

Green Growth and Renewable Energy in Himachal Pradesh

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Author Ashish John George, Research Associate, TERI

Email: ashish.george@teri.res.in

Reviewer Shirish S Garud, Associate Director, TERI

Email: shirishg@teri.res.in

For more information

Project Monitoring Cell
TERI
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi – 110 003
India

Tel. 2468 2100 or 2468 2111

E-mail pmc@teri.res.in

Fax 2468 2144 or 2468 2145

Web www.teriin.org

India +91 • Delhi (0)11

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1 Introduction

The state of Himachal Pradesh has a geographical area of 55, 673 km² and lies between altitudes ranging from 350 to 7,000 meters. Most of the area lies above 1,000 meters and is mountainous. Kangra, Mandi and Shimla districts which lie at medium altitudes with respect to the state constitute almost 50% of the total population. The districts lying on the lower altitudes i.e. Una, Hamirpur, Bilaspur, Solan although smaller in terms of area, have higher population densities. The major contributor to the GDP of the state is Agriculture. Tourism also plays a predominant role.

Energy problems in Himachal Pradesh are complex and area specific necessitating energy solutions with a decentralized focus. The Integrated Rural Energy Programme (IREP) was formed in response to this. And to provide thrust to this initiative as well as institutionalize programs of renewable energy the Himachal Pradesh Energy Development Agency (Himurja) was established in February 1989. The objective of HIMURJA is to promote research and development in the field of non-conventional and renewable sources of energy. HIMURJA has been promoting renewable energy programs with financial support of the MNRE and the state government. Efforts are continued for the promotion and propagation of renewable energy devices such as solar water heating systems, solar

Power is one of the most important inputs for economic growth and overall development of the state. Renewable energy options such as solar thermal, solar PV and small hydro hold significant potential as part of strategies for green growth in Himachal Pradesh. Figure 1 below shows the renewable potential of Himachal Pradesh. It can be seen that solar and small hydro together exceeds 99% of total estimated potential. Wind, biomass and waste to energy have very limited power generation potential compared to solar and small hydro and the state has been actively promoting the latter two technologies.

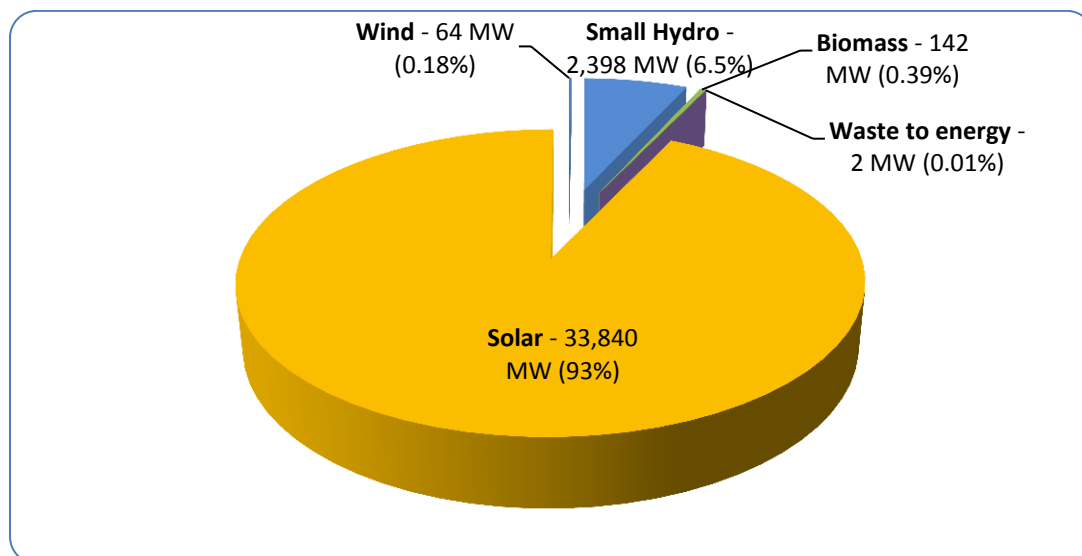


Figure 1: Renewable Energy Potential in Himachal Pradesh

Source: MNRE Annual Report 2014

2 Institutional setup of the power sector in Himachal Pradesh

Through the Himachal Pradesh Power Sector Reforms Transfer Scheme (2010), Himachal Pradesh State Electricity Board Limited (HPSEBL) performs the functions of distribution, trading and generation of electricity while Himachal Pradesh Power Transmission Company Limited (HPPTCL) performs the function of evacuation of power by transmission lines. HPSEBL is responsible for the development, (planning, designing, and construction), operation and maintenance of power distribution system in Himachal Pradesh with inherent trading functions. The HPSEBL is the State Electricity Regulatory Commission created for rationalization of electricity tariff, policies regarding subsidies, promotion of efficient and environmentally benign policies. Himurja is the nodal renewable energy authority of the state and has been involved in promotion of renewables and formulation of policy. Department of Energy (DoE) is the state government department that formulates general policy within the general.

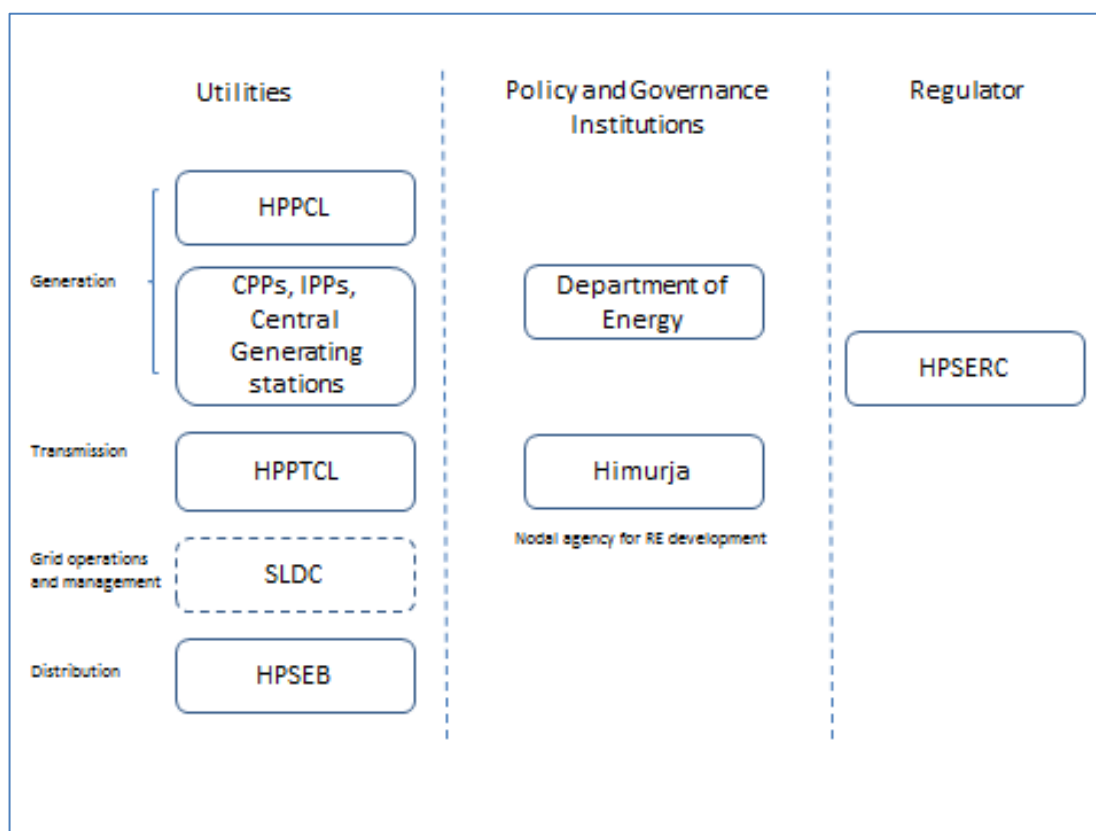


Figure 2: Institutional setup of power sector in Himachal Pradesh

Source: TERI compilation

Notes: CGS – Central Generation Stations, CPP - Captive Power Producer, HPPCL - Himachal Pradesh Power Corporation Limited, IPP – Independent Power Producer, HPPTCL - Himachal Pradesh Power Transmission Corporation Limited, SLDC – State Load Despatch Centre

2.1 Renewable Energy Policies of the State

2.1.1 Small Hydro Power Policy

As a source of energy hydro power is economically viable, non-polluting and is environmentally sustainable. The Power Policy of the State attempts to address all aspects like capacity addition energy security, access and availability, affordability, efficiency, environment and assured employment to people of Himachal. The Small Hydro Power Policy came into force in 2006 and was amended in January 2010. The policy is applicable to hydro systems up to 5.0 MW. The main features of the policy are:

- SHP projects of up to 2 MW are reserved for Himachali and Cooperative Societies comprising Himachalis. Furthermore preference is given for Himachalis until 5MW.
- The state government would acquire land for permanent structures and land for other purposes would be leased out by Government at approved rates.
- Operative period of the projects under this policy is 40 years after which the projects would be handed over to the Government.
- Power generated will be sold to HP State Electricity Board preferentially and if the developer intends to sell the power to a third party he is free to do so at a higher cost.
- Wheeling charges for captive use is at 2% including losses and for sale and captive use of power outside HP, it would be 1% of the energy received.
- No water royalty up to 5 MW for 12 years, 12% for next 18 years and beyond at 18% for sale within the state.
- For new projects upfront premium exempted for project capacity up to 2 MW

2.1.2 Solar Power Policy

Himachal Pradesh Solar Power Policy of 2014 has policy targets to promote solar initiatives in the state. The policy targets 50 MW of solar power installation from 2013 to 2017 (Phase I) and 250 MW from 2017 to 2022 (Phase II) JNNSM.

- Promotion of off-grid and decentralized solar applications
- Promotion of grid connected solar plants
 - Category I (up to 100 kWp)
 - Domestic consumers
 - Category II (Integrated rooftop/small solar plants up to 1 MW)
 - Group of individuals, housing colonies, rural/urban housing schemes

- Category III (Solar power plants from 100 kWp to 500 kWp)
 - Commercial, industrial, educational institutions and government buildings
 - Category IV (Solar power plants from 100 kWp to 500 kWp)
 - Solar plants installed on owned land or land leased from government/private entity
 - Category V (Solar power plants above 500 kWp)
- Tariff to be determined by HPERC on net metering basis (for categories I,II and III) and on competitive bidding basis (for categories IV and V)
 - Nodal agency has been directed to facilitate and monitor solar power projects. Single window clearances to be provided.
 - Solar power producers are responsible for evacuation up to the Interconnection point with HPSEB/HPPTCL at their own cost.
 - Captive consumption, REC mechanism, sale of power to Discoms at FiT and third party sale are allowed.
 - Developer to ensure 70% employment to be reserved for Himachalis
 - Exemption from payment of electricity tax to the extent of 100% on electricity generated from solar power projects used for self-consumption/sale to utility for first 5 years.

2.2 Renewable Purchase Obligations

The Himachal Pradesh Electricity Regulatory Commission (HPERC) has brought out the Renewable Power Purchase Obligation and its Compliance Regulations, 2010 that specifies the quantum of Renewable Power Purchase Obligations (RPPO) from solar and non-solar sources. The obligated entities include the distribution licensee, captive and open access consumers. Table 1 below specifies the RPO obligations for the state.

Table 1: RPO for Himachal Pradesh

Year	Minimum Purchase from renewable sources	
	Total RPPO (%)	Solar RPPO (%)
2011-12	10.01	0.01
2012-13	10.25	0.25
2013-14	10.25	0.25
2014-15	10.25	0.25

2015-16	11.25	0.25
2016-17	12.25	0.25
2017-18	13.50	0.50
2018-19	14.75	0.75
2019-20	16.00	1.00
2020-21	17.50	2.00
2021-22	19.00	3.00

Source: HPERC RPPO regulations

3 Solar Power Initiatives

Himachal Pradesh is a hilly state with generally clear sky. The average solar insolation in the state ranges between 4-5.25 kWh.m²/day with around 300 clear sunny days in a year. However solar power is expensive when compared to abundant and cheap hydro-electric power (with huge potential in the state). HPSERC has however made it mandatory for discoms and obligated consumers to purchase a percentage of power from solar project. Additional factors to be considered are that the cold desert region in Lahaul & Spiti and part of Kinnaur districts are remote and do not have sufficient power evacuation arrangements.

Solar Water Heating System: HIMURJA has been recognized as the best state-based nodal agency in the areas of promotion and market development of solar water heaters by the MNRE. Solar water heating systems of 1,629,970 liters per day capacity have been installed in different parts of the state (as on March 2014). A target of installing 200,000 LPD was been proposed for 2014 under the JNNSM. Solar water heating systems of 271200 LPD capacity have been installed through Market Mode under Jawaharlal Nehru National Solar Mission (JNNSM), in the different parts of the State up to December, 2014. Most of Himachal Pradesh is over 1,000 meters above sea level and is covered by mountains and hence the need for water heater also arises due to firewood shortage. HIMURJA has successfully demonstrated the concept of community solar water heaters at several sites throughout the region and the benefits arising from substituting firewood as a fuel source. The hotel industry has been identified as the sector with the best long-term potential as tourism is a major industry in Himachal Pradesh. Solar thermal market in Himachal Pradesh has a well-developed sales and service network of solar water heater suppliers which address the hotel sector.

Solar Cooker: A total of 36,838 box type and 372 dish type solar cookers have been distributed to the beneficiaries. A target of 1,000 box type and 200 dish type solar cookers has been proposed for the FY14 under JNNSM. Up to December 2014, 226 Box type and 236 Dish type solar cookers under JNNSM have been provided

SPV Street Lighting System: A total of 44,338 points of SPV street lighting systems, 22,586 domestic lights and 32,649 solar lanterns have been installed/distributed in the state. A target of 66,940 SPV street lighting systems and 10,000 solar lanterns have been proposed for

2014 under JNNSM. 7410 SPV Street Lighting Systems have been installed for community use up to December, 2014 under JNNSM.

SPV Power Plant: 90Kwp have been commissioned up to December, 2014 under JNNSM of Govt. of India. Figures are expected to be 900 Kwp for March, 2015. A target of 1 MW capacity SPV Power Plants under MNRE, Govt. of India programme/Tribal Sub Plan (90:10) has been proposed for the year 2015-16

SPV Lanterns: During the year 5536 SPV Lanterns have been provided to the flood affected families of Kinnaur district upto December, 2014 under JNNSM and anticipated figures upto March, 2015 will be 5,597 Nos.SPV power plant: SPV power plant of 264.5kWp capacity has been commissioned under JNNSM. A target of 5MW capacity SPV power plant under JNNSM/Tribal Sub Plan (90:10) has been proposed for the FY 14.

4 Small Hydro Power Initiatives

Himachal has small hydro potential (i.e. up to the capacity of 25 MW) of about 2,500 MW, of which about the 350 MW have been commissioned, including about 100 MW in State public sector. About 1300 MW additional capacities have been allotted, mainly to private sector for execution, comprising of about 800 MW up to 5 MW and 500 MW between 5 to 25 MW. Himachal Pradesh has a Small Hydro Development Program through which the state government has entrusted the responsibility of harnessing of small hydro potential up to 5 MW by private investment through HIMURJA. Himachal Pradesh is among the few States, which has streamlined and is continuously refining procedures/processes to minimize the bottlenecks.

During 2014-15, 18 Implementation Agreements for projects with total capacity of 53.53 MW have been signed. 5 projects with an aggregate capacity of 18.70 MW have been commissioned. 17 Projects have been allotted with an aggregate capacity of 23.65 MW. For the year 2015-16 commissioning of 17 projects with an aggregate capacity of 54.50 MW has been targeted.

Hydro Electric Projects Being Executed By HIMURJA

Micro Hydel projects under generation

- Lingti (400KW),
- Kothi (200 KW),
- Juthed (100 KW),
- Purthi (100 KW),
- Sural (100 KW),
- Gharola (100 KW),

- Sach (900 KW) and
- Billing (400 KW)

During current year 3,095,589 units electricity has been generated from these projects upto December, 2014. Other projects, such as Bara Bhangal (40 KW) and Sarahan (30 KW) have also been executed by HIMURJA. From Bara Bhangal project, energy is being provided to local public. 3 HEPs of 14.50 MW capacity have been allotted to HIMURJA by the State Govt. Further process for allotment of these projects on BOT basis is in progress.

Portable Micro Hydel Generator Sets

Himurja had commissioned portable generator sets in Pangi Subdivision of Chamba District. The O&M charges being paid are very high and the same are paid from the Himurja resources. It has now been decided to condemn these generation sets as their repair costs were deemed not to make economic sense.

5 Barriers

The barriers span financial, regulatory and technical dimensions. Listed below are some of the key barriers for renewable energy that exists in Himachal Pradesh.

Evacuation: Evacuation is a problem affecting wind, solar and the small hydro sector. Lack of adequate evacuation facilities has led to scaling back the commissioning and partial commissioning of new generation and the reduction of generation during peak periods. This issue is constraining the development of small hydro projects and solar development in the remote areas of in Himachal Pradesh. Banks and financial institutions are more cautious lending to RE projects given the poor state of the evacuation networks.

Clearances: Himachal Pradesh has adopted a single window project approval and clearance system for renewable energy. However, the effectiveness of this system is questionable. The issue is sometimes complicated by the fact that delays in obtaining clearances for projects awarded through competitive bidding (such as SHP) result in the levy of a penalty on the developer. There is a need to reduce cost and time of clearances, statutory as well as administrative, by way of reforms and effective governance. Instead of obtaining NOCs, focus should be on laying down norms and their compliance and enforcements of statutory provisions. A robust system needs to be developed that sets a time bound target for getting all approvals and RE developers to not have to follow up with different state government departments.

Off taker risk: The creditworthiness of the distribution companies is a critical issue and plays a key role in determining the bankability of a PPA (Power Purchase Agreement). Very few discoms are in good financial health. When discoms have poor financial health, the risk of off-taker default and delayed payments is high. Weak financials of discoms will keep them from meeting commitments and affects the effectiveness of instruments that have been put in place for deployment of renewables. Recently the Electricity Regulatory Commission of Uttarakhand imposed a penalty on its discom for not complying with its renewable

power obligation (RPO) target. Such actions are important for proper functioning the renewables sector.

Lack of enforcement of RPOs: The RPO is the biggest driver for the uptake of renewable energy by state utilities and captive users (obligated entities). The RPO regime is an instrument for stimulating renewable energy investments. However lack of RPO enforcement has led to concerns about the final purchase of renewable power. The state discoms will have to start taking RPOs seriously and state regulatory authorities would have to hold the discoms responsible and penalize them for failing to comply on purchase obligations. Instead of forcing defaulters to buy RECs (Renewable Energy Certificates) to cover shortfall in power purchase, states are allowing the obligated entities (such as DISCOMs and captive consumers) to 'carry forward' deficits to the next financial year. There also needs to be harmonization of the state-level RPO targets with the national targets.

Reverse Bidding

Implement fixed Feed-in Tariffs (FiT) as opposed to reverse auctions to rapidly expand renewable energy deployment. FiT based approach can result in cutting down project development cycle (time and money spent on completing bidding process) and provide certainty to the market. A location adjusted FiT structure may ensure a wider spread of renewable energy. However, FiTs have to be designed carefully, keeping in view the prevailing market conditions, state of technology development and availability of resources.

6 Ways Forward

6.1 Short Term

- Realize the trajectory of renewable power purchase obligation to reach 19%, including 3% solar by 2022
- Develop policy and regulation for Net-metering through which consumer would be able to sell the extra power generated through rooftop solar plant to the grid.
- Commission and additional 1,000 MW of small hydro power capacity
- Target energy generation from agro-residues (briquetting of crops residues) and gasifiers run on wood billets, crop and processing residues. Stand-alone power units run on small hydro and crop residues can be useful in promoting rural agro-processing industries.
- Promote solar cookers, solar water heaters, solar dryers and photovoltaic for residential as well as commercial, industrial and agricultural sectors.
- Target family and community size biogas plants run on cattle dung and alternate feedstocks

- Promote 'farm level solar power generation' where land-owning farmers can install solar power projects of 2-3 MW capacity. Such projects can have multiple purposes of generating clean energy, tackling the issues of land scarcity, result in additional income for the farmer as well as foster skill development. Up to 500-1000 MW power generation can be targeted.
- Facilitate delivery of bank credits through low-interest loans, particularly for small-capacity systems
- Conduct training and capacity-building programs for local technicians, dealers and manufacturers, in order to ensure proper installation and maintenance of SWHs.

6.2 Medium Term

- For SHP there is a need to reduce cost and time of clearances, statutory as well as administrative, by way of reforms and effective governance. Instead of obtaining NOCs, focus should be on laying down norms and their compliance and enforcements of statutory provisions.
- Provide further regulatory support to SHPs in terms of providing evacuation arrangement, grid connectivity, open access and equitable wheeling tariff to make them competitive and provide level playing field to all the developers.
- Develop the vast Spiti cold desert into a renewable energy hub by setting up a 1,000 MW solar and wind facility. Spiti has abundant sunshine and wind to generate energy.
- Develop low-cost domestic solar water heaters to attract a maximum number of residential customers.
- Creating awareness across the institutional sector with respect to the benefits of SWHs through focused seminars, campaigns and study tours in all major, potential districts
- Promotion of solar greenhouses for horticultural crops to supplement the income of the farmers as well as for space heating of houses in winters.
- Solar passive housing technology needs to be propagated in urban and rural areas keeping in view the vast potential of the technology for cold regions.

6.3 Long Term

- Support research and development, demonstration and commercialization of new and emerging technologies in renewable energy sector such as chemical energy, geothermal energy, and bio fuels
- Support research and development, demonstration and commercialization of hydrogen production, storage and distribution.

- Promote research and commercialization of storage technologies including fuel cells
- Initiate move to electrify automotive transportation or develop electric vehicles - plug-in hybrids.
- Creation of conducive conditions for attracting private sector investment along with broader participation by public community/civil society.
- Provision of decentralized renewable energy for agriculture, industry, commercial and household sector particularly in rural areas thereby improving the quality of power and reducing transmission & distribution losses.
- Supporting specific projects and schemes for generating energy and conserving energy through energy efficiency.

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