with) ever-expanding coal power generation*" sector in India (Vasudha Foundation, 2014: 4). Whilst this view is ebbing from its near-universality, it is not yet visible as a receding object in India's rear-view mirror.

Perhaps this is because that, even now in April 2018, that the Indian coal "emperor" *does have* new clothes: the GoI's national strategic planning documents, current in March 2018, retain a very significant and important role for coal-fired power, even for many decades into the future. This awkward fact is illustrated and evidence by the figures contained in both GoI's: draft, as of March 2018, National Energy Policy (NEP) (NITI Aayog, 2017b: 34–40); and its promulgated Three-Year Action Agenda, 2017/8 to 2019/20 (NITI Aayog, 2017a: 97–103). Echoing the above debate on king coal's future longevity of rein in India, the Three-Year Action Agenda states that "*the reality of India's energy sector is that around three-quarters of our power comes from coal powered plants and this scenario will not change significantly over the coming decades*" (NITI Aayog, 2017a: 99); the draft NEP likewise states that "*coal based power generation capacity of 125 GW in 2012 is likely to go up to more than 330–441 GW by 2040*" (NITI Aayog, 2017b: 34).

Even so, the draft National Electricity Plan (CEA, 2016) reveals that no additional coal-based capacity, beyond that already under construction, is required during the time period 2017–2022, and that the resulting net increase in installed power capacity "*would fulfill the capacity requirement for the years 2022–2027*" (CEA, 2016: 5.34). This is partly due to increased projected "*capacity addition from gas (of) 4,340 MW, hydro (of) 15,330 MW,*

nuclear is 2800 MW and renewables (of) 1,15,326 MW, as committed capacity during 2017–2022" (CEA, 2016: xxv).

7.2 Paradigm Shift: From King Coal to Sun King?

Gulagi et al. (2017: 48) argue that "*for India, a 100% RE-based system is achievable and the real policy option*", mainly solar, implying an inferiority of any option falling short of 100% RE supply, on the basis of India achieving the necessary "*storage solutions to balance intermittency… (in particular) batteries, which provide as much as 42% of the total electricity demand*" (Gulagi et al., 2017: 37) in this modelling. This RE energy mix would not just be better for the Indian (and global) environment but would be cheaper too: "*results indicate that a 100% renewable energy based plants and storage technologies installed to achieve a fully RE based power system by 2050 considering the base year's (2015)*" (Gulagi et al., 2017: 37). The above would represent a striking paradigm shift of global significance, both economically and environmentally, in sum and in sun. However, the bar for achieving a paradigm shift from the monarchy of King Coal to the 'Sun King' is surely set far lower than 100%. The Indian reality is likely to be more nuanced, drawn out, and incomplete, than that modeled by Gulagi, Bogdanov and Breyer—which is simply a truism of models in general.

In draft NEP policy terms, India's transition to renewable energy and away from coal is best represented by the '*Greater Sustainability*' key policy objective, and it is driving forward a clean energy transition away from coal in India that is spearheaded by the low-and-lower prices achieved through competitive bidding. Downstream energy market penetration now achieved, its rival the coal sector can and is looking for protection from the other NEP key policy objectives listed, namely '*access at affordable prices*', '*improved energy security*', and '*economic growth*' (NITI Aayog, 2017b). Yet, on many of these points so too can renewable energy: now that renewable energy matches or betters coal on price, so too its broader adoption can match or better coal as a driver of economic growth, affordable access, and national self-sufficiency in reliable (outside of the non-monsoon season) downstream energy supply. In fact, solar and wind have recorded historic low tariffs through competitive bidding in May 2017 at Solar Park Bhadla III: 2.44 Indian Rupees (INR) per unit for solar and INR 2.64 for wind, thereby achieving grid parity (KPMG, 2017: 1). As a result, India's adoption of renewable energy is continuing apace, even "*an irreversible trend*" (KPMG, 2017: 1).

As of November 2017, India had achieved installed solar energy capacity of 14.7 GW and installed 2,247 MW of new capacity in the third quarter of that year alone, such that "*solar continues to be the leading new power generation in India… solar new installed capacity additions accounted for 39 percent of total power capacity additions at the end of the third quarter*" (Mercom India, 2018). Indeed, solar energy's development has been so fast that the commentary on solar energy provided in India's 2006 Integrated Energy Policy (Planning Commission, 2006), can now be read as unduly limited in its aspirations for the sector, or perhaps simply as misplaced and patronising: "*it would not be out of place to mention that solar power could be an important player in India attaining energy independence in the long run. With a concerted push and a 40-fold increase in their contribution to primary energy, renewables may account for only 5 to 6% of India's energy mix by 2031–2032. While this figure appears small, the distributed nature of renewables can provide many socio-economic benefits*" (Shahi, 2007: 169).

However, some of these socio-economic benefits are proving hard for India to accrue, not least with respect to solar energy manufacturing jobs argument: in February 2018 it was reported that 88% of India solar modules and generating equipment is being imported from China, with Indian firms unable to compete against imports that have allegedly benefited from (unknown levels of) Chinese government subsidies (Razdan, 2018). GoI attempts at favoring Indian solar manufacturers through levying a 7.5% import levy from August 2017 were abandoned by May 2018 following a logjam of imports at Indian ports. This is an outcome that both benefits India's power sector through lower costs but also reduces the national benefit, in economic terms, of the energy transition since the manufacturing jobs supported are overwhelmingly Chinese, not India. This contentious outcome mirrors discussions regarding imports of both coal to India and also of imported coal washing technology.

Contentious and/or contested energy sector governance is not limited to any one energy source in India, but regrettably afflicts solar at least partly in the same way as apparent in the thermal energy sector in that country too, and nor is the manufacturing jobs argument notably compelling in respect of Indian content (manufacturing jobs), at least so far as solar energy is concerned. Moreover, coking coal is still required for metallurgical use, given the extremely high temperatures required, in particular in the key, and energy intensive, steel sector of the Indian economy. This is effectively a protected market for (coking) coal that any other form of power production will find it very hard to compete with (Razdan, 2018).

Akin to governance malaise cross-contamination, the risk of underbidding on price by failing to cost in risk that struck India's thermal power sector, in

that case by way of Indonesian government policy change, could equally, and through some other causal chain, impact India's renewable energy sector too—possibly with equally damaging results in terms of the credibility of the sector's overall regulation and governance. Indeed, there are initial signs of this already happening, albeit at a far more limited scale than has afflicted coal: an annual 'Economic Survey' official GoI publication (Ministry of Finance, 2018: 72, of Volume 2) reflects that low RE tariffs resulting from auctioning "*though a welcome news, possibly contributed to some demands for renegotiation of the already signed PPAs*" with some discoms hinting "*at the possibility of renegotiating the PPAs signed by them at tariffs higher than those in the recent bids*" at a possible "*risk for investments worth 480 billion INR*".

While the GoI subsequently notified that any such cancellation by either the state or the developer will attract a minimum of 50% penalty of the tariff (Reuters, 2017), an issue linked to the '*spectre*' of downstream energy over-capacity as Indian RE fights for electricity market share against its, coal, incumbent: "*recent cases of reneging of PPAs have further added to the spectre, needing system-wide resolution to the stressed asset problem*" (KPMG, 2017: 1). As a result, one state, "*Andhra Pradesh, which accounts for the highest number of solar projects in the country, is not (now) looking to sign new PPAs in the near term*", due to over-capacity (Reuters, 2017).

Such over-capacity of supply of energy, as a whole, is symptom of the success of renewable energy generation in particular, leading to "*stress in the (energy) sector—thermal to a large extent, and renewable seeing some signs*" (KPMG, 2017: 1), as noted above. As indicated by the KPMG (2017), the resulting pain is being felt unequally between thermal and RE Indian energy producers; that is India's new downstream energy monarch and the old.

Overall, these travails can be seen to have a dampening impact on India's RE sector and energy transition, even as many of the same factors negatively impact its thermal sector too, and to an even greater extent. Whilst a rising tide may float all ships, rising levels of indebtedness may result in them being tied up at harbour, whether they are powered through renewable energy (e.g. wind) or fossil fuels alike. Writing in 2018, the authors of (Frankfurt School—UNEP Collaborating Centre for Climate & Sustainable Energy Finance, 2018: 22), observe Indian renewable energy "*investment oscillating in the $6-14 billion range since 2010—still not reaching the sort of levels that would be required for that country to meet Prime Minister Narendra Modi's ambitious goals for 2022*." A report of the same year (International Energy Association (IEA), 2018), India's 2017 increase of 6% in renewable energy generation (page 10) is observed to fall only marginally short of its 7% GDP growth rate

for that year, but substantially short of the increased level of Indian electricity demand in 2017, reported at "over 12% (or 180 TWh)" (IEA, 2018: 12).

Moreover, whilst Indian targets for greatly increased levels of renewable energy installed capacity may (or many not) be achievable, there is a difference between capacity and utilisation, and that continues to favour coal overwhelmingly: comprising only 58% of installed capacity, as reported in February 2018, coal-fired power accounts for 76% of actual power (electricity) generation (Shahi, 2018). Hence, "*a large selection of informed people have started also cautioning: that we all love renewables, but are we all OK in the targets that we have fixed for ourselves (in India)? …Not from the point of view whether it is achievable, but from the point of view of whether (we) will be able to manage technically, commercially, financially all the things put together*" that are required to make implementing policies born of "*overwhelming support for renewables and overwhelming criticism of coal*", a success in terms of not just installed capacity, but power generation (Shahi, 2018). Shahi, answers his only question by predicting no major shift in the proportional constituents of India's energy mix, in terms of actual power generation rather than installed capacity, over a time period of fifteen to twenty years (Shahi, 2018).

That indeed, would be the prelude to a very 'long goodbye' to Indian coal burning, assuming indeed that an energy transition to renewables happened even thereafter. Whilst it is not necessary to agree with this, very conservative, prognosis, this contrarian view, expressed very recently (to this chapter's publication) in 2018, demands recognition too; if it is to be rejected, then that rejection should be evidence-based and not due to its unwelcome (to many readers) conclusion, i.e. as a matter of wishful thinking.

8 Conclusions

It is in the nature of paradigm shifts that they are hard to predict the outcome of, even in periods when they are occurring (Kuhn, 1996: 83), and it is entirely possible—e.g. as a result of a high impact and highly visible instance of an inconvertibly climate change related extreme weather event occurring in or near India—that the paradigm shift effected could not be from coal to non-coal primary sources of energy generation.

It is possible that India's energy transition, from fossil fuels to cleaner forms of energy such as renewables, is developing at such a pace that coal will be eclipsed as a primary energy source in India far faster than expected, but the prudential principle forbids too hasty a jump to such a conclusion.

What is surely clear even now, however, is that such a paradigm shift is occurring, and that fundamental change is occurring within that sector, change unleashed by a potent mix of different factors and forces; only time will tell how long the resulting goodbye to fossils will be. This, indeed, is the conclusion of Sivaram and Busby (2018), who still predicts a large-scale and significant Indian energy transition towards more (specifically) solar power—it is the timescales of that energy transition that the Review revises to 2022 from the target date of 2020, not whether or not those targets will be met.

Hence, we argue above that the pace of India's energy transition away from, or 'long goodbye' from, coal (in particular) and towards other forms of energy, especially renewables, is a matter of public policy alongside good economics and the (mis)management and governance of the power sector, and of the sourcing of the natural resources necessary to supply that sector—in particular coal.

GoI policy changes outlined above were and are happening in tandem within the context of radically changing energy economics, driven in part by private sector competition and in part by technological change and related cost curves. The economics is in part driven by technological change, and the follow-through impact on Indian climate change policy of the above in sum is openly stated in India, e.g. Anil Razdan, Former Secretary of Power, GoI, whilst reviewing current Indian energy policy and contrasting it to that prior to 2015, stated simply that '*technological development will shift the debate*' once more (Razdan, 2018), the implication being of a clear direction of travel towards cleaner energy that is driven by technological innovation and, thereby transformed economics.

If true, and thus far the evidence supports such optimism, the net result of all of the above changes would be to empower an insurgent competitor to coal in India's energy markets, namely renewable energy, and to undermine coal's ongoing hegemony. The observable fact of an energy transition from coal towards renewables is undeniable, however to what degree this highly dynamic and transition occurs and how fast it does so, remains to be seen. As Jeff Bezos, CEO of Amazon, once advised: "*if you want to build a successful, sustainable business, don't ask yourself what could change in the next ten years that could affect your company. Instead, ask yourself what won't change, and then put all your energy and effort into those things.*" (D'Onfro, 2015). '*What won't change*' is surely the advent of RE and an, ongoing, 'long goodbye' to coal fired power generation, even in India.

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