IPCS
INSTITUTE OF PEACE AND CONFLICT STUDIES

Revamping India's Renewable Energy Sector
Opportunities and Challenges

Policy Brief

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INTRODUCTION

This **IPCS Policy Brief** draws from the conclusions of the seminar on '**Indian and Chinese Energy Policies Addressing Energy Needs and Climate Change**' held in February 2017. It was organised by IPCS in collaboration with the Centre for East Asian Studies (CEAS) and Energy Studies Programme, Jawaharlal Nehru University (JNU), New Delhi.

The five policy recommendations listed below have been identified on the basis of an assessment of government intent and willingness, actionability, availability of resources, and affordability. An elaboration of each recommendation follows in the next section, flagging also the challenges that may be faced in their implementation.

RECOMMENDATIONS

I. Improve the flexibility of renewable energy (RE) grid systems by replacing large-scale interstate transmission systems with small-scale local grid clusters.

II. Reduce variability in RE output and uncertainty in RE supply by mainstreaming hybrid power generation systems and improving electricity storage.

III. Reform the market for Renewable Purchase Obligations (RPOs) and Renewable Energy Certificates (RECs) through appropriate policy interventions.

IV. Explore provisions to build a sustained financial flow for the RE sector.

V. Develop the Smart City project on the principle of sustainable development by incorporating the use of Small Modular Reactors (SMRs) as the primary energy source.

RECOMMENDATION I

Improve the flexibility of renewable energy grid systems by replacing large-scale interstate transmission systems with small-scale local grid clusters

Background: The electricity grid infrastructure that is available for renewable energy systems suffers from a low degree of flexibility, such that most grids are unable to adjust to the variable output produced by the RE systems. In India, the problem of lower flexibility leads to high curtailment during peak generation periods. As a consequence, over 50 per cent of power generated through wind and solar systems goes to waste.

Recommendation: To improve the flexibility of the grid systems in India, it is recommended to improve the dispersion of RE systems on a local scale such that both electricity generation and use is local in nature, transmitted through an integrated micro grid. The micro grid can function as a collection of 'n' smaller cluster grids spread all over the region. The micro grids can then be extended to provide for an interstate linking of grid systems. This micro linking of grid clusters is expected to drastically reduce transmission losses.

Another solution is to ramp up the demand side constraint by linking residential meters with RE transmission lines in a way that the consumers are able to use energy only when the supply is available from the RE systems. This can help match the demand with supply.

Challenges to Implementation: The advanced metering systems are priced relatively higher than the normal meters in India. Additionally, improving the penetration of small scale solar PV full form and wind mills to the local level would require a greater amount of capital investment in RE infrastructure. Both the scenarios require an active government intervention in the form of price support measures.

RECOMMENDATION II

Reduce variability in RE output and uncertainty in RE supply by mainstreaming hybrid power generation systems and improving electricity storage

Background: The RE systems based on wind and solar energy naturally suffer from a high degree of variability in output and uncertainty in supplies. This leads to higher operating costs and therefore lower penetration of RE systems.

Recommendation: Both variability and uncertainty can be addressed by mainstreaming the construction and use of hybrid energy systems. These hybrid systems are based on a combination of both conventional and non-conventional energy sources. Solar systems, in collaboration with small scale hydro, coal or gas-based power plants, which are able to ramp up or ramp down their output, cycle on/off multiple times during the day to balance the variability of the main RE systems. Such flexible coal-gas based power plants are currently employed to provide a robust backup to the widely used RE systems in countries like Denmark and Germany. These combined cycle power plants with shorter start up times and higher ramping rates can serve the dual purpose of providing energy security and cutting down on carbon emissions, something that augurs well for India's envisioned energy scenario.

Improving electricity storage can also help cut down on the losses generated by variability and uncertainty. Molten salt thermal storage for solar thermal systems, to super capacitors (useful for frequency regulation), compressed air, flywheels, ice storage and the large grid scale batteries are some of the technologies that are being employed worldwide to increase storage of solar and wind produced electric power.

Challenges to Implementation: Hybrid power plants will still be capital intensive in nature. The provisioning of finance for the construction of these systems presents a major bottleneck to their development. Another constraint can arise from the distorted subsidy regime in this country, which can eventually push up the price of electricity generated, making purely coal or gas-based power plants a preferred option. Similarly, the high transportation costs and other logistical challenges associated with the storage battery systems present a major barrier to mass adoption. In this regard, local manufacturing of batteries, incentivised by the government, can go a long way in improving the storage systems in the country.

RECOMMENDATION III

Reform the market for Renewable Purchase Obligations (RPOs) and Renewable Energy Certificates (RECs) through appropriate policy interventions

Background: The market for the Renewable Purchase Obligations (RPOs) and Renewable Energy Certificates (RECs) is extremely sluggish owing to low demand. The RPO/REC obligations of many State Electricity Regulatory Commissions (SERCs) have been far below the national levels mandated by the Central Electricity Regulatory Commission (CERC). The problem can be attributed to the prevailing uncertainty in the RE market, owing to three sets of factors, including; lack of long-term targets, no clarity on compliance and absence of long-term price signals to investors. Most of the current REC demand also comes from the existing sets of producers, as the mechanism has been unable to mobilise new investment.

Recommendation: In order to establish a robust market for the REC, it is important to strictly enforce RPO compliance. This can be done by penalising entities who fail to meet their RPO targets. The Alternative Compliance Payment (ACP) system in the US provides for an important case study, in which RPO compliance is enforced by imposing a fine for every MWh of electricity that the entity fails to meet.

In India, the enforcement of rules against non-compliance is subject to the discretion of the SERCs, which is a potential loophole. To mitigate the effect of non -functioning state discoms on national RE targets, it is important for the government to announce long-term targets and obligation requirements. This gives greater time and planning space for long-term projects and helps provide credible price signals to the investors. The RPO targets in India need to be set for at least 10 years, with intermediate annual targets. Secondly, the development of a forward and futures contract market (secondary) for RECs can enhance the liquidity in the market and mitigate the underlying risks associated with the REC spot markets.

Challenges to Implementation: There are certain inherent risks associated with the Forwards and Futures markets. Given that secondary trade are hard to verify independently, it can allow certain ineligible projects to sell their RECs in the REC market. The lack of a robust legal system in India and limited experience with open markets will only exacerbate this problem.

RECOMMENDATION IV

Exploring provisions to build a sustained financial flow for the RE sector

Background: The RE sector in India has been suffering from a lack of sustainable investment. There has been very little fresh equity in the RE market from private investors and the allotments under the union budget for the sector has been meagre when compared to the enormous fuel subsidy bill paid by the government. The lack of sustained finance impacts both operation and innovation in the sector and is therefore a serious problem facing the RE sector in India.

Recommendation: To build 'patient finance' in the RE sector, it is recommended to include renewable energy systems such as solar pumps and solar sprayers in the Priority Sector Lending (PSL) targets of banks. This would help incentivise rural application of renewable energy. Additionally, the Green Masala bonds need to be popularised among the issuers so as to tap the full potential of the market. In this regard, the use of green bonds to provide for clean energy to smart cities and urban clusters is another potential market for foreign investors. The opening of a Green Bank to facilitate sector-specific foreign investments at concessionary rates can also go a long way in promoting investments in the RE sector. Additionally, India can also look at investments from outside for its RE sector. In this regard, India can look for ways to secure finance from the recently launched South-South climate cooperation fund by China. As China emerges to take the lead in the global campaign against climate change, India could look for ways to collaborate closely with the financial institutions funded by the country and garner resources at comparatively lower interest rates for its RE projects.

Challenges to Implementation: The small-scale projects such as roof top solar heating panels; standalone solar pumps etc still remain an unprofitable investment for institutional investors. The vast geographical spread of the RE systems, lack of aggregation and securitisation has also proven to be a major constraint for garnering 'patient finance'.

RECOMMENDATION V

Develop the Smart Cities Mission on the principle of sustainable development by incorporating the use of Small Modular Reactors (SMRs) as the primary energy source

Background: The Smart Cities Mission is based on the principle of sustainable development, and clean energy systems form an important part of the plan. The solar and wind-based sources of electricity, however, still suffer from a problem of intermittence of supply. Owing to geographic conditions, certain parts of the country see less than 150 days of sunshine and more windless days. The geographic conditions therefore impose major constraints on increasing the penetration of RE systems across the country.

Recommendation: To enhance the uninterrupted clean energy access and availability in smart cities. The Small Modular Reactors (SMR) technology can also be brought into extensive use. The SMRs are nuclear reactors that are powered at 300 MWe or less and are built either independently as small units or as modules in a larger complex. The total overnight costs and overnight costs per KWe of the SMRs are estimated to be much less than for the Advanced Light Water Reactors (ALWRs), which are the reactor systems much in use at present. Additionally, these lighter models do not incur significant costs or schedule overrun issues that have weighed down the larger nuclear power projects. These portable models can be brought into use to supply power to remote areas owing to their ease of mobility and low technological input as the energy demand in India is likely to rise in the near future. India has already indigenously developed an 83 MW light-water reactor (LWR) used to power INS Arihant. Based on similar technology, indigenous development of SMRs should not pose serious difficulties. The SMRs also address freshwater availability concerns. Desalination and other water treatment plans which are highly energy intensive can benefit from deployment of SMRs.

Challenges to Implementation: The first models of SMRs, developed in isolation, are expected to produce electricity at roughly the same price as the larger nuclear reactors. The price is expected to come down only when larger numbers of SMRs are commissioned. However, the costs are expected to come down significantly once the market for such reactors are revealed. Further Indian energy sector has the potential to accommodate these facilities in large scale as we aim for many smart cities and SEZs in the long run.

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