

Overview of Electricity Generation and Consumption in Rajasthan

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Abstract: Rajasthan is the biggest state of India so it is necessary to develop Rajasthan as the backbone of country and we know that power resources play a key factor in the modern agricultural, industrial and economic development. It is said that, chronically Rajasthan has been power Hunger state.

In this paper we will discuss about various power plants established in India, their location, generation capacity, and other various details so is to make a brief overview about the power consumption and generation in Rajasthan. As well as we will also make a focus about the hope of non-conventional renewable resource of energy. Non-conventional sources like solar and wind energy may play vital role in converting Rajasthan into a power surplus state.

Keywords: T.P.P , H.P.P , Non-Conventional, RERC

1. Introduction

The Rajasthan electricity regulatory commission (RERC) is responsible for regulation Electricity sector in Rajasthan. Also RERC is responsible for distribution of electricity, distribution of licensees among consumers, electricity rate and other activities.

Rajasthan Rajya Vidyut Utpadan Nigam Ltd. (government of Rajasthan) looks after the generation of electricity in Rajasthan. Establishment of new power plant, their maintenance, and other sectors are taken under the functioning of Rajasthan Rajya Vidyut Utpadan Nigam ltd.

We will elaborate all power generating sectors of Rajasthan liker thermal power plant, solar plant, diesel power plant etc. one by one .



Fig. 1. Rajasthan electricity regulatory commission

The main power sources of Rajasthan are,

- Thermal power plant
- Hydro power plant
- Gas power plant
- Wind power plant
- Biomass power plant
- Solar power plant
- Nuclear power plant

2. Thermal power plant

Thermal Power Plant:

- 1) Surat garh super thermal power plant
- 2) Kota super thermal power plant
- 3) Chhabra thermal power plant
- 4) Kalisindh thermal power station
- 5) Giral lignite power plant
- 6) Barsingsar thermal power station
- 7) Jsw barmer power station
- 8) Kawai thermal power station
- 9) VS lignite power plant

1) Surat Garh Super Thermal Power



Fig. 2. Surat Garh Super Thermal Power Plant

Surat Garh Thermal Power Plant is the first super Thermal power plant of Rajasthan. It was established in May -1998 It has installed capacity of 1500 megawatt power, which is

Table 1
 SSTPS progress at a glance

Stage no.	Unit no.	Capacity	Date of Commercial run	Status
1	Unit 1	250MW	May 1998	Running
2	Unit 2	250MW	March 2000	Running
3	Unit 3	250MW	October 2001	Running
4	Unit 4	250MW	March 2002	Running
5	Unit 5	250MW	June 2003	Running
6	Unit 6	250MW	March 2009	Running
7	Unit 7	660MW	-	Under construction
8	Unit 8	660MW	-	Under construction

Table 2
 Kota super thermal power station

1	Location	Kota, Kota Rajasthan(India)
2	Status	Operational
3	Commission date	1998
4	Operator(s)	Rajasthan Vidyut Utpadan Nigam Ltd(RVUNL)
5	Primary fuel	Coal power generation
6	Units operational	Seven
7	Name plate capacity	1241.00mw

still highest in the state.

Also, there are 6 units in Surat Garh thermal power station and each one of them has capacity of 250 mv power. It is located 27 km away from Surat Garh town in Ganganagar in district on the left bank of IGNP at up stream of Surat Garh barrage. The station is operated and maintained by Rajasthan Vidyut Utpadan Nigam limited.

It is coal based thermal station which receives coal from MP and JHARKHAND. It receives water from Indira Gandhi canal. Now a day it is generating 1500 mw electricity with six units of 250 MW each and it is expected to generate 2660 mw electricity after the setup of 7th and 8th unit.

2) Kota Super Thermal Power Plant

Kota super thermal power station is located on the left bank of river Chambal in Rajasthan principal industrial city kota infrastructural facilities like adequate a water availability in kota barrage throughout the year.

Kota thermal power station has received meritorious productivity awards during 1984, 1987, 1989, 1991 and every year since 1992 onwards.



Fig. 3. Kota Super Thermal Power Plant

3) Barsingsar Thermal power station

The undated satellite photo below shows the power station in Barsingsar village in Bikaner District Unit 1-2

- Unit -1 (125mw) was Commissioned on June 28, 201
- Unit-2(125mw) was commissioned on January 25, 2011
- Unit-3(250mw) received its Environmental clearance on July 30, 2012
- In its 2013- 2014 annual report NLC Started the company was seeking environmental.
- In May 2015 the NLC Board approved investing in the 250 mw Barsingsar extension and hadla lignite Mine at a cost of 2, 628 crore.
- Extension of the existing Barsingsar power project at an aggregate cost rupees 2638.04 crore (Nov. 2014)
- Government of Rajasthan has allocated mining lease area of 15.66383 sq. km.
- Implement the above project through epic mode and the project is expected to be commissioned during the year 2019.
- Cumulative expenditure increased up to 31st march 2015 is 3.08 crore and 31st march 2016 is 3.34 crore.



Fig. 4. Barsingsar thermal power station

Table 3
Kawai thermal power station

1	Location	Kawai village, atru taluk, baran district, Rajasthan
2	Coordinates	24.7779971, 76.7371443
3	Status	Operating (phase 1); shelved (phase 2)
4	Capacity Phase 1 Phase 2	1320 mw (2*660 mw) 1600 mw
5	Type	Supercritical
6	Projected in service	2014 (phase 1)
7	Coal source	As wet unknown , coal linkage applied for from government of India
8	Estimated annual CO ₂	7806085

Table 4
JSW Barmer power station

1	Unit 1	135MW	October 2010
2	Unit 2	135MW	July 2010
3	Unit 3	135MW	November 2011
4	Unit 4	135MW	November 2011
5	Unit 5	135MW	Commissioned February 2013
6	Unit 6	135MW	Commissioned March 2013
7	Unit 7	135MW	Commissioned March 2013
8	Unit 8	135MW	Commissioned February 2013

4) Kawai Thermal Power Station

The Kawai Thermal Power station is a 1320 mw coal fired power station in Kawai district Baran, Rajasthan, India. It was commissioned in 2014. The project was developed by Adani power Rajasthan limited, a subsidiary of Adani power.

A power purchase agreement has been executed with Jaipur vidyut vitran nigam limited, Ajmer vidyut nigam limited and jodhpur Vidyut Nigam limited for the sale of 1200 MW power for term of 25 year at a tariff having a non-escapable component and an escapable component fuel and fuel transportation with yearly escalation us notified by CERC escalation indexes from time to time. According to the central electricity authority unit 1 will be commissioned in January 2013 and unit 2 in April 2013. The power station was commissioned in January 2014.

In September 2014 Adani power applied to expand the power station by 1600 MW.

5) Chhabra Thermal power station



Fig. 5. Chhabra thermal power station

There are 6 running units of chhabra thermal power plant. Unit 1 to 4 of chhabra thermal power plant is located at MOTI PURA chowki Village Chhabra Tehsil, Baran District Rajasthan (India) And unit 5 and 6 are located to the north of

existing plant. This is a thousand megawatt coal fired power station and 1320 MW expansion of the power station is under construction. It began as a 500 megawatt power station commissioned in 2009 2010. The Chhabra thermal power station is under construction of two 250 megawatt units.

6) Kalisindh Thermal Power Station



Fig. 6. Kalisindh Thermal Power Station

Kalisindh thermal power station is located at about 7 km south west of Jhalawar near Nimoda, Undal, Motipura, Singharia and Devri village in Jhalawar district of Rajasthan state.

That plant site is about 12 km from jhalawar. And 2km from state highway no 19 and 8km from proposed Ramganj mandi Bhopal broad gauge rail line

Sponsor: Rajasthan RV Utpadan Nigam

Location: Kalisindh village, Jhalwar district, Rajasthan

Coordinates: 24.5325129, 76.100353 (exact)

Status:

(1) Phase 1: Unit 1: Operating (2014)

Table 5
 Chambal hydroelectric project
 Salient features

S. No.	Attribute	Value
1	Hydroelectric project name	Chambal hydroelectric project
2	Hydroelectric project name Alias	
3	State	Madhya Pradesh ,Rajasthan
4	District	Kota
5	River	Chamlal
6	Basin	Ganga
7	Hydroelectric region	Northern HE region
8	Total installed capacity(mw)	386
9	Type of project	Major (>25mw)
10	Hydroelectric project status	Completed
11	Purpose	Hydro electric
12	Owner	State
13	Owner name	RRVPNL
14	Inter basin	No
15	Project sharing	Inter state
16	Interstate Agreements	MP:50% RJ:50%
17	Intercountry	None
18	Remarks	

Associated Entities with Hydro-Electric project		
#	Name	Type
1	Gandhi sagar dam	DAM
2	Gandhi sagar power house	Power house
3	Jawahar sagar dam	DAM
4	Jawahar sagar power house	Power house
5	Rana pratap sagar power house	Power house
6	Rana pratap sagar dam	DAM

(2) Phase 2: Unit 2: Operating (2015)

(3) Phase 2: Sheaved

Capacity: Phase 1: 1200mw (2*600mw);

Phase 2: 1320mw (2*660mw)

Type: Phase 1 and Phase 2: Supercritical

Coal Source: Paras east and Kanta basin, Rajasthan

Estimated annual CO₂: 7,096,441

7) JSW Barmer Power Station

JSW Barmer (Jalipa Kapurdi) Power station is a partly commissioned coal-fired power station in Rajasthan, India. It is proposed by JSW Energy subsidiary Raj West Power.

A “Phase 1” of 8*135mw units was completed in 2013. An additional 660mw has been proposed.

In January 2012 presentation to investor, JSW Energy stated the entire first phase of the plant (8*135mw) will be completed in 2012. Actual completion was in early 2013. The company stated that it has entered into a “long term arrangement for entire capacity with state government distribution utilities.

Waterford power plant is sourced from Indore Gandhi Canal by constructing a 185km pipeline.

JSW states that Rajasthan state minerals and mining Ltd and Raj west power limited have collaborated to setup a joint venture company. Barmer Lignite mining Company Limited (BLMCL). This is the first and largest public private partnership in the state of Rajasthan. It shall be mining and supplying lignite from Jalipaand Kapurdi mines.

8) VS Lignite Power Plant

- Capacity-135MW
- Commission date-for Bikaner district
- Primary fuel-Combustion boiler
- Nameplate capacity -135MW

3. Hydro power plant

There are two hydro power plant are running in Rajasthan.

- 1) Chambal hydroelectric project
- 2) Mahi hydroelectric project

4. Gas power plant

There are two gas power plants in Rajasthan. They are

- 1) Dholpur Combined Cycle Power Plant
- 2) Ramgarh Gas Thermal Power Plant.

1) Dholpur Combined Cycle Power Plant

It is located in Dholpur Rajasthan it is operated by the Rajasthan Rajya Vidyut Utpadan Nigam LTD (RVUNAL) .It’s capacity is 330MW. Its estimated cost is Rs. 1155Cr. It is started in March 2007 only one unit. Now it is in the stage 3 unit started in December 2007.

2) Ramgarh gas thermal power station.

It is located at Ramgarh in Jaisalmer district. It is started in 15 Nov.1994.

The plant is operated by Rajasthan Rajya Vidyut Utpadan Nigam. Total capacity is 270.5MW.

Table 6
 Mahi hydroelectric project
 Salient features

S. No.	Attribute	Value
1	Hydroelectric project name	Mahi hydroelectric project
2	Hydroelectric project name Alias	
3	State	Rajasthan
4	District	Banswara
5	River	Mahi
6	Basin	mahi
7	Hydroelectric region	Northern HE region
8	Total installed capacity(mw)	140
9	Type of project	Major (>25mw)
10	Hydroelectric project status	Completed
11	Purpose	Hydro electric
12	Owner	State
13	Owner name	RRVPNL/RVUNL
14	Inter basin	No
15	Project sharing	NONE
16	Interstate Agreements	
17	Intercountry	None
18	Remarks	

#	NAME	TYPE
1	Mahi- I power house	Power house
2	Mahi- II power house	Power house
3	Mahi Bajaj sagar dam	DAM

5. Wind Energy



Fig. 7. Wind Energy

There are five major wind energy in Rajasthan. They are,

- 1) Welspum energy commission
 - Capacity- 20MW
 - Commission date
 - Primary fuel
 - Place/area- Rajasthan
- 2) Nalco wind power project.
 - Capacity- 50MW
 - Commission date- 2013
 - Primary fuel
 - Place-Rajasthan(Jaisalmer)
- 3) CLP India wind power plant.
 - Capacity- 100MW
 - Commission date: 2013
 - Primary fuel
 - Place: Rajasthan

- 4) Inox wind park GSS Rajasthan wind power plant
 - Capacity- 54118 MW, 02 units
 - Commission date: June 2015, for Gujarat
March 2016, for Rajasthan
- 5) Suzlon energy limited wind power plant.
 - Capacity: 17000MW
 - Commission date: 1995 (23 years ago)
 - Area: world wide

6. Biomass power plant

- 1) Dholpur consigned power plant station (RVVNL)
 - Capacity: 330 MW, it has 2 units
 - Commission date: March 2007
 - Nameplate capacity: 330 MW
- 2) Ramgarh gas thermal power station (RVVNL)
 - Capacity: 270.5 MW, it has 5 units
 - Commission date: 15 November 1994
 - Nameplate capacity: 270.5 MW
 - Primary fuel: Natural gas

7. Solar power plant

Solar Power Plant in Rajasthan:

By the virtue of nature and geography, Rajasthan has highest number cloud –free days and high insolation ideal for the generation of solar power plants in Rajasthan. Also due to highest level of solar radiation, abundant and availability at the cheapest rate and an investor friendly policy. Therefore, the day is not so much far off when Rajasthan become the hub of solar energy.

There are so many solar plants working in Rajasthan. Some important solar projects of Rajasthan are

Table 7
 Detail of on-going list of solar power plants in Rajasthan

S. No.	Name of solar power producer	Capacity (MW)	District	GSS
1	M/s Diwakar solar projects Pvt. LTD.	100	Jaisalmer	220kv gss ps1
2	M/s KVK energy ventures PVT LTD.	100	Jaisalmer	220kv gss ps1
3	M/s. corporate Ispat alloy LTD.	50	Jaisalmer	220kv gss ps1
4	Arjun green power Pvt. LTD.	5	Jodhpur	440kv gss bhadla
5	Ergo engineering projects Pvt. LTD.	10	Jodhpur	440kv gss bhadla
6	VS lignite power Pvt. LTD	10.00	Bikaner	132kv gss , kolayat
7	Saboo sodium chloro LTD.	1.25	Bikaner	132/33kv gss , kolayat
8	M/s. Zenex Multiventure Pvt. LTD>	5.00	Jodhpur	220/132kv gss bilara
9	M/s Reeja infracon Pvt. LTD.	5.00	Jodhpur	220/132kv gss bilara
10	Reliance green power Pvt. Ltd	150.00	Jaisalmer	220kv gss dechu
11	M/s Mukherji & Mukherji	1.00	Ajmer	132kv gss roopangarh
12	M/s Udaipur minerals D.S. pvt.ltd	1.00	Bhilwara	33kv gss ghewaria
13	M/s sangam India limited	3.00	Chittorgarh	33kv gss nimbahera
14	M/s Messadhu wali military cant., Sirgan Ganagar.	2.00	Bikaner	33kv gss keshrisinghpur
15	M/S Airport authority of India ltd.	1.80	Jaipur	33kv gss pratap nager & jawahar circle.

Table 8
 Nuclear power station

Coordinates	24.52'20"N 75.36'50"E
Construction began	1963
Commission date	16 December 1973
Operator(s)	Nuclear power corporation of India Ltd(NPCIL)
Reactor type	PHWR
Units operation	1*100MW 1*200MW 4*220MW
Units under cont.	2*700MW
Nameplate capacity	1180MW
Capacity factor	30.4%
Annual net output	3,140GW.h

Unit	Type	Net mw	Gross mw	construction	Date of criticality	Commercial operation	Shut down
Rajasthan-1	CANDU	1981	100mw	01.08.1965 - 30.11.1972	11.08.1973	16.12.1973	Oct 2014
Rajasthan-2	PHWR	187mw	200mw	01.04.1968 - 01.11.1980	May 1981	01.04.1981	
Rajasthan-3	PHWR	202mw	220mw	01.02.1990 - 10.03.2000		01.06.2000	
Rajasthan-4	PHWR	202mw	220mw	01.10.1990 - 17.11.2000		23.12.2000	
Rajasthan-5	PHWR	202mw	220mw	18.09.2002 -	24.11.2009	04.02.2010	
Rajasthan-6	PHWR	202mw	220mw	20.01.2003 -		31.03.2010	
Rajasthan-7	PHWR	630mw	700mw	18.07.2011	2017(expected)		
Rajasthan-8	PHWR	630mw	700mw	Dec.2011	2018(expected)		

- 1) Dhirubhai Ambani solar park, Pokhran, Jaisalmer
- 2) Bhadla solar park, Bhadla, Johpur

Some private companies are also producing solar energy.

8. Nuclear power station

The Rajasthan atomic power station (RAPS), Also Rajasthan power project is located at Rawatbhata in the state of Rajasthan, India.

9. Conclusion

This paper presented overview of electricity generation and consumption in Rajasthan

References

- [1] Rajasthan Rajya Vidyut Utpadan Nigam Ltd.
- [2] The Rajasthan electricity regulatory commission (RERC)