

CHAPTER-II

2.1 Performance Audit Relating to Tamil Nadu Sugar Corporation Limited and Perambalur Sugar Mills Limited



CHAPTER - II

2.1 Performance Audit Report on Tamil Nadu Sugar Corporation Limited and Perambalur Sugar Mills Limited

Executive Summary

As of March 2015, there were 43 sugar mills in Tamil Nadu. Of these, two sugar mills were owned by two State Public Sector Undertakings (PSUs) viz., Tamil Nadu Sugar Corporation Limited (TASCO) and its subsidiary Perambalur Sugar Mills Limited (PSM). These two sugar mills contributed about four per cent of State sugar production during 2014-15. These two PSUs are financially sick since 1998 and 1999. Audit took up the Performance Audit of these PSUs covering the period from April 2010 to March 2015.

Planning for availability of sugarcane

Both the companies did not achieve the target for area registration for sugarcane cultivation during 2010-15 (except during 2010-12 in TASCO). The shortfall in area registration, which ranged between 6 and 29 per cent in TASCO and 4 and 35 per cent in PSM, led to reduction in availability of sugarcane to the extent of 2.55 lakh MT in TASCO and 5.08 lakh MT in PSM. Failure of the companies to promote drip irrigation impacted the availability of sugarcane. Due to not ensuring staggered plantation, there was bunching of sugarcane plantation and receipt of over-aged sugarcane upto 96 per cent during the five years of 2010-15.

Sugarcane procurement

During 2010-15, TASCO, which fixed the target for procurement of sugarcane more than 93 per cent of its installed capacity, had procured sugarcane ranging between 68 and 102 per cent of the target. However, though PSM had fixed its target between 46 and 83 per cent of its installed capacity, this lower target could be achieved only in 2010-11 and 2012-13 and in the balance three years, the achievement ranged between 66 and 82 per cent. Both the companies diverted sugarcane to other mills on unjustified grounds, resulting in loss of contribution of ₹ 9.92 crore. The procurement of sugarcane by both the companies with extraneous material, much in excess of the norm of one per cent, resulted in wasteful expenditure of ₹ 24.94 crore.

Production performance

Due to the inability of both the companies to maintain the corporate norm for recovery of sugar from the sugarcane crushed, the companies lost 36,472 MTs of sugar valued at ₹ 110.53 crore. Against the permitted loss of production hours of 8 per cent, the time loss suffered by TASCO ranged from 15.05 to 33.01 per cent and PSM from 18.57 to 39.71 per cent. The excess consumption of utilities viz., steam, bagasse and power beyond the permissible levels, led to avoidable extra expenditure of ₹ 17.59 crore.

The programme for modernisation and establishment of co-generation plant at a cost of ₹ 254.58 crore (taken up as part of rehabilitation of the companies) in February 2008, with scheduled completion by September 2011 remained incomplete (December 2015) due to inadequate deployment of labour force by the contractor. This led to continued inefficiencies in operation of the sugar mills.

Monitoring and internal control

There were frequent changes in the post of Chief Executives of the mills, with the average tenure during 2010-15 being only six months, resulting in lack of continuity in leadership. The Internal Audit in TASCOS was confined only to financial matters. Absence of age-wise data of sugarcane procured beyond 12 months and sugarcane crushed beyond 24 hours are some of the deficiencies in internal control noticed in Audit.

Introduction

2.1.1 In Tamil Nadu, sugarcane is cultivated in an area of 3.50 lakh hectares. The State contributes, approximately, seven to nine *per cent* of the national sugar production¹⁹. As of March 2015, there were 43 sugar mills in the State (with crushing capacity of 263 lakh MT *per annum*), of which two²⁰ were owned by public sector companies viz., Tamil Nadu Sugar Corporation Limited (TASCOS) and Perambalur Sugar Mills Limited (PSM), 16 were in Co-operative Sector and 25 in Private Sector. The sugar mills owned by PSUs contributed about four *per cent* of the State's sugar production during 2014-15.

TASCOS, formed in 1974, manages Arignar Anna Sugar Mills (AASM) at Thanjavur district with an installed capacity of 2,500 tonnes crushed per day (TCD), while PSM, which was formed as a subsidiary of TASCOS in 1976, has its sugar mill at Perambalur district with an installed capacity of 3,000 TCD.

Organisational setup

2.1.2 The management of TASCOS is vested in a Board of Directors (BOD), comprising of eleven Directors, nominated by Government of Tamil Nadu (Government) and headed by a Managing Director (MD), who also holds the post of Commissioner/Director of Sugar (C/DOS) of the State. Similarly, the management of PSM is vested in a BOD, comprising of seven Directors, nominated by Government including a Chairman-cum-Managing Director (CMD). The CMD/MD of both the companies are assisted by a General Manager, who is in charge of both the companies and two Chief Executives, who manage the activities at the sugar mills.

¹⁹ The national sugar production during the year 2013-14 was 245.5 lakh MTs.

²⁰ Arignar Anna Sugar Mills and Perambalur Sugar Mills.

Scope and methodology of Audit

2.1.3 The performance of TASCOT and PSM was last reviewed and included in the Report of the CAG of India (Commercial) for the year ended 31 March 2005, Government of Tamil Nadu. During this review, audit observed that the performance of TASCOT and PSM was adversely affected due to controllable factors such as (i) shortfall in procurement of sugarcane, (ii) low crushing rate of sugar mills, (iii) avoidable loss of production hours, (iv) consumption of utilities²¹ over and above the norms, *etc.* The Committee on Public Undertakings (COPU) had discussed the review and recommended (May 2013) that both the companies should (i) avoid shortfall in sugarcane procurement, (ii) avoid time losses in operation of machinery and (iii) adhere to the norms for consumption of utilities.

The companies had initiated (February 2008) modernisation programme of their mills, which was in progress (December 2015). To evaluate the efforts taken by these companies in overcoming the deficiencies pointed out in the earlier review and examine the impact of modernisation programme, Audit took up a Performance Audit covering the period from April 2010 to March 2015.

Audit methodology involved scrutiny of the records at sugar mills and Head offices, of both the companies, at the DOS and the Government and interaction with the officials of TASCOT and PSM. The Performance Audit commenced with an Entry Conference, held on 18 March 2015, in which audit scope, objectives and methodology were shared with the Management. The Draft Performance Audit Report was discussed with the DOS, Government of Tamil Nadu in the Exit Conference held on 17 December 2015. The views expressed by DOS in the Exit Conference and the reply received (January 2016) from the Government were considered and incorporated, where appropriate.

Audit objectives

2.1.4 The main objectives of the Performance Audit were to ascertain whether:

- adequate planning existed for ensuring availability of quality sugarcane;
- procurement of sugarcane was made economically;
- production activities were carried out economically, efficiently and effectively;
- adequate monitoring and internal control mechanism existed.

Audit criteria

2.1.5 The audit criteria adopted for assessing the achievement of the audit objectives were:

- policies and orders of the Government with reference to sugar production;
- annual financial forecasts and budgets;

²¹ Bagasse, steam and electricity, used for operation of sugar plant, are called utilities.

- financial and physical targets set by the companies;
- provisions of statutes applicable for sugar industry;
- industrial norms for production of sugar and consumption of utilities;

Acknowledgement

Audit acknowledges the co-operation and assistance extended by the staff and the management of both the companies in conducting this Performance Audit.

Audit findings

2.1.6 The audit findings are discussed below:

Financial position and working results

2.1.7 The financial position and working results of both the companies for the five years ending 2014-15 are given in **Annexures-3 and 4**. Analysis of the same revealed the following:

- The paid up capital of ₹ 118.21 crore of these companies was eroded by their accumulated loss of ₹ 310.52 crore due to short fall in procurement of sugarcane, delay in completion of modernisation of the mills, lower sugar recovery rate, excess consumption of utilities, *etc.*, which are discussed in Paragraphs 2.1.13, 2.1.29, 2.1.19 and 2.1.22 to 2.1.25.
- TASCO earned profit only in two years, *i.e.*, 2010-11 and 2012-13 but sustained losses (₹ 46.56 crore) in the balance three years. Similarly PSM, which earned profit only in 2010-11, had incurred continuous losses amounting to ₹ 64.27 crore during the subsequent four years upto 2014-15. The profit earned in 2010-11 by these companies was not from their business operations, but out of Government support in the form of conversion of outstanding interest into capital and waiver of penal interest.
- PSM, which was dependent mainly on borrowings from the commercial banks for its working capital, had increased its borrowings from ₹ 145.94 crore to ₹ 187.57 crore during 2010-15.
- Both the companies were declared (2000) sick by the Board for Industrial and Financial Reconstruction (BIFR). The rehabilitation packages initiated by the companies in October 2008 (approved by the Government in September 2009), involved modernisation of mills and establishment of co-generation and ethanol plants. However, they were not completed even after receipt of share capital assistance from the Government, as discussed in Paragraphs 2.1.27 and 2.1.29. Consequently, the companies continued to be sick till date (December 2015).

Planning for availability of sugarcane

2.1.8 The DOS had instructed the companies, from time to time, to undertake cultivation of adequate sugarcane for optimum utilisation of the installed capacity of the sugar mills. The deficiencies noticed in planning for availability of sugarcane are discussed below:

Shortfall in cane area development

2.1.9 The DOS, based on the request from the mills, allots the agricultural areas to all the sugar mills in the State for development of sugarcane. The companies prepare their annual budget in September every year, projecting their requirement of sugarcane taking into account the expected yield and the crushing capacity of the mills. The companies, thereafter, register areas by entering into agreements with farmers for sugarcane development within the area allotted by DOS.

The details of target area fixed *vis-a-vis.*, area actually registered are given in **Annexure-5**. Examination of the details in Annexure revealed the following:

- Both the companies did not achieve the target for area registration during 2010-15 (except during 2010-12 in TASCO) and the shortfall in area registration, ranging between 6 and 29 *per cent* in TASCO and 4 and 35 *per cent* in PSM, led to reduction in availability of sugarcane to the extent of 2.55 lakh MT in TASCO and 5.08 lakh MT in PSM during the above period. The shortfall in area registration was mainly due to lack of interest shown by the farmers for sugarcane cultivation due to low yield and delay in harvesting sugarcane to match the crushing capacity of the mills, resulting in blockage of their investment. However, Audit observed that yield of sugarcane could have been improved by the companies by motivating the farmers to carry out drought management practices, as discussed in Paragraphs 2.1.10 to 2.1.12. The failure to carry out staggered plantation, which led to procurement of over-aged cane, was also controllable by the companies as discussed in Paragraph 2.1.16.
- In respect of TASCO, the area registered continuously decreased from 14,780 acres in 2010-11 to 9,539 acres in 2014-15. Though TASCO had 1,915 acres available for registration in Cauvery basin (which is a high potential sugarcane production area), it registered only 675 acres during 2010-15.
- Against the average annual requirement of 17,200 acres to achieve the installed capacity, PSM registered only 10,357 to 10,899 acres during 2010-15. While approving (March 2008) the re-allocation of area of PSM to a private sugar mill, the De-limitation Committee²² directed the Company to develop sufficient cane in the available areas, which was not done by the Company. Consequently, the capacity utilisation of the mill continuously decreased from 67 to 51 *per cent* during 2010-15.

The Government, in its reply, attributed decline in area registration to uncontrollable factors like decline in rainfall, insufficient irrigation, *etc.*, forcing the farmers to choose other crops. It further stated that the field staff of the companies had been instructed to carry out nursery programme, encourage new ryots to cultivate cane, conduct periodical village level meetings and introduce new cane varieties to increase the productivity. Had the companies adopted the drought management practices, as prescribed by

²² A Committee appointed by the State Government to re-allocate areas to the sugar mills.

DOS²³, during the earlier periods, they could have avoided shortfall in area registration.

Non-ensuring the quality of seed cane

2.1.10 During 2010-15, both companies had earmarked areas ranging from 13 to 22 acres for captive sugar farms²⁴ in the premises of the mills. It was, however, noticed that both companies failed to exploit the entire area of captive farms. Though TASCOCO developed seed cane in 0.5 to 6 acres of captive land and supplied 312 MT of seed cane, PSM did not develop any seed cane from the captive farms.

The Government replied that the nurseries are maintained by the farmers at village level, which ensured supply of good quality seeds. The reply is, however, not specific to the reasons for shortfall in development of captive farms in the mill's premises.

Shortfall in achievement of drip irrigation targets

2.1.11 As per the Policy note of the Government, drip irrigation of sugarcane would ensure increase in productivity and irrigation with the available water. The targets fixed by DOS and achievements thereagainst by the companies under drip irrigation for in-plant²⁵ area of cultivation are tabulated below:

Table -2.1.1
Target and achievement for drip irrigation

(Area in acre)

Planting Season	TASCOCO				PSM			
	Total in-plant area	Target	Achievement	Achievement (in per cent of in-plant area)	Total in-plant area	Target	Achievement	Achievement (in per cent of in-plant area)
2009-10	NA	562	425	--	6,475	500	172	2.65
2010-11	7,473	688	621	8.30	6,219	500	224	3.60
2011-12	5,867	750	568	9.68	4,918	500	135	2.74
2012-13	5,021	769	683	13.6	3,269	500	169	5.16
2013-14	4,834	250	225	4.64	4,414	800	376	8.51
TOTAL	23,195	3,019	2,522		25,295	2,800	1,075	
Grand total (TASCOCO+PSM)	48,490	5,819	3,597					

Source: Details furnished by the companies

²³ DOS prescribed drought management practices, drip irrigation, introduction of drought tolerant varieties to overcome shortfall in rainfall and drought situations.

²⁴ Captive farms are used to raise primary nursery to demonstrate new technology and to try new varieties of sugarcane.

²⁵ Initial plantation of sugarcane from the seeds.

Against the total in-plant area of 48,490 acres, target for coverage of drip irrigation was fixed only as 5,819 acres (12 *per cent*). However, even this could not be achieved and the drip irrigation was achieved only in 3,597 acres, *i.e.*, 62 *per cent* of the target despite availability of subsidy of ₹ 43,816 per acre. The continued shortfall in drip irrigation indicated that the companies failed to promote drip irrigation methods, which impacted the yield of sugarcane.

The Government admitted that the farmers' reluctance to adopt drip irrigation was on account of cumbersome procedures in obtaining subsidy and stated that steps were being taken to simplify the procedures.

Failure to achieve staggered planting programme

2.1.12 DOS fixed the month-wise target for planting sugarcane during November to April every year in a staggered manner for getting continuous supply of right age cane²⁶ in the following year. The detailed analysis of the plantation programme carried out by these companies revealed the following:

- TASCO achieved its month-wise targets only in five out of 26 months in respect of in-plant crop and 12 out of 25 months in respect of ratoon²⁷ crop.
- While TASCO achieved 60 to 86 *per cent* of the annual targets between November and January, PSM planted 10 to 18 *per cent* of the cane after May in all the years upto 2014-15 resulting in receipt of over-aged sugarcane in the subsequent crushing season, as discussed in Paragraph 2.1.16.

The Government replied that the planting programme was dependent on the mills requirement of cane. However, the mills did not receive sugarcane to their requirement and the shortfall in sugarcane procurement persisted in all the five years of 2010-15, as discussed in Paragraph 2.1.13.

Sugarcane procurement

Shortfall in sugarcane procurement

2.1.13 Both TASCO and PSM fixed the annual requirement of sugarcane based on their crushing capacity of 4.30 lakh MT and 5.16 lakh MT respectively. The target and the actual procurement of sugarcane in the last five years upto 2014-15 are given in **Annexure-6**. It would be seen that:

During 2010-15, TASCO fixed the procurement target of more than 93 *per cent* of its installed capacity and its achievement ranged between 68 and 102 *per cent* of the target. But, PSM fixed its target between 46 and 83 *per cent* of its installed capacity. Even the lower target was achieved only in 2010-11 and 2012-13, while in the balance three years, the achievement ranged between 66 and 82 *per cent* only. Significantly, COPU had recommended that both the companies should avoid shortfall in sugarcane procurement. Had these companies procured the sugarcane, equivalent to their installed capacity, the

²⁶ The right age of in-plant cane is 12 months and for ratoon cane is 11 months.

²⁷ Germination of crop from root portion of harvested sugarcane.

same would have resulted in additional contribution to the extent of ₹ 25.32 crore.

Avoidable cane diversion

2.1.14 During the period 2010-15, TASCO diverted 2.36 lakh MT of sugarcane and PSM diverted 2.86 lakh MT to other co-operative and private mills. Analysis of the diversions revealed the following:

- PSM diverted 2.77 lakh MT of sugarcane due to breakdown of the machinery. As the mills are operated only for 172 days in a year and balance period is earmarked for maintenance and repair of the machinery, large scale breakdown of machinery during the crushing period was avoidable.
- TASCO diverted 1.91 lakh MT (1.30 lakh MT in 2011-12 and 0.61 lakh MT in 2014-15) of sugarcane, citing employees' strike as a reason. Considering the daily crushing capacity of 2,500 MT, the Company should have diverted only 1.48 lakh MT during the entire strike period of 59 days. Hence, the diversion of 0.43 lakh MT was avoidable.
- TASCO had also diverted 27,937 MT of sugarcane due to specific request from other mills. Diversion on this account was avoidable as TASCO itself was not crushing to its fullest capacity during the period of diversion.

These avoidable diversions resulted in loss of contribution of ₹ 9.92 crore (TASCO- ₹ 3.39 crore and PSM ₹ 6.53 crore) to the companies.

The Government replied that the diversions were made to protect the interests of the farmers during the non-operational periods of the mills. The reply is not convincing because some of these diversions were avoidable in view of the reasons mentioned in the above paragraphs and were against the financial interest of the companies.

Procurement of cane with excess extraneous material

2.1.15 As per the Sugarcane Control Order of 1966, the sugar companies were allowed to procure one *per cent* on the gross weight of sugarcane as its binding material. Further, to ensure receipt of clean cane and to control the receipt of extraneous materials, such as tops, roots, water shoots, mud *etc.*, the DOS issued (May 2001) four-tier control measures in the field at the time of harvesting, receiving the cane at the yard, testing at the laboratory and for carrying out surprise checks. Audit, however, noticed that none of these checks were carried out by the companies during the period 2010-15. Sugarcane received by the mills included extraneous material ranging between 2.77 and 25.45 *per cent* of the sugarcane procured. This resulted in wasteful expenditure of ₹ 24.94 crore (for purchase of 1.02 lakh MT of extraneous material over and above the norm) to these companies.

The Government replied that every year the extraneous matter in the harvested cane was closest to the norms. The fact, however, remains that the percentage of extraneous materials was beyond the norms prescribed by DOS.

Procurement of over-aged cane

2.1.16 As per the directions issued by DOS from time to time, cutting of the right age cane would result in achieving sugar recovery above 9.50 *per cent*. Against this direction, the companies procured over-aged sugarcane during the period 2010-15 as tabulated below:

Table -2.1.2
Proportion of over-aged sugarcane in total procurement

Crushing season	TASCO			PSM		
	Cane procured*	Total over-aged cane		Cane procured*	Total over-aged cane	
	In lakh MT	In lakh MT	In per cent	(In lakh MT)	In lakh MT	In per cent
2010-11	4.06	2.4	59.14	3.39	2.98	87.77
2011-12	3.52	1.77	50.42	2.84	2.32	81.68
2012-13	3.7	1.9	51.36	2.83	1.55	54.84
2013-14	3.36	1.01	30.03	2.77	1.78	64.14
2014-15	2.93	2.81	95.79	2.62	2.51	95.76

Source: Details furnished by the companies

* Cane from its own area.

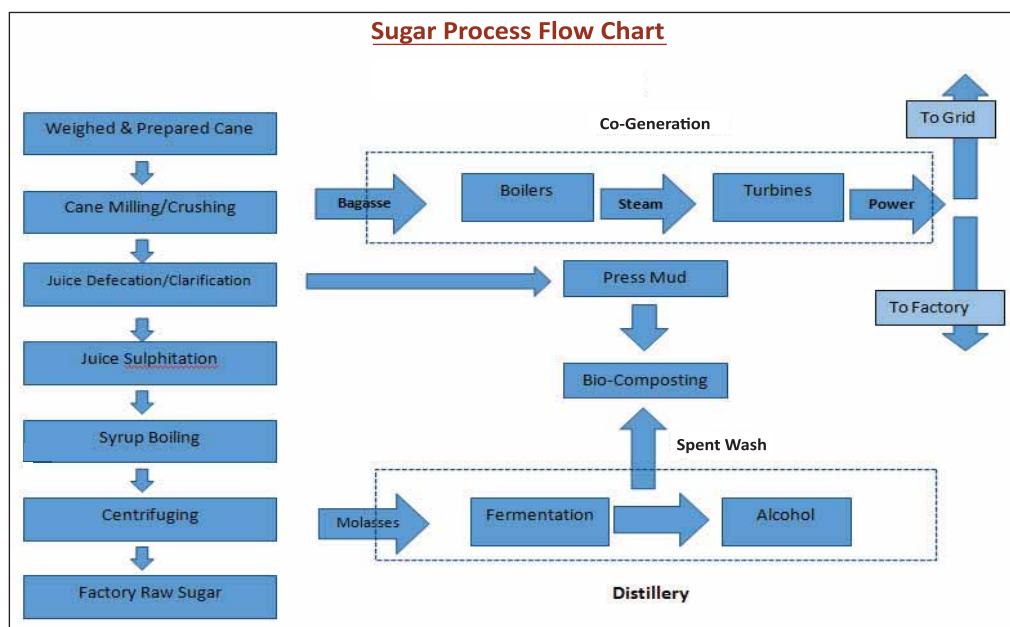
The percentage of over-aged cane procured by TASCO ranged between 30 and 96 *per cent* and the same in respect of PSM was between 55 and 96 *per cent* during the period 2010-15. The receipt of over-aged sugar cane was due to non-adoption of staggered plantation method (as discussed in the Paragraph 2.1.12) and partly due to stoppage of mills due to breakdowns *etc.* The usage of over-aged sugarcane led to low recovery of sugar, as discussed in detail in the Paragraph 2.1.19.

The Government attributed the crushing of over-aged cane to employees' strike at the commencement of the crushing season and frequent breakdown of old age machinery. The fact, however, remains that the failure of the companies to follow staggered plantation, as per the directions of DOS, was the main reason for receipt of over-aged sugarcane, as discussed in Paragraph 2.1.12.

Production performance

Manufacturing Process

2.1.17 The process of sugar manufacturing is depicted in the following diagram:



The effective functioning of the sugar mill depends on availability of good quality sugarcane, optimum utilisation of machinery and prudent utilisation/sale of by-products.

Profitability of cane crushed

2.1.18 The cost involved in crushing of one tonne of sugarcane and the sales realisation in respect of sugar and the by-products, viz., molasses, bagasse and press mud in respect of both the companies are detailed below:

Table -2.1.3 Cost of production

TASCO		(Amount in ₹)			
Particulars	2010-11	2011-12	2012-13	2013-14	2014-15
Cost per MT of cane crushed	2,486	2,627	3,171	3,368	3,311
Amount realised per MT of cane crushed	2,931	2,997	3,172	3,222	2,948
Profit/Loss (-) per MT of cane crushed	445	370	1	(-)146	(-)363

PSM		(Amount in ₹)			
Particulars	2010-11	2011-12	2012-13	2013-14	2014-15
Cost per MT of cane crushed	2,717	2,979	3,391	3,748	3,371
Amount realised per MT of cane crushed	2,827	2,832	3,290	3,310	3,026
Profit/Loss (-) per MT of cane crushed	110	(-)147	(-)101	(-)439	(-)345

Source: Details furnished by the companies

Both TASCO and PSM had incurred operating losses in the major portion of the five year period upto 2014-15 on account of (i) annual increase of State

Advised Price (SAP) by the Government (from ₹ 2,000 in 2010-11 to ₹ 2,650 in 2014-15), (ii) fall in revenue realisation per MT of sugar (from ₹ 2,451 in 2010-11 to ₹ 2,092 in 2014-15 in TASCO and ₹ 2,503 in 2010-11 to ₹ 2,188 in 2014-15 in PSM) and (iii) loss of 15 to 40 *per cent* of production hours, against the norm of 8 *per cent* due to frequent repairs and maintenance and engineering problems of the mills, usage of utilities in excess of the norms, not carrying out modernisation in a time bound manner, *etc.* While increase in cost of procurement of sugarcane and decrease in selling price of sugar were not in the control of the company, the other factors *viz.*, improper maintenance of the machinery and delay in modernisation were controllable. Audit analysis of these controllable factors revealed the following:

Failure to maintain budgeted sugar recovery rate

2.1.19 As per the corporate plan of the companies, a norm of 9 to 9.50 *per cent* of sugarcane crushed was adopted for sugar recovery. Against this norm, the actual sugar recovery rate decreased from 8.74 to 7.05 *per cent* in TASCO and from 8.79 to 7.60 *per cent* in PSM, during 2010-15. Consequently, these companies lost 36,472 MT of sugar valued at ₹ 110.53 crore, as detailed in **Annexure-7**.

The lower recovery rate of sugar was due to crushing of over-aged cane in all the five years, as discussed in Paragraph 2.1.16 and existence of excessive extraneous matter in cane crushed, as discussed in Paragraph 2.1.15.

Crushing of sugarcane beyond 24 hours of its receipt -- As per the orders of DOS, the sugarcane is required to be crushed within 24 hours of its harvesting to avoid loss in cane weight due to moisture loss and reduction in sugar content. However, Audit noticed that during the five years upto 2014-15, TASCO had crushed 10.97 lakh MT out of 17.58 lakh MT (62 *per cent*) and PSM had crushed 14.16 lakh MT out of 14.59 lakh MT (97 *per cent*) of sugarcane beyond 24 hours of its receipt. PSM did not maintain data on waiting time of cane to be crushed beyond 24 hours. Similarly, TASCO did not maintain such data for sugarcane with waiting time of more than 32 hours. In the absence of the above data, Audit could not ascertain the extent of sugarcane crushed beyond the excessive waiting time of 24/32 hours in PSM and TASCO and its impact on sugar recovery.

Loss on account of escapement of sugar -- As per the norms fixed by both the companies in their corporate plan, there could be escapement of sugar upto 1.80 *per cent* of the sugarcane crushed. However, the actual percentage of escapement of sugar in respect of TASCO ranged between 1.84 and 2.14 and in respect of PSM between 1.97 and 1.99 of the sugarcane crushed. The quantity of sugar lost on account of this reason worked out as 4,423 MT of sugar. However, both the companies did not analyse the specific reasons for excess escapement of sugar in the process.

The Government replied that the sugar recovery rate would be improved after completion of modernisation of the mills.

Shortfall in sugarcane crushing rate

2.1.20 The installed crushing capacity of the sugar mills, as mentioned in the corporate plan, in respect of TASCO and PSM was 2,500 and 3,000 TCD

respectively. However, Audit noticed that, while PSM never achieved the maximum capacity during the entire period of five years upto 2014-15, TASCO achieved it only on 354 out of 795 crushing days (45 *per cent*) in the above period. Due to under-performance of the mills, the crushing period, which should have lasted for 704 days and 487 days, was extended upto 952 days and 706 days in respect of TASCO and PSM respectively. This extended crushing season resulted in additional labour cost, which was worked out by Audit to ₹ 9.83 crore. The reasons for the low efficiency of the mills were frequent stoppages of mill on account of engineering problems and excessive time for general cleaning.

Agreeing with Audit, the Government replied that the position would improve once modernisation and co-generation works are completed.

Analysis of mill stoppages

2.1.21 The corporate plan of the companies permitted a time loss of 8 *per cent* (2 *per cent* for want of cane, 2.50 *per cent* for engineering problems, 3 *per cent* for cleaning and 0.50 *per cent* for other reasons) of the available production hours. The analysis of segment-wise time loss, in both the companies during the period 2010-15, is tabulated below:

Table – 2.1.4
Analysis of loss of production hours
(loss of hours in percentage)

Crushing season	Cane		Engineering		Cleaning		Others		Total	
	TASCO	PSM	TASCO	PSM	TASCO	PSM	TASCO	PSM	TASCO	PSM
2010-11	4.50	10.38	2.15	3.19	4.52	1.24	7.79	9.43	18.96	24.24
2011-12	0.91	0.94	1.75	8.13	3.92	2.96	23.56	27.68	30.14	39.71
2012-13	5.52	2.21	4.72	4.95	4.46	5.35	3.34	6.06	18.04	18.57
2013-14	5.80	2.49	1.92	11.28	4.45	4.59	2.88	5.26	15.05	23.62
2014-15	3.76	3.65	10.72	8.54	5.45	5.24	13.08	5.97	33.01	23.40

Source: Physical performance report of the companies

- Against the permitted time loss of 8 *per cent*, the percentage of time loss suffered by TASCO ranged between 15.05 and 33.01 and in respect of PSM, the same was ranging between 18.57 and 39.71.
- Both TASCO and PSM achieved the norm of 2 *per cent* of time loss on account of want of cane only in 2011-12. In the remaining four years, the percentage of time loss was in excess of the norms. This indicated that the companies did not synchronise receipt of sugarcane with the daily cane cutting requirements.
- COPU had recommended avoiding time losses on account of breakdown of machinery. However, TASCO maintained its time loss within the norm only in three years (2010-11, 2011-12 and 2013-14) and PSM could not maintain the time loss in any year due to breakdowns. This was despite the fact that the mills are working only during the crushing season, which extended to a maximum of 210 days during the five years upto 2014-15 and had the remaining days of the year to take care of repairs and

preventive maintenance of the mills. This indicated that the preventive maintenance of the machinery of the mills was not carried out at the required level.

- As projected in the corporate plan, the normative cost of repairs and maintenance was to be restricted to ₹ 30 per MT of cane crushed. Against this norm, the actual expenditure on repairs and maintenance incurred by PSM ranged between ₹ 39 and ₹ 66, whereas in respect of TASCOC, the same was between ₹ 49 and ₹ 156 during the five years ending 2014-15. Consequently, the companies incurred excess repairs and maintenance expenditure to the extent of ₹ 10.96 crore. Further, the comparison by Audit with the expenditure on repairs and maintenance (₹ 36 and ₹ 42 per MT) incurred by two co-operative sugar mills²⁸ of similar capacity during 2014-15, indicated that the same was lower than that of the two sugar mills. Had the companies carried out the modernisation programme, as scheduled, the excess cost on repairs and maintenance could have been avoided.

Excess consumption of utilities

2.1.22 The major utilities involved in the production of sugar are (i) bagasse (fuel required for raising steam), (ii) steam (required for operating the mills of the sugar plant and power turbines to generate power) and (iii) power. Audit analysis of the consumption of utilities revealed the following:

Steam

2.1.23 Both the companies had projected that 50 per cent of the total steam generated from the boilers would be required for their processing activities. The balance 50 per cent was to be utilised for power generation. As against this, TASCOC used steam for milling operations ranging from 52.72 to 57 per cent and PSM used 55 to 55.16 per cent during the period 2010-15 (details in **Annexure-8**). In addition, these companies also failed to generate the normative quantity of power by usage of the balance steam due to frequent failure of power turbines. These two factors led to purchase of additional power from TANGEDCO to the extent of 3.91 MUs valued at ₹ 2.89 crore instead of their selling 11.60 MUs of surplus power valued at ₹ 3.65 crore to TANGEDCO.

Bagasse

2.1.24 Bagasse, the by-product obtained in sugar manufacturing process, is used as a fuel for the boilers to generate steam. The bagasse in excess of self consumption is also sold to the paper industries. The excess consumption of steam for milling activities and power generation, as discussed above, had resulted in excess consumption of bagasse as detailed in **Annexure-9**:

The excess consumption of bagasse was attributed to ageing of the boilers of sugar mills. The value of excess consumption of bagasse by both the companies, as worked out by Audit was ₹ 9.89 crore.

²⁸

Cheyar Co-operative Sugar Mills and Kallakurichi Co-operative Sugar Mills.

Power

2.1.25 The sugar mills of both the companies utilised power purchased from TANGEDCO, in addition to captive power generated from steam. The norm fixed by these companies for consumption of power in sugar production was 20 units per MT of sugarcane crushed. Audit analysis of the actual consumption of power against norm indicated that during the period of five years upto 2014-15, both the companies had consumed excess power to the extent of 24.20 lakh units valued at ₹ 1.16 crore.

Based on the Audit observation on the excess consumption of utilities included in the earlier review, COPU had recommended that the companies avoid the excess consumption. The Government had assured COPU that after the proposed modernisation of the mills, excess consumption of utilities would be avoided. However, the assurance was yet to be complied with, as the envisaged modernisation of the mills was not complete as of December 2015.

Disposal of by-products

2.1.26 The by-products obtained during production of sugar are (i) bagasse, (ii) molasses and (iii) press mud. While major portion of bagasse is consumed as fuel in the mills, the surplus quantity of bagasse and other by-products are sold in the market. Audit analysis of disposal of by-products, other than bagasse, revealed the following:

Molasses

2.1.27 During the five years upto 2014-15, both companies generated 1.38 lakh MT of molasses, which was sold for the manufacture of ethanol and raw spirit through tender initiated by Tamil Nadu Co-operative Sugar Federation Limited, the nodal agency for sale of by-products. Audit noticed that:

- In order to utilise the molasses generated from the sugar mills, the Government approved (July 2009) the proposals for establishment of two ethanol plants of 45 Kilo Litre per day (one each for TASCOS and PSM) at a total cost of ₹ 91.50 crore. The project was to be funded by the Government's contribution of ₹ 17.40 crore, cane growers contribution of ₹ 9.16 crore as equity and the remaining amount of ₹ 64.94 crore was to be raised as loan from commercial banks.
- Though the Government contribution was received as early as in December 2010, the balance was not arranged by these companies due to their negative net worth. Consequently, the Government's share of equity was wiped off due to the continuous loss of these companies. The ethanol project was a non-starter, even six years after its approval by the Government, though nine private and two co-operative sugar mills within the State already had ethanol plants. Consequently, the companies were selling the molasses within the State at lower price and continued to suffer loss of revenue.

The Government replied that the delay in commissioning of ethanol plant was due to delay in selection of latest technology of the plant. The reply is not convincing because the said technology of the plant was not decided even after lapse of six years of approval of the project by the Government.

Press mud

2.1.28 The sugarcane juice, obtained in milling process, is added with chemicals to remove dirt and other impurities in the boiling house. The resultant residue is called press mud, which is used as fertiliser.

DOS directed (April 2010) the companies to sell the press mud to improve their revenue. While PSM had sold entire quantity of 18,190 MT of press mud in the market and realised ₹ 64.38 lakh, TASCOCO did not attempt to sell 49,099 MT of press mud generated during 2010-15 and allowed removal of press mud free of cost. Consequently, TASCOCO lost potential revenue of ₹ 1.05 crore²⁹.

The Government replied that based on the decision taken at Annual General Meeting of TASCOCO in December 2004, press mud was distributed free of cost to cane growers. However, the directions of DOS issued in April 2010, were subsequent to the Company's decision of 2004, which were not brought to the attention of BOD for its adherence, despite its weak financial position.

Tardy implementation of modernisation programme

2.1.29 Based on the proposal (July 2007) of the DOS, and as a part of the rehabilitation programme of the companies, the Government approved (February 2008) establishment of co-generation plants in TASCOCO and PSM through TANGEDCO³⁰. The benefits of co-generation and modernisation, as projected in DPR (July 2008), were (i) reduction in the consumption of power and steam by 16 *per cent* in the mills and (ii) export of 172.51 Million Units (MUs) of additional power to TANGEDCO *per annum*. Due to accrual of cost reduction in milling operation and revenue by sale of power to TANGEDCO, the pay-back period of modernisation would be eight to nine years.

Accordingly, TANGEDCO awarded the contract for project implementation to an Engineering, Procurement and Construction (EPC) contractor (February 2010) at a total price of ₹ 254.58 crore. As per the contractual terms, the work was scheduled to be completed in September 2011. Audit analysis of the delay in implementation revealed the following:

- The scope of work of the contractor included establishment of co-generation plant in 10 co-operative sugar mills and modernisation cum co-generation in TASCOCO and PSM at a total cost of ₹ 1,125.63 crore. The work in all the sugar mills was to be completed within 18 months. However, the contractor had completed 90 *per cent* of the co-generation work in both the companies and 67 and 50 *per cent* of work, relating to modernisation of TASCOCO and PSM respectively, till date (December 2015). The slow progress of the work was attributed to inadequate deployment of labour force, as indicated in the review meetings. Further, the contractor failed to adhere to the 12 revised schedules committed in the 19 review meetings held between TANGEDCO, Government, sugar mills and the contractor during 2010-15. A show cause notice was issued by TANGEDCO in August 2015. Despite noticing the inordinate delay and

²⁹ Worked out by Audit by comparing the rate obtained from a co-operative sugar mill.

³⁰ The work was executed through TANGEDCO which is a power utility company because the power generated from the co-generation plant of these companies was to be sold to TANGEDCO.

repeated failures to adhere to the revised schedules, the Government did not initiate any action against the contractor.

- The agreement entered into between the companies and TANGEDCO (April 2011) for executing the project did not provide for any control over the project execution by these companies. Moreover, the agreement also did not determine the transfer price of project upfront. Hence, the possibility of the cost escalation on account of delayed completion, if any, being passed on to the companies is not ruled out.
- Besides the above, the delay in modernisation led to continued inefficiencies in operations of the mills in the areas of (i) sugar recovery rate being lower than the norms (Paragraph 2.1.19), (ii) frequent breakdowns of the machinery (Paragraph 2.1.21), (iii) consumption of steam and power in excess of the norms, *etc.* (Paragraphs 2.1.22 to 2.1.25)

Thus, the objective of the Government (as mentioned in the Industrial Policy 2009-10), to establish co-generation and ethanol plants within the sugar mills for a better product-mix and profitability, remained unfulfilled.

The Government replied that, as per the agreement between TANGEDCO and TASCO/PSM, the role of these companies was confined to reporting the progress of ongoing modernisation works to TANGEDCO. The reply confirms the audit point that the companies, which were the beneficiaries of modernisation and co-generation plants, were not given an active role in project implementation.

Other points of interest

2.1.30 (a) Audit had pointed out in the earlier review that the Government had not reimbursed the difference between the State Advised Price (SAP) and the Fair and Remunerative Price (FRP), fixed by the GOI for procurement of sugarcane, which resulted in additional burden to the companies. Following this, the Government had replied to COPU that the differential amount was reimbursed as ways and means advance. However, Audit observed that during the five years upto 2014-15, TASCO and PSM had incurred extra expenditure of ₹ 103.49 crore and ₹ 85.38 crore respectively on account of SAP being more than the FRP³¹. Neither the companies approached the Government to pay the differential amount as ways and means advance, nor the Government paid such advance as committed to COPU. PSM had been dependent on the cash credit from the commercial banks for payment to the sugarcane growers. Had the Government paid the differential amount to PSM, as assured to COPU, the cash credit of PSM, which stood at ₹187.57 crore as of March 2015, could have been reduced by ₹ 85.38 crore.

(b) As per the provisions of Sugar (Packing and Marketing) Order, 1970 issued by GOI, a producer shall pack all sugar manufactured in new jute bags, which shall contain 50 kg of sugar net. Audit observed that in violation of the above order, both the companies supplied 5,959 MT³² of levy sugar to Food Corporation of India (FCI) in 100 kg jute bags, which led to non-recovery of

³¹ The FRP increased from ₹ 1391.20 in 2010-11 to ₹ 2200 per MT in 2014-15. During the same period the SAP increased from ₹ 2000 to ₹ 2650 per MT.

³² TASCO – 3,243 MT and PSM – 2,716 MT

₹ 2.68 crore from FCI for supply of sugar in 100 kg jute packs in 2009-11 even after five years of supply of sugar and repeated reminders from the DOS.

Monitoring and internal control

2.1.31 Monitoring of the activities of the organisation by the Management ensures the best practices and systems are followed within the organisation. The review of the monitoring mechanism, prevailing in these companies by Audit, revealed the following deficiencies:

- During the period 2010-15, 14 officials held the post of Chief Executive in each of the sugar mills of these companies. Out of the above, 10 officials were changed during the crushing period. The average tenure of these Chief Executives was only upto six months during the entire five years upto 2014-15. Only two officials held the post of Chief Executive for more than six months in both the companies. The mills suffered from lack of continuity of leadership.
- Though, in both the companies, the area under registration (as per agreements with the farmers), continuously declined every year, neither the management recorded the reasons for such reduction nor the management directed the companies to ascertain the reasons for such reductions.
- Both the companies had the data on procurement of sugarcane upto 12 months, upto 13 months and beyond 13 months. Though the procurement of sugarcane by these companies beyond 13 months constituted 30 to 96 *per cent* of total procurement, further break-up of this category, which was essential for arresting the procurement of over-aged sugarcane, was not compiled by the companies.

Non-utilisation of Simputers

2.1.32 Under the e-governance policy, the State Government issued 99 Simputers³³ (March 2011) to both the companies for real time capture of data relating to sugarcane farming operations. However, these simputers were not utilised at all by the companies due to non-motivation/training of staff by the Management. By not utilising the simputers, the companies not only violated the instructions issued (October 2011) by the DOS to stop manual system of recording of cane development activities from November 2011, but also deprived themselves of the benefits of (i) real time cane registration and harvesting at appropriate time and recording of payment details of individual farm holdings, (ii) on the spot information sharing between farmers and mills, (iii) web based storage of data and (iv) pest and disease management.

The Government replied that the simputers were not put to use as the field staff of the companies had limited knowledge of their operation.

³³

Hand held computer.

Adequacy of internal audit

2.1.33 The internal audit function of both the companies was outsourced to the firms of Chartered Accountants. The scope of internal audit of PSM included operational areas such as cane development, engineering and production activities, stores and purchases. However, the scope of internal audit of TASCOT was confined to review of accounting and financial records. The Statutory Auditors had also in their report (2013-14), suggested for improvement in the scope of internal audit of TASCOT.

The Government, in its reply, agreed to strengthen internal audit of TASCOT.

Conclusion

Both TASCOT and PSM, which were declared sick companies in 2000, continued to be in the same state till date (December 2015) mainly due to (i) not taking up of qualitative and quantitative improvements in cane development such as staggered plantation, micro irrigation, raising of high yielding varieties of sugarcane, *etc.*, (ii) shortfall in procurement to the levels of mills' capacity and unwarranted diversion of sugarcane and (iii) procurement of over-aged sugarcane, upto 96 *per cent* and crushing of sugarcane beyond 24 hours of harvesting, upto 97 *per cent*.

Coupled with the above deficiencies, the companies also suffered due to delay of more than four years in completion of modernisation and co-generation projects, which had hampered the milling performance in terms of (i) not obtaining the envisaged sugar recovery, (ii) avoidable downtimes and (iii) consumption of utilities more than the norms.

The ethanol project, which was considered essential for improved efficiency of the sugar mills, was not taken up despite receipt of Government's equity.

Thus, both the companies continued to suffer from persistent deficiencies, without any remedial measures, resulting in accumulation of losses.

Recommendations

Both the companies need to:

- Ensure registration of adequate area, adoption of drip irrigation methods and introduction of new sugar varieties, so as to procure adequate sugarcane to meet the installed capacity.
- Ensure staggered plantation and crushing of sugarcane within 24 hours of harvesting to ensure optimal sugar recovery.
- Expedite co-generation and modernisation programmes of the sugar mills, to improve the sugar recovery and to avoid the consumption of utilities beyond norms.

The Government, in its reply, stated that the recommendations would be scrupulously followed by the sugar companies for improving their physical and financial performance.

**2.2 Performance Audit Relating to Procurement of Wind
Energy by Tamil Nadu Generation and Distribution
Corporation Limited**



2.2 Performance Audit on Procurement of Wind Energy by Tamil Nadu Generation and Distribution Corporation Limited

Executive Summary

The State of Tamil Nadu, which had the wind power potential of 14,152 MW ranked third in the country, next to Gujarat and Andhra Pradesh. In respect of the installed capacity, the State ranked first in the country as on March 2015, with an installed capacity of 7,439 MW. Performance Audit was taken up to assess the system in place for management of wind energy procurement, including wheeling and its transmission, covering the period from 2010-11 to 2014-15.

Planning

Despite huge potential for wind energy, the State Government had not so far (December 2015) issued a comprehensive wind energy policy. This led to the State utilities viz, Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) and Tamil Nadu Transmission Corporation Limited (TANTRANSCO) lacking directions from the Government for planning and procurement of wind energy. Though Central Electricity Regulatory Commission mandated (April 2010) that the existing wind energy projects should schedule their energy generation by entering into agreement with transmission utilities, the relevant clauses were not included in any of the agreements with the 11,543 existing Wind Energy Generators (WEGs).

The connected load of 80 sub-stations out of the existing 115 sub-stations, had exceeded their available transmission capacity, which indicated absence of proper planning for optimum utilisation of the available capacity.

Procurement of wind energy

TANGEDCO is the nodal agency for according approval for establishment of wind mills within the State. Though temporary connection to the wind mills was to be given only for testing purpose, wind mills with connected load of 1,223 MW in two circles were found to be under temporary connection for periods ranging from one month to five years. TANGEDCO had not collected Infrastructure Development Charges of ₹ 87.59 crore payable for the period from August 2005 to November 2010. Invoices for operation and maintenance charges, amounting to ₹ 44.18 crore, had also not been raised and ₹ 3.98 crore was collected after the omission was pointed out by Audit.

Despite continuous increase in wind energy generated during 2010-11 to 2014-15, purchase by TANGEDCO declined from 60.30 to 39.08 per cent, due to continued backlog in making payments and constraints in transmission facilities. The resultant shifting of WEGs from sale of energy

to wheeling arrangements, caused a loss of ₹ 60.59 crore to TANGEDCO in respect of 173 test checked WEGs. Avoidable backing down (stoppage of generation based on the request of TANGEDCO) of wind energy, led to extra expenditure of ₹ 159.20 crore.

Execution of transmission schemes

Though TANTRANSCO planned execution of five transmission works at a cost of ₹ 1,440.91 crore by 2013-14, these works were not completed as of December 2015, resulting in non-realisation of intended benefit of maximum evacuation of wind energy.

Wheeling of wind energy

TANGEDCO did not collect transmission charges amounting to ₹ 124.19 crore from open access consumers and collected only ₹ 1.54 crore, after the omission was pointed out by Audit. Verification of system for payments for the banked wind energy revealed overpayment of ₹ 31.86 crore, carrying forward of banked energy valuing ₹ 7.59 crore to subsequent months in violation of the orders and short billing of ₹ 3.75 crore as well as non-levy of penalty of ₹ 14.31 crore, due to irregular adjustment of banked wind energy during power holiday periods.

In 11 circles test checked, the benefits of group captive mechanism amounting to ₹ 122.20 crore was allowed to ineligible consumers.

Monitoring and internal control

The monitoring and internal control mechanism was deficient, as TANGEDCO did not (i) carry out regular inspection of WEGs, (ii) levy penalty for continued low performance of WEGs and (iii) install the mandatory availability based tariff meters in 6,031 out of 11,543 wind mills.

Introduction

2.2.1 Due to growth in urbanisation and industrialisation, there has been a continuous growth of demand for power in the State of Tamil Nadu. The requirement of energy, which was at 76,293 Million Units (MU) in 2009-10, had increased to 95,758 MU³⁴ in 2014-15. Against this requirement, the power availability³⁵ from all the entitled sources, during the same period, ranged between 64,492 MU and 76,981 MU. The energy projections³⁶ for the State indicated a further increase in annual energy requirement to 1,71,718 MU by 2021-22. TANGEDCO, which is the power generation and distribution utility of the State, had planned capacity addition of 8,360 MW³⁷ during the 12th Five Year Plan (2012-17). However, these additions, mostly from thermal plants were still under preliminary stages of implementation, such as obtaining coal linkage, finalisation of tenders, etc., during the period from April 2012 to March 2015.

³⁴ CEA's Load Generation Balance Report 2010-11 and 2015-16.

³⁵ TANGEDCO's Statistics at a glance.

³⁶ Source: 18th Electric Power Survey Report of September 2011.

³⁷ Source: 12th Five Year Plan (2012-2017) of Government of Tamil Nadu.

During the period from April 2010 to March 2015, the demand for power ranging from 73.60 to 84.53 *per cent* was met from own generation of TANGEDCO and the entitled share of power from the Central Generating Stations (CGS), as also purchases from Independent Power Producers (IPP), wind mills, *etc.* Further, 7.51 to 17.90 *per cent* of the demand was met by power purchase on short term basis. Despite the above, there was deficit of power ranging from 1.66 to 18.89 *per cent*, which forced TANGEDCO to impose restriction and control measures³⁸.

Development of wind power in the State

2.2.2 The National Electricity Policy envisaged optimal utilisation of renewable sources of energy in the development of power sector. As per the assessment made (2004) by the National Institute of Wind Energy (NIWE)³⁹, the total wind power potential in India was 48,561 MW, of which the share of Tamil Nadu was 5,530 MW, later re-assessed⁴⁰ and revised (2010) to 14,152 MW. The State was ranked third in the country, next only to Gujarat (35,071 MW) and Andhra Pradesh (14,497 MW). In respect of installed capacity as on 31 March 2015 (7,439 MW), the State was ranked first (All India capacity – 23,444 MW).

As the nodal agency for development of wind power in the State, TANGEDCO established (1986) the first of the demonstration windmill projects near Tuticorin with 20 Wind Electric Generators (WEGs), with capacity of 55 KW each. It further established (between 1986 and 1993) 101 more WEGs, totalling a combined capacity of 19.35 MW. Subsequent addition to the installed capacity was made by private developers. All the wind mills set up by TANGEDCO had already outlived their useful life of 20 years since 2013.

The table below indicates year-wise addition to installed capacity and wind energy generation in the State.

Table – 2.2.1
Installed capacity and Generation of wind energy in the State

Year	Installed capacity (in MW)		Generation (in MU)	
	During the year	Upto the year	TANGEDCO	Private
Upto 2009-10	---	4,889.765	432	41,117
2010-11	997.400	5,887.165	13	8,707
2011-12	1,083.460	6,970.625	12	9,751
2012-13	166.050	7,136.675	13	12,935
2013-14	107.380	7,252.605	13	10,918
2014-15	186.250	7,438.855	8	10,140

(Source-MIS Data of TANGEDCO)

³⁸ This includes power cuts and load shedding.

³⁹ NIWE (earlier known as the Centre for Wind Energy Technology) is an autonomous R&D institution, set up by Ministry of New and Renewable Energy.

⁴⁰ Wind resource assessment, evaluated at the average wind speeds above a section of land, at 80 metre hub level.

The private promoters could either (i) sell the wind energy to TANGEDCO at the tariff fixed by the Tamil Nadu Electricity Regulatory Commission (TNERC), or (ii) sell the wind energy to a third party within the State under open access by using TANGEDCO's grid⁴¹ or (iii) transmit the energy through the State grid for their own captive consumption⁴².

Scope and methodology of audit

2.2.3 A review on wind energy was conducted by Audit and included in the Report of the CAG of India (Commercial) for the year ended 31 March 2005, Government of Tamil Nadu. The review revealed deficiencies such as imbalance between generation and evacuation facilities, non-recovery of infrastructure development charges from the wind energy generators, non-recovery of line and distribution losses in evacuation of wind power and inadequate internal control systems in respect of adjustment of wind energy. Subsequent to this review, there were many developments in generation and transmission of wind energy in the State. TNERC issued three tariff orders (2006, 2009 and 2012) stipulating among others, the tariff for purchase of wind energy by TANGEDCO.

Performance Audit was, therefore, taken up to assess the system in place for management of wind energy procurement, including wheeling and its transmission, covering the period from 2010-11 to 2014-15.

Records relating to procurement and transmission of wind energy were verified in both TANGEDCO and TANTRANSCO in the two wind energy circle offices at Tirunelveli and Udumalpet, all the nine 'Generation End' distribution circles⁴³ and 21 out of 42 'Wheeling End' distribution circles⁴⁴, selected based on the number of wind energy adjustments. Records relating to construction of sub-stations and erection of transmission lines were verified in five General Construction Circles⁴⁵.

An Entry Conference was held with the Secretary, Energy Department, Government of Tamil Nadu on 12 March 2015, wherein the scope, objectives and audit criteria were shared. The Draft Performance Audit Report was also discussed with the management in the Exit Conference held on 30 November 2015. The views expressed by the management in the Exit Conference and the replies received from the Government in December 2015 were considered and incorporated, where appropriate, while finalising the report.

⁴¹ TANGEDCO was entitled to charges for wheeling (transmission of energy from generating point to TANGEDCO's grid) and 50 *per cent* of cross subsidy fixed by TNERC.

⁴² TANGEDCO was entitled only for wheeling charges in these cases.

⁴³ Distribution circles, where windmills are located and wind energy is generated – viz., Coimbatore (South), Dindigul, Kanyakumari, Ramnad, Theni, Tirunelveli, Tiruppur, Tuticorin and Udumalpet.

⁴⁴ Distribution circles, where the transmitted wind energy is drawn for use, viz., Chengalpattu, Chennai (North), Chennai (South), Coimbatore (South), Coimbatore (Metro), Coimbatore (North), Dindigul, Erode, Gobi, Kanyakumari, Madurai, Madurai (Metro), Ramnad, Salem, Sivaganga, Theni, Tirunelveli, Tiruppur, Tuticorin, Udumalpet and Virudhunagar.

⁴⁵ General Construction Circles where wind energy infrastructure projects are being carried out, viz., Chennai, Madurai, Coimbatore, Salem and Trichy.

Audit objectives

2.2.4 The objectives of the Performance Audit were to assess whether:

- adequate planning was in place for procurement of wind energy and creation of infrastructure for transmission of wind power;
- power procurement from the windmills was made efficiently, effectively and economically;
- sufficient infrastructure for transmission of wind power was created as per plan and executed effectively and economically;
- Energy Wheeling⁴⁶ Agreements (EWAs) were prepared as per relevant rules and procedures and the charges thereon were duly collected; and
- Monitoring and Internal Control system with reference to wind energy procurement and execution of transmission schemes were effective.

Audit criteria

2.2.5 The criteria adopted for the Performance Audit included:

- Electricity Act 2003, National Electricity Policy/Plans and plans of TANGEDCO/TANTRANSCO;
- guidelines issued by the Union Ministries of Power (MOP) and New and Renewable Energy (MNRE) and Tariff orders issued by TNERC;
- Board Minutes, Circulars and other instructions issued by TANGEDCO/TANTRANSCO.

Acknowledgement

Audit acknowledges the co-operation and assistance extended by the staff and the management of TANGEDCO and TANTRANSCO in conducting this Performance Audit.

Audit findings

2.2.6 The audit findings are discussed below:

Planning

Absence of policy for wind energy

2.2.7 Though Tamil Nadu had huge potential for wind energy with vast wind passes along the Western Ghats and was a leader in development of wind energy in the country, the State Government had not so far (December 2015) issued a comprehensive wind energy policy. However, in States like Andhra Pradesh, Gujarat and Rajasthan, where the installed capacity of wind energy was far less, separate wind energy policies already existed. Consequently, the State utilities, viz., TANGEDCO and TANTRANSCO, lacked direction from the Government for planning and procurement of wind energy from the

⁴⁶ Energy wheeling refers to transfer of energy from the generation end to the consumption end to enable consumption directly by the consumers.

WEGs. The absence of a policy was one of the contributing reasons for the State not exploiting the wind energy potential in a sustained manner and not absorbing the entire wind energy generated during the wind season.

The Government replied that the existing rules and regulations of TNERC, available for wind energy, would take care of the issues pointed out by Audit. The fact, however, remains that TNERC regulations are only directive in nature and not comprehensive in areas like wheeling, captive use of wind power, repowering *etc.* Therefore, laying down of policy at Government level would create a vision and long term direction for development of wind energy in the State.

Planning for procurement

2.2.8 Planning for procurement of wind energy should take into account, the likely availability of wind power and proposed capacity additions during the ensuing period. The India Wind Atlas of 2010 indicated the potential of wind energy in the State at 80 metre mast height as 14,152 MW, against which the actual capacity as of March 2015 was 7,439 MW (*i.e.*, 53 *per cent* of the potential energy). Actual capacity addition, during 2012-2015, was a meagre 459.68 MW. Despite higher potential, TANGEDCO, as the nodal agency for development of wind power, failed to set annual targets for wind energy capacity addition and resultant procurement, based on the above projections. Since 2012-13, there was only minimal addition to capacity by the private windmill developers, which was mainly due to withdrawal of the benefit of Accelerated Depreciation⁴⁷ by the GOI with effect from April 2012, the uncertainty in continuation of the Generation Based Incentive⁴⁸ scheme and inadequate transmission facilities for evacuation of wind energy.

The Government replied that the revised potential of 14,152 MW would be tapped in a phased manner.

Non-implementation of CERC guidelines for forecasting of wind energy

2.2.9 CERC mandated (April 2010) that all new wind energy projects of 10 MW and above should schedule power generation and provide forecast to the system operator⁴⁹. In respect of wind energy projects with capacity below 10 MW and existing wind farms, scheduling of wind energy could be mutually agreed between the wind generator and the transmission utility. However, in Tamil Nadu, though a majority of the 11,543 WEGs were with capacity of less than 10 MW, TANTRANSCO had not initiated any action to enter into agreements with the private developers for forecasting of wind energy. An effective system for forecasting of wind energy, which would have greatly enabled TANGEDCO in planning its procurement of wind energy, was thus not put in place as of December 2015.

⁴⁷ Accelerated depreciation is a tax benefit where 80 *per cent* of the project cost was allowed to be written off within the first year of operation, thereby substantially lowering the tax liability. The scheme has since been reintroduced from July 2014.

⁴⁸ Generation Based Incentive is given at the rate of 50 paise per unit of power fed into the grid. The scheme, which was to end by the 11th Plan period, has now been extended to the 12th Plan period (September 2013). The delay in decision caused uncertainty.

⁴⁹ TANTRANSCO is the system operator in Tamil Nadu.

Further, a pilot project for forecast of wind energy was established (May 2015) in the State by the NIWE in collaboration with the private wind energy developers. Based on the five day forecasts provided from the project, TANGEDCO was able to absorb 93 *per cent* of the wind power generated during July 2015. However, the required Renewable Energy Management Centres (REMCs) at TANTRANSCO's Load Despatch Centres (LDC), which would further enable accurate forecasting and scheduling, were not put in place as of December 2015. Consequently, TANGEDCO could not estimate possible generation and drawal of wind energy to reduce dependence on other sources of energy.

The Government replied that MNRE is presently scrutinising the project reports for establishment of REMCs and based on further directions of MNRE, the establishment of REMCs would be taken up.

Infrastructure creation

2.2.10 As on 31 March 2015, against the installed generation capacity of 7,439 MW, TANGEDCO had transmission capacity for only 6,846 MW⁵⁰ (7,606 MVA) as indicated below:

Table-2.2.2

Transmission facility available with TANGEDCO for evacuation⁵¹ of wind energy as on 31 March 2015

	Aralvoimozhi Pass		Shencottah Pass		Palghat Pass		Cumbum Pass		Total	
	MVA	MW	MVA	MW	MVA	MW	MVA	MW	MVA	MW
Windfarm Sub-stations	1,365	1,229	1,056	950	1,624	1,462	NIL	NIL	4,045	3,641
Distribution Sub-stations	262	236	780	702	833	750	461	415	2,336	2,103
Private Sub-stations	100	90	350	315	600	540	175	158	1,225	1,102
Total	1,727	1,555	2,186	1,967	3,057	2,752	636	573	7,606	6,846

Further analysis, with reference to capacity available and connected load in the 115 sub-stations in these four passes, revealed that 35 sub-stations had adequate capacity for transmission of the connected load, whereas in 80 sub-stations, the connected load had already exceeded the available transmission capacity as detailed in the table below. This mismatch between the sub-station capacity and connected load indicated absence of proper planning for optimum utilisation of the available capacity.

⁵⁰ Mega Volt Ampere (MVA) is converted into MW by multiplying it by a power factor of 0.9, as specified in the TNERC Supply Code.

⁵¹ Evacuation is transfer of wind energy from the generating station to the sub-station.

Table-2.2.3

Sub-stations having excess/shortage in transmission capacity compared to connected load of WEGs as on 31 March 2015

	Aralvoimozhi Pass			Shencottah Pass			Palghat Pass			Cumbum Pass		
	Capacity already overloaded	Spare capacity available	Total No. of sub-stations	Capacity already overloaded	Spare capacity available	Total No. of sub-stations	Capacity already overloaded	Spare capacity available	Total No. of sub-stations	Capacity already overloaded	Spare capacity available	Total No. of sub-stations
Wind farm sub-stations	14	1	15	8	0	8	14	1	15	NIL	NIL	NIL
Distribution sub-stations	4	3	7	18	5	23	7	14	21	5	5	10
Private sub-stations	1	1	2	1	4 ⁵²	5	4	1	5	4	0	4
Total	19	5	24	27	9	36	25	16	41	9	5	14

(Source: MIS data of TANGEDCO)

In this connection, Audit observed that:

- The State's 12th Five Year Plan⁵³ (2012-17) envisaged creation of additional wind energy capacity of 6,000 MW during the Plan period. Moreover, TNERC had ordered (May 2006) creation of adequate transmission infrastructure in the critical areas of wind energy generation on an urgent basis. Audit had also pointed (2004-05) out in the earlier review that there was an imbalance in the generation and evacuation facilities and therefore, recommended correction of such imbalance. The continued imbalance between the generation and evacuation facilities revealed that TANGEDCO failed to overcome the mismatch in transmission facilities in a time bound manner.
- As on 31 March 2015, 2,058 applications, dating back to 2006-07, from the private wind energy developers seeking TANGEDCO's permission for setting up wind mills with capacity of 2,936 MW, were pending due to non-availability of evacuation facilities. This reflected absence of a long-term planning process for creation of transmission facilities on the part of TANGEDCO and TANTRANSCO.
- The 230 KV Kayathar – Abishekapatti feeder with route length of 25.174 kms was overloaded continuously during wind season from 2009 onwards. During the period April 2010 to March 2014, instructions from the SLDC were issued to the sub-stations⁵⁴ to back down⁵⁵ wind energy equivalent to 29.17 MU. However, TANTRANSCO had not initiated action for strengthening of the feeder/load segregation to avoid such backing down of power so far (December 2015).

⁵² This includes the Alankulam sub-station where the capacities were equal.

⁵³ Power Grid Corporation's Green corridor report – Volume-II.

⁵⁴ Sanganeri, Rastha, Pazhavur, Vadakkankulam, Muppanthal, SR Pudur, Maharajapuram, Irunkkanthurai, Ayyanarvoothu and Aralvoimozhi.

⁵⁵ Backing down of energy refers to stoppage of generation of power by the wind energy generator based on the instructions of TANTRANSCO.

The Government replied that though the transformer capacity had been exceeded, the peak transmission was less than the transformer capacity and hence, there was no shortage of transformer capacity. The reply is not convincing because TNERC had prescribed that power transformers should not be loaded to more than 70 *per cent* of their capacity and the available 30 *per cent* surplus capacity could cater to the demands of the transformers in the nearby sub-stations during emergencies/shutdown.

Procurement of wind energy

System for procurement of wind energy

2.2.11 TANGEDCO accords approval for establishment of WEGs after collection of Infrastructure Development Charges (IDC), ⁵⁶ as fixed from time to time. It also levies annual Operation and Maintenance (O&M) charges on the WEGs for maintenance of the transformers, transmission lines and sub-stations connected to the wind mills. After erection of the WEGs, TANGEDCO accords temporary connectivity to them for testing. Permanent connectivity to WEGs are given after ascertaining the capacity of the sub-stations to which they are to be connected. The deficiencies noticed in the linking of the WEGs to the grid are discussed below:

Continued temporary connectivity of WEGs resulting in loss of generation

2.2.12 As per TANGEDCO's instructions (September 2011), temporary tie-ups of WEGs would be given only for testing purposes. Permanent tie-ups would be given later, depending on the availability of evacuation facility. Audit verification of WEG services effected under temporary connectivity revealed that WEGs with connected load of 894.20 MW under Udumalpet circle and 328.80 MW under Tirunelveli circle were under temporary connectivity, for periods ranging from one month to five years, due to delay on the part of TANGEDCO in commissioning of lines and sub-stations. TNERC, taking (July 2015) exception to the practice of temporary connectivity, stated that it was the responsibility of TANGEDCO to maintain the network and purchase/evacuate the generated power. A test check in audit of 62 WEGs (totalling 43.28 MW) in Tirunelveli circle, which were under temporary connectivity, revealed that wind generation equivalent to 25 MU (in 56 WEGs) was lost during the period when the WEGs were switched off.

During the Exit Conference, the Company assured that it would review the status of temporary connectivity of WEGs.

Non-collection of charges in respect of WEGs connected to TANGEDCO sub-stations

2.2.13 Audit scrutiny of the records relating to collection of IDC and O&M charges revealed the following:

⁵⁶ ₹ 25.75 lakh per MW upto June 2005 and ₹ 28.75 lakh per MW upto November 2010 and ₹ 30.00 lakh thereafter.

- Though the rate of IDC was enhanced from ₹ 25.75 lakh per MW to ₹ 28.75 lakh per MW in July 2005, TANGEDCO collected IDC at the pre-revised rates between August 2005 and November 2010. The differential IDC to be collected with interest in respect of eight circles⁵⁷ worked out to ₹ 119.83 crore, out of which only ₹ 32.24 crore had been collected as of March 2015.
- Similarly, annual O&M charges of ₹ 1.60 lakh per MW were required to be collected from the generators. Audit noticed that TANGEDCO had not raised invoices for O&M charges amounting to ₹ 44.18 crore. After the omission was pointed out by Audit, an amount of ₹ 3.98 crore was collected. As of March 2015, O&M charges of ₹ 40.20 crore remained uncollected.

The Government replied that collection of differential IDC was in progress and the balance of O&M charges would be collected under intimation to Audit.

Decline in procurement

2.2.14 TNERC had issued the ‘Power Procurement from New and Renewable Sources of Energy Regulations 2008,’ making it mandatory for TANGEDCO to procure a minimum quantity of nine *per cent* of its annual energy requirement from renewable energy sources. As wind energy accounted for more than 10 *per cent* of its annual energy requirement, TANGEDCO had been meeting this target. For procurement of wind energy by TANGEDCO, TNERC had issued separate wind tariff orders (in March 2009 and July 2012) fixing the procurement price. Scrutiny by Audit of the system in place in TANGEDCO for procurement of wind energy revealed the following:

2.2.15 TANGEDCO, while submitting its tariff petition to TNERC, projected the following quantum of wind energy purchase from the private wind mills for the years 2010-11 to 2014-15. Actual purchase of wind energy against the projected and generated quantity is also indicated below:

Table-2.2.4
Actual wind energy purchases by TANGEDCO

Year	Total Generation by private windmills (MU)	Projected purchase (MU)	Actual purchase (MU)	Percentage of purchase compared to generation	Percentage of purchase compared to projection
2010-11	8,707	8,452	5,251	60.30	62.13
2011-12	9,751	8,152	5,711	58.57	70.06
2012-13	12,936	8,152	7,474	57.78	91.68
2013-14	10,918	5,320	5,110	46.80	96.05
2014-15	10,140	5,586	3,963	39.08	70.95

(Source- TANGEDCO)

⁵⁷ Coimbatore (South), Dindigul, Kanyakumari, Tiruppur, Theni, Tirunelveli, Tuticorin and Udumalpet.

While the quantity of wind energy generated by the wind mills continuously increased over the years, actual purchase of wind energy by TANGEDCO declined from 60.30 to 39.08 *per cent* of the total energy generation during the corresponding periods. Though TANGEDCO achieved more than 90 *per cent* of its purchase projections during 2012-13 and 2013-14, there was shortfall in achievement of the projections during the three years 2010-11, 2011-12 and 2014-15. One of the major reasons for decline in procurement was the continued backlog⁵⁸ in making payments for energy supplied to TANGEDCO due to financial constraints. Consequently, many of the wind energy generators opted for direct sale to consumers through wheeling arrangements of TANGEDCO. Due to shifting of WEGs from sale to wheeling, TANGEDCO suffered a minimum differential loss of ₹ 2⁵⁹ per unit of energy so wheeled. The loss of revenue during the period 2010-15 in respect of 173 WEGs worked out to ₹ 60.59 crore.

The Government, in its reply, admitted that payments to wind energy developers were delayed due to its financial position, which resulted in their switching over from sale to TANGEDCO to third party consumers.

Avoidable extra expenditure on backing down of wind energy

2.2.16 Because of the constraints in transmission system and to maintain the frequency within the bandwidth⁶⁰, as per the Indian Grid Code, TANGEDCO had to back down wind energy. The quantum of wind energy backed down (which would otherwise be available to TANGEDCO for procurement) was 8,801 MU during 2010-2015. Detailed analysis of backing down of power by Audit revealed that:

- TANGEDCO purchased 800 MU of power through six short term power purchase agreements during the period from May to September 2014, which coincided directly with the wind season in which wind energy equivalent to 3,000 MU was backed down. It was further observed that variation in the quantum of purchase (either increase or decrease) in these agreements was approved by TANGEDCO at short notice and TANTRANSCO was also able to re-schedule the revised quantum on day-ahead basis. Under the circumstances, the backing down of low cost wind power on the grounds of grid conditions was not justified. Considering the fact that a difference of at least ₹ 1.99 per unit existed between the short term power purchase rate (₹ 5.50) and the maximum wind energy purchase rate (₹ 3.51), the backing down led to an additional power purchase expenditure of ₹ 159.20 crore for the 800 MU alone.

The Government replied that even during high wind season, there would be drastic intra-day variations in wind generation. Hence, infirm wind power should not be compared with the base load, which is provided under short term purchase. The reply is not justifiable as variation in the quantum of short term

⁵⁸ The payments accumulated during the five years upto 2014-15 ranged from ₹ 205.35 crore (2010-11) to ₹ 1,098.40 crore (2011-12).

⁵⁹ Difference between average purchase cost of wind energy (₹3.39 per unit) and average selling rate (₹5.39 per unit) to HT consumers, after allowing transmission and wheeling charges (₹0.11 per unit).

⁶⁰ Between 49.5 and 50.2 hertz.

power was possible and with sufficient infrastructure in place, TANGEDCO could have avoided backing down of the 800 MU of wind energy.

Undue benefits to ineligible developers due to delay in effecting name transfer

2.2.17 As per the conditions prescribed by TANGEDCO in the energy agreements, the developers are required to obtain consent of TANGEDCO for sale, transfer of the WEG to a third party. Further as per the Comprehensive Tariff Orders for wind energy issued by TNERC from time to time, cross-subsidy⁶¹ charges were leviable in respect of third-party sales, but were exempt in respect of captive consumers. Audit scrutiny revealed that in respect of 38 out of 75 name transfers in Tirunelveli and Tuticorin Distribution Circles, there were delays ranging from one to 37 months⁶² in registering application (after considering one month time for registration of application by TANGEDCO) for approval of name transfer. Due to such delays, the circles released payments for purchase of wind energy to the initial owners, who had already transferred ownership. Further, the transferor continued to be exempt from payment of cross-subsidy charges during the period of belated application, even though the ownership of the windmills was already transferred. Undue benefit thus, extended to 11 WEGs, worked out by audit amounted to ₹ 3.67 crore, besides loss of revenue to TANGEDCO by way of non-collection of cross-subsidy charges amounting to ₹ 26.07 lakh.

The Government replied that delay in name transfer could be attributed to wanting documents. The fact, however, remains that in the absence of an enabling clause in the agreements providing time frame for registration of name transfers, the circles released payments for purchase of wind energy to the initial owners, who had already transferred the ownership.

Payment without verification of quantum of wind energy

2.2.18 As per the Energy Purchase Agreements (EPAs)/Energy Wheeling Agreements (EWAs) entered into with wind energy generators, TANGEDCO was to provide check meters of the same specification as the main meters in the WEGs. Whenever the main meters were found to be defective or had stopped, the readings as per the check meters could be cross verified for the purpose of billing. In 562 out of 11,543 existing WEGs, physically verified by Audit, TANGEDCO did not install check meters in any of these services. Due to this failure, energy generation accounted for payments remained un-reconciled leading to possible over payment for energy not generated. Illustrative cases of overpayment, due to non-availability of check meters, noticed by Audit, are discussed below:

- WEG No.1627 was not running from December 2011 to March 2012 and the meter recorded NIL generation. However, energy generation was noted for subsequent periods in the meter card based on unverified data and TANGEDCO continued to make payments totalling ₹ 63.89 lakh for 2.32 MU (April 2012 to September 2013). Subsequent examination by

⁶¹ Cross-subsidy is payable by third party consumers of wind energy at 50 per cent of the normal rates chargeable.

⁶² 1-10 months (21 cases), 11-20 months (8 cases), 21-30 months (5 cases) and 31 to 37 months (4 cases).

TANGEDCO revealed that there was no display in the meter as it had failed in March 2012 itself. The final reading of the meter was the same as recorded in March 2012 and therefore, the subsequent recordings entered in the meter card were not authentic. After comparison of generation of a similar WEG, the circle arrived at an excess claim for generation amounting to ₹ 12.72 lakh. Though this amount was recovered, there was no other evidence to vouchsafe the payment for the balance amount of ₹ 51.67 lakh.

- WEGs, connected to a particular feeder and having the same make/capacity, would record similar generation and the capacity utilisation factor⁶³ (CUF) between the WEGs would not vary much. Audit observed abnormal variation in generation in certain WEGs as compared to other WEGs in the same feeder with same capacity and make. The abnormal variation in generation, where there was difference in excess of 20 per cent verified by audit, implied possible excess payment/adjustment to an extent of ₹ 3.30 crore. The abnormal variation in the recorded generation was not verified by TANGEDCO.

Execution of transmission schemes for wind energy

Delay in execution of sub-stations and transmission lines

2.2.19 For evacuating the entire wind energy generated to other parts of the State and to accommodate future capacity additions, TANTRANSCO establishes 400 KV sub-stations and associated line networks. Scrutiny of records relating to execution of these works revealed the following:

- TANTRANSCO planned (March 2008), establishment of 400 KV sub-stations and associated line networks between Kayathar (in the Southern part of the State) and Ottiyambakkam, near Chennai. Accordingly, work orders for construction of the Kayathar sub-station and the allied line works were issued between March 2012 and February 2013. As a further part of the network, a new 400 KV corridor passing through Theni and Udumalpet district upto the Power Grid Corporation of India Limited (PGCIL's) 765 KV sub-station at Salem was also proposed (March 2011) under Public Private Partnership (PPP) mode, to be completed by 2013-14. A consultancy contract for advising TANTRANSCO on the commercial feasibility and financial viability of the project, to be executed under PPP mode, was also awarded (January 2012). Subsequently, the proposal for taking the work under PPP mode was given up (November 2012), considering time consuming procedures like approvals from TNERC as well as GOI and short listing of project developers *etc.* It was decided (November 2012) to execute the work under Engineering, Procurement and Construction (EPC) route, to enable completion of the works by the end of 2014-15. Work orders were awarded for construction of four sub-stations and allied line works between August 2013 and July 2014. Audit observed in this regard that though the PPP mode was given up, the

⁶³ Capacity utilisation factor of a wind turbine is a function of wind velocity, air density, mechanical efficiency and age of the machine, height of the hub and length of the blade and is the weighted average of the assessed generation of each machine.

consultancy contract, which was mainly for advising TANTRANSCO on modalities of executing the project under PPP mode was not rescinded after taking into account the revised decision to execute the project under EPC mode. An expenditure of ₹ 84.93 lakh was incurred (March 2014) on the consultant's report, which was not put to use, rendering the expenditure infructuous.

The Government replied that the payment given to the consultant for studying 400 KV level transmission works cannot be treated as waste as TANTRANSCO had experience in 230 KV level only. The reply is not convincing as the sub-station contracts were finally awarded on EPC mode, whereas the consultancy was for advising the financial and commercial implications of executing the project under PPP mode. Hence, the payment for consultancy, which was envisaged for execution under PPP mode, had become infructuous.

- Further, TANTRANSCO planned execution of five transmission works for completion by 2013-14. Audit scrutiny of these project works revealed that the works were under execution (December 2015) as indicated in the table below. The intended benefits of the wind corridor work, viz., maximum evacuation of the wind energy generated, thus remained unrealised.

Table-2.2.5

Status of 400 KV sub-stations and transmission lines for wind evacuation

Sl No.	Name of the work	Expected date of completion as per contract	Anticipated /actual date of completion	Remarks
	Date of award			
	Awarded cost			
1.	Kayathar sub-station and allied line works	May 2013-Dec 2013	Jul-Sep 2014	Completed after a delay of one year due to non-completion of related work at the Karaikudi PGCIL sub-station. Even after completion, the earmarked WEGs were not connected to the sub-station fully, resulting in under utilisation of the sub-station by 50 per cent.
	Oct 2012-Feb 2014			
	₹ 513.16 crore			
2.	Thappagundu sub-station	Dec 2014	Mar 2016	The contractor commenced the work with a delay of four months after taking over the site (September 2013). The civil works were stopped midway (February 2015) and were still incomplete.
	Sep 2013			
	₹ 125.59 crore			
3.	Anaikadavu sub-station	Dec 2014	Mar 2016	Physical progress of the work was only 20 per cent due to slow progress of the work by the contractor.
	Aug 2013			
	₹156.19 crore			
4.	Rasipalayam sub-station and allied	Nov 2015	Apr 2016	There was delay of eight months in issuing the work order to the

Sl No.	Name of the work	Expected date of completion as per contract	Anticipated /actual date of completion	Remarks
	Date of award			
	Awarded cost			
	line works	Mar 2015		contractor. While the site for line works was handed over in October 2013, the site for the sub-station was handed over only in May 2014. Due to non-synchronisation of sub-station and line works, the line works were on the verge of completion as of December 2015, whereas the sub-station works were only at the initial stage.
	Aug 2013			
	₹ 417.91 crore			
5.	Kanarpatti sub-station and allied line works	June 2015	Mar 2016	The proposal for taking up of the sub-station work was originally approved in June 2007 at an estimated cost of ₹ 143.35 crore but was taken up for execution only in July 2013 at a revised cost of ₹ 228.06 crore, resulting in cost escalation of ₹ 84.71 crore. Civil works were still under progress as of December 2015.
	Mar 2014 –Jul 2014			
	₹ 228.06 crore			

(Source- TANTRANSCO)

During the Exit Conference, TANTRANSCO admitted that there were delays in execution of transmission schemes. It also stated that the contractors were being pursued to expedite the completion of the ongoing works.

Wheeling of wind energy

2.2.20 Wind energy generators had the option of entering into Energy Wheeling Agreements (EWAs) with TANGEDCO for wheeling the power generated for captive use or third party sale.

Audit scrutiny of the files, relating to collection of various charges by TANGEDCO from the generators for wheeling of the generated power, revealed short collection of charges as detailed below:

Non-recovery of transmission charges and compensation for line loss

2.2.21 As per instructions issued (September 2012) by TANGEDCO, the Generation-End distribution circles have to collect transmission charges from the open access consumers at the rates specified in the TNERC's tariff orders. From the records verified by Audit in Udumalpet, Theni and Coimbatore (South) circles, it was observed that the circles started the recovery of transmission charges only from July 2013 onwards as against the effective date of August 2012, resulting in non-recovery of transmission charges for the intervening period amounting to ₹ 124.19 crore. Subsequent to being pointed out by audit, an amount of ₹ 1.54 crore was collected by TANGEDCO.

Similarly, the Wheeling-End circles have to deduct transmission and distribution losses based on the injected and drawal voltages. Verification of

62 out of 95 service connections in Virudhunagar circle revealed that the circle did not work out the transmission and distribution loss and deduct it from the net export units of wind energy, resulting in excess adjustment/banking and consequent lesser billing amounting to ₹ 5.42 crore.

The Government replied that instructions had been issued to the field for recovery of the above charges pointed out by Audit.

Non-levy of penalty for reactive power

2.2.22 As the reactive power creates low voltage problems in the wind pocket areas, TNERC imposed (May 2006) penalty at 25 paise per KVARh⁶⁴ for WEGs, which draw reactive power upto 10 *per cent* of active power generated/exported and 50 paise per KVARh for those, which draw more than 10 *per cent*. In the billing software used by TANGEDCO, only the data on KVARh recorded on the import mode of the meters are fed into, whereas KVARh recorded on the export mode is not accounted. Audit test checked records relating to 2013-14 and 2014-15 in three out of 60 sub-stations in Tirunelveli region and observed that penal charges to the extent of ₹ 2.60 crore were not levied due to non-availability of proper billing software.

It was replied (December 2015) that it was not necessary to record the reactive power in the export mode. The reply is not acceptable because TANTRANSCO itself had pointed out (September 2012) huge revenue loss to TANGEDCO on account of the non-levy of reactive power charges in the export mode and had suggested suitable modification of the billing software to plug the loophole.

Banking of wind energy

2.2.23 As per TNERC's Tariff orders on wind energy, the captive generating plants (CGPs) in Tamil Nadu are entitled for an additional facility of banking of wind energy. Under these arrangements, the wind energy not adjusted under the captive mode is allowed to be carried forward on monthly basis from April to March of the respective financial years. In States like Andhra Pradesh, Gujarat and Rajasthan, banking was not allowed or restrictions were placed on use of banked energy. In Tamil Nadu, there is no restriction in the use of banked energy. As per Audit's estimation, TANGEDCO had incurred an additional expenditure of ₹ 470.18 crore during the period 2010-15 due to allowance of banking facility in the State.

The Government replied that TNERC is the final authority to decide about the policy on banking of wind energy. Audit observed that if the Government had a policy on wind energy, including banking of wind energy, the same would have influenced TNERC's decision on banking of wind energy.

Audit scrutiny of the system of banking of wind energy in TANGEDCO revealed the following deficiencies:

⁶⁴ Reactive power, *i.e.*, KVARh, is the difference between working power (active power measured in KW) and total power consumed (apparent power measured in KVA).

Excess payment for banked wind energy

2.2.24 As per TANGEDCO's instructions (September 2012), unutilised banked energy as on 31 March every year may be encashed at the rate of 75 *per cent* of the relevant tariff rate. When restriction and control measures are in force, the unutilised energy at the end of the banking period is to be encashed at 100 *per cent* of the relevant tariff. Restriction and control measures are applicable only on the TANGEDCO component of base demand and energy quota would be fixed accordingly. In view of the above, there was no restriction for the consumers to utilise the captive power upto the sanctioned demand. The consumers were, therefore, not eligible for encashment of 100 *per cent* of the banked energy.

Audit scrutiny of the payments made on encashment of unutilised banked energy revealed that the circles made payment to the consumers in this category of cases at 100 *per cent* instead of 75 *per cent* of the applicable tariff, resulting in excess payment of ₹ 31.86 crore.

The Government replied that the inability of the consumer to draw the entire quantum of banked energy was on account of grid constraints. The reply is not convincing because as per TANGEDCO's working arrangements, the quantum of energy consumed from the captive and third party sources was first to be adjusted from the maximum demand recorded in the consumers' meters and the balance consumption was to be treated as a supply from TANGEDCO. Therefore, unutilised portion of the banked energy was not on account of grid constraints.

Carry forward of banked energy in violation of orders

2.2.25 As per TNERC's Tariff Order (July 2012), wind energy generated during the respective months should be adjusted against consumption of the same month and balance, if any, should be reckoned as banked energy. Audit scrutiny revealed that the available banked units were not fully drawn and utilised in the current month in four circles and the payment of unutilised banked energy without adjusting consumption kept at the Generation End was irregular. As a result, banked energy was carried forward to subsequent months in violation of the orders resulting in undue benefit of ₹ 7.29 crore in 11 cases, due to not imposing penalty for exceeding the quota during the restriction and control period.

The Government replied that instructions have been issued to the circles to examine the correctness of the payments.

Irregular adjustment of banked energy during power holiday period

2.2.26 While implementing the restriction and control measures from November 2008, the concept of 'Optimum Demand' was introduced by TANGEDCO in respect of continuous process industries. These industries could go for optimum demand (*i.e.*, minimum demand required to operate the industry beneficially) with restricted number of days. The balance days in the months should be power holidays, during which period, consumers were permitted to utilise only TANGEDCO power upto 10 *per cent* of the fixed

quota plus one *per cent* of the transformer loss. In the event of consumption in excess of the quota fixed, penalty would be imposed.

In light of the above instructions, audit checked the adjustment of wind energy against power holiday consumption in three distribution circles, which revealed that wind energy was utilised by five consumers during the periods of power holiday resulting in short-billing on this account to the extent of ₹ 3.78 crore. The excess penalty, leviable on this account, worked out to ₹ 14.31 crore.

The Government replied that instructions had been issued to all the Generation End circles to maintain the banked energy at their end to avoid the above irregularities.

Operation of Group Captive Plant mechanism

2.2.27 Section 9 of the Electricity Act, 2003 allowed setting up of Captive Generating Plants. The owners of captive plants were given the right to open access for carrying electricity from the plant to the destination of its use. For this purpose, the captive user (or collectively as a Group) should hold not less than 26 *per cent* of the ownership in the Group Captive Plant (GCP) in aggregate and should consume not less than 51 *per cent* of the aggregate electricity generated in the plant determined on an annual basis in proportion to their shares in ownership with a variation not exceeding ten *per cent*. If the captive user did not fulfil either of the two conditions, the entire energy consumed would be treated as sale on open access and would be charged at the stipulated rates.

TANGEDCO issued periodic instructions (May 2010, September 2012 and July 2014) to the circles for verification of GCP status and in the event of a generator losing captive status in any financial year (*i.e.*, not fulfilling the condition of 26 *per cent* ownership or 51 *per cent* captive consumption), it was stipulated that the entire consumption by the captive user would be treated as third party sale and cross subsidy charges at the rate of 50 *per cent* would be leviable.

Audit's scrutiny of implementation of group captive mechanism in TANGEDCO in 11 circles⁶⁵ revealed that in all the circles, the data regarding actual consumption adjusted against wind energy wheeled for captive use and details regarding changes in shareholding pattern were not being verified. As a result, many of the group captive consumers did not fulfil the two required conditions and therefore, were not entitled for the benefits. Independent audit verification of the GCP status of 28 such consumers in 11 circles revealed that these consumers did not fulfil the prescribed conditions and hence cross subsidy charges amounting to ₹ 122.20 crore (**Annexure-10**) were recoverable from them. Two of these cases are illustrated below:

Non-fulfillment of 26 per cent equity norm

2.2.28 M/s Ushdev Engitech Limited (Ushdev) had a pan-India wind energy capacity of 58.2 MW, out of which the capacity in Tamilnadu was 28.05 MW.

⁶⁵ Coimbatore (Metro), Chengleput, Erode, Gobi, Kanyakumari, Sivaganga, Theni, Tiruppur, Tuticorin, Udumalpet, Virudhunagar

The total paid up equity capital in Ushdev was ₹65.31 crore consisting of ₹ 64.98 crore- class A shares and ₹ 33 lakh –class B shares. Four consumers holding class B shares worth ₹ 9.90 lakh, out of the total ₹ 33 lakh (30 *per cent*), were deemed as captive consumers and allotted their share of energy from the 28.05 MW capacity windmills in Tamil Nadu. As the equity investment of ₹ 65.31 crore in Ushdev was for a capacity of 58.2 MW, the proportionate investment for 28.05 MW worked out to ₹ 31.48 crore and therefore, the investment of ₹ 9.90 lakh by the four captive consumers was only 0.31 *per cent*, which was below the required 26 *per cent*. Hence, the entire consumption by the four consumers should be deemed as ‘third party sale’ and charged accordingly.

Non-adherence to proportionate consumption

2.2.29 TANGEDCO executed EWA with M/s Beta Wind Farm (Beta), a Special Purpose Vehicle of an association of persons, comprising of 25 captive consumers holding 26 *per cent* and one non-captive consumer holding 74 *per cent* ownership in Beta. The company adjusted a total consumption of 20.01 MU within the 25 group captive consumers for the year 2012-13. The total annual consumption was apportioned in proportion to the ownership. Audit observed that out of the 25 captive consumers, only eight consumers fulfilled the norms of consumption proportionate to holding of shares. Similarly, during 2013-14, out of 37 captive users, only 18 fulfilled the proportionate consumption norm. In view of non-fulfilment of the requirement for proportionate consumption according to share holding, the entire consumption was to be treated as ‘third party sale’ and cross subsidy surcharge levied.

The Government replied that a third party audit agency had been appointed for verification of norms of captive generation and to monitor the circles complying with the instructions of TANGEDCO.

The Company, further, in the Exit Conference, stated that the system of verification of status of captive consumers would be strengthened by deploying dedicated teams.

Monitoring and internal control

2.2.30 Audit examination of the monitoring and internal control system, existing in TANGEDCO and TANTRANSCO with reference to wind energy procurement and execution of transmission schemes, revealed the following:

- As per the revised guidelines for wind power projects issued (June 1996) by the GOI, the State utility would carry out regular inspection of wind farms by outside agencies to ensure that generation is optimal. Scrutiny in audit revealed that TANGEDCO did not carry out inspections as required. Further scrutiny of 51 WEGs in four circles revealed that the WEGs recorded ‘NIL’ generation continuously for three years upto 2014-15. Further, in 4,182 out of 6,328 WEGs in Tirunelveli circle, the average capacity utilisation factor during the peak wind season of May-September 2014 ranged between ‘zero’ to ‘73’ *per cent*. Though the wind energy developers agreed for imposing penalty for low performance of their plants and for disconnection, no action was taken to watch the performance of the WEGs and impose penalty for poor performance.

- Though TANGEDCO was the nodal agency in the State for development of wind energy, it did not maintain a centralised data base relating to the windmills, especially relating to repowering, claiming of incentives like accelerated depreciation, generation based incentives, permission accorded for change of status of WEGs from ‘Sale to TANGEDCO’ category to ‘Captive Use or Sale to Third Party’. Consequently, their impact on either cost or revenue could not be verified. Further, there was no system for reconciliation between the Generation End and Wheeling End circles with reference to adjustment of units wheeled and recovery of various charges.
- To ensure proper energy accounting and online monitoring of generation data, installation of Availability Based Tariff (ABT) meters was made compulsory in all the WEGs from January 2012. TANGEDCO had not ensured compliance of this stipulation as only 6,031 out of 11,543 WEGs had been provided with ABT meters as of March 2015.
- In order to check the meter condition, correctness of the wind generation, bill claimed and generation sent for wheeling adjustment, it was decided (January 2011) by TANGEDCO Headquarters that a mass raid would be conducted in the wind farm feeders by each Generation-End circle. Based on these instructions, special teams were deputed (May 2012) to take meter readings at the sub-station ends and to compare the same with the generation statements to find out revenue loss, if any. Audit noted that even three years after the mass raid, follow-up action had not been taken (December 2015).

The Government stated that the report on mass raid would be studied for appraisal.

- Though the actual progress of implementation of the transmission schemes, *vis-a-vis* its scheduled completion, was discussed in the review meetings of TANGEDCO and TANTRANSCO, the outcome of these reports were not discussed at the Board level.

Conclusion

The State of Tamil Nadu has been managing shortage of power through short term power purchases and imposition of power cuts and load shedding. On the other hand, the State, which had potential wind energy capacity of 14,152 MW had exploited the potential only upto 7,439 MW (53 *per cent*) as of March 2015. Even the potential wind energy was not procured in full by TANGEDCO due to short fall in availability of adequate transmission facility and backlog in payments for purchase of wind energy. These factors contributed for decline in procurement of wind energy from 5,251 MU in 2010-11 to 3,963 MU in 2014-15 and backing down of wind energy to the extent of 8,801 MU during the above period.

The system for purchase of wind energy was not robust due to delays in approval of name transfers, non-installation of check meters at generation point, *etc.*

The proposals for execution of the network of transmission lines and sub-stations for wind energy to tackle the constraints in evacuation of wind energy were not vigorously pursued by TANTRANSCO. Moreover, avoidable delays

in completion of the transmission schemes taken up for execution were also noticed.

Absence of fool-proof system for execution of group captive mechanism and banking of wind energy led to instances of undue benefits to the private wind energy producers.

Thus, the efforts of TANGEDCO/TANTRANSCO for procurement and transmission of wind energy need to be strengthened.

Recommendations

The State Government may:

- evolve a policy for procurement and transmission of wind energy;

TANGEDCO may:

- purchase maximum quantity of wind energy generated within the State to avoid procurement of power at a higher rate.
- install robust system of verification of status of group captive users of wind energy and ensure that banking of wind energy is not misused.

TANTRANSCO may:

- expedite the execution of backbone network of wind energy and other transmission schemes already taken up.
- install forecasting mechanism for wind energy to minimise backing down.

