SECTOR RATING: Overweight

PL Capital
PRABHUDAS LILLADHER

Power

Sector Update

August 24, 2026

Coverage Universe

Name of the Company	Rating	CMP (INR)	TP (INR)
Adani Energy Solutions	HOLD	1,542	1,752
CESC	BUY	155	220
Coal India	Accumulate	405	472
Indian Energy Exchange	Hold	124	135
JSW Energy	Buy	545	646
NTPC	BUY	340	450
Power Grid Corporation of India	BUY	272	331
Tata Power Company	Accumulate	374	414

AESL Kudus–Aarey HVDC: Powering Mumbai's Grid

Quick Pointers

- Adani's VSC-HVDC adds 1 GW to Mumbai
- Compact VSC ideal for space-constrained urban grids

We visited Adani Energy Solutions Mumbai HVDC project at Aarey, Goregaon. Discussion during the visit centred around operational aspects of HVDC vs HVAC transmission line, VSC vs LCC technology in HVDC and other operational aspects. Mumbai's peak power demand is ~4.3 GW, while local generation capacity is ~1.9 GW, making the city structurally dependent on power imports. The Kudus–Aarey HVDC link therefore serves power highway into Mumbai, adding 1 GW of incremental power import capability and strengthening the city's power supply reliability. Other key takeaways from the visit are as follows:

Kudus–Aarey HVDC strengthening Mumbai's power infeed: The Kudus–Aarey HVDC link, developed by Adani Energy Solutions Limited (AESL) is a 1,000 MW, VSC based HVDC project commissioned in April 2026. The ~80 km transmission corridor comprises 30 km of overhead line and ~50 km of underground cable, connecting Kudus in Maharashtra directly to Aarey in Mumbai. The project acts as a "virtual power plant" for Mumbai, enabling the city to import a large block of power, including renewable energy, from outside the city and reducing reliance on local generation. The link has increased Mumbai's power import capability.

Technology & EPC partner ecosystem: The INR 72bn Kudus–Aarey HVDC project has an estimated cost mix of ~50% equipment, ~30% cable, ~10% IDC, ~8% land and the balance in other costs. The project brings together global and domestic transmission specialists, with Hitachi Energy providing the core VSC-HVDC technology and undertaking the majority of the HVDC equipment/EPC scope. KEC International, as a subcontractor to Hitachi, is involved in civil and transmission-related execution, while an Indian company - Trenchless Engineering Services is responsible for HDD (Horizontal Directional Drilling) crossings. LS Cable (from South Korea) is supplying the specialised underground HVDC cable, while Stantec (from Canada) is providing engineering and consulting services.

VSC-HVDC: superior flexibility for urban grids: The Kudus–Aarey project uses VSC (Voltage Source Converter) technology, which offers greater flexibility and control compared with traditional LCC (Line Commutated Converter)-based HVDC systems. While LCC is well suited for high-capacity, long-distance power transmission with less T&D loss, it consumes reactive power and generally requires additional equipment (like STATCOM, Synchronous condenser) for voltage support, whereas VSC can independently and rapidly control active and reactive power, providing dynamic voltage support and better grid stability. VSC also offers black-start capability, a more compact footprint and greater suitability for underground cable systems, making it particularly relevant for Mumbai's space-constrained urban grid. In simple terms, LCC is like a high-

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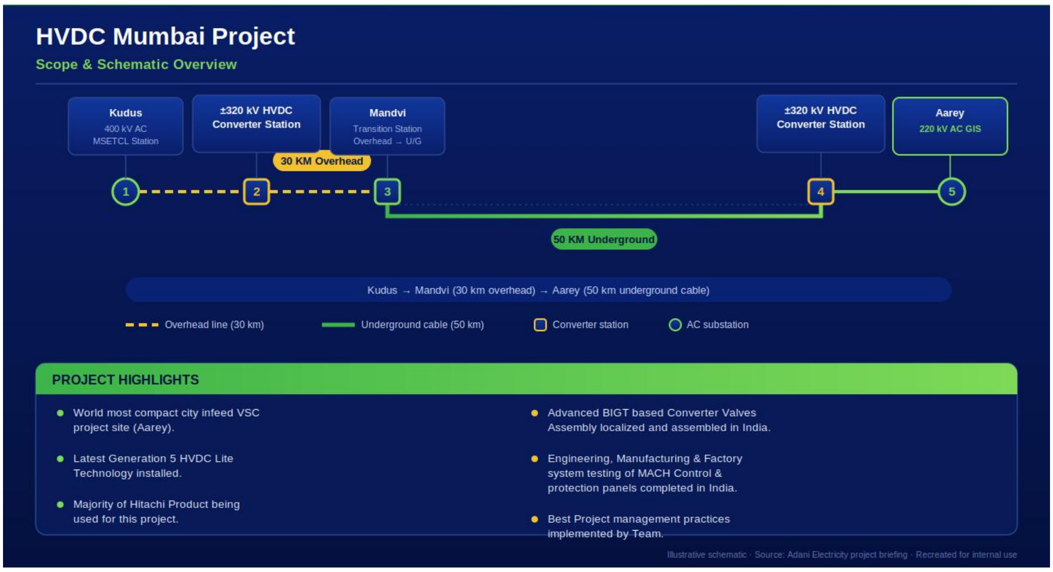
capacity electricity highway, while VSC is a highway with better traffic control and an in-built voltage stabilisation capability.

India's Growing HVDC Footprint: ~10 Operational Links: As of 2026, India has roughly 10 major operational HVDC schemes/links if Mumbai is included, comprising both long-distance point-to-point HVDC and back-to-back HVDC stations. Grid-India's operating data lists major links such as Vindhyachal, Mundra–Mohindergarh, Champa–Kurukshetra, Bhadrawati, Raigarh–Pugalur, etc.

Exhibit 1: **Mumbai HVDC Project Overview**



Source: PL, Company

Exhibit 2: : **Upcoming HVDC opportunity / bids for developers**

Name	Size in MW	Ckm	MVA
Rajasthan REZ (Ramgarh Complex) (Ramgarh-II)	6,000	2,700	7,500
Rajasthan REZ (Barmer Complex) (Barmer-III 6GW)	6,000	2,500	7,500
Rajasthan REZ (Jalore/Sirohi/Sanchore Complex)	6,000	2,500	7,500
Rajasthan REZ (Bhadla Complex) (Bhadla-V)	6,000	2,500	7,500
Rajasthan REZ (Ramgarh Complex) (Ramgarh-III)	6,000	2,700	7,500
Rajasthan REZ (Merta Complex) (Merta-III/Pali)	6,000	2,500	7,500
Rajasthan REZ (Bhadla Complex) (Bhadla-VI: 6GW)	6,000	2,500	7,500
Rajasthan REZ (Bikaner Complex) (Bikaner-VI)	6,000	2,500	7,500
Lakadia-II and Alephata HVDC	6,000	1,450	4,500
Karur PS – Pugalur (HVDC) 400kV	6,000	120	1,000
Ramgarh-II – Aurangabad (New) HVDC	6,000	1,000	1,500
Bhadla-IV – Raigarh Kotra-II HVDC link	6,000	2,500	7,500

Source: PL, Industry

Exhibit 3: HVDC vs HVAC Transmission Lines

Aspect	HVDC	HVAC
Conductors for given power	2 (bipolar) — ~33% less conductor material	3 (three-phase)
T&D Losses per 1000 km	~3–3.5%	~6–7%
Converter / terminal station losses	~0.7% per station (LCC) to ~1% (VSC) — ~1.5–2% total for both ends	Negligible (transformer only, <0.5%)
Break-even distance (overhead line)	Cheaper above ~600–800 km	Cheaper below
Break-even distance (submarine / underground cable)	Cheaper above ~40–70 km	Cheaper below
Practical AC cable length limit	No limit — links of 700+ km cables exist	~50–80 km (charging current)
Right-of-way for ~2000 MW	~25–30 m corridor (roughly half)	~50–60 m corridor
Reactive power on the line	Zero on the DC line	Significant; needs compensation every ~200–300 km
Typical voltage levels (India)	±320, ±500, ±800 kV DC	220 / 400 / 765 kV AC

Source: PL, Industry

Exhibit 4: HVDC Converter Technologies: LCC vs VSC

Parameter	LCC (thyristor)	VSC (IGBT / MMC)
Max power rating today	Up to ~8,000–12,000 MW	Up to ~3,000 MW, now reaching higher
Max DC voltage	±800 kV (UHVDC), ±1,100 kV in China	~±640 kV
Lower end of economic range	~250+ MW	A few tens of MW (down to ~30 MW)
Losses per converter station	~0.7%	~1.0%
Reactive power	Consumes ~50–60% of active power; needs filters + capacitor banks	Independently controllable (absorb or supply); no compensation needed
Harmonic filtering	Large AC/DC filter banks required	Minimal to none
Footprint (station area)	Large	~50–60% smaller
Minimum grid strength needed	Strong AC grid (high short-circuit ratio)	Works with weak or passive/dead grids
Black-start capability	No	Yes
Power reversal	Requires voltage polarity reversal	Reverse current direction (fast)
Fault response	Robust to DC faults; slow AC response	Grid-forming response within ~200 ms
Relative capital cost	Baseline (cheaper)	~10–30% higher for equivalent rating
Best-fit applications	Bulk point-to-point, strong grids	Offshore wind, weak/island grids, urban infeed, multi-terminal
Manufacturers (India + global)	Hitachi and GE Vernova	Hitachi, Siemens Energy and GE Vernova

Source: PL, Industry

Analyst Coverage Universe

Sr. No.	Company Name	Rating	TP (INR)	Share Price (INR)
1	Adani Energy Solutions	HOLD	1752	1724
2	Ahluwalia Contracts (India)	Buy	930	837
3	Ashoka Buildcon	BUY	150	114
4	CESC	BUY	220	165
5	Coal India	Accumulate	472	410
6	Dilip Buildcon	Accumulate	507	422
7	H.G. Infra Engineering	Accumulate	622	523
8	Indian Energy Exchange	Hold	135	124
9	IRCON International	HOLD	136	126
10	JSW Energy	Buy	646	562
11	KNR Constructions	HOLD	126	132
12	NCC	BUY	195	146
13	NTPC	BUY	450	351
14	PNC Infratech	BUY	271	210
15	Power Grid Corporation of India	BUY	331	272
16	PSP Projects	Accumulate	1062	951
17	Rail Vikas Nigam	SELL	165	228
18	RITES	BUY	267	216
19	Tata Power Company	Accumulate	414	371

PL's Recommendation Nomenclature (Absolute Performance)

BUY	:	> 15%
Accumulate	:	5% to 15%
Hold	:	+5% to -5%
Reduce	:	-5% to -15%
Sell	:	< -15%
Not Rated (NR)	:	No specific call on the stock
Under Review (UR)	:	Rating likely to change shortly

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