

# Power Sector of Rajasthan

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Rajasthan Rajya  
Vidyut Prasaran  
Nigam Ltd.



Jaipur Vidyut Vitran  
Nigam Ltd.



Ajmer Vidyut Vitran  
Nigam Ltd.



Jodhpur Vidyut  
Vitran Nigam Ltd.



Rajasthan Rajya  
Vidyut Utpadan  
Nigam Ltd.



The Oberoi, Dr. Zakir Hussain Marg, New Delhi  
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# In this presentation...

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- Introduction
  - Power supply position
  - Accelerated Generation Capacity Addition Programme
    - Power requirement and availability
    - XI plan projects
    - XII plan projects
  - Expansion of Transmission network
    - Status & plan
    - New technology adaptations
    - Private sector participation
  - Distribution sector
    - Loss Reduction Programme
    - Distribution network expansion
    - Rural electrification
  - Renewable energy scenario
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# Introduction

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- ❑ Rajasthan is among the first few states to introduce reforms in the Power Sector
  - ❑ Rajasthan Electricity Regulatory Commission functioning since Jan 2000
  - ❑ RSEB was unbundled into one Generating, one Transmission and three Distribution companies on 19 Jul 2000
  - ❑ Open Access allowed by the Regulator in phased manner
    - 1 MVA & above wef 1 Apr 2008
  - ❑ Largest state in India, High cost of energy delivery
  - ❑ Rajasthan lacks conventional sources of energy but endowed with abundant Solar and large Wind potential
  - ❑ Present installed capacity (Dec. 10)- 8868 MW
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# Power Supply Position

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- Power supply position Satisfactory as compared to the Region
    - No power cuts on Industry except peak period restriction during shortages
    - No power cuts in Urban area
    - 16-20 hrs power supply to rural domestic and non domestic consumers
    - 6 hrs power supply to Agriculture
  - Strong and robust transmission system
    - Transmission system spread in every nook and corner of the State
    - Transmission system comprising of 400 kV, 220 kV and 132 kV Grid Substations
    - Peak load of 7407 MW handled in Jan 2011
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# Power Requirement and Availability

- ❑ Projected peak demand at the end of XI plan (2011-12) **8927 MW**
- ❑ Capacity required to meet this peak demand **11903 MW**
- ❑ Projected peak demand at the end of XII plan (2016-17) **14396 MW**
- ❑ Capacity required to meet this peak demand **19195 MW**
- ❑ Capacity addition planned/ expected **MW**

	XI Plan (remaining period)	XII Plan	Total
State Sector	1860	7750	9610
Central Sector	331	1505	1836
Private Sector (State IPP)	810	3840	4650
UMPP allocation -2555 MW	-	1533 (60% success rate)	1533
Total	3001	14628	17629

# XI Plan Projects

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## □ State Sector- 3150 MW

### ■ Already commissioned- 1290 MW

□ Dholpur GTP Unit 2	110 MW	16.6.07
□ Dholpur GTP Unit 3	110 MW	26.12.07
□ Giral Unit 2	125 MW	26.12.08
□ STPS Unit 6	250 MW	29.8.09
□ KTPS Unit 7	195 MW	31.8.09
□ Chhabra TPS Unit 1	250 MW	30.10.09
□ Chhabra TPS Unit 2	250 MW	3.5.10

### ■ Likely to be commissioned- 1860 MW

□ Chhabra TPS Unit 3 & 4	500 MW	Oct 11 & Dec 11
□ Kalisindh TPS Unit 1 & 2	1200 MW	Dec 11 & Mar 12
□ Ramgarh GTP Ext	160 MW	Nov 11 & Mar 12

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# XI Plan Projects

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- Private Sector- 1080 MW
    - M/s RajWest Power selected through Competitive bidding. Tariff determined through RERC
    - Already commissioned- 270 MW
      - RajWest Power LTPS U-1      135 MW      26.11.09
      - RajWest Power LTPS U-2      135 MW      4.10.09
    - Likely to be commissioned- 810 MW
      - RajWest Power LTPS U-3-8      810 MW      Upto Mar 12
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# XII Plan Projects

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## □ State Sector- 7750 MW

□ STPS Unit 7 & 8	1320 MW
□ Chhabra Unit 5 & 6	1320 MW
□ Dholpur GTPP St II	330 MW
□ Ramgarh GTP Ext St IV	160 MW
□ STPS Unit 9 & 10	1320 MW
□ Kalisindh TPS St II	1320 MW
□ Banswara TPS Unit 1 & 2	1320 MW
□ Kota GTPS	330 MW
□ Chhabra GTPS	330 MW

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# XII Plan Projects

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- Private Sector (State IPP)- 3840 MW
    - Case 1- 1200 MW
      - PPA signed with M/s Adani Power for 1200 MW from Project at Distt. Baran
    - Case 2- 2640 MW Bidding process initiated
      - 2x660 MW TPS at Banswara
      - 70 MW Lignite TPS at Gurha (West)
      - 2x125 MW Lignite TPS at Giral Unit 3 & 4
      - 1000 MW Keshoraipatan
    - Another project under Case 1
      - Petition filed before RERC for additional 1000 MW
    - UMPP allocation- 2555 MW
      - Considering 60% success rate- 1533 MW
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# Expansion of Transmission Network

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- Existing transmission system is Strong extending to every part of the state

	<u>Sub Station</u> (No./MVA)	<u>Line</u> (ckt. km)
<u>Present Status (Dec 10)</u>		
■ 400 kV	9 / 4530	2632
■ 220 kV	71/ 14005	10207
■ 132 kV	305/ 17194	13661
<u>Addition upto 2014-15</u>		
■ 765 kV	2 /7500	470
■ 400 kV	7/4410	4050
■ 220 kV	43/4660	2850
■ 132 kV	95/2400	2100

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# New Technologies in Transmission by RVPN

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- ❑ 765 kV transmission system for bulk power evacuation
- ❑ Compact EHV stations for Urban and densely populated areas
  - Hybrid/ GIS- 132 kV and 220 kV GSS
  - Upgradation of existing 132 kV lines to 220 kV level
  - Narrow based transmission towers
  - Underground EHV cable
  - OPGW on EHV lines
  - Use of SCADA and automation
- ❑ State's first 132 kV Hybrid GIS commissioned at SMS Stadium
- ❑ Work in progress for 220 kV Hybrid GIS Indira Gandhi Nagar & 132 kV substation Station Rd, Jaipur and 132 kV cable

Substation space requirement substantially reduced

# Transmission Projects in Private Sector

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- Projects already awarded to selected TSP as per MoP standard Bid process
    - 400 kV S/C Bikaner- Deedwana- Ajmer line with 400 kV GSS at Deedwana
    - 400 kV S/C Hindaun- Alwar line with 400 kV GSS at Alwar
  
  - New projects to be offered to private sector
    - 400 kV D/C Babai (Jhunjhunu)-Jaipur (North) line with 400 kV GSS at Jaipur (North)
    - 400 kV D/C Jodhpur (New)-Udaipur line with 400 kV GSS at Udaipur
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# Essential Features of Loss Reduction Programme

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- ❑ Segregation of Urban/ Industrial feeders from Rural feeders
  - ❑ Strong theft preventive technical measures
    - HVDS
    - Use of AB Cables for LT lines
    - Temper proof consumer metering (push fit type)
    - Service line through armoured Cable
  - ❑ Sustained support through vigilance activities
  - ❑ Providing better quality of Domestic supply in Rural areas
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# Loss Reduction Programme

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- Feeder Renovation Programme for rural areas
  - 8166 feeders renovated up to Dec.10 out of total 8850
  - Continuous domestic supply to 32000 villages where losses come down below 20% getting domestic supply 20-22 hrs.
- Losses of 80 Distt. HQ & Municipal towns reduced below 20%
- Losses of 101 industrial areas come down to below 2%
- Losses to be brought below
  - 8% in Jaipur City
  - Below 15% sector as a whole in next 3-4 years
- Schemes sanctioned under R-APDRP Part B for 82 cities sanctioned amount Rs. 1462 Cr.

Distribution losses brought down from 40.22% in year 2005-06 to 25.01% in year 2009-10

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# Sub-Transmission & Distribution Network

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## Present Status (Nov 10)

	<u>Sub Station</u> (No./MVA)	<u>Line</u> (ckt. km)
■ 33 kV	3388/ 14552	39079
■ 11 kV	791689/ 25894	276429
■ LT	-	242554

- HT LT Ratio of 1.31 depicting Strong HVDS
  - HT LT Ratio improved from 0.92 (2004-05) to 1.31 by induction of HVDS in Feeder Renovation Programme
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# Gram Panchayat Vidyut Vitran Yojna

## Essential features

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- ❑ Each **Panchayat** will have a **separate 11 kV Feeder** from nearest 33kV Substation
  - ❑ **3-4 Villages** shall lie on a Feeder
  - ❑ Total Villages are Approx 39,000
  - ❑ About 13000 Feeder shall have to be there
  - ❑ Additional about **1150 New 33/11kV Substation** will be required to be created
    - 442new GSS created upto Dec. 10
  - ❑ After complementation of Panchayat Feeder Yojna, **no need** of new 33/11kV Substation for at least **5 Years**
  - ❑ To encourage local bodies like **Panchayat** as franchisee for distribution management
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# Status of Rural Electrification

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- Electrification as on 31.3.04
    - Villages
      - As per Old Definition- 38515 (97.95%)
      - As per New Definition- 25685 (65.32%)
    - Dhanis- 55738 (53.38%)
  - Present status (Dec.10)
    - Villages electrified- 34834 (88.58%)
    - Dhanis electrified- 68596 (62.00%)
      - 17623 Dhanies falling under population between 100 to 300, supplementary RGGVY schemes submitted for sanction
      - 30034 Dhanies having population below 100, 13299 eligible under MSLVY
    - Release of Rural Domestic Connections (Mar 10)
      - House electrified- 42.38 lac (60.08%)
      - BPL families 11.20 lac (52.86%)
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# IT Initiatives

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- R-APDRP
    - Reliable Energy audit be possible only through IT enabled recording of energy to eliminate human error/manipulations.
    - To get data on real time basis to avoid 2-3 month delay
    - To improve consumer satisfaction by on line monitoring at all level
      - Rajasthan took lead in the country to award contract to M/s HCL Infosystem
      - Total cost of the scheme is Rs. 529 Cr.
      - Project to be completed by FY 12.
    - Rural Area also included in R-APDRP Scheme in Rajasthan involving Rs. 233 Cr.
    - SCADA for 5 big cities (Jaipur, Jodhpur, Ajmer, Kota, Bikaner) sanctioned by GoI- Rs. 157 Cr.
  - e-payment facility to all consumers
  - Call centres with fuse replacement work run by private agency in Jaipur and Kota city
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# Renewable Energy Potential

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- Abundant potential for energy generation from renewable sources

Sources	Total Potential (MW)
Wind	5900
Biomass	530
Solar	>50000

- State has liberal policies for promotion of renewable power generation
  - Specific Rajasthan Solar Policy under consideration
  - Very enthusiastic response from investors for Solar power projects
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# Renewable Energy Scenario

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- Present installed capacity 1413 MW
    - Wind 1336 MW
    - Bio Mass 71.3 MW
    - Solar 4.75 MW
  - Plan for next three years
    - Wind 1000 MW
    - Bio Mass 100 MW
  - Solar energy
    - Leveraging of benefits from NSM
    - 2x5 MW projects under MNRE GBI scheme
      - 5 MW project at Khinvsar commissioned
    - 11 projects of 66 MW sanctioned by GoR migrated under NSM Phase 1
  - Selected under NSM
    - 105 MW SPV Projects
    - 400 MW Solar Thermal Projects
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# Thank you

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## ■ Urbanization in India

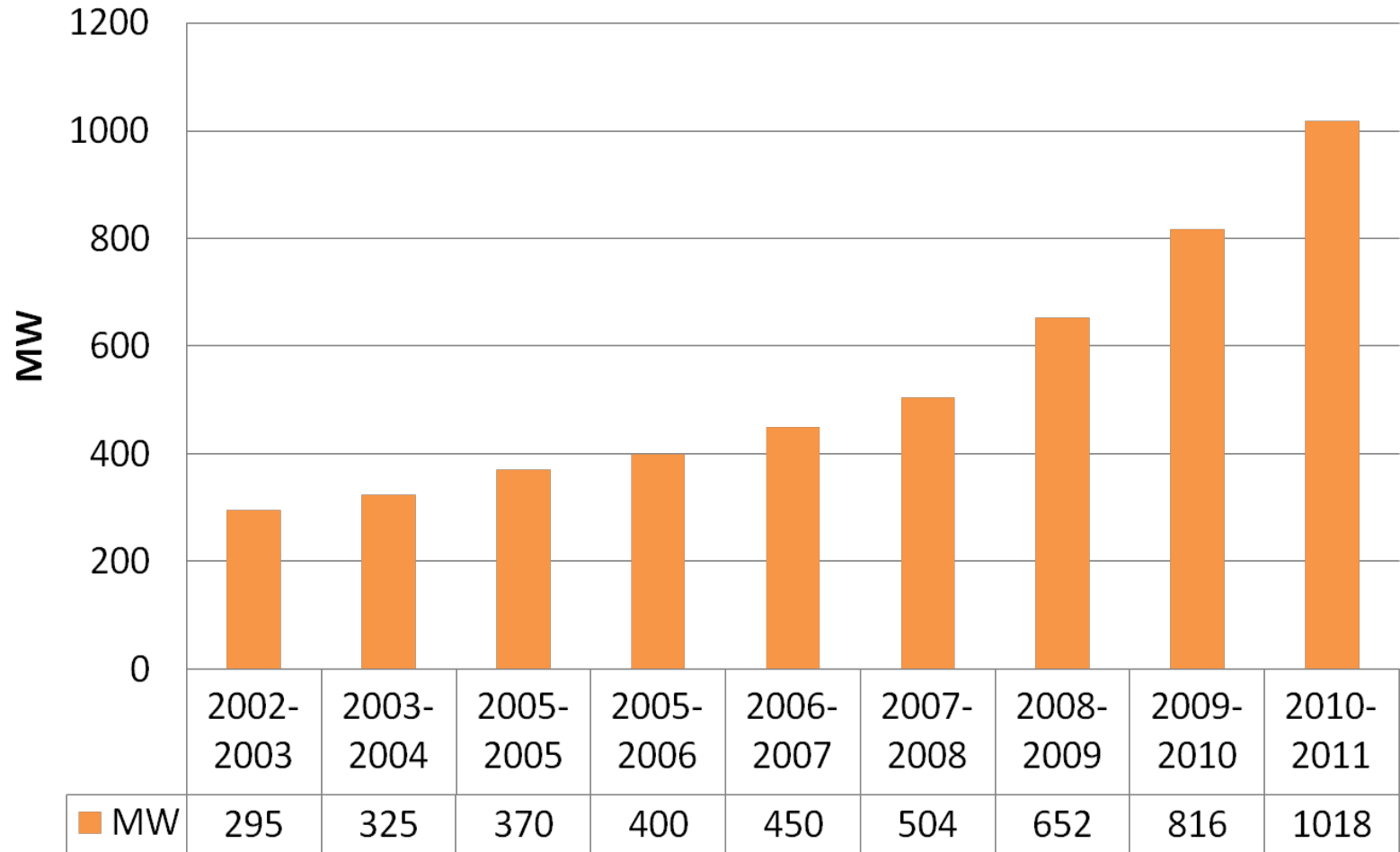
- Faster Pace
- 10 Out of 35 Fastest growing cities in World
- Urbanization Rate 29%
- Approx. 140 million by 2020 and 700 million People by 2050 from Rural Areas move to Urban Areas

## ■ Power Demand

- 7.55 GWh by 2011-12 from 3.62 GWh of 2003-04
- Approx. 7-8 Times increase by 2017 even with conservative estimates

- Faster Urbanization
- Growth in Household Consumptions due to Lifestyle Changes
- Electrification in Rural Areas
- Growth in Manufacturing/ Commercial Activities
- Realization of demand suppressed due to Load Shedding

# LOAD PATTERN FOR JAIPUR CITY



- Existing Infrastructure not sufficient
- Expansion/ Up-gradation of Electrical Network
- Urban Area Difficulties/ Challenges:
  - Space Limitations
  - Higher Prices of Land
  - Corridor Limitation in densely populated areas for new ROW of Lines
  - Limitation of ROW for Up-gradation of Lines

- Compact Substations
  - Use of Gas Insulated Switchgears
  - Automation Technologies
- EHV XLPE Cables
- Narrow Base/ Tubular Tower Designs

### New Technology Adoption -

- 132 kV Hybrid GIS Modules
- 132 kV Full GIS Modules
- 36 kV Metal Clad GIS
- IEC-61850 based Automation System
- Digital PLCC
- Narrow Base Tower Designs
- 132 kV EHV XLPE Cables

### Projects Undertaken-

- 132 kV Hybrid GIS Substation, SMS Stadium, Jaipur
- 220 kV Hybrid GIS Substation, Jagatpura, Jaipur
- 132 kV GIS Substation, Jhotwara, Jaipur
- 132 kV GIS Substation, Station Road, Jaipur
- 132 kV EHV XLPE Cable between Existing Nala Power House Substation and Station Road Substation
- Narrow Base Tower Designs

### Projects Brief Details-

- 132 kV Hybrid GIS Substation, SMS Stadium, Jaipur

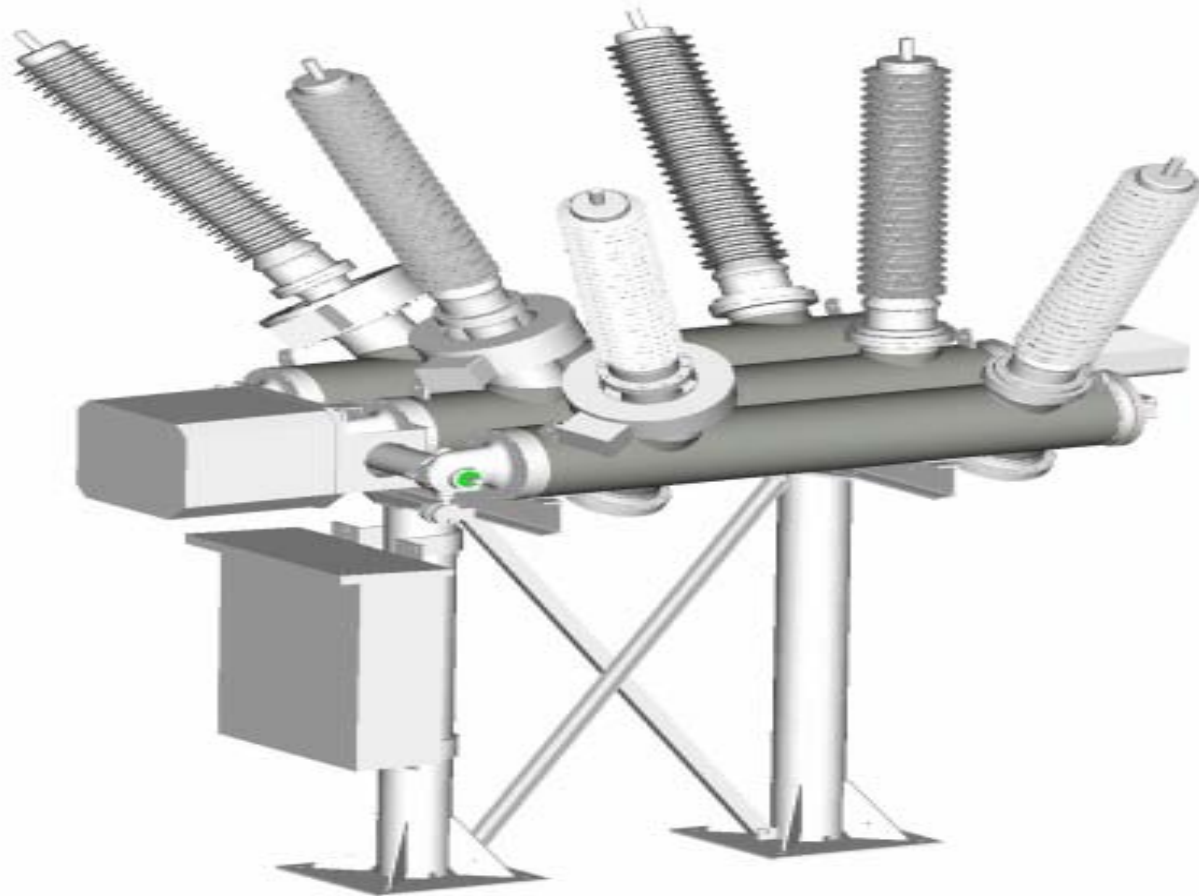
### Status: Commissioned

- Voltage Level: 132/ 33 kV
- Capacity: 2 X 50 MVA
- 132 kV Bays: 2 Incomer, 1 Bus Sectionalizer, 2 Transformer Bays
- 33 kV Bays: 2 Incomer, 1 Bus Coupler and 7 Outgoing
- Automation/ SCADA: IEC-61850 based
- Communication: Digital PLCC
- Space Utilization: (35 X 60 m) Approx. 2100 Sq. m against conventional requirement of 35,000 Sq. m.



# RVPN INITIATIVES: 132 kV Hybrid Module

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Size: 3340 mm (W) 3725 mm (L) 4370 mm (H)

# RVPN INITIATIVES: 132 kV SMS Substation Actual Implementation

32



# RVPN INITIATIVES: 132 kV SMS Substation Actual Implementation

33



# RVPN INITIATIVES: 132 kV SMS Substation Actual Implementation



# RVPN INITIATIVES: 132 kV SMS Substation Actual Implementation

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### Projects Brief Details-

- 132 kV GIS Substation, Jhotwara/ Station Road, Jaipur

### Status: Under Implementation

- Voltage Level: 132/ 33 kV
- Capacity: 2 X 50 MVA
- 132 kV Bays: 2 Incomer, 1 Bus Coupler, 2 Transformer Bays
- 33 kV Bays: 2 Incomer, 1 Bus Coupler and 7 Outgoing
- Automation/ SCADA: IEC-61850 based
- Communication: Digital PLCC/ OLTE
- Space Utilization: (30 X 99 m) Approx. 2970 Sq. m (for Jhotwara) and (25 X 42.67 m) Approx. 1067 Sq. m (for Station Road)

### Projects Brief Details-

- 220 kV Hybrid GIS Substation, Jagatpura, Jaipur

### Status: Under Implementation

- Voltage Level: 220/132/ 33 kV
- Capacity: 2 X 100 MVA (220/132 kV) and 2 X 50 MVA (132/33 kV)
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- 220 kV Bays: 4 Incomer/ Outgoing, 2 Transformer (Conventional One and Half Breaker Scheme)
- 132 kV Bays: 5 Incomer/ Outgoing, 1 Bus Sectionalizer, 2 Transformer Bays (Hybrid Modules)
- 33 kV Bays: 2 Incomer, 1 Bus Coupler and 7 Outgoing (GIS Modules)
- Automation/ SCADA: IEC-61850 based, Distributed Architecture
- Communication: Digital PLCC/ OLTE
- Space Utilization: (60 X 200 m) Approx. 12000 Sq. m against conventional requirement of 60,000 Sq. m.

### Projects Brief Details-

- 132 kV XLPE Cable System Between NPH Substation and Station Road Substation

### Status: Under Implementation

- Circuit: Double Circuit each circuit has 3 Single Core Cable in Trefoil format with Optic Fiber Cable
- Length: 4.5 Km Route Length
- Size/ Type: 500 Sq. mm 132 kV XLPE Copper Cable
- Sheath: Corrugated Aluminium
- Bonding: Cross bonding with Sheath Voltage Limiters
- Terminations Types: Outdoor (XLPE-Air) / Suitable for GIS Switchgear (XLPE-SF6)

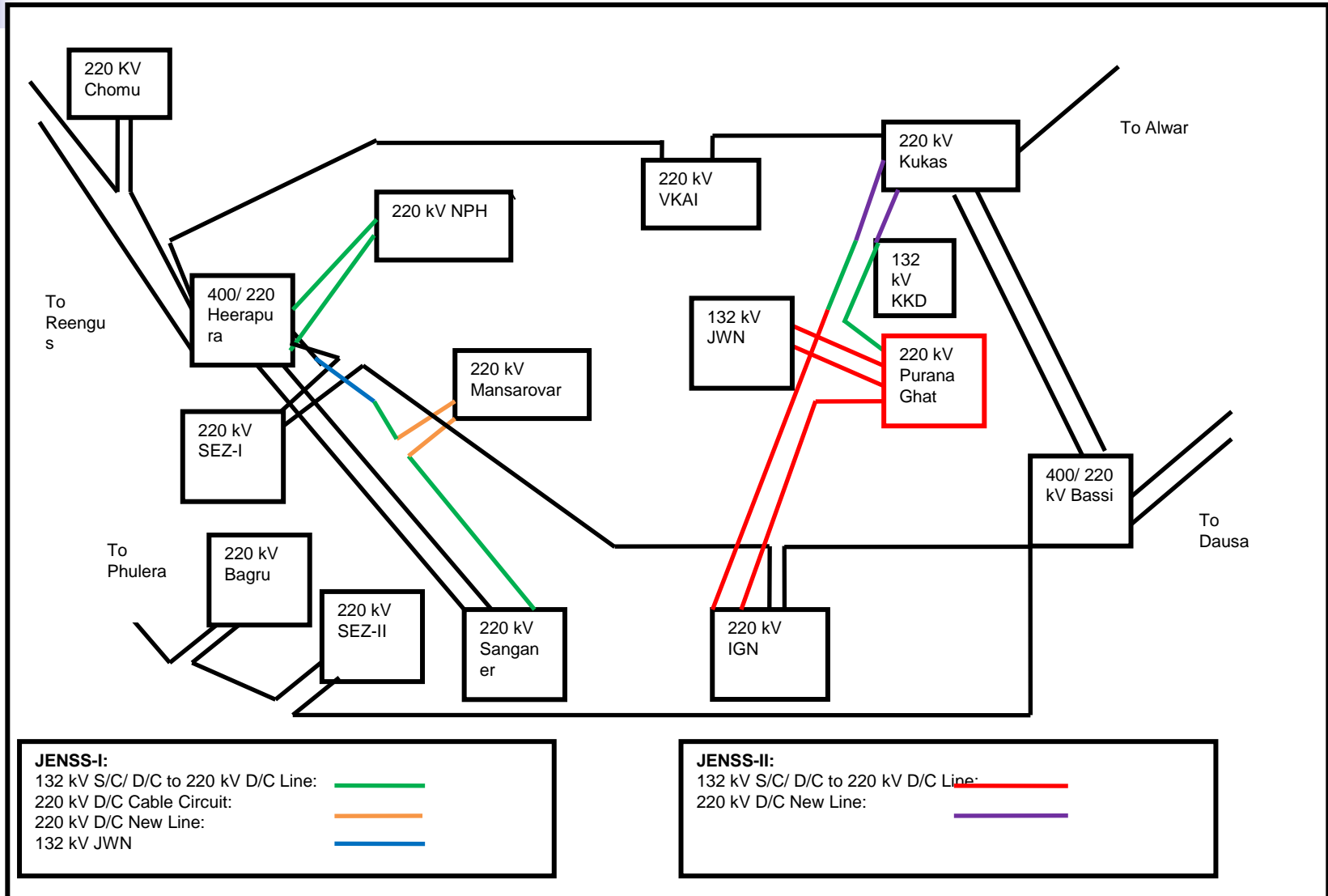
# RVPN INITIATIVES- Narrow Base Tower Designs

Type of Tower (220 kV Double Circuit)	Base Width	Approx Weight with + 6 m Extn. (Kg.)
DA (0-2 deg.) Normal + 3 m Extn. + 6 m Extn.	2.5 m 2.684 m 2.867 m	5570
DB (30 deg.) Normal + 3 m Extn. + 6 m Extn.	3.5 m 3.867 m 4.234 m	11000
DC (60 deg. & Dead End) Normal + 3 m Extn. + 6 m Extn.	4.5 m 4.93 m 5.362 m	12450

# RVPN INITIATIVES: Narrow Base Tower Under Testing 40



# RVPN- Future Plans and Challenges- EHV Ring



- 220 kV Hybrid/ Full Gas Insulated Switchgears
- 220 kV XLPE EHV Cables
- Optical Ground Wire on Transmission Lines with Optical Terminal Equipments for faster communications
- Network Level SCADA/ Automation Implementation with City Transmission Control Center

- Under-ground EHV and Distribution Substations
- Multi-Circuit Towers in the approach sections of the substations
- Under-ground transmission lines using cables in dedicated corridors
- Capacity enhancement of transmission lines by re-conductoring with high capacity conductors and/ or using insulated cross arms for up-grading voltage levels

