MINISTRY OF POWER
GOVERNMENT OF INDIA

Himachal Pradesh
Directorate of Energy

STATE ENERGY EFFICIENCY ACTION PLAN (SEEAP)

HIMACHAL PRADESH - ACTION PLAN

AUGUST 2023

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Yours Sincerely,

Neeraj Arora

Assistant Secretary General
ASSOCHAM, New Delhi
www.assocham.com

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ABBREVIATIONS

AAGR - Average Annual Growth Rate
ASSOCHAM - The Associated Chambers of Commerce and Industry of India
AgDSM - Agriculture Demand Side Management
AMRUT – Atal Mission for Rejuvenation and Urban Transformation
BEE - Bureau of Energy Efficiency
BLDC - Brushless Direct Current
CAGR - Compound Annual Growth Rate
CEA- Central Electricity Authority of India
DISCOM - Distribution Company
DSM - Demand Side Management
ECBC - Energy Conservation Building Code
ECSBC – Energy Conservation & Sustainable Building Code
EE - Energy Efficiency
EESL - Energy Efficiency Services Limited
EIA - Energy Information Agency
ENS – Eco Niwas Samhita
ESCO- Energy service companies
FY - Financial Year
GSDP - Gross State Domestic Product
HPERC - Himachal Pradesh Electricity Regulatory Commission
HPPCL - Himachal Pradesh Power Corporation Ltd.
HPPTCL - Himachal Pradesh Power Transmission Corporation Ltd.
HPSEBL - Himachal Pradesh State Electricity Board Ltd.
KUSUM - Kisan Urja Suraksha Evam Utthaan Mahabhiyan
HRIDAY – Heritage City Development & Augmentation Yojana
MEEP – Municipal Energy Efficiency Programme
LED - Light Emitting Diode
MNRE - Ministry of New and Renewable Energy
MOSPI - Ministry of Statistics and Programme Implementation
Mtoe - Million Tonne of Oil Equivalent
MU - Million Unit of Electricity (in kWh)
MuDSM - Municipal Demand Side Management
NEMMP - National Electric Mobility Mission Plan
NHPC - National Hydroelectric Power Corporation
NMEEE - National Mission on Enhanced Energy Efficiency
PMKSY - Pradhan Mantri Krishi Sinchai Yojana
RBI – Reserve Bank of India
SLNP – Street Light National Programme
SEEAP - State Energy Efficiency Action Plan
SEEI - State Energy Efficiency Index
UNNATEE - Unlocking National Energy Efficiency Potential

Executive Summary

Increasing energy demand naturally strains the country's resources and impacts the environment. These warrants decoupling the country's economic growth and energy demand. This is also echoed through India's Intended Nationally Determined Contribution submitted in the run-up to the Paris Climate Conference, where the government has highlighted energy conservation as a key mitigation strategy. The Government of India in the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Glasgow, United Kingdom in 2021, presented the five nectar elements (Panchamrit) of India's climate action including the target of net-zero emissions by 2070 and get 50% of its energy from renewable resources by 2030. In meeting the national level targets, States/UTs play a vital role in transitions to low-carbon development pathways. Bureau of Energy Efficiency under the guidance of Ministry of Power developed state specific energy efficiency action plan to ensure that the allocation of resources is as per the requirement of State that will help in meeting state-specific goals on sustainable development.

The State Energy Efficiency Action Plan for a particular State/UT developed by identifying focus sectors of the State/UT and estimate the potential of energy conservation in sectors which are predominant in the region. The State Energy Efficiency Action Plan is developed for short term-plan for a tenure of 5 years and a long-term plan targeting high-impact energy efficiency by the year 2031.

For the State of Himachal Pradesh, SEEAP was developed under the guidelines of Bureau of Energy Efficiency, Ministry of Power, GOI and Himachal Pradesh Directorate of Energy and inputs & suggestions from various government departments and sector experts were considered. The objective of the State Energy Efficiency Action Plan is to arrive at sector-specific approaches for energy efficiency for the State of Himachal Pradesh.

Himachal Pradesh's total final energy consumption (TFEC) for FY 2020 amounted to 2.39 Mtoe[1]. Within this, oil consumption accounted for 66.24% of the TFEC, followed by electricity at 32.85% and coal (non-power/industry) and gas consumption at 0.73% & 0.17% respectively. Based on energy consumption and economic growth of state total final energy consumption of state is projected and it is estimated that TFEC of Himachal Pradesh in FY 2031 will be 4.97 Mtoe. On the basis of projected GSDP of the state and projected energy consumption, Industry, Buildings, Transport and Agriculture sectors were identified as focus sectors and sector specific strategies were analyzed. List of sector specific focused strategies to ensure that the allocation of resources is as per the requirement of the State/UT is listed below:

Industry Sector:

- Deepening and Widening of PAT Scheme in (Textile & Pharmaceutical)
- Energy Efficiency Intervention in Food Processing & Light Engineering clusters

Buildings Sector:

- Effective Implementation of Energy Conservation & Sustainable Building Code (ECSBC)
- Replacement program for inefficient appliances
- BEE Star Rating and Shunya Rating of Building.

Transport Sector:

- Infrastructure development for EV charging stations and incentives to consumers for quick transition to EVs.
- Ethanol Blending program
- Promotion of Standard and Labelling program of Tyres for Fuel Efficiency in Vehicles

[1] **Primary Energy Data:** www.coalcontroller.gov.in, www.mopng.gov.in, NITI Aayog: India Energy Dashboards, **Secondary Energy Data:** HPSEBL/Statistical Abstract & CEA General Review 2021

Agriculture Sector:

- Transition of conventional diesel pumps to Solar powered pumps
- Replacement of old pumps (10 years old) or less efficient pumps (non-star rated) with 5 Star rated Pumps along with smart control panel
- Intervention of solar powered cold storage systems

This action plan will result in a total energy consumption reduction of 0.200 Mtoe in the moderate scenario and 0.390 Mtoe in the ambitious scenario in the FY 2031. This plan will also create awareness at the mass level and create a market potential of approximate rupees 718.6 Crore in the field of energy efficiency and reduce the CO_2 emission by 0.627 $MtCO_2$ in moderate scenario and 1.222 $MtCO_2$ in ambitious scenario by FY 2031.

1 Introduction

1.1 Background

India's economy is characterized by an emerging and developing market. In 2019, India became the fifth-largest economy in the world in nominal terms, surpassing United Kingdom and behind the United States, China, Japan and Germany[2]. The size of the Indian economy in Fiscal Year (FY) 2020 was INR 145 Lakh Crores at constant prices of 2011-12[3]. With the growth of the Indian economy, the demand for energy has increased significantly, resulting in high energy levels in some sectors and increase in the country's emissions.

As per International Energy Agency's (IEA) World Energy Outlook 2021 report[4], India currently has a share of 6.1% in the global primary energy consumption, which is projected to increase to 9.8% by the year 2050. India's Final Energy Consumption in FY 2020 was recorded at 533.44 MTOE[5] (as per Domestic Conversion Factors), with coal and crude oil being the largest contributors to the total energy consumption. India's per capita energy consumption and per capita emissions are well below the global average per capita emissions. However, India continuously taking steps to reduce the energy consumption and emissions and ensure sustainable growth of nation.

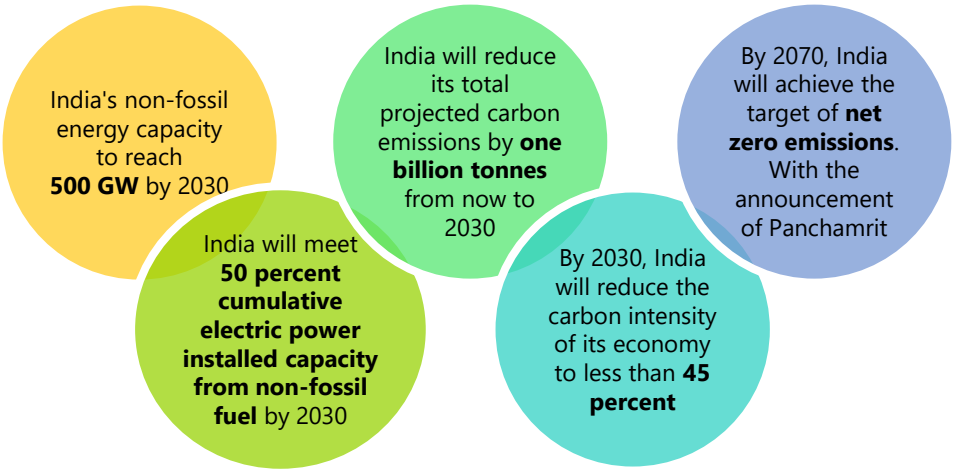
India has set ambitious economic goals for the future and achieving these goals is expected to result in significant increase in the country's energy demand and emissions. In view of this, India has also set ambitious goals for energy and climate performance. The country has also emphasized the importance of energy transition towards de-carbonization of the economy and has recently emerged as one of the world leaders in Energy Transition. States and Union Territories of the country have a key role to play in the fulfilment of these goals. The key strategy adopted by the Government of India is the efficient use of energy resources and their conservation. This is essential since the efficient use of energy

[2] www.weforum.org/agenda/2022/09/india-uk-fifth-largest-economy-world
[3] www.rbi.org.in (Handbook of Statistics on Indian Economy 2020)
[4] www.iea.org/reports/world-energy-outlook-2021
[5] www.mospi.gov.in (EnergyStatisticsIndia2023)

and its conservation is the least-cost option to meet the increasing energy demand, reduce wasteful consumption and in leading the country's economic growth in sustainable manner.

1.2 India's Nationally Determined Contributions (NDCs)

In the 2016 Paris Climate Conference, India in its Nationally Determined Contributions (NDCs) had committed that it will reduce the emission intensity of its GDP by 33% to 35% by 2030 from 2005 level. In the Conference of Parties (COP -26) at Glasgow, UK, India announced the Panchamrit, which lists down five ambitions:



Along with the idea of '**Lifestyle for the Environment (LiFE)**'. It is advised to individuals and institutions across the world to support LiFE as a global movement, aimed at promoting mindful and deliberate utilization instead of mindless and destructive consumption to safeguard the environment. This means making choices that are better for the environment, such as using renewable energy sources, reducing waste, and conserving resources. The program aims to teach people about the impact their daily actions have on the environment and provide them with the tools and resources they need to adopt eco-friendlier practices.

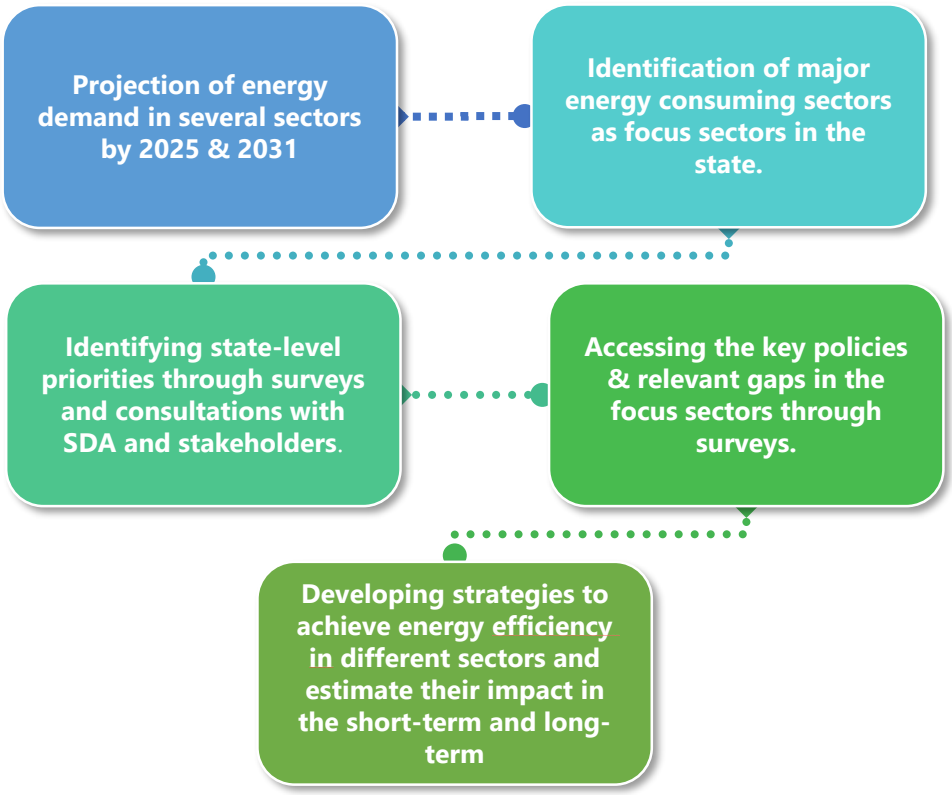
India's earlier target of 33% to 35% reduction in emission intensity from 2005 level by 2030 has been revised to approximately 45%. In view of the enhanced target under Panchamrit, India's energy efficiency efforts need to be increased and States and UTs have a vital role in India's energy efficiency policy

implementation and in meeting state-specific goals on sustainable development in the most energy-efficient way. It is imperative that the States and UTs actively participate in the schemes to facilitate the achievement of the overall goal of reducing the energy intensity of the country.

1.3 About SEEAP

The State Energy Efficiency Action Plan for the State of Himachal Pradesh has been developed by identification of focus sector, to ensure that the allocation of resources is as per the requirement of the State of Himachal Pradesh and estimate the potential of energy conservation in sectors that are predominant in the State of Himachal Pradesh such as Buildings, Transport, and Industries. The State Energy Efficiency Action Plan has been developed in two parts, a short term-plan for a tenure of 5 years and a long-term plan targeting high impact energy efficiency by the year 2031 to achieve the targets committed in COP-26. This State Energy Efficiency Action Plan has been developed under the guidance and support of stakeholder departments/agencies of the State of Himachal Pradesh and will be implemented by them in the state after its adoption.

Expected Outcomes of State Energy Efficiency Action Plan (SEEAP)



1.4 State Profile

Himachal Pradesh, a state in Northern India is situated in the Western Himalayas. The state is progressing both socially and economically as evident from the fact that the State has received 2nd position in NITI Aayog's Sustainable Development India Goals in the year 2021[6]. The vast resources of forests, minerals, and hydel power hold promise for immense progress. The physical diversity in the state, climate, and peaceful environment boosts up the tourism industry of the state. All this adds up to the economic development of the state. Himachal Pradesh is divided into 12 districts namely Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul & Spiti, Mandi, Shimla, Sirmaur, Solan and Una.

Figure 1: Himachal Pradesh – Geographical Map

The state is famous for Himalayas, fairs and fests, adventure, and Culture & Heritage, making Himachal Pradesh a favorable destination for tourists across the globe. With an area of 55,673 sq. km, Himachal Pradesh is one of the smaller states of India in terms of geographical area. The rural population constitutes around 90% of the total population of the state. For this reason, agriculture holds an important place in the economic development of the state. Rivers Chenab, Ravi, Beas, Sutlej, and Yamuna are present in the state, providing the state with vast hydropower potential.

6 https://www.tribuneindia.com/news/nation/himachal-pradesh-among-top-five-states-on-niti-aayogs-sdg-india-index-263077

Table 1: Basic Statistics of Himachal Pradesh[7]

S. No.	PARTICULARS	UNIT	NUMBERS
1	Area	Sq. Km	55,673
	(i) Rural Area		55,402
	(ii) Urban Area		270
2	No. of Districts	Number	12
	No. of Divisions	Number	3
3	Tehsils	Number	75
4	(Population 2011)		
	Total Population	Lakh	68.6
	Rural Population		61.8
5	% Of Rural to Total Population	%	89.97
6	Municipal Corporations	Number	5
7	% Of urban to Total Population	%	10.03

1.5 State Energy Scenario

Himachal Pradesh boasts abundant natural resources that can potentially provide abundant energy to the state. Its energy mix is varied, with conventional and renewable sources of energy contributing to the overall energy supply. Here's a summary of the state's energy scenario:

1.5.1 Power Generation

In recent years the power supply position in the state has improved considerably. Significant capacity additions of hydropower plants (both small and large) in recent years have helped the state to meet the power demands irrespective of the sector.

[7] *himachal.nic.in*

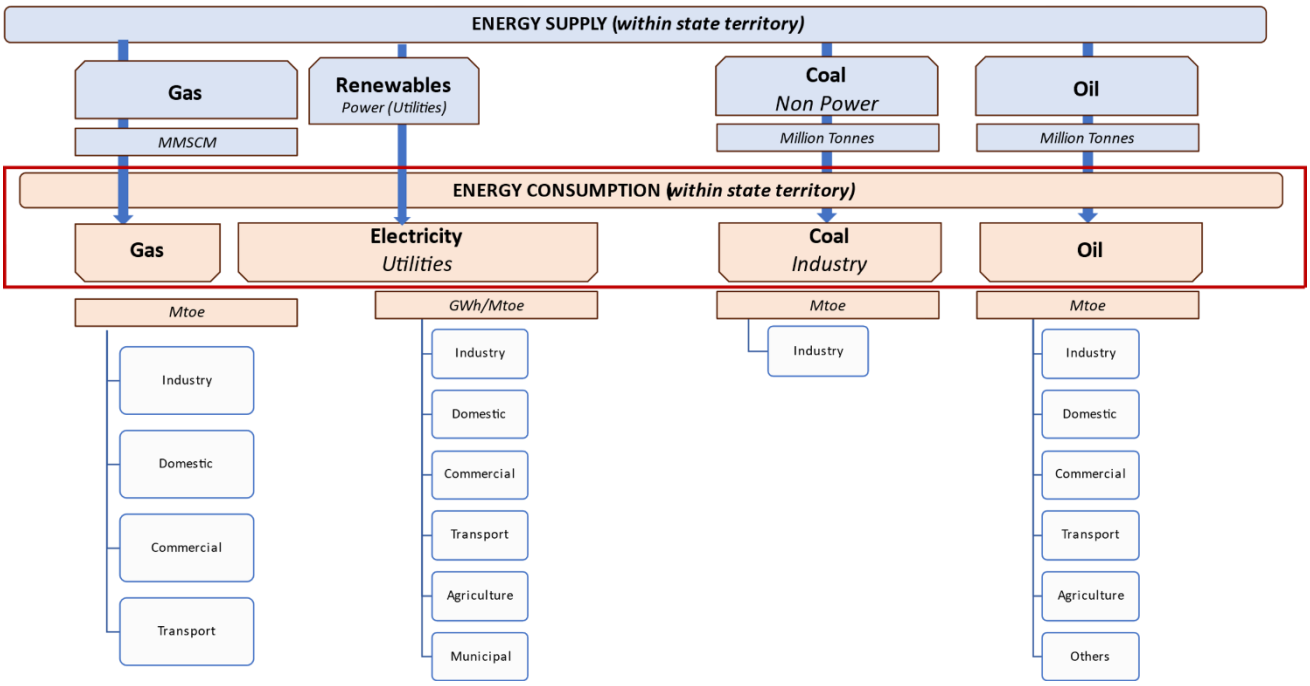


Figure 2: Energy Flow

Himachal Pradesh has estimated Hydro Potential of 27,436 MW out of which 24,000 MW has been assessed as harness able.[8] The total commissioned Hydro Power in the State of Himachal Pradesh is 11,128.08 MW. The plants are operated by Himachal Pradesh State Electricity Board Limited (HPSEBL), Himachal Pradesh Power Corporation Limited (HPPCL), State & Central PSUs and various private entities. In order to fulfill the growing power demand of the state, various hydropower plants are under construction stage.

The availability and accessibility of power has increased in recent years. Also, the power production capacity of the state can meet the constantly rising demand of the consumers in the state. Currently, there are 170 hydropower generating stations.

Table 2: Electricity Generation from Individual Plants Operated by HPPCL[9]

Electricity Generation from Individual Plants Operated by HPPCL till 20.05.2022		
FY wise Generation (Hydro)		
Projects	**FY**	**Total Gross Generation**
		GWh
IKHEP	FY 2017	52.19

[8] https://himachalservices.nic.in/economics/pdf/Economic_Survey_eng2019-20.pdf
[9] http://www.hppcl.in

IKHEP + Sainj HEP	FY 2018	332.02
	FY 2019	545.27
	FY 2020	535.03
IKHEP + Sainj HEP + Sawra Kuddu HEP	FY 2021	454.98
	FY 2022	951.88
	Grand Total	**2871.37**

FY wise Generation (Solar)		
Projects	**FY**	**Total Gross Generation**
		GWh
Berra Dol Solar PV (5MW)	FY 2019 after COD i.e. 04.01.2019	1.8
	FY 2020	8.37
	FY 2021	8.32
	FY 2022	7.98
	Grand Total	**26.47**

Electricity Generation from Individual Plants Operated by HPPCL till 20.05.2022		
Project	**FY**	**Total Gross Generation**
		GWh
Kashang HEP (1X65 MW)	FY 2017 after COD i.e., 01.09.2016	52.19
	FY 2018	197.04
	FY 2019	134.91
	FY 2020	189.5
	FY 2021	12.98
	FY 2022	7.98
	Grand Total	**542.41**
Sainj HEP (2X50 MW)	FY 2018 after COD i.e., 04.09.2017	134.98
	FY 2019	410.36
	FY 2020	345.53
	FY 2021	424.77
	FY 2022	418.83
	Grand Total	**1,734.47**
Sawra Kuddu HEP (3X37 MW)	FY 2021 after COD i.e., 21.01.2021	17.23

	FY 2022	322.45
	Grand Total	**339.68**
Grand total of all Hydro Projects		**2,616.56**

Table 3 : Installed Capacity of Power plants operated by HPSEBL as on 30.04.2022[10]

Plant Name	Total Capacity (MW)
A: EQUAL & ABOVE 3 MW	
Bhaba	120.000
Bassi	66.000
Giri	60.000
Andhra	16.950
Ghanvi	22.500
Ghanvi-II	10.000
Baner	12.000
Gaj	10.500
Binwa	6.000
Thirot	4.500
Gumma	3.000
Holi	3.000
Larji	126.000
Khauli	12.000
Bhaba Aug	4.500
Total 'A'	**476.950**
B: BELOW 3 MW	
Nogli	2.500
Rongtong	2.000
Sal-II	2.000
Chaba	1.750
Rukti	1.500
Chamba	0.450
Killar	0.300
Billing	0.400
Lingti	0.400
Sach	0.900
Purthi	0.100
Sural	0.100
Total 'B'	**12.400**
G. Total (A+B)	**489.350**

Himachal Pradesh is blessed with abundant potential for hydro energy. Currently there are 172 hydro powered power plants in the state of Himachal Pradesh

[10]https://secure.evidhan.nic.in/SecureFileStructure/AssemblyFiles/14/2/20230405/Documents/2_1_6.pdf

having an installed capacity of 11,149.58 MW. Out of these hydro power plants 27 hydroelectric plants with installed capacity of 489.35 MW are operated by Himachal Pradesh State Electricity Board Limited (HPSEBL) and 3 hydroelectric plants with installed capacity of 276 MW are operated by Himachal Pradesh Power Corporation Limited (HPPCL). Below image reflects the Status of Hydro Potential in Himachal Pradesh (as on January 2023):[11]

Status of Hydro Potential in Himachal Pradesh(as on Jan 2023)

Sr. No	Sector		Commissioned		Under Construction		At Various Stage of Clearance & Investigation		To be allotted		Foregone		Disputed		Grand Total	
			No. of Projects	Capacity in MW	No. of Projects	Capacity in MW	No. of Projects	Capacity in MW	No. of Projects	Capacity in MW	No. of Projects	Capacity in MW	No. of Projects	Capacity in MW	No. of Projects	Capacity in MW
1	2	3	4	5	6	7	8	9	10	11		13	14	15	16	17
1	Himurja		5	0.47	0	0	0	0	0	0	0	0	0	0	5	0.47
2	HPSEBL		27	489.35	1	100	7	91.5	0	0	0	0	0	0	35	680.85
3	HPPCL		3	276	2	580	17	2300	0	0	0	20	0	0	22	3176
4	Central & Joint		12	7457.73	3	1076	11	3155	0	0	0	0	0	0	26	11688.73
5	Yamuna Projects (Himachal Share)			131.57					0	0					0	131.57
	Ranjeet Sagar Dam (Himachal Share)			27.6					0	0					0	27.6
	Kishau Dam(660 MW) (Himachal Share)							324	0	0					0	324
6	Private	upto 5 MW	92	339.25	32	87.29	639	1273.2	151	164	0	0	0	0	914	1863.74
		above 5 MW to upto 25 MW	24	318.61	11	153.8	41	554.1	23	274.9	1	25	5	50.5	105	1376.91
		above 25 MW	9	2109	3	434	7	728	9	1091.5	5	710	1	200	34	5272.5
Total Allotted			172	11149.58	52	2431.09	722	8425.8	183	1530.4	6	755	6	250.5	1141	24542.37
Total Harnessed																11149.58
Balance Potential																13392.79

1.5.2 Renewable Energy

The State of Himachal Pradesh is blessed with vast sources of hydropower. For the same reason, small hydropower has always been the center of focus and is given impetus in terms of the policy. The state also has great potential for solar power. Clear sky and average solar radiation throughout the state favor the generation of solar power.

Table 4: Electricity Generation from RE sources[12]

YEAR	GENERATION (GWh)
FY2015	1661.30
FY2016	2112.80
FY2017	2028.30
FY2018	2207.38
FY2019	2040.94
FY2020	2321.53
FY2021	1967.73

[11] Department of Energy (DoE), SDA
[12] CEA : https://cea.nic.in/renewable-generation-report

Himachal Pradesh has shown incremental growth in electricity generation from renewable energy sources. Statistics showcase that the renewable energy generation in the state has advanced from 1,661.3 GWh in 2015 to 1,967.73 GWh in 2021, indicating appreciable growth. This increase in renewable energy generation growth is the result of initiatives taken by the State Government in the implementation of policies and incentive schemes related to renewable energy sources. The data for renewable energy generation has been taken from CEA monthly generation reports. The total renewable generation includes power generation from small hydro and solar projects. For the current year till March 2022, the renewable energy generation is 255.77 GWh.

HIMURJA, the State Nodal Agency for implementation of Non – Conventional Energy Programs in the state of Himachal Pradesh is responsible for (Small Hydro Power) SHP development in the state. HIMURJA has made substantial efforts to promote various renewable energy programs. It has been possible due to the collaborative contribution of the Ministry of New and Renewable Energy (MNRE) and the State Government. With an emphasis on the optimum utilization of natural resources, HIMURJA has managed to drive strategic initiatives for renewable energy production in the state.

Table 5: Solar Power plants (HIMURJA)[13]

S.No.	Plants	Achievements
1	Biomass	8.7 MW installed capacity as on 2022
2	Grid-connected Solar Roof Top Power Plants	17.21 MW installed capacity as on 2022.
3	Ground Mounted Grid-connected Solar Power Projects	33.65 MW installed capacity as on 2022.

Table 6: Small Hydro Electric Projects (HIMURJA)[14]

Projects	Numbers	Capacity (MW)
Total allotted Projects	742	1781.58
Commissioned	88	326.25
Under Construction	34	106.29

[13] HIMURJA
[14] Economic Survey of Himachal Pradesh 2021-22

Table 7: Programs of HIMURJA[15]

S.No	Programme	Achievements
1	Solar Cooker	246 box type and 40 dish type solar cookers have been provided up to December 2020. A target of 200 box type and 50 dish type solar cookers haven been proposed for 2021-22.
2	Solar Water Heating System	In 2020-21 solar water heating systems of 8,300 Lt. Per day capacity have been installed. A target of 1,00,000 liters per day capacity solar water heating systems installation has been proposed for the year 2021-22.
3	SPV Street Lighting System	In 2020-21, 24,389 No. SPV Street Lighting Systems have been installed up to December 2020. A target of 15,000 SPV Street Lightning Systems has been proposed for the year 2021-22.
4	SPV Domestic Light	In 2020-21, the anticipated achievement of SPV domestic lights up to March 2021 will be about 3,000. A target of 3,000 SPV Domestic Lights have been proposed for the year 2021-22.

HPPCL, apart from hydropower plant the organization is entrusted with the role to identify other renewable power development sources as well. HPPCL has set up a 5 MW Berra Dol solar power plant, near Shri Naina Devi Ji Shrine in District Bilaspur. This is the first solar power project in Himachal Pradesh which was built in the Government sector. HPPCL has generated 16.97 GWh of electricity from this project and revenue generated by sale of power till 31.12.2020 was 6.45 crore. Targets of power generation up to 31.03.2021 are 19.29 GWh. HPPCL has also planned to set up another solar power plant of 10 MW capacity at Aghlor in district Una. DPR has been prepared and HPPCL is pursuing the matter of transfer of land with the industrial department.[16]

Waste-To-Energy Plants, Himachal Pradesh has two waste-to-energy plants. One of them is of 2.5 MW capacity with an outlay of INR 42 crore in Bhariyal, Shimla, while another is of 1 MW in Rangri, Manali. The waste to energy plant in Shimla was set up by Municipal corporation Shimla. The plant is based on "Refuse-Derived Fuel" (RDF) Technology using "Gasification Technology". The plant is made functional for processing of Municipal Solid Waste (MSW) which is then converted into Refuse-Derived Fuel (RDF) for further generation of electricity. The plant has a capacity of handling 100 ton of waste per day. The

[15] https://himachalservices.nic.in/economics/pdf/Economic_Survey_eng2020-21.pdf
[16] https://himachalservices.nic.in/economics/pdf/Economic_Survey_eng2020-21.pdf

waste to energy plant in Manali has a capacity of 1 MW and works on gasification technology. As of now, no power generation is taking place in both the plants. The Shimla plant is generating Refuse-Derived Fuel (RDF) which is supplied to the nearby cement plants. Due to technical problems the plant is unable to generate electricity. The plant in Manali is also generating Refuse-Derived Fuel (RDF), but currently no plan is there for the generation of electricity.[17]

1.6 Energy Consumption Scenario (TFEC)

Oil Consumption: As of March 2020, the State of Himachal Pradesh consumed around 19,30,000 tonnes of petroleum products (equivalent to 1.58 Mtoe[18]), which includes LPG, Kerosene, Petrol, Diesel, Furnace Oil, Low Sulphur Heavy Stoke (LSHS) and Pet Coke annually.

LPG is a clean-burning fuel commonly used for cooking and heating, while Kerosene is mainly used as a fuel for lighting and heating appliances. Petrol and diesel are the primary fuels used in transportation, while Furnace Oil is used for heating and power generation. Low Sulphur Heavy Stoke (LSHS) is a residual fuel oil used in industrial boilers and power plants, while Pet Coke is a solid fuel used in cement plants.

This consumption of petroleum products indicates the high level of energy usage in Himachal Pradesh, which is essential for the state's economic and social development. However, it also highlights the state's dependence on fossil fuels, which has significant environmental and economic implications. The continued reliance on fossil fuels can contribute to air pollution, climate change, and other environmental issues, while also making the state vulnerable to fluctuations in global oil prices. Therefore, there is a need to explore alternative energy sources and promote energy conservation measures to reduce the state's dependence on petroleum products.

Coal Consumption: Himachal Pradesh is known for its abundance of hydroelectric power potential, which is one of the primary sources of energy in

[17] http://himachalpr.gov.in/PressReleaseByYear.aspx?Language=1&ID=16263&Type=2&Date=23/02/2020
[18] www.mopng.gov.in

the state. The government has been actively promoting renewable energy sources to reduce dependence on fossil fuels. Hydroelectric power projects and solar energy play a significant role in meeting the state's energy requirements. Himachal Pradesh is not a significant consumer of coal compared to other states in India however, as of March 2020, coal consumption in the state by the non-power industries, such as cement, steel, and other industries, for their production processes. The state consumed 0.031 million tonnes of coal (non-power/industry), which is equivalent to 0.018 Mtoe.[19]

Gas Consumption: The consumption of natural gas in the state was minimal, with a total supplied gas (CNG) of 4,090 tonnes equivalent to 0.004 Mtoe[20] as of March 2020. Natural gas is a clean-burning fuel that can be used in various applications such as power generation, heating, and transportation. However, the consumption of natural gas in Himachal Pradesh seems to be very low, and the state mainly relies on other sources of energy like petrol, diesel, LPG, and hydropower. CNG (Compressed Natural Gas) is a type of natural gas used as a fuel for vehicles. The supply of CNG in the State of Himachal Pradesh was only 4,090 tonnes, which is a relatively small amount compared to other states in India. This indicates that the use of CNG vehicles in the State of Himachal Pradesh is not very popular, and the majority of vehicles run on petrol or diesel. Overall, the state was heavily reliant on hydropower and other renewable sources for electricity generation, with a growing focus on solar power.

Electricity Consumption: As of March 2020, the total electricity consumption in Himachal Pradesh was 9,129 GWh, with a peak demand of 1,786 MW. The state had an installed capacity of around 11,236 MW as on March 2020, which included hydropower, and renewable energy sources (Small Hydro Project, Biomass Power, Urban & Industrial Waste Power, Solar Energy).[21]

In addition, Himachal Pradesh has also made progress in the use of renewable energy sources, such as Small Hydro Project, Biomass Power, Urban & Industrial

[19] www.coalcontroller.gov.in
[20] NITI Ayog
[21] https://cea.nic.in/dashboard/?lang=en

Waste Power, and Solar Energy, to generate electricity. Himachal Pradesh's energy mix includes a range of energy sources to meet the state's electricity demand. Further promotion and investment in renewable energy sources can help the state to promote a cleaner and more sustainable energy generation system.

Table 8: Total Final Energy Consumption (Mtoe)[22]

Total Final Energy Consumption - TFEC (MTOE)						
Source/Year	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020
Oil	1.15	1.42	1.54	1.46	1.45	1.58
Coal (Non-Power/Industry)	0.12	0.04	0.03	0.01	0.01	0.02
Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.0042
Electricity Utilities	0.67	0.68	0.68	0.72	0.78	0.78
Total	**1.94**	**2.14**	**2.26**	**2.19**	**2.24**	**2.39**

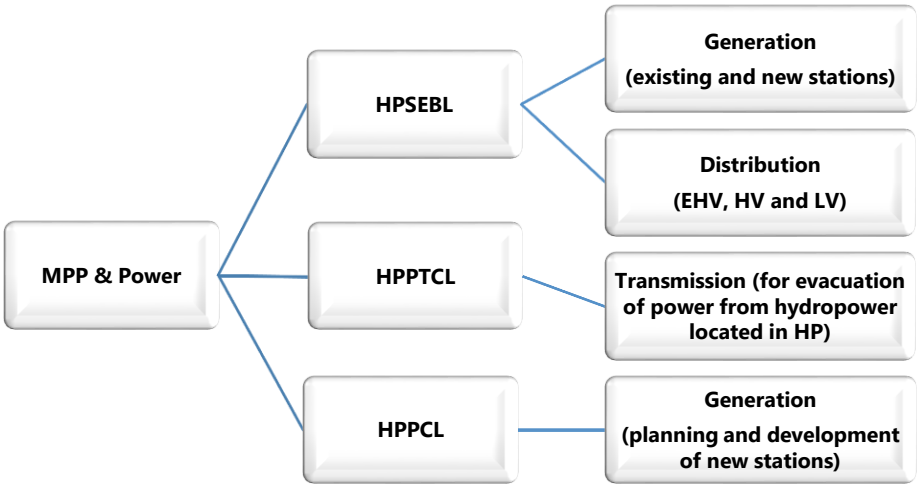
1.7 Overview of Institutional framework and stakeholder mapping

Himachal Pradesh State Electricity Board Limited (HPSEBL):

In accordance with the provisions of Electricity Supply Act (1948), the Himachal Pradesh Electricity Board was constituted on 1st September 1971. It was reorganized as Himachal Pradesh State Electricity Board Ltd w.e.f. 14.06.2010.

- HPSEBL is responsible for the supply of uninterrupted & Quality power to all consumers in Himachal Pradesh.
- It looks after the generation, distribution, and trading functions in the buying and selling of electricity in the State.
- Since its inception HPSEBL has achieved many milestones, one of them being providing 100 % metering, billing, and collection.
- HPSEBL has a mission to provide reliable and economic power by timely capacity addition, performance improvement, cost reduction and better utilization of human resources.
- The organization is also focused upon reducing T&D losses by strengthening existing power network based on the advanced available technology.[23]

[22] www.coalcontroller.gov.in, www.mopng.gov.in, *NITI Aayog: India Energy Dashboards, HPSEBL/ Statistical Abstract & CEA General Review 2021*
[23] HPSEBL website



Himachal Pradesh Power Transmission Corporation Limited (HPPTCL):

- HPPTCL is the State Transmission Utility for the state of Himachal Pradesh.
- It manages all new networks – Transmission lines and Sub-Stations of 66 kV and above voltage rating.
- The organization coordinates with Ministry of Power, Central Electricity Authority and Central Transmission Utility for transmission related issues.
- As of January 2021, HPPTCL has operationalized 11 Substations with Transformation capacity of 2473.5 MVA, 1 Switching Station and 24 Transmission lines with 583.56 Ckt Km to strengthen the state transmission network.[24]

Himachal Pradesh Power Corporation Limited (HPPCL):

- The role of HPPCL is to plan, promote and organize the development of all aspects of hydroelectric power on behalf of Himachal Pradesh Government and HPSEBL. Apart from hydro the organization is entrusted with the role to identify other power development sources such as renewable.
- The organization has a target of developing 1241 MW of Power generation facility by the year 2022. [25]

[24] HPPTCL Website
[25]http://www.hppcl.in/WriteReadData/userfiles/file/CompliancetoSection4RTIupdatedon2018.pdf

2 Identification of Focus Sectors

The economic sectors of the State of Himachal Pradesh can be broadly classified into the sectors namely Industry, Buildings, Transport, Agriculture, Municipalities and DISCOMs, and Cross Sectors. These sectors can be further divided into sub-categories, as shown in below figure:

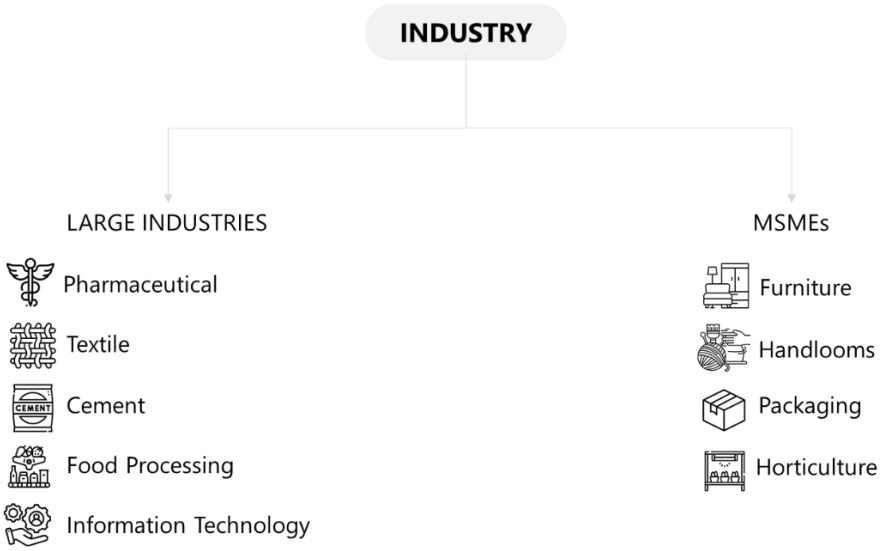


Figure 3: Sub-categorization of Himachal Pradesh's industry sector

Identification of focus sectors or focus areas is important because it is a general characteristic of a state that a major portion of energy is being consumed by few particular energy-guzzling sectors. Focusing efforts towards these sectors is necessary to ensure that the allocation of resources is as per the state's priorities and towards sectors that have the highest potential of energy savings and emissions reductions.

2.1 Methodology of Focus Sector Identification

The methodology used to determine the focus sectors in the State of Himachal Pradesh includes multiple factors. The first factor is the energy consumption profile of the state. This information provides a clear understanding of where energy is being used and which sectors are consuming the most. The analysis reveals that the Industry sector is the largest energy consumer in the state.

The second factor is the input from stakeholders. Stakeholders include individuals, organizations, and communities that have a vested interest in energy

consumption and production in the state. Their inputs are valuable as they have a direct impact on the sector they represent.

The third factor is priority areas of the state. Priority areas are determined based on the state's development goals, energy policies, and future aspirations. These priority areas help in identifying sectors that require immediate attention and support.

After considering these factors, the focus sectors are identified, which are the Industry, Buildings, and Transport sectors. The Industry sector is the primary focus as it is the largest energy consumer in the state. The Buildings sector is important as it accounts for a significant amount of electricity consumption in the domestic and commercial sectors with 31% of the total electricity consumption. The Transport sector is also a critical focus as it is one of the largest energy consumer and relies heavily on fossil fuels (oil).

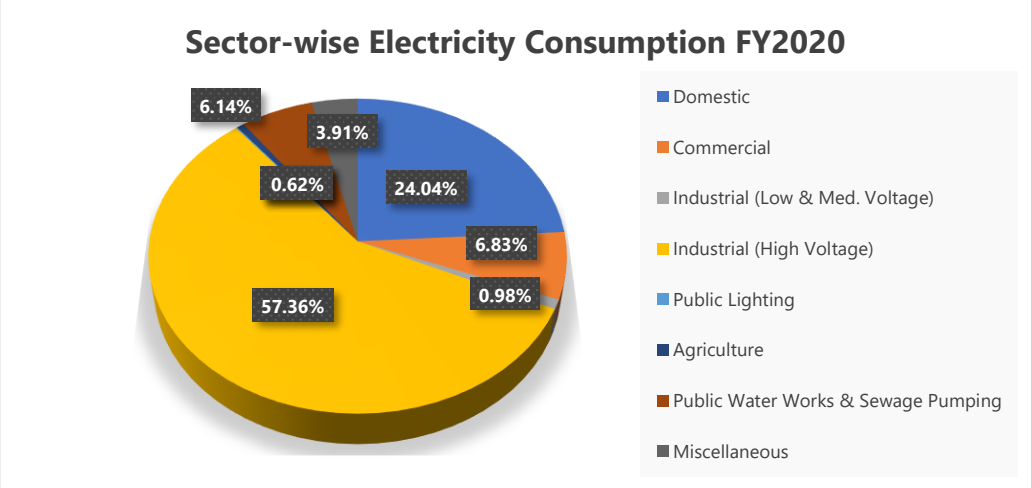


Figure 4: Electricity Consumption FY2020 (GWh)[26]

Stakeholder Consultation

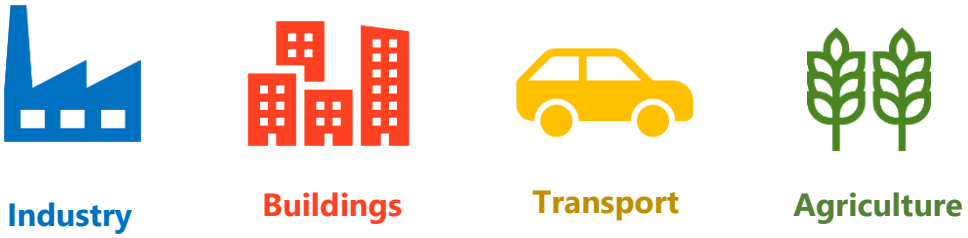
Inputs and suggestions from stakeholders identified for the State of Himachal Pradesh were invited at different stages in the development of the action plan. Feedback and inputs received from stakeholders play a key role in highlighting the areas of focus in their respective sectors going forward and helps understand

[26] Central Electricity Authority (CEA) Dashboard

the implementation of practices and the feasibility of proposed energy efficiency strategies within the sector.

2.2 Identified Focus Sectors

Based on the above parameters and other important considerations, the following have been identified as the focus sectors for devising energy efficiency strategies in the State of Himachal Pradesh.



Total Final Energy Consumption (TFEC) of the focus sectors Industry, Buildings, Transport and Agriculture is contributing major portion of the total energy consumption in the State of Himachal Pradesh for FY 2020.

3 Projections and Forecasting

Economic and energy projections for the State of Himachal Pradesh to the target year FY 2031 are performed in order to predict the future growth patterns of the respective sectors and to assess the impact of possible energy efficiency interventions in these sectors. The Gross State Domestic Product (GSDP) projections and the energy consumption projections form the basis of defining the actions for energy conservation in the state, which is important in developing the consumption reduction targets for the state and in aligning the state with the national goals.

Fiscal Year (FY 2020), implying the period from April 2019-March 2020 has been selected as the base year for projections in this study keeping in view the years FY 2021 and FY 2022 being pandemic years.

The Gross State Domestic Product (GSDP) of the State of Himachal Pradesh was recorded at INR 1.21 Lakh Crore in FY 2020 and is projected to reach INR 2.39 Lakh Crore in FY 2031, at constant prices of 2011-12. The GSDP for the period FY 2023-FY 2031 is forecasted by taking weightage of the GSDP growth rate recorded in the years FY 2015-FY 2020 and the projection of GSDP growth rate by vision document of Himachal Pradesh. The historic and forecasted GSDP for the State of Himachal Pradesh is shown in the figure below:

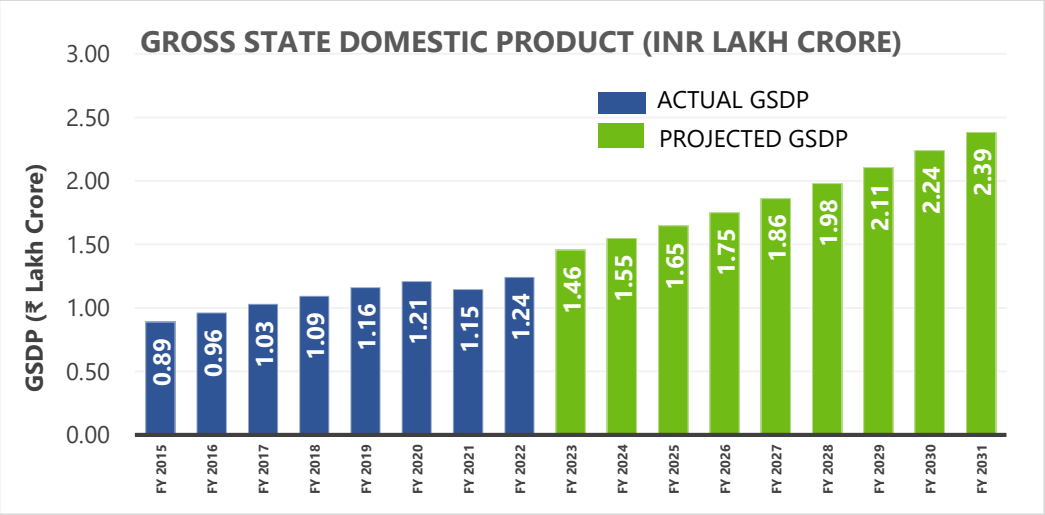


Figure 5: GSDP Projection of Himachal Pradesh

The Total Final Energy Consumption (TFEC) has been projected for the state up to FY 2031 taking into account the historic average energy intensity (Mtoe/INR Lakh Crore) from FY 2015 to FY 2020 along with the historic and projected GSDP growth for the State of Himachal Pradesh. The methodology used to project the energy consumption takes into consideration economic aspects along with the total final energy consumption trend of the state.

The Total Final Energy Consumption of the state in the Business-As-Usual (BAU) scenario is projected to reach 8.84 MTOE in FY 2031 from 4.37 MTOE in FY 2020, with a projected CAGR of 6.62%.

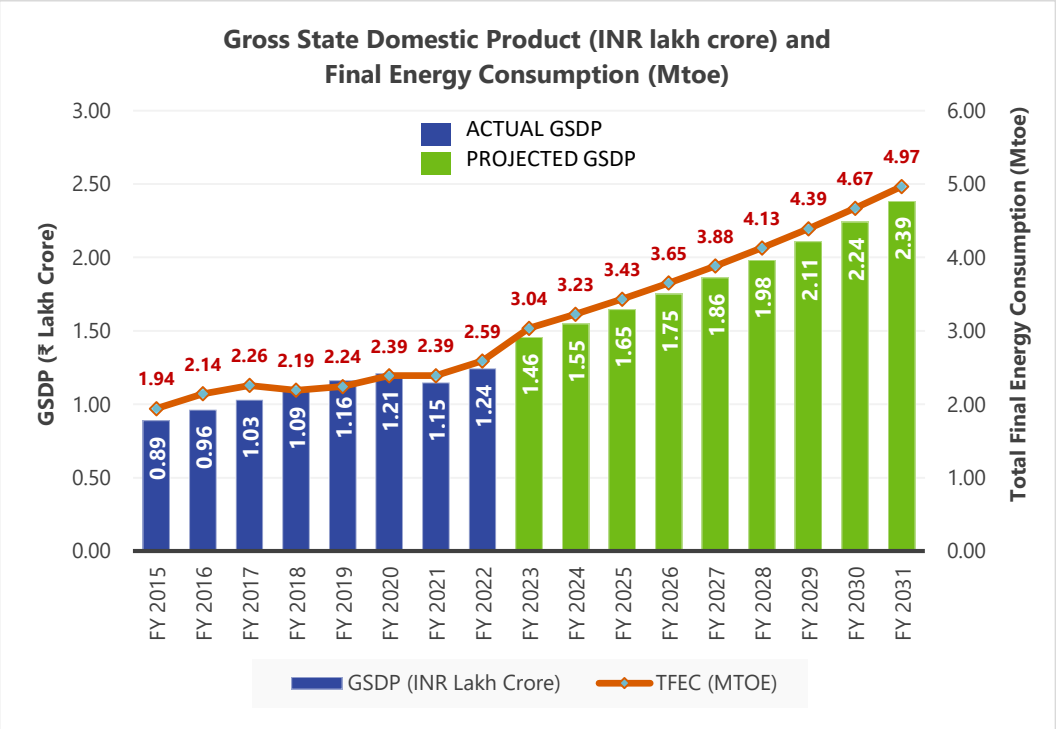


Figure 6: Gross State Domestic Product (INR lakh crore) & TFEC (Mtoe)

INDUSTRY SECTOR

4 Focus Sector-1: Industry

4.1 Current Scenario

In the recent years there has been a transition from agrarian economy to an industry and service led economy. This has led to an accelerated socio economic growth in the state.

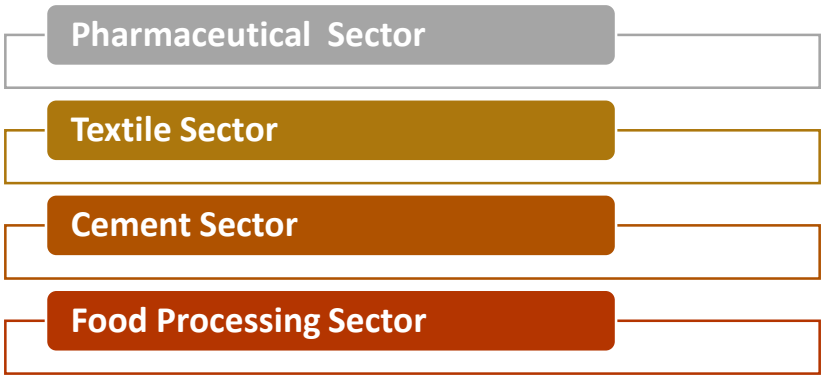
Availability of power, progressive policies, human capital and favorable climate are some of the advantages that would help Himachal Pradesh to develop as an industrial hub in the coming future.

The Himachal Pradesh Industrial Investment Policy, 2019:

The state has many opportunities for the development of industrial infrastructure like availability of industrial power, open and progressive policies enabling fast clearances and human and financial capital. The Industrial Investment Policy, 2019 is focused upon utilizing these resources to maximum extent in order to promote industrial development in the state.

Emphasis would be given on the installation of energy efficient systems & use of green power in the facility. [27]

The state offers ample scope to investors in varied sectors. As per the growth & significant export of the specific industry, prioritization of industries in the state are as follows:[28]



Himachal Pradesh has made significant industrial advancement over the past few years. Recently, many initiatives have been undertaken by the government to

[27] https://emerginghimachal.hp.gov.in/themes/backend/uploads/notification/Notification/Investment-Promotion-Policy-and-Rules-2019.pdf

[28] Rising Himachal 2019, Department of Industries, HP

facilitate investment in the State. The total number of registered factories in the state are 5173 which is generating employment for 3.5 lakh persons as on 2019-20[20].

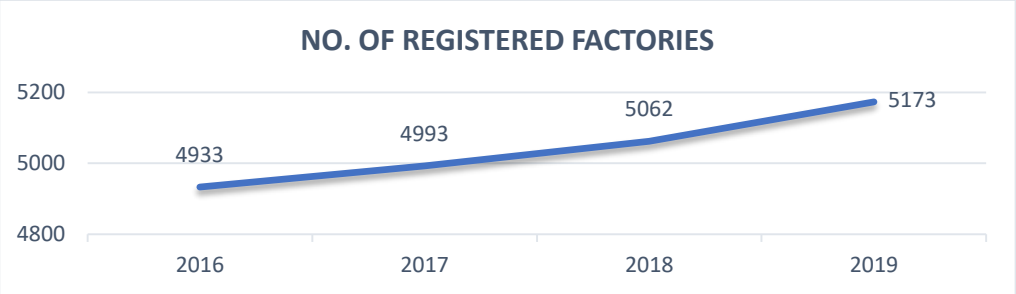
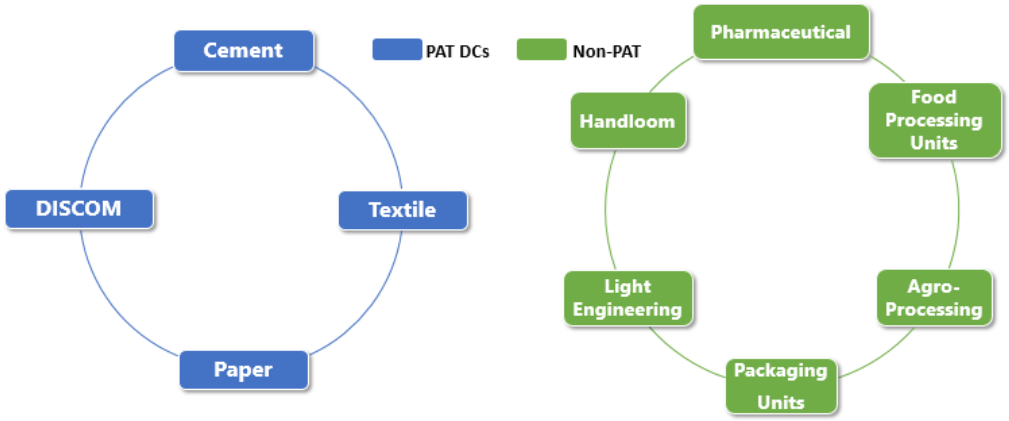


Figure 7: Industrial growth in State of Himachal Pradesh[29]

In last few years, there has been a major reformation in industries sector was witnessed. Perform Achieve & Trade (PAT) scheme of Bureau of Energy Efficiency has identified 15 designated consumers (DCs) in the state. In which 6 DCs are from Cement sectors, 7 DCs are from Textile sectors, 1 DC from Paper and 1 DC from DISCOM sector.[30]



In 2019-20, Industry sector consumed approximately 5,325 million units[31] of electricity which is around 58.36% of total electricity consumption in the state. It is expected that in the next 5 years the energy demand will exceptionally be increasing. Apart from electricity, coal is also being consumed in industry sector of state, which is approximately 45% of total final energy consumption of state.

[29]https://himachalservices.nic.in/economics/pdf/StatisticalAbstract_2019_20.pdf
[30]https://beeindia.gov.in/en/programmesperform-achieve-trade/pat-notifications
[31] https://himachalservices.nic.in/economics/pdf/StatisticalAbstract_2019_20.pdf

In order to reduce the consumption in industry sector and develop a robust system for energy efficiency in state, specific action plan is required.

4.2 Energy Efficiency Strategies in the Industry Sector:

This section presents the proposed strategies in the prominent sectors and focus areas identified in the industry sector along with their impact in terms of energy efficiency and emissions reduction. Strategies are proposed with their relevant action items.

Strategy #1: Deepening and Widening of PAT Scheme

Implementation Timeline: Long Term (Till FY 2031)

In the proposed strategy, it is recommended that the state enhances coverage of energy consumption in PAT industries (DCs) by deepening and widening the PAT scheme in the state. Deepening and Widening of PAT scheme would imply notifying more industries as designated consumers under the current PAT sectors by lowering the threshold limit for eligibility (TOE/annum), as well as the inclusion of new sectors under the PAT scheme. Introduction of new DCs from other sectors such as Pharmaceutical, Food Processing, Textile etc. can be targeted in the PAT scheme for Himachal Pradesh. In order to estimate the energy saving potential, Moderate and Ambitious SEC assigned to Textile non-PAT units, and to cement units. It is assumed that the existing units of both sectors will achieve the moderate SEC target in 50% units and achieve the ambitious SEC target in 70% units. The textile sector is expected to grow at a CAGR of 3.96%[32]. Estimated energy saving potential in Moderate scenario 0.024 Mtoe and in ambitious scenario 0.048 Mtoe can be achieved with this strategy.

Table 9: Moderate and ambitious scenarios for deepening and widening of PAT scheme

Sector	Baseline SEC (toe/tonne*)	Moderate SEC (toe/tonne)	Ambitious SEC (toe/tonne)	Production in 2031 ('000 tonnes)	Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
Textile	0.743	0.669	0.594	3582.3	**0.023**	**0.046**
Cement	0.067	0.060	0.536	1,24,483	**0.001**	**0.002**

[32]https://www.researchgate.net/publication/338980058_ISSUES_AND_PROSPECTS_OF_HANDLOOM_SECTOR_OF_HIMACHAL_PRADESH

Actionable items:

1. **Partial Risk guarantee program to encourage implementation of latest energy efficient technologies in the sectors (Over and above existing schemes with state contribution)**

   A Partial Risk Guarantee (PRG) program can be an effective tool for encouraging the implementation of the latest energy-efficient technologies in various sectors. The program involves providing a guarantee to a lender or investor, which covers a portion of the risk associated with financing the adoption of energy-efficient technologies.

   Under the program, the lender or investor can provide financing at a lower interest rate, as the risk is partially covered by the guarantee. This helps to reduce the cost of financing for the borrower, making it more affordable to implement energy-efficient technologies.

   BEE, under its existing Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) scheme has already released guidelines for partial risk guarantee that may be adopted by the state for effective implementation.

2. **Capacity Building of Energy Managers and Energy Auditors in PAT DCs and new probable sectors for compliance with scheme and new technologies.**

   Though its mandatory to go through a refresher training for all energy auditors and managers, it is important to attain knowledge of changing schemes and policies that could positively impact large consumers and help them implement schemes in their respective organizations.

3. **Mandatory Standardized Energy Audits in every three years for all units that have energy consumption below PAT threshold, in all notified PAT sectors, excluding MSMEs.**

   Though separate guidelines are issued for PAT industries, non-PAT, non-MSME industries could also benefit from energy audits. This shall not only ensure their improved energy performance, but also, ensure that if brought under PAT scheme at a later stage, they would be accustomed and more willing to participate in it. The audits will also improve competitiveness of these industries. A monitoring mechanism may be developed to see the

impact of energy audits and advise industries in a constructive way from time to time.

4. **Development of mechanisms for B2B interaction with global technology suppliers.**

   Global technologies are often beyond the reach of domestic industries due to several reasons. A platform to improve competitiveness and efficiency in energy may be provided under a structure to ensure advancement of manufacturing process and improvement in energy efficiency at the same time.

Strategy #2: Energy Efficiency Interventions in MSME Clusters

Implementation Timeline: Short Term (Till FY 2026) for lower coverage; Long Term (Till FY 2031) for higher coverage.

The strategy is proposed for the Small and Medium Enterprises (SME) sector which consists of MSMEs in identified prominent sectors such as Pharmaceuticals and Light Engineering. An auditing and implementation scheme is proposed under this strategy for the unorganized and small industries sectors which would not meet the threshold energy consumption under the conventional PAT scheme. The strategy would involve the implementation of energy efficient technologies and new & innovative decarbonization technologies in the market in order to enable SMEs to meet their energy saving targets. It was assumed that 50% of industries will be able to adopt the strategy in moderate scenario and 70% industries will be covered in the ambitious scenario. The strategy is expected to result in energy savings of 0.0028 Mtoe and 0.0056 Mtoe in the moderate and ambitious scenarios respectively.

Table 10: Table showing key reduction potential in major MSMEs

Sector	Baseline SEC (toe/tonne)	Moderate SEC (toe/tonne)	Ambitious SEC (toe/tonne)	Production in 2031 ('000 tonnes)	Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
Pharmaceuticals	4.96	**4.464**	**3.97**	**5101.85**	**0.0025**	**0.0051**
Light Engineering	0.399	0.3591	0.32	6909.72	**0.0003**	**0.0006**

Implementing agency(s) – Bureau of Energy Efficiency (BEE); Directorate of Energy (DOE) of Himachal Pradesh may implement the strategy though various ESCOs empaneled with BEE or with State.

Actionable items:

A number of action items will need to be adopted by the relevant departments and implementing agencies for achieving the energy savings estimated for this strategy. These action items include:

1. **Workshops on technology interventions for energy conservations in MSMEs –**
   It is proposed to organize cluster wise workshops for MSMEs on technology interventions that can be implemented in respective industries. It is important to disseminate technical information about new technologies among owners and maintenance team of MSMEs so that they can implement latest technologies in their units.

2. **Demonstration projects on latest Energy Efficiency Technologies in SME clusters –** Demonstration projects are proposed to be carried out every year on a periodic basis in all prominent SME clusters to promote these technologies and make stakeholders aware about the monetary and energy performance impact of these technologies.

3. **Periodic standardized energy audits for MSMEs on load basis and reimbursement of energy audit cost with a maximum cap** – Develop a standard format of energy audit and issue notification for conducting mandatory periodic (in every 3 Years) energy audits by every unit above a certain limit of connected load. Government can also provide reimbursement of energy audit cost with a maximum cap of INR 75,000. Monetary support to small industries and MSMEs can be provided to maintain the standard of conducted energy audit.

4. **Sector-specific policy development for financial assistance on implementation of Energy Conservation Measures (ECMs) suggested in energy audit-** A policy shall be developed at state level to provide the financial assistance for implementation of Energy Conservation Measures (ECMs) recommended in the energy audits. Policy development shall consider the sector specific requirements, energy saving potential of sector and its importance in state level GSDP.

5. **Issuance of directives for implementation of ISO 50001, Energy Management System in organizations on load basis-** ISO 50001 is an international standard that outlines the requirements for an energy management system (EnMS). It provides a framework for organizations to establish, implement, maintain, and improve energy performance and efficiency. State Government shall issue directive to all units in state which are above a limit of connected load, to implement ISO 50001 and adopt Energy Management System in organizations. Implementation of ISO 50001 can help organizations identify and address energy efficiency opportunities, reduce energy consumption and costs, and improve their environmental performance.

6. **Technical assistance for transition from inefficient (installed before 2010) boiler to Energy Efficient boilers, use of steam traps, heat recovery systems and use of EE motors with different drive and other ECMs-**

State government departments through energy efficiency cell or ESCOs can provide technical support to MSMEs for transition from inefficient or old technology based boiler with latest technology based energy efficient boilers in Food Processing units. Steam Traps and heat recovery systems can also use in Food and Pharma industries. In Light Engineering clusters, support in replacement of motors & drives along with Installation of energy saver for welding machines can be provided. These technology changes can reduce the energy consumption of MSME sectors.

7. **Phase wise plan to implement DSM scheme for replacement of existing inefficient (non-star rated) pumps & motors in all clusters**

State government department shall develop a demand side management (DSM) plan to replace all existing pumps which are lower than 3 star rated or purchased/installed before 2015 with BEE 5-Star rated appliances. Phase wise plan can be executed through DISCOMs or listed ESCOs in the state.

4.3 Energy Saving Targets & Monitoring Mechanism

The proposed strategies can together achieve maximum potential energy savings of 0.026 MTOE & 0.053 MTOE in moderate and ambitious scenario respectively by FY 2031.

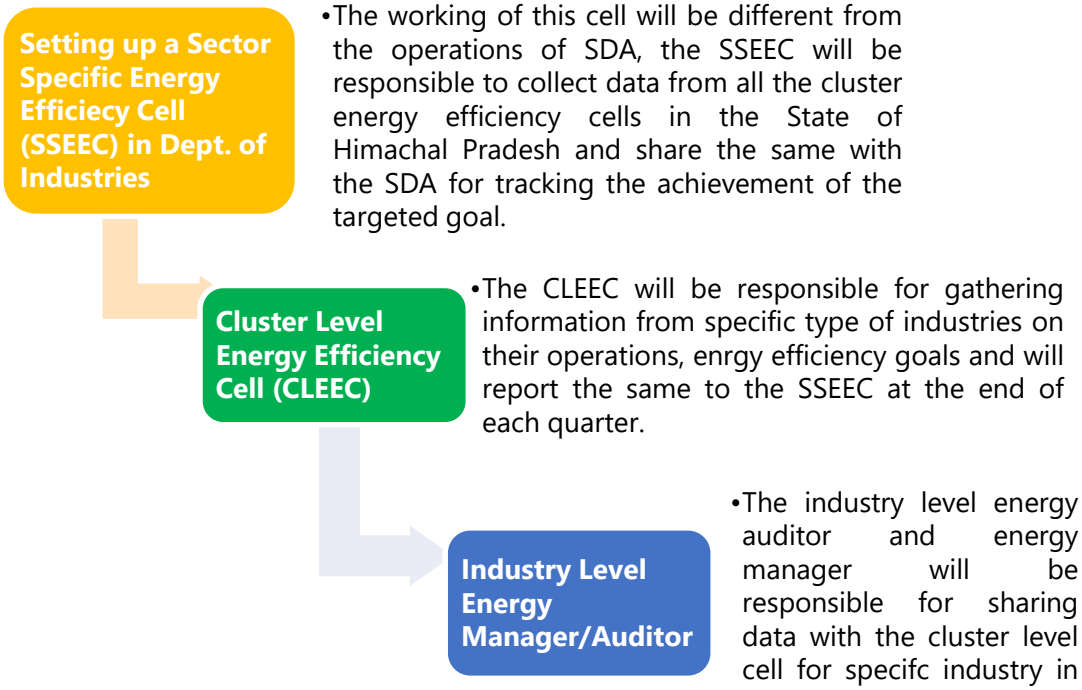
Table 11: Moderate and ambitious scenarios energy savings for Industry sector

Action Plan	Energy Savings in 2031 under moderate scenario (Mtoe)	Energy Savings in 2031 under ambitious scenario (Mtoe)
Deepening and Widening of PAT Scheme	0.024	0.048
Energy Efficiency Intervention in Light Engineering & Pharmaceuticals clusters	0.0028	0.0057
Total	**0.026**	**0.053**

Monitoring Mechanism:

The monitoring framework for achieving the target of the industry sector can be easily set up by defining annual reduction targets of the sectoral reduction goal.

The reduction target verification can be later done for monitoring the following for each quarter:


Setting up a Sector Specific Energy Efficiecy Cell (SSEEC) in Dept. of Industries
•The working of this cell will be different from the operations of SDA, the SSEEC will be responsible to collect data from all the cluster energy efficiency cells in the State of Himachal Pradesh and share the same with the SDA for tracking the achievement of the targeted goal.
Cluster Level Energy Efficiency Cell (CLEEC)
•The CLEEC will be responsible for gathering information from specific type of industries on their operations, enrgy efficiency goals and will report the same to the SSEEC at the end of each quarter.
Industry Level Energy Manager/Auditor
•The industry level energy auditor and energy manager will be responsible for sharing data with the cluster level cell for specifc industry in the specified format.

BUILDINGS SECTOR

5 Focus Sector 2: Buildings

5.1 Current Scenario

Out of the total population of Himachal Pradesh, only 10 percent of the people live in the urban region. Despite this fact, the power consumption in the buildings sector is gradually increasing. The energy consumption in the urban areas is significantly high due to the growing demand of energy in the buildings sector.

The state government of Himachal Pradesh has adopted the ECBC and notified it through the Himachal Pradesh Energy Conservation Building Code (HPECBC) in 2019. The HPECBC is applicable to all new commercial buildings, including buildings for office, hotels, and healthcare facilities with having a built-up area equal or greater than 750 square meters. The code mandates certain energy-efficient building design and construction practices, including requirements for building envelopes, lighting, air conditioning, and ventilation systems, and renewable energy utilization.

To facilitate the implementation of the HPECBC, the state government of Himachal Pradesh has established a State Designated Agency (SDA) - Directorate of Energy for energy efficiency. The SDA is responsible for providing technical assistance to government buildings to ensure compliance with the ECBC provisions.

Further, Bureau of Energy Efficiency (BEE), GoI has also launched Eco-Niwas Samhita (ENS) for residential buildings and residential part of mixed land used projects build on plot area ≥ 500 square meters in 2018. In the first phase minimum standards for the building envelope were launched to limit heat gain or heat loss of the residential building comprising adequate day lighting potential and ventilation. BEE, GoI developed Eco-Niwas Samhita part–II for setting up minimum standards for the Electromechanical Equipment for efficient use of energy in residential buildings. The provisions of ENS must be incorporated in Unified Building Byelaws (UBBL).

In Recent, The Energy Conservation (Amendment) Act, 2022. A unified code for building sector "Energy Conservation and Sustainable Building Code (ECSBC)" has been introduced. The ECSBC code will be applicable for both commercial and residential buildings. The buildings sector is a major energy guzzling sector in Himachal Pradesh. As per the graph below it can be witnessed that the energy consumption in building sector is continuously increasing since FY 2015.

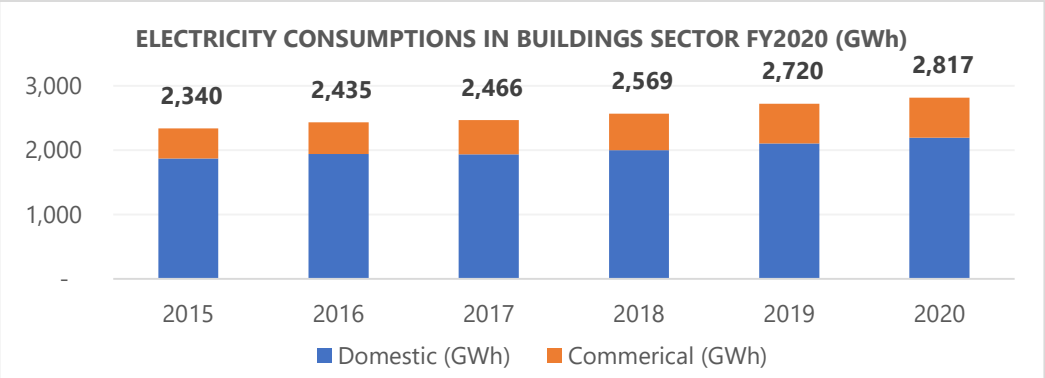
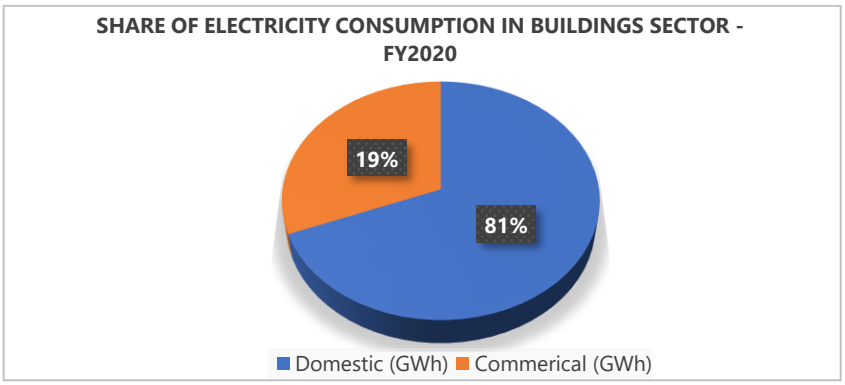


Figure 8: Electricity Consumption in the Buildings Sector (GWh)[33]

The commercial sector supports urbanization in Himachal Pradesh, but still caters to only 19% of the total electricity consumption in the buildings sector in FY2020. The domestic sector on the other hand, retains 81% of the electricity consumption, this indicates that the state requires a policy to encourage energy efficiency in the domestic sector, it may be noted that even if a fraction of the domestic sector is addressed by following energy efficiency plans, then a huge some of electricity consumption can be eradicated.

The sharing pattern of electricity consumption of the commercial and domestic sector for FY 2020 is represented in the following figure:[34]



33 32 https://himachalservices.nic.in/economics/pdf/StatisticalAbstract_2019_20.pdf, www.cea.nic.in/wp-content/uploads/general/2020/General_Review_2021.pdf,

5.2 Energy Efficiency Strategies in the Buildings Sector:

This section presents the proposed strategies in the domestic buildings and commercial buildings sector along with their impact in terms of energy saving potential. The following strategies are proposed in the building sector, as part of the State Energy Efficiency Action Plan:

1. **Effective Implementation of ECSBC**
2. **Replacement program for inefficient appliances**
3. **Promotion of BEE Star Rating and Shunya Rating of Buildings**

Although programs like Standards & Labelling and ECBC are prevalent in the state, the proposed strategies focus on enhancing the extent of their implementation by increasing the penetration of technology into the population and rate of implementation of these strategies.

Strategy #1 Effective Implementation of ECSBC (previously known as ECBC & ENS)

Himachal Pradesh is in the process of adopting Eco-Niwas Samhita (ENS) for residential buildings, while ECBC has been adopted and notified through HPECBC 2019. However, in the recent EC Act Amendment 2022, unified code "Energy Conservation and Sustainable Building Code" (ECSBC) is introduced which will cover both commercial and residential buildings. Till the implementation of ECSBC in states/UTs, ECBC and ENS will know as ECSBC.

Effective implementation of Energy Conservation and Sustainable Building Code (ECSBC) by increasing the penetration of ECBC and ENS compliant buildings in the state is proposed for upcoming commercial and domestic buildings in the state as a strategy for energy savings in the building sector. In order to estimate the savings through ECBC, the electricity consumption of the commercial buildings sector was projected till FY 2031. After forecasting the energy demand in the commercial building sector from FY 2023 to FY 2031, the annual increment in the electricity consumption in the commercial buildings sector was projected.

The total incremental electricity consumption of commercial buildings in the state is projected to be 86.72 GWh between FY 2023 to FY 2031This increment in

electricity consumption accounts for all the categories of commercial buildings of varying built-up areas. Relevant stakeholders in the state revised the consideration approach by incorporating that the buildings having a built-up area equal to or greater than 750 square meters shall be considered for ECBC compliance in the state. It has been taken into consideration that around 5% of the total Incremental electrical consumption contributing to the new commercial buildings having a built-up area equal to or greater than 750 square meters is estimated to be almost 4.34 GWh.

Based on the energy savings percentage from ECBC and ECBC+, the moderate and ambitious savings in the commercial building sector are found to be **1.08 GWh** and **1.52 GWh** respectively. An effective approach to reduce long-term unnecessary electricity usage in residential buildings is by making them more energy efficient. Implementing Energy-saving measures as per Eco Niwas Samhita (ENS) can be helpful in achieving this goal in the residential sector.

In the residential sector, by FY 2031, the electricity consumption is projected to be around 3,460 GWh. The overall incremental electrical consumption is estimated to be 1,011 GWh based on the anticipated household electricity demand by FY2031. In order to assess the savings that can be achieved from successful implementation of ENS, it is assumed that 4% of all the residential building stock would be ENS compliant by FY2031. The strategy is expected to result in electricity savings of 4.9 GWh in the moderate scenario and that of 6.1 GWh in the ambitious scenario. The cumulative energy savings expected from the enhanced implementation of ECBC and ENS in the state is shown below:

Table 12: Moderate and ambitious scenarios for effective implementation of ECSBC

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE) in ECBC	0.00009	0.00013
Energy Saving Potential (MTOE) in ENS	0.00042	0.00052
Total	**0.00051**	**0.00065**

Implementing Agency: Bureau of Energy Efficiency, Directorate of Energy-HP

Actionable Items:

1. **Setting-up of effective enforcement plan with ULBs and SDA as monitoring agencies-** Effective implementation of ECBC and ENS depends on the effectiveness of rules & regulation adopted by the State/UT. To ensure the same role & responsibility of all concerned departments, check points, monitoring mechanism and penalties must be properly defined in ECSBC rules & regulations.

   SDA being an extended arm of Bureau of Energy Efficiency shall monitor the process of ESCBC compliance and record the data of total energy savings achieved through the implementation of ECSBC.

2. **Development and maintenance of ECSBC compliance portal, directory of energy efficient materials/technologies** – For effective and aggressive implementation, it is proposed that the state shall have its own ECSBC online portal to aid in quick ECBC & ENS approval and monitoring process online. The portal would ensure a faster process of compliance application, third party verification and certification. The portal may also contain educational resources, directory of materials and vendors and user-friendly guides for enhanced awareness and capacity building of developers and professionals. Investment would be needed in the development and annual maintenance of the ECSBC portal for which SDA will be the implementing agency.

3. **Market Outreach for ECBC compliant Products, Radio Jingles, Social Media Awareness** – Market outreach for ECBC compliance products or products utilized in sustainable construction such as building materials used in passive building design would enable a conducive market for such materials which will promote construction practices necessary to comply with ECBC and ENS guidelines. The market outreach can take place through professional conventions and seminars, radio jingles and awareness campaigns on social media.

4. **Pilot projects for Super ECBC buildings as case studies (initial 20 Buildings)** – It is proposed that the state government also undertake the development of Super-ECBC buildings in the state and publish its case studies for the understanding of stakeholders. Initially upcoming government

building can be taken as a pilot project and best energy efficient technologies can be implemented to achieve the Super ECBC level. Case Study can be published in social media to encourage developers and other stakeholders to make Super ECBC compliant buildings.

5. **Home Energy Auditor Training, compliance structure and incentive on energy savings for first few residential projects** – BEE has developed a Home Energy Auditing tool. SDA may run awareness and capacity development programs in Himachal Pradesh to train building professionals about the benefit of auditing and implementation of Energy Conservation Measures (ECMs) in residential houses. SDA may encourage RWAs by providing some incentive based on energy savings on implementation of ECMs in their societies. These action items will help in the promotion of ENS in Himachal Pradesh and create technical capacity of the professionals.
6. **Periodic upgradation of PWD Schedule of Rates (SoR) to incorporate latest energy efficient materials and technologies**

   Regular upgradation of PWD Schedule of Rates (SoR) to incorporate latest energy efficient materials and technologies is required as technologies in the field of energy efficiency is developing on some very regular intervals. Adoption of new innovative technologies becomes easier if it is mentioned in PWD Schedule of Rates (SoR) document.
7. **Inclusion of curriculum on energy efficiency in buildings, in universities and Schools**

   Raising awareness about energy conservation among children is crucial. To instill a fundamental understanding of this concept and promote a behavioral shift in children, it is suggested that the curriculum on energy efficiency and conservation be developed and integrated into schools and universities in the State of Himachal Pradesh.

Strategy #2 Replacement program for inefficient (below than 3 Star Rated) appliances

Implementation Timeline: Long Term (Till FY 2031)

The Standards & Labelling (S&L) Programme of Bureau of Energy Efficiency (BEE) has seen a successful implementation across the country, leading to significant savings in energy through mandatory and voluntary use of energy efficient electrical appliances by consumers in a wide range of applications. The S&L programme encompasses appliances and equipment that have applications in multiple sectors, however the buildings sector is the most widely covered sector in terms of types and number of appliances.

At present, the S&L Programme covers the 29 appliances, with 11 appliances subject to mandatory regulation and the remaining 18 appliances subject to voluntary regulation. The list of mandatory and voluntary appliances is given in the table below:

Table 13: List of mandatory and voluntary appliances under S&L Programme

BEE Mandatory Appliances	BEE Voluntary Appliances
1. Room Air Conditioners	1. Induction Motors
2. Frost-free refrigerators	2. Agriculture Pump Sets
3. Tubular Florescent Lamps	3. LPG Stoves
4. Distribution Transformer	4. Washing Machine
5. Room Air Conditioner (Cassette, Floor Standing)	5. Office Equipment's (Printers & Copier)
6. Direct Cool Refrigerator	6. Ballast
7. Colour TV	7. Computers (Laptop/Notebooks)
8. Electric Geysers	8. Diesel Engine driven monoset pumps
9. Variable Capacity Inverter Air Conditioners	9. Solid State Inverter
10. LED Lamps	10. DG Sets
11. Ceiling Fans	11. Chillers
	12. Microwave Oven
	13. Solar Water Heater
	14. Light Commercial Air Conditioner
	15. Deep Freezers
	16. High Energy Li Battery
	17. Air Compressor
	18. UHD TV

*In addition to these 29 appliances, tyres/Tires are also covered in S&L programme

The current strategy has been proposed for the complete buildings sector covering both Domestic and Commercial Buildings. However, a majority of the mandatory and voluntary appliances have a significantly higher penetration in the domestic buildings sector than in the commercial buildings sector.

The electricity consumption pattern varies greatly between urban and rural areas. This is due to the variation in type and number of appliances being used by urban and rural residents. This entails the inclusion of the number of urban and rural households in the savings calculation. Based on the estimated population of the state as per the report "Population Projections for India and States 2011 – 2036" and Household Size as per census, the number of households were estimated out for urban and rural regions. Different categories of appliances have different penetrations among the urban and rural households, based on the usage pattern.

Some appliances viz. Fans, refrigerators, washing machines, LEDs, air-conditioners and microwaves have higher penetration as compared to other appliances. Taking into account the study given in the report "Impact Assessment of BEE's Standard & Labeling Program", penetration of different appliances among urban and rural areas was estimated. List of appliances considered in strategies is mentioned in the below table.

Table 14: Appliances taken into consideration for the strategy

Window AC	**Colour TV - LCD/Plasma/LED**
Split AC	Washing Machines
Refrigerator-DC	TFL (Tubular Flourescent Light)
Refrigerator-Frost Free	Electric Geysers
Ceiling Fans	LPG Stoves
Coulor TV CRT	Computer/Laptop/Notebooks

According to the study conducted by CLASP (Collaborative Labeling and Appliance Standards Program)[35] to assess consumer awareness of energy labelling, 48% of consumers are aware of the scheme and 15% have some knowledge of it. Appropriate number of 3-Star rated appliances have been taken from the calculation of total number of appliances. Saving strategies in the

[35]https://www.clasp.ngo/wp-content/uploads/2021/01/2007-05_IndiaLabelingProgramImpacts.pdf

moderate scenario include replacement of 3-star rated equipment to 5-star rated appliances, whereas in the ambitious scenario, replacement of non-star rated to 5-star rated equipment has been considered as a saving strategy. The percentage savings achieved upon transitioning from non-Star to 5-Star Labelled equipment's (efficiency) were considered for calculating savings in above mentioned scenarios.

The strategy is estimated to result in energy savings of 0.014 MTOE in the moderate scenario and 0.018 MTOE in the ambitious scenario till FY 2031.

Table 15: Moderate and ambitious scenarios for deepening of S&L Programme

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE)	0.014	0.018

Implementing Agency- Directorate of Energy – HP**,** DISCOMs, ESCOs

Actionable Items:

The action items to be carried out in order to implement the strategy at ground level mainly involve dissemination of the scheme's guidelines and specification amongst stakeholders such as manufacturers, retailers and consumers in a way that can ensure meeting the implementation timeline proposed for the strategy. The following action items are suggested in order to ensure effective implementation:

1. **Development of state-specific implementation models and identification of relevant agencies-** A detailed phase-wise plan needs to layout based on consumer's priority and reachability. It is important to develop a transparent model that can reach out to every household in the state. Financial implications will play a major role in replacement scheme so ESCOs and PPA models can be analyzed in detail. UJALA scheme is a successful case study in this area, can be referred for the development of state specific plan. Identification of implementing departments and agencies and listing of ESCOs in the state is required.
2. **Issuance of directive to government offices and buildings in the State to replace all existing inefficient appliances (lower than 3 Star Rated) with**

BEE 5-star rated appliances- State Government shall issue directives to all government offices and buildings owned by state government to replace all appliances which are lower than 3-star rated or purchased/installed before 2015 with BEE 5-Star rated appliances.

3. **Phase-wise plan for replacement of existing inefficient appliances (lower than 3 Star Rated) with BEE 5-star rated appliances in all buildings, through DSM schemes** Development of phase-wise Demand Side Management (DSM) plan based on the consumer's priority and market scenario shall be developed in consultation with DISCOMs. Implementation can be done with support of DISCOM's and various ESCOs listed with state government.
4. **Workshops & Campaigns on behavioral change interventions for energy conservation –** Capacity building of these stakeholders is key to develop a market environment for energy efficient appliances. State Government shall organize workshops at various levels to encourage people for behavioral change and run mass campaigns to reach out maximum people to increase awareness about benefits of behavioral changes and promote Lifestyle for Environment (LiFE). Workshops and campaigns shall be carried out to target maximum people by organizing through online platforms, print media, social media, nukkad nataks, and radio jingles etc.

Strategy #3 Promotion of BEE Star Rating and Shunya Rating of Buildings

Implementation period: Long Term (Till FY 2031)

The Star Rating and Shunya Rating of buildings is currently at a voluntary stage which is used as a benchmarking system for buildings in order to classify them in terms of 'Star-Rating' & 'Shunya Rating' on the basis of their energy performance. It is proposed that to promote Star Rating & Shunya Rating in all government & commercial buildings and conduct an assessment for their energy performance along with the ECBC Compliance process. Assessment of buildings on a scale of 1-5 stars or Shunya Rating will promote the development of energy efficient buildings in the state. Certification of Star Rating or Shunya Rating can be provided based on this assessment.

Implementing Agency: Bureau of Energy Efficiency; Directorate of Energy

Actionable Items:

1. **Issuance of directives to all government departments to conduct energy audits and target to achieve BEE Star Rating for their buildings**-
   State Government shall issue directives to all government departments and buildings owned by state government to conduct energy audit and implement energy conservations measures and target to achieve BEE Star Rating or Shunya Rating for their buildings.
2. **Periodic energy audits for commercial buildings on load basis and incentives on achieving specific level of star rating for buildings**-
   A notification from State Government shall be issued for conducting mandatory energy audits of commercial buildings based on their connected load and incentives can be given on the achievement of star rated energy efficient buildings to encourage more building owners to reduce their EPI and save more energy.
3. **Capacity Building of Architects & Building Professionals and Developers**-
   Capacity building programs of Architects & Building Professionals and Developers will ensure to increase the technical capacity of and awareness about innovative technologies. Capacity building of these stakeholders is key to developing a market environment for energy efficient buildings. The capacity building programs can be taken up periodically, preferably quarterly. Capacity building workshops may be carried out either district-wise or zone-wise and target maximum stakeholder to participant in these programs.
4. **Market Outreach for Star & Shunya Rating by Radio Jingles, Social Media Awareness-**
   Promotion of the Star & Shunya Rating is an important part of promoting energy efficiency in buildings. In order to increase awareness about these rating program, promotion campaigns shall be carried to reach masses by advertising in print media, social media, conduct nukkad nataks, plays and run radio jingles etc.

5. **Mandatory minimum set point of 24 degrees for air conditioners in all government buildings –** The Bureau of Energy Efficiency has been raising awareness on the energy savings and cost benefit of lowering the operating set point of air conditioners and have advised consumers across the country to maintain set point on or above 24 degrees Celsius to ensure optimal temperature and energy consumption from the use of air conditioners. It is recommended that government departments take lead in the implementation of this practice across the state.
6. **Transformation of iconic government buildings to Net-Zero energy buildings** -Transforming government buildings to net zero will ensure maximum energy performance of these buildings. It will further boost the market and professional environment of sustainable construction products, energy efficient appliances, and energy audit and consulting services. The SOR of government construction projects can be regularly updated with energy efficient and climate responsible materials through the help of this strategy.

5.3 Energy Saving Targets & Monitoring Mechanism

The proposed strategies can together achieve maximum potential energy savings of 0.01867 MTOE by FY 2031. The energy saving and emissions reduction targets for the short term (till FY 2026) and long term (till FY 2031) for the buildings sector under the two scenarios are shown in the table below.

Table 16: Moderate and ambitious scenarios energy savings for buildings sector

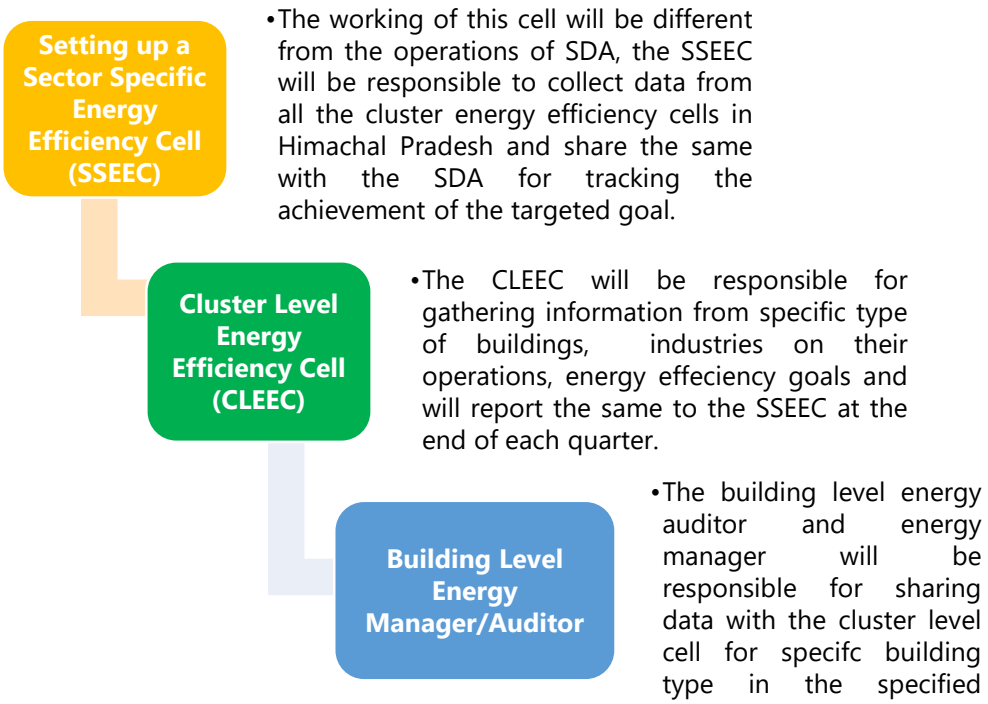
Action Plan	Energy Savings in 2031 under moderate scenario (Mtoe)	Energy Savings in 2031 under ambitious scenario (Mtoe)
Effective implementation of ECSBC	0.00051	0.00065
Replacement program for inefficient appliances	0.01371	0.01800
BEE Star Rating and Shunya Rating of Buildings	0.000013	0.000019
Total	**0.01424**	**0.01867**

Monitoring Mechanism:

The monitoring framework for achieving the target of the building sector can be easily set up by defining annual reduction targets of the sectoral reduction goal. Monitoring of points mentioned below through the dashboard will support in monitoring of energy efficiency initiatives in the state.

- Development of strategy-specific dashboards to monitor the impact and track progress of ECBC buildings, ENS buildings, Net Zero buildings in the state and the energy savings achieved from these strategies.
- Regular reporting and updating of dashboards can be done with the support of Directorate of Energy or ECBC/ENS cell.
- Development of dashboard to monitor the sale of different star-labelled appliances sold in a year categorized according to star rating level.

Mechanism for data collection and reporting from various clusters and various energy efficiency initiatives may be done through Setting up a Sector Specific Energy Efficiency Cell (SSEEC), Cluster Level Energy Efficiency Cell (CLEEC) and Building Level Energy Manager/Auditor.



TRANSPORT SECTOR

6 Focus Sector 3: Transport

6.1 Current Scenario

Being a tourist spot Himachal Pradesh receives heavy traffic of vehicles throughout the year. The Himachal Pradesh government in order to promote sustainable transportation is taking several steps. One of these steps include promotion of Electric vehicles.

The State government has launched H.P. State EV Policy, 2022. Under this policy the state government is targeting setting up of low or zero emission zones where only electric vehicles would be permitted. Priority will be given to tourist spots, eco-sensitive areas, and reserve forests to have minimum emissions. Presently, 75 electric buses are being plied by the Himachal Road Transport Corporation (HRTC) besides 50 electric taxis and 150 three wheelers.[36]

As per the data received from Vahan Portal an average increment of 36% is observed when compared with the base year FY 2017. Further, there has been a steady increase in private vehicles under four wheelers and two wheeler category which exhibits a potential of positive EV transition in Himachal Pradesh.

Adding to that, the sectoral transport share of the state is led by two-wheelers which holds around 52% of the total registered vehicles. This shows potential of transition when compared with the market availability. The data for the number of vehicles has been sourced from the Vahan Portal.

The number of registered vehicles in the state has increased from 14,56,153 in FY 2017 to 19,85,505 in FY 2021, with an Average Annual Growth Rate (AAGR) of 8%. In the study, tractors, ambulance, tankers, and private trailers have been excluded which is negligible in the numbers as compared to the total registered vehicles.

[36] H.P. State EV Policy, 2022

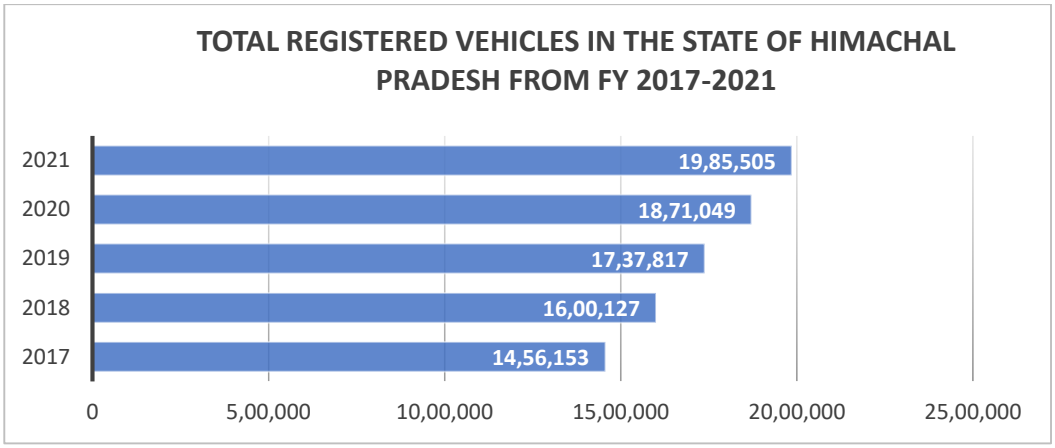


Figure 9: Total registered vehicles in the State of Himachal Pradesh

The AAGR of each vehicle category has been considered as CAGR in order to estimate the total number of vehicles of each category by the year 2031.

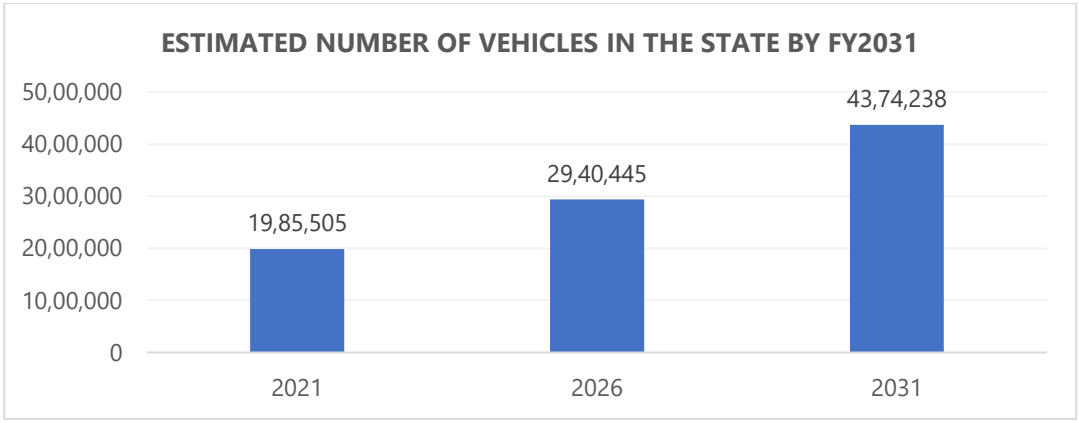


Figure 10: Projected number of vehicles in Himachal Pradesh by FY2031

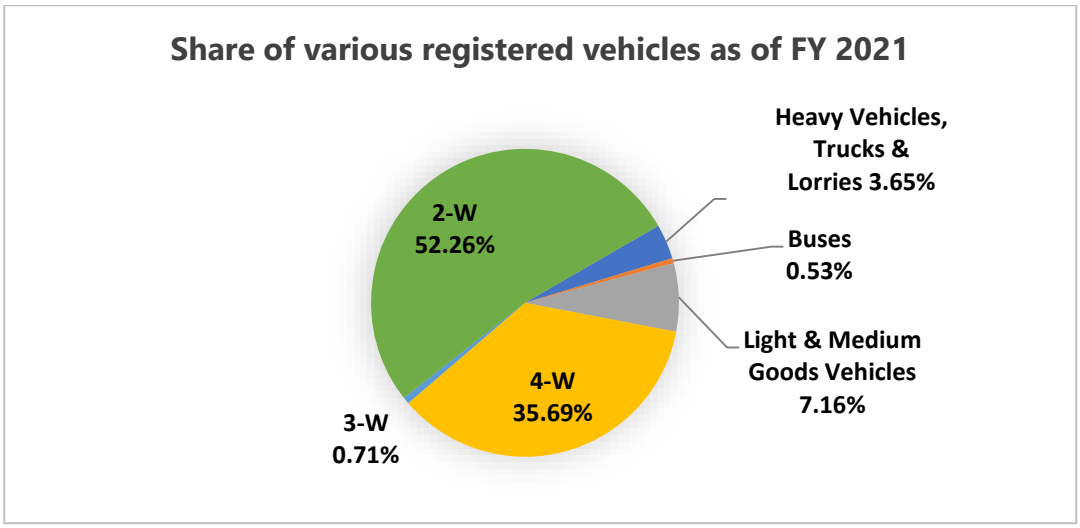


Figure 11: Share of various registered vehicles as of FY 2021

It can be seen that 2 wheelers at 52.26% make up the largest share in the vehicle category type. The next-highest is 4 wheelers at 35.69% share. Hence, targeting two-wheelers for transition to electric vehicles can bring about significant reduction in primary energy consumption in the transport sector of Himachal Pradesh.

6.2 Strategies in the Transport Sector:

In line with the Himachal Pradesh EV Policy 2022, the long-term strategy for Electric Vehicle Transition has been proposed for the state. The policy and the proposed strategy encompass a number of aspects of the transport sector ranging from incentives to consumers to undergo EV transition, converting state's bus fleet to electric, electric transition in logistics transport, and development of charging station across the state. Ethanol blending in petrol is proposed as another strategy to bring about emissions reduction in the transport sector. The strategy has been proposed in line with the national policy on ethanol blending.

Strategy #1 Infrastructure Development for EV charging stations and Incentives to Consumers for quick transition to EVs

Implementation Period: Long Term (Till FY 2031)

The transition to Electric Vehicles (EVs) across all segments of vehicles will be instrumental in decarbonization of the sector and in bringing significant savings in fossil-fuel based energy consumption. In this strategy, it is proposed to convert new vehicles registered in the state till FY 2031 to electric vehicles along two different scenario trajectories, namely moderate scenario and ambitious scenario. The highest EV conversion rate is proposed for 2-wheelers because of it having the highest share in registered vehicles and taking into consideration the availability and affordability of 2-Wheeler electric vehicles. The EV conversion considerations for moderate and ambitious scenarios are given in **Table 17**.

Table 17: EV transition considerations for moderate and ambitious scenarios

Moderate Scenario	Ambitious Scenario
• 15% of conventional 2-Wheelers convert to electric by 2031 • 15% of conventional 4-Wheelers convert to electric by 2031 • 15% buses in the state to transition to electric buses by 2031 • 15% of 3-Wheelers to convert to electric by 2031 • 15% of heavy vehicles (trucks and lorries) to convert to electric by 2031	• 30% of conventional 2-Wheelers convert to electric by 2031 • 30% of conventional 4-Wheelers convert to electric by 2031 • 30% buses in the state to transition to electric buses by 2031 • 30% of 3-Wheelers to convert to electric by 2031 • 30% of heavy vehicles (trucks and lorries) to convert to electric by 2031

The EV transition strategy can result in potential energy savings of 0.07 MTOE and 0.15 MTOE in the moderate scenario and ambitious scenario respectively.

Table 18: Energy Savings Potential

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE)	0.07	0.15

Actionable Items:

1. **Establishment of regulatory mechanism to develop EV charging Infrastructure**-

There are several regulatory mechanisms that can be put in place to develop EV charging infrastructure in Himachal Pradesh. Some possible approaches are mentioned below:

- Incentives for private companies to install charging infrastructure: The government can provide incentives such as tax breaks or subsidies to private companies that install EV charging infrastructure in Himachal Pradesh.
- Public-private partnerships: The government can enter into partnerships with private companies to develop and operate EV charging infrastructure. This can include agreements on revenue sharing, investment, and maintenance.

- Zoning regulations: The government can zone certain areas of the city for EV charging infrastructure, such as near highways or in commercial areas, to ensure that the infrastructure is developed where it is most needed.
- Time-of-use pricing: The government can introduce time-of-use pricing for EV charging to encourage drivers to charge their vehicles during off-peak hours when electricity is cheaper.

By implementing some or all of these regulatory mechanisms, the Himachal Pradesh government can encourage the development of a robust EV charging infrastructure that will help to support the transition to electric vehicles in the state.

2. Pilot projects on Battery Swapping stations

Establishment of a wide network of swappable battery station is a key of success for EV infrastructure in the state. Pilot projects on battery swapping stations can provide valuable information and insights into the feasibility and effectiveness of this technology.

Battery swapping pilots can be tried in key Government offices and through private, specially IT buildings, with large car ownership. In Himachal Pradesh, the battery swapping stations could be setup along a major highway to demonstrate how this technology can enable long-distance electric vehicle travel. This pilot project can provide valuable data on how battery swapping affects driving patterns and charging behaviour.

These pilot projects can provide valuable information on the practicality, cost, and user acceptance of battery swapping stations, which can inform the development and implementation of future policy initiatives.

3. Pilot projects on Hydrogen Fuel Cell Vehicles (HCVs)

Pilot projects on hydrogen fuel cell vehicles (HCVs) can be an effective way to explore the potential of this technology and to identify any barriers or challenges to its widespread adoption. The results of the pilot project should be shared with stakeholders, including the public, to raise awareness of the potential of HCVs.

Strategy #2 Ethanol Blending Program

Implementation Period: Long Term (Till FY 2031)

The Ethanol Blending Program is proposed to ensure mixing of ethanol in motor spirit (petrol) in a fixed ratio to offset a part of the energy consumed by petrol and bring about reduction in emissions. In the proposed strategy and in line with the country's target of 20% blending of ethanol blending in petrol by 2031, a 10% blending target is suggested in the moderate scenario and a 20% blending target is suggested in the ambitious scenario.

The ethanol blending can lead to potential fossil fuel energy savings of 0.09 MTOE and 0.17 MTOE in the moderate and ambitious scenarios respectively.

Table 19: Moderate and ambitious scenarios for Ethanol blending

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE)	0.09	0.17

Implementing Agency: Oil Marketing Companies (OMCs), Department of Agriculture, Department of Transport & Individual Government Departments.

Actionable Items:

1. **Financial Assistance on Biofuel production plants (Capital Subsidy for MSMEs)**

   To ensure a steady supply of ethanol for blending with petrol, it is recommended to offer financial assistance for the installation of biofuel production plants. Micro, small, and medium-sized enterprises (MSMEs) interested in setting up these plants could receive capital subsidies. The aim is to establish a strong supply chain for feedstock to meet production targets and create a supportive environment for ethanol blending in fuel. By promoting the growth of biofuel industries, new technologies can be introduced and the market can be strengthened.

Strategy #3 Promotion of Standard and Labelling program of Tyres for Fuel Efficiency in Vehicles

The Bureau of Energy Efficiency (BEE) in India has implemented a standard and labeling program for tyres to promote fuel efficiency in vehicles The promotion of a standard and labeling program for tyres with regard to fuel efficiency in vehicles can be an effective way to encourage the adoption of more fuel-efficient tyres by consumers.

Actionable Items:

1. **Awareness campaigns:** The first step is to create awareness among consumers about the importance of fuel-efficient tyres and the benefits of using them. This can be done through advertising campaigns, social media, and other public outreach efforts. The government can provide education to consumers on how to maintain their tyres for optimal fuel efficiency. This can include tips on proper inflation, regular rotation, and alignment.

2. **Capacity Building of Tyre Manufacturer and Vehicle OEMs-** Capacity building workshops shall be organized in the state to enhance the knowledge of Tyre Manufacturers and Vehicle OEMs about Star Rating of Tyre and its benefits and compliance methodology to encourage them to produce or use star rated tyres.

   By promoting a standard and labeling program for tyres with regard to fuel efficiency, consumers can make informed decisions about which tyres to purchase, and manufacturers can be encouraged to develop more fuel-efficient tyre technology. This can result in significant reductions in fuel consumption and greenhouse gas emissions, contributing to a more sustainable future.

6.3 Energy Saving Targets & Monitoring Mechanism

On the basis of the two strategies proposed for the transport sector, the total energy saving estimated is 0.16 MTOE in the moderate scenario and 0.32 MTOE in ambitious scenarios. The potential savings under moderate and ambitious

scenarios is the overall estimated savings from individual strategies under the respective scenarios, and can be considered as the energy saving targets for FY 2031 for the Transport Sector.

Strategies	Energy Savings in 2031 under moderate scenario (Mtoe)	Energy Savings in 2031 under ambitious scenario (Mtoe)
Transition to electric vehicles	0.07	0.15
Ethanol blending	0.09	0.17
Total	**0.16**	**0.32**

Monitoring Mechanism:

The monitoring framework for achieving the target of the transport sector can be easily set up by defining annual reduction targets of the sector. Monitoring of points mention below through the dashboard will support in monitoring of energy efficiency initiatives in the state.

- Development of dashboard to monitor the sale of electric vehicles sold in a year categorized under 2-wheelers, 3-wheelers, 4-wheelers, buses, and heavy vehicles.
- The dashboard can also include city-wise mapping of EV charging infrastructure across the state.
- The dashboard may be scalable to include alternative fuel vehicles such as Hydrogen Fuel Cell Vehicles.

Mechanism for data collection and reporting from various clusters and various energy efficiency initiatives may be done through Setting up a Sector Specific Energy Efficiency Cell (SSEEC) and Cluster Level Energy Efficiency Cell (CLEEC).

Setting up a Sector Specific Energy Efficiency Cell (SSEEC)

- The working of this cell will be different from the operations of SDA, the SSEEC will be responsible to collect data from all the cluster energy efficiency cells in the state and share the same with the SDA for tracking the achievement of the targeted goal.

Cluster Level Energy Efficiency Cell (CLEEC)

- The CLEEC will be responsible for gathering information and will report the same to the SSEEC at the end of each quarter.

AGRICULTURE SECTOR

7 Focus Sector 4: Agriculture

7.1 Current Scenario

Agriculture is the main occupation of the people of Himachal Pradesh and therefore plays an important role in the economy of the State. According to the 2011 Census, Himachal Pradesh is the only State in the country where 89.96 per cent of the population lives in rural areas. About 13.62 per cent of the total GSDP comes from agriculture and its allied sectors. Though the share of agriculture in overall GSDP is low but the number of people associated with this sector is quite high. About 69 per cent of the main workers are engaged in agricultural pursuits. Agriculture is beset with the disadvantage of small holdings. Only 75 per cent of the total reporting area is available for cultivation. Out of this area, 'net area sown' and 'current fallows' account for only 13 per cent.[37]

Table 20: Land use statistics of Himachal Pradesh[38]

Land Use	Area (sq km)	Percentage
Total geographical area	55,673	NA
Reporting area for land utilization	45,490	100.00
Forests	11,010	24.21
Not available for cultivation	11,290	24.82
Permanent pastures and other grazing lands	14,960	32.89
Land under misc. tree crops and groves	650	1.43
Cultivable wasteland	1,380	3.03
Fallow lands other than current fallows	150	0.33
Current fallows	640	1.41
Net area sown	5,410	11.90

7.2 Energy Efficiency Strategies in the Agriculture Sector:

This section presents the proposed strategies in the Agriculture sector along with their impact in terms of energy saving potential. The following strategies are proposed as part of the State Energy Efficiency Action Plan:

[37] Economic Survey of Himachal Pradesh 2020
[38] *data.gov.in/ resources/ land-use-pattern-himachal-Pradesh*

1. Transition of conventional diesel pumps to Solar powered pumps.
2. Replacement of inefficient (non-star rated) pumps with BEE 5 Star Rated Pumps along with smart control panel.

Strategy #1 Transition of conventional diesel pumps to Solar powered pumps

Implementation period: Till FY2024[39]

Implementing Agency: Department of Agriculture, Department of Horticulture

The proposed strategy in the agriculture sector is to transition from conventional diesel pumps to solar-powered pumps by FY2024. This strategy is in line with the country's target to replace diesel with renewable energy sources in the agricultural sector to achieve the goal of zero diesel use by FY2024. This transition is necessary to reduce the sector's dependence on fossil fuels and move towards a more sustainable and environmentally friendly energy source.

The first scenario is the moderate scenario, which aims to transition 75% of diesel-powered pumps to solar pumps by 2024. This scenario aims to achieve a significant reduction in the energy consumption of pumps used in irrigation, leading to significant energy savings.

The second scenario is the ambitious scenario, which aims to transition 100% of diesel-powered pumps to solar pumps by 2024. This scenario is the ideal goal and aims to achieve maximum energy savings in the agriculture sector by completely eliminating the use of diesel-powered pumps. This scenario will not only lead to energy savings but will also contribute to reducing carbon emissions, improving air quality and environmental sustainability.

It is also essential to note that the transition to solar-powered pumps will reduce the operational and maintenance costs as solar pumps do not require regular fuel refilling and have fewer moving parts, resulting in less wear and tear. Moreover, the installation of solar pumps will also provide an additional source

[39] https://pib.gov.in/PressReleasePage.aspx?PRID=1797488

of income for farmers, as they can sell excess electricity generated by the solar panels back to the grid.

In addition to the benefits mentioned above, the transition to solar-powered pumps will also lead to increased reliability and stability of power supply, as solar energy is available throughout the day and is not subject to disruptions in fuel supply.

Overall, the transition from conventional diesel pumps to solar-powered pumps will lead to a total savings of 0.000438 MTOE in moderate scenario and 0.000583 MTOE in ambitious scenario.

Table 21: Energy Savings Potential in Transition of conventional diesel pumps to Solar powered pumps

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE)	0.000438	0.000583

Actionable items:

1. **Greater outreach to relevant stakeholders:** It is crucial to engage and inform all relevant stakeholders, including farmers, Panchayat officials, and other key players in the agriculture sector, about the benefits of the PM KUSUM Yojana. This can be done through awareness campaigns, workshops, and meetings at the local level. This will help ensure that everyone is aware of the program and its benefits and can work together to implement it effectively.

2. **Capacity building of Panchayat/Block level officials:** It is important to provide training and capacity building programs to Panchayat and Block level officials to ensure effective implementation of the program. This can include training on the technical aspects as well as on the administrative aspects of the program. This will enable officials to provide the necessary support and guidance to farmers and other stakeholders in their respective areas and ensure the successful implementation of the program.

Strategy #2 Replacement of inefficient (non-star rated) pumps with BEE 5 Star Rated Pumps along with smart control panel

Implementation period: Long-term (Till FY2031)

Implementing Agency: Department of Agriculture, Department of Horticulture

This strategy aims to reduce energy consumption and increase the efficiency of the pumps used in irrigation. The implementation period for this strategy is long-term, until FY2031. During this period, two scenarios have been proposed. The first scenario is the moderate scenario, which aims to replace 50% of the inefficient electric-powered pumps with BEE Star rated pumps by FY2031. This scenario aims to achieve significant energy savings and improve the efficiency of pumps used in irrigation.

BEE Star rated pumps are designed to consume less energy and operate efficiently, resulting in cost savings for farmers in terms of lower electricity bills and reduced maintenance costs. The second scenario is the ambitious scenario, which aims to replace 70% of the inefficient electric-powered pumps with BEE Star rated pumps by FY2031. This scenario is the ideal goal and aims to achieve maximum energy savings in the agriculture sector by replacing the majority of inefficient pumps with energy-efficient ones. Overall, this strategy will lead to a total saving of 0.000125 MTOE in moderate scenario and 0.000175 MTOE in ambitious scenario.

Table 22: Energy Savings Potential in Replacement of inefficient (non-star rated) pumps with BEE 5 Star Rated Pumps along with smart control panel

Particulars	Moderate Scenario	Ambitious Scenario
Energy Saving Potential (MTOE)	0.000125	0.000175

Actionable items:

Development of a phase-wise plan to implement Demand Side Management (DSM) scheme for replacing existing inefficient pumps through Energy Service Companies (ESCOs).

1. The plan should include the identification of inefficient pumps, the assessment of the feasibility of the replacement of these pumps with energy-efficient ones, and the selection of ESCOs for the implementation of the DSM scheme.
2. The plan should be developed in consultation with relevant stakeholders, including farmers, pump manufacturers, and ESCOs, to ensure that the implementation of the DSM scheme is feasible, cost-effective and leads to energy savings.
3. Intervention of Solar-powered and energy efficient cold storage systems for the agriculture and horticulture departments. Below are the parameters which can improve energy efficiency in cold storage systems:
    - Insulation
    - Temperature Control
    - Efficient Refrigeration Equipment
    - Lighting & Controls
    - Maintenance and Regular Inspections
    - Renewable Energy Integration
    - Data Monitoring and Analysis
    - Employee Awareness and Training

7.3 Energy Saving Targets & Monitoring Mechanism

On the basis of the two strategies proposed for the agriculture sector, the total energy saving estimated is 0.000563 MTOE in the moderate scenario and 0.000759 MTOE in ambitious scenarios. The potential savings under moderate and ambitious scenarios is the overall estimated savings from individual strategies under the respective scenarios and can be considered as the energy saving targets for FY 2031 for the Agriculture Sector.

Strategies	Energy Savings in 2031 under moderate scenario (Mtoe)	Energy Savings in 2031 under ambitious scenario (Mtoe)
Transition of conventional diesel pumps to Solar powered pumps	0.000438	0.000583
Replacement of inefficient (non-star rated) pumps with BEE 5 Star Rated Pumps along with smart control panel	0.000125	0.000175
Total	**0.000563**	**0.000759**

Monitoring Mechanism:

The monitoring framework for achieving the target of the agriculture sector can be easily set up by defining annual reduction targets of the sector.

Setting up a Sector Specific Energy Efficiency Cell (SSEEC)

- The working of this cell will be different from the operations of SDA, the SSEEC will be responsible to collect data from all the cluster energy efficiency cells in Himachal Pradesh and share the same with the SDA for tracking the achievement of the targeted goal.

Cluster Level Energy Efficiency Cell (CLEEC)

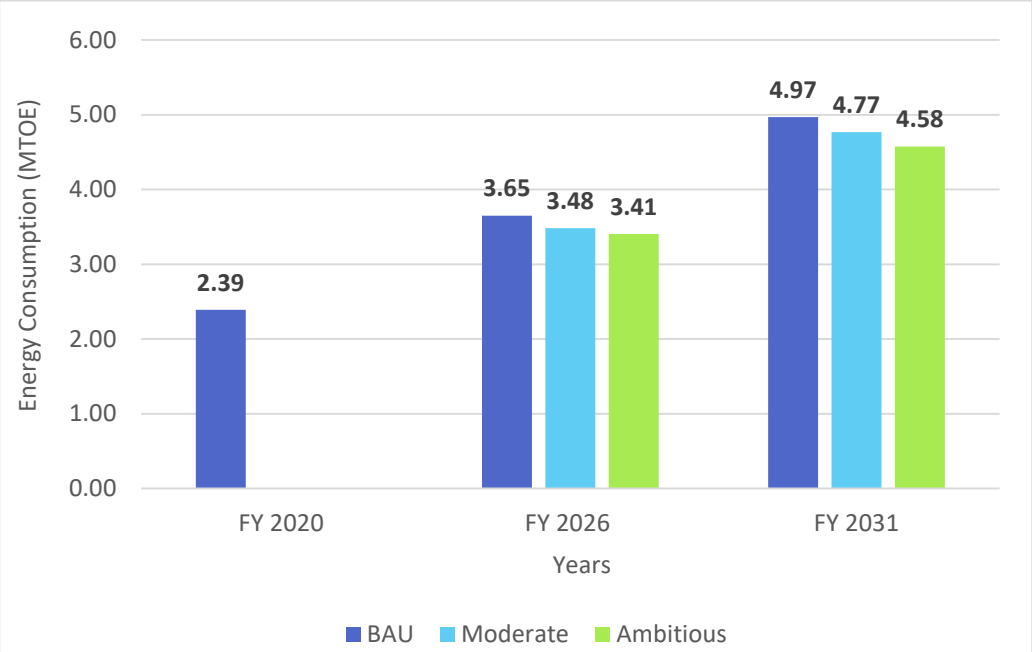
- The CLEEC will be responsible for gathering information about the transition of conventional diesel pumps to solar-powered pumps and the replacement of inefficient pumps with BEE 5 Star Rated Pumps along with smart control panels. The CLEEC will report the data to the SSEEC at the end of each quarter, including the number of pumps replaced, energy consumption data, and any other relevant information.

Regular Review and Monitoring

- The SSEEC will review the progress of the program on a regular basis, ensuring that the targeted goals are being met. The SSEEC will also provide regular feedback to the CLEECs and the SDA to ensure that the program is running smoothly and that any issues are addressed in a timely manner.

8 Investment Potential in Focus Sectors

The energy saved as a result of the proposed strategies in all sectors will lead to avoided generation of equivalent amount. In order to implement the suggested strategies, there will be need for investments in energy efficiency projects, development of new policies, and modification of existing policies. In order to estimate the investment potential generated from the suggested strategies in the focus sectors, the equivalent cost of the saved energy in terms of metric tonnes of oil equivalent has been calculated. The Ministry of Power, Government of India, in consultation with the Bureau of Energy Efficiency (BEE) has notified the price of per metric tonne of oil equivalent as INR 18,402 only for the year 2018-19. The same amount has been applied to energy savings under ambitious scenario for the estimation of maximum investment potential. Total energy saving potential by implementing various strategies in Himachal Pradesh is shown in the graph below:



It is estimated that with the implementation of various proposed strategies of Building, Transport, Agriculture and Industry Sectors, energy saving of 0.20 MTOE in moderate scenario and 0.39 MTOE in ambitious scenario can be achieved.

Sectors	Energy Consumption Reduction (Mtoe) - FY2031		Investment Potential (INR Crores)
	Moderate	Ambitious	
	Mtoe	Mtoe	
Industry	0.03	0.05	97.63
Buildings	0.014	0.019	34.36
Transport	0.16	0.32	585.20
Agriculture	0.0006	0.001	1.40
Total	**0.20**	**0.39**	**718.59**

9 Way Forward

The state energy efficiency action plan, through the research and interaction with various stakeholders, identifies the need, opportunity, and the potential of energy efficiency in the State of Himachal Pradesh. While addressing the key focus sectors – Industry, Buildings, Transport and Agriculture, the action plan envisages to analyze consumption pattern, growth rates in alignment with GDP growth rate of the state and potential strategies for achieving savings.

The action plan lays out a plan for the state to implement the strategies, while at the same time being able to monitor implementation. It is imperative that implementation is carried out in the state through various stakeholders.

A market-based mechanism is anticipated to be developed through the implementation of the action plan which drives energy efficiency through better availability of energy efficiency products, financial instruments for improving the product reach and a wider adoption of energy efficiency schemes and policies curated by both state and central governments.

A collaborative approach, on the part of the government, industry and academia is the ideal way forward to implement the vision and targets of this action plan and continue to put the country on a high pedestal of energy efficiency achievements at the global platform.

10 Bibliography

1. Bureau of Energy Efficiency (BEE). (2019). *Unlocking National Energy Efficiency Potential (UNNATEE)*
2. Bureau of Energy Efficiency (BEE). (2019). *Roadmap of Sustainable and Holistic Approach to National Energy Efficiency (ROSHANEE)*
3. Reserve Bank of India (RBI). (2021). *Handbook of Statistics on Indian Economy 2020-21*
4. Ministry of Power, Govt. of India. *24x7 Power for All (Himachal Pradesh)*
5. Ministry of Environment, Forest & Climate Change, Govt. of India *State Action Plan on Climate Change (Himachal Pradesh)*
6. Himachal Pradesh Statistical Abstract 2019-20
7. Sameeeksha Dashboard
8. Vahan Dashboard
9. Census of India 2011
10. NITI Aayog: India Energy Dashboards
11. Annual Report, Govt. of India, *Ministry of Micro, Small and Medium Enterprises, 2014-15*