State Energy Efficiency Action Plan

Assam

August 2023

asda
Office of The Chief Electrical Inspector -cum- Adviser, ASSAM

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GOVERNMENT OF ASSAM

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MINISTRY OF POWER

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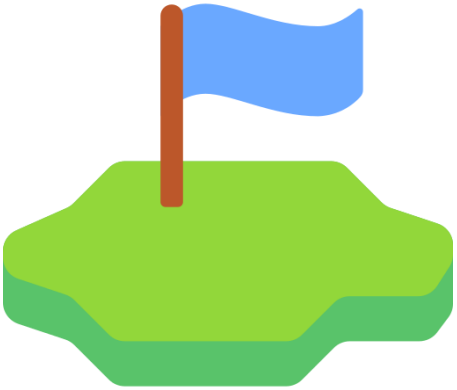
Introduction & State Profile

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

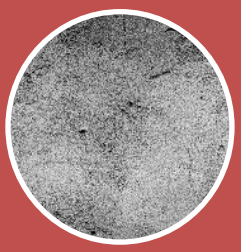
With the energy efficiency agenda gaining traction and momentum in India, there is a need to continuously evaluate institutional capacity, policies, programs, and markets at the state level to identify best practices and promote cross learning. Developing State Specific Energy Efficiency Action Plan 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 Assam.

As a part of the assignment, there has identification of stakeholders from various sectors, identification of focus sector in the state of Assam, 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.

Assam is in the north-eastern part of India and has geographical area of 78,438 sq. km and population of 3.4 crore. The natural resources, policy incentives and location-specific advantages of Assam support investments in sectors such as cement, petroleum refinery, fertilizer and pulp & paper. In 2019-20, the gross domestic product of Assam was INR 2.4 lakh crore and per capita GDP was INR 90,123. Assam has the largest tea growing area in the world, constituting around one-seventh of the global tea production. In 2020-21, tea production in the state stood at ~503.46 thousand tonnes, which was 39.12% of the total tea production in India during the same period. It also has 20 industrial estates, three industrial growth centres, 11 Integrated Infrastructure Development Depots, 17 industrial areas, 12 growth centres, eight mini-industrial estates, one export promotion park and one food processing industrial park. Assam is also the most popular tourist destination among the northeast states.

Key Economic Areas in Assam

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



Cement

Assam is a cement producing state with six cement plants and installed capacity of 6.98 MTPA. Assam has several large and small cement plants which produce cement for domestic use and export market.

Refinery

Assam has one of India's largest refineries i.e. Numaligarh Refinery Limited. In total, Assam has four large oil refineries. The small town of Digboi in the remote north eastern corner of the country is the birth place of the Oil Industry in India.

Fertilizer

Assam has three main fertilizer producing units. The fertilizer industry in Assam includes public and private sector companies. Major companies are Brahmaputra Valley Fertilizer Corporation Limited and Assam Petrochemical Limited.

Tea

Assam has the largest tea growing area in the world, constituting around one-seventh of the global tea production. In 2020-21, tea production in the state stood at ~503.46 thousand tonnes, which was 39.12% of the total tea production in India during the same period.

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.

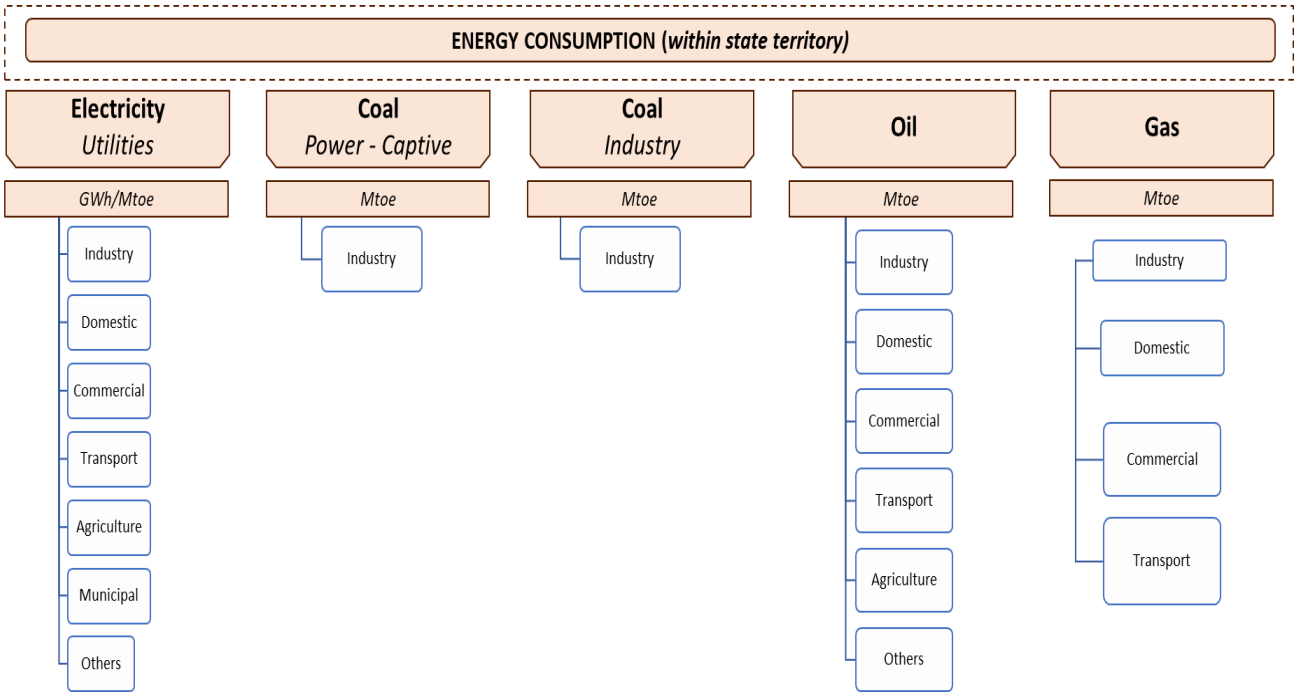
Therefore, there is a dire need for a focused sector-based energy efficiency approach by states/UTs. In view of this, the Bureau of energy efficiency has taken on this endeavor to state specific Energy Efficiency Action Plan through identification of focus sector, undertaking gap analysis, adopting best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

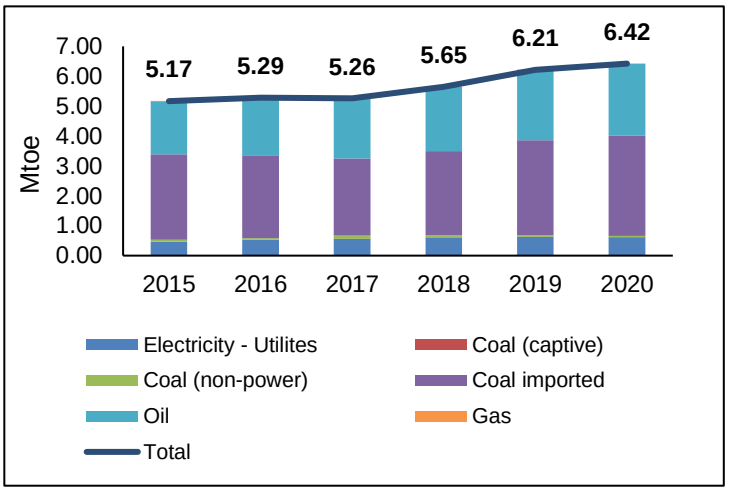


The Energy Consumption Scenario

From a consumption standpoint - the total energy consumption of Assam has been estimated to be approximately 6.42 Mtoe for the year 2019-20

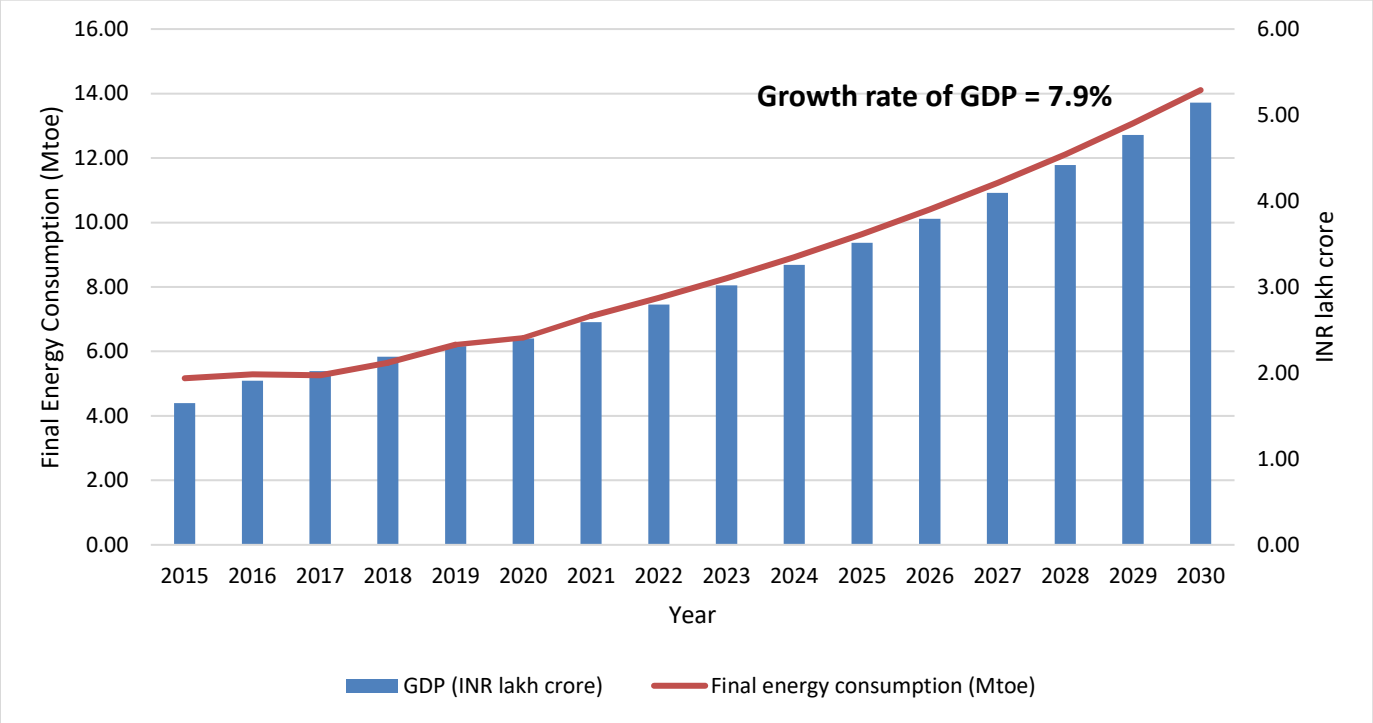
The total energy consumption for the State of Assam has been estimated to be approximately 6.42 Mtoe for the year 2019-20. The energy consumption in the state is composed of primary energy and electricity. The primary energy is mainly derived from the use of coal and oil consumption. The electricity 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



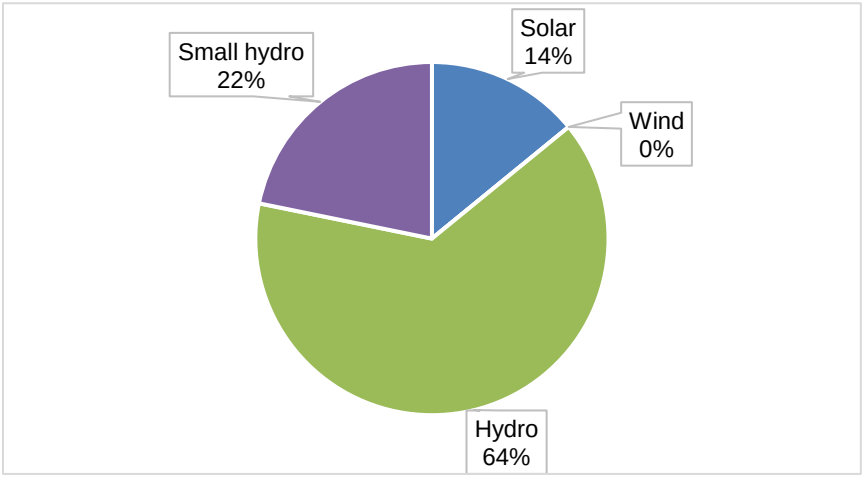
Projection and forecasting of GDP and Energy Consumption

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 7.78% and 20% weightage to the forecast of 8.5% as per Assam Economic Survey 2022-23. The figure below shows the historic and forecasted trends of GSDP for Assam.



Installed Capacity in Assam

Assam has 503 MW installed capacity out of which renewable energy is 100 MW large hydro and 50 MW solar,



wind and small hydro installed capacity as in 2019-20[1]. Figure below shows the installed capacity in Assam of solar, wind and hydro.

It is seen that hydropower is the dominant source of renewable energy capacity.

[1] 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 0.01 Mtoe and 0.02 Mtoe respectively under moderate and ambitious scenario by 2030 under energy efficiency policies.

The natural resources, policy incentives and location-specific advantages of Assam support investments in sectors such as cement, petroleum refinery, fertilizer and pulp & paper. Assam has 20 industrial estates, three industrial growth centres, 11 Integrated Infrastructure Development Depots, 17 industrial areas, 12 growth centres, eight mini-industrial estates, one export promotion park and one food processing industrial park.

Key highlights of Industry sector in Assam

Assam is a major producer of crude oil and natural gas in India. Assam is also renowned for its tea production and is one of the largest tea-producing regions in the world. The PAT sector in Assam is Cement, Aluminum, Chlor alkali, Pulp & paper, Iron & steel, Fertilizer, Thermal Power Plants, Petroleum Refinery, Railways, Petrochemicals, DISCOM, Railways, Textile, and Commercial buildings.

Energy efficiency potential in the sector

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

Action Plan	Energy Savings in 2030 under moderate scenario (toe)	Energy Savings in 2030 under ambitious scenario (toe)
Action plan 1	1462	6173
Action plan 2	8297	23,232
Total Energy Savings Potential in Industry Sector (mtoe)	**0.01**	**0.02**

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. 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 savings in moderate scenario (toe)	Energy Savings in ambitious scenario (toe)
Cement	0.0716	0.0708	0.0676	2477105	**990**	**6935**
Petroleum Refinery	89.36 (MBN/thousand barrels)	85 (MBN/thousand barrels)	81.8 (MBN/thousand barrels)	8572 MBBLS	**472**	**1145**

(Note: For the moderate and Ambitious SEC assigned to cement and petroleum refinery 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. In cement sector, the zig-zag technology is considered and in petroleum refinery, the PAT notification target is considered as ambitious)

Action plan 2 - Manufacturing MSME may *be looked at more carefully from the lens of energy efficiency. The tea industry cluster of Assam is very energy intensive, and it is recommended that tea sector 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)
Tea	0.68	0.544	0.408	122019	8297	23,232

(Note: For the moderate scenario it is assumed that 50% penetration of VFD in hot air exhaust fan in dryer and for the ambitious scenario it is assumed that 70% penetration of VFD in hot air exhaust fan in dryer in tea producing units will take place)

Apart from tea clusters, Cottage processing clusters in Assam also hold significant potential in terms of energy efficiency and may be incentivized or prompted to adopt energy efficient technologies.

Focus Sector: Buildings

The Building Sector in Assam has energy savings potential of 0.09 Mtoe and 0.15 Mtoe under moderate and ambitious scenario respectively

The buildings sector in Assam 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. Assam is home to several major cities, including Guwahati, Dispur, Silchar, Dibrugarh and Jorhat. 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 Assam. The commercial building sector in Assam is also expanding, with several new commercial spaces being developed in major cities. The state is home to several industrial hubs, which have attracted investments from major companies, leading to the construction of several commercial buildings and office spaces.

Key highlights for Building sector in Assam

The buildings sector of Assam consumed 15% of electricity consumption in 2019-20. Replacement of inefficient appliances with energy efficient appliances can reduce the energy consumption in buildings. UJALA, launched in 2015, is a Central Government scheme which aims to increase uptake of energy efficient appliances by households. Draft Assam Energy Conservation Building Code was launched in 2018, which is applicable for all commercial buildings

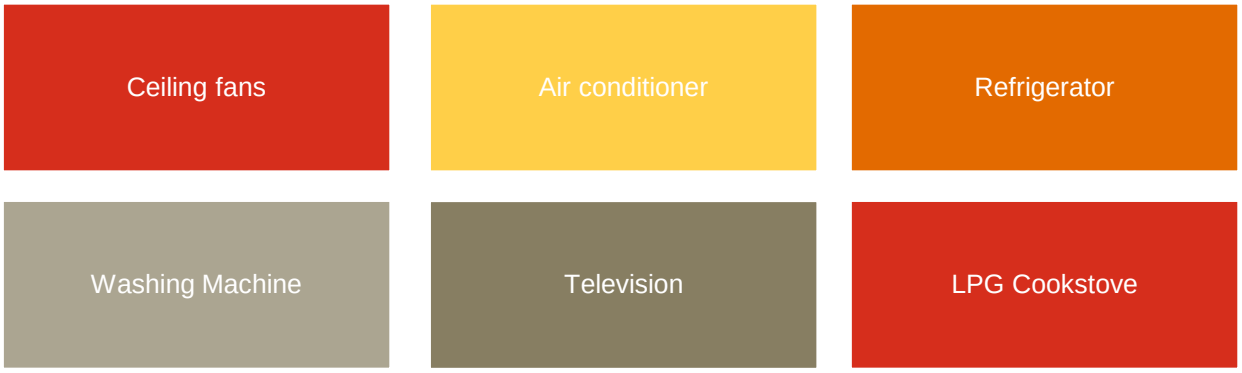
Energy efficiency potential in the sector

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

Action Plan	Energy Savings in 2030 under moderate scenario (toe)	Energy Savings in 2030 under ambitious scenario (toe)
Action plan 1	89939	145008
Action plan 2	1796	2515
Action plan 3	1862	3725
Total energy savings potential in Buildings Sector (mtoe)	**0.09**	**0.15**

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 (toe)	Energy saving in ambitious scenario (toe)
Fan	7785000	27182	45304
Air conditioner	1211000	9416	15,694
Refrigerator	3892500	28,917	48,196
Washing Machine	3200500	2972	4953
Television	4498000	1253	2088
LPG cookstove	8044500	20,197	40,395

(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)

Action Plan 2 - Effective implementation of Assam ECBC 2018: 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:

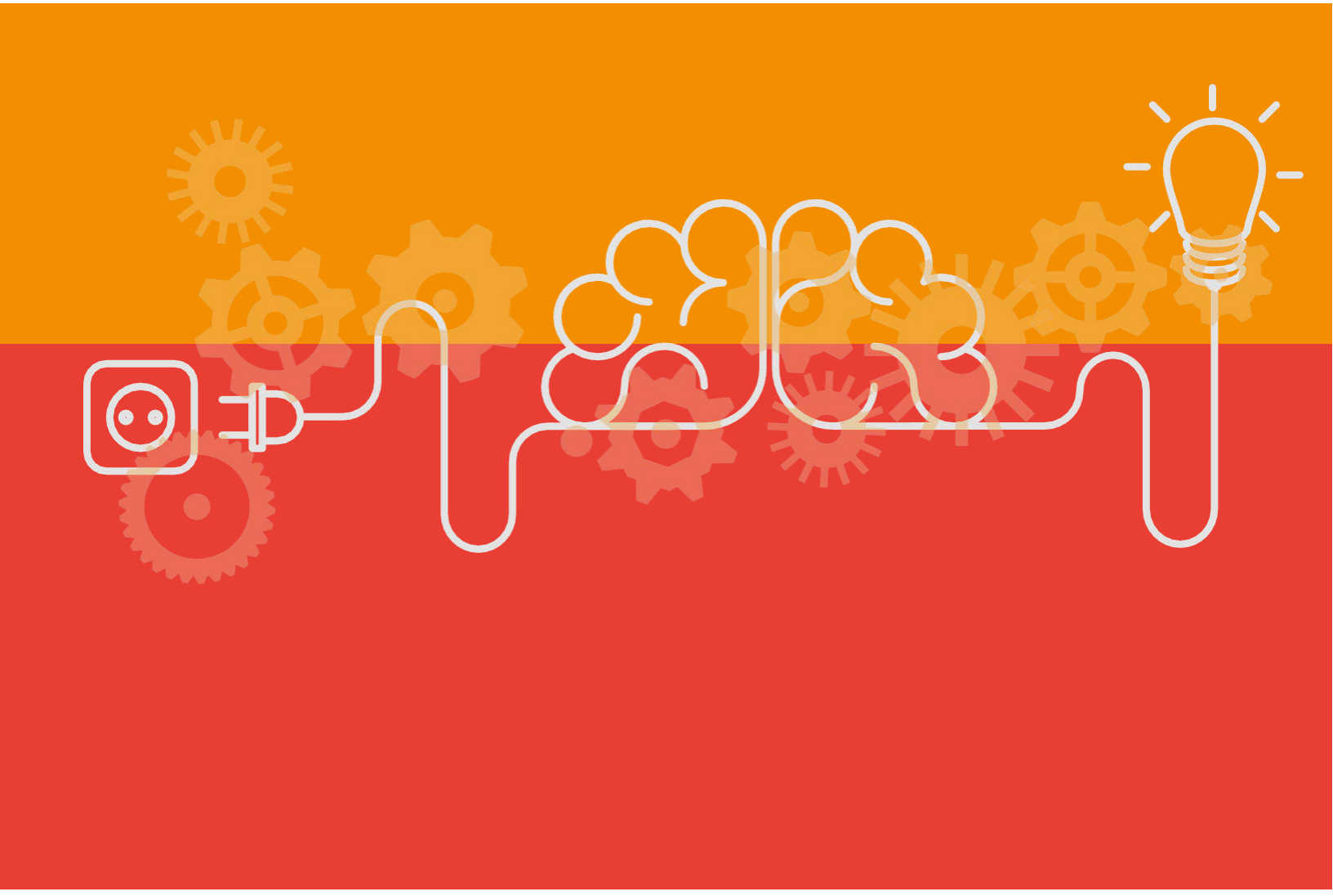
Energy saving in moderate scenario (toe)	Energy saving in ambitious scenario (toe)
1796	2515

(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 (Mtoe)	Energy saving in ambitious scenario (Mtoe)
1862	3725

(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

Assam's transport sector has the highest energy efficiency potential amongst all other demand sectors.

Assam 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 Assam, with the state having a vast network of roads connecting its cities and towns. In addition, the state government has been working on improving its road infrastructure by constructing new highways, bridges, and flyovers.

Key highlights for Transport sector in Assam

Under the Assam Electric Vehicle Policy 2021 to accelerate the adoption of electric mobility, all types of electric vehicles will be incentivized based on the electric vehicle battery capacity along with incentives for charging infrastructure and manufacturing of EV and their components to create an ecosystem for EV in Assam. Assam Electric Vehicle Policy 2021 also targets to convert 100% of public transport bus fleet into electric buses (Battery Electric Vehicles) by 2030.

Energy efficiency potential in the sector

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

Action Plan	Energy Savings in 2030 under moderate scenario (Mtoe)	Energy Savings in 2030 under ambitious scenario (Mtoe)
Deployment of electric vehicles in state	0.6	1.1
Ethanol blending	0.1 (as per policy)	
Total energy savings potential in Transport Sector(mtoe)	0.67	1.2

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)
0.6	1.1

(Note: As per state policy 25% of two-wheelers, 25% three-wheeler, 25% four-wheeler, 100% bus and 25% HDV to be electric by 2027. This has been considered moderate scenario (Assam EV Policy 2021), For ambitious scenario, 50% of two-wheelers, 50% of three-wheelers and 50% of four-wheeler, 100% of bus and 50% of HDV to be electric by 2030.

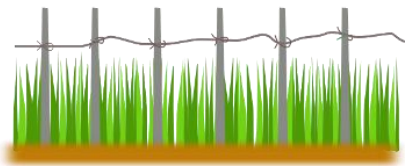
Action plan 2 - Ethanol blending programme: Under this strategy - it is recommended that, as per the national target, ethanol blending in conventional fuels may be executed. The target already set in this segment is 20%. Following table encapsulates both the aforementioned scenarios and demonstrates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

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

Assam's inland water transport heavily relies on diesel-powered vessels for navigation. Diesel engines are commonly used in boats, ferries and vessels that operated on the Brahmaputra River and its tributaries. Efforts to reduce reliance on diesel and promote sustainable transportation may include exploring alternative fuels, such as biodiesel or electric propulsion systems, or investing in more fuel-efficient vessels.

Focus Sector: Agriculture

Agriculture sector has energy saving potential of 0.05 Mtoe under both moderate and ambitious scenario by 2030 under energy efficiency policies.



Assam's economy is fundamentally based on agriculture. Agriculture sector continues to support more than 75% of the state directly or indirectly by providing employment to 53% of the workforce. Assam occupies a geographical area of 7.8 million hectares of which total cropped area is 4.0 million hectares. However, only 5.4% of the gross cultivated area is irrigated and the average cropping intensity of the state is 145.9%. The cropping pattern in Assam has been more or less stable with only marginal changes in the importance of a few crops. Rice is the most important crop in Assam followed by rapeseed, mustard and tea.

Key highlights of Agriculture sector in Assam

Most of the energy consumption in agriculture sector of Assam is in irrigation pumps. The agriculture sector of Assam is being transformed towards ending diesel usage. Use of BEE 5-star energy efficient agricultural pumps, Decentralized Grid Connected Renewable Energy Power Plants, solar agriculture pumps and Shallow Tube Wells will ensure reduction in agricultural irrigation energy consumption.

Energy efficiency potential in the sector

Action Plan	Energy Savings in 2030 under moderate scenario (toe)	Energy Savings in 2030 under ambitious scenario (toe)
Replacement of diesel pumps with solar	46,404 (as per national policy)	
Replacement of inefficient pumps (15 years old) with Star-Rated pumps	517	862
Total energy savings potential in Agriculture sector (mtoe)	0.05	0.05

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 2030 (toe)
46,404 (as per national policy)

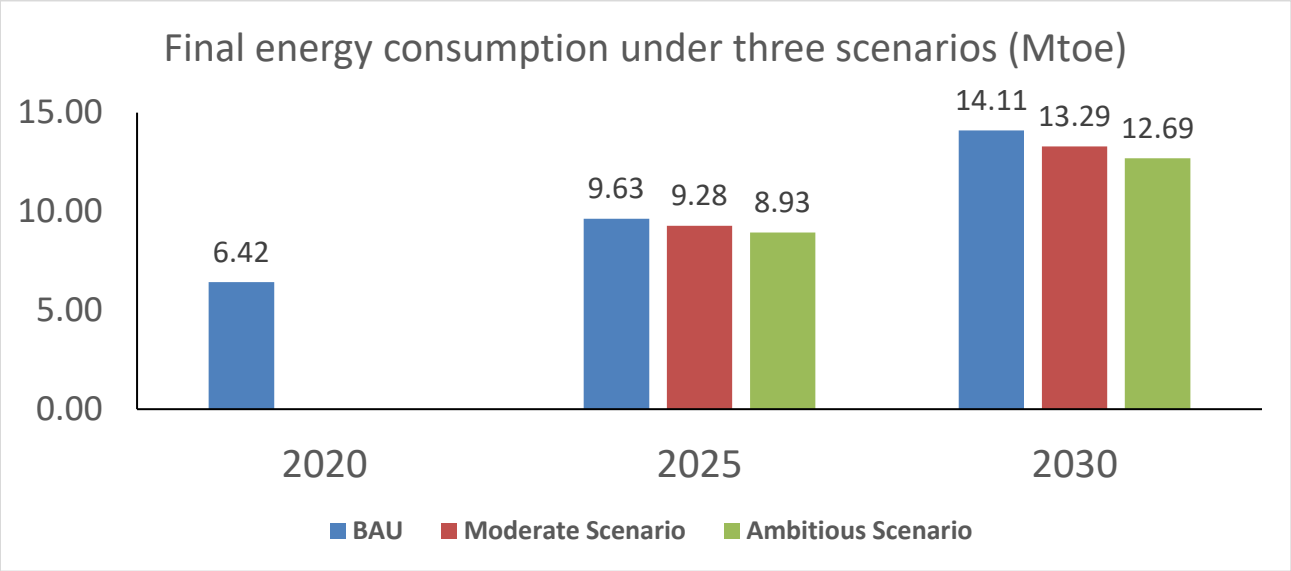
(Note: Only one scenario is considered since there is a national policy for zero use of diesel in agriculture. By 2025, 100% diesel pumps will be replaced with solar pumps)

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 (toe)	Energy saving in ambitious scenario (toe)
517	862

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 Assam 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 Assam 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	0.03	0.08	0.01	0.02	44.9
Buildings	0.29	0.47	0.09	0.15	273.7
Transport	2.09	3.76	0.67	1.20	2208.7
Agriculture	0.15	0.15	0.05	0.05	87.0
Total	**2.55**	**4.45**	**0.81**	**1.42**	**2614.2**

The energy savings of 0.81 Mtoe and 1.42 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.