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*Originally published in:
Energy Research & Social Science,
44 (2018), 75-82
DOI: [10.1016/j.erss.2018.04.040](https://doi.org/10.1016/j.erss.2018.04.040)*

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India's energy future: contested narratives of change

Abstract

In this perspective article, we undertake a brief empirical analysis of the dominant narratives in debates around India's energy future. India has ambitious goals for increasing renewable energy and enabling universal energy access, but there is little social consensus on how these goals should be achieved. We find two compelling narratives in energy policy debates in the country: 'energy for development' that privileges energy as critical to economic growth and long term strategic security; and 'energy for all' that prioritises the role of energy for basic development and ending poverty. We find that while these narratives find common ground on certain issues such as the role of coal, they clash in the socio-technical imaginaries they represent about India's energy future. Indian energy policy has been characterised so far by top down, centralised policymaking. With this article, we highlight the societal choices that are inherent in discussions about transformations in India's electricity sector and call for further research on the socio-cultural dimensions of future energy pathways in India.

Keywords

Energy policy; narratives; renewables; coal power

Section 1: Introduction

India has pledged ambitious goals to increase its clean energy capacity in its submitted Nationally Determined Contribution (NDC) to the Paris Agreement on climate change [1]. This includes a commitment to install low carbon energy capacity up to 40% of the total installed electrical capacity by 2030 and to reduce the carbon intensity of its economy by 33-35 % by 2030. The government has also publically declared a domestic target for 175 GW of renewable energy (RE) capacity in the country by 2022¹, including 100 GW of solar and 60 GW of wind energy capacity. In 2027, India is estimated to have installed 275 GW of RE capacity which would be more than a four-fold increase on current levels [2]. At the same time, the Indian government has committed to bold plans to achieve universal access to electricity in the country by December 2018 [3].

Several studies and reports have been commissioned to study the pathways for India's energy future and how it may transition to a clean energy supply from one that is currently dominated by fossil fuels, especially coal, which in 2015 supplied nearly 80% of India's electricity (see in Figure 1). However, transformations in the Indian electricity sector will be a complex process and as we show in this paper, there is a lack of social consensus on what the preferred policy pathway for this transition should be. Trade-offs between energy access and environmental constraints as well as contestation over the pathways for deployment of certain technologies lead to contrasting visions of energy futures. Accordingly, the policy roadmaps required to implement India's ambitious electrification and clean energy goals diverge. Key actors in the energy domain such as policymakers, power producers, and civil society actors coalesce around different narratives of the role of energy in society and the goals and priorities of Indian energy policy. By sketching out central fault lines as well as interesting overlaps we aim at making a point for strengthening the analysis of socio-cultural dimensions in developing future pathways for energy systems in India, which are likely to be reflected in other developing countries. Bringing these choices and assumptions to light will enable a broader discussion around India's energy transition which is currently dominated by narrow techno-economic considerations. As India is the world's third largest emitter of greenhouse gases (GHG), its energy pathway has significant impact on global climate targets. Our focus therefore lies on the debate on clean energy growth in India, expanding energy access, and their interdependencies with the coal sector. The question is: how do different narratives translate into policy options - and what are points of interventions where narratives may 'speak' to each other in order to find compromises? Through our brief empirical analysis, we outline the broad contours of the two overarching narratives that are currently jostling for pre-eminence in debates over India's energy future. We believe this holds value in two ways: 1- it can serve to initiate a much needed discussion and research agenda on the importance of social debate and value based choices in Indian energy policy which has so far been limited; and 2- the dominant narratives can reveal the opportunities and challenges in implementation of India's energy access and climate action goals.

The next section provides a background note on contestations in India's energy domain and the need for analysis at a 'framework' level, of the different logics that ascribe Indian energy

¹ Renewable energy (RE) in India according to the government definition does not include large hydro power. Therefore, in this paper when referring to RE we mean wind, solar, biomass, and small hydro power.

futures. Section 3 describes the concept of narratives used in this study, and the methodology used to deconstruct the different policy narratives. Section 4 outlines the competing policy narratives and the role of the actors involved in bringing these futures about. Section 5 discusses some of the implications of these alternative narratives for debates on energy futures in India, suggesting that these debates must engage with the social and political choices inherent in alternative pathways. Lastly, Section 6 attempts to provide some suggestions for future work in this area.

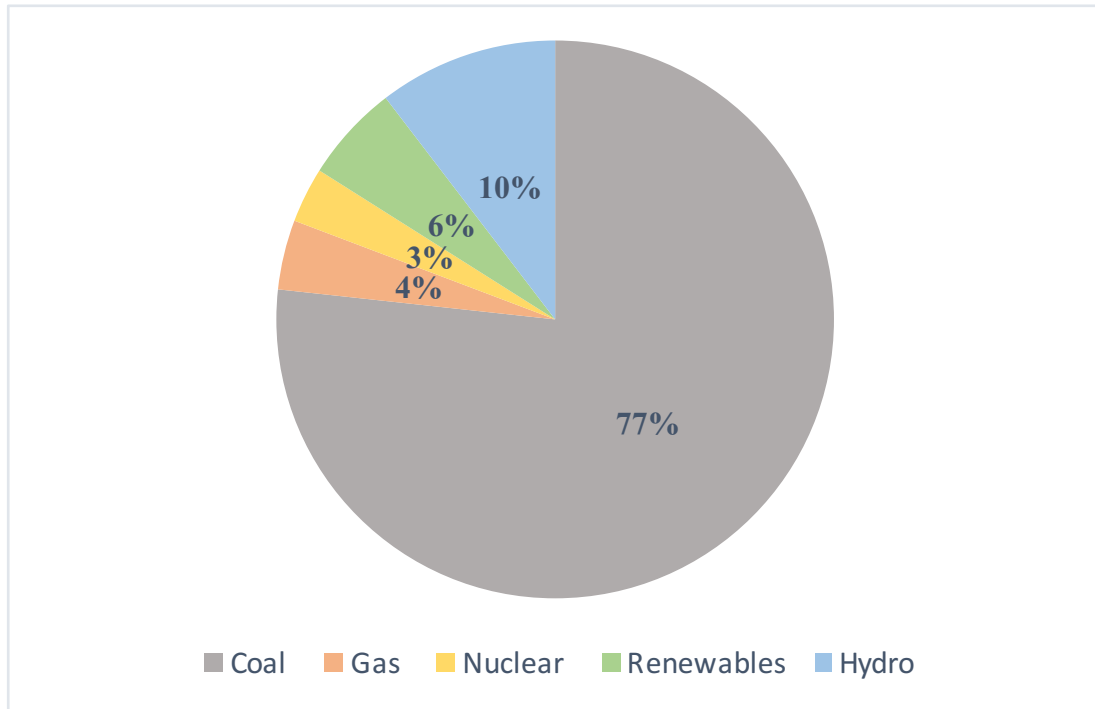


Figure 1: Share of electricity production in India 2015-16 [4]

Section 2: Background - contestation in future visions

The domestic targets for RE growth, India's NDC commitments to the United Nations Framework Convention on Climate Change (UNFCCC), and the rapidly falling price of solar and wind power in India are leading to discourse around far reaching changes in India's electricity sector. However, complex systems such as the electricity grid in a country like India, rarely (if ever) lend themselves to such uncomplicated claims of linear transitions without inviting significant challenges and counter claims. In fact, a review of seven independent modelling studies found a broad range of possible outcomes, ranging from 7% to 31% of clean electricity in 2030 [5]. As the authors of the review note, '...projections of India's future electricity mix suggest widely divergent projections on the future electricity mix in 2030 even in reference scenarios.' Even under reference scenarios, growth rates of RE for instance vary by as much as a factor of four. Interestingly, even the most ambitious growth rates are more modest than the government targets [5]. The authors go on to suggest that common expert judgement and more reasoned assumptions are needed to narrow the divergences in modelling studies [5].

However, scholars have noted the narrow scope of mainstream energy debates which consider lack of consensus as a function of techno-economic inadequacies which can be improved upon [6]. It has been observed that ‘conflicts in the domain of energy and climate are not primarily due to lack of scientific facts or objective truth. Instead, they are more due to a clash of priorities, interests, and normative assumptions which create a number of subjective truths’ [7]. Resolution on ‘facts’ are implausible when the disagreements are at a ‘framework’ level - divergences in energy futures are not so much a reflection of the differing data sets and modelling methods used but rather symptomatic of the competing logic driving such studies. Competing visions of societal futures drive the construction of alternate energy policy pathways [8] but mainstream literature on energy studies pays little attention to visions as key drivers of energy policy debate [9,10].

More broadly, the use of techno-economic modelling processes itself suffers from drawbacks as assumptions of linear trajectories of technological change overlook the significant social and political changes which will have to accompany energy transitions [11]. Geels [12] for example criticises traditional modelling forecast methods on two levels: 1. ‘an implicit linear model of technological development’; 2. ‘undue emphasis on macro-logic and neglect of meso-logic’.

Alternative policy pathways for energy transformations reflect not just different technological choices and economic assumptions but in many cases represent fundamentally different governance frameworks [8,13]. Policy systems, regulatory contexts, role of institutions, user practices and consumer-producer relationships can significantly vary between alternative pathways as technological change precipitates a range of social outcomes. Lovins has argued that ‘hard’ and ‘soft’ energy paths which emphasise centralised vs decentralised solutions respectively are distinguished not only by ‘choices of hardware’ but ‘by the socio-political structure of the system’ [14]. They are therefore ‘mutually exclusive’, not as a result of technical incompatibility but due to the divergent governance arrangements they require [14]. A recent study of controversy among future visions of RE in Europe also finds that the roots of the contestation lie in ‘normative end-state aims and governance solutions for achieving these aims, and not primarily in technology, power mix pie-charts or costs’ [15].

Methods such as social-technical scenarios, narratives, and storylines are increasingly being used to address this lacuna in energy policy debates and capture the interconnections between social and technical pathways of change and their co-evolution [16,17]. This paper draws on the concept of narratives to outline the differences in political, technical, social, and economic choices by different actors which will influence trajectories of change in the electricity sector in India.

Section 3: Theoretical framework & method

3.1. Narratives

A narrative is a story with a temporal sequence of events which lays out a problem, its causes and consequences and typically makes arguments for possible solutions to the

problem [18–20]. Narratives simplify and communicate complex issues and enable actors to make decisions in the face of uncertainty and complexity [18]. They may help frame a system and the guidelines for action for different actors in the system [21]. Narratives normally characterise actors in the story as heroes, villains and victims. Attributing roles for actors in a story is a useful way to inspire action and affix blame and responsibility [18,22,23]. The importance of analysing narratives in policy debate relies on the assumption that subjective reality and facts are social constructions, and narratives influence how individuals interpret the world around them [24,25].

Narratives have a clear purpose for policy change as they are not simply neutral, objective descriptions of the status quo but provide suggestions on how the world should be, by identifying both the norm and the point of departure [25]. Narratives may therefore often be strategically designed to influence the policy preferences of the target audience and narratives usually express a stance on policy issues [22,26]. Narratives therefore interplay with frames in that they start with a particular framing of an issue and seek to suggest solutions on that basis.

“Narratives are created and promoted by particular actors, networks and institutions. They often start with a particular framing of a system and its dynamics, and suggest particular ways in which these should develop or transform to bring about a particular set of outcomes. Narratives therefore suggest and justify particular kinds of action, strategy and intervention. Some narratives, in turn, come to be supported by institutional and political processes – governance – so as to define and shape pathways: particular directions in which interacting social, technological and environmental systems co-evolve over time. Other narratives, meanwhile, may not become manifested in actual pathways of intervention and change, remaining marginalised.” [27]

Particular framings and narratives of an issue therefore ‘lock in’ a particular set of processes, technologies, system boundaries, political goals, strategies of intervention and socio-economic arrangements that marginalise alternative pathways [27]. Geels [28] for instance has suggested that diagnostic framing, i.e. identification of problems as well as prognostic framing i.e. advancing solutions, both form part of the discursive strategies used by powerful actors to advance their interests and resist fundamental regime change. For the purpose of this paper, the overall focus is therefore on narratives as a communicative tool in the policy process, and as a major resource of key actors for influencing policy debates [26].

3.2. Method – Identification of narratives

In the Indian energy policy subsystem, we identify two major narratives being pushed forward to describe Indian energy policy futures. These narratives advocate for alternative pathways for Indian energy futures which are governed by competing logics with different regulatory contexts and distributions of power, technology, and institutional arrangements. The policy narratives summarise the key technological, institutional and political changes in the diverging visions of energy futures in India. The narratives also identify the key actors responsible for realising policy goals and the challenges for individuals, private sector, and social movements in sustaining the transformation.

The dominant narratives were deconstructed through qualitative analysis of secondary sources - technical and non technical publications such as future energy scenarios studies, peer reviewed research papers, energy industry reports, policy documents, articles on India's energy future and the future prospects of RE, news articles, and opinion pieces. This covers a range of recent publications (since the change of government in 2014) published by different actors in government, civil society, and the private sector. Semi structured interviews with energy 'gatekeepers' [29] were also undertaken. The full list of interviewees is published in the Appendix. In total, ten interviews were conducted through non random sampling, also called purposeful sampling [30], with respondents from central government advisory bodies, research institutes, non-governmental organisations (NGOs), think tanks, and private companies working in the power sector. Although the relatively small number of interviews is a limitation of our analysis, we contend that our findings are nonetheless important given the exploratory nature of the work and the immediacy of data saturation [31], particularly with government actors who stick to official and well known positions in conversations. Our respondents were also hard to access populations such as government elites and energy policy experts with whom interviews were gained through much difficulty.

The narratives identified here are not meant to be exhaustive by any means. A thorough analysis of the different positions of all the actors in India's energy debate is beyond the scope of this perspective. As such the narratives identified here are not intended to conclude a discussion on India's energy further, but rather, spark one. Lastly, as the policy narratives for a large domain such as energy futures can be vast and encompass several technological transitions in fields such as heating, cooling, electricity, transport and more, in this paper the focus is on transitions in the Indian electricity sector, particularly the future role of coal and the growth of renewable power. The electricity sector is set for strong growth in the coming decades, has been subject to ambitious government targets, is fundamental to debates over India's energy future, and forms the basis of India's international commitments for climate action.

Section 4: Policy narratives

4.1 'Energy for development' - Economic growth and energy security

The dominant narrative in Indian energy policy continues to inextricably link energy use and economic growth. Assumptions over strong economic growth have historically been the underlying basis of the Indian government's ambitious plans to increase electricity capacity [32] and the government think tank, the National Institution for Transforming India (NITI) Aayog's Draft National Energy Policy (DNEP) released in 2016 also estimates a Gross Domestic Product (GDP) growth rate of 8% till 2040 [33]. Based on this, the central government policy planning documents and reports indicate a clear focus on solving for the energy trilemma, i.e. delivering cost effective energy for economic growth while maintaining climate commitments and ensuring energy security. For government actors, concerns over energy security lead to a focus on coal mining and coal based power generation as coal has traditionally been seen as the only domestic source of energy in the country. The NITI Aayog DNEP for instance states:

“Sustained levels of high domestic production would greatly advance India’s energy security. [33]”

Concerns over India’s rising emissions are brushed aside. The Chief Economic Advisor to the Government for example has said that India must “shape the national and global narrative and not be stampeded by the rhetoric of carbon imperialism.” [34] The former Minister of Power in India has also argued that India reserves the right to pursue coal once stating in an interview:

“Thirty per cent of our people are living in poverty. I cannot tell them: British people have benefited from coal-based power for 200 years and have spewed all that carbon up there and now India will pay three times the cost.” [35]

Western ‘carbon imperialism’ and international environmental non governmental organisations are therefore cast as villains, undermining the government agenda of development. Several non-governmental organisations such as Greenpeace have experienced crackdown in the country [36]. The hero of this narrative is expert planning and technocratic policymaking that reconciles economic considerations of the need for affordable energy with macro level energy questions over supply, demand and grid stability. This narrative is also supported by several actors in the Indian private sector who point to the ambitious RE goals of the government and a series of central government policy initiatives such as providing land and other infrastructure to power producing companies, introduction of generous feed in tariff schemes, and creation of an overall investment friendly atmosphere, as critical to the rapid growth in RE in the country (Interview 1,2).

The strong emphasis on economic growth and energy security however means that no technological option, particularly domestic coal based power, will be abandoned. All major thermal power companies in the private sector including Adani Power, Tata Power, and Reliance Power also have significant investments in RE plants themselves which creates limited incentive for the large thermal power companies to pressurise government intervention in the rapidly changing power markets. Furthermore, some market actors feel that it is a matter of time before industrial demand once again picks up and long term economic growth rationale leads to an increase in the use of coal power [37]. This view is supported by government officials who are confident overall coal use will continue to steadily increase even if certain coal plants have reduced profitability (Interviews 9,10).

To reconcile the significant role of coal in India’s electricity grid within the overall narrative of a rapid increase in low carbon power, there is also a strong discourse surrounding ‘clean coal’– several government documents and reports refer to new coal power on the grid as clean coal and emphasis is given to the fact that newly installed coal power stations will use ‘supercritical’ technology, i.e. having lower pollution levels and higher efficiency. The Central Electricity Authority’s (CEA) National Electricity Plan for instance consistently argues that clean coal technology and supercritical power plants are part of a ‘low carbon’ growth strategy [2].

The CEA’s National Electricity Plan estimates a four fold increase of renewable power by 2027 and the NIT Aayog DNEP projects more than a 10-fold increase by 2040 [2,33,38]. The

falling prices in RE leading to record low bids in auctions for new capacity and the ambitious targets for wind and solar energy in the country beg the obvious question as to why India needs any new installations of coal power. This is addressed by leading government officials such as the Chief Economic Advisor challenging the assumption that renewables are already cheaper than thermal power sources [34]. A frequent line of attack is the generous subsidies provided to renewables and secondly, the additional costs of integrating and managing intermittent RE which mask its true cost on the grid. The theme of hidden system costs of RE is for instance a highlight of the Central Government's Economic Survey 2016-17 section on RE which concludes:

“Social cost analysis of coal and renewables based power done in the chapter indicate higher social costs for renewables. Storage costs and stranding of assets based on coal based power are major costs associated with the renewables based power. Given that the first goal for India is to provide 100 per cent energy access to its population and bridge the development deficit gap, all energy sources need to be tapped.” [39]

Interestingly, despite the strong connection of RE to decentralised power systems and a 'soft' energy path [14], with the narratives of citizens leading the battle for energy democracy, such as in the case of Germany [40], India's large growth in RE is envisioned by government actors as coming from centralised, utility scale, grid connected projects. This view is supported by certain actors in the private sector who point to the lack of market for decentralised solutions (Interview 2).

With regards to solving the challenge of energy poverty and access, the government consistently portray off grid solutions as only 'backup' or 'short term' measures, useful for providing some level of limited and expensive electricity access (Interview 9), but only as a stop gap measure until full grid connectivity can be established. For instance, a senior government official in an interview states:

“If the grid has not reached or if it is too expensive or time intensive to extend the grid then those remote areas can be supplied by off grid solutions” (Interview 10).

This is a view echoed by some actors in the private sector who consider off grid solutions expensive and politically unfeasible to solve the challenges of energy access:

“A focus on off grid solutions would mean India will continue to remain a below poverty line society for a long time without development. Off grid solutions are extremely expensive and this is a problem because when the grid eventually does get extended, the consumer will switch over to the grid. So to install off grid solutions, the private sector needs a guarantee that the grid wont be extended, which the government naturally cannot promise for political reasons” (Interview 6)

Issues are also noted with the management and maintenance of off grid solutions with limited capacity available in rural areas for self reliance (Interview 4). Both decentralised and off grid RE solutions are therefore seen as having a minor role to play in this narrative. Overall, the conclusion presented is that the 'vast electricity demand of India cannot be met

by decentralized solutions in a short time' [33]. The central government has accordingly announced a goal for 100% electrification of all households and the recently launched 'Saubhagya' scheme is intended to tackle the issue of last mile grid connectivity.

Last but not least, the challenge of high shares of RE in the energy system is seen as to be dealt with by sophisticated modelling exercises for the future grid and new financial models for electricity markets. The government has released a report on the grid integration of RE which concludes that further penetration of variable wind and solar power will require new investments in transmission and additional planning for new financial models for thermal power plants and improved coordination of scheduling and dispatch to avoid excess curtailment [41]. Little attention is however being paid to the need for political reform of the state owned electricity distribution companies (DISCOMS) and the uncertainty in the success of the debt swap scheme (UDAY) in terms of the financial health of DISCOMS and the inability of the scheme to fix longer term issues (Interviews 1,2,3).

4.2 'Energy for All'

The second narrative that is prominent in the Indian energy policy debate promotes a vision of energy futures that places energy access for all as its primary goal. The broad theme running through the story is egalitarian – energy access is treated very much as a public good and the focus is on ensuring energy access to stimulate socio-economic development for groups in the lowest income levels of society. The narrative is this transformation should be led by bottom up citizen initiatives for decentralised and/or off grid energy solutions. Civil society organisations as well as some private companies in the off grid energy sector show support for this storyline.

“More than 250 companies across India, with long supply chains and networks of village-level entrepreneurs, operate in the decentralized clean-energy sector already. They demonstrate that putting power in the hands of poor people can begin a transformation in how energy access is understood and delivered.” [42]

The heroes of India's energy future in this narrative are the individual and local communities, seen as taking an active role, with the central government required to step in to support such initiatives through generous incentives, subsidies, and technological backing for community led initiatives. Political reform of the power sector and state distribution companies is a consistent demand as well as reforms in the cross subsidy model so as to move towards a system where the rich pay to subsidise poor rural consumers. The villain in this narrative is the central government, particularly the lack of systemic thinking, and an undue focus on targets for political expediency instead of frameworks is blamed for incoherent energy policymaking [43]. This problem is compounded by the fact that government receptivity for insights from academia and research institutes is seen as low. Challenges with availability of data for energy modelling studies and research with sufficient level of granularity are also cited (interview 8).

Interestingly, the government's view on coal is actually partially supported by prominent think tanks who also advocate for a 'realistic' energy policy in India in the short to medium term, i.e. one dominated by coal with increasing share of renewables. Coal is mainly seen as

currently indispensable to address widespread energy poverty. An interviewee from a leading energy and environment think tank in New Delhi says:

“The kind of energy poverty that this country continues to see means coal will be an important part of our energy future.” (Interview 8)

In this way, environmental organisations in India diverge from their foreign counterparts, expressing an explicit approval for government support of coal power.

“We look at coal in a very different way to other international environmental agencies – we have to think of the 200 million plus people in India who do not have access to electricity.” (Interview 7)

The continued use of coal despite rising carbon emissions and the threat of severe climate impacts in India is justified by invoking the principle of equity in international climate politics. Prominent environmentalists continue to advocate the importance of coal in India’s energy mix and support the government narrative that any criticism of coal in India is a function of western hypocrisy [44].

Off grid RE solutions in particular are also seen as critically important for solving the challenge of energy access by both civil society actors [42,45] and private companies operating in the off grid energy sector [46,47], who argue that rural energy needs cannot be solved through the extension of the electrical grid but must instead be met through localised solutions, for which markets and business models need to be encouraged. For instance, Power for All, a coalition of over 200 public and private organisations working on universal electricity access decry the Indian government’s push for centralised grid access and instead call for decentralised solutions such as RE mini grids and stand alone solar rooftop systems to be deployed through public private partnerships and distributed energy service companies:

“.....the Indian government seems so intent on centralised grid extension that it may be missing a once-in-a-cycle opportunity to both pioneer a 21st century rural power infrastructure and efficiently solve its longstanding problem of 300 million un-electrified people at the same time.” [48]

Civil society actors across the board are doubtful of the government claim that India will achieve government targets of 175 GW of installed RE capacity by 2022 (Interviews 3,5,7,8). Actors also caution that more important than the targets itself however is the whole of system approach to the unfolding energy transition. The growth of RE is viewed not as an end in itself but as means to lead to a more efficient and resilient grid with equitable and affordable access to electricity (Interviews 3,5,8). Decentralised energy is also promoted as the future of renewable energy growth and the electric grid:

“Our perspective is that the future of energy is decentralised. Renewable energy by nature itself is decentralised and meant to be consumed where it is generated. (Interview 7)”

Future investments in centralised infrastructure are therefore seen as outdated and clashing with a narrative of a new vision of society where citizens are both consumers and producers of electricity and the grid only acts as a ‘backup’ for millions of customers [49]. The technical challenges of grid integration of RE are also viewed differently by civil society actors. Overall, the narrative that integration of high shares of RE on the grid is only a technical challenge is contested with a focus instead on the need for political reform of the DISCOMS which currently operate with huge losses in India, and the tariff regime which allows for inefficient cross subsidy of consumers (Interviews 3,8).

Section 5: Discussion

Our empirical analysis reveals two compelling narratives in energy policy debates in India that are summarised in Table 1: one that privileges energy as critical to economic growth and long term strategic security, and another that prioritises the role of energy for basic development and ending poverty. Both policy prescriptions look to increase the share of RE as well as tackle energy poverty but while central government actors with support from large utilities focus on continuing high shares of coal supplemented with large scale utility based RE projects, civil society actors along with private actors in the off grid sector call for solutions targeted at addressing problems of energy access through micro grid solutions and envisage a decentralised energy future.

Energy for Development	Energy for All
<ul style="list-style-type: none"> • Energy is a vital input to long term economic growth and programmes of economic and industrial modernisation 	<ul style="list-style-type: none"> • Energy is important for enabling basic levels of development, ending poverty, and reducing inequality in society;
<ul style="list-style-type: none"> • Coal is critical to energy access and energy security in the short and long term; 	<ul style="list-style-type: none"> • Coal is a necessity for ending energy poverty in the short term;
<ul style="list-style-type: none"> • RE growth mainly through centralised, auction based allocations with additional growth possible through decentralised power; 	<ul style="list-style-type: none"> • RE growth should come predominantly through decentralised power (rooftop solar) as well as off grid solutions;
<ul style="list-style-type: none"> • Off grid solutions cannot solve for the scale of energy poverty in India and are only suitable where the grid cannot be extended; 	<ul style="list-style-type: none"> • Grid based solutions have never delivered on their promise - off grid solutions hold the key for basic energy access;
<ul style="list-style-type: none"> • Integration of high shares of renewables is a function of grid upgrades and technical planning exercises. 	<ul style="list-style-type: none"> • Grid upgrades must go hand in hand with political reform – RE is only one part of the shift to a better functioning grid that works for everyone.

Table 1: Summary of the policy positions in both narratives

Energy from the central government point of view is framed as an input into the economy, i.e. national GDP, and the government's dependence on coal is largely a reflection of the imperative of security of energy supply to maintain a rising trend of electricity consumption, seen as unavoidable to maintain high economic growth rates of greater than 8% p.a. until 2040. The framing of energy as a means to an end for delivering economic growth has implications for technological choices and socio-political decisions. Framings of a policy issue inevitably circumscribe the range of solutions and tools available to deal with the challenge. Rein and Schon for instance suggest that frames act as 'strong and generic narratives that guide both analysis and action' [50]. In this case, high energy requirements and rising demand automatically suggest that growth in the power system will be opportunistic – all technologies have a role to play in India's energy future and no technological option will be prematurely abandoned. It also translates into a focus on grid connected power as a means to achieve universal energy access, as decentralised solutions are seen as insufficient to counter energy poverty and meet high levels of energy demand.

Policy narratives that emphasise decentralised and off grid RE growth are therefore rejected by government policy planning documents ostensibly for technical and financial reasons but also more fundamentally represent a clash in what Jasanoff and Kim have coined as 'socio-technical imaginaries', i.e. 'collectively imagined forms of social life and social order reflected in the design and fulfilment of nation specific scientific and/or technological projects' [51]. Narratives of energy access for equitable sustainable development proposed by civil society and certain private actors clash with hegemonic ideas of modernisation, industrial growth and economic prosperity, to be achieved through universal grid connectivity and a mammoth build up of large scale energy infrastructure.

Genuine alternative pathways emerge from challenges to the dominant discourse characterised by socio-political struggles with powerful incumbent actors [28]. In India, policymaking is characterised by a heavy top-down model of techno-economic management with close knit networks between government and privileged large industry actors that limit access to outsiders. Research institutes in India also consistently point to the lack of data as a significant barrier to making meaningful contributions to the energy debate in the country [52]. Regime incumbents therefore draw on material strategies such as leveraging financial resources and technical expertise as well as broader institutional power in terms of governance structures and closed off policy processes to avoid the 'agonistic confrontation of competing visions of a different socio-ecological order' [53]. Long term energy forecasts and scenarios developed by powerful actors can serve as social objects embedding pre-determined social contexts, legitimising certain worldviews and casting some aspects of the world as fixed (e.g. coal power in the case of India) and others as variable [54]. Lastly, civil society actors need to balance the twin imperatives of access to government and independence from government as total independence is likely to be incompatible with any meaningful level of political influence [55]. This is a particularly challenging issue in India given the closed policy networks that erect high barriers to new entrants, surmounting which might require relating to the state [55] and risk being co-opted into existing worldviews, institutional contexts and political goals [56]– what Dryzek has termed the 'state imperative' [57]. If the Indian government's rhetoric is taken as face value – India's economic and social development and its very programme of industrialisation hinges on its ability to mine and burn coal. Opposition to this is therefore seen as an attack not just on

coal, but on India's very right to development. Indian civil society organisations working in the environmental space have therefore struggled to reconcile their environmental protection goals with the need for coal in the agenda of economic development. What emerges is a clumsy narrative that struggles to sanitize counter arguments and contradictions of coal from India's climate action and RE goals, with discourse around clean-coal technology and emphasis on the principle of equity in global climate policy a favoured outlet to legitimise the status quo.

However, in the past year, the continued success of RE in India followed by global setbacks to the coal industry may finally be creating space for policy innovation and a challenge to the central government led narrative. Just this year, a divide opened up between prominent research and environmental organisations in India on the issue of coal power in India's future energy mix as the influential Energy and Research Institute (TERI) which has close ties to the government, began to question the dependence of coal in future energy plans [58]. Mobilisation of independent knowledge and wider technical expertise from the bottom-up by civil society organisations as a form of political contestation [59] can be forerunners to new policy paradigms, inspired by a post-normal approach [60,61].

Section 6: Conclusions and suggestions for further work

This paper has attempted to draw out the competing dominant narratives at work in India's energy debate, following in the work done in other countries that has attempted to describe broader societal debates around the future of national energy systems [8,60,62,63] It is hoped that this paper serves to initiate further discussions around the political and social dimensions of energy transitions particularly in India, but also in other developing countries which stand on the cusp of significant economic and industrial transformations.

Our analysis finds that there is little room for policies supporting a strong disruption at the socio-technical landscape level [64] of Indian energy policy. The benefits of coal power in supporting the development agenda are prominent in both the identified narratives as is the rejection of criticism of coal use as the work of foreign organisations and actors. This finding casts doubt on the opportunities for transformative climate policy in India and as a result of its large carbon footprint, global climate targets. The real points of contestation instead lie in the future pathway of technological deployment in the RE sector and tackling energy access, with strong preferences expressed for both centralised and decentralised energy systems. Here the narrative most closely supported by the central government frames energy as vital to economic growth and to be delivered through expansive state machinery in an ongoing process of national modernisation. The fundamental clash this vision represents against the idea of distributed, small scale, localised energy solutions suggests that private sector and civil society efforts which target off grid rural energy access may struggle to attract any significant level of government support. Furthermore, research that shows significant public support in rural areas for government led electrification compared to solutions provided by private companies [65] as well as limited socioeconomic benefits from off grid solar electricity [66] casts further doubt on the efficacy of distributed models in tackling energy poverty in India.

Identification of key narratives can reveal pathways of least common resistance, uncover differences but also commonalities, as well as highlight fixed core beliefs and those motivations that can be subject to change. For the governance of transitions, it is crucial to visualize and to take into account these aspects. Future pathways may naturally also be affected by exogenous shocks that could impact energy policy depending on the dominant narrative at the time [67] or could result in branching points [8] wherein contesting policy pathways could converge or diverge significantly. Further work could benefit from seeking to better understand the level of support from different actors for the different narratives. This will help determine the power of the narratives and how influential they can be. Furthermore, while these narratives may hold true at the national level, state level politics may find other perspectives and framings that hold particular salience at lower levels of governance. As such, the divergence of state level narratives from those at the central level may reveal challenges and opportunities in energy policy implementation in India, as electricity is a subject under both central and state government control.

Broad societal support will ultimately be a critical component of the shifts required in the production and use of energy as we seek to meet the challenges of energy for all and climate action. Energy transitions will lead to profound social impacts and the social dimensions of such large scale changes in energy systems need greater attention [11], particularly from researchers in developing countries.

Funding

This research was made possible through funding from the Alexander von Humboldt Foundation.

Appendix

List of Interviewees

Interview No:	Position	Sector	Date
1	Advisor to the CEO of a leading renewable energy power producer	Private Sector	31-1-2017
2	Manager, Investment Strategy of a leading renewable energy power producer	Private Sector	31-1-2017
3	Lead Researcher on energy issues at New Delhi based think tank	Civil Society	9-2-2017
4	Lead Analyst at RE forecasting and scheduling company	Private Sector	13-2-2017
5	Senior Researcher on energy and climate policy at Indian think tank	Civil Society	22-2-2017

6	Senior Analyst at renewable energy markets consulting company	Private Sector	01-08-2017
7	Senior staff member at prominent Indian environmental organisation	Civil Society	08-08-2017
8	Programme Head at prominent Indian environment and energy think tank	Civil Society	21-08-2017
9	Head, Energy Division at Government policy planning body	Government	12-04-2018
10	Member, Planning Division at Government advisory body for electricity policy	Government	12-04-2018

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