BUILDING FORWARD BETTER - PATHWAYS FOR A SUSTAINABLE POST-COVID RECOVERY FOR INDIA

Energy and Power

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COVID-19 AND INDIA'S ECONOMY

The Covid-19 pandemic has infected nearly 19 million people, with over 200,000 deaths, in India by the end of April 2021.[1] Combined with the lockdown, India's unemployment rate had touched 27% in April 2020, with over 120 million people losing their jobs.[2] Informal sector wages fell by 23%,[3] and the economy is estimated to have contracted by 9.6% in calendar year 2020.[4]

At the same time, energy demand, pollution levels, and greenhouse gas (GHG) emissions decreased temporarily, and new ways of doing business emerged, supported by an accelerated shift to a digital economy. Even as there is a need to return to previous levels of growth and employment, there is an equal and simultaneous opportunity to revisit India's long-term sustainable development challenges. For instance, green investments – including in renewable energy (RE) like solar photovoltaics (PV), energy efficiency in buildings, public transit, and forest restoration – can create more jobs per dollar in the immediate term than investments in fossil fuels.[5] In addition to the number of jobs, it is also critical to ensure that the measures taken in this socioeconomic reset are equitable and inclusive.

This policy note offers three sets of recommendations – on rural access, capacity planning, and building demand – through which the energy sector can be further developed to benefit the economy, environment, and society.

WAYS FORWARD

1. Rural Electricity Access: For Health, Livelihoods and Education

Context

In April 2018, the government announced that all villages in India had been electrified. However, this did not translate into electrification of all households, given the narrow definition of electrification. It was also no guarantee for power availability; a 2018 survey had found that only 47% of India's households received more than 12 hours of electricity a day.[6] Although data indicates that 99.9% of

houses in rural India are now electrified, there are still significant disparities across the country in the number of hours that households receive electricity. For instance, while households in West Bengal receive 20 hours of electricity on average, Jharkhand households receive only 9 hours.[7, 8]

Access to clean, affordable, and reliable electricity is a key driver for attaining higher levels of human development; analysis shows a high positive correlation (0.98) between access to electricity and the Human Development Index (HDI) in India.[9] Electricity plays a critical role in facilitating the delivery of outcomes in health, education, agriculture, and poverty reduction.

A lack of access to reliable electricity services at home can negatively impact education;[10] access to electricity is crucial for digital and remote learning. Relatedly, as many children are withdrawn from school to work longer hours on household chores, several studies have documented the link between the effects of prolonger indoor pollution (from cookstoves) and respiratory infections in children.[11, 12, 13] Per government data, 36% of all schools across the country also do not have electricity.[14]

Similarly, in rural India in 2018, nearly 40,000 public health facilities, serving 580 million people, were operating without electricity supply.[15] A majority of rural public health clinics in Chhattisgarh experience power cuts during operating hours.[16] Even when health facilities are connected to the grid, many suffer frequent power outages. A study of hospitals across 10 developing countries found that a third of medical equipment failures were due to poor power quality,[17] which also affects the availability of cold storage facilities and blood banks. Power outages compromise healthcare provision in other ways too; many facilities depend on back-up diesel generators, which are expensive, noisy, and dirty.[18] The availability of reliable healthcare is particularly important in the current pandemic scenario.

Access to electricity also positively impacts livelihoods and poverty reduction through its use in agriculture and rural businesses. For instance, in the absence of timely and evenly distributed rains, pump sets are a reliable source of irrigation, including solar PV-based systems. Crop production and irrigation, as well as agro-processing, are greatly reliant on energy;[19] more than four million rural micro-enterprises in India mentioned the lack of reliable electricity as a major bottleneck to their business.[20]

Even though solar PV solutions can help address these electricity access challenges in rural areas, given their remoteness and the lack of information on potential electricity demand, solar vendors have limited interest in venturing into such areas. Also, the upfront costs of a solar PV system are very high for facilities serving poorer communities.[21] The problems in power availability and quality in rural areas also relate to the barriers faced by distribution companies (discoms) in ensuring revenue sustainability and keeping aggregate technical and commercial (AT&C) losses within the prescribed range.

Further, the policies that guide the relevant ministries in health, education, and others are largely informed by sector-specific considerations that do not account for inter-dependencies. Recognizing electricity as a catalyst in development is key to achieving development objectives; people are often trapped in a cycle of poor education, low productivity, low incomes, malnutrition, and poor health. Access to electricity has the potential to end this cycle and support well-being and poverty reduction.

Recommendations

- Short-Term Steps
  - Support the expansion of energy storage systems in rural areas to support flexibility in electricity supply and ensure uninterrupted power to critical services such as healthcare.
  - Increase the availability of portable solar charging stations to power smaller devices such

as smartphones and laptops, which will support the ongoing shift to digital education – and online health services – in an inclusive manner.
    - In parallel, encourage off-grid solar and micro-hydel solutions in a manner that complements grid expansion and reduces the cumulative costs and carbon footprint.

- Support Rural Electrification via Grid Improvements and RE Expansion in Medium Term[22, 23]
    - Upgrade grid technology by supporting real-time high-resolution data on grid conditions, integrating centralized forecasting mechanisms with system operations, and implementing advanced decision-making and control systems to enable operators to respond significantly faster to changed grid conditions.
    - Upgrade distribution networks to enable reliable electricity services, and to improve electricity distribution for solar-powered irrigation under the PM Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM) scheme.
    - Promote flexible demand and supply resources through routine grid simulations to identify pools for various flexible resources, implementing procurement mechanisms to ensure these resources are connected for use in grid stability, and setting up mechanisms for fair price discovery and compensation of flexible resource providers.
    - Continue to support states even after achieving universal electrification under the scheme through continued monitoring, evaluation, and feed-forward guidance.
    - Explore shifting to a national merit-order load dispatch model to help integrate more RE and reduce the variable costs of power that arise due to coal transport expenses. Separate content and carriage, such that operators can compete to bring in efficiency.

- Create Livelihood Opportunities Along the RE Supply Chain[24]
    - Develop training programs for entry-level RE jobs, coupled with other types of technical training.
    - Focus on building the capacity of the poor, thus ensuring project sustainability. Specifically target enrolment of women in local training programs
    - Embed poverty impact assessments into project design. Capture the impacts on beneficiaries not just in the short term but also over a longer period.

- Integrate Energy with Development Outcomes[25]
    - Rethink planning approaches: Adopt and develop more integrated development plans – discussed further in Section 2 below – to inform collaborative action among ministries. Encourage sector-specific M&E frameworks that use energy as a key input parameter.
    - Link data and action: Support common structures for data collection and sharing between line ministries and energy agencies. Better harmonize across energy and other sectors by embedding staff from energy agencies in line ministries and local governments.
    - Create enabling environments: Promote a healthy investment climate for the private sector through clear and transparent regulations that govern energy and other development sectors. Establish clear and transparent structures for multi-stakeholder engagement with development planning and build the capacity of multi-stakeholder partners to engage.

Benefits

- Economics and Employment
    - Collaborative and consolidated planning and action would lead to more effective allocation and use of resources.[26]
    - Compared with fossil fuel technologies, which are typically mechanized and capital intensive, the RE industry is more labour intensive. This means that, on average, more jobs are created per unit of energy generated from renewable sources than from fossil fuels.[27]

- Grid-based and off-grid decentralized RE creates jobs that require a range of skill sets. For example, a 10-25 MW solar PV plant requires roughly 40 skilled and 80 unskilled employees through the project's lifecycle. India's solar industry employs about 103,000 people, including 31,000 in grid-connected and 72,000 in off-grid applications; another 48,000 people work in the wind sector. CEEW and the NRDC estimated that 300,000 full-time jobs would need to be created—in construction, project commissioning and design, business development, and O&M—to meet India's previous solar target of 100 GW by 2022.[28]
- Access to electricity can expand the range of employment options in rural areas, owing to the expansion in the range of services for manufacturing, communication, mechanical power, and illumination that they would provide.[29]

- Emissions and Pollution
  - India's electricity sector alone accounts for 30.3% of the country's GHGs.[30] By improving energy access in rural India using renewable energy sources, multiple sustainable development outcomes are achieved in the form of improved health and education indicators, and livelihood opportunities, while benefitting the environment.

- Equity and Vulnerability
  - Skills acquired by rural residents in RE enterprises have supported poverty reduction by creating entrepreneurship, since many of the trained people go on to start their own enterprises related to RE or solar technologies and electrical services. For off-grid enterprises, local employees bring local knowledge and networks that help expand their business.[31]
  - Solar-powered lamps can provide light to homes and classrooms across underserved communities, allowing students to study after dark, while also charging communications devices for enhanced information and access. Household electrification is shown to increase school enrolment by about 6% for boys and 7.4% for girls,[32] and electrified households witness higher literacy rates.[33]
  - Rooftop solar systems can help electrify health clinics and keep medication at safe temperatures and medical equipment running during operations. Other innovative, off-grid technologies can power small businesses and agricultural equipment, boosting economic productivity and alleviating poverty.

Potential Challenges

- The government will need to determine fiscal and other funding models to help pay for these investments.

2. Electricity Capacity Planning: Using Integrated Approaches

Context

India's electricity planning process is largely driven by national considerations, anchored by national institutions.[34] The process, while effective in setting national targets and sending strong signals to the market, often cannot fully consider the diverse contexts and needs of individual states, leading to potential misalignments with national priority and policy documents. Similarly, plans are largely informed by sector-specific considerations that do not account for inter-sectoral inter-dependencies.

Current electricity supply planning is based on path-dependent economic growth, which can result in excess capacity and stressed assets.[35] The dependence on coal-based generation in particular risks locking into a fossil fuel-intensive pathway and can lead to more stranded assets in the future.[36]

Current stressed assets have contributed to the poor financial health for discoms across states.[37] Recent government measures, including the PM-UDAY financial support and revival scheme, have not been effective, partly because of the challenges discoms face in recovering the cost that they pay for power.[38] This, together with the diversion of the funds collected through the coal cess towards supporting non-RE actions,[39] has also affected the growth of RE in India.

Another problem in India's electricity supply is of unreliability, due to the stretched infrastructure supporting sparsely distributed loads over large areas, and low voltages of supply. Even though the country has connected most households with power lines, electricity flow is constrained by these inefficiencies.[40] There is a need for more integrated approaches to planning for the future development of the electricity sector.[41]

Recommendations

- Short-Term Steps
  - Ensure that discoms are financially viable through short-term capital infusion plans, additional to the liquidity infusion scheme announced under the Aatmanirbhar Bharat package in 2020.

- Intermediate Recommendations
  - Encourage a longer-term view to planning with the Central Electricity Authority's Planning Division,[42] coordinated at the central and state levels, incorporating cost-effective sources of supply with access to reliable power for all, and integrate with other sectors such as manufacturing, infrastructure, oil and gas, water, finance, and social welfare.[43] Ensure that these plans are periodically reviewed and updated.
  - Accommodate diverse priorities – resources and needs – in planning processes, by helping states co-own and adapt national plans and targets through consultative and flexible design. Establish collaboration among local and national governance levels to ensure that local contexts are factored into national plans. Build the technical capacity of local governments to integrate energy into local development plans and strategies.
  - Plan for the use of any future energy cess to be limited to supporting sectors relevant to RE adoption in the country. In this planning, revisit the funding challenges facing solar roof-top installations to create a mechanism – using the cess funds – to attract private investments.
  - Ensure that discoms are financially viable and resilient in the longer term, through focused and coordinated approaches to rationalize tariffs and reduce the gap between average cost of supply (ACoS) and annual recurring revenue (ARR). Financially viable discoms will enable higher adoption of RE and support India's clean energy transition.
  - Link policies and incentives for RE with enforcing RPO mandates, upgrading grid infrastructure, and integrating new technologies – especially energy storage – to holistically ensure system efficiency and support India's climate targets. Support or extend innovative financing mechanisms, such as green bonds, accelerated depreciation, generation-based incentives, and mezzanine financing.[44]

Tamil Nadu Electricity Governance Initiative

In April 2013, the Tamil Nadu Electricity Governance Initiative (TEGI)—a network of consumer and civil society groups—was launched to improve energy planning and implementation in the state. TEGI – which has since transitioned to the Sustainable Energy Transformation for Tamil Nadu (SET-TN) initiative – worked with the state government to be more proactive and systematic, and to engage with consumers on issues of electricity reliability, with the goal to find long-term solutions to the energy crisis. It used a WRI tool – 10 Questions to Ask About Integrated Resources Planning – as a framework to evaluate the state's planning approach and start understanding how it can be improved. Among other insights, TEGI's research found that plans in the state were developed in the absence of robust data on the actual demand for electricity and that a significant portion of electricity consumed was not metered. Furthermore, despite being one of India's top 5 states for clean energy capacity, Tamil Nadu's electricity planning process failed to integrate RE and EE in its state plans. These findings were used by TEGI to develop a set of recommendations and to begin conversations with the State Planning Commission, the State Energy Department and other state policy makers, while continuing further work.[45, 46]

Benefits

- Economics and Employment
  - More integrated and considered planning would avoid creating excess capacity and potential stranded assets, meet seasonal demand variations and reduce peak demand, and would improve system efficiencies, thereby reducing costs and improving discom health, and build a more resilient and sustainable electricity system.
  - Reliable energy access would reduce the need for (expensive and polluting) backup power and improve productivity, with spill-over effects on and employment creation in energy-dependent socioeconomic sectors.

- Emissions and Pollution
  - Careful supply planning and discom health would support RE capacity addition and integration and would avoid locking into fossil fuel-based polluting technologies.
  - Reduced reliance on captive sources of generation – which are currently typically diesel-powered – would reduce air pollution and GHG emissions.

- Equity and Vulnerability
  - Decentralized and integrated processes would support reliable energy access to vulnerable groups, including those located in rural and remote areas of the country.
  - Reliable energy access would support critical social services in health, education, etc.

Potential Challenges

- The inclusion of a greater set of considerations and/or stakeholders in planning processes may induce some status quo resistance from incumbent interests

- Measures to improve discom viability, initiate tariff reform, or upgrade distribution networks may involve significant additional costs; the government will need to estimate, identify, and allocate sources of funding and/or promote new models to help support these.

3. Reducing Energy Demand: Efficient Buildings

Context

In 2016, in India, residential and commercial structures consumed 32% of the country's total electricity, according to the Ministry of Statistics, Planning and Implementation. Niti Aayog estimated that energy demand from India's buildings would increase by 800% in 2047 as compared with 2012,[47] especially as many of the buildings that will exist in 2030 were yet to be built.[48]

Globally, the restrictions associated with Covid-19 brought down the use of commercial buildings 2020. In many countries, electricity use in the first half of the year grew in residential buildings and fell in commercial buildings. However, even when commercial buildings such as offices remain unoccupied, most continue to consume energy for maintenance of heating, ventilation and air conditioning systems, or processes such as powering computing servers. In India, further, while the pandemic has generally reduced energy demand in commercial buildings, decreases have varied widely across business sizes, customer segments, and regions. In addition, the migration of city dwellers to less densely populated areas affected energy intensity less than longer-term urbanization. As buildings in less densely populated areas tend to be larger, they often use more energy. In residential buildings, the pandemic also delayed energy-efficient renovations, including the installation of equipment such as insulation, glazed windows, and efficient heating and cooling systems. The Energy Efficiency Services Limited (EESL) reported a drop in installations to around 2000 per day, from 10,000 per day under normal conditions.[49]

According to a study on overall electricity demand during the lockdown and unlocking in Delhi in 2020, the overall level of electricity demand reduced during the peak lockdown; but with partial unlocking, together with heat waves and thermal discomfort in poorly designed buildings, the peak demand spiked again – reaching levels similar to previous summers. Each one degree's rise in the heat index resulted in a 187 MW increase in electricity demand during lockdown – this was 6% higher than in 2019.[50]

Under the Energy Conservation Act 2001, the government launched the Energy Conservation Building Code (ECBC) on a voluntary basis, revised in 2017. The ECBC prescribes minimum energy performance standards for large commercial buildings; it sets parameters to integrate RE sources in building design, with a goal of achieving a 50% reduction in energy use by 2030. However, several barriers limit the full implementation of this code. The code is not a mandatory requirement and is not notified within building bylaws. Builders, buyers, and investors lack access to adequate information on energy performance data and the certification and benefits of energy efficient buildings. India also lags in technology related to testing, standardization, and certification for efficient building materials.[51]

Buildings have the longest life span among major energy-use investments, meaning that they also have the most lasting impacts on resource use, urban services, energy consumption, and climate.[52]

Recommendations

- Short-Term Steps
  - Link the PM Awas Yojana (PMAY) housing scheme – as well as other government housing schemes – with the ECBC.
  - Implement the India Cooling Action Plan 2019[53, 54]
    - Accelerate adoption of adaptive thermal comfort standards.
    - Adopt climatically appropriate and energy efficient building design in large scale housing

programmes for EWS and LIG segments; incorporate mandatory requirements for building resilience; initiate funding and support for initiatives providing thermal comfort such as cool-roof programs, off-grid micro-systems for cooling, and localized heat-action plans.
    - Promote robust and collaborative R&D, including remote sensing and other technologies to map and monitor urban heat islands to help identify vulnerable regions

- Intermediate Recommendations
    - Make ECBC notification mandatory in remaining states within the building bylaws, accompanied by their effective enforcement by urban local bodies. This may also help expand the market for EE building products.
    - Encourage technology transfer with developed countries and design innovative financial schemes between the government and private financial institutions. Financial incentives could include grants and rebates, tax incentives and green mortgages, revolving loan funds and tax lien financing. Complement these through non-financial incentives such as fast-track permitting or expediting building permits through priority processing and an allowance for extra height or floor area.[55]
    - Initiate capacity-building programs to develop technical and managerial capacity for implementation of and compliance with ECBC.
    - Provide clear technical guidance on construction of energy-efficient affordable housing projects to state governments, which states can adopt with some customization.
    - Extensively retrofit public buildings with energy-efficient appliances and equipment (particularly cooling equipment) while ensuring that old equipment is safely recycled. Introduce benchmarking and transparency requirements for tracking energy use in buildings and make the data accessible. Make energy audits of buildings mandatory. Implement mandatory or voluntary energy use disclosure programs and offer tax incentives to encourage energy savings.[56]

Benefits

- Economics and Employment
    - Making buildings more efficient will create additional economic opportunities and employment in the construction sector and among suppliers to the construction sector. Raising building efficiency requirements to achieve a 27% increase in energy efficiency in Europe by 2030 (compared with 2005 levels) would result in two million new jobs.[57] Equally, retrofitting 40% of the United States' building stock would result in at least 600,000 additional, long-term jobs.[58] Each additional USD 1 spent on energy efficiency avoids more than USD 2 spent on energy supply investments.[59] Savings from building efficiency can free up capital for other strategic investments.[60]
    - Residential and commercial buildings make up approximately 34% of the opportunity to improve energy productivity, i.e., energy consumption per unit of GDP.[61] And doubling the global rate of energy productivity improvement, from approximately 1.5 to 3% per year, has the potential to reduce global fossil fuel use by more than USD 2 trillion by 2030 and create more than 6 million jobs by the year 2020.[62]

- Emissions and Pollution
    - Buildings have consequences for the environment, from land-use decisions at the planning stage, selection of materials during design and construction, the use of energy and water over the building's life, and the management of the waste produced in the building.
    - Low-carbon and energy-efficient heating, cooling, building shells, and lighting have the potential to lower global emissions by 83% below business-as-usual for the buildings sector

by 2050.[63] In India, combined energy efficiency measures at the national and state levels contributed to GHG emissions reductions of 151.74 million tonnes in 2018-19.[64]
    - Properly implemented efficiency improvements can significantly improve indoor environmental health. Combustion of fossil fuels used to generate electricity contributes to outdoor air pollution. Reducing energy consumption in buildings would, thus, indirectly contribute to improving air quality and health.

- Equity and Vulnerability
    - Efficient buildings can help increase energy access and reduce energy poverty for low-income residents, leading to improved health, productivity, and comfort. Occupants of energy-efficient homes are likely to spend less money on lighting, heating, or cooling, resulting in more spending power for purchase of food and other essential items.

Potential Challenges

- The provision of financial incentives may involve significant additional public expenses; the government will need to identify and allocate sources of funding and/or promote new business models to help support these

CONCLUSION

Policymakers should rethink energy sector planning by expanding rural energy access through grid improvements and off-grid initiatives, while focusing on improving building efficiency especially in urban areas. Above all, promoting integrated resource planning approaches with multisectoral perspectives would lead to significant developmental benefits. These measures will increase economic efficiencies, improve ambient air quality, and increase the opportunities to and resilience of the most vulnerable, thereby supporting a more sustainable economy overall.

ABOUT WRI INDIA

WRI India, an independent charity legally registered as the India Resources Trust, provides objective information and practical proposals to foster environmentally sound and socially equitable development. WRI India's mission is to move human society to live in ways that protect Earth's environment and its capacity to provide for the needs and aspirations of current and future generations. Through research, analysis, and recommendations, WRI India puts ideas into action to build transformative solutions to protect the earth, promote livelihoods, and enhance human well-being. We are inspired by and associated with World Resources Institute (WRI), a global research organization. Currently over 150 researchers are working with WRI India in our offices in Delhi, Mumbai and Bengaluru. *www.wri-india.org*

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