State Energy Efficiency Action Plan

Odisha

May 2024

EIC (E)-cum-PCEI (O)
Department of Energy

GOVERNMENT OF INDIA
MINISTRY OF POWER

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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 Odisha.

The study involves identification of stakeholders from various sectors, identification of focus sector in the state of Odisha, 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 nodal agency. The report include energy savings potential under moderate and ambitious scenario till 2030 The plan also highlights the benefits derived from these initiatives to the state.

State Profile

Odisha is the 8th largest state by area located on the eastern side of India. Odisha is one of the fastest growing Indian states with GSDP growing at a CAGR of 6.3% from 2016-17 to 2020-21. (From 2011-12 prices) Odisha contributes approximately 2.7% to the national GDP[1].

Odisha is well-equipped with physical and social infrastructure with well-connected road and rail networks, airports, power, ports etc. Odisha has about 30 districts with 114 urban local bodies. Rourkela and Angul are the major Industrial towns in Odisha. Odisha is also amongst the top 10 states in India with highest number of MSMEs. Odisha is a power surplus state with 4 distribution companies serving their industrial, commercial, and residential consumers.

The economy of Odisha majorly depends on key sectors like agriculture, industries, and services. Odisha's manufacturing industries contribute about 48.4% to GVA (Gross value added) to its economy and mining/quarrying sector contributes about 25% while electricity, water, gas and building contributes 18.4% and 8.6% respectively. In Odisha, iron Ore, aluminum, steel products shared majority of overall exports from the state.

Odisha is well connected with its neighboring states like West Bengal, Chhattisgarh Andhra Pradesh by road and rail networks. Odisha has road network of about 2,69,779 kms with road density of about 164 km per 100sqm of area. Odisha's Paradeep Port is one of the largest ports in India who handled about 114.54 MT of Cargo in 2020-2021

[1] IBEF Report Odisha

Key Economic Areas in Odisha

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

Agriculture

Odisha's main agriculture products are rice, pulses, oilseeds, vegetables,

groundnut, cotton, jute, coconut, spices, sugarcane, potatopotatoand fruitsfruits.

Steel

Odisha's produces almost 50% of India's total iron ore which makes Odisha suitable location for Steel manufacturers. The installed capacity of crude steel making in Odisha has now grown to 33 MT per annum in 2020-21 from just 4 MT per annum in 1999-2000 and is projected to be 100 MT in 2030.

Major Steel producers like TATA steel, Jindal Stainless Steel (JSL) and Jindal Steel and Power Limited have their integrated steel plants in the state.

Minerals

Odisha is one of the richest states by availability of minerals in India having major reserves of iron ore, coal, limestone, dolomite, tin ore, bauxite, and chromite. These mineral source base has given Odisha an edge in terms of setting up various mining-based industries in the state.

Tourism

Bhubaneshwar, The capital city of Odisha is also known as temple city of India with hone to about 500 temples. Puri, Bhubaneshwar and Konark are the major religious tourist attractions.

Accordig to a study done, In Odisha state, a capital expenditure of about INR 12.5 billion through PPP Model may be required to cater Tourism Demand

IT/ITeS

Odisha's IT sector is dominated by over300 SMEs.The sector gives employment to around 12000 professionals. In order to attract ICT investments, the

Some of the major Companies in IT/ITes segment include Infosys, TCS, Wipro, Orisys Infotech Pvt Ltd etc

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.

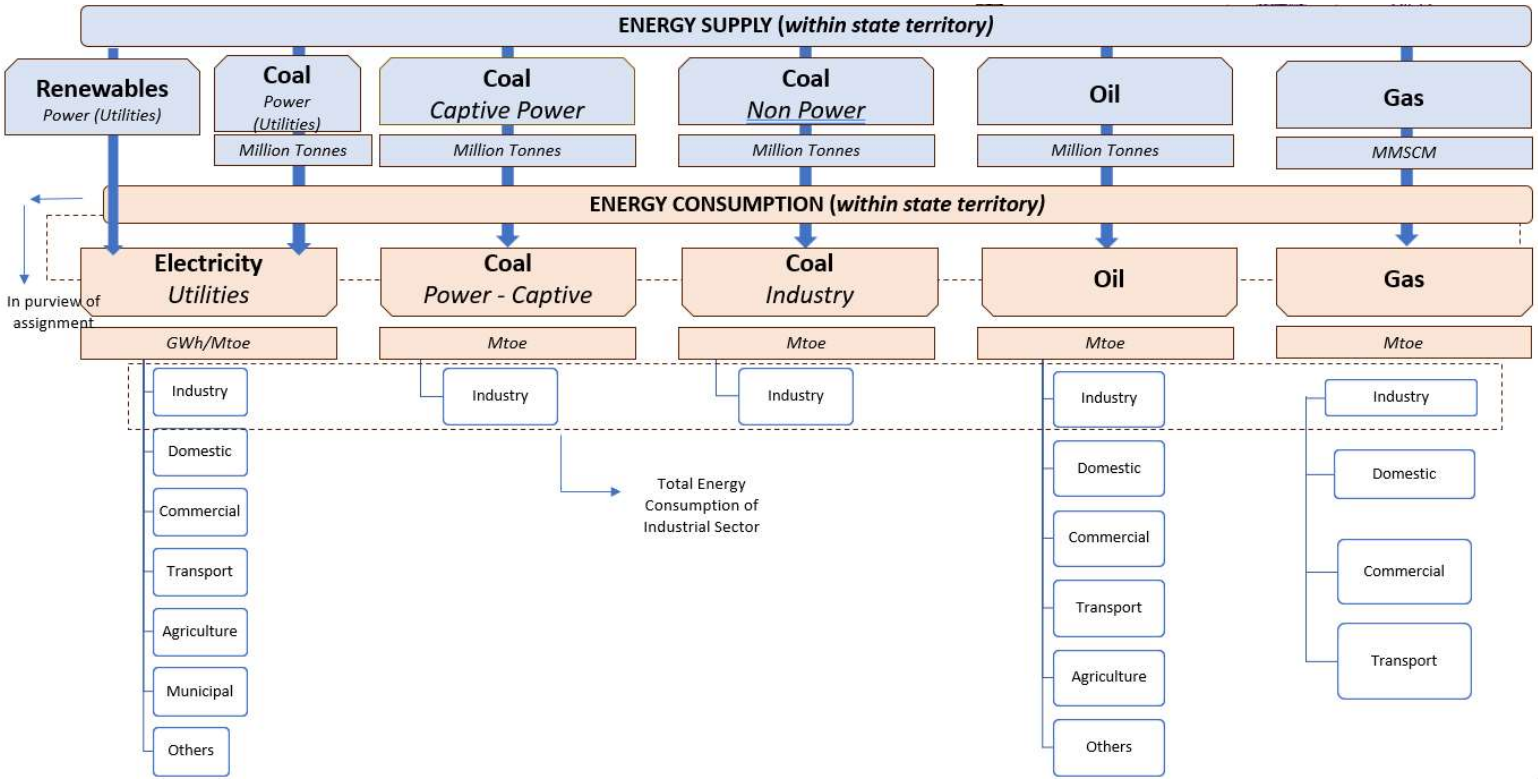
Therefore, there is a dire need for a focused sector-based energy efficiency approach by states/UTs. In view of this, the Bureau of energy efficiency has taken on this endeavor to state specific Energy Efficiency Action Plan through identification of focus sector, undertaking gap analysis, adopting best 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

From an energy supply standpoint – oil in the form of LPG, Petrol, Kerosene, HSD, LDO & FO is the most prominent source of energy followed by coal (coal for thermal power plant and non-power activities). Following flowchart illustrates energy supply and consumption scenario in Odisha:

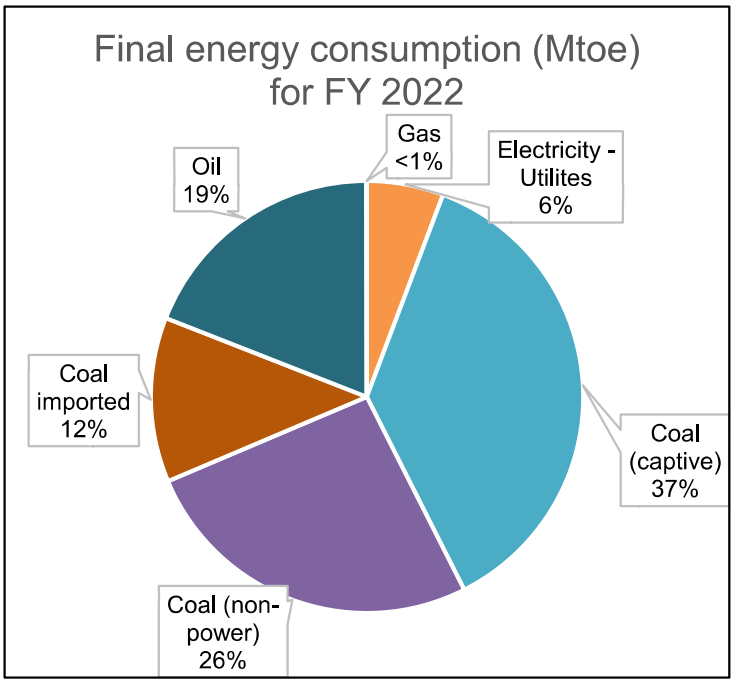


The Energy Consumption Scenario

From a consumption standpoint - the total energy consumption of Odisha has been estimated to be approximately 23.59 Mtoe for the year 2022.

The total energy consumption for the State of Odisha has been estimated to be approximately 23.59 Mtoe for the year 2022. This energy consumption scenario is split majorly between four energy source types which are, Coal (used in Captive power plants), non-power coal, imported coal, oil and Electricity (Utilities). The energy consumption related to gas is very less. The following graph depicts the Final Energy Consumption with respect to different sources in Odisha for the FY 2022.

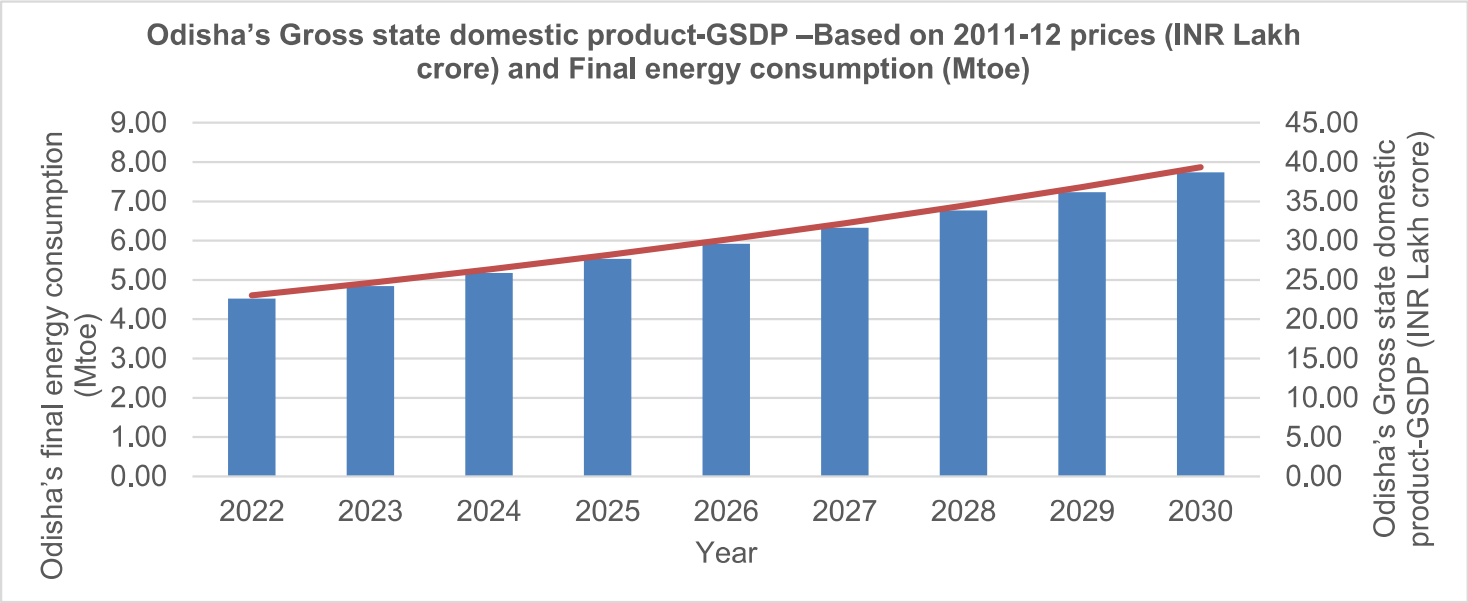
Final energy consumption (Mtoe) for FY 2022



Projection and forecasting of GDP and Energy Consumption

It has long been axiomatic that economic growth and energy demand are linked. As an economy grows – its energy demand increases; if energy is constrained, GDP growth pulls back in turn.

Following figure captures Odisha's GDP over the years (between 2014/15 to 2019/20). Odisha's GDP varies from INR 2.92 Lakh Cr in 2015 to 3.96 Lakh Cr in 2020 at a CAGR OF 6.3%. (From 2011-12 prices) This figure also projects the increase in GDP from 2020 to 2030. This has been projected till 2030 using 80% weightage to historic trend of 6.3% and 20% weightage to the forecast of 6.9% as per the latest Odisha Economic Survey.



Installed Capacity in Odisha

Power sector in Odisha is highly coal dependent with 77% of installed capacity and 72% power generation from coal. Hydro power installation capacity has also significant presence in Odisha's energy mix with 17% of total installed capacity and power generation of 24%. Large coal reserves and power plants proximity to coal pits provide a cost advantage and this has been the reason for coal dominance in the state.

In terms of electricity access, Odisha has achieved 100% rural electrification with power for all households.[2] Odisha is a power surplus state and continues to progress towards net exporter of electricity from 2020.

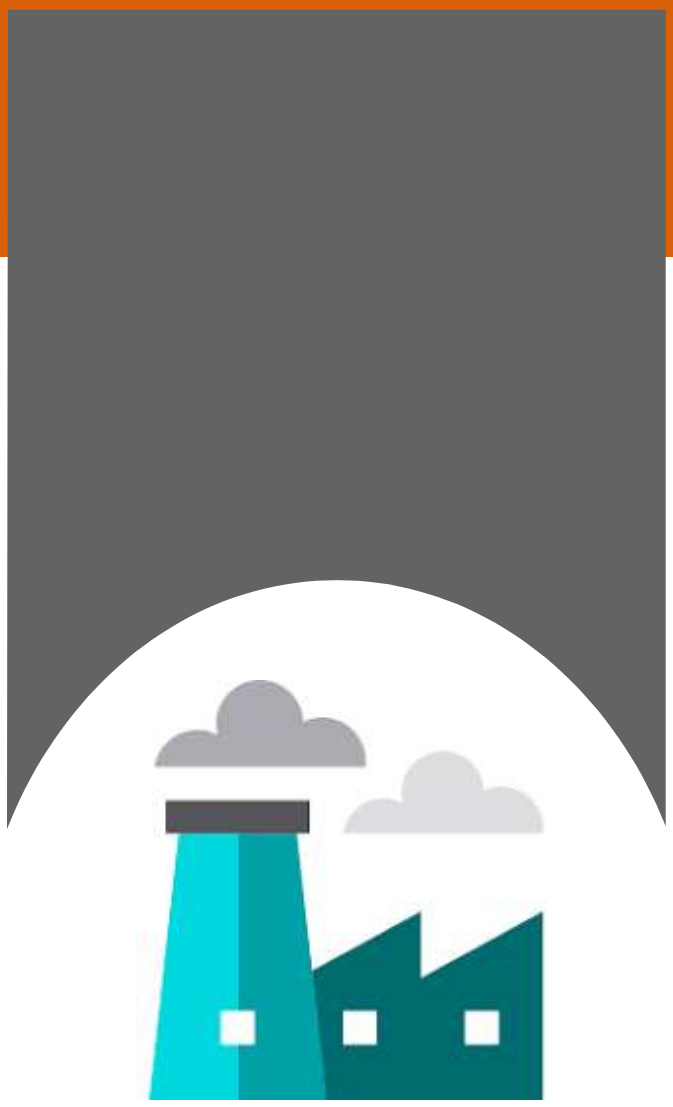
Odisha's total installed capacity at the end of 2022 FY was 7.6 GW. It is pertinent to mention here that Odisha's total installed power generation capacity had increased from 6.8 GW in 2022 to 7.6 MW.[3]

[2] Department of Energy, Government of Odisha
[3] CEA General review 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.

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



Focus Sector: Industries

Odisha's industrial sector has the highest energy efficiency potential amongst all other demand sectors.

Odisha is one of the leading states in India in terms of its industrial sector. The state has a wide range of industries, including steel, Odisha is one of the leading states in India in terms of its industrial sector. The state has a wide range of industries, including steel power, aluminum, chemicals, textiles, and food processing. Odisha has a strategic location on the east coast of India, which provides easy access to markets in Southeast Asia and the Middle East.

Key Highlights of Industrial sector in Odisha:

The industrial sector in Odisha is identified as a priority sector based on energy consumption and high potential for energy efficiency. PAT sectors in Odisha are Aluminum, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Pulp & Paper, Thermal Power Plants, DISCOM, Petro Chemicals, Railways and Petroleum Refinery[4]. Odisha is the largest Stainless-Steel producer in the country with about 20% of steel manufacturing capacity of India. Odisha has major Steel manufacturers including Tata Steel, Jindal Stainless Steel, Jindal Steel and Power Limited with integrated steel plants[5]

Energy efficiency potential in the sector

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

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Action plan 1	0.5	1.24
Action plan 2	0.16	0.28

4 Department of Industries, Odisha

4 Annual Report 2020-21, Ministry of Steel

5 Annual Report 2020-21, Ministry of Steel

Strategies in Industries Sector

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 sponge iron units present within the state. Following table illustrates the energy efficiency that can be achieved via this strategy: -

Sector	Baseline SEC	Moderate SEC	Ambitious SEC	Production in 2030 (kilotonnes)	Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
Sponge Iron	0.6284 **(toe/tonne)**	**0.447(toe/tonne)**	**0.380(toe/tonne)**	**2001**	**181.4**	**347.89**
Aluminium	0.33 toe/tonne	0.265 toe/tonne	0.2 toe/tonne	**9845**	**320**	**896**
Coal Mining	14.71 tonne/MT	13.24 tonne/MT	11.77 tonne/MT	**221 (million tonnes)**	**0.073**	**0.205**

(Note: For the moderate and Ambitious SEC assigned to Sponge iron and Aluminum non-PAT 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 Odisha that are energy intensive. It is recommended that sponge iron, rice mills and sea-food processing industries cluster 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)
Sponge Iron (Small units)	0.7624	**0.7**	**0.68**	**4968658**	**151528**	**265175**
Rice Mills	0.09	0.087	0.082	1416051	**6850.2**	**14385.5**
Sea-food processing industries	0.15	0.11	0.10	132555	**2549**	**4997**
Plastic	0.456	0.041	0.036	141533	**323.3**	**905.3**

Table 1: Energy efficiency potential in key SME sectors of Odisha

(Note: For the moderate scenario it is assumed that 50% penetration of energy efficient motors in sponge iron units, 50% penetration of energy efficient motors in rice mills and 50% energy efficient refrigeration systems in seafood processing industries. For the ambitious scenario it is assumed that 70% penetration of of energy efficient motors in sponge iron units, 50% penetration of energy efficient motors in rice mills and 50% energy efficient refrigeration systems in seafood processing industries)

Focus Sector: Buildings

The Building Sector in Odisha has energy savings potential of 0.12 mtoe and 0.21 mtoe under moderate and ambitious scenario respectively.

The buildings sector in encompasses different types of buildings present in Odisha i.e., domestic (households) and commercial (health facilities, commercial complexes, public buildings etc.). This sector can be considered as a low hanging fruit from the perspective of EE implementation as such programs in this sector are relatively less complex as compared to industries.

Key highlights for the building sector in Odisha.

The buildings sector in Odisha is identified as a priority sector based on high energy consumption and high potential for energy efficiency.

The Odisha Energy Conservation Building Code 2022(OECBC-2022) of Odisha was notified in Oct-2022. This will cover schools, hospitals, hotels, shopping complexes, offices, multiplex/theatres, airports, railways stations and bus stations.[6]Odisha has also initiated equipping all public hospitals including health centres with rooftop solar plants. Operationalization of the Energy Conservation and sustainability Building Code (ECSBC) is being supported under the NLTA initiative of the World Bank[7]

Energy efficiency potential in the sector

The estimated savings potential in this sector is specified below.

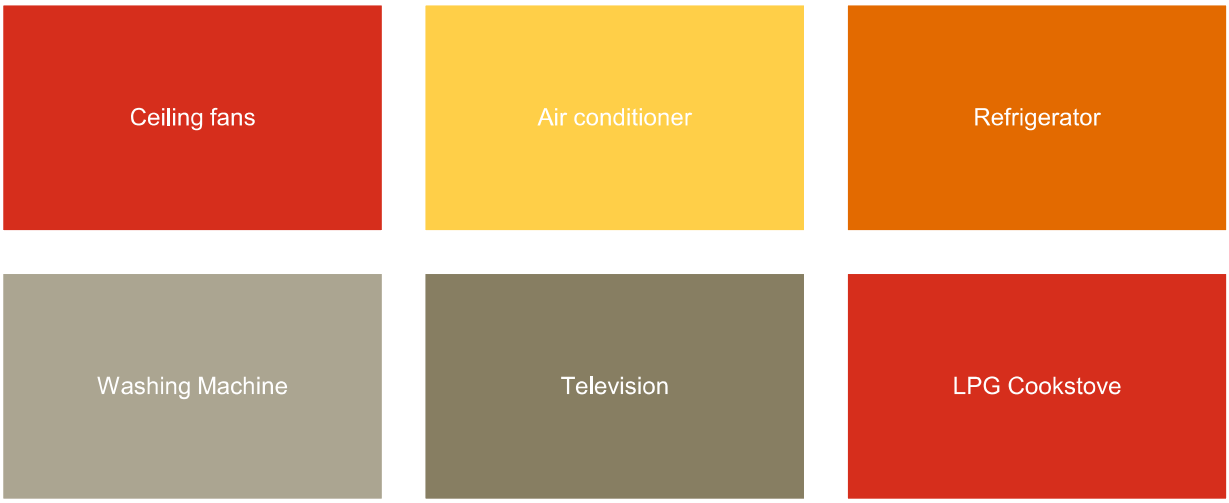
Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Action plan 1	0.11	0.19
Action plan 2	0.0003	0.0004
Action plan 3	0.005	0.011

6 Ministry of New and Renewable Energy

7 Odisha's Climate Change Action Plan

Strategies in Building Sector

1. 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 encapsulates the energy efficiency potential in the year 2030 as per this strategy appliance replacement Programme:-

Appliance	Inefficient stock in FY2022	Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
Fan	**98,66,700**	**30**	**60**
Air conditioner	15,34,820	12	20
Refrigerator	49,33,350	40	60
Washing Machine	40,56,310	4	6
Television	57,00,760	2	3
LPG cookstove	10195590	26	50

(Note: In moderate scenario, it is assumed that 30% of appliances will be replaced with efficient appliances

and 10% switch to electric cookstove. In ambitious scenario, it is assumed 50% appliance replacement with efficient appliance and there will be a 20% switch to electric cook stove)

2. Action Plan 2 - it is recommended that the new and upcoming commercial and domestic buildings (having a connected load of minimum 40 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:-

Following table encapsulates the energy efficiency potential in 2030 as per this strategy of mandating the compliance of ECBC for new buildings:-

Energy saving in moderate scenario (ktoe)	Energy saving in ambitious scenario (ktoe)
0.26	**0.36**

(Note: In moderate scenario, it is assumed ECBC will be implemented in new commercial buildings more than 40 kW connected load and lead to 25% savings. In ambitious scenario, ECBC is assumed to be implemented in new commercial buildings more than 40 kW and lead to 35% savings)

3. Action plan 3 - 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 (Mtoe)	Energy saving in ambitious scenario (Mtoe)
5.4	10.7

(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 is one of the largest consumers of energy in Odisha and contributes to approximately 62% of the total energy consumption in the state. Therefore, there needs to be a strong emphasis on electric vehicles to decarbonize this sector. Unlike other state where the transport sector is looked after by road transportation corporations, in Odisha, this is directly taken care of by the government department i.e., Transport Department.

The Transport has energy saving potential of 0.63 Mtoe and 0.84 Mtoe under moderate and ambitious scenario respectively by 2030 under energy efficiency policies.

Key highlights for the Transport sector in Odisha

Two wheelers constitute highest 82% of share in Vehicle segment of Odisha.8 recently launched Electrical Vehicle policy in August-2021 to increase adoption of EVs specifically in categories of 2W, 3W and Light Motor vehicles. 9. The state has provided 100% exemption in road tax and registration fees of e-bus for first 4 years. 15% of subsidies are to be provided on purchase of 2,3 and 4-wheeler vehicles. Government of Odisha will also provide capital subsidy of 25% for selected energy operators for charging installations. 10For customers, there is 100% exemption from vehicle registration fees and road taxes.

Energy efficiency potential in the sector

The estimated savings potential in this sector is specified below.

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Action plan 1	0.4	0.6
Action plan 2	0.21 (As per policy)	

:

8 Odisha Electrical Vehicle policy-2021

9 Odisha Electrical Vehicle Policy-2021

10 Odisha Electrical Vehicle Policy-2021

Strategies in Transport Sector

1. **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)
0.4	0.6

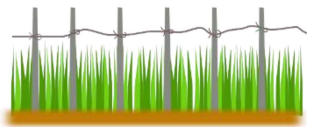
*(Note: As per Odisha's EV policy, under **moderate scenario,20% EV penetration in vehicle mix by 2031** across all category of vehicles is considered, As pe Odisha's EV policy, under **ambitious scenario, 30% EV penetration in vehicle mix by 2031** across all category of vehicles is considered)*

2. **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 as per policy (Mtoe)
0.210

Focus Sector: Agriculture

Agriculture sector n Odisha has energy savings potential of 0.25 mtoe and 0.27 mtoe under moderate and ambitious scenario by 2030



The agriculture sector is a significant energy consumer in Odisha, as in many other Indian states. Energy is required for various agricultural activities such as irrigation, land preparation, harvesting, threshing, and transportation of agricultural produce. In Odisha, the agriculture sector consumes a substantial amount of energy in the form of electricity, diesel, and other fuels. As per the data from the Odisha State Load Dispatch Center (SLDC), the agriculture sector consumed around 11,109 million units (MUs) of electricity in the 2020-21 fiscal year. This accounts for about 25% of the total electricity consumption in the state. Most of the electricity consumption in the agriculture sector is for irrigation purposes.

Key highlights for the agriculture sector in Odisha

Odisha being an agricultural state provides employment to 62% of the total workforce. Odisha has about 39% of cultivated land of total Land mass of Odisha which is roughly about 61.80 Lakh hectares.11 The agricultural economy is characterized by low investment, low productivity, mono-cropping, inadequate irrigation facilities and small holdings of land. The main energy consumption in this sector is by tractors and water pumps. OREDA is promoting uptake of solar water pumps in the state by offering subsidy and loans. There are 176 solar water pumps as of 2020.[12]

Estimated energy savings potential:

The estimated energy savings potential in this sectors specified below:

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Action plan 1	0.25	0.25
Action plan 2	0.004	0.020

[11] IBEF-Odisha Report

[11] Department of Agriculture and Farmers empowerment

[12] OREDA Annual activity report

Strategies in Agriculture 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 :-

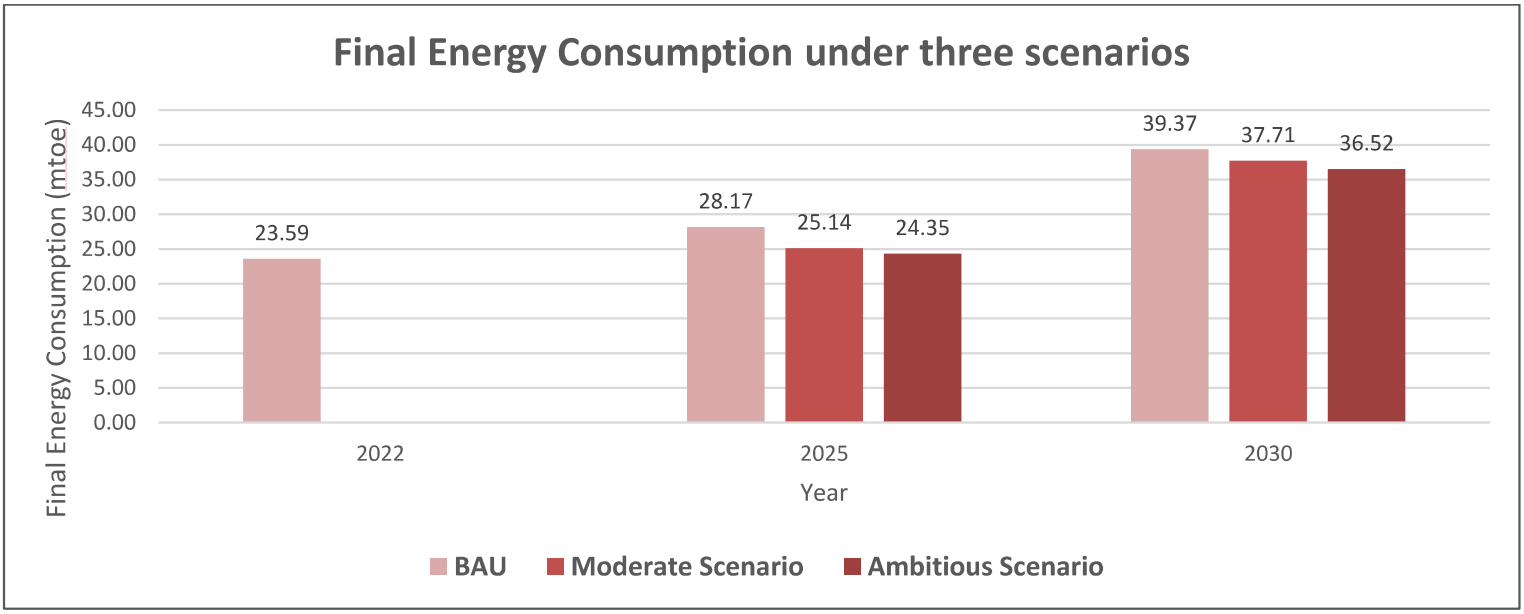
Diesel pumps estimated inventory by 2025	Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
4,95,500	**0.25 (Policy scenario)**	**0.25(Policy scenario)**

(Note: By 2025, moderate scenario assumes 100% replacement of diesel pumps with solar pumps. By 2025, ambitious scenario assumes 100% replacement 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 may be replaced by solar based pumps by 2025. Following table encapsulates both the aforementioned scenarios and demonstrates the energy efficiency potential in 2030 as per this strategy: -

Inefficient pumps estimated inventory by 2030	Inefficient pumps replaced by Star-Rated pumps in ambitious scenario by 2030	Energy saving in moderate scenario (Mtoe)	Energy saving in ambitious scenario (Mtoe)
552145	551245	**0.004**	**0.020**

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



Consumption trends in 2025 and 2030 under three scenarios

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 Odisha is shown below.

Sector	Emissions Reduction (MtCO2) - FY2031		Energy Consumption Reduction (Mtoe) - FY2031		Investment Potential (INR Crores)
	Moderate	Ambitious	Moderate	Ambitious	
	MtCO2 reduction	MtCO2 reduction	Mtoe Reduction	Mtoe Reduction	
Industry	2.07	4.78	0.66	1.53	2814.7
Buildings	0.37	0.66	0.12	0.21	385.7
Transport	1.96	2.62	0.63	0.84	1538.5
Agriculture	0.80	0.85	0.25	0.27	497.6
Total	5.21	8.90	1.66	2.85	5236.4

Table 2: Energy Savings, Emission Reduction, and Investment Potential for Odisha

The energy savings of 1.66 Mtoe and 2.85 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.