Coal and thermal power generation
Inputs to National Energy Policy 2015

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1 Background

The Government of India has entrusted NITI Aayog with developing a National Energy Policy (NEP), which is expected to provide an overarching framework for the direction of India's energy sector for the near (2022) and medium (2030) terms. As part of this process, NITI Aayog has invited Prayas (Energy Group) to provide inputs on coal and thermal power generation[1] based on stakeholder consultations. Accordingly, a background paper was prepared by Prayas and shared with various stakeholders. Based on the background paper, consultations were held with around 30 stakeholders at a roundtable discussion chaired by the Secretary (Energy), Government of Maharashtra in Mumbai on October 19, 2015. The list of organizations represented at the consultations is given in the appendix. This note builds on the background paper and incorporates the inputs from the consultations and constitutes Prayas's inputs to NEP 2015 on the coal and thermal generation sectors.

2 Introduction

India is characterized by low levels of access to and consumption of modern energy. According to the 2011 Census, about a third of India's households (80 million) did not have access to electricity and about 70% of households (170 million) did not use modern cooking fuels as their primary cooking source. India's per-capita consumption of modern energy – at less than 500 kg-oil-equivalent (kgoe) per-capita per-year – is less than a third of the global average of around 1,800 kgoe per-capita per-year. India's domestic reserves of conventional energy resources such as oil and gas are limited and these are reflected in rapidly growing imports with India's import dependence reaching about 33% in recent years. Other important resources such as land and water are also highly constrained and contested.

India produced about 610 million tons (MT) of coal[2] in 2014-15, with about 80% (494 MT) of this coal being produced by Coal India Ltd. (CIL). While domestic coal production in 2014-15 increased by about 8% compared to 2013-14, imports went up by about 30% from 167 MT in 2013-14 to about 218 MT in 2014-15 though imports in the first half of 2015-16 have been lower. The Government of India has announced ambitious targets for domestic coal production and hopes that India would produce about 1500 MT coal by 2020 with CIL producing 1000 MT of those. It has also initiated a series of reforms in the coal sector with this objective.

[1] In this note, thermal generation is intended to mean coal- and gas-based generation. In particular, it does not include nuclear generation.

[2] These numbers do not include lignite. Data source: Ministry of Coal and Coal Controllers' Organization

India has an installed thermal generation capacity of about 192 giga-watts (GW) as of August 31, 2015 of which about 168 GW is coal-fired and about 23 GW is gas-fired. Thermal generation capacity forms about 80% of India's installed capacity today and contributes about 83% of total generation[3]. Installed thermal capacity has grown rapidly from 92 GW in 2008 to about 192 GW in 2015 and is further expected to grow to about 285 GW by 2022 and 350 GW by 2032 according to the "Determined scenario" of IESS 2047[4]. The working group of the Ministry of Power for the 12th Five Year Plan projected the addition of about 125 GW of thermal capacity by 2022 from a base of 132 GW in 2012.

While these sectors have such ambitious plans for growth, they also face multiple challenges. There are reports of significant 'stranded assets' in both coal- and gas-fired generation sectors. This is due to many reasons such as a shortage of fuel, contractual disputes and, perhaps most significantly, subdued demand[5]. There is also considerable flux in the international market with the rapid growth of shale gas from the US, rapidly falling international coal prices and more recently, oil prices. In contrast, the discovered prices for coal-based generation have been steadily increasing in India even as the cost of renewable based generation has been plummeting[6]. India has also announced ambitious targets for renewable energy capacity addition (175 GW installed capacity by 2022) and announced in its INDC[7] that it would strive to achieve a share of 40% for fossil-fuel-free electricity capacity by 2030. Therefore, in the medium term, economic as well as environmental factors will drive radical transformation in the Indian energy system, which will bring its own challenges.

These factors call for a comprehensive re-assessment of India's energy costs, demand, supply options and hence requirement of coal and thermal capacity, factoring in priorities such as providing affordable and reliable quality of supply to all citizens. Given the dynamic nature of the energy system, the Government should undertake such detailed analysis on a periodic basis in a consultative manner, so as to be able to inform policy on an ongoing basis. For the present exercise, it is assumed that India is likely to require an augmentation of its coal production and thermal capacity and generation in the short term and also the medium term. The policy suggestions below are based on this assumption.

3 Coal

Ambitious targets as well as many significant reforms have been announced in the coal sector. However, the coal sector also faces significant challenges that require policy responses. The likely change in the role of "King Coal" in the Indian energy basket would also have to be factored in. This section proposes policy relevant suggestions for the Indian coal sector[8] for the short and medium term in this context.

[3] Data source: Central Electricity Authority
[4] See indiaenergy.gov.in
[5] This demand represents the demand for power from consumers with access to reasonably reliable power supply and to the extent that they can afford. It does not account for latent or unmet demand.
[6] Recent power procurement auctions have discovered prices of around Rs 5/kWh for both coal-based and solar power.
[7] Intended Nationally Determined Contributions, to be submitted as part of ongoing international climate negotiations.
[8] This note does not cover issues related to imported coal and primarily focuses on domestic coal related issues.

3.1 Sector structure and governance

In the past, the coal sector has faced serious problems regarding governance of the sector and enforcing contracts. Examples include lack of clear policy framework[9], the problems around allocation of coal (through captive blocks or linkages)[10] and the strictures passed against CIL by the Competition Commission of India[11] regarding its non-adherence to fuel supply contracts. In light of the proposed reforms to the coal sector, the following suggestions to improve the governance and management of the sector may be considered.

1. **Regulation and concession management:** The coal sector requires an independent, empowered and accountable regulator given the multiple challenges faced by the sector and the reforms that are proposed such as opening up the sector for commercial mining. In case of commercial mining, the issue of concession contract design and management also becomes critical and needs to be developed based on Indian realities and international best practices to ensure a fair balance between risk and reward, and between ensuring that the benefits of the resource are used for public interest and making it attractive for investors.

   There have been periodic proposals for such a regulator, and such a regulator has also been recommended by various committees in the past[12]. The structure, empowerment, roles, responsibilities and accountability of the regulator should be devised based on lessons learnt from other energy sector regulation exercises such as the power and natural gas sectors, and it should dovetail with the regulations and functions of the power sector regulators. Introduction of such a regulatory structure should be a pre-requisite to initiating serious reforms in the sector.

2. **Linkages and supply contracts:** Policies such as the New Coal Distribution Policy (NCDP) and contractual arrangements such as the Fuel Supply Agreement (FSA) have their own weaknesses and need to be amended to address the weaknesses.

   The method of granting linkages under the NCDP allowed for discretionary allocations. To address this, the Government has proposed to auction linkages as a means of allocating them fairly. While doing this, the NCDP should be revisited and amended appropriately. Additionally, the Government may also factor in viability of end-use projects and rational bidding for linkages, as the initial experience from coal block auctions suggests that it could lead to exuberant and perhaps irrational bids in an attempt to ensure coal supply. It should also ensure rational allocation of linkages to minimize coal transportation needs.

[9] There was no policy framework for linkage allocations until a Supreme Court judgement led to creation of the New Coal Distribution Policy in 2007.
[10] See http://supremecourtofindia.nic.in/outtoday/wpcrl120.pdf and http://prayaspune.org/peg/publications/item/267.html.
[11] See http://www.cci.gov.in/May2011/OrderOfCommission/27/592012.pdf.
[12] For example, the T L Sankar led expert committee on roadmap for coal sector reforms.

The current model FSA structure seems to be unable to assure coal customers of the quality and quantity of coal, as evidenced by multiple complaints from power and other coal consumers and orders from the Competition Commission of India. Two issues need to be urgently addressed to overcome this challenge. The first is to develop a mechanism for testing the quality and quantity of delivered coal at the consumer end to ensure adherence to contract. Some moves have been initiated in this regard such as having an empaneled set of agencies for third party sampling. These have to be strengthened further through development of appropriate protocols and dispute resolution mechanisms to ensure fairness in contract adherence. The second is to include coal transporters – Railways or road transporters – as part of the contracts, since they need to ensure that the quantity and quality of coal loaded reaches the destination. Both these issues have also been highlighted in earlier expert committee recommendations and should be implemented expeditiously. The need for such well-developed contract structures and protocols to ensure their adherence will become even more important if the coal market structure changes to have multiple suppliers and consumers entering into supply contracts. There is the possibility of deviations from the model FSA structure for specific contracts. Such deviations should be overseen by some appropriate authority and available in public domain.

3. **Role of coal:** The role of coal in the energy sector will undergo significant change in the near to medium term due to economic and environmental reasons. Therefore, there is a need to realistically and periodically reassess the role of coal in the Indian energy basket in the medium to long term, beginning with more realistic demand estimation under different price and technology trajectories. Future investment decisions into coal, say beyond the 12th five year plan, should be guided by such an assessment to avoid resource and technology lock-in that may be detrimental. In this context, it would perhaps also be good to revisit mining lease structures, fuel supply contracts and power purchase contracts, wherever applicable, to make their durations shorter and/or more flexible.

3.2 Enhancing domestic production

The Government has plans to enhance coal production significantly in the coming years. It aims to do so through increasing production from CIL as well as from other sources such as captive mines and, perhaps, commercial mining by private sector miners. In this context, the following suggestions may be considered.

1. **Coal reserves:** India currently publishes data about its coal resources and reserves using the ISP code[13], which is not the same as internationally accepted standards such as UNFC or JORC. The Government should either switch to an internationally accepted standard or clearly state why ISP is more suitable for India. In any case, India should expedite exploration of its coal bearing areas (while respecting natural constraints such as dense forests and rivers) to determine the useful coal reserves available for exploitation and publish such information with GIS mapping. This will transparently provide information to all stakeholders about the extent of reserves and their location (including information such as their relation to dense forests, habitations, rivers, demand centres)

[13] One report on UNFC classification of the blocks then held by CIL was published in 2013 (http://www.cmpdi.co.in/unfc_code.php), but no further such reports have been published.

etc. and enable better policy formulation, planning and investment decisions. Such publicly available information along with supporting policies can also help to expedite issues related to land acquisition and forest clearances.

2. **Productivity:** In all future coal production scenarios, CIL would almost surely remain a major player. Historically, CIL's productivity has been quite low and it has an aging workforce[14]. Recently, steps have been initiated to address this. These initiatives should be actively tracked and CIL's productivity figures should be benchmarked against international best practices to make it an efficient coal miner in addition to the world's largest coal producer. Schemes such as sharing the bulk of extra revenues from increased productivity between CIL subsidiaries and its employees (rather than being shared with the Government as dividend) may be considered. CIL and its subsidiaries should also consider investing in improving the skills and capacities of their workforce to improve their productivity so that they can contribute towards increasing domestic production.

3. **Model of private participation:** The current discourse regarding private participation in the coal sector is either around captive coal generation for an end-use or commercial mining. There are many arguments against captive mining as an approach, such as sub-optimally sized blocks, insufficient mining expertise among end-users and loss of coal under block boundaries. Thus, commercial mining is likely to be an important option for the future as current legislation allows for it. In such a scenario, adequate policy measures should be in place to ensure that a genuinely competitive market emerges in the coal mining space. In particular, policies would need to facilitate price discovery through real arms-length transactions and 'unbundling' of various activities in the coal value chain (such as mining, washing, transportation, handling and end-use). Regulation of mining, markets and contracts would also be important and policies for these should be devised before commercial mining is introduced. Similarly, transparency is an indispensible aspect of a well-functioning market system. Therefore, policy and legal changes necessary for instilling transparent market operations and creating a level playing field should precede opening up of the sector.

   For the power sector, India could also consider the option of 'case II' or UMPP like bidding model. This will help to keep electricity tariffs low in a country with severe access and affordability constraints, even if this may result in forgoing revenues and may suffer some of the problems of captive coal blocks.

4. **Other issues:**
   - Underground mining: India currently produces a small share of its coal from underground mines. Many coal sector experts feel that this is unlikely to change for a variety of reasons. Coal seams in India are not suitable for efficient underground coal mining techniques such as long-wall mining. Underground coal mining is also typically costlier, extracts only a small part of coal reserves, is more hazardous and is liable to accidents such as mine collapse and fires. Moreover, open-cast mining techniques have now improved to be able to access coal

[14] See, for example, the report of the Working Group on Coal and Lignite for the 12th Five Year Plan.

at depths of greater than 500 m also. Hence, it is felt that underground mining may not play an important role in Indian coal mining, though care should be taken that overburden from open-cast mines is stored carefully and safely, and exhausted mines are restored properly.

- Coal-bed methane and underground coal gasification: Coal sector experts feel that India does not have very good prospects of coal-bed methane which can be exploited in an economically viable manner. Therefore, coal-bed methane policies should perhaps be revisited, while ensuring that the methane is dealt with in a safe manner. Some experts have also suggested underground coal gasification as an idea to exploit coal resources that may not otherwise be accessible. This option needs to be scientifically explored.

3.3 Pricing and allocation

Currently, allocation of coal through linkages is Government-controlled, while allocation for captive consumption is partially Government-controlled (allotments) and partially through auctions[15]. Pricing of commercially sold coal is determined by CIL. However, with the changing dynamics of the coal and energy sectors, these will perhaps change in the near to medium terms. In this context, the following suggestions need to be considered.

1. **Market structure:** In a future situation where there may be multiple coal producers, there is a need to consider what kind of market structure would be desirable. In particular, there should be clarity about whether there would be one coal market in the country or segmented markets for different end-uses, since the structures of the consuming sectors and their ability to absorb coal prices are quite different. For example, it would be worth debating whether a case-II or UMPP like model would be appropriate for the power sector. It should also be kept in mind that creation of a unified nation-wide coal market would require robust evacuation infrastructure including rolling stock – which is currently a serious challenge.

2. **Role of CIL:** The role of CIL in such a market structure also needs to be considered, given that it is likely to be a major player in any future scenario. In the past, some reports have recommended breaking CIL into a set of smaller mining companies which would then compete with each other and perhaps with other market participants. On the other hand, if CIL is seen not just as a market participant but as a critical component of national energy security which produces and supplies an important fuel, then its role needs to be viewed differently from other market participants. Such a discourse needs to take place as the country moves towards opening up the coal sector.

3. **Pricing and allocation:** Two issues closely related to the market structure are allocation and pricing of coal. There needs to be clarity whether opening up the coal sector would only be to introduce more players into mining operations or whether it is also to move towards competitive markets. If it is the former, then there is a need for an empowered and enlightened regulator who can determine prices for various coal consumers and also an objective and transparent method to allocate the resource among many applicants. If it is the latter, there is a need for a market design and

[15] It should be noted that even in the auction process, the actual end-user of coal from a block may be different from the block winner due to the possibility of “arrangements” and “diversions” that is provided for.

regulatory structure to ensure a level playing field and genuine competition, which can ensure that all coal consumers have a fair chance of accessing coal at non-discriminatory prices. Coal from other sources such as imports should also be factored into devising policies to deal with pricing and allocation. Either approach would require the setting up of an effective regulatory framework.

4 Thermal generation

Coal based thermal generation is critical to meet base load and is also an important component of the Government's plan to provide 'Power for All' by 2019. Natural gas is the second most used fossil fuel in power generation and fuels about 10 percent of India's installed capacity. However, since India only owns about 0.7% of natural gas reserves[16] and given the limited exploration of its sedimentary basin thus far, India imports a significant amount of its natural gas requirement. Between the years 2006-07 and 2013-14, natural gas imports have grown at the rate of about 12.5% per annum while the net import bill for natural gas has increased by about 41% every year in the same duration[17]. Given the uncertainty of domestic gas production and availability, the share of gas-based generation is unlikely to increase significantly in future though it could have a critical role to play in meeting peak power demand and/or variability due to increased penetration of renewables.

Generation cost is one of the most crucial parameters that accounts for more than 70% of the cost of electricity supply. Many newly commissioned thermal generating plants have high tariffs and face the danger of being backed down as per merit order dispatch. Further, power distribution utilities are under severe financial distress with accumulated losses being estimated at Rs. 2.5 lakh crores. Such high and rapidly increasing financial losses have a debilitating effect on the sector posing a serious threat to not just the sector but the economy at large, and will be a strong deterrent to higher uptake of new thermal capacity. CEA published load and generation balancing report anticipates 19 states to have 'surplus' energy in the year 2015-16. Without major changes towards scientific demand estimation, capacity addition planning and market based instruments; many states could end up with high cost surplus power[18] and no buyers, and simultaneously have huge unmet and latent demand. It is interesting to note that against a target of 63 GW of thermal capacity addition in the 12th five year plan, 53 GW have already been added by 2014-15 and 20 GW is in the pipeline for 2015-16. Thus, the issue facing the thermal generation sector, in the short term, is not of availability but of affordability. The following policy suggestions for the thermal generation sector are given in this background and context.

4.1 Capacity addition planning

[16] BP world energy statistics, 2015

[17] Table I.4, Pg. 10, Indian Petroleum & Natural Gas Statistics 2013-14, MoPNG

[18] Distribution utilities routinely curtail demand by shedding load and 'managing' agriculture demand. Based on revenue considerations, utilities can choose to not supply power to certain areas or category of consumers. Presently, there is no accountability mechanism to regulate and monitor actual supply hours and hence the utilities can claim to be surplus and also undertake load shedding simultaneously, without facing any regulatory action.

With the carriage and content separation being proposed under the amendments to the Electricity Act 2003[19] and strong policy push for renewables[20], the issue of need, demand and role for thermal capacity becomes an increasingly important issue. The following recommendations are made to address this.

1. **Role of thermal generation:** It is necessary to have a clear policy vision regarding the role for thermal generation in the short and medium term, and any required transition in the role. As stated earlier, this should be based on a periodic assessment of the demand and supply options given current technology and price trends. If gas based generation is expected to meet peak demand and / or act as balancing supply and the coal-based capacity is likely to operate at lower PLFs and perhaps also meet some of the variable demand, then these issues need to be studied further. Specifically, it is desirable that policy mechanisms should be devised to price capacity and availability, so that higher penetration of variable renewable capacity is possible without jeopardizing affordability. An agency such as the Central Power Research Institute should also study how Indian coal-based plants can be designed to act as balancing options and the resultant cost implications.

2. **Possibility of lock-in:** The challenge of potential lock-in of large investments in thermal generation needs to be dealt with. For example, it may be more prudent to first maximally utilise all existing (and stranded) capacity before going in for further capacity addition. Bidding and contracting mechanisms may also need to be revisited to factor in the costs and risks of lock-in. For example, shorter term power purchase agreements could be thought of, rather than the current 25 year duration.

3. **Market determined capacity addition:** The rapidly evolving nature of the power sector, market structure, technologies and prices make the traditional CEA approach of demand forecast obsolete and unreliable. While CEA can improve its broad supply and demand forecasting methodology, distribution utilities should be strongly encouraged to do their own detailed assessment of power demand based on ground realities to contract power supply. With increased open access and carriage and content separation, the following approach can be considered for capacity addition:
    a. Existing thermal capacity should be reserved for the existing distribution utilities, to the extent needed for meeting the demand of their regulated, small consumers (LT agriculture and small domestic). In addition, coal blocks should be allocated to states that do not have sufficient generation capacity to meet their present and future LT demand for the fulfillment of the national target of '24 x 7 Power for All'. Such blocks can be used to procure power through case-2 or UMPP like bidding.
    b. New thermal capacity addition should be determined by market forces, based on the demand for such capacity from the open access eligible consumers. Thus, open access eligible consumers and the new supply licensees should be the primary procurers of any

[19] See http://prayaspune.org/peg/publications/item/293.html
[20] There is already a plan and policy commitment to have 175 GW of renewable energy based capacity by 2022. Additionally, as per India's INDC, 40% of India's installed capacity in 2030 will be from fossil fuel free sources.

new thermal capacity and their demand should be the primary factor to determine the need and extent of such capacity addition.

c. To the extent that thermal capacity addition is undertaken for meeting peak demand, fulfillment of responsibilities as supplier of last resort and/or grid stability and management purposes, such capacity should be priced accordingly while insulating the small-regulated and/or newly electrified consumers from such burden.

4. **Transmission and distribution infrastructure:** With increasing capacity addition and likely increase in demand, the country's transmission and distribution infrastructure needs to be strengthened. This is required to ensure a smoothly functioning grid that can handle regional variations in supply and demand, to ensure quality of supply to consumers in all parts of the country and to reduce transmission and distribution losses. The current discourse of transmission planning focuses more on managing greater penetration of variable renewable capacity and needs to be broadened to factor in the above concerns. As transmission infrastructure is typically very investment intensive, it should be undertaken in a transparent and competitive regime.

4.2 Efficiency and performance

As per CEA data, more than 32,000 MW of existing coal and gas-based capacity is older than 25 years and needs to be phased out. Further, most of the state owned thermal generating stations tend to have low plant load factors and high station heat rates, which leads to inefficient fuel utilisation and increased per unit costs,. As efficiency improvement is a lower cost alternative to building new capacity, it should be explored as the first option. In this context the following can be considered:

1. Renovation and modernization of existing thermal capacity to improve operational efficiency and reduce emissions through appropriate regulatory mechanisms and incentives should be considered.

2. Better regulatory and policy mechanisms to improve efficiency: Improving the efficiency of power generation is important if India has to achieve its INDC commitments. The following suggestions aim to provide the right policy signals to power plants to improve their efficiencies.
    a. Tariffs for capacity under Section 62 of the E-Act (regulated capacity) are determined on a cost-plus basis based on actual quantity and quality of coal received and burnt in the plant. This eliminates the need for generators to improve their plants' efficiencies and seek enforcement of fuel supply contracts. It also complicates the electricity regulator's task. Therefore, a uniform approach to determine energy charge based on normative parameters for heat rates, auxiliary consumption, etc. determined by an agency such as CEA and coal costs as determined by signed FSA may be considered to incentivize efficiency improvement in regulated power plants. This should, of course, go hand in hand with efforts to ensure that coal suppliers comply with FSAs.
    b. The competitive bidding framework for thermal power procurement has recently been modified to make fuel cost entirely a pass through element. Since fuel cost is a major

component of electricity cost, making it a pass through effectively reduces an important aspect of competition. Moreover, it eliminates all incentive to improve plant operation efficiencies. Therefore, the fuel risk (cost, quantity and quality) of all competitively bid procurement should remain with the bidder and not be made a pass through.

c. Government agencies such as CEA or CPRI should periodically benchmark fixed and variable costs for a given unit size, technology, cooling system, normative heat rate etc. to act as a guide in evaluating bids (for competitively bid power) and costs (for regulated power).

5 Coal and power sector linkages

Given the close connection between the coal and power sectors, policies in these two sectors also need to go hand-in-hand. Unfortunately, that has not generally been the case so far. For example, the initial rounds of bidding for power procurement discovered seemingly competitive tariffs. However, inconsistent understanding, interpretation and implementation of coal sector policies and contracts have resulted in many projects seeking a revision of discovered tariffs and thus possibly forgoing the advantage of the low discovered tariffs. None of the UMPPs have also delivered power at the contracted price though they had been hailed as a successful model for power capacity addition and procurement.

Therefore, coal and power sector policies should be developed in an integrated manner to facilitate competitive discovery of generation tariffs. The case-II bidding approach discussed earlier in the coal section could be one such mechanism. End-to-end completely competitive markets could be another mechanism, though setting up such competitive markets along the value chain requires careful policy, regulatory and contractual design and oversight.

It should also be kept in mind that coal and power generation related policies will be infructuous without addressing the financial woes of distribution utilities through a comprehensive approach that factors in social and political realities such as the need and pressure to provide affordable, reliable, universal access and the need to provide some level of subsidy to the needy.

6 Social and environmental concerns

Coal mining is an inherently unsafe and hazardous profession[21]. Coal mining and thermal power generation have social and environmental implications due to displacement, pollution and associated impacts, deforestation etc. Historically, India's record on these aspects has not been very good. CIL's sustainability report for 2013-14 says that total number of fatalities and fatality rates at CIL have increased between 2011 and 2013. These reports also reveal that the share of informal or contract workers in the total workforce has increased, while a 2010 CAG audit of CIL's Corporate Social Responsibility finds that only about 8% of such contract labour are subject to regular medical check-ups though it is mandated that all workers should be checked at regular intervals. Air pollution data

[21] For example, the report of the working group on occupational safety and health for the 12th Five Year Plan says that coal mining is "recognized as one of the most hazardous peacetime occupation[s]".

available from Government databases[22] show that particulate pollution levels near coal mining and thermal power projects are consistently higher than permitted norms with some sites even reporting concentrations more than 3 times the permitted norms. Therefore, these issues need urgent attention. The following suggestions may be considered to address these issues and enable sustainable and inclusive development.

1. **Labour issues:** The Parliamentary Standing Committee on Coal and Steel has made certain recommendations[23] regarding worker safety that should be considered for implementation:
    a. Many laws governing worker safety, such as the Mines Act 1952, the Electricity Act 2003 and Explosives Act, 1884 should be revisited.
    b. Compensation packages for those injured or killed should be revisited and should be disbursed in a timely manner.
    c. It must be made mandatory to wear protective gear in hazardous activities and subject the workforce to periodic preventive health checkups.
    d. Good practices in safety audits and risk assessments put in place by Neyveli Lignite Corporation should be replicated across all coal companies.

    In addition, all these facilities and appropriate safety nets should be extended to contract labour and labour used by MDOs also. Coal companies should also consider skilling their workforce appropriately to increase their productivity on one hand and, over the medium term, to help them adapt to occupations outside the coal sector as the coal sector gradually approaches its sunset.

2. **Air and water issues:** Coal mining and transportation results in significant particulate pollution. It could also affect local water tables. Coal-fired power generation results in air and water pollution through the chimney stack as well as ash disposal. Coal-fired power generation is also quite water intensive. While the Government has proposed new norms for emissions from power plants and for water consumption for coal-fired power generation, the current state of air and water pollution near coal mines and coal-fired power plants is very poor, suggesting a need to strengthen mechanisms and policies to mitigate the social and environmental impacts of coal mining and power generation. Some measures are suggested below:

    a. It is understood that India's air and water quality norms are considerably weaker than corresponding WHO norms. India should tighten its norms to match world's best practices.
    b. Pollution Control Boards (PCBs), which are responsible for monitoring and ensuring compliance to environmental management plans, should regularly publish environmental management plans along with compliance reports submitted by industry and reports of onsite inspection carried out.
    c. Air and water pollution levels, as well as other indicators such as ground water levels and land productivity should be monitored and published on a real-time basis in an easily

[22] See cpcbedb.nic.in and data.gov.in
[23] See http://164.100.47.134/lsscommittee/Coal%20&%20Steel/16_Coal_And_Steel_14.pdf

accessible form on PCB websites. MoEFCC could commission occasional third party studies to ground-truth PCB readings and industry submissions.

d. Local citizens – most affected by the pollution – could be made partners in measuring pollution levels by training them and providing them with simple gadgets that can indicate air and water pollution levels that are above permissible levels.
e. MoEFCC has proposed stringent new norms for water consumption in coal-fired generation. In addition, India should explore and encourage ways of further reducing water use for power generation through measures such as dry cooling.
f. Though there is a mandate to use 100% of fly-ash produced through thermal power generation, this norm is not being met. Cement and other industries should be strongly encouraged to use fly-ash and appropriate arrangements introduced to facilitate smooth transactions of fly-ash between power generators and fly-ash consumers. MoEFCC should also institute mechanisms to periodically check fly-ash storage and usage.
g. Another MoEFCC mandate that is more violated than observed is the requirement that coal transported over 500 km should have less than 34% ash content. Absence of washing facilities makes it difficult to meet this norm. Therefore, coal miners should be encouraged to accelerate setting up of washeries. Regulatory mechanisms to deal with pricing of washed coal, monitoring its quality and dealing with washery rejects should also be instituted.

3. **Project siting**: Much of the existing and proposed coal based thermal capacity addition is concentrated in few areas, typically close to coal producing areas, which are already critically polluted and/or water-stressed[24]. Such concentration of thermal capacity is not desirable from social, environmental and even from grid stability points of view. Siting of thermal generation capacity and environmental clearances for them should be constrained by cumulative carrying capacity and cumulative impact assessments and the processes for this should be tightened and streamlined. Similarly, siting of thermal power plants should also consider the various conflicting uses of water and capacity addition should only be permitted based on basin-level understanding of water availability and contesting requirements.

4. **Preventing resource lock-in:** Currently, the various steps required for setting up a thermal generation project or coal mine, such as land acquisition, fuel and water linkages, and environment and forest clearances happen in parallel with the project construction and are only loosely inter-linked. However, failure or inordinate delays on any of these fronts can result in the project getting stranded and locking-in crucial resources. Examples include the captive coal blocks that never materialized or stranded power generation capacity. In many such cases, even affected parties have not raised the issue at appropriate forums, resulting in inordinate delays in identifying and eliminating such projects even though they have missed multiple deadlines[25]. Experience so far suggests that relying on apparent self-interest (such as the electricity procurers initiating steps for

[24] See http://prayaspune.org/peg/publications/item/164.html for more details.
[25] For example, it is not clear whether MSEDCL has initiated any action regarding a PPA for 680 MW at Rs. 2.70 / kWh it had signed with Lanco Kondapalli Pvt. Ltd. and which was supposed to have been commissioned in 2012, and about which there is no report of progress.

contract termination) is not a reliable mechanism. To avoid this, there is an urgent need for a coordination framework that enables monitoring progress of projects and early weeding out of unviable and stuck projects that miss crucial milestones, so that it can unlock these resources for other uses.

5. **Minimising local impacts:** Projects with very high social and environmental impacts, or projects that do not have broad local acceptance, or projects leading to a sub-optimal use of transmission, fuel, land and water should be put on hold till all other options are exhausted. For example, brown field capacity addition should be preferred to green field, subject to the cumulative carrying capacity assessment for the location and other such factors. Only after exhausting all such brownfield options, should the option of green field projects be considered.

7 Summary

The following table summarises the major policy relevant suggestions contained in this note.

Sr. No.	Sector	Suggestion
1.	Coal	Modify NCDP and model FSA to develop fair and objective allocation mechanisms and balanced contractual agreements. Ensure that coal transporters (Railways or others) are also part of coal supply contracts.
2.	Coal	Publish GIS-based reserve data to enable planning, investments etc. while factoring in considerations such as forests, rivers etc.
3.	Coal	Set up an independent, effective regulatory mechanism to promote fair and transparent markets as a prerequisite to introducing commercial mining. For the power sector, case II or UMPP like models may also be considered.
4.	Power	Utilize stranded capacity optimally before going in for fresh capacity addition as the current problem is not availability but affordability.
5.	Power	In view of carriage-content separation, existing capacity should be reserved for current utilities serving small consumers. Coal blocks may be allotted to states to help achieve the 24x7 power-for-all objective. Capacity addition for other consumers can be market-driven.
6.	Power	In order to ensure that power generators have an interest in improving operational efficiency, fuel costs should not be made a pass-through for both cost-plus and competitively bid power.
7.	Coal and Power	Pro-actively plan for a transition to a power sector with reduced role for coal and coal-based power through mechanisms such as mining leases, FSAs and PPAs of shorter duration, capacity markets and cycling coal plants.
8.	Labour welfare	Recommendations of the Parliamentary Committee on Coal and Steel should be implemented. In addition, the workforce should be equipped with skills to improve productivity (short to medium term) and adapt to occupations outside the coal sector (long term).
9.	Air and water quality	PCBs should publish environmental management plans, environmental compliance reports, pollution levels etc. on a regular basis. Local citizens can be made partners in monitoring pollution levels.

10.	Dealing with fly-ash	Efforts should be made to ensure that 100% fly ash utilization is realized. Similarly, washery development needs urgent attention to ensure that high-ash coal is not transported or used.
11.	Project siting	Siting of coal and thermal power projects should be informed by cumulative impact assessment and carrying capacity of a region.
12.	Resource lock-in	A coordination mechanism needs to be evolved for early weeding out of projects that are stuck for some resource or clearance and lock up other resources.

Appendix

The following organizations that were represented at the stakeholder consultations held at the Prakashgad office of Mahagenco in Mumbai on 19th October 2015.

1. Government of Maharashtra represented by Principal Secretary, Energy
2. Ministry of Coal, Government of India
3. NITI Aayog, Government of India
4. Central Electricity Authority, Ministry of Power, Government of India
5. NTPC Ltd.
6. Maharashtra Electricity Regulatory Commission
7. Maharashtra State Power Generation Company
8. Tata Power Company Ltd.
9. Essel Mining & Industries Ltd.
10. Cement Manufacturers' Association
11. Indian Institute of Technology
12. Centre for Science and Environment
13. New Trade Union Initiative
14. Thane Belapur Industries Association
15. One independent advisor on energy, infrastructure and finance
16. Prayas (Energy Group)

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