

## CHAPTER 15

### ENERGY

#### Power (RSEB)

#### Eighth Five Year Plan Targets and achievements - Review

15.1 An outlay of Rs. 3200 crores was approved by the State Government for the Eighth Five Year Plan. Against this provision, the likely expenditure is Rs. 3081.44 crores. This expenditure includes the loan given by the State Government as well as expenditure incurred by RSEB from its own resources. The provision made and expenditure incurred during the Eighth Five Year Plan in various heads of development is given below :-

(Rs. in Crores)

Item	Plan Outlay	Expenditure
Generation	1629.89	1579.33
Transmission	610.00	1018.55
Sub-transmission & Distribution	533.11	
Rural Electrification	427.00	483.56
Total	3200.00	3081.44

15.2 The physical achievements vis-à-vis targets set for the Eighth Five Year Plan period are given in the following table :

Head	Unit	Eighth Five Year Plan period	
		Targets	Achievements
1. Generation	MW	540.19	258.65
2. Transmission			
a. 400 KV Lines	KM	340.00	-
b. 220 KV Lines	KM	2464.00	1275.55
S/S	MVA	2000.00	1300.00
c. 132 KV works line	KM	1296.00	1608.46
S/S	MVA	487.50	865.00
d. Augmentation (220 KV)	MVA	1437.50	2586.00
e. Capacitors	MVAR	340.00	907.66
3. Sub-transmission & Distribution			
a. 33 KV Lines	KM	5000.00	4497.55
b. 33 KV S/S	MVA	1250.00	1837.72
4. Rural Electrification			
a. Villages	Nos.	3750 (By REDA 50)	3703
b. Wells	Nos.	125000	125278

15.3 Efforts were made to augment the generation capacity and as a result of which, the Fifth Unit of 210 MW at Kota was commissioned on 26 March, 1994 and 3 MW & 35.5 MW gas units at Ramgarh in Jaisalmer district were

commissioned on 15.11.1994 & 12.1.1996 respectively. Thus there has been an addition of 262.25 MW in the installed capacity including benefits by way of commissioning of Micro Hydel Power Stations and uprating of one machine of Bhakra Right Bank Power Plant. Efforts were also made by the State Government/RSEB to get extra allocation of power from the Central generating power stations. Ministry of Power, Government of India, made 620 MW as special allocation to RSEB during 1994-95 from the unallocated quota of the Central Generating power station. In spite of these efforts, the State faced power shortage during the entire period of Eighth Five-Year Plan. As a consequence, power cuts had to be imposed on HT industries in the event of lesser availability as well as power supply to agricultural sector was restricted to 8 hours per day in two 4 hour blocks. Due to persistent power shortage in the Eighth Five-Year Plan period, efforts were made by the RSEB to purchase additional power from the adjoining states at a significantly higher rate which has given some relief to the consumers but has adversely affected the finances of the Board.

15.4 There has been shortfall in achieving the target of laying the EHV transmission and 33 KV lines due to the shortage of the resources. At the same time the addition in transformation capacity have exceeded and fourteen additional 220 KV S/S and 53 Nos of 132 KV S/S have been added during this plan period. The system continued to suffer with voltage fluctuation problems, and therefore, with the growth of the load it was necessary to adequately support the system. Therefore, 949 MVAR capacitors were additionally installed during this plan period which by and large met the requirement of the Northern Regional Electricity Board. This has given improved power supply parameters to the consumers besides enabling the RSEB to draw its share from the Central Generating Power Stations.

15.5 Under Rural Electrification Programme, the Board has achieved the target set for energisation of pump sets and electrification of villages. In the year 1994, the Board also introduced the "Nursery scheme" for out of turn agriculture connections, the full cost of which is to be borne by the consumer and they have to pay 50% of the tariff of non domestic category. Thus the consumers under this category are paying more than twice the normal rate for the agricultural consumers. The introduction of the scheme has been popular and there has been a good response from agriculture consumers. More and more connections are being released under this category.

15.6 Taking into consideration the long term power requirements the State Government entered into an MOU with Himanchal Pradesh in October 1992 to receive 40% power from the Parbati H.E. project Stage II & III to be constructed by HP Electricity Board. The Board also negotiated for purchase of 300 MW power from BASPA Stage - II, which is being set up in HP by the private sector i.e. by M/s Jai Prakash Industries. Similarly, another MOU was signed in 1994 with M/s RPG Enterprises for setting up a coal-based power station in Dholpur.

15.7 In the State sector, the major on going project is Suratgarh Stage - I (2X250 MW). The work on this project is in full swing. The benefit from one unit from the project was envisaged in the Eighth Five-Year Plan period. Due to the paucity of funds the work on the project slowed down and as a result the benefit may now spill to 1997-98 and efforts is being made to commission the unit by December,

1997.

15.8 The Board also explored the possibility of purchasing 1200 MW of power from 6X660 MW Coal based Thermal project to be established in Orissa by CEPA, Hongkong and has signed an agreement with the Consolidated Electric Power Asea Ltd. and Power Grid Corporation of India Ltd. This is with an intent to enter into power purchase agreement for the purchase of 1200 MW power from the project.

15.9 To supplement the efforts in bridging the gap between demand and supply during the Eighth Plan period, the Government of Rajasthan granted a licence to M/s CTIL as early as April 1988. This was when the climate for private sector entry in the Power sector in the country had not even been conducive. M/s CTIL was to establish a coal based power station in Chittorgarh. Though the State Government gave full support to M/s CTIL, as the firm could not tie up necessary inputs for getting the scheme sanctioned, the project proposals were not entertained by the CEA and returned to M/s CTIL.

15.10 From the beginning of 1994, RSEB, in line with the liberalisation policy of the Government of India for the power development by the private sector, took advance action and achieved good progress.

15.11 Though an outlay of Rs. 3200 crores was recommended by the State Government for RSEB, the actual expenditure has been limited to Rs. 3081.44 crores. This reduction has been affected because of pruning of need based outlays proposed by RSEB. Based on the price level of 1991-92 the expenditure during the Eighth Five Year Plan period works out as Rs. 2406 crores (about 75% of the outlay envisaged in the Eighth Five Year Plan).

### **The Ninth Five Year Plan Period**

15.12 In the Ninth Five Year Plan period, priority has been accorded for commissioning of both the units of Suratgarh Stage - I of 250 MW each in the State.

15.13 There is a programme to electrify 2750 Nos. of villages and energisation of 1,00,000 nos. of pump sets. Further 250 non potential villages are to be electrified by REDA. With the electrification of 3000 nos of villages, percentage of villages under electrification will increase from 86.73% (1991 census) in 1996-97 to 94.27% in 2001-02. Emphasis will also be given to drinking water schemes, lift irrigation schemes and development of new industrial areas. The following provisions have been made for the RSEB under different heads :-

Head	(Rs. in Crores) Proposed outlay
Generation	972.00
EHV system	2478.00   includes Rs. 1115.00 crores
Sub-transmission & distribution	1100.00   for Externally Aided Project
Rural Electrification	960.00
	5510.00

15.14 In addition, PFC assistance and SPA has been considered as under :-

		(Rs. in Crores)
PFC Head	Proposed outlay	
i. PFC		
Generation		125.00
EHV Transmission		220.00
Sub-transmission & distribution		105.00
ii.SPA		40.00
Total		490.00

### Generation

The physical targets for Ninth Plan are given in the following table :

Head	Unit	Ninth Five Year Plan (1997-02) Targets
1. Generation	MW	533.58 MW Suratgarh I & II uprating of BRB machines (Raj.'s Share)
2. Transmission		
a. 400 KV Lines	Km.	927.00
b. 220 KV Lines	Km.	2686.00
S/S	MVA	2700.00 (25 Nos.)
c. 132 KV works line	KW	1733.00
S/S	MVA	1015.00 (81 Nos.)
d. Augmentation (220 KV)	MVA	4000.00
e. Capacitors	MVAR	1000.00
3. Sub-transmission & Distribution		
a. 33 KV Lines	Km	5700.00
b. 33 KV S/S	MVA	1750.00
4. Rural Electrification		
a. Villages	Nos.	3000 (By REDA 250)
b. Wells	Nos.	100000 @ 20000 per year #

#1200 per year under SPA

15.15 In the Ninth Five Year Plan period there is a programme to add 500 MW capacity in the State by way of commissioning of both the units of Suratgarh Stage-I. There will also be capacity addition of 33.58 MW by way of uprating of Bhakra Right Bank, Ganguwal & Kotla and Pong Power projects. There is a likelihood of an addition of 590.20 MW capacity to Rajasthan by way of allocation of power from the Central Generating Power Stations.

Unchahar Stage - II	(2X210 MW)	42.00
Rihand	(2X500 MW)	100.00
RAPP Extension	(2X220 MW)	88.00
Uri	(4X120 MW)	43.20
Nathapa Jhakri	(6X250 MW)	150.00
Dulhasthi H.E. Project	(3X130 MW)	39.00
Dhauliganga	(280 MW)	28.00
Tehri Stage - I	(4X250 MW)	100.00
Total		590.20

### New Generation Projects

15.16 In the State, Mahi parallel canal will be the main project for which a provision of Rs. 23.66 crores has been kept in the Ninth Five Year Plan period. Besides this, the work on Kota Thermal Stage IV (1X210 MW) for which the feasibility report has been submitted to the CEA in 1994 for techno-economic appraisal may also be taken up after sanction by the Government of India. The funds for the project are to be arranged from the external agencies. However, a token provision of Rs. 10 crores has been kept in the Ninth Five Year Plan period for the project. Besides above, Bhakra Beas Management Board is also undertaking renovation of Bhakra Right Bank machines and Kotla Power Station, and Pong Power Plants. Though substantial renovation and uprating work is to be arranged from M/s PFC by raising loan however, the matching provision has been kept in the Ninth Five Year Plan period. All the new generation projects are to be taken up in the private sector as per the present policy of the State Government.

### **Transmission programme**

15.17 During the Ninth Five Year Plan period the following priority has been kept for execution of transmission schemes :-

- Ongoing schemes
- Transmission scheme primarily meant for evacuation of power from various Power projects.
- Schemes meant for PHED/Lift Irrigation and to meet the industrial demand.
- Schemes meant for reducing T & D losses to a level of 20%.
- Schemes to meet increasing load demands.

15.18 A provision of Rs. 2478 crores has been kept in the Ninth Five Year Plan period which includes evacuation system also.

### **Sub-transmission and distribution system**

15.19 The programme includes construction of 33 KV lines and 33/11 KV Sub-stations to open the new areas for improving the distribution system and reduce the T & D losses. This programme also include implementation of the system improvement schemes to be taken up in the towns having a population of 50000 and above, and those not having LT schemes. The target during the Ninth Five Year Plan period is to construct 5700 Km of 33 KV lines and to add 1750 MVA of Sub-station capacity. A total provision of Rs. 1100 crores has been kept for these works. Two EAP namely Project for Improvement of Transmission and Distribution and Power Sector Reforms Study are proposed to be included in Ninth Plan for which adequate provision has been kept.

### **Rural Electrification**

15.20 Out of a total 37124 villages as per 1981 census, 31458 villages are to be electrified by March, 1997 thereby bringing the electrification level in Rajasthan to 84.74%. Based on the 1991 census, number of villages electrified will be 34527 out of the total 39810 villages, those that are non potential villages located in sanctuaries, protected forests and inaccessible desert will now be electrified by non conventional energy sources. During the Ninth Five Year Plan period a provision of Rs. 960 crores has been kept for the RE programme to electrify 2750 villages and energise 1,00,000 pump sets. Further 250 villages will be electrified

through REDA.

### **Renovation & Modernisation Programme**

15.21 The renovation and modernisation of KTPS - I (2X110 MW) is an approved scheme and is in progress. This is likely to be completed in 1997-98. There is no programme for renovation and modernisation of other units of KTPS in the Ninth Plan. The feasibility of renovation and modernisation of RPS and J.S. machines will be examined during the plan period and preliminary expenditure on this account will be met from the provision for Survey and Investigation works.

### **Improvement of Plan Load Factor**

15.22 Kota Thermal Power Station is the only Thermal Station in the State, which has so far received seven meritorious productivity awards from the Government of India. The PLF achieved in the last few years is given below :

1992-93	77.01%
1993-94	80.96%
1994-95	75.60%
1995-96	72.90%
1996-97	75.70%

## **REDA**

### **Eighth Five Year Plan 1992-97 - A Review**

15.23 Rajasthan Energy Development Agency (REDA) is the nodal agency to disseminate useful knowledge about various sources of Non-conventional Energy and to deal to an extent with the problems created on account of rapid depletion of non-renewable energy resources and increasing pollution caused by existing use of energy. For the achievements of its targets during Eighth Five Year Plan, Rs. 5168.40 lakhs were allocated. The progress in various programmes of REDA during the Eighth Five Year Plan are as below:-

#### **SPV Power Packs**

15.24 In Rajasthan Solar Photovoltaic application comprises of Solar Power Street Lights, Solar Lanterns and Solar Refrigeration, SPV Pumps an electrification of villages through Solar Power Packs.

15.25 REDA has undertaken electrification of far flung villages which are not likely to be electrified by RSEB in the next 5 to 10 years, through Solar Photovoltaic devices. For the Eighth Five Year Plan Period, Rs. 1000.00 lakhs were kept as provision to establish 500 KW Power Packs. Till the end of the Eighth Five Year Plan Rs. 665.855 lakhs have been spent, to create a capacity of 221.82 KW produce of Energy.

#### **Strengthening of Street Lights**

15.26 Under the Solar Photovoltaic Street Lights Programme nearly 5000 Street Lights have been installed in 746 remote and border villages of 93 Panchayat

Samities. The Government of Rajasthan has decided to take up repair and strengthening of street lights. For the Eighth Plan Rs. 78.00 lakhs were kept as a provision for strengthening of SPV lights and Rs. 200.00 lakhs for the purchase of Batteries. Against this, Rs. 262.545 lakhs have been spent during the same period, achieving the strengthening of 4695 SPV Lights.

### **Sale of Solar Cookers**

15.27 Solar Cookers programme has very wide acceptance in the State. The Agency has decided to promote only ISI marked Solar Cookers. On each cooker there is a State Subsidy of Rs. 200/- and MNES assistance of Rs. 121/-. During the Eighth Five Year Plan period Rs. 100.00 lakhs were kept as a provision out of which Rs. 25.25 lakhs have been spent on the supply of 5468 Solar cookers.

### **SPV Pumps**

15.28 SPV Pumps of 900 watt capacity have been developed and 45 SPV Pumps have been installed during the Eighth Plan period, the expenditure incurred was Rs. 19.43 lakhs. The total cost of each pump was Rs. 2.32 lakhs, out of which the Government of India have provided a subsidy of Rs. 1.35 lakhs and the balance cost of 0.97 lakhs has been borne by the State Government. These pumps have been installed primarily in the Forest Department nurseries where some skilled manpower is constantly available for maintenance.

### **Solar Water Heating System (SWHS)**

15.29 Solar Water Heating System have begun to enjoy wide acceptance. REDA has installed SWH systems with a total capacity of 184100 liters per day, the expenditure being Rs. 52.622 lakhs during Eighth Five Year Plan period. Special efforts have been made for the introduction of SWHS in Mount Abu, the only hill resort in Rajasthan.

### **Wind Mills**

15.30 REDA is implementing the installation and commissioning of wind mills at various public wells in the State of Rajasthan. These wind mills are supplied, installed and commissioned by the wind mill manufacturers approved by the Ministry of Non-Conventional Energy Sources. 125 wind mills were installed during the Eighth Five Year Plan with the total expenditure of Rs. 27.18 lakhs.

### **Ninth Five Year Plan**

15.31 Rajasthan Energy Development Agency (REDA) is the nodal agency to diffuse useful knowledge in various phases of Non-conventional Energy and thereby to deal with the problems on account of rapid depletion of non-renewable resources and increasing pollution caused by the existing use of energy. REDA is a registered Society under the Rajasthan Societies Registration Act, 1958 (Rajasthan Act No. 28 of 1958). The society was registered on 21.1.85. Objects of the Agency include formulation and implementation of demonstration projects, co-ordinate or promote research programme, advise State Government and other agencies including panchayats and municipalities in matter pertaining to alternate energy sources, formulation and implementation of the Solar Energy Conservation Programme and to popularise alternate sources of Energy.

## **Solar Energy Programme**

15.32 In Rajasthan a large proportion of the total Annual Plan allocations for Non-Conventional Energy Sources is spent on harnessing of Solar Energy. Utilisation of Solar Energy is achieved through one of the two routes, of Solar Photovoltaic (SPV) or the Solar Thermal Utilisation. For Ninth Five Year Plan an amount of Rs. 3800.00 lakhs has been proposed.

### **Solar Photovoltaic Applications**

15.33 In Rajasthan Solar Photovoltaic applications comprise of Solar Power Street lights, Solar Lanterns, Solar Refrigerator, SPV Pumps and Electrification of villages through Solar Power Packs.

15.34 Under the Solar Photovoltaic Street Lights Programme 5440 Street Lights have been installed in 746 remote and border villages of 93 Panchayat Samities in the State. The Government of Rajasthan has decided to take up repair and strengthening of Street Lights on a time bound basis rather than installation of Street Lights. During the financial year 1996-97, 777 street lights have been repaired. For the Ninth Five Year Plan, Rs. 200.00 lakhs have been kept for strengthening of Street Lights.

### **Power Pack Villages**

15.35 In the year 1995-96, the Government of Rajasthan took a policy decision to electrify such villages through non-conventional energy mode i.e. SPV Power Packs which are for flung and not feasible to be electrified by conventional sources of energy in the near future. In pursuance to this decision, 50 villages of districts Dungarpur, Banswara, Chittorgarh, Udaipur, Gangangangar, Sawai Madhopur and Jaisalmer have been selected for electrification through SPV Power Packs by REDA. For this an amount of Rs. 1500.00 lakhs has been kept as a provision.

### **SPV Pumps**

15.36 SPV Pumps of 900 watts capacity have been developed for drinking water and for irrigation purposes for the villagers. These pumps have been installed primarily in Forest Department nurseries where some skilled manpower is constantly available and probability of maintenance and proper upkeep of these pumps is high. At present 45 pumps are working satisfactorily.

15.37 During Ninth Five-Year Plan, Rs. 142.50 lakhs have been kept as a provision to spend.

### **Solar Cooker**

15.38 Solar Cookers Programme is a programme, which has very wide acceptance in the State. However it was found that in many households solar cookers were not being used because of lack of repair facilities. To overcome this problem REDA has organised repair camps in the State for replacement of mirror, glass, insulation and painting of containers. REDA has developed a community solar cooker, in which food can be cooked for about 15 to 20 persons at one time.

15.39 REDA has also decided to promote only ISI marked Solar cookers from 1.4.95. REDA has been getting cookers confirming to ISI specifications at Rs.

1021/-. These are being sold at Rs. 700/- each allowing for a State subsidy of Rs. 200/ and MNES assistance of Rs. 121/-.

15.40 For the Ninth Five-Year Plan Rs. 10.00 lakhs have been kept for this activity.

### **Preparation and Maintenance of Windmills**

15.41 REDA is implementing the installation and commissioning of windmills at various public wells in the State of Rajasthan. These windmills are supplied, installed and commissioned by the windmills manufacturers approved by the MNES. Ninety-two windmills have been installed so far. For Ninth Five-Year Plan, Rs. 400.00 lakhs have been kept as a provision.

### **Mathania Solar Thermal Power Project in Rajasthan**

15.42 In Rajasthan, in State Government plans to establish a Solar Energy Enterprises Zone (SEEZ) in the districts of Barmer, Jaisalmer and Jodhpur by offering a package of incentives to private investors willing to develop various solar power technologies including Solar Thermal Power, Solar PV, Solar chimney etc. International offers recently asked for by Rajasthan have resulted in commencement of work on two 50 MW Solar PV power stations as well as one Solar Chimney Project (200 MW) to be operated on an independent power production (IPP) basis. Rs. 98,000 lakhs have been earmarked for Mathania Solar Power Project (EAP).

15.43 The Project would be pursued under Ministry of Non-Conventional Energy Source Programme objective and is envisaged as the first step in a long-term programme for promoting solar thermal power in Rajasthan. The project involves construction of an Integrated Solar Combined Cycle (ISCC) plant with a Solar field of about 35 MW and a fossil field of up to 4 times the Solar field capacity. The total output of around 175 MW. It will be based on the integrated operation on the Parabolic through solar plant with a Combined Cycle Gas turbine using fossil fuels such as Naphtha, fuel oil or low sulphur heavy stock (LSHS). The ISCC will operate as a base load plant with an expected plant load factor of 80%. The project site is at Mathania near Jodhpur.

15.44 GEF has allocated US \$ 49 million for the project. GEF has agreed to provide technical assistance to ensure that adequate institutional and logistical support for the technology is available to support future expansion. One hundred and fifty hectare of land has been acquired by the Government of Rajasthan and is available for the project. Compound wall has been completed and a fully equipped solar observatory has been established at the project site.

### **Bio-Gas**

15.45 In the State, bio-gas programme has attracted attention in the context of energy crisis and the need for decentralised cheaper renewable energy sources.

15.46 Prior to the year 1979-80, the bio-gas programme in the State was being implemented by Khadi and Village Industries Commission. Looking at the

importance of the programme and increasing energy needs, the State Government took over the programme and the National Project on Biogas Development launched by Government of India was started in the State.. Main objects of the programme are as under:

- To provide fuel for cooking purposes and organic manure to rural household through biogas plants.
- To mitigate drudgery of rural women and reduce pressure on forests.
- To improve sanitation in villages by linking sanitary toilets with biogas plants.
- To generate employment for masons village technicians & unskilled in rural areas.

15.47 The progress of installation of Biogas plants from Sixth Plan onward is as under:

S.No.	Period	Biogas plants installed
1	Sixth Plan	13660
2	Seventh Plan	20779
3	1990-91	3950
4	1991-92	4128
5	Eighth Plan	18243

15.48 For the Ninth Plan a provision of Rs. 688.25 lakhs has been made which includes committed liability of Rs. 192.25 lakhs and new items of Rs. 496.00 lakhs. In all 10,000 new Biogas plants would be installed and 20000 plants would be revived during the Ninth Plan.

15.49 The State Government provides following subsidies for installation of Biogas plants.

- Rs. 1000/- subsidy to all type of biogas plants for all categories of beneficiaries.
- Rs. 1000/- subsidy for drum type biogas plants in addition to above.
- Upto Rs. 500 (maximum) per biogas plant for repair & revival including pipe line and accessories.
- Rs. 100/- per plant for revival of plant for motivation to village level workers
- Additional subsidy of Rs. 1500/- to all type of biogas plants and to all categories in the notified forest areas.
- Promotional incentive for the repair of sick Biogas plants @ 250 per plant.
- Additional subsidy of Rs. 300/- per plant for linking biogas plants with sanitary toilets.

15.50 Besides this, Central subsidy is also provided for different categories of beneficiaries as given below at the rate of Rs. 500/- per biogas plant set up on turn key basis with three years warranty for trouble free functioning, payable to corporate bodies, recognised societies, registered. NGO's.

Capacity of Plants perday in cum	SC/ST/Desert District/SF/MF/land less labourers	General
1	2000	1500
2	2400	1800
3,4,6,8 and 10	2600	2000

15.51 Government of India also provides fixed subsidy for installation of Institutional/Community biogas plants depending on size of plant as under:

Capacity of Plants	Subsidy for IBPs Goshalas & institutions
15	35000
20	45000
25	55000
35	80000
45	95000
60	115000

15.52 A new scheme for promotion of small capacity night soil based biogas plants in schools & hospitals for rural areas has been introduced under which Central assistance of 70 percent of the total cost subject to a maximum of Rs. 10,000/- for construction of sanitary toilet linked biogas plant is available.