

Exploring Demand Side Concerns for an Energy Secure India

Background

The Government of India entrusted NITI Aayog with the preparation of the National Energy Policy (NEP) that seeks to provide a framework for India's energy sector. NITI Aayog has taken a participatory approach by inviting views from stakeholders across the energy sector to provide their view points and called upon think tanks to conduct a series of discussions on select thematic areas. Towards this end, TERI in partnership with NITI organized a stakeholder consultation on November 9, 2015 to facilitate dialogue with different stakeholders with a focus on *the sectors that are consumers of energy and how to manage them*.

Introduction

India's energy profile is characterized by low per capita energy and electricity consumption, which is less than a third of the world average. 80% of rural India depends on traditional fuels for cooking and lighting purposes as the benefits of modern fuels are concentrated in urban centers. India does not have a diverse energy mix and 70% of the primary energy is consumed through fossil fuels, considerable amount of which is imported. To minimize reliance on fossil fuels and reduce the import bill a national energy policy must ensure and facilitate optimal energy use.

Energy policies tend to have a bias towards planning the availability or supply of the resource because of the paucity and value of these resources. However, demand side assessment is an important feature and should not be ignored. The stage of development for India means that there is a spurt in growth that is expected to ensure better standards of living in an inclusive and healthy society. The same level of growth can be led by one or a combination of sectors and industries. Every combination entails a different implication for the energy basket that would be demanded by the economy. Further, an increase in growth would lead to changes in household and consumer behavior. The energy basket changes with increase in income - for example, the use of multiple electronic devices such as phones, tablets, and laptops increases standby power dramatically.

Given the expected changes in energy consumption, limited means of resources in satisfying these needs, pressures of sustainability and climate change, there is an urgent need for an integrated and holistic planning for the economy. This planning and formulation of policy must be such that it provides stability and taps into the synergies of the energy sector, addressing issues across the demand-supply chain. Since India has been growing at a relatively high rate, India now also has a growing middle class, sections of which are high consumer of electricity and have levels of consumption comparable to world averages. At the same time, 80% of rural consumers remain dependent on traditional sources (firewood, kerosene) for their cooking and lighting needs. Keeping both these aspects in mind, India needs an energy policy that understands and compliments these differences, one which can be sympathetic to needs of access and try and manage the demands of the high-end consumers. Towards this end, behavior analysis becomes critical because of variations in energy use by income classes.

There is a strong consensus within the stakeholders about the need for holistic planning for the energy sector. There is a need to understand demand itself and the underlying factors that influence it. Utilizing every unit of energy through energy efficiency and demand side management becomes critical to efficiently utilize our resources. To achieve this end, this paper proposes a goal based approach which aims at achieving welfare through sector-wise planning and understanding.

Section 1: Goal based approach: Larger objectives need to be set

- The objective of the policy should be welfare of the society such that it be inclusive, fair, ambitious, and stable. The ambition should be to ensure rapid and inclusive sustainable growth. Inclusive to all would imply taking cognizance of differences in the society such as - gender, economic status, and the differently abled people. The need for a stable policy is given since repeated policy changes especially in the short term generate uncertainty and lead to suboptimal decisions by the market. Such a policy would also send the right signals to investors to set up longer term investments in the Indian economy which are particularly necessary for the energy sector. At the same time the policy should not be rigid considering the changing nature of the energy market in terms of technology, pricing and consumption patterns. Therefore, there is a need for policy review on a regular basis to avoid delayed responses to these changes.
- Provision of basic energy services to the underprivileged and increasing the standard of living people should be the one of the key objectives of the policy. The policy needs to holistically assess end use objectives from development perspectives and examine factors underlying the demand. Provision of access to energy services including access to mobility, electricity, and modern forms of energy for cooking and lighting should be top priority for the government while keeping in mind the underlying factors influencing it.
 - The policy needs to frame definitions for output oriented energy access and not the currently followed infrastructure supply oriented energy access. For example, the policy must not only focus on building the supporting infrastructure for LPG connections such as local distribution networks and refueling stations, adequate means and modes of transportation and facilities to make optimal use of incentives like the direct cash transfer scheme (bank accounts), but it should also ensure last-mile connectivity. Similarly, change of metrics required from per kWh to per lumen for lighting purposes.
 - While providing access to mobility through increased public transport facilities, the need for mobility in itself should be examined. Innovative policies to reduce the need for mobility should be taken before a policy on mobility is executed. There also needs to be a focus on unintended impacts of such a policy, like unequal access to benefits because of lack of enablers/access for disadvantaged communities or less use by women because of the perception of lack of security. Further, the policy must account for sustainable means of transportation and the kind of infrastructure that should be constructed; for example, addition of bus fleet, possibly electric would be cheaper than construction of metro rail. A comprehensive plan should be developed for all cities, with building synergies with other government plans and programme, such as the smart city programme.

- The policy should look at the sector-wise disaggregation of demands, their levels and patterns and their variation and map it across sectors along with the fuel scarcity, pattern of availability and technologies required to optimize across these parameters. Precursor to any efficient planning would be the need to estimate the patterns today, which require comprehensive databases, available in the public domain. Further to this, planning for optimal resources requires harmonizing which entails using different models of energy-economy-resource linkages available in the country to ensure any solution that is proposed or agreed upon is a result of cumulative knowledge base of the country. The policy should be based upon comprehensive models that can capture feedbacks in the economy.
- While planning for the future, not just latent (underserved) demand, but also aspirational demands should be considered. This implies that the policy must be constructed with ample consideration of aspirations increase in the country, differentiated by factors such as geography, urbanization, bandwagon effects etc.
- The complex nature of the energy economy and multiple stakeholders involvement entails that enough attention must be paid while forecasting and predicting their demands for planning purposes. This calls for integrated modelling exercises, of not only the energy system but its interactions with the economy, resources and investors.

Section 2: Features of a successful national energy policy

A successful national energy policy should plan for a rapidly growing country keeping differentiated ambitions in mind. It should be dynamic so that it can respond to global changes in both technologies and prices. It should be flexible to be able to adapt to a fast-paced economy. It should have optimal linkages for ensuring least cost to the economy. It should have the following features:

1. It should have equal focus on urban and rural centers in the economy

There needs to be equal focus on villages and cities. The policy must adequately recognize that villages are habitations in transition, tending towards imminent urbanization. Therefore provision of basic infrastructure from village should be accelerated. This would ease the pressures of migration and would go a long way in increasing the standard of living. Depending on urbanization to increase the standard of living of people is not a sustainable model of economic development. There should be a focus towards energy as an enabler and therefore dedicated efforts towards planning for provision of energy for productive use.

More often than not, renewable energy projects in rural areas cater to use of energy for consumptive purposes by households. Even though availability of energy (electric and non-electric) for basic consumptive use is an essential and inalienable requirement, long-term economic growth and development of rural areas is incumbent on provision of energy for productive use as well. Productive activities in villages not only include income generating (and livelihood providing) activities such as agriculture and entrepreneurship, but also encompass a broader range of welfare services, such as healthcare, education and sanitation. In many cases, the efficiency of these 'productive' services is limited due to interruption in energy supply (where some form of energy provisioning infrastructure already exists). In such cases, renewable energy systems can help in plugging these gaps

to ensure provision of uninterrupted energy supply. In cases where supply infrastructure is absent, decentralized systems can be deployed for energy generation.

Comprehensively addressing energy supply in rural areas for both productive and consumptive purposes requires energy to be viewed as an integral component of village development plans. Government programs for integrated rural development such as *Adarsh Gram Yojana* and the *Shyama Prasad Mukherjee Rurban Mission* must explore potential areas of convergence with rural electrification and renewable energy policies, so that provision of energy becomes an inseparable part of rural development planning. The concept of 'smart cities' could be implemented in a cluster of villages thus preempting the solutions to the problems that will arise over time as the population increases and the requirements and aspirations also will progressively increase.

2. It should be interlinked with resources use (Water, materials; possible example of cement, steel and power plant).

The energy sector is material intensive, it is critical to consider linkages within the sector and with other resources to ensure holistic and optimal planning. Use of critical resources such as water, minerals should be regulated or appropriately priced to avoid scarcity. The material intensity of every resource must be taken into cognizance while planning, for example, a kWh of electricity should not be treated as fungible. While planning capacities based on various sources of energy such as solar, wind or coal, differences in material, carbon and water intensities should be taken into account.

3. It should consider behavioral aspects while designing and implementation of policies for demand-side management

Behavior of consumers towards energy services and its changing pattern is an important part of the energy chain and it needs to be kept into consideration while planning for the economy. For example, **the consumption of electricity**, average load, peak load would change from different consumer categories and over time. To optimally manage the energy systems such changes are critical and must be kept into account.

Similarly, for **promotion of public transport**, the behaviors of consumers need to be understood. In cities, with increasing standards of living, people may prefer to use private cars, even when metro rail facility is available and is affordable, because of the convenience associated with it. Therefore, in such cases, merely setting economic case would not lead to policy success. There has to be a combination of incentives and disincentives set up to ensure people moving towards public transportation. Availability of cycles at metro stations or shuttles for popular routes may increase the uptake of metros. Other similar examples successfully tested in other countries include toll/taxes on cars entering business districts during business hours to minimize their use.

In the buildings sector, where uptake of net zero buildings is limited despite comparable costs, using a sophisticated incentive structures (subsidies on raw materials, faster approvals for buildings using green design, awarding lower energy use during construction) will enable a constructive shift towards a cleaner energy system.

4. Should have a plan for optimal transportation mechanism of fuel from source to point of consumption.

If there is limited availability or intermittency in supply of fuels, there should be a contingency plan which incorporates and mitigates the same. Example would be selection of industry clusters with synergies such as cement, steel and power plants. These should be built as close, possibly with a planned transport linkage around it. Currently, power plants, cement plants and steel plants are built as close to the pit head as possible. However, because of the needs to utilize slag and fly ash, in light of sustainable practices, an optimal energy consuming transport linkage should be envisaged. In light of this, goals of 100% fly ash utilization may be revised.

Similarly for enabling energy access in rural areas fuel stacking becomes a key issue. While LPG is healthier alternative vis-à-vis firewood, logistical hurdles in the distribution network of LPG do not adequately discourage the use of firewood for cooking purposes.

5. It should optimize energy use through promotion of energy efficient technologies.

Promotion of efficient utilization of energy is critical given the importance of energy. However, given that India is a developing country the policies should not constrain the growth of the energy related sector, such as industry sector. In this regard, the Perform-Achieve-Trade (PAT) scheme has been a welcome step in this direction and the momentum towards this should be maintained. As the industry sector expands, the policy must account for such a structural shift in the economy. While nudging the industrial sector towards a more efficient system, the needs of the Micro-Small-Medium Enterprises (MSMEs) should be considered and their needs assessment should be done on a cluster identification basis. **It should plan differentiated interventions for smaller players.**

Development of micro-industry require both energy & non-energy inputs. Demand estimation become complex when one is not sure of the level of availability of non-energy inputs. A location with proper institutions with presence of non-energy inputs (such as finance facility for training, market linkages etc.) will see a better growth in energy demand than where institutions who can channelize non-energy inputs are present

6. It should focus on sustainability of the energy system and the energy economy at large

- a. Policy must assess technological needs and enable innovation to indigenize global technologies, concomitant with other plans such as the National Action Plan on Climate Change and the future technology basket envisaged under the Intended Nationally Determined Contribution (INDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) by India.
- b. There should be a clear framework for Research, Development, Demonstration and Deployment (RDD&D) of technologies. Further distinction should be made between developing new ideas indigenously and emulating (through customization) of technologies and ideas developed elsewhere. Measured effort should be put in for both.

- c. Learning curves of technology costs should be incorporated while planning adoption of new technologies.
- d. There should be policy response towards disruptive technologies such that these encourage and develop technology through

7. Should have a strong emphasis on skill development and educational structure.

It should be aligned with the market requirement at all levels of supply chain. In addition to educating super specialized staff, more emphasis is required in developing capacity of support staff at all tiers of employment chain. Training and capacity building programmes should be easily accessible beyond two tier cities. Since India envisions increasing the share of manufacturing sector under the 'Make in India' scheme, there is an implied need to increase training of the workforce in industrial activities. The energy system involves heavy machinery and machines that pose risk to untrained staff, training in safety requirements should be provided as a part of skill development, even to the staff not directly involved with the machinery and full implementation of the rule must be envisaged.

8. Should plan for infrastructure that requires least energy. While **planning for infrastructure**, embodied energy should be taken into account and priority should be given to infrastructure used by maximum number of people.

- a. **City planning** should be done keeping building (both residential and commercial) and transport linkage in mind along with embodied energy. There are benefits and costs involved in both horizontal and vertical planning. The embodied energy in high rise buildings is considerably higher and horizontal planning leads to higher transportation requirements. Therefore a city should optimize vertical and horizontal development, such that minimum energy is used in its construction, operation and management.
- b. Currently development of the transportation sector focuses on infrastructure which is not only capital intensive but also uses high embodied energy (flyovers and metro rails). Thus attention must be paid to planning and efficient utilization of existing infrastructure in a way to maximize the benefits of low embodied transport modes such as buses. In fact, instead of continuing the trend of investing in high embodied energy infrastructure, the policy must benefit from low embodied energy technologies like buses (preferably electric) which will help in optimizing costs and reduce locking in to a high carbon pathway.

9. Should have synergies with other policies

For example, the policies like Make in India and RE mission for 175 GW should not be considered isolated policies. To avoid shifting of the trade balance from oil to material imports, it is essential to ensure development of indigenous manufacturers for production of the supply chain of the renewables.

10. Institutional coordination.

To ensure maximum impact of policy with minimum institutional costs, a policy should be designed to enable coordination between different institutions such as the **Central and State Government**, different ministries, and other local level bodies. During policy formulation, it would be prudent to involve stakeholders from the state governments and other local bodies to smoothen the gaps between formulation and on ground implementation.