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UP FROM DEVELOPMENT

A Framework for Energy Transition in India

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Trade Unions for Energy Democracy (TUED) is a global, multi-sector initiative to advance democratic direction and control of energy in a way that promotes solutions to the climate crisis, energy poverty, the degradation of both land and people, and responds to the attacks on workers' rights and protections.

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Up From Development

A Framework for Energy Transition in India

By Rohan Dominic Mathews with Susana Barria and Ashim Roy

Trade Unions for Energy Democracy (TUED) emerged as an attempt to develop a common understanding of a "democratic direction and control of energy in a way that promotes solutions to the climate crisis, energy poverty, the degradation of both land and people, and responds to the attacks on workers' rights and protections".[2] This initiative brought together trade unions working on core sectors that are central to the debates around energy from within the energy production process but also those that saw the centrality of energy in the climate debate. Over the last five years, trade unions from developed and developing countries have worked together covering important ground and discovering areas that need further discussion.

One of these areas is the importance of articulating the specific challenges that face countries in the global South, emerging from the complexity that is raised by its populations' "need" or "right" to development. This is a real and concrete issue, though in international negotiations it often gets conflated with a "right to pollute". This has direct implications for countries that have a singular source of energy.

The New Trade Union Initiative joined TUED at its creation. It felt that this was an important space that would enable trade unions to engage with climate change issues and advance an informed perspective within the international trade union movement. It also presented an important opportunity to develop a trade union understanding that could contribute to the debates and efforts that had been developing in India.

In the early stage, the need was felt to develop a space for deeper engagement with trade unions from other countries in the South facing similar challenges. The idea of a coal working group was proposed based on the fact that several countries were characterised by coal-dependent energy systems, and such a group would therefore provide an adequate space to develop a framework from which to understand energy transition. The advantage of such a group would have been to ground the discussion on energy in a transition framework from the perspective of the pathways to take our economies out of a dependence on or dominance of fossil fuels as the main source of energy while ensuring that this framework also subscribes to principles of social justice and workers' rights. Unfortunately, the working group could not be taken forward.

In the second stage, there was again a felt need to articulate the perspective of labour from the South. This was evident in the meeting that followed the 2014 Peoples' Climate March in New York. There was a very vibrant articulation of issues and strategies to engage trade unions membership on climate and energy issues. Trade unions from Latin America shared the progress of discussions in Peru being held in anticipation of the United Nations Framework Convention on Climate Change (UNFCCC) meeting (COP 20, Lima, December 2014), which were very well received. However, it was clear that the overall perspective of the group was shaped by experiences located in developed countries.

From our perspective, the main concern is in the implicit assumption that industrialisation

has a purely economic role and that pursuing industrialisation strategies would derail efforts at decreasing emissions, especially in countries where energy production is highly dependent on fossil fuels. In northern countries, the industrialisation phase is over, with a shift towards a services-led economy being already completed. In contrast, in southern countries where agriculture is not able to provide for the livelihoods of the population there needs to be a framework that addresses the need for an expansion of other sectors of the economy. There is an assumption that a necessary requirement for this shift will be an industrialisation process. However, in addition to the purely economic argument described above, industrialisation also plays an important welfare function. Creating general welfare (i.e. public schools, hospitals, or a public transport system) is a fundamental objective of industrialisation that is too often overseen. It is essential to link the dialogue on emissions with a social justice and development perspective and not to see them as mutually exclusive.

As a contribution to the ongoing process of articulating a trade union movement perspective on energy issues and with an intention to contribute to strengthening the perspective of southern countries in our network, NTUI proposed to develop a study on energy transition in the South, based on the case of India. In this sense, this scoping study is informed by NTUI's concerns. This study aims at discussing the components and framework for such a just energy transition from the perspective of a southern country, as well as arguing for industrial policy in the energy sector—as distinct from a simple regulation of energy markets—as a key policy tool. This will address both the necessity for regulation in the energy sector in light of the global climate crisis as well as fostering a transition that recognises the development needs of people in the South and the key role of Labour in this process. Further, as a qualification, this document holds a core labour perspective and sees this paper as an initiation for dialogue between unions from across the globe.

Climate Change and Development in the South

The UNFCCC conference, which was held in Paris between November 30 and December 11, 2015 (COP 21), could have been an opportunity for the international community to reach a binding and conclusive agreement that seriously deals with the threat of climate change if it weren't for the deep gaps in perspectives that cast a shadow very early on the possibilities of such an outcome. The final document emerging out of the conference reduced the average temperature above pre-industrial levels target from two degrees Celsius—agreed at Copenhagen in 2009—to 1.5 degrees Celsius.[3] Prior to the Paris conference, almost 180 countries submitted pledges on emission reductions (Intended Nationally Defined Contributions or INDCs), and estimates from these pledges indicate that it accounts for an average temperature rise of 2.7 degrees Celsius above pre-industrial levels.[4] At present, the scientific evidence regarding global warming leaves little doubt of the threat that climate change as a phenomenon poses.[5] The decades between 1983 and 2012 represent the warmest period in human history. Between 1880 and 2012, the average ocean and land surface temperature has risen by 0.85 degrees Celsius.[6] With increased oceanic acidification, receding arctic ice sheets, and increasing global mean sea levels, the threat of climate change is immediate and real.[7]

While national leaders representing their countries' priorities gather every year to pledge certain commitments and seek negotiated settle-

ments, the day-to-day effects of climate change are felt across the world, especially in the tropical regions, which are largely populated by people from the global South. Changes in precipitation levels have meant the alteration of existing hydrological systems, negative impacts on crop yields, and an increase in extreme events like droughts, heatwaves, floods, cyclones, and wildfires, all pointing towards an imminent catastrophe.[8] Therefore, any binding, equitable commitment on reducing greenhouse gas (GHG) emissions has direct implications for the lives of the poor in these countries, and any such commitment impacts the nature of production in these economies, affecting those working in key sectors.[9]

The core debate at the UN climate change summits has been the question of limiting anthropogenic interference in nature by limiting GHG emissions. However, it is the division of responsibility—in this case of what are the limits to emissions across countries—which have been at the forefront of all debate and disagreement in these summits and have led to a failure to reach a binding agreement. The lack of consensus within this framework is a reflection of the difference in the needs and perspectives of participating countries. It shows the failure of countries to bridge these gaps. Underlying these differences are key elements that inform the discussion on energy transition, which reinforces our conviction of the need to develop these problematics in this paper. An international trade union movement, if informed by a southern perspective on these issues, can be a powerful tool in pushing the debate in a constructive direction.

One important component of the "anthropogenic interference" in terms of emissions has been the energy supply. Fossil fuels, since the emergence of capitalism, have been the energy source that has fuelled immense economic and technological advancement. Fossil fuels, like coal, oil, and natural gas, have been advantageous for technological change under capitalism, owing to their high returns to energy input, ease of transportation, and storage and flexibility in production.[10] However, their intrinsic link to the growth of capitalism has meant that energy use has similarly seen an inequality in matters of access, both within and between countries. With advanced capitalist countries boasting of access to immense energy resources, the lack of access to basic energy sources, like electricity, has been a mainstay of daily reality in large parts of the global South. However, the fossil-fuel-centric energy supply across the world has called into question not only issues of access but the nature of the energy mix in different countries, including in the global South. The immediate threat of global warming has meant that the global order within a structure of capitalist growth is facing the limits of nature. However, within this global crisis, the starkness of the situation can be better understood if we see that while the three largest consumers of energy remain China, the United States, and India, the per capita energy consumption of the United States at 6815 KTOE (Kilotonne of Oil Equivalent) is nearly three times that of China and around ten times that of India at 680 KTOE.[11] This sharp difference reflects the crisis of access that is at the centre of the debate.

Projecting Transition

Energy security is a dominant narrative governing any attempt by Indian official agencies to assess energy demand projections. The purpose is largely to assure adequate resources to

meet the current rate of economic growth and eventually lead to an expansion of the energy base, i.e. increased access to the poor. Energy modelling appears to serve this purpose. Several agencies across the world, and in India, undertake modelling exercises, providing potential scenarios based on energy use.[12] These scenarios should not be seen as predictions, as they are based on certain assumptions about policy changes and structural transformation of the economy, and therefore can be seen as possible futures if the necessary conditions are met. In fact, quite often, modelling in India is plagued by these assumptions, and as a result the normative argument is *primarily growth-centric* and has little space for questions of employment generation or human development or even emissions constraints. The business-as-usual approach, where projections are mere extensions of current trends with limited scope for lower cost or climate-optimal solutions, is a common concern.[13]

In addition, when referring to economic growth, current economic growth patterns represent a limited insight into *the nature of the economy*, and any projection based on current growth patterns needs to account for variability in the structure of the economy, i.e., "the relative contribution of primary, secondary and tertiary sectors to the economy, the energy intensity of different sectors, and the emissions intensity of energy".[14] This has implications for developing countries, especially for the vast sections of their population still excluded from access to modern forms of energy. Further, this gives us an indication of the relevance of a sectoral analysis of emissions, which can provide insights into particular economic sectors.

Different countries take different economic growth trajectories. For example, India has seen a shift towards the service sector during the last three decades while China has moved towards manufacturing, meaning that "the range of available structural compositions for the future [...] implies that a simple extrapolation of historical trajectories for economic growth may be an inaccurate measure of the potential changes in the future". Furthermore, these extrapolations based on the existing structure of the economy or energy demands "are likely to significantly underestimate the future requirements of physical infrastructure, industrial production, and energy services for developing countries and the constraints that climate change would place on their increase".[15] This is especially true for fulfilling welfare objectives that are too often not clearly spelled out when, in fact, infrastructural requirements quite often imply infrastructure for the promotion of production and ignore any effort towards expanding social infrastructure.

From this discussion, it is evident that CO_2 emissions, if linked to projected economic growth, whether in terms of current or transformed economic structures, still appear to retain a dependence on the supply and demand projections for energy based on this very economic growth model. This almost amounts to a tautological account for it places energy markets within the domain of markets, subject to the rules of other markets, while claiming that transition will take place led by an innate market-dynamic. This approach in appearing to locate energy markets outside existing fossil-dominated markets—ends up persuing a business-as-usual approach—towards emission reduction.

Furthermore, such a market based approach intrinsically moves away from the primary reason behind any discussion on emissions. As mentioned in several key international documents, especially the Copenhagen accord, "to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, we shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius, on the basis of equity and in the context of sustainable de-

velopment, enhance our long-term cooperative action to combat climate change".[16] It is this cooperative element that cannot be delivered by the market, even in a peculiar moment where the expansion of renewable energies is profitable enough that from a narrow perspective on energy transition the market might seem to deliver. The market remains inadequate when it comes to enhancing social infrastructure and improving access to energy for the poor.

It appears that the whole discussion on emissions and its linkage to economic growth sees emissions as a controlled feature of the current economic system when, in fact, there should be recognition that economic decisions need to be cognizant of emissions. The climate crisis demands that all economic decisions be based on ensuring limited increase in CO_2 emissions. In the case of southern countries, the argument for economic growth has essentially been reduced to a "right to pollute" that would place the burden of mitigation solely in the court of northern countries. However, a right to access energy as well as to develop welfare infrastructure and goods remains valid and has to be reasserted while recognising that ignoring mitigation targets will also have disastrous consequences, as the immediate impacts of climate change will be felt in tropical regions, leading to huge economic as well as human costs. A just energy transition model must recognise and reconcile these diverging and partially contradictory priorities.

In this context, Kanitkar et al. use a "carbon budget" approach, which considers the total usable carbon space in order to have a fifty percent probability of an increase within two degrees Celsius of average global temperature above pre-industrial levels as standing at 327 Giga tonnes of carbon (GtC) over 2010-2050. They propose a budgeting exercise where the carbon share of a country is decided on the basis of the population residing there, i.e. a per capita approach.[17] This is different from the general practice of average annual emissions, which do not give any indication of the population and require mitigation targets that adversely impact the current development requirements of developing countries. For instance, India ranks third in terms of total CO_2 emissions but 97th in terms of per capita CO_2 emissions,[18] indicating a skewed distribution of energy access. This model provides useful tools to deal with contradictory priorities and contribute to framing an energy transition model. This will be elaborated further in the paper.

Energy Policy in India

At COP 21 in Paris, India submitted its INDCs, which outlined its strategy to deal with increasing global temperatures until 2030. These included reducing its GDP's emissions intensity by 33-35 percent (based on 2005 levels), achieving a total electric power installed capacity from non-fossil fuel based energy resources of forty percent based on technology transfer through the Green Climate Fund (GCF), and creating an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent.[19] It is interesting to note that the document on INDCs recognises, "the gap between their equitable share of the global carbon space and the actual share of carbon space that will be accessible",[20] but sees this problem resolved through an appropriate transfer of technology, implying that concerns of transition are restricted to technology transfer. This is not very different from an approach that sees increase in renewable energy as another factor in furthering the current model of neoliberal economic growth. However, a more

detailed understanding of the energy situation in India will allow us to recognise the complex picture that emerges, one that is not immediately resolved through any major improvement in access to technology, especially if one is considering democratic access to energy for working people in the country.

Energy generation and coal dependence

Coal is the largest contributor to India's *primary energy supply*. Raw coal represents a primary source of energy which is converted into other forms, such as electricity and utilised in different sectors. Electricity or power generation accounts for 74.70% of raw coal and 83.09% of lignite consumption in India.[21] The electricity sector represents the single largest component of energy consumption in India. Any discussion on coal and future emissions cannot ignore this. Further, electricity generation has been rapidly expanding over the last two decades. In 1989-90, the gross electricity generated from coal was 172,643 GWh or 70.34% of gross electricity generated.[22] According to recent figures, the gross electricity generated from coal has increased almost five times to 835,838 GWh and stands at 75.61% of the total gross electricity generated.[23]

India has significant *coal resources*, with domestic production at 565.77 million tons in 2013-14, which has been growing at a compounded annual growth rate[24] of 3.73% since 2005-06. However, owing to high ash-content and low calorific value, the net energy output per kilogram of coal is significantly less. This has led to an increasing trend in coal imports. In 2013-14, coal imports increased 15.54% to 168.44 million tons as compared to 2012-13, which is 22.76 % of the total available coal resources in India.[25] In fact, the contribution of coal imports to total available coal in India was 2.28% in 1990-91 and 6.43% in 2000-01.[26] In the case of crude petroleum, India has very limited resources, with an annual production of 37.79 million tonnes, which accounts for only 16.64% of the total available oil supply, with the remainder of 189.24 million tonnes are imported.[27] While coal and oil represent the two most significant components of the energy mix, the increase in imports implies a progressive dependence on imports to meet end-use requirements for these primary resources. Therefore, any discussion will take into account the total available supply of either coal or oil, but it is important to recognise the significant import proportion as it is a crucial rallying point for any perspective on energy security and self-sufficiency in India.

The CO_2 *emissions from consumption of coal* was at 1.28 gigatonnes, which was 69.91% of the total emissions for 2012 (1.8 GtC).[28] Any shift towards a low-carbon economy will need to address the complexities underlying coal production and consumption in India, with direct bearing on potential carbon emissions in the future. As has been shown earlier, this complexity requires a perspective that recognises the status of coal as a source of energy in the economy, and any transition will need to recognise the policy options with respect to coal.

It is evident that *coal-based electricity generation* is a crucial component in the overall energy scenario in India, and consequently carbon emissions cannot be understated. In fact, the rapidly growing electricity generation and its increasing dependence on coal is a crucial component in any discussion on energy transition in the Indian context. Additionally, while petroleum-based energy consumption is also a significant component of the energy mix—and has implications for current and future carbon emissions—any transition framework which attempts to evaluate prospects for a transition to renewable energy sources would necessarily have to begin at electricity as most sources of renewable energy, whether wind or solar,[29] are primarily geared towards production of electricity.

Shifting patterns of coal production

Recent legislative changes present significant changes in coal production in India. In March 2015, the government of India, passed the Coal Mines (Special Provisions) Act in Parliament, effectively ending four decades of state control on coal mining. Until recently, Coal India limited (CIL), a public sector corporation, possessed a monopoly over coal production in India. However, the act permits the private sector to augment CIL's activities in order "to ensure continuity in coal mining operations and production of coal, and for promoting optimum utilisation of coal resources consistent with the requirement of the country in national interest".[30] CIL has been showing increased production over the last year. For the year 2014-15, the rate of increase in coal production has been 8% over the previous year, with CIL showing a net profit for the year. While 2014-15 saw a corresponding rise in coal imports of almost 34%, that trend has been reversed over the last few months with coal imports falling 5%, with increased production from new and old pits.[31] This turnaround has several implications, as previous trends had suggested that increasing coal imports could serve as one of the many deterrents against expanding coal-based electricity in India. This new trend in privatisation of coal mining and increased production in existing pits may taper off in the end, but if the trend continues for a few years, this would mean continued lower costs for coal. In fact it has been shown that to maintain a global average temperature target of two degrees Celsius, around 66% of known reserves in India and China will need to remain untapped.[32] Based on current trends, the scenario appears bleak.

Further, the Centre for Science and Environment (CSE) recently released a report titled, *Heat on Power: Green Rating of Coal-based Thermal Power Plants*.[33] The report assessed 47 coal-based thermal power plants, almost half the total number in the country, and the picture that emerged was dismal. Most of the plants used coal which had ash content of 40-50%, old and inefficient sub-critical technology, with a quarter of these exceeding their operational life. The plant-load factor[34] was on an average at a low of 65%, with many plants claiming that sufficient demand did not exist to run on higher capacity, leading to higher pollution as a proportion of produced-electricity. Further, owing to a policy order that allows cheaper electricity to be loaded on to the grid first meant that older plants which produce cheaper electricity are allowed to run at higher capacity as opposed to more efficient plants which perform at below par capacity. Also, severe pollution violations were another concern raised by the report. Based on the CSE report, Union Minister for Coal Piyush Goyal recently reiterated that coal will continue to remain central to power generation in India but acknowledged the need to de-commission older plants and move towards super-critical coal technology, which is more energy-efficient and less emissions intensive.

Two intended goals of an energy transition are to ensure access to energy and to establish a low-carbon transition pathway. While renewable energy appears to serve both these purposes, one crucial factor in favour of coal-based electricity has been its limited fluctuation and ability to provide baseload. Most of the projections in the earlier section provide ample space for baseload capacity of coal to be a crucial factor in any transition pathway, including options that mark a shift from sub-critical to super-critical coal technology.

Confused renewable energy policy

The drive towards renewable energy appears to have gained steam under the new government. Union Minister Goyal had stated that a dedicated effort towards increasing the share of renewables is underway.[35] In his annual budget speech the Finance Minister had an-

nounced an amount of US$400 million to ensure a renewable energy target of 175 GW.

According to 2015 figures, the total grid-interactive renewables installed capacity was 37,414 MW, out of which wind power had the highest share at 65%, solar energy at 11.6%, bio-power (including biomass, gasification, and bagasse generation) at around 11.8%, small-hydro projects at 11%, and waste-to-power accounting for around 0.3%.[36] Apart from this, according to 2013-14 data, off-grid efforts include the installation of 1221.26 MW solar cookers and the electrification of 7971 remote villages and 2183 hamlets through off-grid power. The Strategic Plan for New and Renewable Energy Sector for 2012-2017 clearly outlines steep aspirations that include plans to "develop, demonstrate and commercialise technologies for harnessing new and renewable energy resources", replacing use of fossil fuels "wherever possible", and increasing the contribution of renewable energy to the total installed capacity in India.

Recently the Ministry of New and Renewable Energy released a draft act titled "National Renewable Energy Act 2015" for public comments. The rationale for the draft act includes a need to acknowledge the human development needs that energy provides, to move away from overt dependence on fossil fuels, and to promote renewables as a "hedging mechanism" against the volatility of fossil fuels.[37]

While the draft represents a fairly detailed policy plan, two features need to be understood in order to locate this draft act and the spirit in which it has been drafted. First, the situation of electricity generation in India is a vastly complicated combination of state-run electricity generators as well as private generators, both public and private transmission enterprises, and state utilities that have the responsibility of purchasing power from the generating units. Many state governments have waived electricity payments from farmers for several reasons, both political and social. Further, mismanaged state-run utilities under the burden of a commercial regime introduced over the last decade and a half has meant that several state utility companies are running heavy debts and are unable to purchase power from the generating companies. In fact, the current electricity being generated is not completely consumed. In 2013-14, the total electricity available for consumption was 980,941 GWh, but the total electricity consumed was 882,592 GWh, with a transmission loss of 23.04%.[38] According to census figures, only 55% of the rural population use electricity from the grid to meet their electricity requirements, and this is further plagued by questions regarding the quality and regularity of supply. While 94.1% of rural areas are connected to the grid, the low use of electricity signifies problems at the level of supply.[39]

Several attempts by governments to roll-out rural electrification through solar decentralised systems appears not to have solved the problem, as they fail to recognise the prevailing grid connectivity issues of most of these villages. While in the case of remote villages, where providing immediate grid connectivity is a challenge, the case of solar PV technologies in grid-connected villages has met with several problems: first, even with free installation, the cost of spare parts makes them unaffordable for populations that are largely not high-income. Second, there is a paucity of skill available to service these units, and third, these villages fall outside existing supply chains that allow for continuous maintenance of these technologies.[40]

In February 2015, the government of India organised the first renewable energy investment expo, where commitments of 266 GW were made, out of which almost half was for solar energy—40% of this for rooftop decentralized solar power units.[41] In October 2015, a series of high profile investment commitments were concretised with over US$100 billion in investments pledged by several high profile companies, in-

cluding Sany Group, China; Chint Group, China; and a memorandum of understanding between SoftBank/Foxconn/Bharti and the State Government of Andhra Pradesh for renewables up to 3 GW. These high profile investments are projected to increase the renewable energy capacity two-fold over the next few years. Further, the Union Power Minister recently announced that transmission of renewable-based electricity across states will be free as a project for green energy corridors.[42] With every successive tender, the cost of producing electricity has dropped, with the latest and lowest to date being a 25 year power purchase price (PPA) fixed at Rs. 4.63/kWh or US$0.07/kWh, which is significantly lower than the PPA for imported coal-based electricity generation.[43]

The spurt in renewable energy capacity is significant, with a mix of state-run renewable energy agencies as well as larger scale private-sector investment. The current year has seen an unprecedented increase in installed capacity, with major international energy companies such as Trina Solar, JA Solar, Hanwha Q Cells, and LONGI planning to set up units in India. Major renewable utilities EDF Energies Nouvelles, ENEL Green Power, and ENGIE have acquired renewable project development firms in India. Further, funds have been released to several state governments for solar parks, which appear to be a concrete feature of the renewable strategy in the Indian context, as are programs to set up solar panels along irrigation canals across the country).[44] Decentralised off-grid projects include both state-based agencies as well as private companies.[45]

IPCC's twenty-year assessment has opened up the possibility of the expansion of the renewable energy sector and in many ways will force a business development model where new energy expansion will be biased towards the renewable sector but dominated by big capital. In other words, it opens another investment cycle in the context of the capitalist crisis. This will unleash another round of competition for capital investment and will also require destruction and retrenchment of the existing fossil-based industry. This investment and destruction cycle will have different impacts on different countries, different forces of capital. The economic conditions are already moving towards a phase where renewable energy will have cost parity with non-renewable energy. Even in India, where "it is widely accepted that renewable energy has the potential to meet all of India's further needs in electricity", the viability of clean energy has emerged as a potential for capital intensification. It is here that the contention between the globalised framework and national developmental framework will also open up.

In one 2013 estimate, global financial flows to the renewable energy sector were US$331 billion, of which the private funds totalled about 58%. IEA estimates that an additional US$1.1 billion every year on an average is required to keep the global temperature within two degrees Celsius. Though there has been a reduction in investment, partly due to the cheapening of renewable technologies, it shows the potential for large investments that global finance capital is looking for. This becomes more so as the fossil fuel sector is retrenched (in other words, destroyed) under the garb of a green economy and climate sustainability. It nevertheless means that there will be massive retrenchment in terms of job losses and destruction of local economies based on coal mining and coal-fired power plants. These changes imply destruction of old investment in coal-based industries, power stations, and local areas in which these are embedded and adverse impacts on people in these areas.

Missing the opportunity on the manufacturing front

India has not been an alien to producing solar panels. Companies such as Tata Solar and

BHEL had begun producing solar components as early as the 1980s and by the 1990s were exporting them to most of Europe and the United States.[46] The Jawaharlal Nehru National Solar Mission (JNNSM), the state-led national solar power initiative, had boosting local production as a priority, including developing domestic manufacturing capacity across the value chain.[47] Under JNNSM, a defined amount of solar-based projects are required to source their panels and modules from domestic units. This is called the Domestic Content Requirement (DCR), and this requirement has been touted as an attempt to boost domestic production of solar panels. However, the mission only aims at developing a meagre four to five GW manufacturing capacity and does not have provisions for other components of the value chain, in effect falling short of an effective framework to promote the expansion of manufacturing.

In practice, under phase I of the JNNSM it was noticed that there was no significant capacity utilization despite addition of manufacturing capacity. In fact, the import content of solar projects increased dramatically. Further moves towards DCR were suggested. However, under phase II, batch one and two, out of a total 2275 MW, only 375 MW aggregate capacity were reserved for domestically manufactured solar panels and modules (16 %). Under phase II, batch three, out of the total capacity of 2000 MW, a capacity of 250 MW will be earmarked for bidding with DCR (12.5%).

In February 2016, based on appeals by the United States at the World Trade Organisation,[48] the WTO dispute settlement board ruled that India's policy with regard to solar panel procurement breaches trade rules.[49] This was an interesting development, considering it was a complaint that simultaneously occurred while the United States was lauding India's efforts towards expanding solar power. There is an increasing shift of global energy towards renewable energy and international finance appears to view this as a major investment opportunity. Further, it is becoming evident that this makes global energy transformation a contested terrain. In the contemporary capitalist framework, the real issue is not just promotion of renewable energy but more importantly open market access to renewable energy trade and investment. This market access has already become a point of contention. Since 2010, when renewable-energy-related disputes emerged in the WTO, they have already reached eight percent of all new disputes. Moreover, the growth in import of renewable energy equipment is higher than the overall growth of merchandise imports from 2007 to 2011. Disputes related to renewable energy have to be seen in the context of capturing and dominating the rapidly growing renewable energy market.[50]

This puts into perspective the domestic content policy dispute with respect to India in the WTO. Domestic content policies are a widely accepted policy option enforced by the United States too, but, at the same time it is the United States that has brought this dispute in the WTO. Beyond the legality of this policy under WTO rules, this case is about a contention for investment and market access for global capital into the expanding renewable energy sector in India.

However, the twist in this whole debate is that while India's track record in producing solar panel components has not picked up and the recent surge in Chinese imports has meant a severe slump in domestic production, the technology required to transform sand into silicon capable of being used for panels is largely missing, and there is no policy to either develop it locally or ensure technology transfer. Hence a lot of the domestic firms' sourcing of silica is based on imports, resulting in no grand expansion in solar panel production in the near future, falling far short of government projections of one-hundred GW by 2022.

Missed employment creation, repeated employment destruction

There are also implications for employment creation. A study using data from 2009-10 shows that if a total investment of 1.5% of the GDP is focused on clean energy, which includes building new capacity as well as increasing energy efficiency, the jobs created in the renewable sector greatly exceed those under the current fossil fuel regime.[51] Pollin and Chakraborty show that renewables' direct and indirect jobs created—if the domestic content is kept stable—is on average 291.7 jobs per one-million US dollars in investment as opposed to 129.1 jobs in fossil fuel sectors. Based on these figures they estimate an addition of twelve-million jobs.[52]

There is a clear mismatch between the areas where renewable energies expansion is taking place and the areas where coal production is taking place. On the one hand, at present the widely promoted green energy corridors, based on resource assessments, seem to be focused on fairly prosperous states such as Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu, Maharashtra, and Himachal Pradesh.[53] Rajasthan, a not so prosperous state, appears to be the exception, but this can be attributed to the state government's very pro-business attitude over the last year and a half. In fact, owing to high costs for building infrastructure to transport electricity from remote locations such as the coast or solar parks, it has been suggested that states with rich renewable resources provide transmission infrastructure to states with lesser burden. However, this is where we meet a very core problem with the private sector. Its generation will be limited to returns on investment, and in this case the returns are guaranteed when utilities are able to purchase electricity. Hence, based on current investment patterns, one notices that most of these firms are focusing their investments towards more urbanised states such as Gujarat, Tamil Nadu, Andhra Pradesh, and Maharashtra. On the other hand, coal mining is concentrated in less prosperous states, such as Orissa, Chhattisgarh, Jharkhand, Telangana, Madhya Pradesh, and Uttar Pradesh, where local economies were disrupted with the entry of mining and will be disrupted again in the event of existing mines' closure, with adverse impacts on local livelihoods at each phase.[54] This in most ways represents a reproduction of the uneven development characteristic in India, accentuated by the introduction of neoliberal reforms in India post-1991.

The competition for new areas and new energy growth is taking place. As rightly stated by Trade Unions for Energy Democracy, "the commodification of nature opens new areas of economic growth, exploitation, and privatisation, and the green transition is nothing but an expansion of big capital into new areas." Previously, many had thought that the market would not be able to deliver this good "clean energy," but we now see that capacity creation is taking place in renewable energies, but in the form of big capital. This will lead to a new round of privatisation and enclosures by big capital. Therefore, if we look at the trends within the two major aspects of any energy transition, the coal sector and the renewable energy (solar) sector, we notice that while efforts are underway to expand renewables, the policy mix, both domestic and international, provides for conditions that foster capitalist growth in renewables "at their own pace and leisure", while continuing the "business-as-usual" approach when it comes to coal-based electricity. Even within a purely market driven scenario, this would lead to decreased investments in coal and increased investment in renewable energy. However, this will not amount to a just transition that addresses both the welfare of the people and eventual structural transformation. Such a transition must be directed by an industrial policy in the energy sector that address both the expansion of renewable energy and the transition away from coal dependence.

Industrial Policy for Energy Transition

An effective energy policy is required both to give direction and to accelerate the process of energy transition. In India such an industrial policy will also be required to make the shift away from the oil, gas, and coal sectors and to build up the renewables sector in a short and limited time. At this point, there is an underlying contention as to whether this can be achieved based on domestic capacity or whether it will demand international capacity and resources. This is important in so far as such a transition will allow the ground work for a sustainable energy transition and structural transformation. For us, it is important to frame such an energy transition within the larger framework of national development as this transition should contribute to the welfare of the people and to structural transformation.

This will require policy tools to evaluate the direction and the condition under which large scale investment in renewable energy and energy efficiency is being done. It is in this context that an industrial policy becomes an important tool to shape this transition. Developing economies like India need to strengthen their capability to "trigger, accelerate and manage structural and technological transformation and accumulate productive capacity through sustained processes of investment". In both these aspects, a policy framework is needed to enable planning and coordination and to provide incentives.

Even if it is assumed that the market has a role to play, the development of the market requires the proactive role of the state in order to ensure national development, encourage technological upgrades, and build up a learning process for accumulating these capabilities. It will require protective mechanisms for developing these productive capacities. Only in such a framework will an energy transition itself play the role of making structural transformation, developing human needs, making industrialisation sustainable, and providing livelihoods.

In post-independence India, coinciding with the post-Second-World-War phase, there was a general environment of support for industrial policy, which allowed for expansion of the economy, increased provision of public goods, and active demand management. Globalisation collapsed this function of the state and allowed for the dominance of the market and the retreat of the former, or rather a reorientation of state priorities. The financial crisis of 2008 has brought back industrial policy as an instrument for managing economies. The crisis has revealed the inadequacies of unregulated markets and weak states to sustain the economy and build sustainable industries.

The energy transition will also require the phase out of the coal industry. This means that a large workforce and embedded local economics in more than twenty districts in India will go through a phase of retrenchment and will require reorganisation and reintegration into viable local economies to provide livelihoods to the people. A fair and democratic transition means that resources as well as planning will be required to rebuild such local economies. An energy transition will not only require resources for making the shift to renewable energy, but also for rehabilitating a retrenched workforce and local economies into viable and sustainable economies.

In fact, in the literature, there has already been an acceptance that there will have to be some industrial policies and the debate is on the scope of such policies. In other words, the role of governance institutions has been recognised, and such governance can only be provided by the state. There is an additional reason for renewed interest in industrial policy: East Asian develop-

ment states have successfully deployed industrial policy in their efforts to absorb technology and know-how from the rest of the world. This becomes more important in the case of energy transition, where a whole new science and technology are developing and being absorbed into industrial processes at a high pace. This approach recognises a proactive role for the state in overcoming information, coordination, and externalities issues in the development of new activities and sectors, but integrated into the concept of comparative advantages.

In our understanding, the developmental needs of developing countries require both an ideology and policy framework for national development. It has to be one in which there is both independence and interdependency with the global economy. In the absence of a national development framework, the concept of comparative advantage, in view of the cumulative advantage of developed countries, invariably benefits the early industrialisers. In this view, energy transition will require the support of an energy policy which is framed in the larger framework of national development. Only then will this energy transition contribute to climate-change mitigation and also to the development needs of the people.

The components of industrial policy

Industrial policy has three broad dimensions: Technological, political economic, and participatory. The technological dimension looks at the existing technology and knowledge framework for a new research agenda and develops production processes for local needs and assimilates them into the economy. This dimension needs to be institutionally embedded to ensure continuity beyond the immediate political expediencies and cycles.

The political economic dimension, from our perspective, must be driven by a perspective of national development in which people's needs are prioritised and the public sector is dominant. Even assuming a market framework, a mixed economy demands the public sector act as an instrument for regulating the market. So it cannot be driven by the needs of global markets. Experience has shown that a receding discourse on national development as a policy instrument has been a result of global finance-led globalisation.

The participatory dimension implies that such an industrial policy necessarily requires a strong people's movement and democratic political processes not only to concretise an industrial policy, but to sustain it. This participatory dimension means spaces where mass organisations and trade unions democratically engage and shape industrial policy and monitor its implementation on a day to day basis. Institutionalising this participatory perspective into industrial policy would allow social development, labour rights, equitable sharing of productivity and profitability, and a more concrete sustainable approach to energy transition.

The question of national development, in its democratic form, implies an inclusive strategy that takes into account both access to energy and empowerment of the working people of the country, while the idea of "national interest" under private capital implies the usual idea of a trickle-down economy, where the enhanced human development of the working people is based on the expansion of capitalist accumulation. Private capitals returns, when subject to taxation regimes and a robust state machinery, allow for such trickle down to occur. In the recent history of India, under a liberalised economy, neither of these conditions appear to occur. Instead what we have is a promise of trickle down without the institutional and democratic mechanisms to even allow this, while growing inequality becomes a reality even as our economic growth rates soar.

Industrial policy for the energy sector

Industrial policy in India was closely linked to the five-year plans, inspired by the Soviet model of a planned economy. The Industrial Policy of 1956 was crucial because it outlined what was essentially the blueprint for economic strategy in the coming decade, which essentially meant an active role for the state in 17 industries, including heavy electricity, coal, oil, and generation and distribution of electricity. It also called for a progressive expansion of the public sector in 12 industries, such as aluminium, machine tools, fertilisers, ad transport. This focus on the public sector did not reject the private sector but implied a heavily regulated system of licensing that allowed for adequate allocation of capital in order to meet planning targets. This policy of a heavily regulated private sector with a public sector monopoly over key sectors gradually began to dilute by the 1980s when the Industrial Policy statement of 1980 "emphasized the need for promoting competition in the domestic market, technological upgradation and modernisation".[55] While an expansive system of public investment was envisaged, the growth rates of the economy remained terribly low, and the shift from a population based in agriculture and traditional occupations to the industrial workforce remained fairly stagnant. But in terms of expansion of public sector units, there is no doubt that the number of public sector enterprises increased drastically and did in some ways constitute the organised workforce within the Indian population. In terms of sheer numbers, this remains fairly low, at around seven percent of the total working population, but trade union density is very high among the organised sector, including the traditional carbon-based energy sector. If we were to consider the expansion of productive capacities under a liberalised economy, we can reconsider the possibility of a focused industrial policy. The power sector appears to present an immediate and concrete space for a coherent industrial policy.

Power planning in India has been an extremely top-down process, and in fact, the influence of workers and citizens is severely limited, except in terms of gaining waivers to pay dues, as in the case of farmers. A comprehensive decentralisation of the governance processes that are inherent to power planning in India is necessary to make the sector more responsive to people's needs. However, the immediate task towards reclaiming this sector is to ensure that increased disinvestment in public sector enterprises does not take place. For example, the Union Ministry recently announced a ten percent dilution of the government stake in Coal India (CIL), which has been directly opposed by the trade unions, threatening a nation-wide strike if the government were to go ahead with its proposed plan.[56] Based on contemporary trajectories of coal use in India, there is very little evidence to suggest that coal will make its exit from the energy mix, so government disinvestment will lead directly to a larger role for the private sector in coal production. The resistance against disinvestment from the state-run CIL is a crucial matter in this respect. It safeguards a model of industrial relations that allows labour to negotiate terms, however contested and fragmented they may be, and provides greater democratic spaces for communities to raise concerns over project implementation than does the private profit-led model.

With the entry of renewables at a large scale, any attempt at state-supported industrial development in the RE sector needs to be seen with respect to those working there and those living there. The predominant notion within the current RE policy essentially seeks to provide a fostering ground for the expansion of the private sector, which in itself does not augur well for labour's bargaining power in the future energy sector. The focus on solar parks with huge land requirements further raise issues of democratic rights for displaced communities.

Democratic Framework for Just Transition

In such a scenario, the model developed by Kanitkar et al. is useful here as it provides a normative framework that brings together carbon constraints, energy production requirements, and energy mix. First of all, Kanitkar et al. show that as developed countries have already used more than their share of the carbon budget, the total available budget to developing countries is reduced. In the case of India, the "entitlement" of 103 GtC is reduced to between 55-68 GtC. Barring immediate reduction in all emissions from the developed world, developing countries will see a further reduction in their carbon budgets. Despite the question-marks remaining on these assumptions, we will consider India's reduced carbon entitlement as being available to India to develop our arguments in this paper (called scenario 2 in Kanitkar et al).[57]

Considering the central role played by energy systems in an industrialisation process, as well as the fact that energy production is a large contributor to carbon emissions, we will concentrate on this element in order to outline an energy transition framework. If we consider the share of energy production constant in the total carbon contribution, the carbon space with which we will be counting for stands at 36% of the total entitlement, equivalent to 24 GtC. Further, the model developed by Kanitkar et al. attempts to provide an adequate fuel mix within the limits of the carbon budget prescribed, based on prospective modest per capita electricity consumption for the case of India. In 2012, India's electricity consumption was 760 kWh per person per year. The model uses a target of 2500 kWh per person per year in 2035 and 4500 kWh per person per year in 2050 (called case IV). This is considerably lower than current consumption rates of 12,950 kWh per person per year in the United States or that of China which is 3,480 kWh per person per year.[58]

According to Kanitkar et al., with a fixed carbon emission budget the costs required to maintain a pre-decided level of per capita electricity requirement are considerably higher as the share of renewable energy is higher.[59] Therefore, there will have to be a trade-off between cost of energy production and the quantum of reduction of carbon emissions while ensuring that it does not exceed the given budget. For each kWh, this trade-off can be quantified. The model gives estimates of the cost differential for different carbon emission intensities of energy production. Using the data provided, it appears that reducing one GtC of emissions based on the per capita electricity consumption mentioned above (case IV) would have an additional cost of between US$29.7 and 31.3 trillion (from a base of 33 GtC).[60]

Another aspect is that the base load capacity for the power sector—for which coal has been a reliable source—would, in the case of renewables, require a multiplication of the current capacity to ensure a reliable base load capacity. In other words, providing the same amount of per capita per year electricity will require a generation capacity of more than 3,500 GW, while with a 33 GtC budget, 2,500 GW would be required. A suggestion made in this regard is to effectively de-commission older coal technology and ensure immediate installation of super-critical technology. This could have immediate impact on aggregate emissions as well as serve as a good starting point for a transition towards renewables.

According to their modelling, Kanitkar at al. foresee that a large part of the rapid addition in renewable energy will be provided by solar photovoltaic and concentrated solar power. They explain that this is due to predictions that costs of solar technology will fall until reaching grid parity by about 2025. But this is also

because their modelling does not provide for a maximum resource limit for solar energy, while it does for all the other fuels. So while cost will be a factor that allows for solar to play a large role, the models provided by Kanitkar might be overestimated to some extent.

Finally, the modelling reveals that an important inflection point takes place around 2038-39 when conventional thermal power plants' capacity reaches a peak at below 500 GW and renewable energy overtakes the former in terms of its share in total installed capacity. This also represents the peak in India's carbon emissions at 1.1 GtC a year. The current debate on emissions and blanket restrictions on emissions does not consider the level of peaking permitted for developing countries based on their carbon budgets. In other words, hypothetically, if India were to ensure a smooth transition from sub-critical coal technology to super-critical coal technology, concurrent with increase in electricity and energy demand, this would mean a peak in carbon emissions. But, it would also mean an adequate base from which a shift towards a low-carbon economy can be envisaged. These peaking situations need to acknowledge a transition in economic structure that can simultaneously address questions of energy access while providing new options for the low-carbon economy.

Keeping in mind the requirements of the power sector and the limitations of a low-carbon framework, it is crucial to effectively ensure a smooth transition for those that are employed in the power sector. In this case, an appropriate policy structure, which includes an industrial policy linked to an emissions perspective, is necessary. To be just, such a transition will necessarily include the following components a) rehabilitation of coal areas, b) redeployment and retraining of the coal sector workforce, c) financing for the transition, and d) public-sector-led and municipalities-controlled renewable energy development. This last point is crucial in order to counter the large capital, high cost model of renewable energy development and develop spaces for people's participation.

Redeployment and retraining of the coal sector workforce

With a total workforce of around 487 million, largely employed in the informal sector, labour in India is unprotected and poorly regulated. In fact, there has been an increasing trend towards informalisation of the organised workforce, which accounts for between 6 to 7% of the total workforce. In 2013-14 Coal India Limited had 352,282 employees, while power sector in the different states employed 678,002 . For the same year, the central power generation companies had 85,595 employees. This represents the core power sector employment, including those employed in the National Hydro-electric Power Corporation (NHPC) as well as the Nuclear Power Corporation Limited (NPCL) of India. However, if we were to focus on employment in thermal power generation and Coal India, and then the total figure for 2013-14 would be around 407,000.

While re-training workers within NTPC towards renewable energy establishments—or likewise those employed in Coal India—may seem a daunting task, it is conceivable considering the level of skill already available. Of course, the costs of training would be borne by government in most cases, as has been mentioned in the draft national renewable energy act 2015.

Another, important factor that needs to be included in a democratic framework is to re-combine struggles for land and livelihood with those of labour. In both cases, the threat of impending disinvestment or land-acquisition means that both these forces are aligned against similar industries. It is important to recognise that concerns of land-acquisition

and rehabilitation are relevant not only in coal mining or thermal power projection, but also in the case of solar parks.

The coal industry has near 90% union density in state-run coal mines, which provides a good leverage from which to negotiate the terms of coal restructuring and transition to renewables. Further, redeployment into RE could be a more organised and collective effort owing to existing union density.

In this scenario, based on the current policy regime, with a government intent on diluting labour laws and ensuring a flexible labour force and a sector that is largely populated by private capital, the condition of workers in the renewable sector appears to follow the story of labour in new manufacturing in India. It is necessary to utilise existing leverage in traditional energy sectors to challenge this trend within the RE sector. Redeployment could serve as an important strategy.

The advantages of a transitional framework for renewable electricity penetration in lieu of coal-based electricity has interesting prospects, as the highly unionised coal sector could negotiate a more favourable deal for employment in the renewable sector and could initiate a process of control across the sector as it expands. This presents an opportunity. However, if the rate of transition from coal to renewables is seen independently of the growth of the two sectors, then the sectors could potentially develop distinct labour regimes.

Further, as was seen above, the primary mover in the renewable sector, as per government plans, is the private sector. The possibility of negotiating decent employment seems severely limited. Therefore, with a limited presence of workers in the electricity sector and a separate private sector thrust being given to renewables, ensuring employment opportunities for those being displaced in the coal sector will require greater control over public resources and public institutions.

Financing for the transition

In 2010, India introduced a coal tax of INR 50 per tonne of coal produced in order to fund clean technology development. However, there should be a concerted demand that proceeds from the coal cess, which was increased to INR 200 recently, should also be focused on creating a fund for employment generation within a transition framework. It could provide funds as a rehabilitation and restitution mechanism towards ensuring shift of employment from fossil fuel based sectors to renewable sectors as the transition proceeds.

In the 2016 budget, the government doubled the clean energy cess (now renamed as the Clean Environment cess) on coal to from US$2.96 to $5.94 per tonne. (Rs 400 per tonne). An equivalent tax increase on all petroleum products equalizes the implied tax on carbon content. This de facto “carbon tax,” comparable to international norms, is a “price signal to reduce fuel burnt, and hence CO_2 emission”, according to Economic Survey of India 2013-14. This report estimated that there would be net reduction of 129 million tonnes at Rs 500 per tonne of coal, leading to about seven percent reduction of CO_2 emissions annually.

By June 2014, Rs 40,000 crore (1 crore=10 million) had been collected, but only a little has been utilised and that also for only power projects. A similar annual cess is collected from petroleum products sale through the oil industry development tax. These cesses should be one of the major sources for financing a fair transition. This could be used to fund compensation and rehabilitation for workers in the coal industry and people in coal-based areas as well as for investment in rebuilding their local economies in a sustainable manner.

Public-sector-led and municipalities-controlled renewable energy development

In terms of restructuring, it is important to move towards developing public sector cooperatives, ideally at the administrative level of the municipality or district, under a public sector framework that allows for local generation for local consumption (though not exclusively) as a way to introduce local control and local management systems.

As has been demonstrated, if a participatory dimension is to prevail, it cannot prevail in a renewable energy sector under either a centralised state or a private company, as this will necessarily weaken the position of communities and labour vis-à-vis the resource. The only option in this case is to provide a significant direct relationship with the source of production. In fact, renewable energy provides an opportunity unlike others, where the source of energy can be potentially utilised at varying scales. The role of the government in this case should be to ensure provision of tools and materials to cooperatives or local governments to determine electricity generation structures at the local level. Further, state support can be provided in terms of transmission equipment across city and state boundaries. In terms of institutional support, the focus must be on using local and industry-based institutions to re-align the intended goals of a RE policy and reintroduce the debate on the "public interest" as a criteria embedded in social and economic inclusion of the marginalised.

However, in the wake of a prevalent private sector strategy, an appropriate statement by Foster and Thomas states, "It is only by piecing together the big picture that the Left can hope to understand its place in a rapidly changing field of play. In this renewable environment, the goal is not—as it is now with oil—to obstruct development, but rather to deny private interests the legal right to own the future sites of humanity's common sustenance".[61]

Hence, the task is two-fold: First, to isolate the distinctly anti-labour form renewable energy takes under capitalism, and second, to diversify the conception of control of public resources, uniting forces that have similar "adversaries" to ensure that state policy continues to identify "public" in terms of social justice, and to reinvigorate the democratic potential of a "just transition".

Conclusion

As has been shown in this paper, in the case of a developing country like India, the penetration of renewables could be a reality, but in most cases renewable energy is not seen as a direct replacement for coal but as a parallel supplement to coal. The electricity demand in India, at the current rate of growth, requires a transition not to be seen merely as between coal and renewables. Instead, it needs to recognise the transition within the thermal power sector as well. The shift from sub-critical to super-critical coal technology, maintenance of public control over coal resources, and eventual redeployment of the workforce in the coal industry in a just manner are all crucial in understanding the transition required within coal.

Based on this transition within coal as a sector, we can hope for a just transition into renewables. There needs to be a push from trade unions in the coal sector to ensure a "just transition", where they are gradually absorbed

into the renewable energy sector as well as the expanding industrial sectors that are obligated to purchase electricity from renewable resources, while ensuring that coal-based units where these workers were employed are eventually phased out. The division of the renewable energy sector into a large scale sector meant for boosting industrial production should be the focus of the immediate "just transition" for Coal India employees, while concerns of household and energy efficiency need to be the task of decentralised energy collectives that need to be expanded at the behest of the trade unions. This two-pronged strategy could be the cornerstone of a new political alignment between social forces organising around land-grabs and unions organising against labour violations and the erosion of workers' rights.

As average global temperatures increase and the severe effects of global warming are experienced across the world, the rapid move towards a low-carbon pathway can only take place if energy needs are divorced from the peculiar nature of commodity production inherent to capitalism. While this may not be an immediate achievement, the task of ensuring greater worker control through public intervention as well as workplace intervention and through decentralised collectives, cannot be understated at this point of time. Further, the immediacy of such a strategy cannot be understated. With unions under continuous attack, it is crucial that a transition framework is collectively formed that takes into account the social forces that are excluded from the development story of India and that these forces mobilise in a collective strategy to reclaim the future control of resources in the coming century.

India is undergoing another round of industrialisation. But due to climate change, this round has to be under a different energy use structure. In other words, this phase of industrialisation will be under constrained energy choices. In this condition, industrialisation has to remain dynamic enough to be both built on the base of increasing renewable energy systems and flexible enough to adopt to the changing fuel mix. These two aspect of this phase of industrialisation can be, and need to be, linked up, integrated, and harmonized in a dynamic environment. This can only be done at the level of an industrial policy framework that will allow the state to strategically shape and guide the industrialisation process. Such policy cannot be based on indicative measures of growth targets and investment requirements but has to address process parameters that can incorporate new energy efficiency standards. This requires more strategic interventions, interactive processes of learning, incentive structures, and regulative institutions to enable this integration. Moreover, even if one includes the market, an important economic instrument for regulating this market itself where focusing on social values entails developing the public sector and promoting the cooperatives sector. These sectors need to be developed to an extent that they can become important instruments for exercising political choices in the public interest. In other words, if industrialisation has to be sustained socially and environmentally, its social base has to be aligned to broader social development and employment of the working population.

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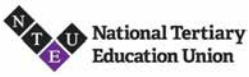

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