Green Growth Background Paper

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Green Growth and Demand Side Management in Himachal Pradesh

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1. Introduction

Himachal Pradesh (HP) is a mountainous state with its topography being mostly hilly, and the type of cultivation being terraced. Although, urban population is increasing at a faster pace in the state at a rate 8-10%, (Govt. of Himachal Pradesh, 2012, p. 118) majority of the population still lives in rural areas, primarily dependent on agriculture-horticulture resources for sustenance. (Govt. of Himachal Pradesh, 2012, p. 22) 66.71% of the population depends on agriculture for their livelihood. This paper will look into the demand side management for the state with a focus on the power sector.

2. Institutional framework

HP Electricity Regulatory Commission (HPERC) is the independent regulatory body which started functioning with effect from January 2001.

The Himachal Pradesh State Electricity Board was constituted in 1971 in accordance with the provisions of Electricity Supply Act (1948) and has been reorganized as Himachal Pradesh State Electricity Board Ltd. (HPSEBL) w.e.f. 14.06.2010 under company act 1956. (HPSEBL) The HPSEBL is a vertically integrated utility and is entrusted with the functions of generation, distribution and trading of power in the State of Himachal Pradesh. It is also the State Designated Agency (SDA) in HP for implementing energy conservation measures in the state. (AEEE, 2013)

Himachal Pradesh Power Corporation Limited (HPPCL), incorporated in December 2006, is the power generating utility with the objective to plan, promote and organize the development of all aspects of hydroelectric power on behalf of Himachal Pradesh State Government (GoHP) and HPSEBL in Himachal Pradesh. The GoHP has a 60% share while HPSEB has a 40% shareholding in HPPCL. (HPPCL) HPPCL has plans to develop 1111 MWpPower generating capacity by March 2017 and 2400 MW by the year 2022.

HP Power Transmission Corporation Limited (HPPTCL), established in 2008, is entrusted with the responsibilities of the transmission segment in this state.

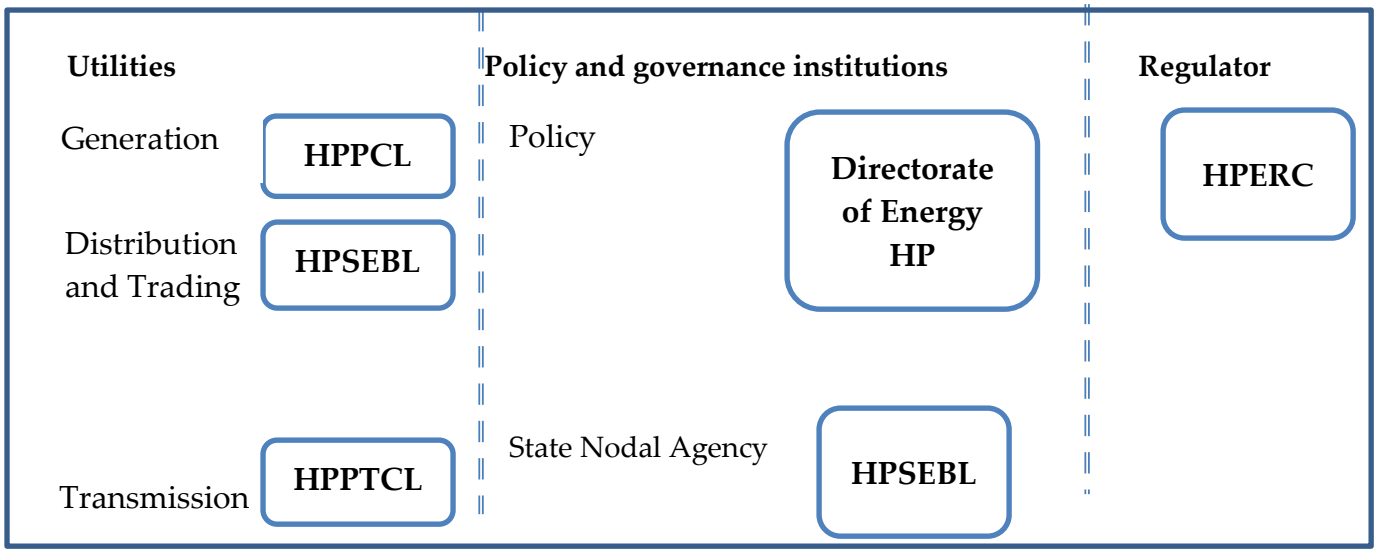

Figure 1 Snapshot of institutional framework in HP Power Sector

Acronyms
HPPCL Himachal Pradesh Power Corporation Limited
HPSEBL Himachal Pradesh State Electricity Board Ltd
HPPTCL HP Power Transmission Corporation Limited
HPERC HP Electricity Regulatory Commission

3. Power sector profile

The total installed capacity of the state of HP was 3,973 MW as on 31st March, 2014. (CEA Installed Capacity, 2014) Out of which, central-owned plants constitute 1,205 MW, state-owned plants constitute 1020 MW, and private-owned plants constitute 1,748 MW.

The generation of electricity in HP is predominantly from hydro sources (around 78%) while generation from renewable energy systems has a small fraction in the total installed capacity of the state (15.76%) followed by thermal sources. (CEA Installed Capacity, 2014) Being a major provider of clean hydro power, the state has a potential of 23 GW, out of which only 8 GW has been harnessed. (Govt. of HP, 2012-13)

Seasonal changes have a significant impact on the power requirements in HP. During summer months, due to surplus availability of hydel generation, a significant amount of energy is exported to the northern grid and fed to states like Haryana, Punjab and to the capital city of Delhi. While during the winter months, the availability of energy reduces considerably due to poor melting of glaciers which results in receding of inflows in these rivers. As a result, while the state is power surplus during rest of the year, it faces severe shortages of power during the winter months, thus resulting in importing of energy from the northern grid.

3.1 Demand and Energy Requirements

It has been forecasted that the demand and energy requirements in the state are expected to increase by two and half times in the next 15 years. (CEA 18th EPS, 2011) Figure 2 depicts the forecasted energy and peak requirements in HP from 2015-2016 to 2021-2022.

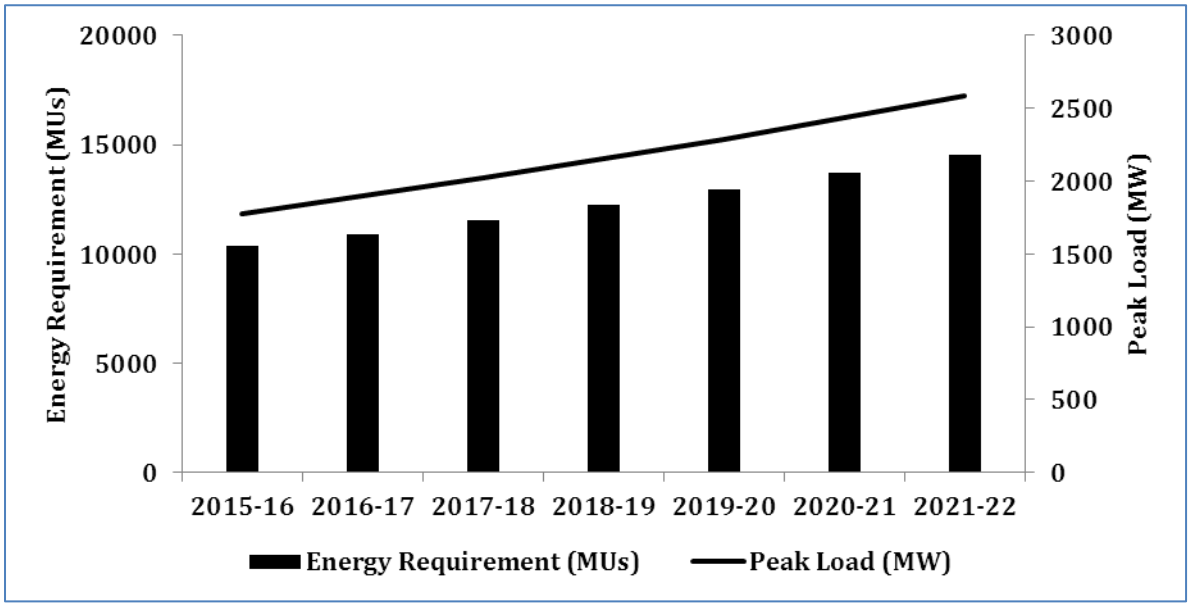

Figure 2 Forecasted Energy Requirement and Peak Load for HP
Source: (CEA 18th EPS, 2011), TERI Analysis

3.2 Demand Pattern

The utility generally experiences higher demand in the winter months except in 2012, when the month of June was recorded as the highest demand month of the utility.

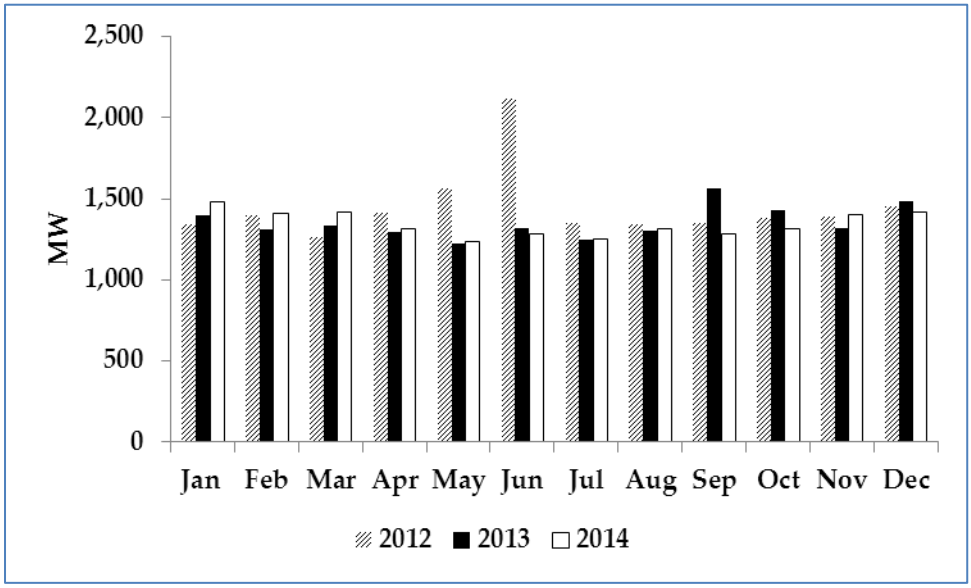

Figure 3 Peak Demand in the state of HP
Source: (CEA Power Supply Position, 2014)

Figure 4 depicts the ratio of hourly demand to the peak demand of a typical day in the winter months during the year 2012. It can be observed that there are distinct peaks a) between 8-9 am which could be contributed due to the pumping and heating load and b) between 6-7 pm in the evening which may be attributed to the lighting load.

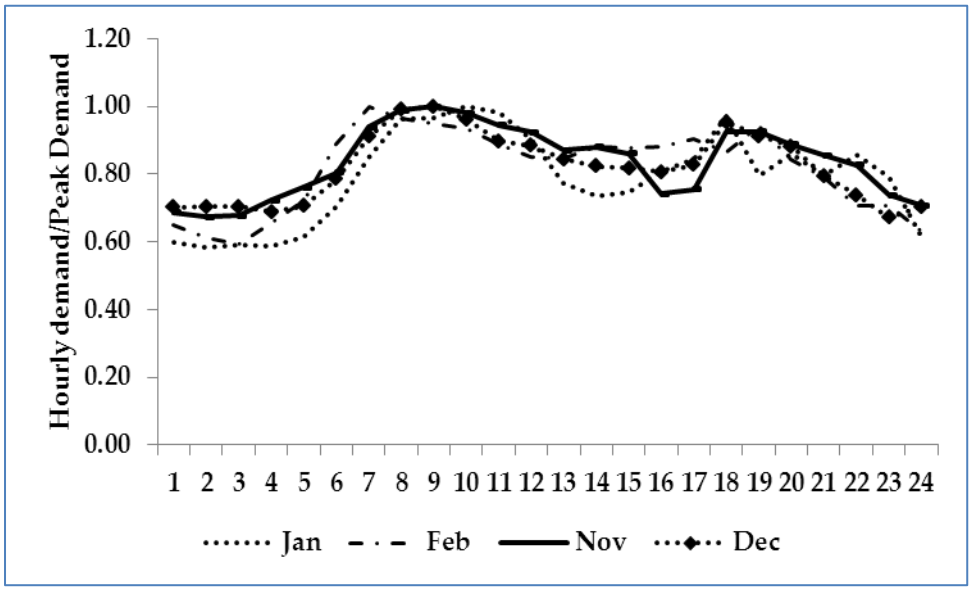

Figure 4 Load Profile for winter months in the year 2012
Source: Data obtained from SLDC, HP and TERI Analysis

3.3 Energy and Peak Deficit

Energy deficit in HP was recorded very low in the last 3-4 years: 0.7 in 2011-12, 2.8% in 2012-13 and 2.3% in 2013-14. However, the state suffered from high peak deficit of the order of 19.9% in the month of September for the year 2013-14. (CEA Installed Capacity, 2014)

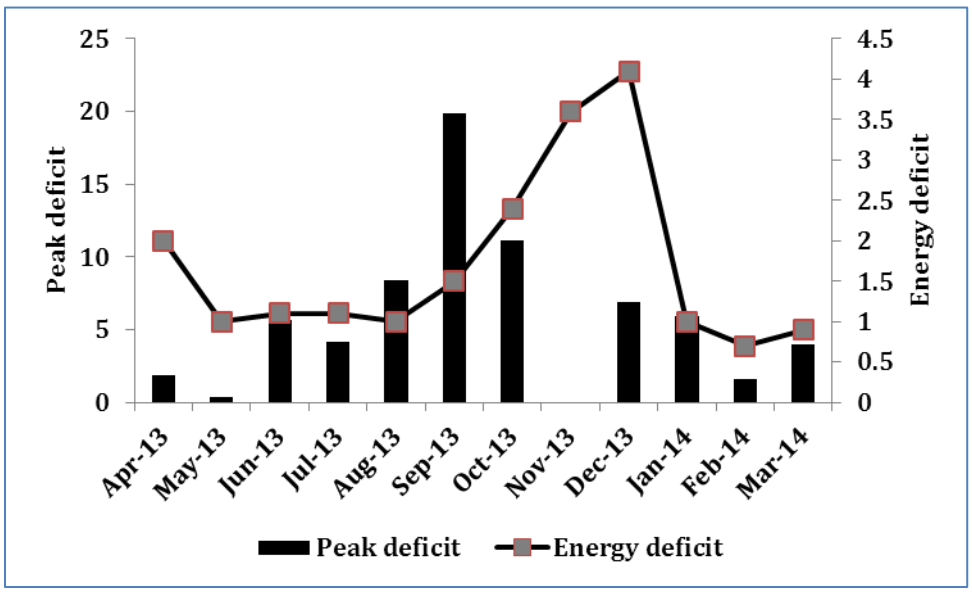

Figure 5 Trend of Energy and Peak deficits in HP for FY 2013-14
Source (CEA Installed Capacity, 2014)

3.4 Energy Sales and Consumption mix

The total energy sales to different consumer categories within the state for the FY 2013-14 were 8,008 MU. Out of which, 4732 MU was provided to large industrial category and 1,756 MU was provided to domestic category. Industrial consumption accounts for around 60% of the total electricity consumption; domestic category contributes to 22% of the energy sales while the agriculture category accounts for only 7% of the total energy sales in the state. (HPERC, 2013)

There are around 40,000 industrial enterprises established in the state. Out of which, small scale enterprises has a share of 98%. Major industries in HP are food processing, tea plantation, pharma products, electricals, engineering, packaging, steel, cement, textile, plastic.(NIC)

3.5 Power Purchase

In March 2014, total amount of net short term transactions of electricity for HP were 103.62 MUs. HP sold 0.75 MUs through bilateral transactions and 158 MUs through power exchanges while purchased 75 MUs via bilateral exchanges and 14 MUs through power exchanges. (CERC, 2014)

4. State Action Plan and DSM Regulations

HP drafted out a State Action Plan with an aim to limit increases in energy consumption and intensify energy efficiency initiatives in different sectors, including transport, industrial, commercial, public and residential buildings. In the context of power sector, the plan aims to establish a center for renewable energy to create policies that guide and create incentives for investors, utilize a government-backed fund for investments in renewable energy and energy efficiency. The purpose of the center would also be to create mechanisms for on-going monitoring of evolution of current and projected baseline for the purpose of tracking the natural evolution of growth in demand, as well as new energy options.

In HP, DSM regulations were notified by HPERC on 30.09.2011. In compliance with these regulations, a DSM Cell was established within the Utility on 11.11.2010 for formulation / preparation of DSM Master Plan and implementation of the same on year to year basis after the approval of the Commission.

The action plan estimates savings of 500 MW in overall consumption of energy from the programs that have already been initiated. (Govt. of Himachal Pradesh, 2012, p. 130) Key programs/objectives in the context of DSM/Energy Efficiency are summarized as follows:

- Launch of Atal Bijli Bachat Yojana promoting shift towards energy efficient appliances
- Harness 22000 MW of hydro potential to contribute to the country's clean energy demand
- Complete ban on use of coal for space heating

- Encourage use of solar passive heating systems and promote use of biogas plants
- Discourage energy intensive industries that contribute large to GHG emissions
- Developing economic instruments to promote energy efficiency in HP

4.1 Lighting schemes

In 2008, the state launched Atal Bijli Bajat Yojana (ABBY) scheme where 4 CFLs were distributed to every family in the state free of cost to achieve reduction in energy consumption in residential sector which resulted in saving of 270 MU power every year and earned a revenue of Rs 109 crore for the state. Government of HP has mandated use of CFLs in Govt. buildings/Govt. aided institutions /Boards /Corporations and Municipalities (Govt. of Himachal Pradesh, 2012, p. 246)

Retrofitting & replacement of existing lighting system with energy efficient street lighting system (LeD) has been implemented on demo basis at the Mall Road, Shimla. Two rural panchayats in the district of Shimla -GP Drogra in Basantpur block and GP Bathmana-jabri in Mashobra Block have been chosen for LeD Village Campaign. A total population of about 4,100 covering 950 households will be targeted for this campaign. (Directorate of Energy, HP)

4.2 Energy Conservation Building Code (ECBC)

The entire Himachal Pradesh has been demarcated into two climatic zones namely cold and composite considering the existing and new commercial buildings having a connected load of 50kW or a conditioned space (heating and air-conditioning) of 500 sq.m. and more. These commercial buildings may be hospitals, hotels, educational institutions, government buildings, guest houses, shopping malls and complexes, call and data centers and other buildings carrying out commercial activities. (Directorate of HP)

Investment Grade Energy Audit (IGEA) of HPSEBL headquarter (Vidyut Bhawan Complex) had been conducted by M/s Zenith Energy, Hyderabad (empanelled with BEE) in the month of March, 2009 with the financial assistance of BEE. The State Level Steering Committee of State Energy Conservation Funds (SECF) in 2012 sanctioned Rs.13.29 Lac to implement the EC measures as suggested in the audit report. (CEA)

4.3 Energy Efficient Pumping

HP has a high reliance on agriculture and horticulture. Erratic climatic conditions like shift in weather patterns, erratic rainfalls, rising temperatures have an adverse impact on crop production and food security. Agriculture is the source of livelihood for more than 70 percent of the population in HP. As only 18-20% of the area is under irrigation, the rest of the land is vulnerable due to erratic monsoon conditions. The State has been giving lot of thrust for agriculture and food grain development through various initiatives, such as provision of subsidies and funds for minor irrigation, crop diversification scheme for

organic farming and improvement of agriculture infrastructure to propel the energy conservation efforts in this sector. (Govt. of Himachal Pradesh, 2012, p. 242)

4.4 Differential Tariff Rates

Peak load charges and night time concession charges are specified for small & medium industrial, large industrial, and water irrigation pumping supply consumer categories. Night time concession charges are more in summer months (June, July and August) as compared to rest of the months in the year especially due to large peak contributed by the domestic and commercial sector during these months.

4.5 State Energy Conservation Fund (SECF)

Pursuant to the EC Act 2001, the Government of HP constituted a fund called as "the Himachal Pradesh State Energy Conservation Fund" for several activities, such as: 1) energy efficiency improvement projects, 2) organizing demonstration/pilot projects on energy conservation, 3) develop testing and certification procedure, 4) capacity building activities etc. (Governor of HP, Govt. of HP, 2011)

Painting and debate competition at the state level and awareness programme through educational institutions and radio are some of the key awareness creation activities. (Directorate of Energy, HP) These activities would help in motivating youth and children to move towards energy efficiency measures in order to manage their energy demand effectively.

5. Ways Forward

Utility, State Government, Regulator, State Designated Agency, ESCOs, financial institutions, consumer groups will have a major role in propelling DSM efforts in HP. Additionally, multi-pronged approach looking at technical, financial, social as well as economic aspects needs to be looked into for the programs to be implemented in an accelerated and sustained fashion and on a larger scale in all the sectors in HP. Further, there is also a need for regular monitoring and verification of the proposed initiatives to analyze the impact of the programmes and understand the ground level realities.

Short-term

- Develop suitable business models, tariff structures and institutional structures for effective implementation of DSM programs
- 24X7 power supply to all households in the country by March 2019[1]
- 100% Feeder Segregation for agriculture consumers
- Special focus on promotion of EE appliances in domestic households, street lighting, government & private establishments, and water pumping needs in agriculture sector
- Implement cluster-specific energy efficient/DSM solutions targeting Medium and Small Scale Enterprises

[1] Except agriculture consumers, the hours of supply to agriculture will be decided by the states as per their requirement

- Enroll smart grid pilot projects in 1-2 cities
- Impact analysis of DSM programs that have already been implemented
- Investment in research and development, training and capacity building programs
- Creation of adequate resource pools, Energy Service Companies (ESCOs) and business models for implementing DSM programs
- Formulation of effective customer outreach and communication programs for active involvement of consumers in DSM and Energy Efficiency
- Develop Centre for Excellence to address R&D and demonstration issues related to DSM and energy efficiency
- Build alliances and partnerships through global collaboration in research & technology development on DSM, Energy Efficiency and Smart Grid technologies

Mid-term

- Improve the reliability, security and quality of supply along with evolving pricing structures
- Impact analysis of the DSM regulations and incorporate modifications to make it effective
- Regulatory impact studies on tariff based interventions
- Impact analysis of business models developed for implementation of DSM programs
- Increase the State Energy Conservation Fund and monitor its utilization
- Continued research and development, training and capacity building programs
- Full rollout of smart grids in urban areas based on learning from pilot studies

Long-term

- Integrate RE, off grids, demand response options and storage solutions with advanced information and communication technology (ICT) infrastructure
- Improve the reliability, security and quality of supply along with evolving pricing structures
- Continued research and development, training and capacity building programs

Demand side management is the implementation of measures designed to facilitate the efficient utilization of electricity at the consumer end. This involves cooperation from the utility and the consumer to modify consumption pattern that would result in providing benefits to the utility, consumer and the society as a whole. In addition, ensuring energy security and the need to reduce carbon emissions makes DSM an important tool to address climate change, creating employment opportunities, reducing import dependencies by using energy efficiently thereby conserving resources for the future generations and moving towards a green future.

Even though some progress has been made in the area of DSM in India, implementation of such programs has been relatively slow and not uniform across the utilities. The feasibility and impact of implementing demand management programs would depend on consumer demand patterns, socio-economic conditions, existing policy, regulatory frameworks, institutional mechanisms and financing mechanisms. In addition, consumer's willingness, acceptance and awareness level also play a critical role in successful implementation of such programs.

It has been gathered that lack of proliferation of DSM projects on a large scale may be attributable to a variety of reasons, such as,

- Lack of adequate financial support and lack of robust institutional framework in the specific state,
- Lack of adequate technical expertise, and information about comparative energy use –especially of appliances bought by retail consumers
- Lack of consumer awareness and motivation
- Perceived risk due to lack of confidence in performance of new technologies –in appliances, building design, industrial technologies
- Higher cost of energy-efficient technologies
- Asymmetry in sharing of costs and benefits –especially in the buildings sector

Some of the key strategies that are being adopted that would help in overcoming some of the hurdles discussed above are:

- Participative financing mechanism involving the utility, government, customers, financial institutions, equipment suppliers and Energy Service Companies (ESCOs) is considered necessary. Several energy efficiency programs are being implemented through Energy Service Companies (ESCOs) which provide an innovative business model through which the energy-saving potential and the risk faced by building owner can also be addressed. According to a 2008 BEE report, "ESCOs in India have executed a large number of meaningful projects in energy efficiency over the past three years; some of these energy efficiency projects have resulted in energy savings of as high as 30% over the original consumption level." (BEE, 2008)

- Funds can also be utilized from other multilateral institutions like the Asian Development Bank (ADB), Norwegian Framework Agreement (NFA), US Agency for International Development (USAID), India Japan Energy Forum (IJEF), Swedish International Development Agency (SIDA) etc.

- Consumer outreach and education using print, visual media and social networking can be a useful strategy in creating more awareness amongst people. Additionally, establishment of Centre of Excellence showcasing technologies, information exchange, research, hardware/ tool lending, training, organization of exhibitions, etc. could be done on a larger scale.

- High cost is still a concern! With higher market penetration of energy efficient appliances, increased awareness about benefits of DSM and introduction of incentives to attract consumers and manufacturers in the market, costs could become more competitive in the near future.

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A unique developing country institution, TERI is deeply committed to every aspect of sustainable development. From providing environment-friendly solutions to rural energy problems to helping shape the development of the Indian oil and gas sector; from tackling global climate change issues across many continents to enhancing forest conservation efforts among local communities; from advancing solutions to growing urban transport and air pollution problems to promoting energy efficiency in the Indian industry, the emphasis has always been on finding innovative solutions to make the world a better place to live in. However, while TERI's vision is global, its roots are firmly entrenched in Indian soil. All activities in TERI move from formulating local- and national-level strategies to suggesting global solutions to critical energy and environment-related issues. TERI has grown to establish a presence in not only different corners and regions of India, but is perhaps the only developing country institution to have established a presence in North America and Europe and on the Asian continent in Japan, Malaysia, and the Gulf.

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