State Energy Efficiency Action Plan

Jharkhand

July 2024

Energy is Life, Conserve it

GOVERNMENT OF INDIA
MINISTRY OF POWER

GOVERNMENT OF JHARKHAND

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Lifestyle for Environment

JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY
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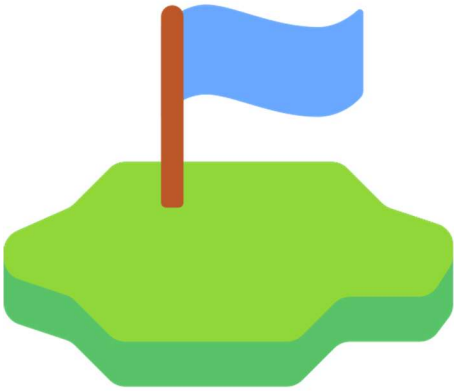
Introduction & State Profile

India's first NDC in Paris Agreement on Climate Change - 2016 called for 33-35% reduction of emissions intensity of GDP by 2030 compared to 2005. However, this target has been increased to 45% in the recent COP26.



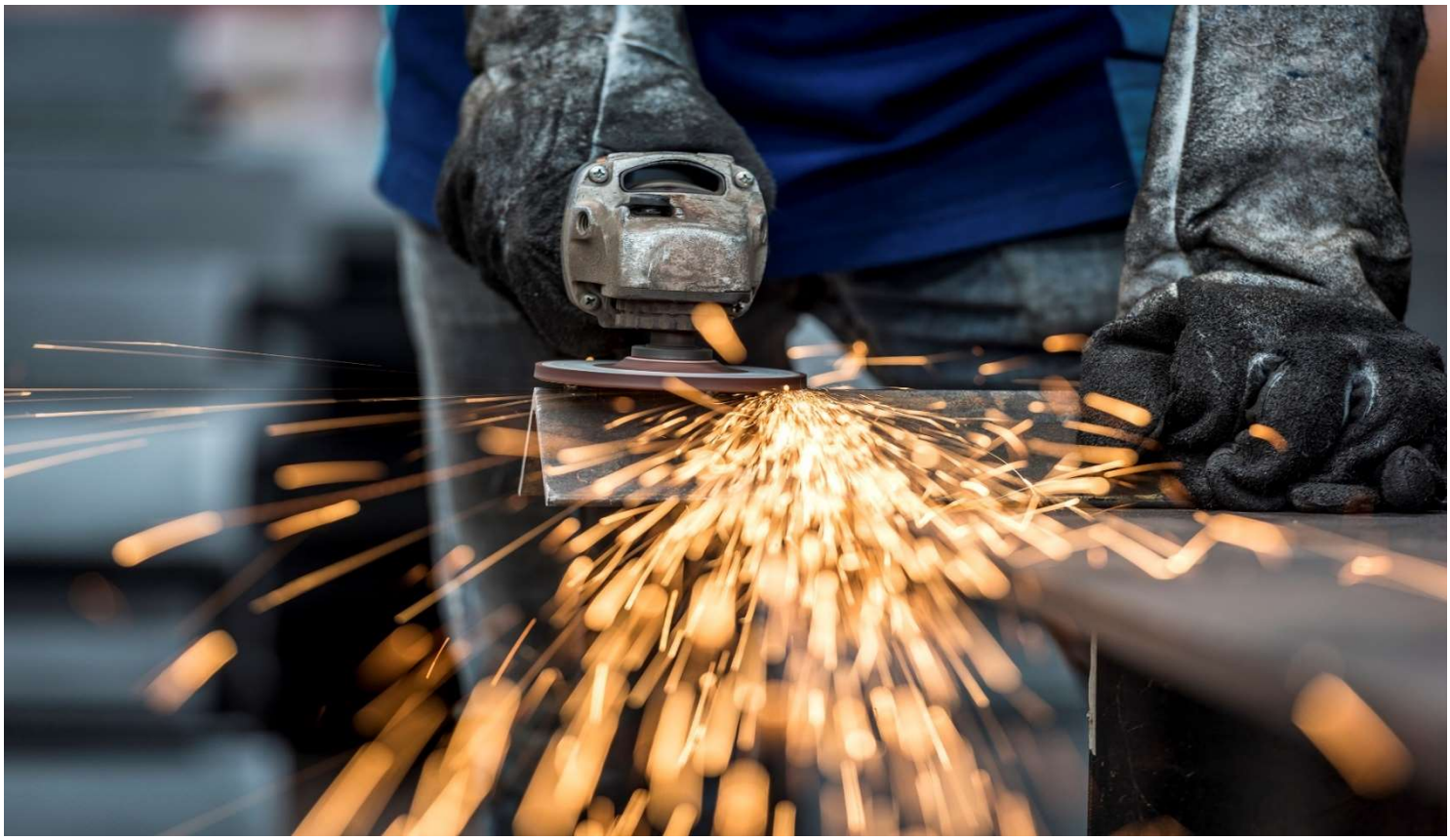
The objective of the **State Energy Efficiency Action Plan (SEEAP)** is to ensure that the allocation of resources is as per the requirement of the state and to estimate the potential of energy conservation in sectors that are predominant in the region. The current assignment envisions the following:

- Identification of stakeholders from various sectors,
- Identification of focus sectors in a state,
- Identification of gaps through surveys,
- Sector-specific energy projections and energy savings targets
- Benefits to the State and various stakeholders through the implementation of the Energy Efficiency Action Plan

Overview

With the energy efficiency agenda gaining traction and momentum in India, there is a need to continuously evaluate institutional capacity, policies, programs, and markets at the state level to identify best practices and promote cross learning. Developing State Specific Energy Efficiency Action Plan through identification of focus sector, undertaking gap analysis, adopting best practices followed in peer group with implementation plan strategy; that can act as platform for developing State's Energy Policy and Programs. This assignment aims to develop State Specific Energy Efficiency Action Plans for the state of Jharkhand

As a part of the assignment, there has identification of stakeholders from various sectors, identification of focus sector in the state of Jharkhand, identification of gaps in the sector, providing best practices and identification of designated agency to carry out efficiency activity in the sector in consultation with state for preparation of a short-term plan till the year 2025 and a medium-term plan till the year 2030. The plan also highlights the benefits derived from these initiatives to the state.



Jharkhand is in the eastern part of India and has geographical area of 79,716 sq. km and population of 3.8 crore. The natural resources, policy incentives and location-specific advantages of Jharkhand support investments in sectors such as mining and metal extraction, engineering, iron and steel, and chemicals. In 2019-20, the gross domestic product of Jharkhand was INR 3,29,726 crore and per capita GDP was INR 87,1271. Jharkhand is rich in mineral resources such as coal (27.3% of India's reserves), iron ore (26% of India's reserves), copper ore (18.5% of India's reserves), uranium, mica, bauxite, granite, limestone, silver, graphite, magnetite, and dolomite. Since Jharkhand has around 40% of the country's mineral wealth, its extensive mineral resources make mining, metals, and related sectors especially lucrative for investments. Jharkhand is the only state in India to produce coking coal, uranium, and pyrite. The state is also a leading producer of coal, mica, kyanite and copper. The state's coal reserves are estimated at around 83,151 million tonnes. Jharkhand accounts for 20-25% of the total steel produced in the country.

Key Economic Areas in Jharkhand

The following are the key sectors that have emerged as major contributors to the growth of Jharkhand:

Agriculture

Jharkhand is a leading producer of vegetables, fruits and flowers. It provides livelihood to 80% of rural population in the state. Paddy, maize, pulses, sunflower, groudnut and fruits are the main agriculture produce.

Steel

Jharkhand is one of India's leading steel producing states and accounts for 20-25% of total steel production in India. Large steel plants like SAIL Bokaro and Tata Steel Jamshedpur have been established in Jharkhand.

Metals & Minerals

Jharkhand has coal reserves of 86,217 million tonnes which account for 24.5% of India's total coal reserves. In terms of minerals and resources, Jharkhand accounts for 27% of India's overall mineral reserves with 26% of iron ore reserves, 18% of copper reserves.

Textiles

Jharkhand is a major producer of Tasar silk and constitutes 62% of India's Tasar silk production. Jharkhand produces 1200 MT of Tasar silk annually and is blessed with abundant raw material. Jharkhand has various garment clusters and there are incentives provided by state government like rebate on land cost

Engineering

Jharkhand has a booming heavy engineering industry and large PSUs like MECON Limited and Heavy Engineering Corporation Limited are situated in the state.The state is a leading supplier of capital equipment in India for steel, mining, railways, power, defense, space research, nuclear and strategic sectors.

Need of the Assignment & Scope

India is a diverse country with diverse energy consumption patterns in different states/UTs. Broadly, the energy consumption is divided in five major sectors i.e., Buildings, Transportation, Municipalities and DISCOMs, Agriculture and Industries. Although India remains progressive and one of the front runners to achieve its Energy Efficiency (EE) potential, through innovative programmes such as the PAT scheme, Standards & Labelling, UJALA scheme, Energy Conservation Building Code, Electric Vehicle mission and Smart metering etc. However, at a state level, there is still an immense potential to be realized from large-scale implementation of EE interventions in various afore-mentioned demand sectors.

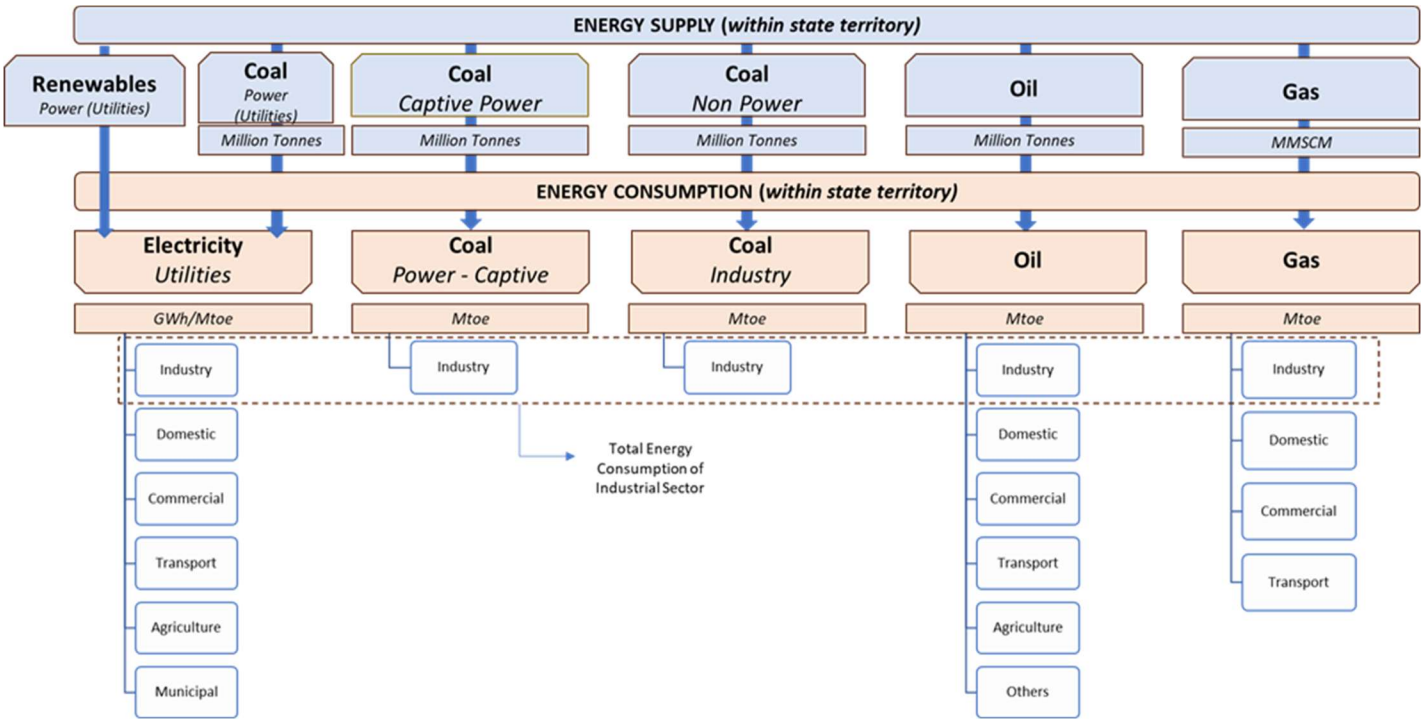
Therefore, there is a dire need for a focused sector-based energy efficiency approach by states/UTs. In view of this, the Bureau of energy efficiency has taken on this endeavor to state specific Energy Efficiency Action Plan through identification of focus sector, undertaking gap analysis, adopting best practices followed in peer group with implementation plan strategy; that can act as platform for developing State's Energy Policy and programs.

Broad scope of work

The overall scope of work for this assignment is as follows:-

- **Identification of stakeholders from various sectors**
- **Identification of focus sectors in the state**
- **Identification of gap via surveys**
- **Sector specific energy projections and energy savings targets**
- **Benefits to the State and various stakeholders through the implementation of the Energy Efficiency Action Plan**

Following flowchart illustrates energy supply and consumption scenario in Jharkhand:

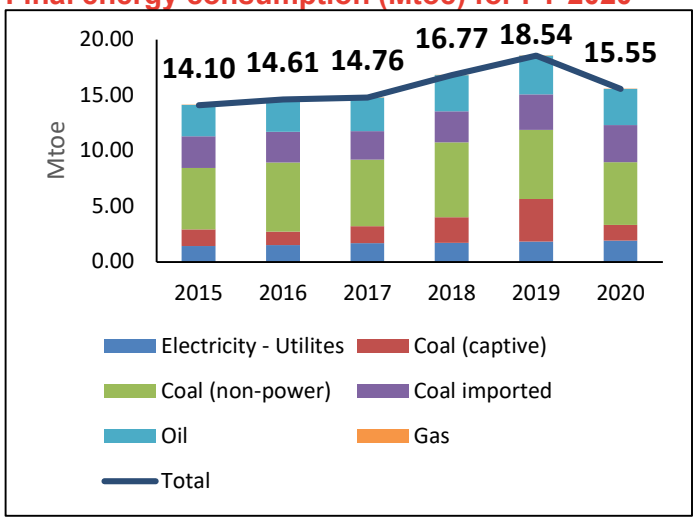


The Energy Consumption Scenario

From a consumption standpoint - the total energy consumption of Jharkhand has been estimated to be approximately 15.55 Mtoe for the year 2019-20

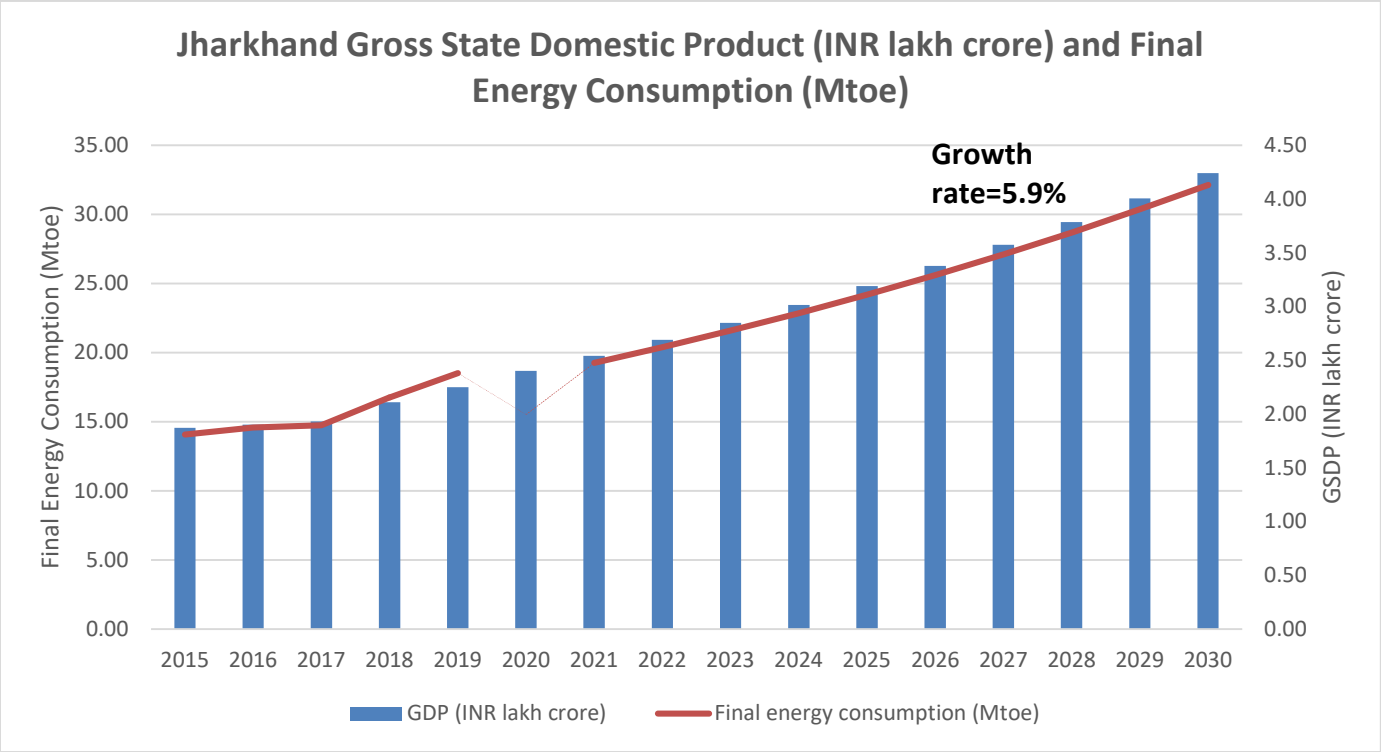
The total energy consumption for the State of Jharkhand has been estimated to be approximately 15.55 Mtoe for the year 2019-20. The energy consumption in the state is composed of primary energy and electricity. The primary energy is mainly derived from the use of coal and oil consumption. The electricity production is mainly done using coal from the coal-based thermal power plants. The historic trend of final energy consumption is shown below:

Final energy consumption (Mtoe) for FY 2020



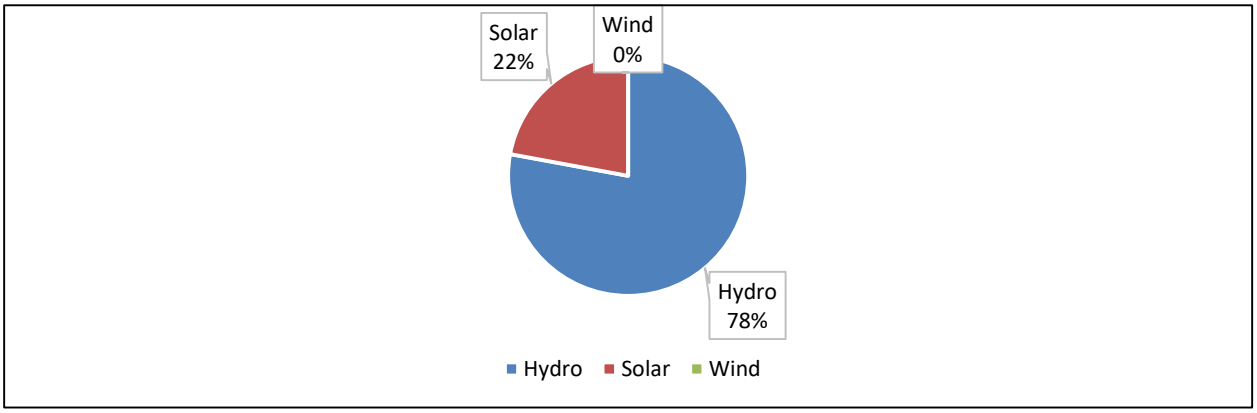
Projection and forecasting of GDP and Energy Consumption

Historic GSDP figures have been considered from 2014-15 to 2019-20 from RBI Handbook of Statistics. Gross State Domestic Product has been forecasted till 2030 using 80% weightage to historic trend of 5.1% and 20% weightage to the forecast of 8.8% as per Jharkhand Economic Survey 2022-23. The figure below shows the historic and forecasted trends of GSDP for Jharkhand.



Installed Capacity in Jharkhand

Jharkhand has 2.4 GW installed capacity out of which renewable energy is 130 MW large hydro and 46 MW solar, wind and small hydro installed capacity as in 2019-20.2 Figure below shows the installed capacity in Jharkhand of solar, wind and hydro. It is seen that hydropower is the dominant source of renewable energy capacity.



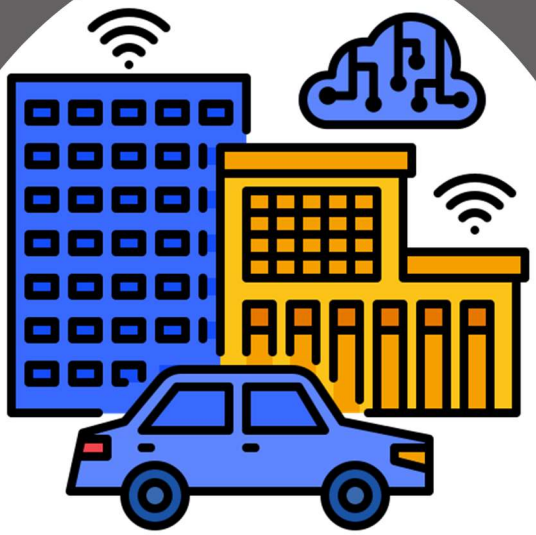
2 CEA All India Statistics 2021

Identifying Focus Sectors

For identifying the major energy guzzling sectors in the state, energy consumption data of a number of sectors was researched and analyzed. This data was gathered via primary consultations with the various stakeholders and through secondary domain research.

Identified Focus Sectors

The four focus sectors identified are industries, buildings, transport, and agriculture.



Focus Sector: Industries

The industry sector has energy saving potential of 0.07 Mtoe and 0.21 Mtoe respectively under moderate and ambitious scenario by 2030 under energy efficiency policies.

The industrial sector of Jharkhand consumed 60% of electricity consumption and 73% of final energy consumption (including coal, oil and gas) in 2019-20.

Key highlights of Industry sector in Jharkhand

Jharkhand, located in eastern India, is known for its rich mineral resources and is home to a variety of industries. The state has a diverse industrial base, with industries ranging from steel to information technology. The state's main industries are steel, power, mining, and agriculture. Jharkhand is one of the largest producers of steel in the country and is home to major steel plants such as Tata Steel, Bokaro Steel Plant, and SAIL. These plants employ thousands of people and contribute significantly to the state's economy. The state is also a major producer of coal, which is used to generate power in thermal power plants. Jharkhand is home to the largest thermal power plant in the country, the Tenughat Thermal Power Station.

Energy efficiency potential in the sector

The estimated energy efficiency potential projected for the year 2030 in the industrial sector in Jharkhand is as follows:

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Action plan 1	0.05	0.14
Action plan 2	0.02	0.07

Energy efficiency strategies in the sector

Action plan 1 - Deepening and widening of PAT scheme: It is recommended that the threshold for the PAT criteria in terms of energy consumption may be lowered so as to accommodate more cement and petroleum refinery units present within the state. . For widening, it is recommended that coal mining sector be added in PAT scheme. Following table illustrates the energy efficiency that can be achieved via this strategy:-

Sector	Baseline SEC (toe/tonne)	Moderate SEC (toe/tonne)	Ambitious SEC (toe/tonne)	Production in 2030 (tonnes)	Energy saving in moderate scenario (toe)	Energy saving in ambitious scenario (toe)
Cement	0.0716	0.0708	0.0676	938103	**375**	**2626**
Sponge iron	0.514	0.447	0.380	1400533	**46,987**	**131,566**
Coal Mining	113.27 tonne/million tonnes	101.94 tonne/Million tonnes	90.62 tonne/Million tonnes	215.6	**549.7**	**1539.3**

(Note: For the moderate and Ambitious SEC assigned to cement, sponge iron and coal mining units - It is assumed that all the existing units will achieve the moderate SEC target in 50% units and achieve ambitious SEC target in 70% units.)

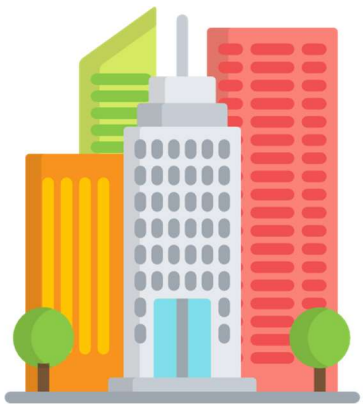
Action plan 2 - : Manufacturing MSME may be looked at more carefully from the lens of energy efficiency. A number of MSME industry clusters are there in Jharkhand that are energy intensive. It is recommended that brick, refractory and coke oven sectors may be incentivized or prompted to adopt energy efficient technologies. Following table illustrates the energy efficiency that can be achieved via this strategy:-

Sector	Baseline SEC (toe/tonne)	Moderate SEC (toe/tonne)	Ambitious SEC (toe/tonne)	Production in 2030 (tonnes)	Energy saving in moderate scenario (toe)	Energy saving in ambitious scenario (toe)
Bricks	0.04	0.036	0.032	6293371	12586.7	35242.9
Refractory	0.21	0.13	0.06	171731	6341.1	17755.3
Coke oven	0.22	0.20	0.19	1086253	5974.4	16728.3

(Note: For the moderate scenario it is assumed that 50% penetration of zig-zag in brick sector, tunnel kiln in refractory units and coke dry quenching in coke oven units will take place. For the ambitious scenario it is assumed that 70% penetration of zig-zag in brick sector, tunnel kiln in refractory units and coke dry quenching in coke oven units will take place)

Focus Sector: Buildings

The Building Sector in Jharkhand has energy savings potential of 0.16 Mtoe and 0.32 Mtoe under moderate and ambitious scenario respectively



The buildings sector in Jharkhand is an important component of the state's economy and infrastructure. The sector includes both residential and commercial buildings and plays a vital role in meeting the housing and infrastructure needs of the state's growing population

Key highlights for Building sector in Jharkhand

Jharkhand is home to several major cities, including Ranchi, Jamshedpur, Bokaro, Dhanbad, and Hazaribagh. These cities have been experiencing rapid urbanization, leading to an increase in demand for housing and commercial spaces. As a result, the real estate sector in the state has been growing rapidly, with several major developers investing in the state. The construction of residential buildings is a significant part of the buildings sector in Jharkhand. The commercial building sector in Jharkhand is also expanding, with several new commercial spaces being developed in major cities.

Energy efficiency potential in the sector

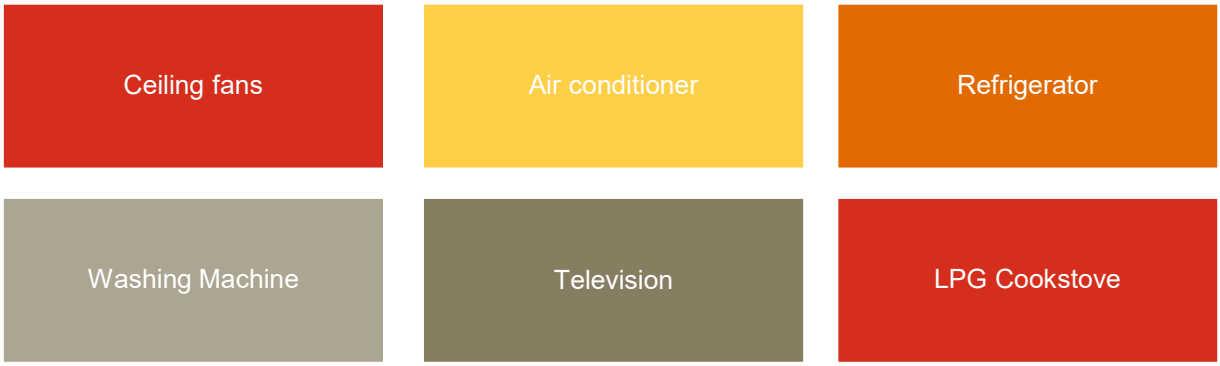
The estimated energy efficiency potential projected for the year 2030 in the buildings sector in Jharkhand is as follows

Action Plan	Energy Savings in 2030 under moderate scenario (ktoe)	Energy Savings in 2030 under ambitious scenario (ktoe)
Action Plan 1	150	300
Action Plan 2	5.2	7.3
Action Plan 3	9.4	18.7

Strategies in Building Sector

Energy efficiency strategies in the sector

Action plan 1 – Replacement programme for inefficient appliances: Replacement of inefficient appliances with their efficient counterparts can be considered as a low hanging fruit from and energy efficiency implementation standpoint. This strategy can be implemented in both domestic as well as commercial buildings. As part of the strategy, following appliances have been identified that can be in the contention for replacement:



Following table illustrates the energy efficiency that can be achieved via this strategy:

Appliance	Inefficient stock in FY2020	Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
Fan	8,535,825	67.8	135.6
Air conditioner	1,327,795	27.2	54.3
Refrigerator	5,026,653	14.2	28.4
Washing Machine	3,509,173	5.0	9.9
Television	6,259,605	4.7	9.4
Geyser	2,276,620	5.6	11.3
LPG cookstove	8,820,353	25.7	51.4

(Note: In moderate scenario, it is assumed that 40% of appliances will be replaced with efficient appliances and 10% switch to electric cookstove. In ambitious scenario, it is assumed 70% appliance replacement with efficient appliance and there will be a 20% switch to electric cook stove)

Action Plan 2 - Effective implementation of Jharkhand ECBC 2022: It is recommended that the new and upcoming commercial and domestic buildings (having a connected load of minimum 100 kW) may be mandated as per the energy conservation buildings code (ECBC) in the state. Following table illustrates the energy efficiency that can be achieved via this strategy:

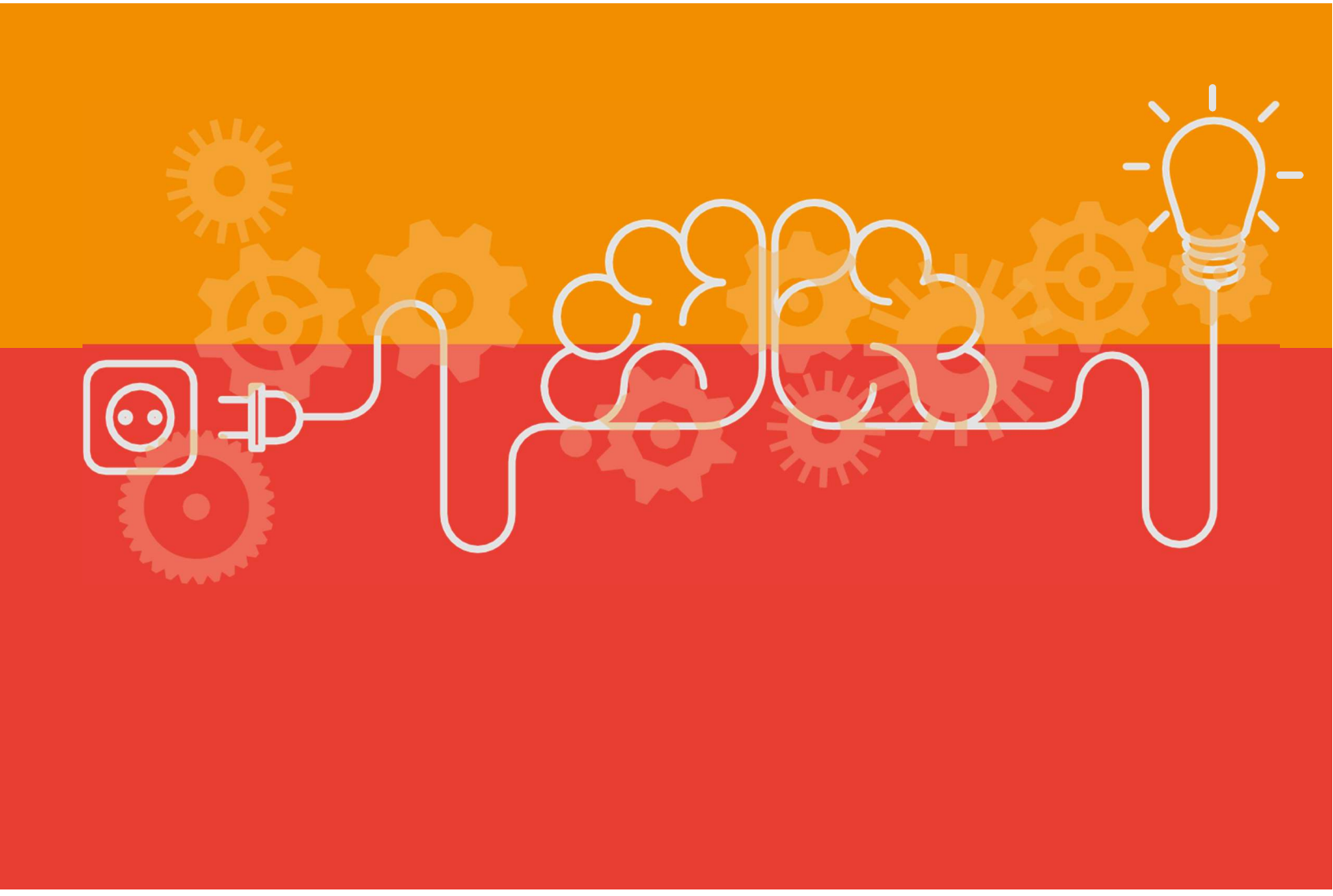
Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
5.2	7.3

(Note: In moderate scenario, it is assumed ECBC will be implemented in new commercial buildings more than 100 kW connected load and lead to 25% savings. In ambitious scenario, ECBC is assumed to be implemented in new commercial buildings more than 100 kW and lead to 35% savings)

Action plan 3 - Energy audits for commercial and public buildings: Under this strategy, it is recommended that periodic energy audits may be carried out at public/commercial buildings on load basis. Directives may be issued to government departments to carry out detailed energy audits at their respective building facilities. Following table illustrates the energy efficiency that can be achieved via this strategy:

Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
9.4	18.7

(Note: In moderate scenario, it is assumed 5% buildings will have energy audit and in ambitious scenario, it is assumed 10% of buildings will get energy audit. In ambitious scenario, it is assumed that energy audit recommendations implementation will lead to 30% savings.)



Focus Sector: Transport

The Transport Sector in Jharkhand has energy savings potential of 0.4 Mtoe and 0.7 Mtoe under moderate and ambitious scenario

Jharkhand has a well-developed transport sector that plays a vital role in connecting its people, businesses, and industries with the rest of the country. Road transportation is the dominant mode of transport in Jharkhand, with the state having a vast network of roads connecting its cities and towns.

Key highlights for Transport sector in Jharkhand

The National Highways passing through the state include NH-2, NH-6, NH-23, NH-33, NH-75, and NH-78. In addition, the state government has been working on improving its road infrastructure by constructing new highways, bridges, and flyovers. The Ranchi-Jamshedpur expressway, for instance, will significantly reduce travel time between the two cities and is expected to boost economic growth in the region. The state also has a well-developed rail network, with several major railway stations, including Ranchi, Dhanbad, Bokaro, and Jamshedpur. These stations are connected to major cities across the country, such as Delhi, Kolkata, Mumbai, and Chennai. Jharkhand is also home to the Chakradharpur Division of the South-eastern Railway, which is one of the largest divisions in India..

Energy efficiency potential in the sector

Following table estimates the energy efficiency potential projected for the year 2030 in the transport sector in Jharkhand:

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Deployment of electric vehicles in state	0.3	0.6
Ethanol blending	0.1 (as per policy)	

Energy efficiency strategies in the sector

Action Plan 1 - Transition of existing fleet to electric vehicles: Under this strategy, it is recommended to transition the existing ICE (Internal combustion Engine) fleet (two wheelers, three wheelers, four wheelers, bus and heavy vehicles) to electric vehicles. Following table encapsulates both the aforementioned scenarios and demonstrates the energy efficiency potential in the year 2030 as per this strategy of transition from ICE to electric vehicles:

Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
0.3	0.6

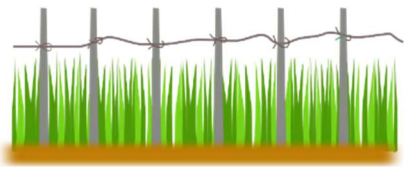
(Note: Note: As per Jharkhand EV Policy 2022, 10% of two-wheelers, 20% three-wheeler, 10% four-wheeler, 10% bus and 10% HDV to be electric by 2027. This has been considered moderate scenario. For ambitious scenario, 20% of two-wheelers, 40% of three-wheelers and 20% of four-wheeler, bus and HDV to be electric by 2030)

Action plan 2 - Ethanol blending programme: Under this strategy - it is recommended that, as per the national target, ethanol blending in conventional fuels may be executed. The target already set in this segment is 20%. Following table encapsulates both the aforementioned scenarios and demonstrates the energy efficiency potential in 2030 as per this strategy:

Energy saving in 2030 (Mtoe)
0.1 (as per national policy)

Focus Sector: Agriculture

Agriculture sector has energy saving potential of 0.17 Mtoe under moderate and ambitious scenario by 2030.



The agriculture sector is an essential component of the economy of Jharkhand, a state located in the eastern region of India. The state is predominantly rural, and agriculture is the main source of livelihood for a significant portion of the population.

Key highlights of Agriculture sector in Jharkhand

The agriculture sector in Jharkhand comprises both crops and livestock, and it plays a vital role in providing food and income to the people. The climate and topography of Jharkhand are conducive to the cultivation of a variety of crops. The state's fertile soil, moderate climate, and abundant rainfall make it ideal for growing rice, wheat, maize, pulses, and oilseeds. The state is also known for its fruit production, with mangoes, litchis, bananas, and papayas being the most commonly grown fruits.

Energy efficiency potential in the sector

Action Plan	Energy Savings in 2030 under moderate scenario (mtoe)	Energy Savings in 2030 under ambitious scenario (mtoe)
Action Plan 1	0.17	
Action Plan 2	0.003	0.006

Strategies in Agriculture Sector

Energy efficiency strategies in the sector

Action Plan 1 - Transition of existing diesel pumps to solar based pumps: Under this strategy, it is recommended that the existing stock of diesel-based pumps may be replaced by solar based pumps by 2025. Following table encapsulates both the aforementioned scenarios and demonstrates the energy efficiency potential in the year 2030 as per this strategy of transition from diesel pumps to solar based pumps:-

Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
0.17	

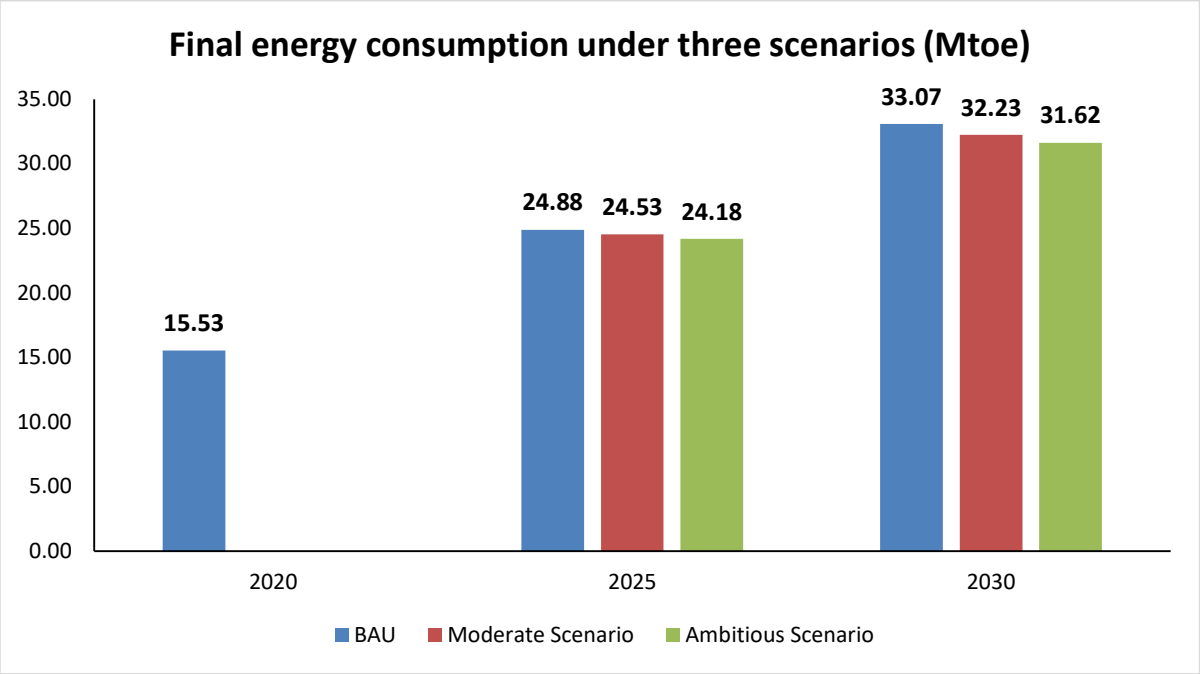
(Note: Only one scenario is considered since there is a national policy for zero use of diesel in agriculture. By 2025, 100% diesel pumps will be replaced with solar pumps)

Action plan 2 - Replacement of inefficient electric pumps with efficient electric pumps: Under this strategy, it is recommended that the existing stock of inefficient electric pumps (15 years old) may be replaced by Star-Rated electric pumps.

Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
0.003	0.006

Overall energy savings and GHG emission reduction

The final energy savings potential has been added and figure below shows the final energy consumption trends in Jharkhand under the three scenarios in 2025 and 2030.



As observed from above, the energy savings potential is highest in ambitious scenario due to ambitious penetration of efficient technologies and equipment in this scenario. The overall energy savings, GHG emission reduction and investment potential for the state of Jharkhand is shown below.

Sector	Emissions Reduction (MtCO2) - FY2030		Energy Consumption Reduction (Mtoe) - FY2030		Investment Potential (INR Crores)
	Moderate	Ambitious	Moderate	Ambitious	
	MtCO2 reduction	MtCO2 reduction	Mtoe Reduction	Mtoe Reduction	
Industry	0.23	0.64	0.07	0.21	378.1
Buildings	0.52	1.02	0.16	0.33	600.6
Transport	1.37	2.33	0.44	0.74	1369.9
Agriculture	0.53	0.54	0.17	0.17	317.4
Total	**2.65**	**4.53**	**0.85**	**1.45**	**2665.9**

The energy savings of 0.85 Mtoe and 1.45 Mtoe are calculated by savings from the four focus sectors. The emission reduction is calculated by multiplying the energy savings with a factor of 3.3 MtCO2/Mtoe. For market investment potential, 1 tonne of oil equivalent is taken as value of INR 18,402 and assuming payback period of 3 years.

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