

List of Transmission Licensees as on 31.03.2023

S.No.	Name of Licensee	Date of grant of licence
1	Powerlinks Transmission Ltd.	13.11.2003
2	Torrent Power Grid Ltd	16.05.2007
3	Jaypee Powergrid Ltd	01.10.2007
4	Essar Power Transmission Company Ltd.	10.04.2008
5	Parbati Koldam Transmission Company Ltd	15.09.2008
6	Western Region Transmission (Maharashtra) (P) Ltd	30.12.2008
7	Western Region Transmission (Gujrat) (P) Ltd	30.12.2008
8	Teestavalley Power Transmission Ltd.	14.05.2009
9	North East Transmission Company Ltd.	16.06.2009
10	East - North Inter - Connection Company Ltd.	28.10.2010
11	Talcher - II Transmission Company Ltd.	08.11.2010
12	Cross Border Power Transmission Company Ltd.	01.12.2010
13	North Karanpura Transmission Company Ltd.	16.12.2010
14	Jindal Power Ltd	09.05.2011
15	Raichur Sholapur Transmission Company Ltd.	24.08.2011
16	Jabalpur Transmission Company Ltd.	12.10.2011
17	Bhopal Dhule Transmission Company Ltd.	12.10.2011
18	Powergrid NM Transmission Ltd.	20.06.2013
19	Torrent Energy Ltd.	16.07.2013
20	Adani Transmission (India) Ltd.	29.07.2013
21	Aravali Power Co. Ltd.	07.11.2013
22	Kudgi Transmission Ltd.	07.01.2014
23	Powergrid Vizag Transmission Ltd.	08.01.2014
24	Darbhangha - Motihari Transmission Company Ltd.	30.05.2014
25	Purulia & Kharagpur Transmission Company Ltd.	30.05.2014
26	Patran Transmission Company Ltd.	14.07.2014
27	Powergrid Unchahar Transmission Ltd.	21.07.2014
28	RAPP Transmission Company Ltd.	31.07.2014
29	NRSS XXXI (B) Transmission Ltd.	25.08.2014
30	Powergrid Kala Amb Transmission Ltd (NRSS XXXI (A) Transmission Ltd)	04.09.2014
31	NRSS XXIX Transmission Ltd. (Sterlite)	14.11.2014
32	Powergrid Jabalpur Transmission Ltd.	15.06.2015
33	Powergrid Parli Transmission Ltd (Gadarwara (B) Transmission Ltd.)	10.07.2015
34	POWERGRID Warora Transmission Ltd.	05.08.2015
35	Maheshwaram Transmission Ltd.	23.11.2015
36	Raipur-Rajandgaon-Warora Transmission Ltd.	29.02.2016

37	Chhattisgarh-WR Transmission Ltd.	29.02.2016
38	Sipat Transmission Ltd.	07.03.2016
39	POWERGRID Southern Interconnector Transmission System Ltd	14.03.2016
40	Alipurduar Transmission Ltd.	21.03.2016
41	Odisha Generation Phase-II Transmission Ltd.	30.06.2016
42	Gurgaon Palwal Transmission Ltd.	29.09.2016
43	Warora-Kurnool Transmission Ltd.	29.09.2016
44	North Karanpura Transco Ltd.	29.09.2016
45	Khargone Transmission Ltd.	17.11.2016
46	NRSS XXXVI Transmission Ltd.	07.12.2016
47	NER-II Transmission Ltd.	20.06.2017
48	Powergrid Medinipur Jeerat Transmission Ltd.	20.06.2017
49	Kohima-Mariani Transmission Ltd.	10.07.2017
50	Powergrid Mithilanchal Transmission Limited (ERSS XXI Transmission Ltd)	24.04.2018
51	Goa - Tamnar Transmission Project Ltd.	13.07.2018
52	Fatehgarh-Bhadla Transmission Ltd.	27.08.2018
53	Powergrid Varanasi Transmission Ltd (WR-NR Power Transmission Ltd)	27.08.2018
54	Powergrid Khetri Transmission System Ltd.	19.12.2019
55	Bikaner-Khetri Transmission Ltd.	27.12.2019
56	Udupi Kasargode Transmission Ltd. (UKTL)	24.01.2020
57	WRSS XXI (A) Transco Ltd.	24.01.2020
58	Power Grid Bhuj Transmission Ltd. (PBTL)	03.03.2020
59	Lakadia Banaskantha Transco Ltd.	03.03.2020
60	Powergrid Ajmer Phagi Transmission Ltd. (PAPTL)	04.03.2020
61	Powergrid Fatehgarh Transmission Ltd. (PFTL)	04.03.2020
62	Lakadia Vadodara Transmission Project Ltd. (LVTPL)	04.03.2020
63	Jam Khambhaliya Transco Ltd.	24.03.2020
64	Vapi-II North Lakhimpur Transmission Ltd.	01.04.2021
65	Powergrid Ramgarh New Transmission Ltd.	31.05.2021
66	Powergrid Bikaner Transmission System Limited (Bikaner-II Bhiwadi Transco Ltd.)	15.07.2021
67	NRSS XXXI (A) Transmission Ltd., (Now known as Powergrid Kala Amb Transmission Limited - on the RTM route)	22.03.2022
68	Koppal-Narendra Transmission Ltd.	28.03.2022
69	Powergrid Sikar Transmission Ltd.	27.05.2022
70	POWERGRID Aligarh Sikar Transmission Ltd.	28.05.2022
71	Karur Transmission Ltd.	16.06.2022
72	Khavda-Bhuj Transmission Ltd.	16.06.2022
73	Kallam Transmission Ltd.	18.07.2022

74	POWERGRID Southern Interconnector Transmission System Limited (RTM Route)	18.07.2022
75	Gadag Transmission Ltd.	18.07.2022
76	Nangalbibra-Bongaigaon Transmission Ltd.	28.07.2022
77	Rajgarh Transmission Ltd. (RTL)	13.09.2022
78	Warora Kurnool Transmission Ltd. (RTM Route)	13.09.2022
79	Powergrid Narela Transmission Ltd.	26.09.2022
80	POWERGRID Bikaner Transmission System Ltd. (RTM Route)	21.11.2022
81	Power Grid Bhadla Transmission Ltd.	25.11.2022
82	POWERGRID Neemuch Transmission System Ltd.	27.12.2022
83	Khandukhal Rampura Transmission Ltd.	27.01.2023
84	POWERGRID ER NER Transmission Ltd.	04.02.2023
85	Gadag II-A Transmission Ltd.	26.02.2023

List of Trading Licensee as on 31.03.2023

Sr. No.	Name of Trading Licensee	Date of Issue of License	Category of License
1	Tata Power Trading Company Ltd.	09.06.2004	I
2	Adani Enterprises Ltd.	09.06.2004	I
3	PTC India Ltd.	30.06.2004	I
4	NTPC Vidyut Vyapar Nigam Ltd.	23.07.2004	I
5	National Energy Trading & Services Ltd.	23.07.2004	III
6	Instinct Infra & Power Ltd.	07.09.2005	III
7	Essar Electric Power Development Corporation Ltd.*	14.12.2005	-
8	JSW Power Trading Company Ltd.	25.04.2006	IV
9	Greenko Energies (P) Ltd.	22.01.2008	III
10	Ambitious Power Trading Company Ltd.	16.09.2008	IV
11	RPG Power Trading Company Ltd.	23.09.2008	II
12	GMR Energy Trading Ltd.	14.10.2008	I
13	Knowledge Infrastructure Systems (P) Ltd.	18.12.2008	IV
14	Kreate Energy (I) Pvt. Ltd.	12.02.2009	II
15	Shree Cement Ltd.	16.03.2010	IV
16	ABJA Power Pvt. Ltd.	26.04.2011	III
17	Customised Energy Solutions India (P) Ltd.	08.06.2011	V
18	Statkraft Markets (P) Ltd.	21.06.2012	I
19	Manikaran Power Ltd.	29.06.2012	I
20	Arunachal Pradesh Power Corporation (P) Ltd.	11.09.2012	II
21	Vedprakash Power (P) Ltd.*	19.08.2013	-
22	Solar Energy Corporation of India	01.04.2014	I
23	Saranyu Power Trading Private Limited*	10.02.2015	-
24	Gita Power & Infrastructure (P) Ltd.	20.10.2015	V
25	Phillip Commodities India Pvt. Ltd.	21.01.2016	IV
26	Atria Energy Services Private Ltd.	20.06.2017	V
27	NHPC Ltd.	23.04.2018	I
28	NLC India Ltd.	13.07.2018	I
29	Refex Energy Ltd.	30.08.2018	I
30	NTPC Ltd.	08.07.2019	I
31	Amp Energy Markets India Pvt. Ltd.	15.04.2021	V
32	Altilium Energies Pvt. Ltd.	23.05.2021	V
33	Shubheksha Advisors Pvt. Ltd.	31.07.2021	V
34	Reneurja Power LLP	31.07.2021	V
35	ReNew Energy markets Pvt. Ltd.	28.11.2021	IV
36	Shell Energy Marketing and Trading India Pvt. Ltd.	22.12.2021	V

37	SJVN Ltd.	10.01.2022	I
38	Instant Ventures Pvt. Ltd.	09.02.2022	V
39	Refex Industries Ltd.	21.03.2022	I
40	Ideal Energy Solutions Pvt. Ltd.	22.03.2022	V
41	AEI New Energy Trading Pvt. Ltd.	25.03.2022	III
42	Kundan International Private Ltd.	29.04.2022	II
43	Saini Power Transactor	06.07.2022	V
44	Powerfull Energy Trading Private Ltd.	09.08.2022	V
45	Visual Percept Solar Projects Private Ltd.	27.11.2022	III
46	REL Power Trading LLP	13.12.2022	V
47	VEH Global India Private Ltd.	26.12.2022	IV

* License category is under review

Historical Volatility Formula:

$$\sigma = \sqrt{\frac{1}{(n-1)} \sum_{y=1}^n \left(\ln \frac{y_i}{y_{i-1}} - \mu \right)^2}$$

$$\mu = \frac{1}{n} \sum_{y=1}^n \left(\ln \frac{y_i}{y_{i-1}} \right)$$

where

1. Daily prices returns = $\text{Ln} (y_i / y_{i-1})$.
2. y_i is price for today; y_{i-1} is price on previous day.
3. Ln is natural logarithm
4. n is the number of observations
5. μ is the average daily returns

Herfindahl-Hirschman Index (HHI)

Formula for computing the HHI is as under:

$$\mathbf{HHI} = \sum_{i=1}^N s_i^2$$

where, s_i is the market share of firm i in the market, and N is the number of firms.

The Herfindahl-Hirschman Index (HHI) ranges from $1/N$ to 1, where N is the number of firms in the market. Equivalently, if percentages are used as whole numbers, as in 75 instead of 0.75, the index can range up to 100^2 or 10,000.

- HHI below 0.01 (or 100) indicates a highly competitive index.
- HHI below 0.15 (or 1,500) indicates an unconcentrated index.
- HHI between 0.15 to 0.25 (or 1,500 to 2,500) indicates moderate concentration.
- HHI above 0.25 (above 2,500) indicates high concentration.

There is also a normalized Herfindahl index. Whereas, the Herfindahl index ranges from $1/N$ to 1, the normalized Herfindahl index ranges from 0 to 1.