



50
YEARS

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Powering Indian Railways 5 GW by 2025



Energy use in Indian Railways

- One of the largest rail networks in the world - carrying an estimated 8 billion passengers each year, and over one billion tonnes of freight/year
- Every day, Railways touch the life of more than 23 million passengers, that's equivalent to the entire population of Australia or Taiwan
- Spends 25% of income generated on energy bills amounting to USD 5 billion
 - Accounts for close to 2.4 % (13.8 billion kWh rising by 5% every year) of the country's total electricity consumption;
 - Consumes 2.6 billion litres of diesel/year
- Vision 2020 - 10% of its energy use from renewable sources
- IR has fixed a target of 1 GW of solar energy by 2020
- Existing rooftop programme
 - 50 MW tendering underway
 - 100 MW RFQ stage

UNDP Partnership with Indian Railways

UNDP is working with Indian Railways in meeting a target of 5 GW by 2025 through:

- Using vacant Indian Railways land and rooftop space to house and support solar installations at no cost to the project
- Improved involvement of private sector, and increased investments
- Developing innovative low-risk project business models

Solar Prospect

	Coverage	Rooftop (MW)	Ground (MW)	Total (MW)
Phase 1	Gujarat & Rajasthan	25	50	75
Phase 2	Nine states	60	660	720
Phase 3	Rest of India	400	3,800	4,200
				~ 5,000 MW

Benefits to Indian Railways and country at large

- This will attract billions in private investment for the Indian Railways; and increase the solar power generation capacity five-fold against Railways target of 1 GW.
- Reduce coal used in power generation by 4 million metric tonnes.
- Reduce emissions by 10 million tons of carbon dioxide.
- Create thousands of clean energy jobs and generate US\$ 4 billion in private investment.
- Contribute 5% to the Nationally Determined target of 100 GW of solar deployment.

Using vacant rooftop space and IR land

Rooftop projects

- Tremendous potential on platform sheds - > 8,500 stations and buildings
- Projects meeting all connected loads of stations and buildings through net-metering



Asbestos sheet



Metal sheet



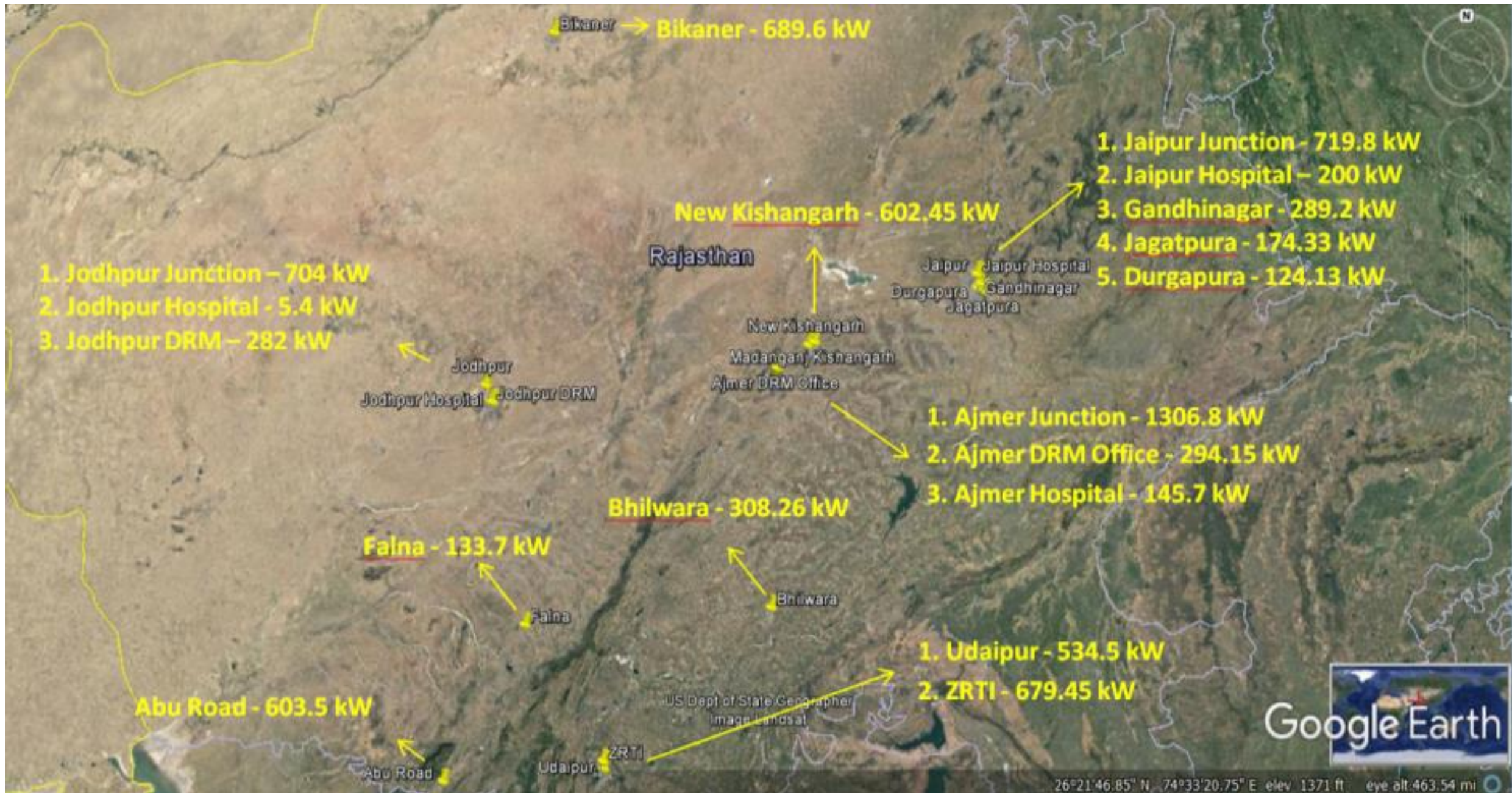
Area available > connected load

Ground mounted projects

- Tremendous potential on trackside land: > 65,000 km/> 26,000 km electrified.
- Tremendous potential on land banks - 44,000 ha
- Will contribute in meeting part of traction loads feeding at traction sub-stations (TSS)

Assessment completed for two states (Rajasthan and Gujarat); survey on-going for other states

Rooftop potential assessed in Rajasthan



Rooftop potential assessed in Gujarat



Route wise proposed solar deployment - Rajasthan



Jodhpur-Jaipur-Alwar



Alwar-Jaipur-Bikaner



Bharatpur-Jaipur-Jodhpur



Ramganj Mandi-Kota-Jaipur



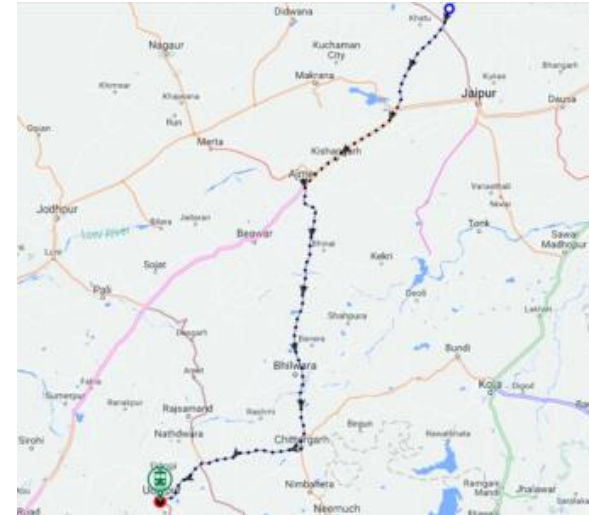
Jaipur-Bikaner-Jaisalmer



Jodhpur-Jaisalmer

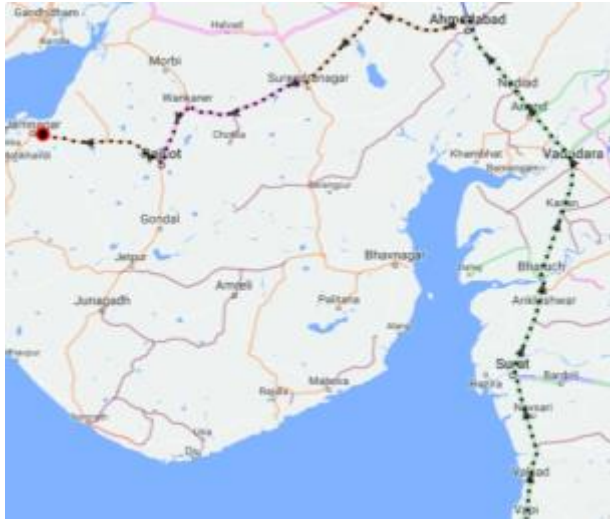


Jaipur-Bikaner-Jaisalmer

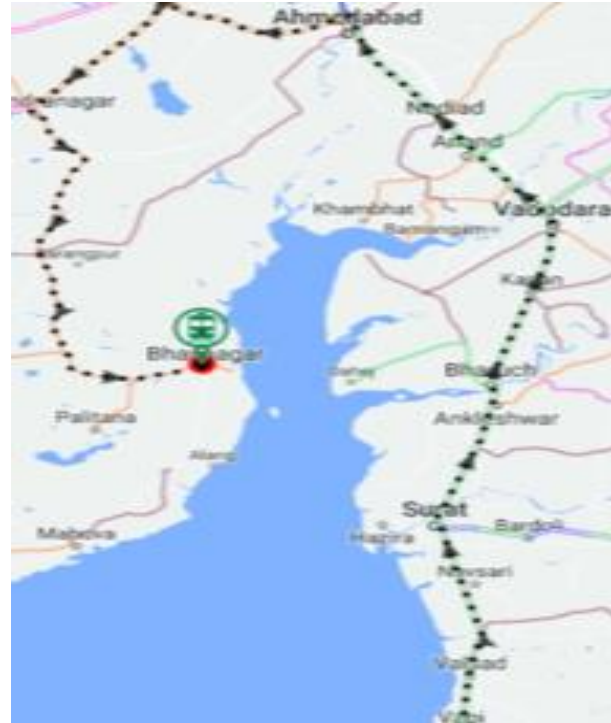


Srimadhampur-Ajmer-Udaipur

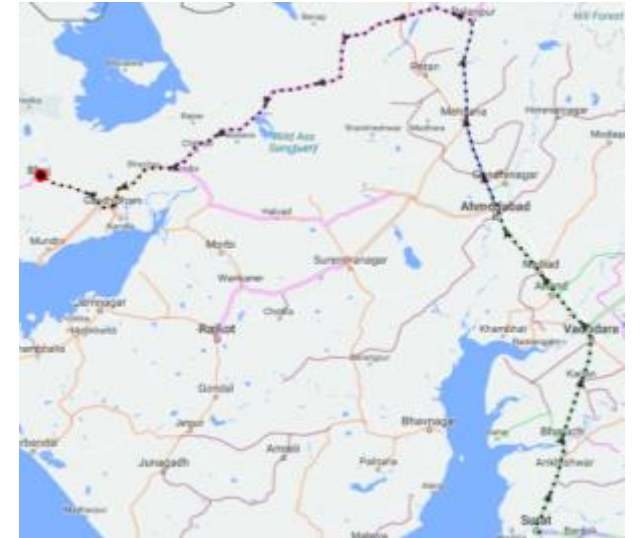
Route wise proposed solar deployment - Gujarat



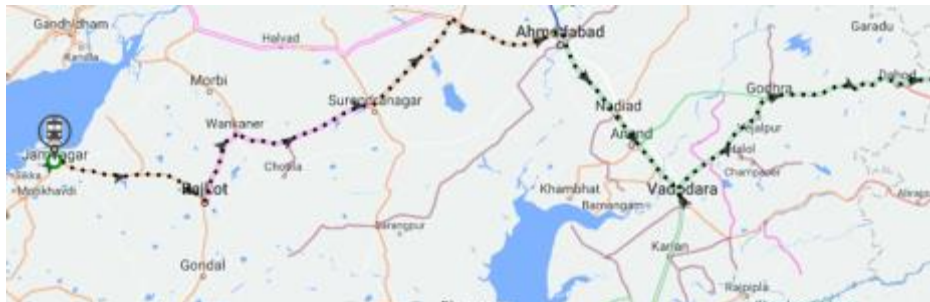
Vapi-Surat-Ahmedabad-Hapa



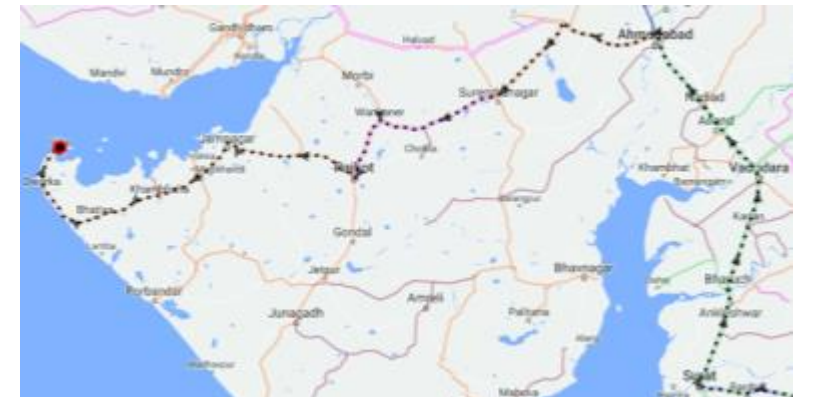
Vapi-Ahmedabad-Bhavnagar



Surat-Ahmedabad-Bhuj



Jamnagar-Ahmedabad-Dahod



Surat- Ahmedabad-Dwarka

Solar rooftop potential: Gujarat & Rajasthan

Route wise solarisation

Rajasthan

Net Routes	Capacity (kW)
Jodhpur-Jaipur-Alwar	4,899
Bharatpur-Jaipur	1,916
Ramganj Mandir-Kota-Jaipur	1,511
Merta-Bikaner	1,361
Sri Madhopur-Ajmer-Udaipur	3,938
Bikaner-Marwar Bithri	560
Jodhpur-Jaisalmer	920
Total capacity	15 MW

Category wise solarisation

	Capacity (MW)	
	Rajasthan	Gujarat
A1, A, B and C	19	16
All stations	23	20

55 - 60 MW

Gujarat

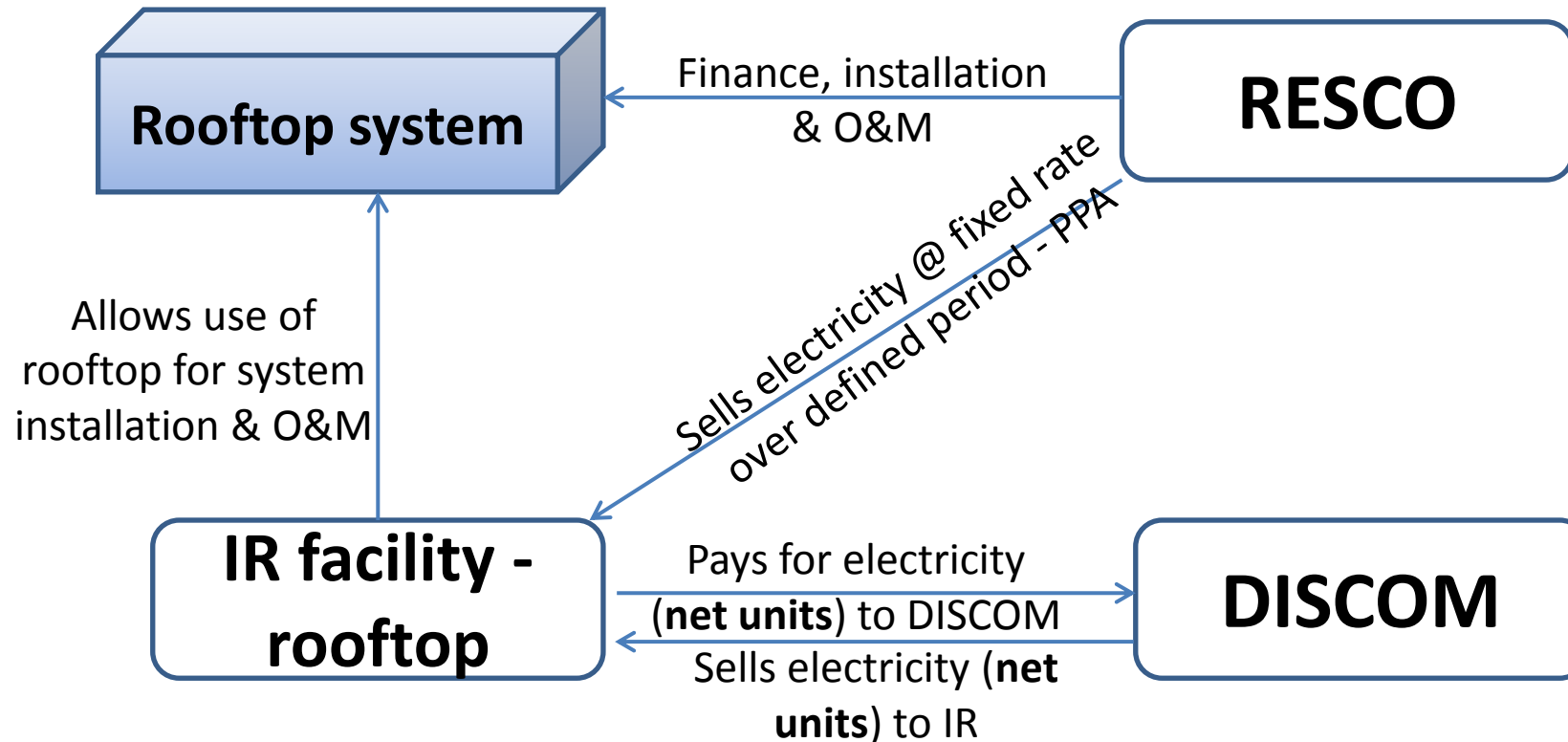
Net Routes	Capacity (kW)
Vapi-Surat-Ahmedabad-Hapa	11,226
Surendranagar-Bhavnagar	914
Ahmedabad-Palanpur-Bhuj	2,096
Vadodra-Dahod	652
Jamnagar-Dwarka	372
Total capacity	15 MW

Workshops/loco sheds

		Capacity (kW)
Rajasthan	Ajmer Loco	5,138
	Ajmer Carriage	4,759
	Bikaner	1,749
	Jodhpur	4,019
	Kota	4,313
Gujarat	Bhavnagar	2,160
	Dahod	4,584
	Junagarh	400
	Pratapnagar	700
	Total capacity	27 MW

Business and financing models

- Demonstrate and validate pilot line of credit and concessional loan mechanisms, routed through national/ international financial institutions
- Customize financing models and financial products for rooftop and land based solar deployment
- Develop governance and administration structure to execute and manage the financing models for solar deployment



Next steps

- Complete rooftop site assessments for other states
- Complete site assessment of land blocks – land banks & track side
- Technical design of pilot project – feeding into traction load
- Application specific financing models
- Commissioning of projects in Rajasthan and Gujarat; and rest of India

