still waiting...

A report on energy injustice.

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Image: Kamruddin, 52, lives in the danger zone of burning coal in Bokahapadi Village near Jharia coal mine. Kamruddin has shown respiratory problems since he was 20 years old and is now suffering from pneumoconiosis, a terminal disease. 90% of people around Jharia coal belt have symptoms of pneumoconiosis, as reported by Doctor O. P. Agarwal, from Life Line Hospital in Jharia. This illness can lead to other respiratory diseases like TB, pneumonia, bronco-pneumonia, or bronchitis

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COVER IMAGES
Top: Aerial view of Mumbai city at night in the state of Maharashtra, India
Image credit: Indiapicture.in
Bottom: Rama Naik has to walk ten kms to charge her cellphone her only lifeline to her children far away - Mahime Village, Karnataka
Image credit: Hari Adivarekar

executive summary

The world has entered an era of dangerous and destructive climate change, and this change is increasing exponentially through lack of action in tackling the problem. India will be among the most severely hit countries from the impacts of runaway climate change. We have witnessed this year a most unusual weather pattern - from floods to droughts and intense spells of rain - a sign of things to come.

Whether we can step back from the brink of a climate crisis and change course will depend heavily on the level of cuts in greenhouse gas emissions the world is prepared to make over the next few years. India will be called on to be part of the solution. At the same time, in India, we are faced with the challenge of development and poverty alleviation, which is closely linked with providing energy access to millions currently denied it.

This report argues that addressing climate change (reducing future greenhouse gas emissions) and meeting India's development goals are not divergent, as is often portrayed. The report offers an alternative energy paradigm as a solution not only to further the sustainability of the planet, but to do so in a manner that offers inclusive growth and quality energy access that has so far remained a mirage in most of rural India.

Establishing the Urban Rural-Divide

The report compares the electricity supply scenarios among rural and urban areas in five states from four regions of the country; two in the East (Orissa and Bihar), and one each in the South (Karnataka), North (Uttar Pradesh) and West (Maharashtra). In each of these states, a tier A city, tier B city, and three villages were chosen for the survey. Across the states, the findings clearly illustrated that there was a widening electricity divide between urban and rural India. To address this divide is crucial not only because approximately 70% of the country's population is still rural, but also because this is a sustainable, climate friendly model that should define India's energy growth plans.

An analysis of the survey data of the five states for the period 2000-2008 showed that the urban population receives far better quality and quantity of electricity in comparison to the rural population. All the villages covered in the survey had power supply for durations less than 12 hours a day on an average. The tier A and tier B locations had supply between 22 and 24 hours. Despite an increase in centralised power systems in these states, the electricity generated has been guzzled by the growing demand in the cities.

The total installed generating capacity in the country has gone up from 58,012 MW in 1989 to 1,52,148 MW in 2009, a 162% increase.

Total monthly generation from conventional sources has increased from 43,596 MU in March 2000 to 65,057 MU in March 2008, an increase of about 50%.

National per capita electricity consumption has gone up from 283 kWH in 1992-93 to 429 kWH in 2005-06, an increase of 52%.

But 40% of the households, mostly in rural areas, have no access to electricity even in 2009.

Decentralised Energy Supply: The Way Forward

The current energy paradigm in India is to build large centralised power generation systems, mainly thermal plants (coal, gas), large dams, and now nuclear power as well. It is apparent from this study that such large centralised power addition is not the best model for providing electricity solutions to a country with as widely dispersed a rural population as India.

In the current scenario, the rural population is the last one to be brought into the centralised grid system. Even if it has access to the electricity grid, it rarely, if

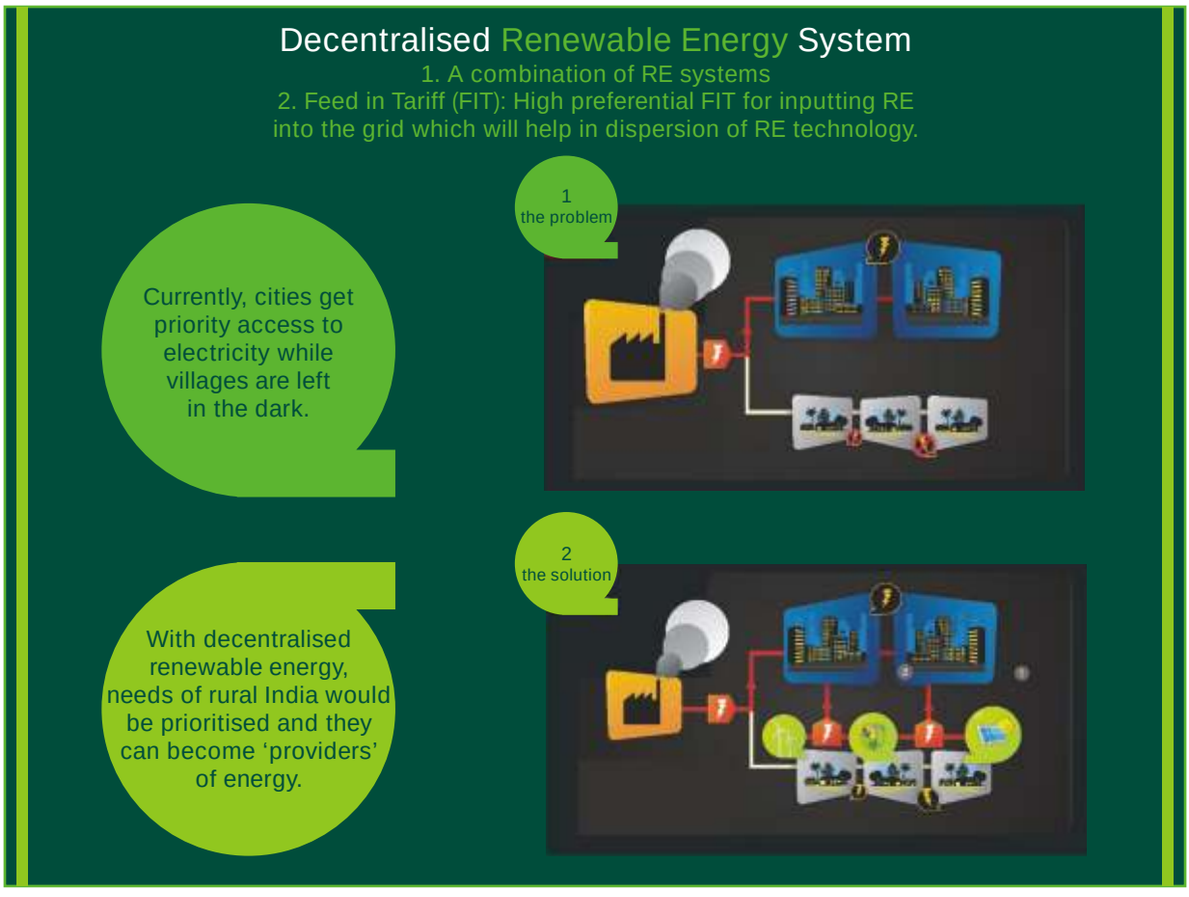
ever, has access to reliable power - a clear case of energy injustice.

Alternatively, decentralised power generation systems are tailored to the needs of the local population, and can assure a reliable supply of electricity to rural communities. Perfectly suited to this model of decentralised power generation are renewable energy systems, which by design can be easily deployed, controlled and managed by a community utilising locally available resources. They are also economically viable for these communities in the long-term, and have none of the associated health impacts of conventional, 'dirty' fuel.

Large centralised power stations in India are still failing to provide quality electricity to the poor of the country, 62 years after independence. The solution to this failing lies with decentralised renewable energy systems - an answer not just for those far flung villages with no electricity, but also for those connected to the grid yet receiving only the leftovers of the cities' electricity supply. The model proposed would incorporate hybrid systems of wind, micro hydel, solar PV and biomass (depending on the specific location and availability of resources), developing mini grids between homes and other nearby villages.

India now has the opportunity to build its future energy infrastructure in a way that provides for the needs of the rural population in a just and sustainable manner. The current energy plans envisage a large uptake of centralised coal-based power. This is disastrous for the planet and not an answer to providing for the poor.

We need to overhaul our energy plans. The time for an Energy Revolution is now, and decentralised renewable energy is at its core.



introduction

The Climate Challenge

A multitude of new findings show that climate change is racing ahead of the worst case forecast of the Intergovernmental Panel on Climate Change (IPCC) in its 2007 Fourth Assessment Report (AR4).

Changes such as the dramatic melting of the Arctic summer sea-ice in 2007 and 2008 make it clear that even the current level of global warming is too much. With a greater urgency than ever before, the world must take immediate and effective action to achieve a peak in global greenhouse gas emissions by 2015 at the latest. This has to be followed by a steep and rapid decline to zero emissions as soon as possible.

The signs of a rapidly changing climate are also rife within India: the fast receding Himalayan glaciers, the rising sea levels that have already displaced people in the Sunderbans, and the unpredictable monsoons are all taking their toll on India's people, environment and economy. The aftermath of the recent floods in Andhra Pradesh and Karnataka, in which thousands of people lost everything and are still homeless at the time of writing, are testament to another aspect of climate change: that the poor will be the worst affected.

Protracted international negotiations are underway to determine a binding treaty that will ensure the average global temperature stays as far below 2 degrees Celsius from the pre-industrial level as possible. India, along with other developing countries, is arguing for common but differentiated responsibilities for each nation to reduce country-specific GHG emissions - namely that developed countries cut their current greenhouse gas (GHG) emissions while developing countries reduce the growth in their future GHG emissions, thus creating a carbon space for the latter group to progress. The basis for such an argument is that developed countries have been responsible for the majority of GHG emissions to date, whereas the developing countries still have much 'catching up' to do before their populations reach an acceptable level of development.

An acceptable level of development is closely linked to an adequate and reliable electricity supply, which in turn is closely linked to energy consumption. Conventional energy consumption is associated with GHG emissions, which lead to global warming and climate change. Of all the various forms of energy, electricity alone is responsible for about 58%[1] of India's CO_2 emissions related to energy.

India is, therefore, offering its low per capita emissions as the basis for the 'common but differentiated' responsibilities request. India is so confident of continuing at such a low per capita emissions that the Prime Minister has assured the international community that it will never be more than that of the developed countries. Table 1 shows the per capita electricity consumption of some of the leading countries, along with their per capita CO_2 emissions.

Table 1: Global Electricity Usage and CO_2 Emission (Year 2007)

Country	Per Capita Electricity Consumption(kWH)	Per Capita Co_2 Emission (Tons)
United Arab Emirates	16,161	29.91
Sweden	15,238	5.05
USA	13,616	19.10
Australia	11,216	18.75
Japan	8,475	9.68
Germany	7,185	9.71
China	2,328	4.57
World Average	2,752	4.38
India	543	1.18
Indonesia	564	1.67

(Source: Key World Energy Statistics, IEA, 2009)

[1] World Resources Institute

India currently is the fourth largest emitter of CO_2 emissions (in absolute terms). If our energy growth plans remain as proposed in the Eleventh and Twelfth Five Year Plans, it is projected to rise to the third position. Yet, consider that around 40% of India's population still has no access to commercial energy, and the gravity of the situation becomes clear: if we aim to provide energy security to this (growing) population in a business-as-usual scenario, the pollution level in India will be enormous. According to the Greenpeace-Energy [R]evolution[3] report, India's contribution to the global CO_2 emissions will increase from about 1,126 million tons in 2003 to approximately 4,039 million tons in 2050, thus increasing its share in global emissions from 4.8% to 8.7% in a business-as-usual scenario.

Yet, there also already exists a great disparity in energy access within India: between the rich and poor, and between the urban and rural communities. A 2007 report by Greenpeace named 'Hiding Behind the Poor', revealed that a small section of the population - those in the highest income group - emitted about 1,500 kg per capita of Co_2, four and a half times more than the many in the lowest income group (335kg), and almost three times more than the average Indian (501kg).

The Indian government quotes the large number of people living without electricity as the main reason to continue building large centralised power addition, especially coal fired thermal power plants. Hiding behind the poor, successive governments have continued to add a huge number of large power plants based on conventional technology (coal, large hydro or nuclear), despite knowing well the deleterious impacts of such policies.

[2] World Resources Institute

[3] http://www.greenpeace.org/india/press/reports/energy-revolution

Image: A boy stands in front of a former village that has been washed away by the sea on the disappearing island of Ghoramara. Ghoramara is one of the Sunderbans' most vulnerable islands and has displaced thousands of islanders due to rising sea levels.

© Greenpeace / Peter Caton

More large-scale addition of conventional power has been planned. The Integrated Energy Policy, as developed by the Planning Commission, has projected that 'to sustain a growth rate of 8% through 2031- 32, and to meet the lifeline energy needs of the poor, India needs, at the very least, to increase its primary energy supply by three to four times and the electricity generation capacity/supply by five to six times of their 2003 - 04 levels'. According to this projection 'by 2031- 32, the power generation capacity must increase to nearly 800,000 MW from the current capacity of about 160,000 MW inclusive of all captive power plants.' It is important to note here that more than 70% of such additional capacity is projected to be coal-based, and about 10% large hydro- based.

Such a large-scale addition of conventional power capacity in a short period will have a profound impact on social, environmental and economic aspects of our society, which unfortunately have not been discussed in the Integrated Energy Policy document. The massive amount of coal burning, and fresh water and land required to support this amount of additional power capacity will not only devastate our environment but will also push the vulnerable sections of our society to destitution, due to displacement, lack of water and threat to livelihood. It is pertinent to note here that the Integrated Energy Policy has also contended that, despite a five to six fold increase of the electricity generation capacity/supply by 2031-32, energy security cannot be assured until at least 2050. This clearly indicates the inadequacy of a grid-based centralised electricity supply system in meeting the energy demands of such a huge population spread over a diverse country.

It is logical that India should argue for common but differentiated responsibilities in the international climate negotiation framework. It is also now well recognised, those people and countries that have contributed least to climate change will be among those most severely affected. The Indian government has a primary obligation to its own people, if not to the global community, to do all that is possible to minimise the impacts.

At a time when the global community is looking to the Copenhagen meet to find a suitable successor to the Kyoto Protocol, India is faced with twin contradictions. On the one hand, it is asking for adequate carbon space for its poor to develop, and yet finding it impossible to provide electricity to those same poor despite pouring money into building additional conventional technology power stations. On the other hand, these same power stations will contribute to GHG emissions, thus exacerbating climate change and causing huge problems directly to India's own population and to the global environment.

Is it not the obligation of the Indian government, which demands larger carbon space for its people in the international arena, to provide such a space for the rural poor within India to get adequate electricity? And are there not better options for India to bring energy justice to its poor and rural population without adding to the carbon emission build-up in the atmosphere?

The study seeks to expose the electricity injustice within India, and to propose a solution.

Image: Villagers from the island of Molkhali await the high tide and hope that rising sea levels do not breach the recently built dikes, which could ruin paddy fields for over two years.

Case Study One:

Unelectrified villages in rural Karnataka

The night hides many things in the unelectrified hamlets of Uttara Kannada District in Karnataka. It hides the black soot deposits on the walls, built up from years of smoky kerosene use. It hides the black soot deposits in the people's noses and lungs; and their weakened eyesight from straining to see in the dim light of the oil lamps. It hides their seclusion and their lack of education, as it is impossible to make visits or read after nightfall. So they just go to bed. But, the most heartbreaking secret the night holds is the aging faces of its captives. For, the children of the hamlets are missing. Unable to study after dark in the dim light of the kerosene lamps, most have been sent to stay with relatives in bigger, electrified towns and villages: a dark seam of separation running through families.

“We see our two children only once every six months, when they come and stay with us for a night,” says Sarojini Rama Naik, a resident of Vatehalla Hamlet in Mahime Village, Honavar Taluk. “Even then, they find it difficult to be without electricity.” She leans against the doorway, the flickering lamplight throwing shadows across her face. “Of course I miss them, but they have to have an education.”

Sarojini and her husband, Rama Timma Naik, sign the annual letters to the village panchayat requesting for electricity; they even boycotted the previous assembly election in protest. But no connection has still been made. Some thirty pylons were erected in the area a few years ago but their arms are empty of the power-carrying cables. Rama doesn't know why this is. He thinks it is because the thick forest that surrounds their hamlet means the cables are considered at too high a risk from falling trees. The disparate nature of these rural villages could also be a factor: each hamlet would require a different set of expensive cables, but would connect only a handful of houses.

So Rama continues to travel to the nearby Gerusoppa town to collect kerosene, though their rural location means the 10 km journey takes him the entire day, on which he must set other business aside. The government subsidises three litres a month for each household. This is not enough for their needs, so Rama purchases more on the black market at a higher price. If they had an electricity supply, he could increase his income not only by saving the time it takes him to travel, but he and his wife could also use the evenings to process the areca nut they grow on their quarter acre of orchard. Sarojini would buy an electric grinder too, to save her the one to two hours a day she spends grinding spices in the giant granite mortar on the floor of the dim kitchen. All her housework is currently done by oil lamp: she's had a cough for years. The United Nations estimated that people who rely on kerosene lamps and biomass stoves inhale the equivalent of two packets of cigarettes a day. Women and children - those who spend most of their time indoors - are the most affected. Two-thirds of the women in India, China and Mexico with lung cancer are non-smokers.

To add to the incongruity of their situation, Rama and Sarojini live in the vicinity of two large hydel dams - the 55MW Linganamaki, and the 240MW Gerusoppa - but the electricity they generate is not distributed to the area's residents. People in the village believe that all the electricity generated by the nearby dam goes to power the city of Bengaluru, and not their homes.

“I remember when the dams were built, when I was young, and my father saying we might get electricity,” says Rama. “Many of the surrounding villages have it. Why don't we? It must be our bad fate. You learn to accept it.”

More incongruous still is the sight of a mobile phone dangling from a roof beam in the house, the pink plastic cover swinging dully in the shadowy porch. Missing their children, the couple bought the phone in an attempt to keep in contact with their son and daughter. Of course, they have no means to charge it, and so Sarojini spends a day each week travelling to Gerusoppa to connect it to a plug socket. As she texts her children by the dim amber light of the kerosene lamp, the small house in the middle of the woods suddenly seems very quiet, and very lonely.

Image: Yenki Thai cooking in the semi-darkness - Mundgar

© Greenpeace / Hari Adivarekar

the electricity scenario in india

The electricity scenario in India has been a sad story of power cuts, both scheduled and unscheduled; low voltages; frequent collapse of the grid either locally or at state or regional level; unsatisfactory customer service; high tariffs; poor operational and financial performance; never - ending subsidies; electricity injustice between rich and poor and urban and rural populations, and so on. Even if we leave out the first decade after independence as a point in our learning curve in managing our own affairs, one cannot look back at the performance of the sector during past five decades with pride, except that there has been massive spending in the power sector resulting in a phenomenal increase in the installed generating capacity, transmission and distribution network, and demand for electricity.

The installed generating capacity has gone up from few hundred MW at the time of independence to 1,50,000 MW, with thermal power providing about 65% of the capacity, hydro providing 25% and the remaining in the form of new and renewable energy sources with a small contribution of 2.9% from nuclear power. Tables 2 and 3 show the installed electricity generating capacity in India with respect to sector and fuel type, respectively. The sector terms in Table 2 refer to the generation under state government control, central government control, and that generation that comes from private companies.

Table 2: Sector-wise Installed Capacity (as on 31.8.09)

Sector	Installed capacity/ MW	Percentage of total installed capacity/ %
State Sector	76,949.67	52.5
Central Sector	49,580.99	34
Private Sector	25,617.75	13.5
Total	1,52,148.41	

[Source: Central Electricity Authority, CEA]

Table 3: Fuel-wise Installed Capacity (as on 31.8.09)

Fuel	Installed capacity/ MW	Percentage of total installed capacity/ %
Thermal	97,869.24	64.6
of which Coal	80,283.88	53.3
Gas	16,385.61	10.5
Oil	1,199.75	0.9
Hydro	36,916.76	24.7
Nuclear	4,120.00	2.9
Renewables	13,242.41	7.7
Total	1,52,148.41	

[Source: Central Electricity Authority, CEA]

Image: Children studying after sundown with the help of solar powered lamps in Tilonia, Rajastan.

Though there have been deficits in electricity supply both during peak demand hours and in annual energy requirement, the problem generally has been acute in meeting the peak hour demand. The deficits have varied from a figure of less than 1% to as high as 25% in some cases. The power supply position indicated in Table 4 for the period April - August 2009, covering a part of summer and rainy seasons, can be viewed as typical for the entire country during recent years.

Table 4: Power Supply Position (April to August 2009)

Region	Peak Demand (MW)	Peak Met (MW)	Deficit / Surplus (MW)	%	Annual Energy Demand (MU)	Annual Energy Supplied (MU)	Deficit / Surplus (MU)	%
Northern Region	35,932	31,439	- 4,493	-12.5	111,746	98,283	-13,463	-12.0
Western Region	35,503	30,031	- 5,472	-15.4	103,743	90,791	-12,952	-12.5
Southern Region	29,216	26,369	-2,847	-9.7	90,199	84,469	-5,730	-6.4
Eastern Region	12,913	11,925	- 988	-7.6	37,524	35,749	-1,775	-4.7
North Eastern Region	1,760	1,400	-360	-20.5	3,879	3,364	-515	-13.3
All India	114,412	98,154	-16,258	-14.2	347,091	312,656	-34,435	-9.9

[Source: Central Electricity Authority, CEA]

The problems besetting the electricity sector have been so many and so serious that it has been identified as one of the main hurdles in India's development. With the exception of a handful of states, a highly unsatisfactory electricity supply has been the feature of our economy.

If we look at the economics alone of the electricity sector, the massive budgetary support every year, and the colossal losses, have been a major cause of concern. The combined loss to electricity supply companies is reported to be about Rs. 25,000 crore a year, which is unsustainable.

Urban - Rural Divide

India is probably one of the few countries to have neglected its villages, although we continue to say that India lives in villages. About 40% of the population, almost all of who live in rural areas, are still without access to commercial energy including electricity. Even though a few states claim to have technically achieved 100% village electrification, official statistics confirm that only 60% of households in India have legal electricity connections. Table 5 shows the level of electrification in the five states selected for analysis.

Table 5: Electrification (as on 29.02.2008)

State	Number of unelectrified villages	Electrified households
Karnataka	356	78.5%
Maharashtra	5,018	77.5%
Uttar Pradesh	12,298	31.9%
Orissa	2,994	26.9%
Bihar	18,395	10.3%

(Source: Question of 21.4.2008 in Rajya Sabha & Planning Commission)

However, even a household power connection does not necessarily mean an adequate power supply. For, the huge majority of rural areas receive electricity only during some parts of the day, mostly when it is not of good value to them. Most rural areas seem to get no power supply during the majority of the morning hours, or during evening hours when the need is at a maximum.

Whereas the demand and subsequent supply of electricity to towns and cities has been increasing at a tremendous rate, the rural areas are unable to meet even their basic requirements for lighting and agriculture. If the profligacy being incurred in the urban areas of each state were to be reduced by 50%, probably all the households in each village could get a lifeline supply of 30 units a month.

The reason given by the successive administrations for the failure in 100% electrification, even after 62 years of independence, has been the high cost of extending the electricity network to villages. Yet, this restraint seems only to have come in the way of rural electrification. Huge sums have been spent in adding to the installed generating capacity and expanding the transmission and distribution network to cater to the needs of the urban areas and industries.

A thorough analysis of the power sector in the country reveals a different reason for this gross neglect of rural areas: huge inefficiencies in generation, transmission, distribution and utilisation of electricity in India are resulting in an effective loss of 25-40% of our installed capacity. These inefficiencies are typical of a badly managed grid-based centralised electricity generation system.

Even within such a system, these gross inefficiencies are largely avoidable. Measures such as improving plant performance, reducing losses from transport and distribution, minimising energy use wastage, and energy conservation, all have tremendous potential to overcome the deficits, and require much smaller investment for new capacity addition. This has been pointed out by experts for a number of decades, but the political will to implement these measures is lacking. Yet, each component of this inefficiency, if taken to international best practice, is able to provide adequate electricity to thousands of villages. Table 7 shows the level of power efficiency per sector in India, as compared to the level of international best practice.

Table 6: Growth of Per Capita Electricity consumption in selected states

	UP	Bihar	Orissa	Karnataka	Maharashtra	India
1992-93	179	117	297	303	439	283
1993-94	186	126	313	328	459	299
1994-95	186	126	313	328	459	299
1995-96	207	138	370	362	545	336
1996-97	197	138	309	340	556	334
1998-99	197	152	312	349	594	359
2000-01	149	113	168	353	515	314
2002-03	188	45	346	461	539	373
2003-04	189	45	373	482	559	390
2004-05	202	45	395	505	585	411
2005-06	209	45	431	517	609	429

[Source: Central Electricity Authority]

Table 7: Power Sector Efficiency in India

Power Sector Area	Prevailing level of efficiency / loss in India	International best practice
Generating capacity utilisation	50 - 60%	More than 85%
Aggregate Technical & Commercial losses (AT&C)	35 - 40 %	Less than 10%
End use efficiency in agriculture	45 - 50 %	More than 80%
End use efficiency in industries and commerce	50 - 60 %	More than 80%
End use efficiency in other areas (domestic, street lights and others)	20 - 30 %	More than 80%
Demand Side Management	Potential to reduce the effective demand by more than 20%	

(Source: Integrated Energy Policy, Planning Commission, Ministry of Power and other sources)

Sustainability of centralised supply system and conventional power plants

Inherent within a grid-based centralised generation system is the need for long lengths of transmission lines, a complex network of distribution systems, and associated equipment such as transformers. Each of these add to the complexity, reduced reliability and increased capital and operational costs. These factors, combined with the large manpower requirements to sustain such a huge organisational structure, make centralised generation systems an economically viable option only for large power plants and concentrated loads. Indian villages are widespread and cannot provide the substantial loads that towns and cities can. Centralised generation systems are therefore a more expensive and inefficient option for rural electricity provision.

Grid-based centralised generation systems also have fossil fuel and hydro-based power plants at their core. These plants are increasingly being seen as unsustainable. A major issue with the coal power stations, for example, is the abysmally low overall efficiency between the phases of coal mining and end use of the electricity thus produced: with a thermal efficiency of coal conversion to electricity as low as 31 to 35 % at the power station. The power station itself uses 8 to 10%, and further Transmission and Distribution losses account for 28% leading to an even lower end-use efficiency. The overall end-use of coal power can thus only be about 10% of its potent energy.

Nationally, the average plant load factor of coal-based power stations is about 74%, as compared with the best practice value of about 95%. Such a low efficiency results in far greater coal power capacity than is really needed, contributing hugely to the GHG emissions and bringing us ever closer to a dangerous level of runaway climate change. Many large hydel dams are also operating far below capacity, and hydel plants in the Himalayas are facing frequent shutdowns because of higher silt loads than they have been designed for. Nuclear power plants, which have also been established at huge costs to society, have not lived up to expectations with low plant utilisation factor and fuel supply shortages. Further, with nuclear power plants, there is another aspect of long-term social injustice that the benefits of nuclear power go to the present generation, while the cost associated with long-term waste management has to be borne by the future generations.

Large power plants, whether fossil fuel or hydro-based, are also associated with many negative societal and environmental impacts. They demand much in the way of precious land, water, coal and construction materials, and have consumed plenty of the country's natural resources and capital, and heavily impacted its environment. They have also caused large-scale displacement of villagers and tribals and generally lead to their impoverishment. The centralised generation systems may have provided direct employment to a tiny section of society, led to an increase in the GDP of the country, and provided for a high per capita consumption of the urban rich. But they have also had a deleterious impact on the rural population, which have suffered the societal and environmental impacts of this

'developmental process' without adequate benefit.

Yet, another inherent problem of the centralised generation and distribution model is that of equity. In case of power shortage, the electricity at the end of the chain will get shut, and the rural poor will suffer. The current concept is that of LIFO: the poor are the last to get power (Last In) and the first to get shut out of power (First Out). This is not the best way forward in a welfare society.

Almost all of India's generating capacity, except for a few captive power plants and recently added non-conventional energy sources, are of centralised generation in nature and are connected to the grid. Though these conventional plants have been established at huge costs, they have not served the rural population well, sentencing them to bear the burden of the associated economic, social and environmental aspects as summarised in Table 8. Fossil fuel based and hydro-based power plants supported by grid-based centralised electricity supply systems thus cannot be seen as a sustainable option, and are not in the long-term interests of the Indian society.

Image: Early morning at Bokahapadi village located at the other side of the valley from the Rajapur Mining Project in Jharia Coal Mine. The ignited coal burning underneath the village causes the release of toxic fumes. The town is slowly cooking underneath its surface.

© Greenpeace / Peter Caton

Case Study Two:

Parli Thermal Power Station, Maharashtra

"We did the protest because the situation had become really bad," Shivaji Ghayal explains in the quiet evening. The horizon is bathed in orange, and the setting sun has turned the still pools of water around him to mirror. It could almost be a beach, but the sand we are standing on is ash, tens of feet deep and packed solid; the accumulated waste of years from Parli Thermal Power Station in Beed District, Maharashtra. The tall thin flues of the plant puff peacefully in the distance: from here the 24 hour rat-a-tat of machinery cannot be heard and the white fumes trail away into the evening sky-like ribbons.

"Every day when it wasn't raining, the wind was picking up the fly ash from this dump and bringing it into our homes," continues Shivaji. "It was coming into our kitchens and settling on food. By July, it was an inch and a half deep on surfaces. We would sweep it away but it would build up again within a day. People were developing allergies and the ash was making their eyes and skin red and sore. Children had stopped going to school because the minute they stepped outside they turned grey."

Coal-fired power plants produce two types of waste: the gas is released into the air through flues, while the solid (fly ash) is mixed with water and transported via pipes to a dumping ground, where a pump house sucks out the excess water and sends it back to the plant to carry more waste. In theory, the dumping grounds should be ponds, the ash weighted down by water, but too much ash and too little water means the coal cinders are often dry and easily transported by the wind. Parli Thermal Power Station generates 3,500 metric tonnes of such fly ash per day and the 5,000 residents of nearby Dadahari Wadgoan Village were becoming sick of it coating their homes and lives.

The village residents signed many petitions. As Sarpanch, Shivaji was involved in presenting them to both the Environment Department of Maharashtra and Mahagenco, the government-owned company which operates the plant. He says the recipients always promised something would be done, but no action was taken. Then, shortly before the protest, two women in the village passed away.

"They had asthma and breathing in the fly ash had made it worse," says Shivaji. "The doctor had told them to stay away from it but what could they do? After their deaths we wrote again to Mahagenco saying we believed they had died because of the fly ash, but again there was no reply and nothing changed."

The breaking point came at the end of summer 2009. All doors and windows in Dadahari Wadgoan had to be shut against the constant onslaught of ash, which in the middle of July made living conditions unbearably hot. Despite the proximity of the village to the power station, like many rural communities, their power supply is intermittent and the fans would rarely work. The school building had no electricity, so with the shutters closed it was too dark to teach.

A panchayat meeting was called, and it was agreed the situation couldn't go on. A group of 10-15 men angrily suggested going down to the pump house. More began to agree and eventually a mob of 400-500 set out for the dump to take things into their own hands.

"The two local security guards ran when they saw us coming," recalls Shivaji. "They must have informed the plant on their wireless radios, though, because soon two official security men showed up in a car. They had guns and started threatening us. Everyone was shouting. One of the guards asked what the hell we thought

we were doing, and said he would shoot us if we did not leave. This made a couple of the younger guys really angry and they grabbed the guns off the security guards, lost their heads a bit and then locked them in the temple in the village. Then we set the seats of their car on fire."

The apathetic attitude of years was quickly reversed. Within hours, the Chief General Manager of the power station arrived with a police envoy, and acquiesced to the villagers' demands. The guards were released and no charges levied against the protesters. The next day, the plant employed 40 people to sprinkle the dump with water, shortly afterwards installing a small sprinkler system to wet the fly ash and prevent it from blowing into the village. They also rooted 10,000 plants in the ash ponds to reduce the amount of blow-off.

For the moment, Shivaji and the other residents are mollified, but they are waiting to see if the power station installs the larger sprinkler system they promised, once the rainy season can no longer be relied upon to help quell the ash.

"I'm glad we did it," he reflects, standing amongst the pools of water on the ash pond. "At least, we eventually got some kind of reaction."

Night has fallen now, and the bright lights of the power station are shining orange in the distance. To our right, where Dadahari Wadgoan lies, there is nothing but darkness, as the village continues to have 10 to15 hours of scheduled power cuts a day. For the moment, though, the residents are merely glad to be rid of the thick grey dust filling their homes. But for the communities who live near other dumping grounds - both of Parli and other thermal power stations - there is no such respite.

Image: Parli Thermal Power Station, Maharashtra

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Table 8: Major issues with conventional technology power sources

	Fossil Fuels (coal, gas, diesel)	Dam Based Hydro	Nuclear Power
Economic Issues	Huge pressure on natural resources such as land, water and minerals; reduced agricultural production; low thermal efficiency	Demands large tracts of forests and fertile land; water logging	Demands large tracts of forests and land; Huge capital costs; long term waste management costs
Social Issues	Peoples' displacement and health issues	Peoples' displacement and health issues	Peoples' displacement and health issues
Environmental Issues	Global warming; pollution of land, water and air	Methane emission, submersion and fragmentation of forests	Mining related pollution; radiation emission for centuries

The grid-based centralised generation system has failed to meet the basic energy needs of the majority of the Indian population that lives in rural areas. But, a few recent initiatives in the private sector to provide electricity to un-electrified villages through stand-alone community-based non-conventional energy power plants fed by bio-mass or wind or solar or micro-hydel power have established that they are the appropriate solution to the energy requirements of most sections of the country. The major advantages associated with these alternatives are the shorter gestation periods, low societal impacts, and their immense suitability to rural needs.

There is an urgent need for a paradigm shift in our energy policy. Instead of blindly adding millions of MW of additional capacity based on conventional power sources and centralised power supply system, we need to adopt an 'integrated energy resource management' approach which will have renewable energy sources and decentralised supply systems at its core.

There are growing indications that in view of the huge societal costs associated with economic, social and environmental aspects of grid-based centralised generation system of conventional power sources, the decentralised electric supply systems based on renewable energy sources are hugely economical in the long run. They are found to be the best option for the accelerated electrification of smaller loads and rural households.

In summary, an objective overview of the electricity scenario in the country provides a sad picture of electricity injustice of huge proportions, which is not leading to the welfare of the rural communities. Unless urgent corrective measures are taken to set right this injustice, the development of the country will greatly suffer, while accelerating the addition of GHG emissions against our own national as well as global interests.

survey methodology

Is rural India getting its due share of electricity?

To compare the electricity supply scenario in rural and urban populations, relevant data were sought from five different states from four regions of the country; two in the East (Orissa and Bihar), one each in South (Karnataka), North (Uttar Pradesh) and West (Maharashtra). In each of these states one tier A city, one tier B city, and three villages were chosen.

Table 9: Data collection locations

State	Tier A location	Tier B location	Villages
Karnataka	Bengaluru	Tumkur	Anekal (Bengaluru Rural district) Salgame (Hassan district) Nagarle (Mysore district)
Maharashtra	Mumbai	Nashik	Ganeshpur (Ratnagiri district), Kochargaon (Nashik district), Brahmanpada (Thane district)
Uttar Pradesh	Lucknow	Jalauan	Rametpura (Jalauan district), Haisalpura (Jalauan district), Galimpur (Jalauan district)
Orissa	Bhubaneswar	Berhampur	Rupra (Kalahandi district), Athanga (Cuttack District), Muskidih (Kalahandi district)
Bihar	Patna	Arrah	Dumri (Buxar district), Bakri (Bhojpur district), Ekauna (Bhojpur district)

Data was sought to be collected for ten years to compare the improvements in electricity supply system. Data such as peak power demand and annual energy demand; deficits; average number of supply hours, scheduled and unscheduled power cuts; households electrified; price of electricity were sought to understand the rural-urban divide.

While it was relatively easy to collect the required data in tier A and tier B cities, it was difficult to get such data in villages, which clearly reflected the neglect of those villages. Some of the data had to be calculated based on the available data and in consultation with village elders and supply company staff. To collect such data, the supply companies were requested to provide the relevant information; the concerned staff of the companies were consulted; the villages were visited; the facilities and quality of life in each villages was observed; and discussions were held with the village elders and the maintenance staff of the electricity supply companies. Prices of electricity (tariffs) were collected from the concerned state electricity regulator when the same was not available quickly from the supply companies.

Accurate data such as peak power demand and annual energy demand were not available for villages. Indicative figures were computed from the data such as total transformation capacity in the village, load factor (0.8 to 0.9 used), diversity factor (0.7 to 0.8 assumed), and the average number of hours of supply (information elicited from the villagers) for each village.

survey data analysis

Confirmation of rural neglect

Analysis of the survey data of five states for the period 2000 - 2008 provides a dismal picture of the neglected rural areas. One result was the clear urban-rural divide. Whereas the urban population has been getting far better quality and quantity of electricity, the rural population has been a neglected lot. The villages covered in the survey had power supply for durations less than twelve hours a day on an average, whereas the tier A and tier B locations had supply between twenty-two and twenty-four hours. The state capitals, Bengaluru, Mumbai and Lucknow, generally had much better quality of supply with almost uninterrupted supply. Bhubaneswar had generally no problem in meeting its peak demand but had 10 to 15% deficit in annual energy during the past few years. Patna has been facing deficits of both peak power and annual energy for few years now; probably a consequence of separation of Jharkhand as a state.

Between 1999 and 2009, there has been a continuous increase in the power availability to each of the states through addition of state's own installed capacity and increase in the central sector shares. At the same time, it can be said that most of the additional power available in each state seems to have gone to the cities and towns to meet their insatiable demands (as exemplified by the increase in per capita consumption), whereas the villages continue to suffer with inadequate amount of electrical energy even for basic needs.

Table 10: Survey Data Highlights for Karnataka

	Tier A location	Tier B location	Village 1	Village 2	Village 3
Annual Peak Power demand	Fully met	18% deficit	31 to 41% deficit	29 to 33% deficit	45 to 59% deficit
Annual energy required	Fully met	15 to 18% deficit	30 to 40% deficit	30 to 35% deficit	45 to 60% deficit
Average no. of hours of supply	24	16 to 23	12 to 15	13 to 15	11 to 14
% of household electrified	100	100	85	95	75
Per capita consumption (kWH)	2674	2006	530	523	363
People's perception of quality of electricity	Good	Average	Poor	Poor	Poor

[Per capita consumption in Karnataka = 720 kWH in 2009]

Table 11: Survey Data Highlights for Maharashtra

	Tier A location	Tier B location	Village 1	Village 2	Village 3
Annual Peak Power demand	Fully met	5 to 17% deficit	8 to 26% deficit	30 to 56% deficit	10 to 27% deficit
Annual energy required	Fully met	8 to 17% deficit	20 to 25% deficit	18 to 27% deficit	41 to 57% deficit
Average no. of hours of supply	23.99	21 to 22	18 to 19	10 to 14	18 to 19
% of household electrified	100	100	90	76	15
Per capita consumption (kWH)	1165	900	286	212	65
People's perception of quality of electricity	Good	Average	Poor	Poor	Poor

[Per capita consumption in Maharashtra = 934 kWH]

Table 12: Survey Data Highlights for Uttar Pradesh

	Tier A location	Tier B location	Village 1	Village 2	Village 3
Annual Peak Power demand	Fully met	22 to 29% deficit	No supply during peak hours	No supply during peak hours	No supply during peak hours
Annual energy required	Fully met	32 to 33% deficit	45 to 57% deficit	44 to 50% deficit	41 to 57% deficit
Average no. of hours of supply	24	10 to 12	12 to 14	9 to 14	13 to 14
% of household electrified	100	78	22	8	29
Per capita consumption (kWH)	1986	1200	674	610	346
People's perception of quality of electricity	Good	Average	Poor	Poor	Poor

[Foot Notes: Poor electricity supply conditions in village 1 and 2 seem to be hidden behind a per capita consumption figure higher than that of the national average. Only 22% and 8% of the households are officially electrified; hence this higher per capita consumption may be due to a number of IP set loads and/or theft of electricity. Peak load deficit has no meaning because there is generally no supply in the evening hours up to 9 pm.]

Table 13: Survey Data Highlights for Orissa

	Tier A location	Tier B location	Village 1	Village 2	Village 3
Annual Peak Power demand	Fully met	4.5 to 40% deficit	No supply during peak hours	No supply during peak hours	No supply during peak hours
Annual energy required	10 to 15% deficit	5 to 25% deficit	79 to 83% deficit	35 to 37% deficit	66 to 68% deficit
Average no. of hours of supply	23 to 24	21 to 23	12 to 15	10 to 14	8 to 14
% of household electrified	100	75	71	51	70
Per capita consumption (kWH)	1025	515	146	146	162
People's perception of quality of electricity	Good	Average	Poor	Poor	Poor

[Foot Notes: Even though more than 50% of the households are officially electrified in villages, reduced number of hours of power supply and the quality of supply is an issue. Peak load deficit has no meaning because there is generally no supply in the evening hours up to 9 pm.]

Table 14: Survey Data Highlights for Bihar

	Tier A location	Tier B location	Village 1	Village 2	Village 3
Annual Peak Power demand	15 to 21% deficit	28 to 33% deficit	No supply during peak hours	No supply during peak hours	No supply during peak hours
Annual energy required	7 to 13% deficit	45 to 50% deficit	90 to 93% deficit	80 to 85% deficit	80 to 85% deficit
Average no. of hours of supply	20 to 24	12 to 15	4 to 8	5 to 8	8 to 10
% of household electrified	91	72	21	28	55
Per capita consumption (kWH)	173	47	42	89	83
People's perception of quality of electricity	Average	Poor	Poor	Poor	Poor

[Foot Notes: Very low per capita consumption figure, much lower than that of the national average can be explained by the fact that at the time of state bifurcation, Jharkhand got most of the power stations while Bihar was left with mostly loads. Low number of hours of supply is no surprise because of low power availability at the state level. Peak load deficit has no meaning because there is generally no supply in the evening hours up to 9 pm.]

None of the fifteen villages covered in the survey have 100% electrification. Even in those villages, where the official records indicate more than 50% electrification of households, the supply is so bad that the per capita electricity consumption is abysmally low. Most of the villages covered in the survey have per capita electricity consumption less than 100, which almost negates the purpose of electrification. Even if we take these figures at the family level, which turn out to be about 200 to 300 kWH per year, the usefulness of such a poor supply can be seriously questioned. Most states consider one unit a day as the lifeline energy requirement for a family. Unless the per capita electricity consumption reaches at the least the present national average of about 650 kWH (during 2008-09), we cannot say that the electrification of country's households is satisfactory.

The worst part of such a poor supply to the villages is that there is neither regularity nor is it provided when people need it most. Generally, supply is provided in the afternoon and late night, when it is not of much use. Additionally, the low voltage conditions and frequent interruptions make the electrification a cruel joke on the villagers.

The author, who lives in a village of about 200 houses in Karnataka, experiences this every day. This village is scheduled to get power supply for twelve hours a day for domestic purposes, but the unscheduled power cuts and other interruptions for maintenance purposes bring this duration down to less than ten hours a day on an average. On many days, the supply situation becomes so bad that even the UPS (Un-interrupted Power Supply) system cannot get sufficiently charged to provide the necessary back up supply for lighting. The rural feeder at 11,000 Volts, which brings supply to the village, like most rural feeders in Karnataka and probably everywhere in the country, is so neglected that simple devices like lightning arresters are not installed to protect them from lightning surges. The consequence of this is that the sub-station which controls this feeder at Thirthahally town switches it off manually when there is indication of lightning. Being a part of Western Ghats, which receives heavy rainfall during the monsoon season, the village is subjected to many such interruptions in a day. In addition to this, there are other types of interruptions which make the electricity supply a farce. Though this village is only 4.5km from the Taluk headquarters (Thirthahally), it gets much less power supply than the Taluk headquarters itself. This situation in Karnataka, where the state capital gets the best quality of supply, and the power quality deteriorates as we go down pop-strata, seems to apply to the rest of the country as well.

Another aspect of such electricity injustice is the financial implication to the rural consumers. In Orissa, the tariff is same through the state, putting the rural population at the additional disadvantage of paying the same price for a lower quality of supply as compared to the state capital and other cities. In Maharashtra too, the tier B location and rural areas have similar tariffs for domestic use despite the rural areas getting much lesser number of hours of supply as compared to tier A and tier B locations. This exemplifies the electricity injustice. Only Mumbai has a different tariff, basically because it is served by private companies. However, even in Mumbai, the part which is served by MSEDCL (Maharashtra State Electricity Distribution Co. Ltd.), has the same tariff as that of villages.

In Karnataka, this injustice is compensated to an extent by prescribing a slightly lower tariff for domestic uses in rural areas as compared to Bengaluru. The domestic tariff for towns and cities other than Bengaluru is higher than that of villages but lower than that of Bengaluru. However, such a small compensation for poorer supply has come only after a stiff opposition. People are continuing to object seriously to the poor quality of supply in rural areas during successive tariff revisions.

In Uttar Pradesh and Bihar also, the tariff order prescribes a slightly lower tariff for domestic uses in rural areas as compared to urban areas. Bihar, after the bifurcation of Jharkhand as a separate state, has even

less number of hours of supply on an average. With an average of about seven hours supply a day, the status of the villages is pretty bad as compared to other states.

What becomes clear is that the rural population suffers the most from this inequity. As compared to the capital city and the tier B location in each of these states, the relative welfare of communities in villages was much less. Even among fifteen villages in different states, it was observed that the relative welfare of communities was better where the percentage of electrification was higher and where the per capita consumption figure was better.

This objective survey of the villages has revealed that with 100% household electrification and twenty-four hours supply, each of these villages will reach a much better quality of life style, drastically reducing the need for urban migration and slums. The Electricity Injustice towards the rural population of the country can be exemplified by the facts in the box .

In Karnataka, between 1999 and 2009, the available power capacity has gone up by 70%; energy consumption has gone up by 95%; and per capita consumption has gone up by 76%. But, 356 villages remained un-electrified.

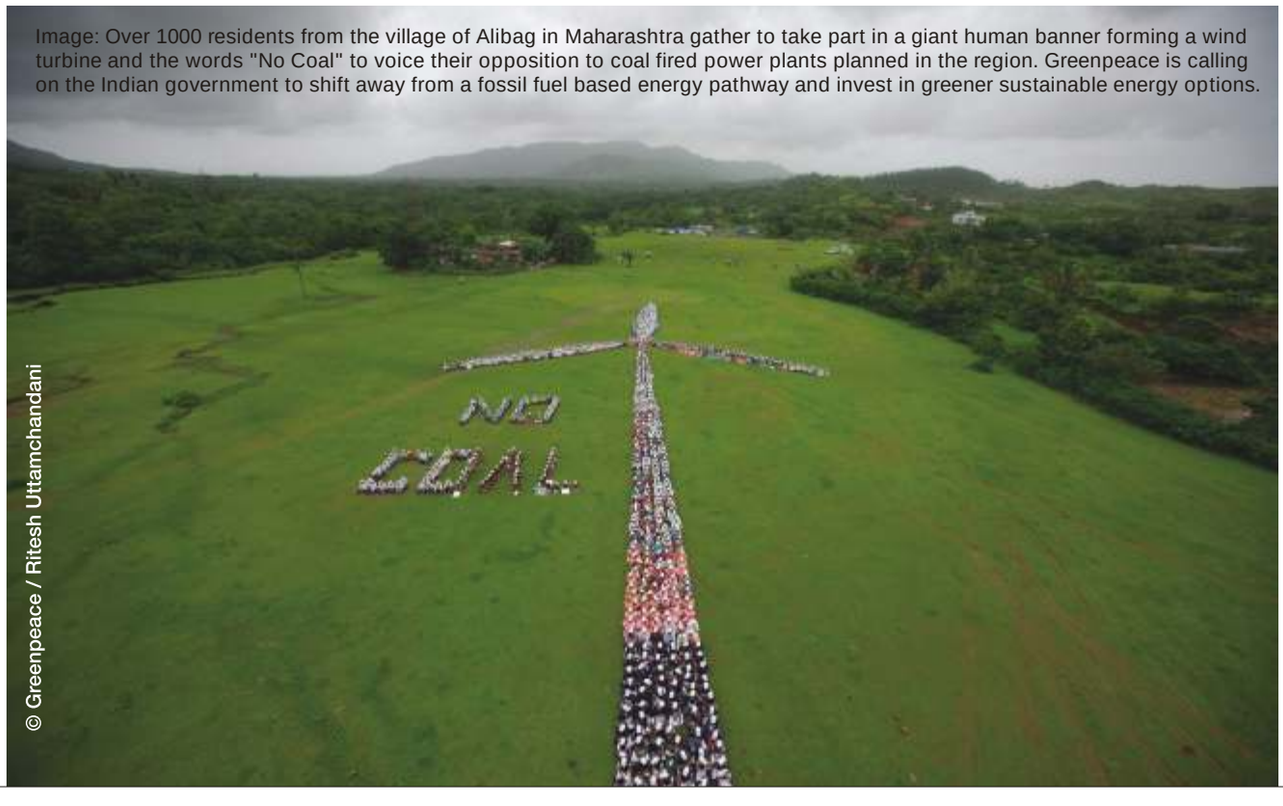
In Maharashtra, between 1999 and 2009, the available power capacity has gone up by 54%; energy consumption has gone up by 54%; and per capita consumption has gone up by 32%. But 5,018 villages remained un-electrified.

In Uttar Pradesh, between 1997and 2009, the available power capacity has gone up by 58%; energy consumption has gone up by 53%; and per capita consumption has gone up by 6%. But 12,298 villages remained un-electrified.

The survey points to the stark reality that the business-as-usual practice of expanding the conventional power project-based centralised grid system will neither enable 100% electrification in the near future nor will it be sustainable.

All the relevant factors indicate that the decentralised supply systems based on renewable energy sources is most suited to Indian conditions.

Image: Over 1000 residents from the village of Alibag in Maharashtra gather to take part in a giant human banner forming a wind turbine and the words "No Coal" to voice their opposition to coal fired power plants planned in the region. Greenpeace is calling on the Indian government to shift away from a fossil fuel based energy pathway and invest in greener sustainable energy options.



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Case Study Three:

Solar Technology and Electricity Injustice in Rajasthan

Mundolav Village in Ajmer District, Rajasthan, is connected to the electricity grid, but this does not mean the 400 families who live there enjoy much of the benefits of electricity. Scheduled power cuts mean they have access to power for only three hours during the day, and four hours in the evening. For the rest, the residents use kerosene lamps and candles. There is no power alternative for irrigating their crop. The Barefoot College in nearby Tilonia has distributed three solar lamps to Mundolav: two are used to run a night school for children, and the third is used by the local midwife.

Danwarsingh Rajput, 35, Teacher

"We have night schools here as during the day children have to take the animals to find grazing, and so cannot come for classes. So we have school from 7 to 10 every night, on the verandah of my house. Twenty-eight children come between Classes I and V and we teach them everything - reading and writing, mathematics, geography.

"Before we got the solar lanterns we were using kerosene lamps, which didn't give enough light and strained the eyes. Children would have to sit very close to the lamp and would get bothered and bitten by the insects that came to the light. They are very smoky too, which would make us cough and give rise to breathing problems. The solar lamps are clean and give out more light, so we can sit further away from the insects. They do not blow out like the kerosene lamps either, which means that we can walk the children home after school when it is late at night and not as safe. So more children come now, and we can have school more often because the solar lamps do not go out in wind or rain like the kerosene lamps, now we have classes in all seasons."

Hagami Devi, 40, Midwife

"I have been a midwife for ten years now; previously, I earned a labourer's wage. The community selected me and sent me to Barefoot College for training to help the village women in their pregnancy. I like it: there are no other health facilities in rural places like this and so the women rely on me.

"Every day I do the rounds of the pregnant women in the village. In the evening I take the solar light to examine them by. Some are very nervous because it is their first baby, and having the light helps them be calmer. We have a little electricity in this village, but what if there is a delivery in the middle of the night? Kerosene lamps are dim and I can't see the situation of the child properly. They are also a fire hazard. So having the solar lantern is a big help.

"In my ten years as a midwife I have delivered 200-300 children by the light of this solar lantern. This month alone it has helped me deliver eight healthy babies."

Gajanand Vaishanav, unemployed resident

Gajanand Vaishanav can't speak very much, but through his gestures and the words of the other villagers he communicated his story.

The electrical wires that connect the village are low quality, he says, as contractors take advantage of the residents' low level of education to purchase cheap wires and keep the surplus money. During monsoons, the walls of the houses sometimes become electrified and consequently accidents happen. Three years ago, three children died from shocks imparted by faulty wiring.

During the rains ten years ago, an electrical wire fell onto Gajanand's head and electrocuted him. He did not die,

but spent two weeks in hospital and can no longer speak articulately. His hands are frozen as claws and one is withered; his blood circulation is poor and his limbs are thin and useless. Where the electrical wire touched his head, no hair grows and there is a stripe of scarred scalp.

The majority of his days are spent lying on a mat in the house of his elderly mother as his condition means he cannot work, and has never married. He is in constant pain.

Image: Night school students studied in darkness until solar powered lamps were provided to the school

© Greenpeace / Grace Boyle

Case Study Four:

Solar panels in Jalka Village, Maharashtra

In March 2009, Greenpeace India installed solar panels in two schools in Jalka Village, Yavatmal district, Maharashtra. The village had come to the country's attention when Rahul Gandhi used the example of Kalavati, a widow living without electricity in Jalka, as supporting evidence for India's need to expand her nuclear power generation. Set up in a mere three days, the photovoltaic panels serve to refute the need for the lengthy set-up times and nuclear power plants, and serve as a symbol of how decentralised renewable systems can provide energy solutions to rural communities. Six months later, the residents of Jalka gave their verdict on the system.

Outside, crowds of men and women dance in the street to the boom of drums and jangling of pipes, raising clouds of dust and purple gulal into the air. It is the last day of Dussehra, but you would not know it if you took a look at the children of Jalka. Inside the village primary school, the children are sitting quietly, heads bent in concentration under the steady whir of electric fans.

"Attendance has really improved since the fans were installed," says Jyoti Hirurkar, a teacher at Jalka Zila Parishad School. "Instead of fidgeting and running around, the students are more comfortable and sit quietly and study. Before the fans, kids also used to fall sick a lot due to the heat. That is not happening anymore."

Before the installation of the solar panels, the primary school had an electricity connection that afforded them a single light bulb, a mismatching and unnecessary cost in an establishment that was closed at night but experienced temperatures of up to 50 degrees Celsius during the day. The secondary school, which is semi-private, uses its solar panels to run the only computer in the village. A local electrician maintains both systems, at a small cost to the schools.

Three-quarters of the houses in Jalka are connected to the centralised power grid - the remainder of the population lives below the poverty line and cannot afford it - but the power supply is unreliable, inflicting seven to eight hours of power cuts per day at the time of writing.

And the villagers' power requirements extend further than lights or fans, with more immediate financial consequences.

"The power cut is during the day, so we have no power to irrigate our crops," says Rudeshwar, a panchayat member and farmer. "There is water in the well, but no way to distribute it. Drinking water should be pulled up by electric pumps too, but we have to use hand pumps instead."

Most Jalka farmers grow cotton, which needs at least an hour of rain every eight days to flourish; something the residents say can no longer be relied upon.

Image: Kalavati, the widow whom Rahul Gandhi met.

"The monsoon this year has been particularly bad," continues Rudeshwar, "though generally rainfall has been decreasing over recent years. And the weaker the monsoon, the more power we will need for irrigation. This year, I think we will have lost 90% of our crop. We are waiting to see if the government will waive our loans."

In fact, this year's monsoon has brought the lowest rainfall in the Vidharba region of the last ten years. Yavatmal district, previously known as the 'suicide belt' of the region, has been the worst hit.

However, so satisfied are Jalka's residents with the uninterrupted power supply to the school's fans that they have sent a written proposal to the panchayat samiti requesting that solar panels be placed in every house.

"We see the solar panels working perfectly. In our village, the electricity is not working perfectly. Therefore we would like all power to come from panels like this," reiterates Anasua, the panchayat president. "Everybody signed the letter, though we have not heard anything in response yet. Rudeshwar also met the BJP candidate and told him the same thing, but we are waiting for his visit also."

As an alternative to photovoltaic panels on every roof, Jalka's residents are also open to the idea of a community solar power plant, which would spread electricity through a decentralised grid. This might be better, they think, because it would allow the responsibility of the panel maintenance to be shared. They have also put thought into how the costs will be covered.

"The government paid for 90% of the cost of our electric water pump. We paid for the other 10% and are paying for the warden to take care of it, and the electricity we use through it," explains Rudeshwar. "We would be willing to follow a similar scheme with solar."

"Decentralised systems would be a good thing for the whole village," concludes Jyoti Hirurkar. "Particularly for small businesses that do things like flour grinding - these get hit hard by the power shortages. As for our school, next we would like to use solar to power a computer."

Image: Smiling students of Jalka Zila Parishad School after solar panels were installed in the school.

© Greenpeace / Peter Caton

conclusions and recommendations

Towards a sustainable and equitable future

The study shows that India has failed to overcome continued electricity injustice. India is demanding higher carbon space from the international community to enable its poor to develop, and is embarking on huge capacity addition drive based on fossil fuel power plants. But, this manner of centralised electricity build has not delivered to its rural population.

The urban-rural divide in the supply of electricity is stark when we consider that even after 62 years of independence about 40% of the households, mostly in rural areas, are still without electricity. The urban areas have almost 100% electrification, and a small section of the urban population is even approaching the per capita consumption levels of developed countries.

The grid-based centralised generation system has failed to meet the basic energy needs of the majority of the country's rural population, and is proving costly in the form of economic, social and environmental impacts. The escalating growth of conventional electricity power plants based on fossil fuels and dams are not only adversely impacting the rural communities around such plants, but are also attracting world attention because the country is seen to be emerging as a significant contributor to global warming.

Grid-based centralised generation system is considered by successive governments as the solution for faster economic growth and accelerated rural electrification, but in reality it is seen to be helping largely to meet the ever-growing electricity demand of urban population.

The capital cities and other urban areas are recording huge increases in per capita electricity consumption, but the rural population is suffering due to poor quality of supply even in those areas, which officially have electrification. Large centralised capacity addition will ultimately not be an equitable solution to ensure quality power to the poor, and will therefore not lead to their development.

The deficiencies, complexities and societal costs inherent in the grid-based centralised generation system in India, cannot provide an assurance that the rural-urban divide will be eliminated soon and that the electricity supply at the national level will be satisfactory in the near future. The decentralised energy solutions are the right answers to provide quality access to electricity to the rural population and not the centralised grid solutions.

Poverty alleviation, rural electrification, decentralised electricity supply system based on renewable energy sources, human development, mitigation and adaptation to climate change are all intricately linked and hence need to be addressed with an integrated approach.

If India is to live up to the expectations as a welfare society; if it is to emerge as a world leader in combating climate change; if it is convinced of the need to eradicate the calamitous divide between urban and rural populations, it has to adopt a paradigm shift in the way it looks at its energy needs, and needs to take all possible measures to move towards a more equitable society.

Greenpeace installed solar panels onto the roof of two schools in Jalka Village, Yavatmal district, Maharashtra

Decentralised electricity supply systems - the only logical option ahead

An objective review of the real costs and benefits to society, of large power plants and centralised power network is urgently required. As compared to grid-based centralised generation system, the distributed and decentralised electricity supply systems based on renewable energy sources such as solar, bio-mass, wind, micro-hydel, etc., are being widely recognised as much better options to meet much of our legitimate energy needs, especially of the rural population. In order to provide reliable electricity supply for the development of rural masses, there is no alternative but to replicate the success stories mentioned in this study on a wider scale. Such hybrid systems have huge potential to be used in urban areas also, and are already being used in various combinations.

Some of these decentralised energy options which have been considered as techno-economically viable are:

1.Roof top solar Photo Voltaic systems, which can meet most of the domestic and smaller loads, such as lighting, TV, computers etc. These are being increasingly used in Germany and USA not only to meet the domestic necessities, but also exporting excess power to the grid through a mechanism known as feed-in tariff.

2.Solar water heaters have established themselves as effective tools to provide hot water for houses, nursing homes, hotels, etc., at economical prices. They are found to be popular in towns and cities, but can find good use in rural villages. These solar water heaters have reduced the heating load of the present grid by a considerable extent and are being encouraged by the supply companies through tariff incentives.

3.Community based bio-mass systems are highly suited for rural areas, which generally have good supply of bio-mass.

4.In locations where there is good average wind speed through the year, windmills can provide cheap power either at the community level or at the individual household level.

Such decentralised power systems have the potential to meet most of the rural loads when they are used in hybrid mode of one or more individual systems mentioned. Such decentralised power systems will provide many other sustainable benefits:

- In the short term to medium term, it will drastically reduce the need for fossil fuel based, hydro-based power stations and the associated transmission and distribution network; in the long term it is likely to eliminate the need for fossil fuel power plants ;
- Will assist in drastically reducing the GHG emissions, and enhance the country's image as a responsible global leader;
- Provide a sustainable, environmental and people friendly energy supply model;
- Will accelerate the rural electrification due to shorter gestation period of individual projects;
- Will greatly reduce the burden on the grid-based power supply system, drastically reduce the T&D losses, and vastly improve the power supply to those consumers essentially needing the grid supply;
- Will lead to increase in rural employment opportunities, and hence in minimising urban migration;
- Will provide the rural people a good control of their energy sources.

Image: Smiling students of Jalka Zila Parishad School under the solar panels installed by Greenpeace India within three days

Greenpeace demands that India should ensure justice in electricity access through enshrining the principle of decentralised energy in its integrated energy plan, leading to sustainable and inclusive growth in the energy pathway of the country.

Other proposals are also placed below for discussion among various stakeholders:

A few recent initiatives to provide electricity to un-electrified villages through stand-alone community-based non-conventional energy power plants fed by bio-mass or wind or solar or micro-hydel power should be replicated at a wider scale throughout the country on a priority basis.

Each of the state electricity supply companies should be asked to manage the establishment of stand-alone community-based non-conventional energy power plants every year until the entire households in each state are electrified.

Public Sector Undertakings such as NTPC, DVC, and NHPC, etc., should be asked to invest a percentage of their annual budget to establish such stand-alone community-based non-conventional energy power plants every year either on their own or in joint venture.

All the necessary encouragements, including subsidy and tax exemptions, if necessary, should be provided to reduce the burden on the power grid through decentralised non-conventional energy power systems either at a community level or individual household level.

The existing monetary incentive to establish solar water heaters should be increased adequately to enable their widespread use.

Other non-conventional energy power systems such as solar PV systems, bio-mass energy systems, small wind mills, etc., should also be encouraged with similar incentives. Suitable tax regimes to cover the societal costs (such as environmental and health costs) of large conventional power plants should be implemented early.

The tariff in each state should be structured to minimise the profligacy in electricity, by having steeply increasing tariff levels beyond specified levels of energy consumption.

The country should enforce responsible behaviour by its electricity supply companies, and make them adopt best world practices in all aspects of electricity supply industry.

The country must implement definitive, well considered and effective action plans not only to eradicate the urban-rural divide and to move towards energy security, but also to emerge as a world leader in combating the climate change.

Image: Greenpeace floats replica wind turbines on the River Ganges in Varanasi, to highlight the impacts of climate change on the Ganges. They hold banners reading 'Stop Ganga's Extinction, Start the Energy [r]evolution'. Local people join the activity.

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still waiting...

A report on energy injustice.

GREENPEACE

Greenpeace is a global organisation that uses non-violent direct action to tackle the most crucial threats to our planet's biodiversity and environment. Greenpeace is a non-profit organisation, present in 40 countries across Europe, The Americas, Asia and the Pacific.
It speaks for 2.8 million supporters worldwide, and inspires many millions more to take action every day. To maintain its independence, Greenpeace does not accept donations from governments or corporations but relies on contributions from individual supporters and foundation grants.

Greenpeace has been campaigning against environmental degradation since 1971 when a small boat of volunteers and journalists sailed into Amchitka, an area north of Alaska, where the USGovernment was conducting underground nuclear tests.This tradition of 'bearing witness' in a non-violent manner continues today, and ships are an important part of all its campaign work.

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