



ASIA CLEAN ENERGY FORUM 2026

Beyond Transition: Building Secure, Resilient, Inclusive, and Intelligent Energy Systems

8–11 June | ADB Headquarters, Metro Manila, Philippines



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Developing Power Sector Resilience to Extreme Weather Events in Coastal Areas – Odisha (India)

9 June 2026 | 2–3:30 p.m. (GMT+8)

In cooperation with





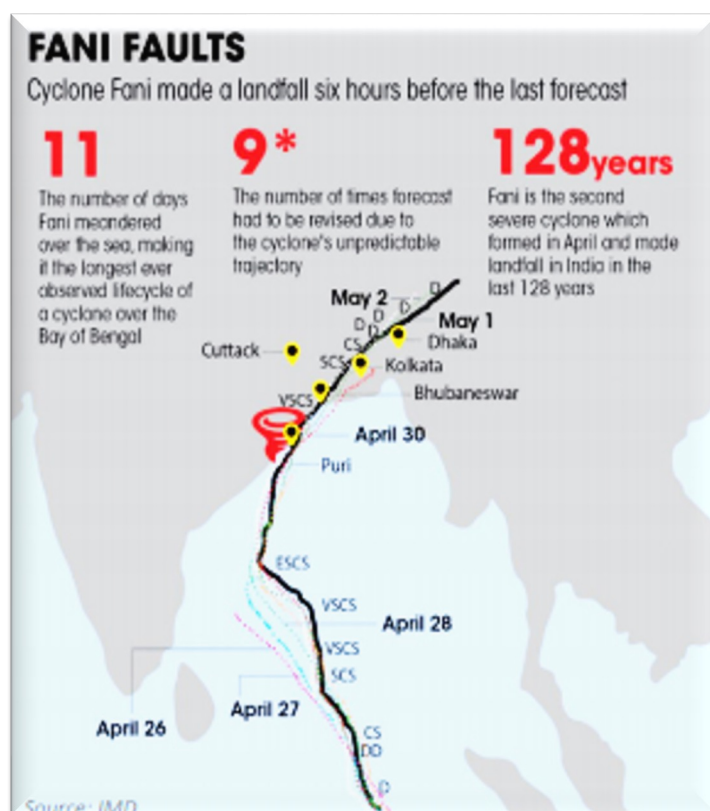
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Odisha Power Study: Cyclone Fani: Impact on Odisha power infrastructure



Damage to power infrastructure: INR 8,139 Crs (USD 1.2 Bn)

Transmission (440, 220 and 132kV)

- 116 towers
- 2 Grids and 250 km lines

Distribution (33kV, 11kV and LT)

- 220,000 poles
- 110,000 km lines
- 12,064 Transformers

Estimated revenue loss:

USD 36 Mn

Electricity consumers impacted:

4.63 Mn

- Departure from the norm- Formed in pre-monsoon (April)
- Gale winds **175-185 kmph**; gusting to **205 kmph**
- Old towers standards not upgraded to the above wind speed
- High winds and torrential rains in Puri & Bhubaneswar

- Major damage to distribution infrastructure; transmission impact was limited
- Power disruption to critical consumers like hospitals, water pumps, state dept. offices
- Clogged roads and highways due to fallen trees, electricity poles, and lines



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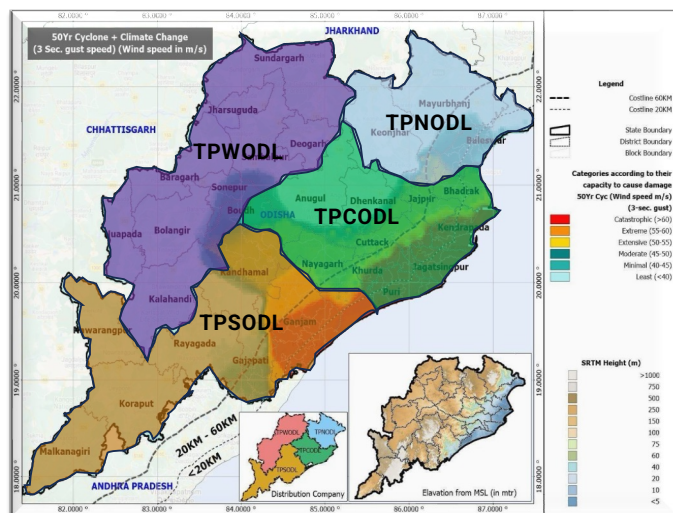
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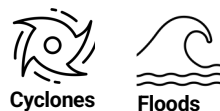


Odisha Power Study: Objective, Hazard Profile, and Key Stakeholders

Study Objective: To understand the current level of infrastructure resilience to major hazards in Odisha and prioritise physical/operational recommendations to enhance the resilience of key infrastructure systems through an **Infrastructure Resilience Assessment Report** for Transmission and Distribution in Odisha.

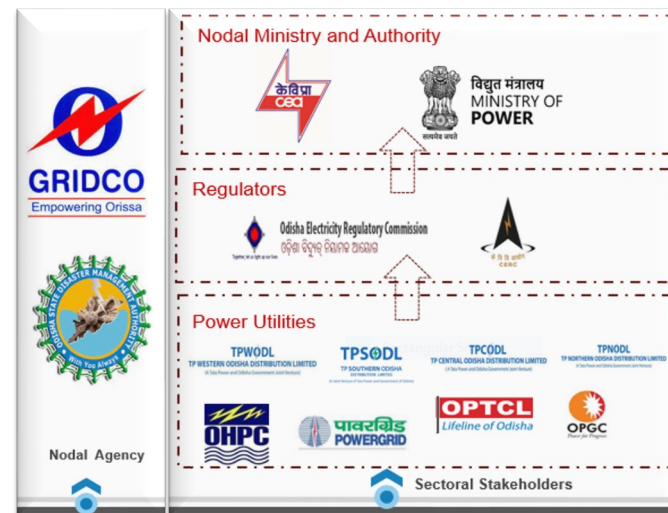


Key Disasters



Cyclone Exposure: Wind Zonation Map for 50-year Return Period incorporating Climate Change in Odisha

Key Stakeholders





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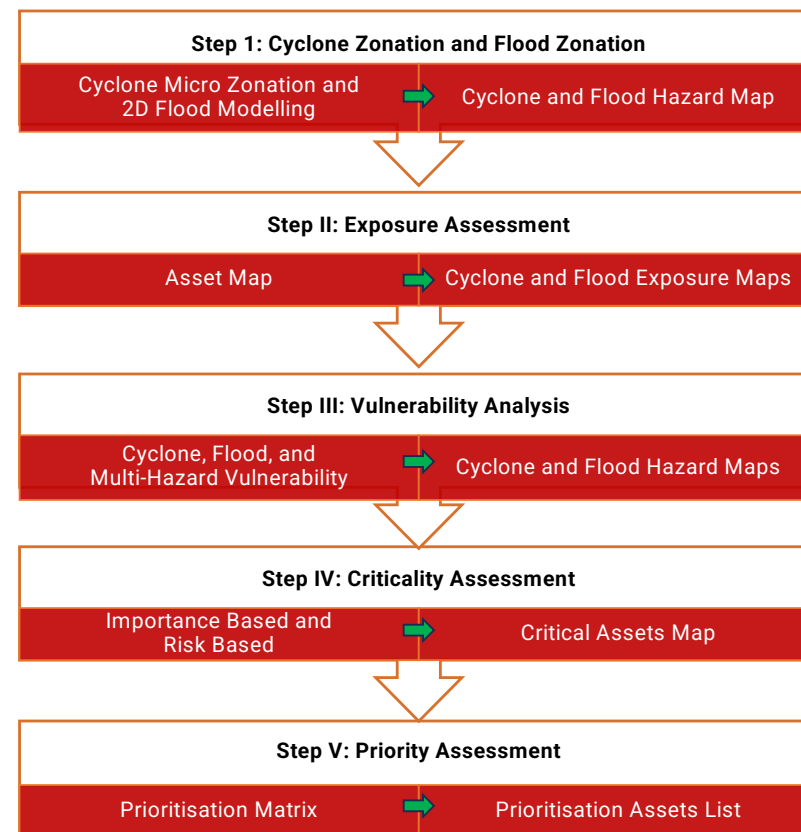
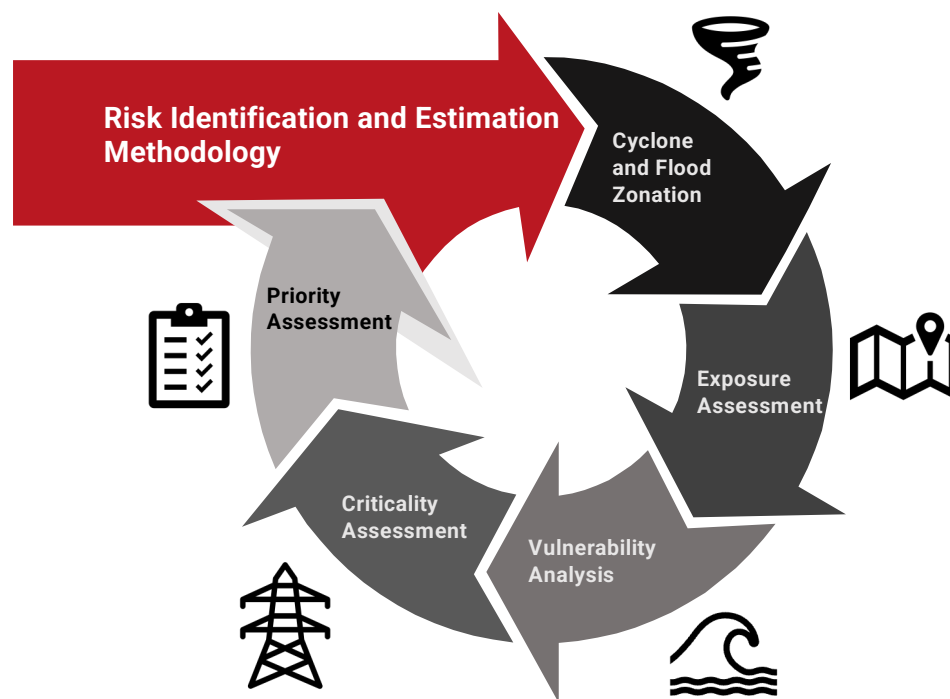
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Methodology: Risk Identification and Estimation

Exposure, Vulnerability, and Prioritization of Assets





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Key Findings for Odisha: Hazard Zonation, Asset Exposure, and Vulnerability Analysis

Hazard Zonation



As per the **50-year return period** cyclone zonation map, indicates that districts like as **Ganjam, Puri, Jagatsinghpur and Kendrapada** see wind speeds above **60 m/s**



As per the flood zonation map, **water depths** reached up to **1.13 meters** in several places

Asset Exposure



Wind speeds ranging from **50 to 60 m/s** detected in approximately **16 per cent** of the coastal areas



DISCOMs have approximately **30 per cent** of the infrastructure exposed to flooding in a **100-year return period** scenario



T&D assets extremely vulnerable to the severe storm, especially across **Puri, Jagatsinghpur, Kendrapada, and Ganjam**

Vulnerability Analysis



Over **30 per cent** of vulnerable distribution substations are located within **20 km** of the seacoast.



Ageing infrastructure, with nearly **75 per cent** of distribution lines commissioned three decades ago.



Approximately **80 per cent** of poles are of joist or PSC designs, making them susceptible to high wind speeds.



Longer span lengths, specifically **70 meters** or more, in **80 per cent** of the 33kV lines, heightening their susceptibility to damage.



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Key Findings for Odisha: Criticality Categorisation and Prioritization

Criticality Categorisation



Category-1: Feeding to **essential services** viz. medical, water supply pumping station, cyclone shelters, etc



Category-2: Based on loading (trunk lines)



Category-3: Based on feeding arrangement of substations viz. **Radial or Ring** system (to meet **N-1 contingency criteria**)

Prioritization Matrix

Criticality	Vulnerability	Distance from seacoast	Priority
Yes	High	High	1
Yes	High	Medium	2
Yes	High	Low	3
Yes	Medium	High	2
Yes	Medium	Medium	3
Yes	Medium	Low	4
Yes	Low	High	3
Yes	Low	Medium	4
Yes	Low	Low	4
No	High	High	2
No	High	Medium	3
No	High	Low	4
No	Medium	High	3
No	Medium	Medium	4
No	Medium	Low	4
No	Low	High	3
No	Low	Medium	4
No	Low	Low	4



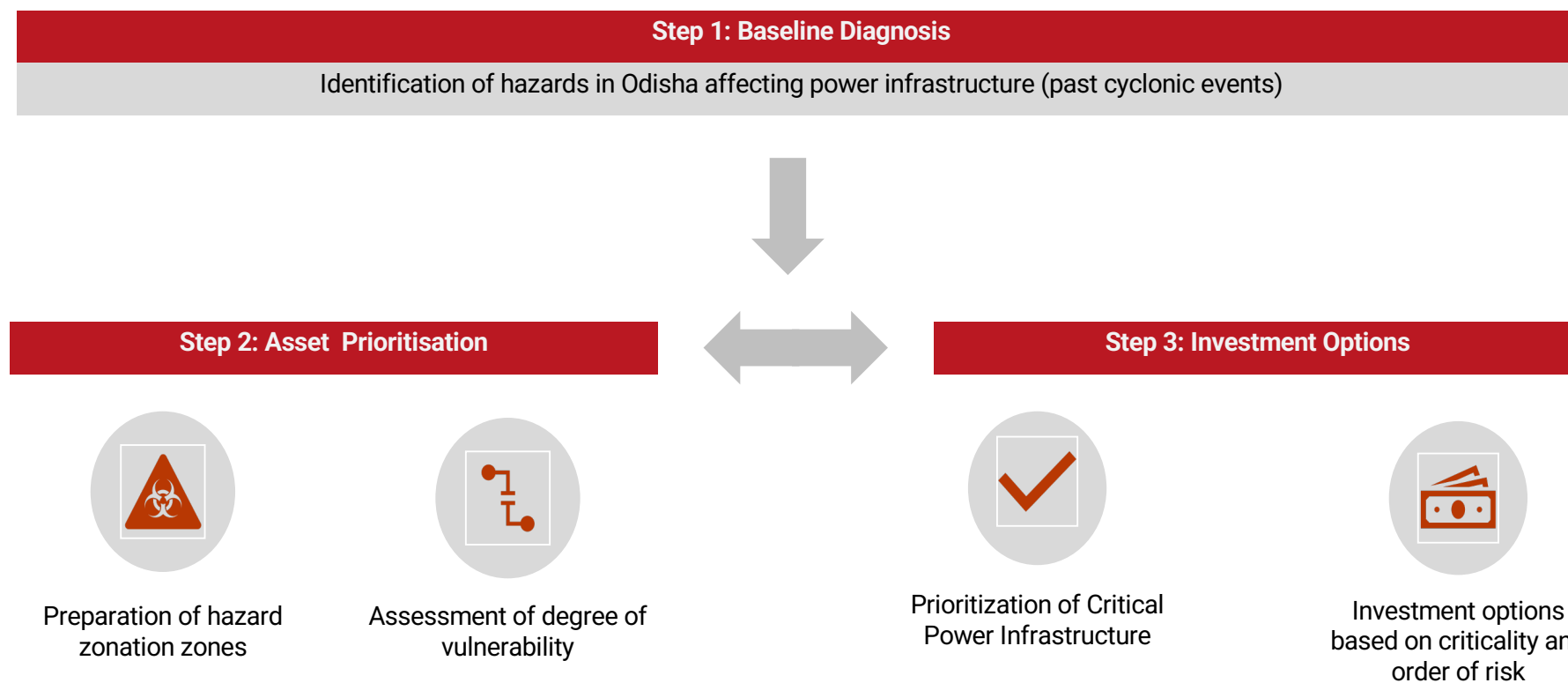
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Cost Benefit Analysis Methodology for Odisha Power Infrastructure





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Investment requirement

Priority Transmission and Distribution Investment (INR Crores)				
Utility	Priority 1 (0-20km)	Priority 2 (20-60km)	Priority 3 (>60km)	TOTAL
TPCODL	3,347	4,889	1,678	9,914
TPNODL	2,769	3,793	2,031	8,593
TPSODL	2,303	3,625	2,557	8,486
OPTCL	908	244	355	1,507
Total	9,328	12,550	6,621	28,499
Total (USD Mn)	972	1307	690	2,969



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Key considerations include benefits of investing in resilience and tariff impact on consumers



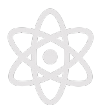
Benefits of Investing in Resilience

- Resilience infrastructure financing vs disaster risk financing: Government budget (or any other investment mechanism) should aim for balance between risk reduction investments before disasters and effective disaster response financing (i.e., restoration cost) to cover the remaining risks.
- Cost benefit or opportunity cost analysis establishes the benefit of investing in disaster resilient infrastructure in terms of avoided losses.



Tariff Impact

Impact of INR 9,328 crores of investment for resilient infrastructure, even if spread over multiple years, would be socio-politically untenable. Further, utilities will continue to undertake additional capex for efficiency and load growth as a part of BAU business plan.



Structuring Govt. Budgetary Support

- Discoms are 51% privately owned (Tata Power) and 49% GRIDCO (Grid Corp of Odisha) which is Govt. of Odisha company.
- Current mechanisms include assets getting created by Energy Department and gradually transferred to discoms in-lieu of 49% equity share of the government.
- ADB loan to Government of Odisha for on-lending to discoms can be explored.
- Resilience investments will likely result in efficiency gain, mitigating tariff impact.



ADB Support

Rationale for ADB loan for financing disaster resilient infrastructure given state's financial position and economic growth.



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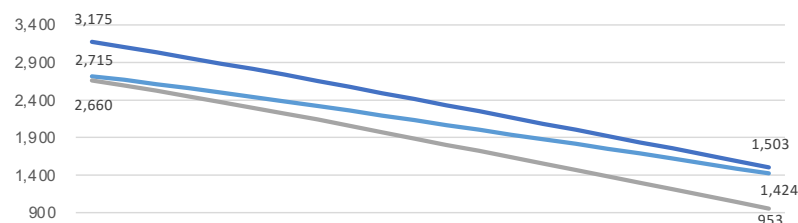
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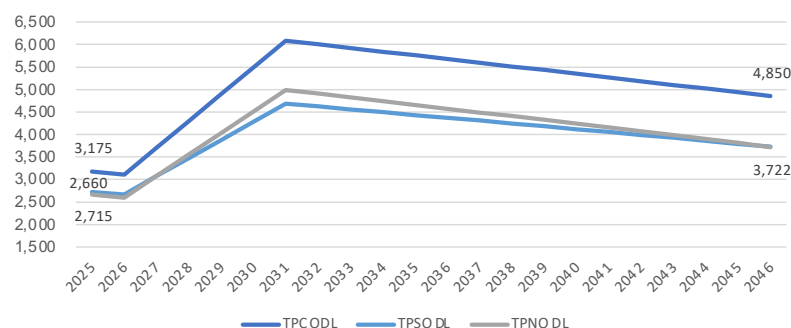


Key regulatory trends in Odisha

Without resilient investments till the end of 25 year tenure...



With resilient investments till the end of 25 year tenure...



The following capex projection has been considered as past trend with capex to follow last 5 year CAGR till 2031 and then reduced capex growth with an assumption that the operations should have reached optimum efficiency and capex requirement would only be required for load growth and asset replacement

Y-o-Y increase in capex		CAGR		Capex Growth Assumption	
DISCOMS	UOM	2027 to 2031	2032 to 2041	2041 to 2046	
TPCODL	%	5.5%	4.0%	3.0%	
TPSODL	%	9.2%	4.0%	4.0%	
TPNODL	%	8.1%	4.0%	4.0%	

Based on the capex projection as above, the equivalent equity transfer in kinds from the books of GRIDCO over the license period, the balance asset on the books of GRIDCO with and without resilient infrastructure will be as depicted in the graph and table below -

Outstanding on GRIDCO Books					
DISCOMs	Actuals as on	Estimated* as on		Estimated* (with resilient investment) as on	
	01.04.2025	01.04.2031	01.04.2046	01.04.2031	01.04.2046
TPCODL	3,175	2,735	1,503	6,082	4,850
TPSODL	2,715	2,381	1,424	4,684	3,727
TPNODL	2,660	2,218	953	4,987	3,722

*Estimated based on Utilities' Capex investment plans approved by Hon'ble OERC



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Options to finance DRI investment and financial assumptions

Options	Assumptions
Option I - Base Case Scenario – DISCOMs funds entire capex as per regulatory provisions	Debt assumptions - Interest Rate: 8.5% (Based on 2025-26 approved tariff order) - Loan Repayment Period: 10 Years Other assumptions - Construction Period : 5 Years - Asset useful life : 25 years - Y-o-Y Load Growth : 5% 70:30 Debt-Equity Ration on Discom Funds R&M 3% of additional GFA created through Disaster Resilience Infrastructure Exclusions – - Impact of efficiency improvement (e.g., technical loss reduction)
Option II – Disaster resilience assets created on GRIDCO books and only <u>depreciation</u> is a pass through.	Assumptions as above (except nil RoE and Interest and Financing Charges) 3% of additional GFA created through grant funded asset for Disaster Resilience Infrastructure



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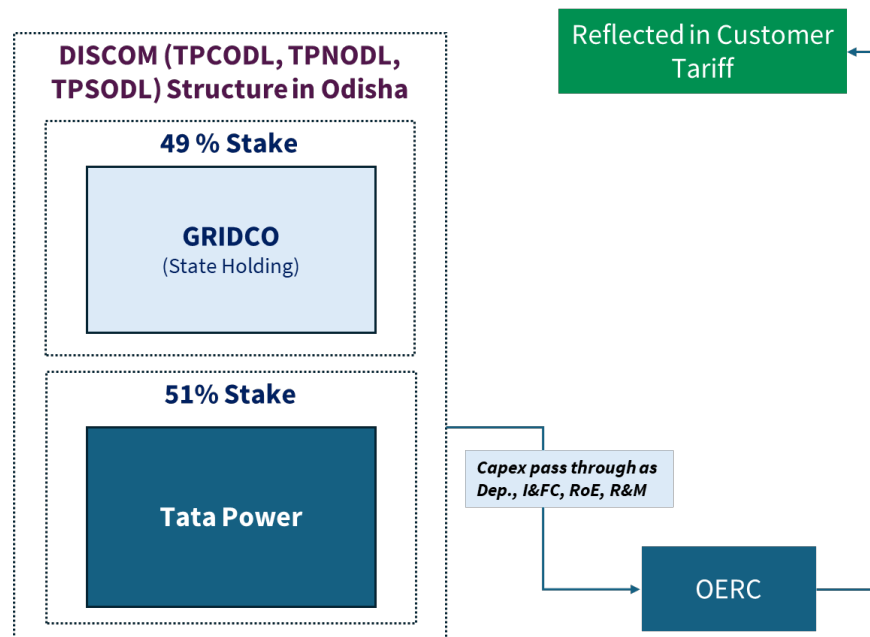
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Option I : Base Case Scenario

DISCOMs funds entire capex as per regulatory provisions (Debt to Equity Ratio – 70:30)



Year on Year and Levelized Tariff Increase (INR/ kWh)

	ACoS (FY2027)	Construction Period					Operational period (05/25 years)					30 yr. Tariff Impact (LCOE)
		FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	
TPCODL	4.92	0.04	0.18	0.31	0.42	0.48	0.44	0.41	0.38	0.35	0.32	0.25
TPNODL	5.05	0.06	0.23	0.39	0.53	0.6	0.56	0.52	0.48	0.44	0.40	0.31
TPSODL	4.78	0.09	0.38	0.63	0.85	0.97	0.90	0.83	0.77	0.71	0.65	0.51

Increase in Tariff vis-à-vis ACOS (FY 2027) (%)

	Construction Period					Operational period (05/25 years)					30 yr. Tariff Impact (LCOE)
	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	
TPCODL	0.9%	3.7%	6.2%	8.5%	9.7%	9.0%	8.3%	7.7%	7.1%	6.5%	5.0%
TPNODL	1.1%	4.6%	7.7%	10.4%	11.9%	11.0%	10.2%	9.5%	8.7%	8.0%	6.2%
TPSODL	1.9%	7.9%	13.2%	17.8%	20.3%	18.8%	17.5%	16.1%	14.8%	13.6%	10.6%



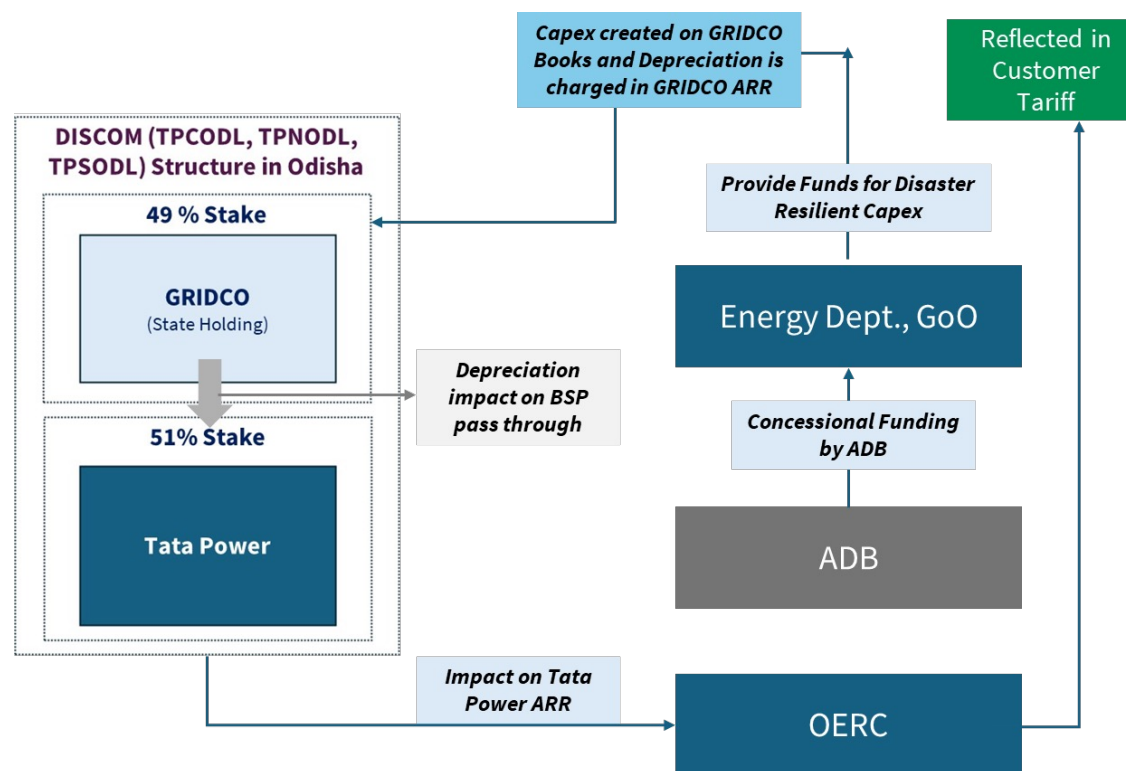
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Option II – 100% funded by GoO (Govt. of Odisha) through GRIDCO No RoE pass through | Only depreciation pass through in GRIDCO tariff





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Year on Year and Levelized Tariff Increase (INR/ kWh)

		ACoS (FY2027)	Construction Period					Operational period (05/25 years)					30 yr. Tariff Impact (LCOE)
			FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	
Dep. allowed	TPCODL _d	4.92	0.03	0.07	0.11	0.15	0.15	0.14	0.14	0.13	0.12	0.12	0.09
	TPNODL _d	5.05	0.03	0.08	0.12	0.16	0.17	0.16	0.15	0.14	0.14	0.13	0.11
	TPSODL _d	4.78	0.03	0.1	0.15	0.21	0.23	0.21	0.2	0.2	0.19	0.18	0.14
Dep. not allowed. Only R&M Impact	TPCODL	4.92	-	0.02	0.04	0.06	0.08	0.07	0.07	0.07	0.06	0.06	0.04
	TPNODL	5.05	-	0.03	0.05	0.07	0.09	0.09	0.09	0.08	0.08	0.07	0.06
	TPSODL	4.78	-	0.04	0.08	0.12	0.15	0.15	0.14	0.13	0.13	0.12	0.09

Increase in Tariff vis-à-vis ACOS (FY 2027) (%)

		Construction Period					Operational period (05/25 years)					30 yr. Tariff Impact (LCOE)
		FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	
Dep. allowed	TPCODL _d	0.6%	1.5%	2.3%	3.0%	3.0%	2.9%	2.8%	2.6%	2.5%	2.4%	1.9%
	TPNODL _d	0.6%	1.6%	2.4%	3.2%	3.3%	3.2%	3.0%	2.9%	2.7%	2.6%	2.1%
	TPSODL _d	0.7%	2.0%	3.2%	4.3%	4.7%	4.5%	4.3%	4.1%	3.9%	3.7%	2.9%
Dep. not allowed. Only R&M Impact	TPCODL	0.0%	0.5%	0.9%	1.2%	1.6%	1.5%	1.4%	1.3%	1.3%	1.2%	0.9%
	TPNODL	0.0%	0.5%	1.0%	1.5%	1.9%	1.8%	1.7%	1.6%	1.5%	1.5%	1.1%
	TPSODL	0.0%	0.9%	1.8%	2.5%	3.2%	3.0%	2.9%	2.8%	2.6%	2.5%	1.9%



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Thank you