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# **MARC Insights** **Enhancing Power Infrastructure: Opportunities for Energizing Goa's Economy**

October 2024



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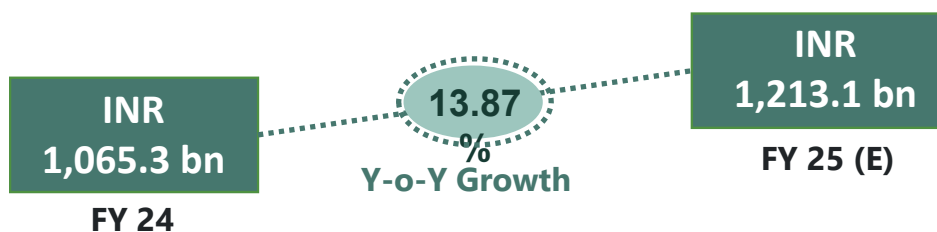
# Glossary

Term	Definition
CAGR	<i>Compounded Annual Growth Rate</i>
CGS	<i>Central Generating Stations</i>
EOI	<i>Expression of Interest</i>
EHV	<i>Extra High Voltage</i>
FDI	<i>Foreign Direct Investment</i>
GEDA	<i>Goa Energy Development Agency</i>
GSDP	<i>Gross State Domestic Product</i>
GTTPPL	<i>Goa Tamnar Transmission Project Limited</i>
Gw	<i>Giga watts</i>
Ha	<i>Hectare</i>
Kv	<i>Kilo volt</i>

Term	Definition
MICE	<i>Meeting, Incentives, Conferences &amp; Exhibitions</i>
MNRE	<i>Ministry of New &amp; Renewable Energy</i>
Mw	<i>Mega watt</i>
NBWL	<i>National Board of Wildlife</i>
PPP	<i>Public Private Partnership</i>
RDS	<i>Revamped Distribution Scheme</i>
TSPC	<i>Toshiba Plant Systems &amp; Services Corporation</i>

# Goa's Economy At Glance

## Gross State Domestic Product (GSDP)



## Per Capita GSDP

INR **7,65,841**

Projected for FY 25

## FDI Inflow

INR **13,711.6 Cr**

Cumulative from Oct 19 - Mar 24

## Key Industries

Fishing

Food Processing

Pharmaceutical

Tourism

IT and ITeS

Biotechnology

## Physical Infrastructure



## Opportunities Driving the Need for Power



Government is simplifying regulations to boost investment, exemplified by the MoU with **TVS Industrial and Logistics Parks to turn Goa into a major logistics hub.**



The **Goa IT Policy** aims to boost the IT industry by improving infrastructure, attracting startups, and nurturing local talent to make Goa one of Asia's top 25 startup hubs by 2025.



**Promoting sustainable tourism** by targeting segments like eco tourism, heritage & spiritual, adventure, MICE & wellness & medical tourism.

Source: GIDC, Pro Kerala, Goa IPB, IBEF, Gomantak Times, Outlook Business, IBEF - Goa Presentation

# Goa's Existing Power Infrastructure: An Insight

# Goa's Existing Power Infrastructure

## Distribution Network

Goa currently has 7 Extra High Voltage (EHV) substations which form the backbone of Goa's power distribution system as they are responsible for further distributing power to local substations.

The Goa Electricity Department is the only licensee in the state of Goa for transmission and distribution of Electrical Energy.

Goa has achieved 100% electrification across all urban & rural areas indicating a good coverage of power distribution network.



**67**  
Substations

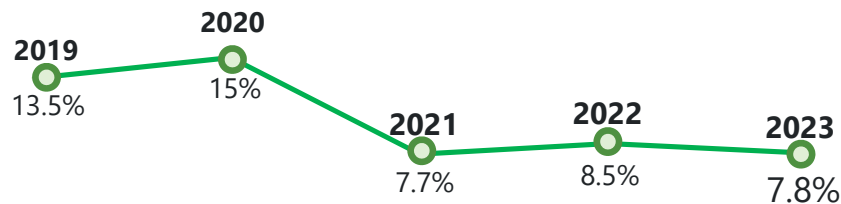


**8,636**  
Distribution  
Transformers



**337**  
Feeder  
Lines

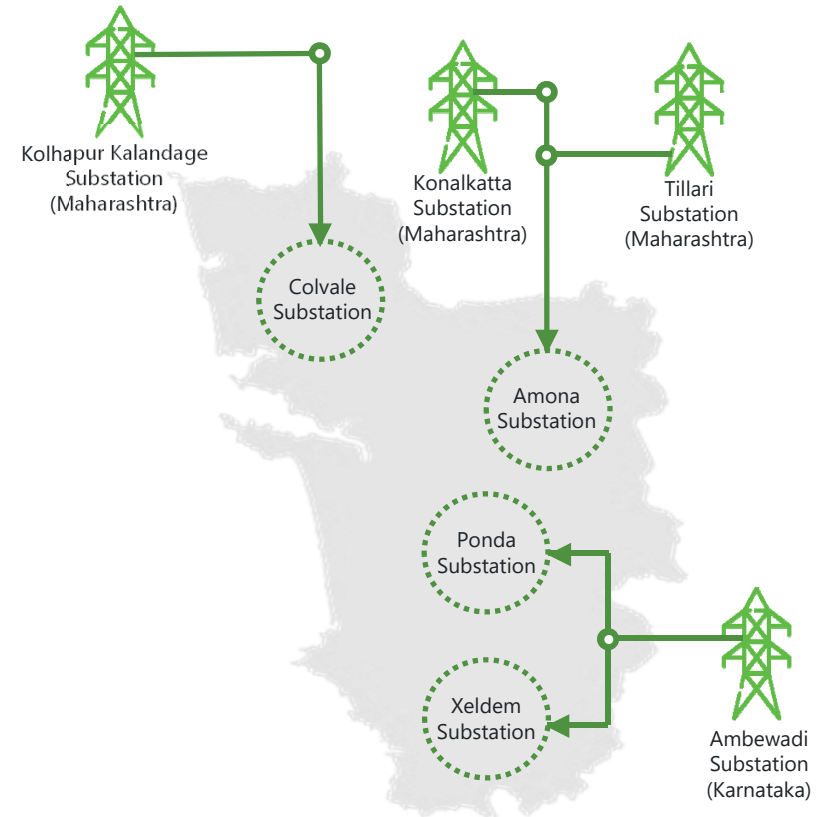
## Power Transmission Loss



The primary reason for decreased transmission loss is the upgrade of infrastructure at substations.

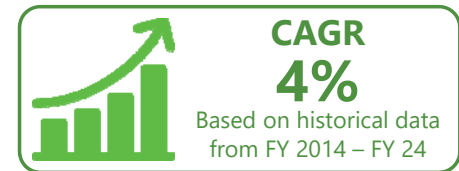
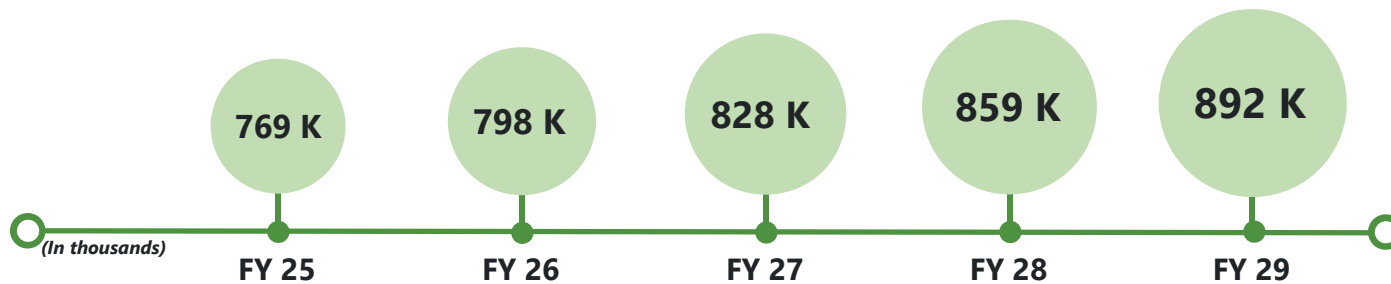
Source: [GED - Whitepaper](#), [CEA - Report](#), [Goa Electricity Department - Whitepaper](#), [Goa Electricity Department - Map](#), [household electrification](#), [TOI](#), [Goa Power Network](#), [beeindia.gov.in](#)

## Substations Powering Goa's Grid

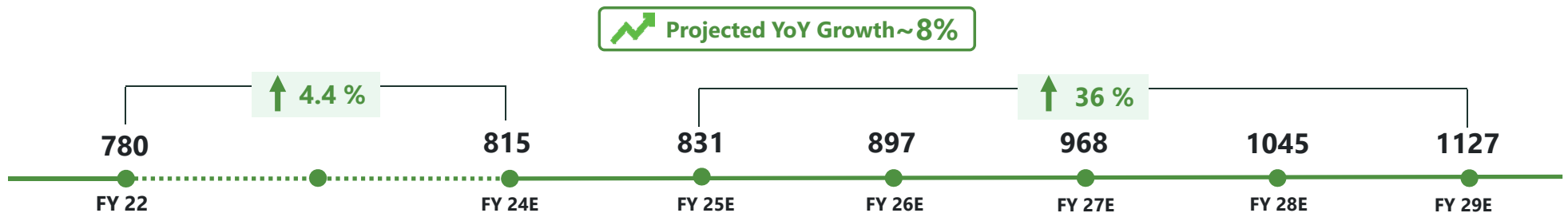


# Electricity Demand in Goa

## Number of Electricity Connections in Goa



## Peak Demand

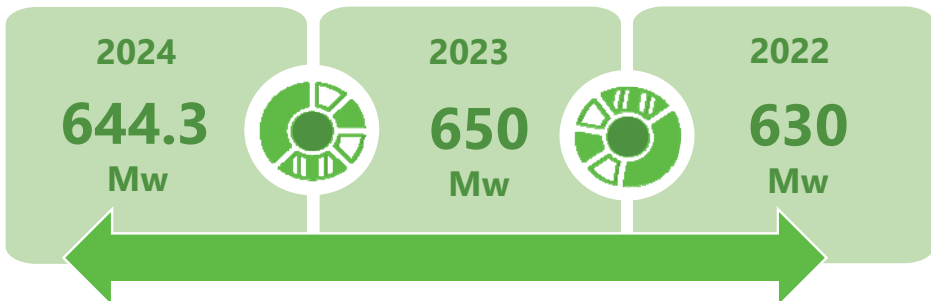


Source: [GED - Whitepaper](#), [CEIC data](#), [CEA](#), [Goa Electricity Department](#), [The Navhind times](#), [CEA – Report](#), [Goa electricity Department - Center Allocation](#)

# Electricity Supply in Goa

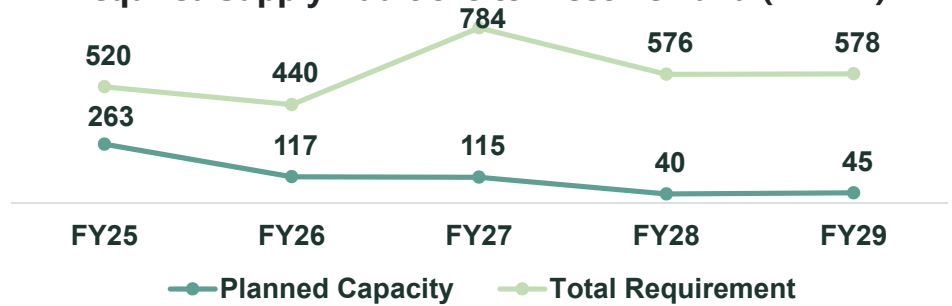
## Power Allocation to Goa by Centre

Goa lacks its own power generation and relies entirely on Central Generating Stations (CGSs), and receives electricity from the Western and Southern regions.

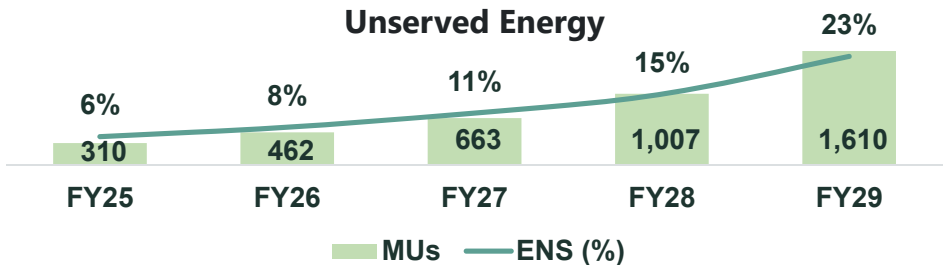


## Future Requirements

Required Supply Additions to Meet Demand (in MW)



Unserved Energy



### The Gap: Demand Vs. Supply

Goa's power demand is rapidly outpacing central government allocations, creating a widening supply gap that requires urgent attention

With peak demand projected to reach 1,127 Mw by FY 29, the 2024 allocation of 644 Mw shows minimal growth in supply.

Source: [GED - Whitepaper](#), [CEIC data](#), [CEA](#), [Goa Electricity Department](#), [The Navhind times](#), [CEA – Report](#), [Goa electricity Department - Center Allocation](#)

MU – million units ENS – Energy not Supplied



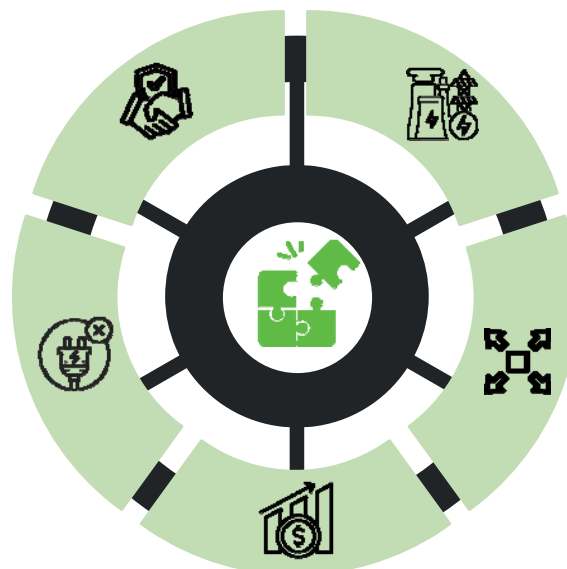
# Challenges With Existing Power Infrastructure

## Dependence on External Power Sources:

**Goa is currently not self-reliant in power generation**, entirely dependent on Central Generating Stations (CGSs) from other states for its electricity supply, receiving power from west & south region.

## Inability to Handle Peak Demand:

Power outages in Goa arise mostly from overloading and poor maintenance of infrastructure. Further considering the peak demand and supply **in future, Goa may experience severe power cuts due to inadequate supply.**



## Tariff hike:

Generally, **the reason for tariff hike is cost recovery.**

The recent 3.5% hike in power tariffs in Goa—from Rs 1.75 to Rs 1.90 for 0 to 100 units—aims to address the significant loss of Rs 2.81 per unit incurred by the government, given the average cost of supply was Rs 5.68 while the average billing rate was only Rs 2.87.

## Aging Infrastructure:

**Goa's aging electricity infrastructure results in transmission losses and frequent power outages** due to overloading & maintenance issues causing recurrent problems, underscoring the urgent need for modernization

## Lack of scope for expansion:

Some **substations encounter space constraints that prevent expansion, even as the demand for power continues to rise**

For Instance, Tivim 220 KV Sub-station faces significant constraints for expansion due to a lack of available land, preventing the installation of additional transformers and necessary upgrades.

Source: [Herald Goa - Power Outage Calangute, TOI](#), [The Goan EveryDay](#), [Herald Goa - Power outage Navelim](#), [Goa Electricity Department](#)

# Boosting Goa's Power Grid & Infrastructure

# Goa – Tamnar Transmission Project (GTTPL) – (1/2)

## GTTPL

GTTPL is an **Inter State Transmission System project** envisaged by the **Ministry of Power** in 2015 and is implemented by "Goa Tamnar Transmission Project Limited"

The project aims to establish an additional power source for Goa, which currently relies on the Western & Southern grid via 400kV and 220kV transmission lines respectively.

The project spreads across the states of Goa, Karnataka & Chhattisgarh and passes through the heavy dense forest of the Western Ghats in Goa & Karnataka.

The total cost of project - INR 1,350 crores.

## Benefits to Goa

The GTTPL project will bring additional 400 KV which will cater to Goa's increasing power requirements.



Provide Goa's residents and industries with a reliable power supply by connecting to both the Western and Southern grids.

## Infrastructure to be build under GTTPL

**240**  
Kms

**Transmission**  
**Line**

**1**

**Substation**

GTTPL comprises **five interrelated yet functionally independent elements**, together forming the additional 400 kV feed to Goa and the system for power evacuation from projects pooled at Raigarh (Tamnar).

### Project Components

400 kV D/c Xeldem –  
**Mapusa Transmission**  
**line in Goa**



400/220kV **substation**  
**at village Dharbandora**  
**in Goa**

400 KV D/c Xeldem –  
**Mapusa – Narendra**  
**Transmission Line In**  
**Line Out (LILo) spans**  
**across Goa & Karnataka**



200 kV D/c **Xeldem –**  
**Xeldem transmission**  
**Line in Goa**



765 kV D/c  
**Dharamjaigarh –**  
**Tamnar transmission**  
**line in Chattisgarh**

Source: [Sterlite Power](#), [ICRA](#)

# Goa – Tamnar Transmission Project (GTTPL) – (2/2)

## Environmental Impact

### Goa

**2.5 Km** of the transmission line pass through Bhagwan Mahaveer Wildlife Sanctuary  
**14,000+** trees to be cut including 1,000 at Bhagwan Mahaveer Wildlife Sanctuary

### Karnataka

**77 Km** Transmission line Passing through Karnataka  
— **38 Km** Transmission line Passing through forest  
— **6.6 Km** Passing through Anshi Dandeli Tiger Reserve  
**174 Ha** of forest & wildlife will be diverted for the project, involving the **felling of 13,000+ trees**

### Chattisgarh

**69 Km** Transmission line Passing through Chattisgarh  
— **20 Km** Transmission line Passing through forest  
**137 Ha** of forest will be diverted for the project, involving the **felling of almost 13000 trees**

## Legal & Political Issues

### Goa

In Past the **project has been opposed by several environmentalists and NGOs** on basis of environmental degradation with opposition political parties supporting the same.

**The National Board of Wildlife (NBWL) has approved the Goa government's proposal to use 27.092 hectares of forest land** from Bhagwan Mahaveer Wildlife Sanctuary, Mollem, for the Tamnar Power Transmission project.



### Karnataka

Initially, Karnataka has faced resistance from environmentalists due to concerns over forest degradation caused by GTTPL

Currently, the **Karnataka government has withheld approval for the GTTPL due to Goa's opposition to the Kalasa-Bandhuri Nala Diversion project**, crucial for North Karnataka's drinking water needs.

Karnataka may reconsider if Goa gives clearance for the Kalasa project.

Source: [Deccan Chronicle](#), [forests clearance](#), [The Navhind Times](#), [Herald](#), [forestsclearance](#), [The Goan EveryDay](#), [The Hans India](#), [Indian Express](#), [TOI](#),

# Goa Solar Rooftop

## Goa Solar Rooftop Initiative

The Goa rooftop solar initiative began as a part of the Government of India's Phase II of the Grid Connected Rooftop Solar Program, aiming for 40 GW of capacity by 2022.

In Goa, the Electricity Department Goa (EDG) oversees the rooftop solar program implementation, with GEDA\* handling execution, and EDG responsible for approvals, grid connectivity, distribution, and billing.

The Goa Solar Portal, developed by the Goa Energy Development Agency, serves as a single-window platform for processing applications for grid-connected rooftop solar systems in Goa.

### Extending the Scheme to Government Buildings

The government plans a 30 MW rooftop solar project on government buildings in Goa, with GEDA seeking bids for design, installation, and 25 years of maintenance under the RESCO model.

## Key Figures



**828**  
houses  
Installed  
Rooftop Solar



**23,300**  
Capacity  
Installed  
(in Kw)



**78**  
Govt.  
Approved  
Installers

## Shift from consumers to prosumers



### Net Metering Policy

Goa has implemented net metering policy that allow solar rooftop owners to feed excess electricity back into the grid and receive credits, turning them into prosumers.



### Government Subsidy

Central government offers a 40% subsidy for rooftop solar upto 3 kW and 20% for additional capacity, while State government provides up to 50% subsidy after 6 months based on system size and consumer type.



### Key Issue

As of June 2024, about **350 eligible consumers had not received their subsidies** due to a dysfunctional government portal required for processing approvals.

Source: [Goa Solar](#), [TOL](#), [Solar Quarter](#), [NSWS](#)

\*GEDA – Goa Energy Development Agency

# Improving Existing Infrastructure



## Upgrading Distribution Network Infrastructure



### 171 Tenders

released by Goa Government for **upgrading transformer and infrastructure** from 2021 - 24

Most of these tenders were related to the supply, erection, testing, and commissioning of power transformers and associated equipment at various substations in Goa.

The **work outlined in the tenders were majorly on upgrading, replacing, and maintaining power transformers**, along with related infrastructure such as switchgear, earthing systems.



## Installation of Smart Meters

The government plans to install **7,50,356 smart meters across Goa**, replacing digital meters at a cost of ₹467 crore under the Revamped Distribution Scheme (RDS) by March 2025.

**Smart meters will monitor real-time electricity consumption, providing data on voltages, currents, power, and energy** via a mobile app accessible to both utilities and consumers.

Features include remote disconnection for non-payment and real-time data feeds for demand-side management, peak load management, and tariff planning.



## Underground Cabling

As of now **government has completed the underground cabling in many parts of Goa** including urban and rural areas.

Underground cabling has been completed in many places like Mapusa, Vasco, Curtorim, Verna, Margao, Ponda, Shiroda, Chopdem, Saligao, Sangolda, Aldona & many more.

**Underground cabling offers enhanced safety, fewer weather disruptions, lower electromagnetic emissions, and better aesthetics**, but disadvantages include higher installation costs and longer repair times.

*Source: Tender detail, Navhind Times, CEA, The Goan, goemkarponn, The Goan - Sangolda, The Goan - Aldona, Herald - Usgaon, Herald - Salcete, Herald - Shiroda, The Goan - Vasco, Herald - Chopdem*

# The Projects In Pipeline

## Wind Turbine Project (2024)

Goa will get a 100 MW vertical axis wind turbine power project costing ₹700-800 crore, funded by GEDA through the MNRE's Solar City program to promote renewable energy in urban areas.

Goa's 105 km coastline, high-altitude sites, and consistent monsoon winds make it more feasible for wind energy, as turbines perform better than solar plants during the rainy season.

GEDA has floated an expression of interest (EOI), inviting developers of wind power plants where their role would involve,



Identifying Land



Handling all statutory compliances



Sign a 30-year power purchase agreement (PPA) with the electricity department



Managing operations & maintenance



## Hydro Power Project (2022)

Goa is set to explore hydroelectric generation potential, as the draft State Water Policy, 2021, suggests accelerating the establishment of hydro power plants in the state's river basins.

The report, prepared by TPSC (I) Private Ltd, in collaboration with the Goa Energy Development Agency (GEDA) and the Water Resources Department (WRD), highlights nine viable sites



Harvalem waterfall

Anjunem dam

Gavanem dam

Mhaisal dam

Salaulim dam

OPA barrage at Khandepar

Chowgule mine, Shirgao

Chapoli minor irrigation tank

Amthane minor irrigation tank

The project will be explored on PPP basis, keeping all other rights on water and infrastructure with the Water Resource Department.

Source: [The Navhind Times](#), [TOI](#)

# Impact On Goa's Economy

## Attracting Investments

Reliable and efficient power supply is a key factor for businesses when deciding to invest. Improved infrastructure can attract new industries and businesses to Goa leading to economic growth.



## Enhanced quality of life

Improved electricity infrastructure enhances access to essential services like healthcare, education, and household conveniences, making life easier and more comfortable. It also supports economic opportunities, enabling people to work efficiently and boosting living standards.



## Lower operating expenditure

For existing industries, better power infrastructure means fewer disruptions and more consistent operations there by reducing the dependence on diesel gensets leading to decrease in operational cost.



## Encouraging Digital Economy

With better power infrastructure, Goa can support the growth of the digital economy, including IT services, startups, and e-commerce. Reliable electricity is essential for data centers, tech hubs, and digital services.



## Boosting Small & Medium Enterprises (SMEs)

Reliable power supply is crucial for SMEs, which form the backbone of Goa's economy. Improved infrastructure can help these businesses operate more efficiently, reduce downtime, and lower operational costs.





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