This is a good time for India to drive sustainable growth by promoting domestic renewables-powered and energy-efficient solutions to convert energy access, especially in rural India, from a consumption paradigm to an economic driver.

Image: iStock

5. Greening the economy: energy, infrastructure and quality of life

India's energy and infrastructure sectors have seen tremendous transformation over the past decade in terms of policy reforms, investment generation, on-ground deployment, and adoption of state-of-the-art technologies, digital interventions, sustainable materials and resource-efficient processes.

Though the COVID-19 pandemic has put a temporary halt on major projects, the government has stepped up efforts to resume work by defining appropriate health and safety standards for the workforce and mandating strict on-ground enforcement.

There are numerous possible interventions to improve these core sectors of the economy. Here, we have selected an indicative set of recommendations to:

- **Rethink energy economics**
  - Provide income support to consume energy and energy products
  - Finance the energy transition in post-pandemic India
- **Strengthen power and renewable energy sectors**
  - Continue power sector reforms
    - Revisit legacy issues of the power sector — subsidy and losses
    - Decommission old and inefficient thermal power plants
  - Support renewable energy projects
    - Set up a Ministry task force to address COVID-19 related sectoral issues
    - Support under-construction RE projects facing force majeure
    - Provide flexible financing covenants for project developers
    - Promote solar manufacturing
  - Create an institutional framework for the power sector
    - Set up a Ministry task force to address COVID-19 related RE sector issues
    - Make an Integrated Energy Resource Plan (IERP)
    - Establish a National Renewable Energy Corporation (NREC)
    - Notify a National Renewable Energy Policy (NREP)
  - Invest in distributed renewable energy (DRE)
    - Promote grid-connected micro-grids for urban and industrial consumers
    - Build new discom-led DRE business models
    - Create new markets for rooftop solar
    - Promote innovation in DRE technologies

- **Shift to cleaner fossil fuels**
  - Revise natural gas utilisation policy
  - Expand city gas distribution infrastructure
- **Build resilient transport and urban infrastructure**
  - Accelerate procurement of buses and micro-buses
  - Rebuild India's HVAC manufacturing sector for sustainable cooling

5.1 Rethink energy economics


Image: iStock

India's energy sector has struggled to keep pace with the exponentially increasing demand as more of its citizens get access to electricity connections, household cooking gas supply, and public and private transportation. In parallel, the rapid economic growth has generated major demand from the commercial and industrial sectors.

To maintain – and increase – fuel supply to consumers while minimising its import bills and the burden on the exchequer and staying on the course of sustainable development, the government is exploring new sources of energy, increasing efficient fuel use, and relooking at mechanisms and beneficiaries of various subsidies.

In this section, we encourage a rethink of India's energy economics to:

- Provide income support to consume energy and energy products
- Finance the energy transition in post-pandemic India

5.1.1 Provide income support to consume energy and energy products

PROBLEM

India spends an astounding INR 2.89 lakh crore (~ USD 38 billion)[107,108,109] a year in subsidising energy and energy products consumption. This includes subsidies and cross-subsidies for electricity, natural gas for North-Eastern states, LPG, kerosene and fertilisers. The subsidised consumption benefits many households, farmers and informal enterprises. However, given the poor assessment of economic status – wealth, income, financial solvency of the beneficiaries, subsidies have become universal and inequitable. This is a large leakage of precious public resources, and has driven inefficiencies into the systems that deliver energy and energy products. Public agencies mask these inefficiencies under the garb of unmeasured universal subsidised consumption.

In the electricity system, this distortion has resulted in sustained losses for discoms over the years. The package of INR 90,000 crore[110] (USD 11.9 billion) announced to help discoms pay their generators is effectively an outcome of this distortion and comes despite the significant subsidy that is already provided to keep prices low. Clearly a more lasting solution is needed – one that signals the right prices to the consumers, triggers end-use efficiency and also addresses the needs of the vulnerable (households and farmers) and those needing strategic support (industries).

LPG supply, under the purview of the Centre, has conditional transfers through a direct benefit transfer (DBT) mechanism, based on consumption. But this offers the same level of support to virtually all consumers, barring a very small addition for PMUY consumers. DBT is also used to provide urea to fertiliser companies, to give farmers access to a subsidised commodity. This does not address the skewed nutrient ratios and the inequitable distribution across farmers with different holding sizes.

SOLUTION

We propose the following options that can rein in the subsidy bill while ensuring equitable outcomes for end-consumers:

- **Establishing wealth or income driven categorisation of population:** The Socio-Economic Caste Census (SECC) offers a window into the diversity in wealth and income across the country. However, an exhaustive mapping and classification of the population might need a repeat of such a census, to gather more details on attributes of households. This could perhaps be a part of the decennial Census that is due to happen in 2021. The categorisation will have to be more comprehensive than simple exclusion and inclusion criteria that the SECC has been used to arrive at. In our ongoing study using a pan-India residential energy consumption survey, we have recreated a wealth-based classification of the population that reasonably correlates with income and is more reliable, as income reporting tends to be poor and unreliable[111]. A combination of a wealth and social indicators from an SECC-like exercise could help households more appropriately.
- **Conditional transfer based on consumption to deserving groups and individuals:** Unconditional income transfer might spur the consumption of demerit goods; for example, conventional solid fuels could again compete with cleaner cooking fuels. To avoid this, we recommend retaining the current model of conditional transfers for LPG till an alternative economic use case is made for conventional fuels. However, differential levels of support must be offered at varying wealth / income levels to ensure equity in end-use and prevent households from lapsing to solid fuels for want of money.

- **Unconditional transfer as income to deserving groups and individuals:** Unconditional transfers are to help support a consumption level that ensures a decent standard of living. For electricity, we suggest that based on estimated nominal consumption levels commensurate to the needs of various climatic zones, housing conditions and wealth status, a direct income transfer be made to households to support all or a portion of this consumption. Support for electricity for farm use and fertilisers must be linked to farmers' household status and land-holding size. A varying subsidy provision to ensure that larger land-holding farmers do not receive a disproportionate share of subsidy is necessary.

FISCAL/ STRATEGIC	The budgetary provision exists in the case of LPG and fertilisers and the main ask is for a reallocation across consumers. In the case of electricity, cross-subsidies provide an equal chunk of the subsidy support today and this needs to find fiscal room. Part of this will have to be from increased tax-revenues from industry and commercial sector – sharing the benefits of cheaper production and contributing to public resources. Bringing electricity under the ambit of GST will also be crucial to unlock gains for intermediate consumers that can be shared. The rest will have to be from growing the economic pie and the potentially increased revenue base of government.
TIMELINE	Establishing the need for this transition must be prioritised in the next few months. The process of carrying out the Census to ascertain the endowments of households will happen in due course over the next year. Meanwhile, the mechanism for targeting must be established, taking into account central ministries, departments and states. The roll-out of DBT could be as early as 2022, signalling a significant transition as India celebrates 75 years of Independence. Periodic declarations via know your customer (KYC) forms would ensure that the classifications of wealth / income status are current and reliable.
IMPLEMENTERS	This will have to be driven by the high-powered Prime Minister's Office. The main task will be driving coordination between the Centre, states, industry, farmer lobbies and key development sector organisations to chart the course of this ambitious plan. The administrative and banking machinery would have to be leveraged during implementation, akin to the rapid deployment of the PMUY scheme.
JOBS	The direct impact on jobs is uncertain; however, this will lead to increased industrial activity and help formal commercial establishments flourish due to with lower energy costs. Since much of the farm sector is currently unmetered, increased metering and monitoring could potentially create new jobs in the electricity sector. Consumer liaison roles will become crucial.
GROWTH	The industrial sector is likely to get fillip from the steep drop of approximately 20-35 per cent in electricity tariffs and become more competitive. Commercial activity and service sector offerings could benefit from tariff reduction in the range of 30-50 per cent, across the states. Growth opportunities also exist for the measurement technologies in electricity supply.[112]
SUSTAINABILITY	Economic and environmental sustainability is at the core of this plan. Income transfers bring in more allocation efficiency[113] and ultimately drive efficiency in distribution and consumption as well. This is critical for the power sector as more than two-thirds of the electricity in the coming decade will be provided by coal-based generation. This will drive generation efficiency and could unleash the potential of decentralised generation as end-consumers will see more parity in delivered price from alternatives to the grid. The direct income transfer to farmers will help drive balance in the use of various fertiliser inputs

and pave way for changes in cropping patterns, thus boosting less fertiliser-intensive and natural farming practices.[114]

TRADE-OFFS

As with all plans to target support, identification and privacy concerns are likely to be raised by many groups. Parting with data for these needs (to authorised government entities) is crucial and equally the need for protecting such data from unauthorised access. Across economic groups, there will be alterations to tax liabilities to help fund the gaps caused by the loss of cross-subsidy for electricity supply. Income transfers and measurements of consumption by design increase the transparency associated with the operations of public utilities and the service delivery process.

Electricity theft is also likely to intensify, as prices go up and with direct transfers, households have more of an incentive to distort consumption levels. There are likely to be a lot of losses for intermediaries in this process and many well-off citizens are likely to see a rise in the cost of consuming energy and energy products. Richer farmers and richer strata of households, which form powerful lobbies could resist this move and create barriers.

None of these is a reason not to pursue the proposal. Managing the political economy of energy consumption and subsidisation in India has always been a challenge, but the pandemic now forces us to re-evaluate our wasteful, distorted and inequitable subsidy structures in a time of severe fiscal constraints.

5.1.2 Finance the energy transition in post-pandemic India

INR 76,000 crore
Bond market flows estimated through a credit enhancement subsidy of INR 4,600 crore over 5 years

110,000
Potential new utility-scale solar and wind sector jobs from enhanced credit flow

INR 1.9 lakh crore
Potential additional GDP from multiplier effect of enhanced credit in infrastructure investment

Data points: CEEW analysis

PROBLEM

The COVID-19 outbreak could slow the pace of India's energy transition by impacting new investments in the RE sector in at least two ways:

- **Heightened counterparty risk:** Decline in economic activity has significantly reduced electricity demand, resulting in increased power curtailment and overcapacity generation. The financial health of discoms has deteriorated with plummeting revenue collection from commercial and industrial (C&I) consumers, amounting to 70 per cent of income. This is likely to result in payment delays to developers and dampen investor appetite for new RE capacity.

- **Constrained financial flows**: Build-up of stressed assets in the financial system will limit the flow of credit from financial institutions into renewables, which could be worsened by restricted exposure in the power sector.

SOLUTIONS

We propose the following three measures to ease the flow of finance to the RE sector:

- **Increase transparency to build confidence:** Regulators must enforce the must-run status of RE to minimise curtailment and increase the transparency of aggregated plant-level generation performance to build trust in the rationalisation of curtailment. Transparency could be increased through a **dedicated National RE Database** of performance data, combining and verifying data inputs from load despatch centres and power producers. Such a transparent database would allow easier dispute settlement in case of conflict relating to off-take and would allow independent power producers (IPPs) to have more consistent cash flows and predictable risk profiles.

  FISCAL

  This has financial implications to the extent of the minimum prescribed offtake, which is already a part of existing RE PPAs through the must-run or deemed generation clause.

  TIMELINE

  The must-run or deemed generation clause and the agreement to report performance data should be included immediately in all new tenders. The database should be implemented as soon as it can be developed.

IMPLEMENTERS Implementation should be a joint effort of central (Solar Energy Corporate of India (SECI), NTPC) and state tendering agencies. The Central Electricity Authority (CEA) and CEEW-CEF are currently developing a National RE Database (in beta testing).

- **Separate or bifurcated sectoral exposure limits for RE:** As lending to the RE sector is subsumed under banks' power sector exposure, it competes with other power sector projects for credit. Existing thermal assets and other power sector lending leave limited headroom for lending to RE. A separate sectoral exposure category for RE should be created to ensure that credit flow to the sector is not constrained.

  STRATEGIC This intervention is a regulatory non-fiscal measure.

  TIMELINE This intervention should be implemented within the next 3 months to enhance capital flow in these credit-constrained times.

  IMPLEMENTER The primary lever for this is action would be a reclassification by the RBI.

- **Enhance financial institutions' capacity to lend to the RE sector by recycling bank capital:** Refinancing lenders' loan books would enhance credit flow to the RE sector. A limited-time credit enhancement subsidy could stimulate bond market flows, freeing up bank capital for fresh lending.

  FISCAL CEEW-CEF estimates that a credit enhancement subsidy of INR 4,600 crore (USD 611 million) spread over five years could mobilise bond market flows of INR 76,000 crore (USD 10 billion)[115].

  TIMELINE This should be implemented within the next 3 months to ease credit flow.

  IMPLEMENTER Subsidy credit enhancement products should be administered by a dedicated credit enhancement guarantee corporation, under the MoF, as envisioned in the Budget 2019-20116 and routed through existing providers.

JOBS	Utility-scale solar and wind sectors generate employment at the rate of 3.45 jobs per MW and 1.27 jobs per MW respectively[117]. This could create an additional 110,000 jobs[118].
GROWTH	These measures will lower oversupply risks to RE deployment and resolve viability challenges from lower payments from curtailed power, and solve the imminent liquidity crunch. In the solar sector alone, this could facilitate the doubling of installed capacity from 32 GW to 64 GW through efficient use of public money by leveraging capital 16.5 times[119]. Considering the multiplier effect of infrastructure investment on economic growth across sectors, the credit enhancement could add INR 1.9 lakh crore (USD 25 billion) overall to India's GDP[120,121].
SUSTAINABILITY	Advancements made in sustainable RE generation will enable a shift towards higher RE targets of 450 GW aimed for 2030. This measure would advance decarbonisation of the electricity mix and aid India's move to fulfil its Paris Agreement commitment of 40 per cent non-fossil electricity capacity by 2030.

5.2 Strengthen power and renewable energy sectors


Image: iStock

In recent years, India has seen drastic changes in the way we generate, transmit, distribute and consume power. In just the past decade, 350 million Indians have got access to electricity. But more localised solutions are needed (via off-grid systems) for about 35 million last-mile customers. Also, for rural energy access, we must think beyond infrastructure and connections and consider affordability, reliability, safety and ease of use.

Inefficient legacy issues such as poorly targeted subsidies and low output, polluting thermal power plants, drain precious resources. The promising RE sector was already beset, even before the COVID-19 crisis, with lengthy payment delays, off-take curtailments, and issues such as state-level renegotiations of PPAs and consequent litigations. The lockdown has halted project development, dispersed workers, and disrupted supply chains, severely stressing the industry.

Electricity, a concurrent subject in the *Constitution of India*, requires the active participation of many stakeholders from the union and state governments, which makes policymaking, regulation and implementation extremely difficult to coordinate.

The need for reforms in the power sector was well realised, but the changed scenarios created by the pandemic requires fast-tracking of reforms to address issues such as multiplicity of authorities, centre-state policy and implementation conflicts, managing depressed demand, and difficulties in revenue collection.

This is also a good time to capitalise on domestic and global opportunities to promote domestic RE-powered or energy-efficient solutions and convert energy access from a consumption paradigm to an economic driver.

We propose a rethink of the structural framework of India's power sector to:

- Continue power sector reforms
- Support renewable energy projects
- Create an institutional framework for the power sector
- Invest in DRE

5.2.1 Continue power sector reforms

The need for reforms in the power sector was well realised; but due to changed scenarios brought in by COVID-19 there is an urgent need to fast track these reforms, with some added points to reminisce. The pandemic has resulted in lesser demand and difficulties in revenue collection. Also, it is high time we understand that old and inefficient power plants need to be done away with as they act as lag in power sector.

Considering the concerns of discoms as well as the power sector as whole, we have proposed measures to:

- Revisit legacy issues of the power sector — subsidy and losses
- Decommission old and inefficient thermal power plants

Revisit legacy issues of the power sector - subsidy and losses

67,000
Additional meter readers needed to ensure timely billing of agricultural and household consumers under *Saubhagya*

INR 3,000 crore
Outlay needed to waive electricity bills of households consuming less than 50 units per month, for April-June 2020

Data points: CEEW analysis

PROBLEM

Due to the lockdown, economic activities have come to a standstill, resulting in a sudden drop in demand (28 per cent y-o-y)[123]. Distribution companies (discoms) are facing the twin challenges of losing revenues from high-paying C&I consumers while facing difficulty in generating bills and collecting revenue from domestic and agricultural consumers. Discoms are staring at a revenue loss of more than INR 30,000 crore (USD 3.98 billion) during April and May 2020[124], besides the accumulated dues of INR 92,000 crore (USD 12.21 billion) to be paid to the generators as of February 2020[125].

The demand crisis has also reinforced the systemic inefficiencies prevalent in the power sector. For instance, C&I establishments may take several months to return to normal production levels; till then, their power demand will remain muted and as a result, the reliance on cross-subsidies will be a double whammy for the discoms. In 2017-18, cross-subsidies from C&I consumers amounted to INR 75,000 crore (USD 9.95 billion)[126]. **The need of the hour is to break the twin challenges of expensive power and low revenue recovery during this financial year.**

SOLUTIONS

We recommend the following measures to enhance the revenue recovery and bring down power purchase costs for discoms:

- **Build political consensus across party-lines to reduce cross-subsidies:** Cross-subsidies are a political reality of each state and doing away with them will require extensive engagement across all consumer groups, particularly farmer groups and households. An all-party agreement is immediately needed to allow for costs to be passed through without political opposition. Pursuant to this, the regulatory commissions must take *suo motu* steps to pass through full costs of power delivery to all categories of consumers for this financial year. Subsidies to consumer categories like unmetered agricultural consumers may be considered by the state governments.

  NON-FISCAL — This is a regulatory process to be followed to allow full pass-through of electricity costs to consumers and reduce reliance on government support. This will free up fiscal space to cater to other priorities.

  TIMELINE — Engagements with different actors and consumers to discuss cross-subsidy reduction in the subsequent tariff petitions must start immediately.

IMPLEMENTER Regulatory commissions must take *suo motu* steps to pass through full costs of power delivery to all categories of consumers.

- **Increase in electricity duty for domestic consumers:** A differentiated electricity duty to target wealthier households with high consumption, such as those using more than 200 units of electricity per month[127], could be in effect until there is a recovery in demand from C&I consumers.

  FISCAL Many states do not even have an electricity duty in place and so this can take the form of targeted taxation, unlike other indirect taxes which affects all consumers.

  TIMELINE This is an immediate measure, which can be implemented in FY2021.

  IMPLEMENTERS Respective state governments must review and arrive at a mechanism that will sit well with their consumers and commensurate to their requirements to help support discom finances.

- **Awareness and incentives to promote timely payment of electricity bills:** Only a small fraction of domestic and agricultural consumers pay electricity bills online. As a result, revenue collection during the time of movement restriction or from sparsely populated areas is often challenging. Moreover, many consumers are wrongly interpreting the temporary moratorium on electricity bill payment as waivers, as per a quick telephonic survey conducted by CEEW. Effective and clear communication by discoms on payment timelines, means of getting access to bills, and payment modes available will heighten awareness for bill payments. Incentives and improved access to online payment modes would be crucial to enable penetration of e-bill payment*.

  NON-FISCAL MoP could issue a letter to states encouraging discoms to implement these measures to enhance revenue collection, which is crucial for delivering reliable supply to its consumers. These actions must continue in the medium term to ensure a transition to electronic bill payments by most consumers.

  TIMELINE This measure needs immediate implementation (in the next 1-2 months) to enhance revenue flow.

  IMPLEMENTERS Respective discoms can implement it.

- **Safety net for vulnerable consumers:** Central and state governments could consider waiving-off the electricity bills (not duties) of domestic consumers with low-consumption for a period of three months (April-June 2020), and directly compensate discoms for expenses towards this consumption. Discoms can use a lifeline electricity consumption level of 50 units/month to identify consumers in need of such support. Nearly 50 per cent of Indian households, mostly rural, consume less than 50 units per month[128].

  FISCAL The proposed safety net would require an additional outlay of around INR 3000 crore (USD 0.40 billion), over three months. **This outlay is less than 5 per cent of the total annual power subsidy on offer across the states.**

* Balani, Kanika; Mani, Sunil and Agrawal, Shalu. "*Solving for Billing and Revenue Collection Challenges: A CEEW Blog Series.*" Council on Energy Environment and Water. April. Accessed 2020. HFCs in India. New Delhi: Council on Energy, Environment and Water.

TIMELINE — This needs immediate implementation to provide a safety net for the vulnerable consumers.

IMPLEMENTERS — Central and state governments must work in tandem to determine the resource requirements. Additional power from the central pool can be allocated to states to the extent that it meets the needs of poorer consumers.

- **Restructuring PPAs in accordance with pragmatic demand projections under different scenarios of economic recovery:** The drop in demand has been largely borne by the thermal power producers, as thermal generation dropped by 27.5 per cent in the week following the lockdown[129]. The financial stress associated with low utilisation of plants would only increase this year. Rationalising the PPA fixed costs to determine the most efficient assets, an optimal allocation of coal (among operational plants) and ensuring merit-order dispatch will be crucial. A compensation package for moth-balled units to cover short-term liabilities must be worked out. Central Electricity Regulatory Commission (CERC) estimates savings to be in the order of INR 6000 crore (USD 0.80 billion), for just five states[130].

NON-FISCAL — There is need for coordination between various stakeholders to aid renegotiation. Moreover, it will also help with restricting and compensating aggrieved parties based on overall savings that can be achieved over the life of these assets.

TIMELINE — This should be implemented in the latter half of 2020, extending to the next three fiscal years i.e. till FY2024.

IMPLEMENTERS — This can be implemented by MoP, through its key agencies CERC and NLDC, in coordination with state agencies such as state LDCs, gencos and discoms.

- **Clearing dues:** States must set a clear time-bound roadmap to clear the unpaid bills to discoms (by various state government departments), amounting to INR 50,000 crore (USD 6.64 billion).

FISCAL — This would require ring-fencing the expenditure dedicated towards power bills of all state departments. It would also need creating a mechanism for direct transfer to discoms against invoices.

TIMELINE — It should be implemented in the near term, after the COVID-19 lockdown is lifted.

IMPLEMENTER — This needs commitment of the respective state governments.

- **Filling the gaps in metering, billing and revenue collection:** Discoms must continue the ongoing efforts to achieve universal metering of all consumers, particularly the agricultural and rural domestic consumers. In order to ensure timely delivery of accurate bills, discoms need to strengthen their management system, keep a check on erroneous bills, recruit more human resources, and provide appropriate incentives to meter readers. Billing based on metered units should be mandated to bridge trust gap between consumers and discoms, which in turn will lead to timely payments. Almost all *gram panchayats* in India have common service centres (CSC), which provide digital services to citizens in rural and remote locations. However, electricity bill payments through this CSC network are active only in 13

states and 3 Union Territories. During April-December 2019, 11.4 million electricity bills were paid through CSCs, accounting for less than 0.6 per cent of total domestic consumers paying an average bill of INR 112/month[131]. Activating electricity bill payments in the remaining CSCs will make bill payment more convenient for rural consumers and significantly improve revenue collection.

NON-FISCAL	Regulators must allow discoms to spend more on metering, billing and collection, and full pass through of these costs. For instance, to ensure timely and accurate bill generation for newly electrified households and all agricultural consumers, discoms will need to spend INR 850 crores (USD 113 million) on human resources (meter readers)[132]. In very high loss making areas, discoms could consider installing smart meters. These expenses will have a multiplier effect on discom revenues. However, states may have to support roll-out, if capex resources are not available and cannot be recovered through tariffs or duties.
TIMELINE	It should be implemented in latter half of 2020, extending to next three fiscal years i.e. till FY2024.
IMPLEMENTER	Discoms need to provide clear time-bound implementation strategy and monitoring of the revenue collection trajectories post-implementation.

JOBS	These interventions have the potential to expand service sector related jobs in consumer focused activities like billing and collection. These are essential value-added services that will result in local employment creation and augment discom revenues. For instance, an additional 67,000 meter readers are required to ensure timely billing of agricultural consumers and households electrified under *Pradhan Mantri Sahaj Bijli Har Ghar Yojana* (*Saubhagya*). By enabling additional services such as bill payments at all CSCs, a commensurate number of local jobs could be created.
GROWTH	The annual losses of the sector are as high as INR 30,000 crore (USD 3.98 billion) even after a total subsidy of INR 90,000 crore (USD 11.94 billion). These losses not only make working capital more expensive but result in persistent underinvestment in the sector against crucial upgradation needs. As a result, the status quo continues on many fronts – especially power procurement and non-compliance with renewable purchase obligations. Clearing the discoms books by allowing for full-recovery and addressing key issues of cost of power purchase and billing would enable a flood of change in the sector and unleash innovation in the distribution sector as well.
SUSTAINABILITY	Current loss levels are in the range of 23 per cent of the Average Cost of Supply (ACOS). Bringing these losses down to less than 10 per cent would improve delivery efficiency and, ultimately reduce the need for procuring additional electricity. In turn, this would reduce emissions and water footprint commensurately. Passing the true cost of electricity to all consumers will also incentivise energy conservation behaviour and uptake of more efficient appliances, which in turn would lower the carbon footprint of consumers and the country as a whole.
TRADE-OFFS	A significant contribution (more than INR 80,000 crore (~ USD 10.6 billion)) to public sector finances comes from entities involved in electricity generation, coal production, coal transportation and involved in the transmission business via cesses, taxes, dividends and royalties. Rationalising the cost of power could dent government revenues in the short-run but will have positive implications in the long run.

Decommission old and inefficient thermal power plants

INR 12,000 - 18,000 crore
Potential savings from decommissioning thermal power plants aged over 25 years by 2024

45 MT
Potential reduction of coal if India produces power from the most efficient plants

INR 14,260 crore
Cost for retrofitting older thermal power plants with Pollution Control Technologies (PCT), which would ultimately be passed on to the consumers.

Data points: CEEW analysis

PROBLEM

Power procurement amounts to 70 per cent of total costs of discoms across India. With 70 per cent of the generation coming from coal-based generation sources, any inefficiency in the procurement from thermal plants needs to be removed. Plants older than 25 years contribute to over 20 per cent of the coal-based generation and constitute a significant fixed cost burden for the discoms. The only reason these plants continue to generate power is the low-cost coal allocation and the resultant low power tariffs offered to the discoms.

Plants identified for retirement consume 155 MT of coal a year. This is a premium commodity given the sector's liquidity challenges and serial waivers being offered to generators, discoms and retail consumers. Coal India Limited (CIL) is unable to increase enough production, as a result, coal imports have been rising steadily despite stated policy goals to reduce imports to nil.

Another major problem is air pollution. An estimated 76,000 premature deaths occur annually due to coal power plant emissions[133]. Retrofitting these older plants with Pollution Control Technologies (PCT) will cost around INR 14,260 crore (USD 1.89 billion), which would ultimately be passed on to the consumers[134]. Addressing inefficiencies in older assets will have positive implications for air quality, competitiveness of renewables, and overall financial health of the power sector.

SOLUTION

Accelerated phase out of these power plants over the next few years (versus the two-step phase out by 2027 proposed in the National Electricity Plan (NEP)) will ensure that newer plants operate at optimal plant load factors (PLFs). Currently, 75 per cent of the total demand is met by coal power plants. As per the NEP, up to 48 GW capacity will be phased out by 2027. It is possible for plants younger than 20 years (today) to cater to more than 50 per cent of the total power demand in 2027. CEA estimates that contribution of coal to overall power generation will be nearly 50 per cent in 2029-30 and the current capacity (with aggressive phase outs) and 61 GW of projects under various stages of construction will be more than sufficient to meet India's demand.

NON-FISCAL / STRATEGIC	This is a strategic and technological solution, which requires centre-state coordination and contract renegotiations.
TIMELINE	This should be done in the latter half of 2020, extending to the next three fiscal years i.e. by FY2024. Plant-specific solutions for reallocating coal linkages requires a dedicated effort which can span a few months.
IMPLEMENTERS	MoP will be the main coordinating agency. Implementation will require multiple authorities like CEA, CERC, central and state gencos, CIL and state governments.
JOBS	Retiring older plants will impact indirect jobs in the local economies of the areas they are based in, and these people would have to be deployed to other employment avenues. The direct jobs will be transferred to upcoming plants.
GROWTH	It is economically prudent to reduce fixed costs of older plants, bring in financial solvency for the many new, disused plants, and free up low-cost coal for efficient generators. We estimate savings in the range of INR 12,000 to 18,000 crore (USD 1.6 to 2.4 billion) through this decommissioning, which will accrue to the system and can be shared among participating discoms.
SUSTAINABILITY	We estimate a reduction of nearly 45 MT of coal if India produces power from the most efficient plants in its fleet. Overall emissions from the power sector would reduce GHG emissions as well as criteria pollutants, which would positively impact air quality.
TRADE-OFFS	Decommissioning will likely increase the cost of coal-based generation as the fixed cost for newer plants will be higher by about 30 paise per unit. However, it will yield major gains for the financial system as non-performing power assets will start generating, thereby allowing for more lending to the sector. Reallocation of coal will require extensive coordination with the Indian Railways (IR), though it may improve its finances. The imbalances created in power transmission will require assessment and may need additional investment to evacuate electricity to the demand centres.

5.2.2 Support renewable energy projects


Image: iStock

The outbreak of pandemic has brought the entire RE sector to a standstill. Multiple stakeholders are impacted at various levels. Moreover, the dependence of the sector on imports from other countries has put a huge burden on domestic supply chain. But this also provides an opportunity for India to strengthen its RE sector on the pillars of the *Aatma Nirbhar Bharat Abhiyaan*. We propose that stakeholders:

- Set up a Ministry task force to address COVID-19 related RE sector issues
- Support under-construction RE projects facing force majeure
- Provide flexible financing covenants for project developers
- Promote solar manufacturing

Set up a Ministry task force to address COVID-19 related renewables sector issues

PROBLEM	The RE sector is highly differentiated, with multiple players across the value chain who operate seamlessly in normal times. They include manufacturers, Engineering, Procurement and Construction (EPC) and Operations and Management (O&M) service providers, developers, and aggregators. COVID-19 impacts the survival and growth of all these units, especially the smaller segments with multiple players, which do not get adequate representation.
SOLUTION	MNRE should set up a central task force to deal with all sectoral issues arising from COVID-19, including late payment from discoms, curtailment, logistical problems due to the lockdown, interpretation of notifications and guidelines by other ministries which may also be applicable to the RE sector, contractual issues between developers and state agencies, etc. This task force should be the single point of connection between industry and the government.
STRATEGIC	Setting up this task force will not require any extra monetary resources. It will only be a streamlining of the procedure within MNRE, which has been handling these issues.
TIMELINE	Given the urgent need for relief, this measure should be implemented immediately. The task force should be active as of now for at least the next six months, and may be extended as required till the sector returns to normal.
IMPLEMENTERS	The MNRE is best suited to play this role. Alternatively, the RE Facilitation Board of the MNRE could be assigned this additional responsibility.
JOBS	The solar and wind sectors currently employ about 50,000 permanent employees and over 80,000 people in various construction and installation activities[135]. Active support from the Ministry would help protect this workforce and ensure continued job creation.
GROWTH	The task force would facilitate smooth execution of the current pipeline of 62 GW of solar and wind generation capacity which is at various stages of project development[136]. This effort will drive ease of doing business and increase investor and industry confidence.
SUSTAINABILITY	This coordination mechanism will ensure uninterrupted supply of services and benefit operational plants as well as those under construction. The 62 GW capacity pipeline is central to India's decarbonisation commitment.

Support under-construction renewable energy projects facing force majeure

PROBLEM	According to MNRE, India currently has around 62 GW of RE projects in various stages of installation, and the Ministry has granted a blanket extension for under-construction projects[137]. However, we foresee a major contractual issue with PPAs that do not provide for costs arising out of a force majeure event such as the COVID-19 lockdown, fixed costs of maintaining project sites, working capital interest costs, overheads, change in the prices, unanticipated currency rate fluctuations, etc. Entities across the value chain would have to bear these unexpected costs.
SOLUTION	We recommend that MNRE and MoP take urgent cognisance of this issue and direct tendering agencies such as SECI and NTPC to assess the force majeure-related costs for each under-construction project in consultation with developers and service providers. After assessment, the agency may direct Indian Renewable Energy Development Agency (IREDA) to extend no cost working capital loans for these sums to project developers to pay their service providers. As learning from this event, future versions of the PPA must contain provisions to allocate costs during such force majeure events. The guidelines for tariff-based competitive bidding issued by the MNRE could also be amended accordingly.
FISCAL	Bearing the interest costs on these loans will involve immediate expenditure on part of the relevant agencies and they may even require additional allocations. These costs are likely to be expensive for each individual player but on an aggregate, we do not estimate that they will cause a major impact on MNRE and MoP budget allocations. Moreover, the government will eventually end up bearing these costs anyway because the developers will most likely claim increased tariffs or other contractual reliefs. Providing immediate relief will keep businesses viable. It will also help prevent any litigation in this regard and facilitate smooth operations across the sector.
TIMELINE	This is a high priority issue as these costs are accruing in the short term and are due immediately.
IMPLEMENTERS	The operationalising of these recommendations would require MNRE, MoP, and IREDA to work in conjunction with SECI and NTPC.
JOBS	This does not create any additional direct jobs, but would safeguard existing jobs and keep the sector viable for future job creation.
GROWTH	If unaddressed, these force majeure-related costs arising from these projects will move up the value chain, compounded with interest costs, and eventually may even translate into multiple petitions before the electricity regulators demanding for release of tariff. This recommendation helps avoid that scenario.
SUSTAINABILITY	Addressing this issue will ensure that there are no further delays in project completion. Further, a proactive approach will increase investor confidence during a stressful time. In the medium run, this will keep India's energy transition growth story alive and thriving.
TRADE-OFF	If unaddressed, these costs would move up the value chain and the government would end up bearing them anyway. The trade-off is going to be between bearing them immediately versus at an unspecified later date through NPAs, litigated project outcomes, etc.

Provide flexible financing covenants for project developers

PROBLEM

The lockdown-induced demand-side disruptions have lowered RE generation by about 10 per cent, leading to strained cash flows and severely constrained the ability of many project developers to meet their debt payment obligations[138]. RBI has permitted a three-month moratorium on 27 March 2020, but the problem of accrued interest payments, especially for working capital loans, continues[139].

Further, different players will suffer differently: larger projects may be cushioned by their contractual debt service reserves, while promoter-backed projects may have group-level liquidity to sustain through the recession. Smaller projects, however, backed by MSMEs and especially prevalent in RTS, bio energy and other distributed energy segments, would likely find it difficult to arrange for cash flows even after the three months.

The banking sector is also in severe crisis and lenders have already expressed reluctance to be flexible with their debt covenants without the RBI's intervention.

SOLUTIONS

RBI should permit banks and financial institutions to be more flexible with individual lenders while maintaining a close watch on the financial health of the lenders and their ability to recover, utilising the information covenants made by the borrower. Relaxations could include:

- Borrowers drawing down unutilised portions of their sanctions despite occurrence of 'material adverse effect'
- Relaxed maintenance of debt service and other cash reserves by the borrower
- Temporary fluctuation in financial ratios such as debt to equity, interest coverage, etc. to allow borrowers access to other debt
- Eased covenants related to project activity, including performance, revenue projections, inspection reports, etc.
- Disputes or claims under the underlying project documents are to be expected; lenders should quickly give consent or relax provisions in relation to changing counterparties and provisions in the project documents
- Waiver of mandatory prepayment or cash sweep provisions by lenders to ensure liquidity of borrowers

STRATEGIC

The RBI has eased monetary policy and there is sufficient liquidity in the banking channels. This regulatory measure, if implemented by the financial institutions, will provide comfort to cash-strapped project developers. While there is no fiscal impact of the measure, there is a danger of unmonitored project debt becoming non-performing. Hence, the measure should come with stringent information covenants from borrowers and strict review and monitoring by lenders.

TIMELINE

Implementing this intervention immediately will alleviate the financial stress brought on by the extended lockdown and other COVID-19 related disruptions.

IMPLEMENTERS

The primary obligation of such an intervention lies with RBI, and implemented through the lending agencies such as banks and NBFCs.

JOBS

This will indirectly prevent job losses due to business closures.

GROWTH	The most important benefit will be that project developers can obtain liquidity to meet immediate expenses like fixed costs, overheads and workforce costs, and channel funds into projects such that their viability remains intact in the medium run.
SUSTAINABILITY	This will help prevent closures of green energy businesses, especially in the MSME sector, which may be viewed as low priority and high risk for lenders with limited capital.
TRADE-OFF	Lenders may adopt a flexible approach, but only if RBI issues a guidance on this matter. Without such flexibility, liquidity may be allocated to projects which do not require it, or defaults may be triggered by lenders on projects which have the potential to be viable post-COVID-19. This may trigger mandatory prepayment of loans, which can further deteriorate cash flows, and affect future project activity of developers and consequently of the entire sector.

Promote solar manufacturing

INR 15,000 crore

Conservative cost of solar modules needed to meet 10 GW domestic demand per year

INR 7,500 crore

Possible forex outflow savings per year if half of the required solar modules are made in India

INR 4,500 - 5,000 crore

Estimated collections from safeguard duties on solar cells and modules since August 2018

Data points: CEEW analysis

PROBLEM

In the past five years, India, on an average, has imported solar cells and modules worth INR 17,600 crore (USD 2.6 billion) annually to meet the demand-supply mismatch[140]. Imported solar modules meet 80 to 90 per cent of the demand. These imports will be hindered by the COVID-19 lockdown and disruption and uncertainty in the global supply chain. With plans to significantly install solar power capacity every year, India must seize this opportunity to reduce its reliance on imported products and at the same time, boost domestic manufacturing to tap the global demand. This will add new jobs, contribute to economic growth, and reduce forex outflow.

SOLUTIONS

India can take the following measures to reduce import dependence and limit the adverse impact of COVID-19 on the domestic solar sector:

- **Set tariff barriers:** In August 2018, MoF, on the advice of the Directorate General of Trade Remedies (DGTR), had recommended a two-year safeguard duty on solar cells and modules, set to expire in July 2020. Going forward, a safeguard duty in the form of a Tariff Rate Quota (TRQ) should be implemented for at least five years. Under the TRQ, a lower duty must be levied on the first 5 GW of imports (assuming this is 50 per cent on the annual demand). Once imports cross this quota, a higher duty can be levied. The duty must be differential i.e. higher on modules and lower on solar cells. The United States had implemented a similar safeguard duty on solar cells and modules in 2018[141]. This intervention will ensure bids with attractive tariffs and support local manufacturing.
- **Provide fiscal support:** The government must assess the impact of fiscal interventions such as production subsidy, capex support, interest subvention, tax rebate or electricity subsidy, and accordingly prioritise them. The Ministry of Electronics and Information Technology's Special Incentive Package Scheme (SIPS) and Modified-SIPS (M-SIPS), launched in 2007 and 2012 respectively with the aim to offset disability and attract investments in electronics manufacturing, are good examples of such inventive support.
- **Indigenise the value chain:** A strategic plan is needed to increase market share of domestic solar products beyond 50 per cent. In the short term, India can focus on setting up an additional 10 GW of manufacturing capacity for ingots, wafers, cells, and modules. The government must provide fiscal and regulatory support to incentivise both domestic and foreign manufacturers to scale up their facilities in India. It must give preference to companies focusing on high-efficiency products. Import of machinery to manufacture these products should be exempted from customs duty, ensuring competitiveness in the global market.

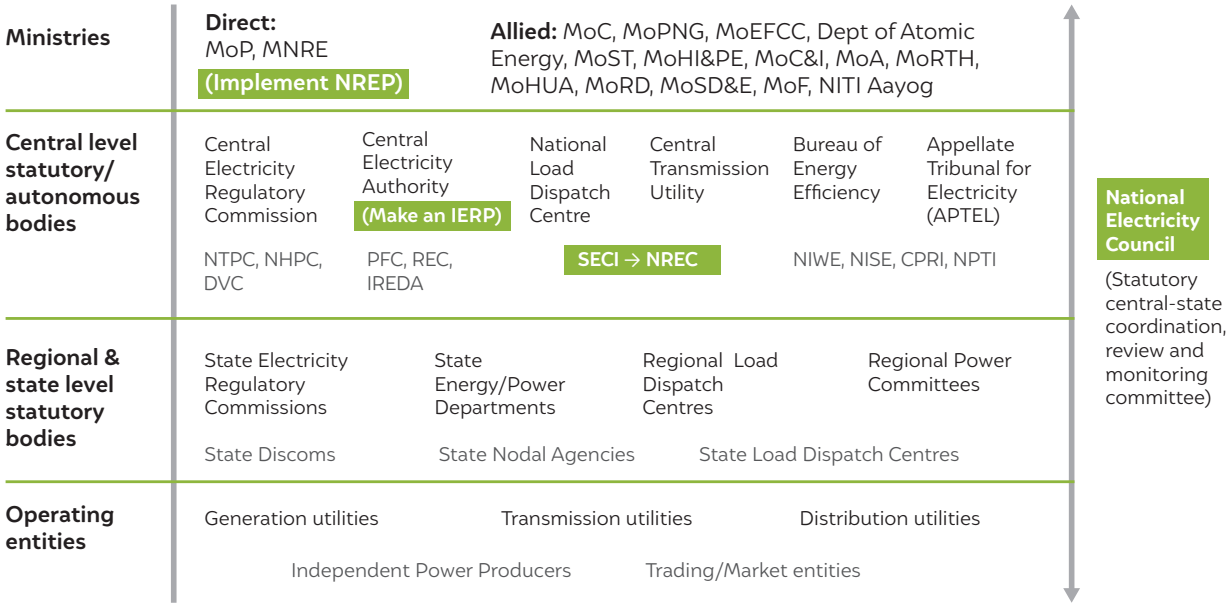
- **Accelerate the pace of existing interventions:** The government has tried to support domestic solar manufacturing by assuring off-take. It must accelerate the pace of such interventions and prioritise the bids under the 12 GW Central Public Sector Undertaking (CPSU) scheme and the *Kisan Urja Suraksha Evam Utthaan Mahabhiyan* (KUSUM) scheme. Recently, two developers won a bid to set up a 12 GW project and an additional 3 GW of solar cell and module manufacturing capacity[142]. There must be no delays in signing PPAs in such cases.

FISCAL	Implementing tariff barriers would not lead to additional costs, but tariffs discovered in bids may increase. Fiscal interventions will require budgetary allocation. CEEW-CEF estimates that approximately INR 4,500 to 5,000 crore (USD 600 to 650 million) has been collected by the MoF from safeguard duties since August 2018. To avoid additional cost, the MoF can allocate this revenue to the MNRE to incentivise domestic manufacturing; for instance, INR 2,000 crore can support 10 GW of domestic cell and module production for one year if INR 2 per watt is provided to domestic manufacturers[143]. Such financial support will ensure correct use of the collected duty and reduce additional burden on the exchequer.
TIMELINE	The tariff quota should be implemented immediately to prevent dumping of solar modules and cells into India. The other fiscal interventions – production subsidy, capex support, interest subvention, tax rebate and electricity subsidy – should be implemented within one year, based on their impact potential and ease of implementation.
IMPLEMENTERS	This intervention will require several different agencies to play a role as detailed below: - Tariff quota – DGTR and MoF - Production subsidy - MNRE, MoF and MoC&I - Capex support - MNRE - Electricity subsidy - MNRE and state nodal agencies, through local discoms - Interest subvention - RBI, IREDA and Power Finance Corporation (PFC)
JOBS	Integrated cell and module manufacturing generates around 2.6 FTE jobs per MW of output 10 GW of additional cell and module manufacturing capacity could generate 26,000 jobs in photovoltaic (PV) manufacturing. Additional jobs can be created in ingot and wafer manufacturing[144].
GROWTH	CEEW conservatively estimates that solar modules worth INR 15,000 crore (USD 2 billion) would be required annually to meet the domestic demand of 10 GW per year. Meeting the bulk of this demand through domestic production (>50 per cent) can avoid forex outflow of INR 7,500 crore (USD 1 billion). In the long term, domestic manufacturers can tap the international market and start by supplying modules to member countries of the International Solar Alliance (ISA).
SUSTAINABILITY	Reduced reliance on imported products will make the sector self-sufficient, competitive, and resilient to supply chain disruptions. It will increase India's energy security and support energy transition efforts while creating domestic value.
TRADE-OFF	Levying a safeguard duty can increase solar tariffs. CEEW-CEF analysed the impact of the current safeguard duty (August 2018 to July 2020) and estimated that tariffs could have been 6 to 10 per cent lower without the safeguard duty[145]. A similar trend may be witnessed if the period of safeguard duty is extended. Also, without greater domestic research and development, new technologies may not get deployed in India.

5.2.3 Create an institutional framework for the power sector

Electricity is a concurrent subject in India and states have autonomous decision-making powers. Over the years, the sector has grown rapidly and multiple institutions are involved in policy-making, implementation, operations and governance. Each institution has a set of functions to perform, objectives to meet, and jurisdictions to serve (Figure 4). In this section, we suggest some changes to the existing institutional structure and roles to increase the sector's performance and efficiency. The changes suggested in **green** are explained in the following sections.

Figure 4 Suggested changes to the institutional framework governing India's power sector



Source: CEEW-CEF analysis

In this context, our recommendations are to:

- Set up a National Electricity Council (NEC)
- Make an Integrated Energy Resource Plan (IERP)
- Establish a National Renewable Energy Corporation (NREC)
- Notify a National Renewable Energy Policy (NREP)

Set up a National Electricity Council (NEC)

PROBLEM

The power sector is evolving rapidly. There are drastic changes in the ways we generate, transmit, distribute and consume power. Electricity, being a concurrent subject in the *Constitution of India*, requires active participation of many stakeholders from the union and state governments. But with several institutions engaged in policy making, regulation and implementation, it is difficult to maintain alignment and coordination.

SOLUTION

We recommend that a **National Electricity Council** (NEC) be constituted within three months of the amendments to the *Electricity Act, 2003* coming into force, through a central government notification. Statutorily, the NEC would be an advisory body with powers to direct tasks to central government agencies in line with their primary roles and responsibilities. It will play an active role in review, monitoring progress, oversight, and coordination between central and state institutions. The NEC should convene at a frequency notified through the *Electricity Act*, ideally once in a quarter. The NEC must act in a transparent and time-bound manner, and publish information regarding its activities and meetings, including advice shared with the central and state governments.

The NEC should have members from central line ministries and their agencies and one senior-level representation from each state. The NEC can be housed within the MoP, with the Secretary, MoP and Secretary, MNRE as co-chairs. Joint Secretaries from various ministries, departments, agencies dealing with power, RE, energy efficiency, urban development, rural development, coal, petroleum and natural gas, environment, forest and climate change, finance, external affairs, agriculture, skill development, labour and employment, science and technology, and industry and commerce should be part of the NEC.

In addition, one representative each from central agencies like CEA, Central Transmission Utility, NLDC, NITI Aayog, Forum of Regulators and Regional Load Dispatch Centres, as well as from financing institutions such as PFC, REC and IREDA, should be inducted as members.

The major functions of the NEC should be to:

- Monitor and evaluate implementation of national policies, including the physical progress against targets/trajectories
- Identify interventions to address bottlenecks being faced at the state/regional levels
- Make recommendations to the central government to modify the *National Tariff Policy* and formulate the National RE Policy
- Monitor the application of grants and funds (for instance, loans to discoms), and any other designated funds or loans allocated by the central government to reduce sectoral risks
- Coordinate on matters related to grid planning and integration of high quantum of RE, in line with the stated medium- to long-term targets
- Direct relevant line ministries to prepare guidelines, model frameworks, and develop proactive approaches for states to customise and adopt to ease/remove bottlenecks to establish a sustainable power sector.
    - Making integrated resource plans of supply and demand side resources
    - Planning and execution of electricity infrastructure projects

- Frameworks to ease land procurement and allocation for projects under environmental regulations
- Subsidy calculation and effective modes of disbursement to consumers
- Opportunities to develop new technologies and applications
- Proposing new business models for discoms which can help increase their revenues and reduce their cross-subsidy burden
- Best practices on creation of manufacturing hubs, RE project planning, large-scale project development models, grid operations, bidding of RE projects, cost-effective procurement options and methods, inter-state trading of electricity, calculation of actual cost of electricity supply, peak load shaving, optimising on distribution network strengthening
- Best practices around skilling and capacity building, safety and quality standards, waste disposal, etc.

◥ Consider strategic bets that India could take to be able to gain a competitive edge over its global counterparts, for example: expansion of indigenous manufacturing of existing and emerging RE technology and equipment; export of equipment and services, and demonstrating leadership in the upcoming battery storage value chain

NON-FISCAL/ STRATEGIC	This strategy is critical, without which the likelihood of success of the *Electricity Act* and the relevant policies will be reduced. This mechanism is necessary to meet the goals, targets and transition pathways of the national policies and regulations. Primarily, administration costs will be incurred for organising meetings. As the NEC will be housed under the MoP, the budgetary allocation for travel and meetings may be made by MoP.
TIMELINE	This intervention should be implemented within three months of the amendments to the *Electricity Act of 2003* coming into force to enhance probability of success, and address the concerns of the power sector which have been exacerbated by COVID-19.
IMPLEMENTERS	MoP would be the nodal agency for this intervention, with other departments, agencies, and ministries playing key roles.
JOBS	This intervention has no direct impact on jobs but will play a critical role in keeping the sector robust, and support existing and future jobs in the sector.
GROWTH	The NEC could remove bottlenecks for initiatives undertaken by the union and state governments to significantly improve the ease of doing business. An efficient decision-making process can increase investor confidence, leading to greater flow of investments and deployments in the sector. This would increase sustainability of the sector and add to economic growth.
SUSTAINABILITY	The NEC process will ensure timely implementation of reforms that will in turn accelerate renewable energy deployment and clean energy transition.

Make an Integrated Energy Resource Plan (IERP)

PROBLEM

As per section 73 of the *Electricity Act, 2003*, CEA develops a national electricity plan for a five-year horizon. This plan covers aspects such as (a) demand forecast for different regions; (b) capacity addition plans for generation (coal, hydro, gas, renewable, etc.), and transmission infrastructure; (c) technologies, innovation, and R&D; (d) funding requirement; (e) and skills/jobs assessment. The key challenges hampering effective planning and implementation are:

- **Suitability of the methodology:** Despite rapid technological and fuel mix advancements in the power sector, demand forecasting methodologies have remained unchanged, resulting in Electric Power Surveys being way off the mark.
- **Top-down process, lack of state participation:** At present, the CEA prepares the national electricity plan based on data received from different agencies. The CEA is assisted by the MoP, MNRE, NITI Aayog, BEE and Central Public Sector Undertakings (CPSUs) such as NTPC, Power System Operation Corporation (POSOCO), Power Grid Corporation of India Limited (PGCIL), PFC, etc. Various state agencies and power companies are only invited for comments on the draft national electricity plan with minimal inputs in its formulation.
- **Lack of enabling infrastructure and funds:** Lack of monitoring / measurement infrastructure (such as smart metering) and poor availability of funds with the states are also major barriers. These have had second-order consequences in the sector such as overcapacity, low thermal PLFs, curtailment of RE power, high aggregate technical and commercial losses, and financial distress across the value-chain, particularly distribution.

SOLUTION

We believe that an IERP framework, under the aegis of the NEC proposed in section 5.2.3, is essential for India's power sector development. The IERP must ensure that:

- All energy choices/resources are evaluated
- Risks are assessed for a variety of energy portfolios
- Energy demand and profile is accurately estimated
- Supply reliability is ensured
- Cost of electricity supply is minimised (not just financial but also economic cost)
- Actions related to energy supply are compliant with regulatory/market mechanisms

To achieve these, a combination of top-down and bottom-up approaches is needed. Key steps should include:

- CEA, in collaboration with the CERC, must design the national guiding / model framework for states to prepare their IERPs every three years. Components should:
  - Define basic and advanced modules, components, and horizon of IERP exercise and establish linkages between the modules
  - Define steps/process to undertake IERP
  - Suggest tools, methods, data requirements, and data collection formats for effective power sector planning
  - Capture international best practices and learning
  - Develop a risk assessment framework that reflects cost implication mapped to the relevant stakeholders

- Map the modules to states' preparedness – identify categories of states eligible for different modules. This includes listing of enablers/drivers and barriers/ disablers to using a module
- Suggest possible institutional structures to implement the above frameworks at the state-level
- Develop possible roles and responsibility matrices – who does what and when, who could anchor the exercise, what could be the institutional interdependencies - mapping the modules/steps/flowchart
- Enable access to the states on technical knowhow, simulation tools, and experts to formulate state-level IERPs

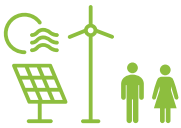
- Once states start adopting modules of the IERP, the CEA must consolidate the outputs, propose adjustments to state plans to optimise, and finalise the national energy plan
- Based on this exercise, targets under the national policies must be set
- NEC must ensure that the CEA conducts the necessary activities to come up with the model framework and guidelines, review progress against milestones, and facilitate adoption by states

STRATEGIC	Conducting the IERP should be a strategic and a vital part of the CEA's mandate. To follow a robust process and methodology, adequate funds can be deployed through the GoI's Integrated Power Development Scheme (IPDS) fund.
TIMELINE	The CEA can develop a model guiding framework in six to eight months and disseminate amongst all states over the following four to six months.
IMPLEMENTERS	The primary implementation responsibility would lie with the CEA, with coordination with several other agencies like the CERC.
JOBS	This intervention would have no direct impact on jobs.
GROWTH	The IERP will help spur investments into economically desirable technologies.
SUSTAINABILITY	A robust and rigorous IERP process will ensure that the electricity mix and infrastructure that is built has the least economic cost to the country.

Establish a National Renewable Energy Corporation (NREC)

INR 5,200 crore
Proposed outlay between 2021–28 of a viable market for 28% wind and solar generation by 2030

4,650 $MTCO_2$
Reduced emissions from 2020-30 if India achieves 28% power generation through solar and wind by 2030



0.53 million
Potential new jobs if NREC supports installation of another 130 GW of wind and 200 GW of solar by 2030

Data points: CEEW analysis

PROBLEM

The share of solar and wind generation capacity in India has recently reached 20 per cent. While India would have to significantly ramp up its efforts to achieve and exceed the ambitious 175 GW RE capacity target, an increasing share of solar and wind generation capacity would lead to a series of challenges that could derail these energy transition ambitions. These include:

- **RE PPAs:** Continuous decline in solar and wind tariffs has resulted in re-negotiation of existing contracts signed at higher tariffs, making states and other RE buyers apprehensive of signing new PPAs. Further, in an asymmetric information environment, bilateral contracting processes are either long or costly or result in biased contracts, exposing RE projects to high operational risks.
- **Project development:** Inherent inefficiencies in lengthy and costly project development processes across states are a key constraint to rapid RE deployment: these include Centre- and state-level investment-grade resource assessments, access to land, and supporting infrastructure development (roads, water, and transmission interconnections).
- **Cost of RE:** Although generation costs of RE have declined rapidly making it the cheapest source of electricity at the margin, other system costs such as the cost of integrating RE, loading costs to make RE dispatchable, and fixed cost implications on discoms under long-term conventional PPAs increase the landed price and raise inhibitions in bulk buyers.
- **Financial support to RE:** Currently, RE projects receive various types of financial support via multiple mechanisms such as Viability Gap Funding (VGF) scheme, accelerated depreciation (AD), tax holidays, concessional loans (PSL, IREDA), exemptions from transmission charges, etc. which burden the exchequer and other power system players.

The redundant overlaps among these provisions, revisions, and variations have created an uncertain investment and project development environment.

SOLUTION

MNRE should lead the effort to expand the scale and scope of SECI to become the **National Renewable Energy Corporation (NREC)** by empowering it to address systemic inefficiencies and market risks for sustained RE growth in the long run. The NREC will:

- **Act as a centralised entity for RE power developers and buyers:** The NREC will sign PPAs, and bundle and sell contracted RE power to discoms and large buyers through power sale agreements (PSAs) at a single pooled price; these PSAs would be used to fulfil RPO targets in full with no exceptions
- **Pool RE tariffs for new and existing buyers:** Any decline in RE tariff with new capacity addition would be transferred uniformly to all buyers to address uncertainty around declining RE tariffs
- **Streamline and standardise contracting, procurement and payment processes,** and publish relevant information for transparency, build confidence among RE stakeholders, and facilitate investment and reduced transaction costs and project risks
- **Fast-track project development liaising with central and state agencies** to facilitate land procurement and evacuation infrastructure and collaborate with national institutions like National institute of Solar Energy (NISE) and National institute of Wind Energy (NIWE) to identify high potential RE zones in the country
- **Execute one transparent and simple financial support and disbursal mechanism** to alleviate the concerns of RE buyers till other structural reforms allow complete parity between RE and conventional power

The NREC route for RE procurement can be voluntary for states and they could continue to do independent tenders. However, participating states would receive the following benefits:

- Reduced adverse tariff impact on discoms from RE procurement, integration, and balancing
- Reduced transaction and complexity costs by dealing with one seller instead of individual developers
- Zero burden of integrating RE projects with state grids because all NREC-procured RE could be connected to the interstate grid
- RE-rich states will be able to easily countrywide markets

FISCAL/ STRATEGIC

NREC is an institutional structure proposed to address project development and tail-end risks in the utility-scale RE sector and implement targeted financial support mechanisms over a fixed period.

NREC could leverage its position as a central government entity to reduce the soft costs associated with project development. Many countries, including the United States, aim to reduce the Levelised Cost of electricity (LCOE) for utility-scale solar by roughly 50 per cent by 2030, mostly by reducing soft costs.

CEEW's preliminary calculations show that a cumulative amount of **approximately INR 5,200 crore (USD 690 million) over 2021-28** could facilitate an economically viable market for 28 per cent of generation from onshore wind and solar PV by 2030. Our estimate is that the financial outlay will become zero beyond 2028 due to increasing competitiveness of RE and falling grid integration costs.

Through subsidy reform, it is possible to consolidate the outlay under existing financial support mechanisms and redirect it to bulk buyers such that it nullifies any additional cost that the procurer would have to bear if they buy RE over conventional power.

TIMELINE	Additional powers and functions can be allocated to SECI over the next six months to one year, under rules and regulations set out by the CERC, to transition it into the NREC.
IMPLEMENTER	Primary responsibility lies with MNRE to empower and expand the scope of SECI.
JOBS	The NREC would support installation of additional 130 GW of wind and 200 GW of solar capacity by 2030. Total employment in the sector would increase by 5,28,000 between 2021 and 2030.
GROWTH	Accelerated RE deployment will save forex from reduced coal imports. Even if half the RE generation is utilised to replace imported coal, India can save more than INR 6.75 lakh crore (USD 89 billion) over 2021-30 (nearly ten times the proposed outlay over the same period). High RE potential sites would offer the cheapest clean electricity which will improve the competitiveness of Indian industry. Higher utilisation of the existing transmission network under NREC would defer investment in creation of additional infrastructure.
SUSTAINABILITY	The NREC model could accelerate growth of utility-scale RE, reduce emissions from the power sector, and attract investments to the sector and the country. Through the NREC, we can target to reach 28 per cent of the generation through solar PV and onshore wind by 2030. As a result, through 2020 - 2030, over 4,650 MTCO2 emissions will be abated as compared to business as usual.
TRADE-OFF	The NREC model could be a win-win solution to address the sector risks, and at the same time, bring down the soft costs, induce efficiency in deployment and financing. However, SECI may take time to build deep technical expertise for non-solar technologies like wind, hybrid, biomass, small hydro, waste to energy and their interaction with each other.

Notify a National Renewable Energy Policy (NREP)

PROBLEM

The political economy roadblocks in scaling RE across the country are manifested as centre-state conflicts, states making retrospective changes in policies or threatening to renege on PPAs and/or curtailing RE, and discoms holding back payment to RE generators. Countrywide deployment of RE requires states to be aligned with the national targets, and that they are motivated to deploy more RE capacity rather than doing so out of threats of penalties.

SOLUTION

We recommend that MNRE and MoP co-develop and co-implement a **National RE Policy (NREP)** to ensure constant alignment in objectives and actions between the Centre and the states. The NREP's objectives and development and monitoring process should be set in the *Electricity Act, 2003* to reduce discretion and ensure policy certainty. The NREP must:

- Allow accounting of all costs, benefits, and co-benefits of meeting the national RE targets,
- Establish principles of cost and benefit sharing to ensure that states are motivated to maximise deployment, and
- Enable active and equitable participation from all states.

Features of the NREP

- Define medium and long-term targets for RE deployment, including mandatory targets for utilisation of RE for electro voltaic charging and emission reduction
- Specify a uniform annual RPO trajectory for all states to ensure equitable contribution, while giving them freedom to choose the technology / clean energy fuel mix to meet the RPO targets
- Set out incentives and other mechanisms to achieve stated targets, including market-based instruments and mechanisms to reduce, socialise, or eliminate the additional cost of integrating and procuring RE until other electricity reforms ensure complete parity to RE
- Create an enabling environment for manufacturing of critical equipment and components by increasing availability of low-cost financing, ensuring commercial viability of nascent RE and/or complementary technologies that can support grid integration, removing barriers to project deployment, ensuring skilling, re-skilling and capacity-building, and promoting investment in physical infrastructure
- Specify aims, objectives and suggested subjects for research and development, innovation, and demonstration programmes to build confidence in new technologies and applications

NON-FISCAL/ STRATEGIC

The NREP is a strategic intervention to bring the Centre and states together to create long-term policy certainty and a conducive environment for investment in RE. The policy will consolidate existing efforts and initiatives and lay out a roadmap and strategies to accelerate RE growth. It does not entail any cost, if required, existing incentives and financial support can be re-structured and streamlined as per the provisions of the NREP.

TIMELINE

The recently proposed amendments to the *Electricity Act, 2003* mention the introduction of an NREP. The first NREP must be notified within six months of the notification of the amended Act, and thereafter, once every five years.

	The states, too, must prepare their respective State Renewable Energy Policy (SREP) within a year from the notification of the amendments and thereafter, once every five years; in the interim, the states must consolidate existing policies in force and notify as the SREP. The SREPs must adopt the uniform targets set out under the NREP.
IMPLEMENTERS	MNRE and MoP along with NEC, proposed in section 5.2.3, must monitor the progress made under the NREP. Together they will facilitate necessary coordination between the Centre and the states, and the removal of implementation bottlenecks.
JOBS	Through clear direction, NREP will support accelerated capacity installations which will in turn create additional skilled and unskilled jobs in the RE sector. Utility scale solar PV and onshore wind could result in 528,000 new jobs between 2021-30. Similarly, other RE segments will also generate employment as they scale-up.
GROWTH	Accelerated RE deployment will save forex from reduced coal imports. Policy certainty and clarity can facilitate indigenisation of the manufacturing base, thus increasing competitiveness of domestic manufacturers and reducing dependence on RE equipment imports. Also, RE being the most affordable source of electricity, its large-scale adoption will make businesses and industry globally competitive. Our agriculture productivity and commercial activity in villages will increase through solar-based solutions.
SUSTAINABILITY	NREP will provide an enabling environment for meeting the GoI's ambition to deploy 450 GW of renewable energy capacity by 2030, which will in turn increase energy security and reduce emissions.

5.2.4 Invest in distributed renewable energy (DRE)

The COVID-19 crisis has shown how an unprecedented calamity can bring the entire world to a standstill. Electricity is an essential resource that can make or break a country's response in such circumstances. The risk is amplified by the spread of critical infrastructure such as transmission lines and generation stations across vast and diverse geographies, beyond the borders and controls of individual states. It is thus crucial to build a resilient and reliable electricity infrastructure that can withstand physical, financial, resource-related, and even cyber-based threats.

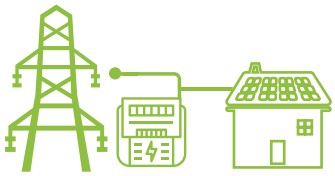
India's distribution network and utilities have been plagued by a host of issues, and even today, do not have the physical or financial capacity to provide 24x7 power to all consumers. Distributed renewable energy can play a big role in bridging these gaps through a range of local and distributed solutions.

An integrated distributed network of micro-grid clusters, community solar systems, aggregated solar plants, other sources such as bio energy, small hydro, and wind, and 'behind-the-meter' battery units and inverters can greatly enhance grid reliability. These micro-grids and systems can also disconnect from the main grid and operate autonomously and could thus mitigate a part of the impact in the unlikely event of a nationwide grid failure. Building such a network requires concerted policy, regulatory, business, and technological interventions.

We propose the following measures:

- Promote grid-connected micro-grids for urban and industrial consumers
- Build new discom-led DRE business models
- Create new markets for rooftop solar (RTS)
- Promote innovation in DRE technologies

Promote grid-connected micro-grids for urban and industrial consumers



INR 1.08 per kWh

Potential net benefit to discom from optimised urban micro-grid system if deployed in BYPL's license area in East Delhi

110,000

Skilled and unskilled jobs created by 20 GW of small- and large-scale micro-grids

Data points: CEEW analysis

PROBLEM

The power grid is coming under increased stress from rising peak demand and a higher proportion of unpredictable load from activities such as EV-charging, cooling, and local power generation. Expensive grid infrastructure upgradation and management is required to meet consumer demand and ensure reliable power supply in such scenarios. Additionally, high dependence on power procured from large plants located far from the demand centres creates supply risk and warrants investment in expensive transmission networks. A viable alternative is micro-grids – smart grids with localised generation, that support a designated set of local loads and can operate synchronously with the main grid as well as independently (islanding).

SOLUTION

We propose that the MNRE sets a target to achieve 20 GW of grid-connected micro-grid capacity by 2025 under the NREP (see section 5.2.3). This will accelerate the deployment of micro-grids across urban and industrial clusters. The policy should set clear guidelines for deployment of micro-grids among different consumer categories and geographies, and state the regulatory changes needed for smooth integration and management. Proposed guidelines:

- **Include technical specifications** for generation sources, batteries, and components, since optimum design and deployment of micro-grids would benefit consumers and the grid.
- **Set the criteria to select industrial clusters** in areas such as Special Economic Zones (SEZs), where multiple generation sources and flexible loads can be integrated. Micro-grids of 50 - 100 MW capacity can be installed in industrial clusters.
- **Set the criteria to choose urban residential and commercial clusters** where micro-grids can be used to decongest the grid and flatten the load curve. Micro-grids of less than 1 MW and 1 - 5 MW capacity can be installed in residential and commercial clusters, respectively.
- **Define ownership models between consumers, discoms, and third parties**. Models with discom co-ownership promoted as micro-grids can substitute grid infrastructure upgrades.

Micro-grids benefit distribution networks through load levelling, minimising power procurement from expensive sources, and deferral of network upgradation. Consumers can benefit from financial savings and greater self-sufficiency. **A CEEW study in partnership with BSES Yamuna Power Limited (BYPL) shows that an urban micro-**

	grid system deployed within the BYPL license area can provide a net benefit of around INR 1.08 per kWh to the discom if designed to optimise for the grid[146].
STRATEGIC	This is a policy intervention with no direct fiscal outlay.
TIMELINE	The policy could be implemented in 2021 with validity till 2025.
IMPLEMENTERS	This can be implemented by MNRE under the proposed NREP.
JOBS	20 GW of small- and large-scale micro-grids can create around 110,000 jobs for skilled and unskilled workers[147].
GROWTH	Deferred investment in grid infrastructure by the debt-laden discoms can contribute to their financial recovery, which in turn will have a positive ripple effect across the sector.
SUSTAINABILITY	Installing micro-grids with high RE generation technologies can contribute to India's overall emission reduction targets while greening the electricity consumption of industrial, commercial and residential consumers.

Build new discom-led DRE business models

INR 18,000 crore
Estimated investment to deploy 4 GW discom-led community RTS

50,000
Potential skilled and unskilled jobs created by 4 GW of RTS

Data points: CEEW analysis

PROBLEM

Discoms are facing revenue losses due to higher uptake of RTS among their lucrative C&I consumers. Additionally, large-scale proliferation of RTS across distribution networks without proper planning and integration can lead to grid instabilities and even higher revenue losses for the discoms. Moving more residential consumers to the RTS segment can help alleviate this burden.

However, there is a low uptake of DRE such as RTS in the residential sector due to market challenges such as high capital investment, lack of access to finance, and few suitable roof spaces[148].

SOLUTION

Component B of the existing incentive scheme of Phase - II of the *Grid-Connected Rooftop Solar programme* provides achievement-based incentives to discoms for installing aggregate capacity up to 18,000 MW[149]. This could be modified to include incentives for deployment of new discom-led business models of RTS installation in the residential sector for 4,000 MW (~ 22 per cent) of 2022 target.

- Quick deployment in the residential sector by addressing local market challenges
- Additional revenue and reduced cross-subsidies for discoms
- Improved grid integration and management through better control of system locations and operations
- Discoms can aggregate and cluster the systems in multiple locations to operate them as single units, creating virtual power plants with better grid operations

CEEW, in partnership with BYPL, has identified multiple discom-led business models to benefit both discoms and consumers[150]. Two promising models are:

- **Discom-led community solar model**, where the discom aggregates residential communities to install shared systems, and
- **The solar partners' model**, where the discom aggregates and deploys large systems installed in multiple locations through third-party ownership and lets consumers subscribe to the solar energy.

CEEW analysis shows that a discom-led community solar deployed in East Delhi can provide BYPL a net gain of INR 0.26 per kWh[151].

FISCAL	The proposed solution requires budget reallocation from the existing RTS scheme: approximately INR 1,500 crore (USD 197.6 million) of the total allocated central financial assistance of INR 11,814 crore (USD 1.56 billion)[152,153].
TIMELINE	It is necessary to implement this in the next three to four months as the RTS sector attempts to make a recovery post the lockdown period.
IMPLEMENTER	MNRE should issue the guidelines under the existing RTS scheme.
JOBS	Deployment of 4 GW of RTS could create around 50,000 jobs for skilled and unskilled worker[154] .
GROWTH	Deployment of 4 GW of RTS requires an estimated investment of around INR 18,000 crore (USD 2.4 billion)[155].
SUSTAINABILITY	Increased RTS deployment substitutes power generation from thermal plants and hence, contributes to reduction in emissions. It will also contribute towards achieving India's target of 175 GW of RE by 2022 and SDGs 7, 11 and 13.
TRADE-OFF	The budget will be reallocated from the existing *Grid-Connected RTS Phase II programme*, from the incentives that discoms could claim for RTS deployment in their licence area, but the net claimable incentives would remain the same.

Create new markets for rooftop solar

PROBLEM

India's RTS industry, struggling to gain foothold even before the pandemic, has now come to a standstill with the extended lockdown. Even after the lockdown is lifted, the impending recession will likely dissuade consumers from investing in RTS, which is not seen as a necessity but a luxury. It is imperative to prevent the collapse of market demand, and new markets must be created to compensate for lost business.

SOLUTION

We propose two options to create new markets for RTS:

- Aggressive promotion of new solar-based applications to domestic consumers for uses such as charging batteries and appliances, and to institutional users such as primary healthcare centres (PHCs)[156]. A CEEW study in Chhattisgarh noted that PHCs with solar PV and batteries have better health outcomes[157].
- A nationwide awareness campaign targeting different consumer categories to reiterate the benefits of investing in RTS as a safe, clean, and reliable source of electricity and provides guaranteed savings from lower cost per unit of power.

Universal healthcare in rural India by solarising PHCs

In an open letter, CEEW and several institutions from the healthcare and RE sectors have urged the GoI and the global development community to ensure universal rural healthcare through a sustainable energy path.

Sub-centres in Chhattisgarh with solar PV with batteries have better healthcare outcomes (especially for maternal and neonatal cases). Such a solution would cost as little as INR 28 per person to deploy.

The group proposes a four-step intervention:

- **Expand clinic-level solarisation of all unelectrified PHCs** and sub-centres at a national scale,
- **Allocate dedicated capital in the national budget:** INR 600 crore, a mere 0.6 per cent of India's 2020-21 energy and healthcare budget, coul d electrify all sub-centres,
- **Ensure long-term operations** by allocating budget for ongoing system operations and maintenance, and
- **Promote innovation by incentivising medical equipment manufacturers** to develop more efficient and rugged appliances suitable for rural services.

Source: Abraham, Mathew, Arunabha Ghosh, Sudarshan H, Harish Hande, Sanjeev Jain, Adwait Joshi, Arvind Kumar, et al. 2020. 'Open Letter to the Government of India and Global Development Community: A Sustainable Energy Path to Universal Healthcare in Rural India', April 30.

FISCAL/STRATEGIC

Current market prices for solar systems and solar with battery systems are at par with grid electricity and diesel-powered back-up systems, respectively. This initiative does not require any additional fiscal support.

An awareness campaign could be run from the budget of INR 66 crore (USD 8.8 million) allocated for capacity building and awareness creation under MNRE's *Grid-Connected RTS Phase – II programme*[158].

TIMELINE	This should be implemented in the near term, after the lockdown is lifted, to retain the recent momentum for RTS amidst the COVID-19 related slowdown.
IMPLEMENTER	MNRE should implement both the proposed solutions.
JOBS	New market development in the sector can create direct jobs in the RTS and DRE supply chains.
GROWTH	It will contribute to India's target of 40 GW RTS capacity by 2022.
SUSTAINABILITY	Increased RTS deployment substitutes power generation from thermal plants and hence, contributes to reduction in emissions. It will also contribute towards achieving India's target of 175 GW of RE by 2022 and SDGs 7, 11 and 13.
TRADE-OFF	Consumers may not choose to make this high upfront investment amidst a recession, in which case the public spending on these solutions may not have high returns, but equally the recession linked loss of consumer appetite makes behavioural interventions even more important.

Promote innovation in DRE technologies

PROBLEM	Innovations in grid management such as smart grid technologies, advancements in power electronics, and information and communications technology (ICT) can significantly improve grid integration of DRE and demand side management, leading to optimum grid performance. However, India is lagging in grid modernisation, and there is an urgent need to advance research and development to facilitate: ◥ Design and development of indigenous low-cost technological solutions suited for Indian grids ◥ Identification and rapid deployment of cost-effective technologies at scale
SOLUTION	We propose an MNRE scheme to promote local innovation, with two components: **Component A**: Set up a '**Centre for DRE Innovation**' in partnership with the Department of Science and Technology's (DST) *Mission Innovation* programme as a platform for individuals, universities, start-ups, and companies working on new DRE solutions. The Centre will monitor developments across the country, identify promising ideas, and facilitate their development, testing and piloting. This could be achieved in partnership with discoms, grid operators, private investors, venture capitalists, and the industry. **Component B**: **Promote local entrepreneurship** in rural and semi-urban areas through a scheme to set up and operate DRE systems or micro-grids locally. Interest subsidy and tax deferral for the first five years may be offered to aspiring small businesses, along with options to upskill in DRE technology and business operations. The scheme could target 10 GW of systems installed by local businesses by 2025. MNRE could partner with the Ministry of Skill Development and Entrepreneurship (MSDE) to offer dedicated DRE entrepreneurship training packages in its training centres under the *Skill India* initiative, or through the Skill Council for Green Jobs.
FISCAL	The annualised budget to set up and operate the Centre for DRE Innovation could be 5 per cent of MNRE's annual R&D budget, which is INR 1 crore (USD 0.13 million) for 2020[159]. A part of the finances can be availed from the Mission Innovation programme. For component B, interest subsidy alone would require around INR 1,400 crore (USD 185.8 million) for 10 GW capacity by 2025[160]. This funding could be procured through allocation from the National Clean Energy and Environment Fund (NCEEF), issuing bonds in the capital market, or raising capital to buy the interest.
TIMELINE	This should be implemented towards the end of 2020.
IMPLEMENTERS	MNRE in partnership with DST and MSDE should implement this scheme.
JOBS	Component A will create jobs for the skilled workforce while component B will create jobs for both skilled and unskilled workers. Deployment of 10 GW of systems could generate around 55,000 jobs in rural and semi urban areas by 2025[161].
GROWTH	These interventions can lead to increased innovation and entrepreneurship, leading to economic growth and serving the national objective to build a self-reliant energy sector.
SUSTAINABILITY	An informed workforce would drive higher adoption of clean energy technologies.

5.3 Shift to cleaner fossil fuels

Image: iStock

Low Asian LNG spot prices provide an excellent opportunity for India to move towards achieving its target of 15 per cent share of natural gas in the primary energy mix by 2030. This will result in job creation, CO_2 reduction and cost savings from more energy-efficient operations. In this context, we suggest the following recommendations:

- Revise natural gas utilisation policy
- Expand city gas distribution infrastructure

5.3.1 Revise natural gas utilisation policy

PROBLEM	The Indian government's natural gas utilisation policy aims to provide preferential access for certain sectors to cheaper and limited domestic gas supplies. The recent trend of low Asian LNG spot prices (pre-dating COVID-19) provides an opportunity to re-visit the policy, which, in its 2019 revision, prioritised city gas distribution (CGD) projects over thermal power, primarily to provide an impetus to the ongoing fight against air pollution[162]. The policy currently does not cover GHG emissions and particulate pollutants from industries. Although pollution standards govern industrial sectors, enforcement is hindered by the limited capacity of local officials. Studies indicate that India is on the path to becoming the world's largest sulphur emitter. Now as refineries produce Bharat Stage Emission Standards (BS) VI-compliant fuels, the additional sulphur will be passed on to the heavier refinery fractions, and subsequently combusted at industrial facilities. Hence the gains from better transportation fuels could be offset by losses in increased industrial emissions.
SOLUTION	**The MoPNG should amend the *Natural Gas Allocation Policy* to include polluting industries as priority sectors. This will be more cost-effective than enforcing pollution standards across thousands of businesses.** The strong policy signal will spur investments by industries that are keen to switch to natural gas but need assurance of long-term stable prices and reliable supplies. This will also incentivise the use of cheaper natural gas instead of burning residual oil in furnaces and unlock competitive advantage through cost savings via energy efficiency, a particularly important consideration in the post-COVID-19 economy. It will also stop cheaper residual fuel oil imports from flooding the market. The CPCB and SPCBs' lists of polluting industries can be a good starting point to identify potential industries.
NON-FISCAL / STRATEGIC	Despite competitors, the relative cost advantage of domestic gas has disappeared with falling LNG prices globally. By including industries, the decreasing share of domestic gas allocation across the existing priority sectors can be met by spot LNG.
TIMELINE	This measure can be implemented in the next three months.
IMPLEMENTERS	The MoPNG should issue a directive to the Empowered Group of Ministers (EGoM), while the Petroleum and Natural Gas Regulatory Board (PNGRB) should facilitate the deployment.
JOBS	New jobs will be created along the gas distribution network; however, a study is required to quantify the potential number of jobs.
GROWTH	Incentivising natural gas would enable companies to shave off significant environmental compliance costs and reparations related to ash handling and disposal. Further, access to both domestic and imported gas supplies will enable discoms to pool and maintain stable power prices for industries, enabling the latter to make better investment decisions.
SUSTAINABILITY	Benefits include improved operational efficiency, and lower GHG and criteria pollutant emissions, which will help India meet its emission reduction targets under the Paris Agreement.
TRADE-OFF	Increasing gas consumption in the economy would increase India's fuel import bill and cause loss of jobs and revenue along the domestic coal supply chains.

5.3.2 Expand city gas distribution infrastructure

PROBLEM

The demand-supply imbalance in the global petroleum sector has resulted in a supply glut of hydrocarbon fuels[163], which can persist for two years, as mentioned by the International Gas Union[164]. The International Energy Agency (IEA) forecasts a 5 per cent plunge in global natural gas demand[165] amid the COVID-19 pandemic, resulting in a 10-year low price of USD 2.5 to 3.0 per MMBtu (March 2020) for spot LNG Asian markets. The Indian gas system can only take limited advantage of these low prices as current demand is met by domestic production and long-term LNG contracts.

A PNG connection costs four times more in upfront costs than an LPG connection (INR 6,000 versus INR 1,500) (USD 80 versus USD 20); existing LPG connections are legacy inclusions in households whereas the cost of switching to PNG has to be borne by the consumer, which poses a financial burden. This is a significant hurdle disrupting rapid expansion of new PNG connections.

SOLUTIONS

We propose the following measures:

- Expand residential CGD networks in the next 3 to 5 years to gain some advantage from the low LNG prices as PNGRB after the conclusion of the 10th bidding round has cumulatively offered 228 Geographical Areas to be covered by 2030
- Incentivise residential CGD consumers to shift from LNG cylinders to PNG by subsidising the upfront cost of connection as PNG is affordable for consumers without access to subsidised cylinders. Moreover, the city gas segment can support gas prices up to USD 16/MMBtu[166]
- Expedite the gas grid expansion by providing single window clearance via MoPNG and PNGRB to facilitate the process of laying pipelines and unobstructed biddings

FISCAL

PNGRB estimates that PNG consumption will expand from 5 to 26 per cent of the households by 2030. We estimate LPG subsidy savings from the rapid penetration of PNG by 2025 to be over INR 1 lakh crore (USD 13.27 billion) even if the government fully subsidises the INR 6,000 (USD 79) cost of a PNG connection at an outlay of INR 25,000 crore (USD 3.31 billion).

TIMELINE

The government can immediately start providing subsidies for the upfront cost of PNG connections. Resolving relevant regulatory hurdles in the residential sector within the next year will allow for quicker expansion of the CGD.

IMPLEMENTERS

The MoF, MoPNG, and PNGRB should conduct a cost-benefit analysis. The MoPNG should propose the subsidy measure to be approved by the MoF. The PNGRB should initiate the formation of a single clearance window by the end of the second quarter of 2020.

JOBS

The CGD network could create approximately 50,000 direct and indirect jobs by 2025[167].

GROWTH

Expanding the CGD network would increase natural gas consumption and thereby support India's target of 15 per cent share of gas in its primary energy mix.

SUSTAINABILITY

The switch from LPG to PNG in a shorter 5-year timeframe will reduce household emissions by 1,363 $MTCO_2$-eq over the next ten years[168].

5.4 Build resilient transport and urban infrastructure

Image: Emotivelens

India's transport and urban infrastructure is increasingly being exposed to climate risks. Building resilience in these systems is critical to ensure minimum impact on lives, livelihoods, infrastructure, and the economy. In this context, we propose measures to:

- Accelerate procurement of buses and micro-buses
- Rebuild India's HVAC manufacturing sector for sustainable cooling

5.4.1 Accelerate procurement of buses and micro-buses

PROBLEM

Transportation is a derived demand that allows people to access employment, education, healthcare, and other essential needs. While households in the middle-income category spend only up to 5 per cent of their earnings on transportation, low-income households spend between 6-10 per cent of their limited income on the same. In the absence of an affordable bus-based public transport (PT) option amidst the COVID-19 crisis, low-income households will be disproportionately impacted by the higher burden of transport expenses. Many will be forced to opt for lower-income jobs close to home or even forego suitable livelihood opportunities, reducing their quality of life and increasing health risks.

SOLUTIONS

The government should:

- **Promote PT travel with enforcement of social distancing interventions** (50 per cent seating capacity, mandating masks, etc.). This will require 50-80 per cent more buses to meet the current demand
- **Support cities to procure and operate more buses** (micro-buses of 12-14 seaters in smaller cities) with high-frequency operations in dedicated bus lanes
- **Devise VGF models for public and private bus service providers** and rope in additional contract and permit private buses (used for schools, corporates, and for tourism)
- Manage travel demand by **encouraging telecommuting and staggered timings** for offices
- **Enhance active modes** (walk, cycle) with safe and connected non-motorised transport (NMT) infrastructure for short trips (< 5km), thus managing crowds in buses. Close to 40 per cent of the urban population commutes less than 5 km[169]
- **Dissuade the use of personal vehicles** via pricing mechanisms including parking, congestion and fuel taxes. These additional revenue streams can cross-subsidise PT

FISCAL

A grant of INR 15,000 crore (USD 2 billion) should be given to city transport authorities to procure and operate 3 lakh buses (estimated for 2020) to meet PT demand[170]. This grant can be used alongside urban transport funds collected by cities as parking tickets, FSI premium, advertisements, fuel cess and challans for traffic violations.

TIMELINE

The procurement process can start within 3-4 months. The planning and design of the integrated NMT and PT systems will take six months.

IMPLEMENTERS

MoHUA should offer grants for bus procurement and operations to the state transport departments, which shall be nodal agencies to provide financial assistance to PT operators or special purpose vehicles (SPVs) and monitor the PT system in cities.

JOBS

Access to affordable means of transport has direct implications on livelihoods. It is estimated that 2.5 times more jobs are created in high unemployment communities by providing transit[171]. Further, jobs will be created in the bus segment of automotive manufacturing. Approximately 13 workers are employed for each bus manufactured, versus 4-6 workers per vehicle for auto-rickshaws, cars and SUVs[172].

GROWTH

Large numbers of buses plying in the city often help create demand for street redesign. This involves construction and maintenance of dedicated bus, bicycle, and walking infrastructure, which stimulates the economy, and allows for the service economy to

	boom. Street vendors for food and consumables are seen in many urban centres in the West, populating spaces vacated by reduced private transport movement.
SUSTAINABILITY	The rise in motorisation in India has been accompanied by rising air pollution and deaths among the young and productive population. Bus-based PT will help reduce local air pollution and build on the *National Mission on Sustainable Habitat* (NMSH) by providing safe, clean and affordable mobility options. PT also ensures equitable access to employment opportunities for all citizens and will save forex on oil imports.
TRADE-OFF	Directing investment towards PT, while restricting private vehicle uptake, can exacerbate the slump in vehicle sales faced by the automotive sector. However, a global trend of changing travel preferences towards shared-mobility and reduced car sales were already underway before COVID-19. Support for the auto industry and jobs in this sector should be directed towards cleaner technologies and sustainable mobility business models. This should be accompanied by a re-skilling and transition programme for the current Internal Combustion Engine workforce for EV manufacturing.

5.4.2 Rebuild India's HVAC manufacturing sector for sustainable cooling

2 million

Expected 10x increase in AC servicing jobs by 2037, up from a base of 200,000 in 2017

INR 400 crore

Estimated cost of training and certifying 2 million AC servicing technicians over the next 15-18 years

Data points: CEEW analysis

PROBLEM

Household air conditioner (AC) penetration in India is currently less than 10 per cent, with demand for space cooling expected to grow eleven times in the next 20 years[173]. India's AC demand is largely met through imports from China as entire systems or key components with units assembled in India. The IEA noted in 2018 that the global stock of ACs in buildings will grow to 5.6 billion by 2050, up from 1.6 billion today – which means 10 new ACs being purchased every second for the next 30 years. The bulk of the energy demand growth for space cooling by 2050 will come from emerging economies, with India, China and Indonesia contributing half of that[174].

India is one of the world's top refrigerant manufacturing hubs, but most refrigerants used in Indian ACs are not climate-friendly and need to be phased down as per India's commitments under the Montreal Protocol, between 2029 and 2047[175]. Shifting to climate-friendly refrigerants and investing in complementary AC manufacturing capacities are opportunities to build a globally competitive supply chain to make ACs in India and reduce import dependence.

SOLUTIONS

Maharashtra, Gujarat, Tamil Nadu, Punjab, and Haryana are India's major manufacturing hubs for AC components, systems and refrigerants. Import substitution and increased investment in domestic manufacturing of efficient HVAC units and low-global warming potential (GWP) refrigerants are opportunities for post-COVID-19 economic recovery.

This initiative should be prioritised under *Make in India* so that India can evolve into a critical export hub of the global AC supply chain while catering to its domestic market.

Policy certainty and regulatory frameworks to encourage indigenous manufacturing will facilitate investments in supply chains and create market readiness[147]. The government should:

- **Ensure medium- to long-term policy certainty to signal upcoming market reforms** related to the refrigerant transition to the industry and regulators. Medium-term limits should be imposed on the permissible GWP value as per India's phase-down timeline, based on the commercial viability of application-specific refrigerants
- **The Bureau of Indian Standards (BIS) should mandate standards for components** to encourage domestic manufacturing of high-standard components. This would allow local producers to make inroads into India's domestic market and avail import substitution. Currently, most AC components imported into India

have a minimal standard threshold, and higher standard components would not be available to manufacturers at the current low prices

- Set up a **fast-track window to develop and update standards** for alternatives to high-GWP refrigerants and components manufactured in India
- **Create authorised benchmarks** to reference low-GWP refrigerant usage
- **Minimise competing policy mandates** via technological guidelines to ensure that:
  - Energy efficiency enhancements are aligned with the impending refrigerant transition so that industry makes investments towards both technical priorities;
  - Building norms reflect the need for climate-friendly cooling or space comfort to generate demand; and
  - Cold chain development encourages the manufacturing and use of low-GWP refrigerants.
- Develop **public and bulk procurement programmes** for low-GWP end-products to create demand and build value chain capacity
- **Update training curricula** to include low-GWP alternative refrigerants and institutionalise training and certification schemes for service technicians
- **Institutionalise the collaborative R&D programme** on low-GWP refrigerant technologies announced by the GoI in 2016 to encourage innovations to support this transition[177]

FISCAL	Training and certifying 2 million servicing technicians for operations and maintenance of low-GWP refrigerant AC units, over the next 15-18 years, would cost approximately INR 400 crore (USD 53 million)[178].
TIMELINE	These solutions can be implemented soon after the lockdown has been lifted.
IMPLEMENTERS	This initiative should be implemented by the Department for Promotion of Industry and Internal Trade, MoC&I, in cooperation with the Ozone Cell, MoEFCC, the Ministry of Chemicals and Fertilisers, BIS and state governments.
JOBS	In the servicing sector alone, a ten-fold increase in jobs is expected over the next two decades from a base of 0.2 million in 2017[179].
GROWTH	India will exhibit high growth in its cooling demand over the next two decades[180]. The measures indicated here are in line with giving a boost to local supply chains, catering to domestic demand, building the infrastructure for cold chains, and boosting overall economic growth[181]. This is what a self-reliant, sustainable cooling sector can achieve. Furthermore, Balance of Payment (BoP) savings from reduced imports, revenues from duties on imports, increased component and refrigerant exports, and catering to higher domestic demand will boost industrial growth and competitiveness.
SUSTAINABILITY	Reviving manufacturing capacity and investments in climate-friendly alternatives and associated components will re-confirm India's commitments under the Montreal Protocol.
TRADE-OFF	Increased domestic manufacturing will adversely impact Indian businesses that depend on imported components and re-sell them for assembling.