Chapter - II

2. Performance Audits relating to Government Companies

2.1 Performance Audit on the 'Implementation of Niranthara Jyothi Yojana by Electricity Supply Companies in Karnataka'.

Executive Summary

Introduction

Karnataka is a power deficit state, with deficit of about 15 *per cent*. In order to have an everlasting solution in bridging the gap between demand and supply, the Electricity Supply Companies (ESCOMs) implemented (2005-09) a scheme called Rural Load Management System (RLMS), which failed due to large scale tampering. Considering the benefits of a scheme implemented in Gujarat, by segregation of feeders, the GoK decided to implement the Scheme called Niranthara Jyothi Yojana (NJY) in Karnataka, after conducting pilot study at Malur.

Niranthara Jyothi Yojana

In NJY, the concept was to segregate the agricultural loads and non-agricultural loads by bifurcation of feeders (11 kV) at the substations by drawing a new independent line (11 kV) feeder, called 'NJY feeder' and shifting the non-agricultural load onto this feeder.

The objectives of NJY were mainly to provide 24 hours of uninterrupted and reliable power supply to non-agricultural consumers; to have better control on agricultural load; and improve the Transmission and Distribution (T&D) losses, Metered sales and Reduction in peak load.

Audit objectives

The performance audit was conducted to assess whether the NJY

- was planned and implemented after assessing the technical advantages and funding arrangements; and
- has achieved its intended objectives.

Audit findings

***The audit findings on the first audit objective on* assessing the planning, implementation and funding of NJY indicate that:**

- *Planning* was deficient as large scale implementation was taken up before analysing the Pilot studies in GESCOM and HESCOM. Further, in CESC, the estimates for the works were prepared in an unrealistic manner, necessitating periodic revisions, thereby delaying the implementation.

- *Implementation* of NJY was affected owing to the delays in finalisation of tenders (GESCOM), delays by contractors (HESCOM), delays in completion of load bifurcation works and instances of clubbing of NJY feeders with non-NJY feeders (all ESCOMs). The Special Design Transformer (SDT) intended to provide power to farmhouses on agricultural feeders had design deficiencies due to failure to include overload protection.

- *Funding* to BESCOM and CESC was inadequate, which would affect the implementation of NJY.

- The NJY planned to be completed in three years (by 2012) is lingering for the last three years with 543 of the 1,748 feeders yet to be completed (as at March 2015) resulting in loss of energy savings of 1,128.70 MUs valued ₹ 569.63 crore.

The audit findings on the second audit objective on **assessing whether the NJY has achieved its intended objectives indicated that:**

- ESCOMs were able to provide about 20 hours of three phase power supply to NJY feeders, but the quality of power supply had not improved with the interruptions continuing unabated.

- There was reduction in peak load. However, the practice of providing power to IP feeders during peak hours and also supply of power for more than scheduled hours a day to IP feeders, in a power deficit scenario was imbibed with poor load management.

- 40 p*er cent* of test check feeders showed an adverse trend in T&D losses.

- Though there was increase in number of hours of supply of three phase from 10 hours (pre-NJY) to 20 hours (post NJY), the increased hours of supply was partly owing to increased purchase of power, which was necessitated as the envisaged reduction of distribution losses did not materialise.

- KERC's directive on assessing the IP consumption based on meter readings in DTCs/ IP feeders has not been complied with.

Introduction

2.1.1. Karnataka is a power deficit state, with a deficit of about 15 *per cent*. The increase in generation did not match the demand and the supply-demand gap widened, resulting in load-shedding for the consumers. In such a scenario, the farmers in Karnataka installed Irrigation Pump (IP) Sets to bore wells and open wells to meet their requirement of water for agriculture and farming. The consumption of electricity by the IP Set consumers was nearly 40 *per cent* of the total energy sold by the State. As a result, the power scenario in the State worsened.

In order to have a lasting solution to bridge the gap between demand and supply, the Electricity Supply Companies (ESCOMs[18] in Karnataka implemented (2005-09) a scheme called Rural Load Management System (RLMS). The concept behind RLMS was to segregate the load on each transformer into IP set and non-IP set consumers by using a Rural Load Management Unit (RLMU). While power supply was to be given for 24 hours to non-IP set consumers, for the IP set consumers, it was regulated by RLMU for specified hours as per a pre-determined program. The Scheme was implemented in 756 feeders[19] (about 1/3rd of the total feeders in rural areas) in all ESCOMs. However, the deterioration in the power supply position led to power cuts in RLMS feeders resulting in non-supply of power during the stipulated time to IP set consumers. This led to large scale tampering of the RLMU by the farmers, which the maintenance contractors (for RLMU) could not handle. The situation aggravated with the rising gap in the supply-demand scenario of power.

In order to overcome the above problems, a team headed by the then Managing Director, BESCOM visited (July 2008) Gujarat to study 'Jyothi Grama Yojana (JGY)'. In JGY, the agricultural (IP) loads and non-agricultural loads were segregated by bifurcation of feeders at the substations. After studying the JGY, the Board of Directors (BoD) of BESCOM concluded (August 2008) that tampering was not possible under the scheme, the substation load would be reduced to one-third, and there would be improvement in tail-end voltage. The BoD of BESCOM also noted (August 2008) that the greatest advantage of the scheme was that 24 x 7 power supply could be provided to rural areas, without serious impact on the total energy handled, as the non-agricultural load of rural areas constituted a small percentage of the total energy handled. It was in this background that 'Niranthara Jyothi Yojana (NJY)' was conceptualised in Karnataka.

[18] Bangalore Electricity Supply Company Limited (BESCOM), Chamundeshwari Electricity Supply Corporation Limited (CESC), Gulbarga Electricity Supply Company Limited (GESCOM), Hubli Electricity Supply Company Limited (HESCOM) and Mangalore Electricity Supply Company Limited (MESCOM).

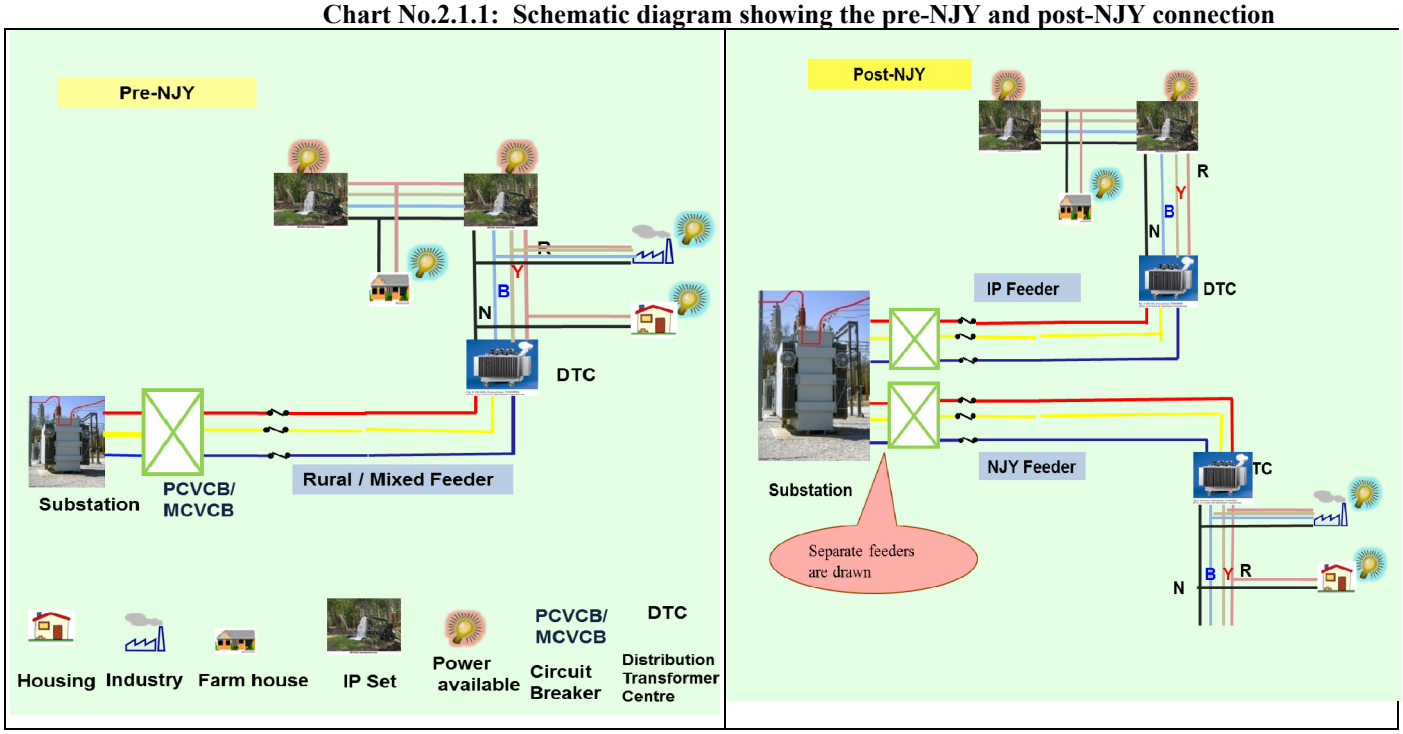
[19] Feeder is an electrical line emanating from the substation and traversing up to the Distribution Transformer Centre (DTC) and from there to the consumers.

Niranthara Jyothi Yojana

2.1.2. In the pre-NJY power supply scenario[20], power supply to both agricultural (IP set) users and non-agricultural (domestic lighting, commercial supply *etc*.,) was through a common 11 kV feeder (rural/mixed feeder) emanating from the substation[21]. The ESCOMs provided three phase power supply[22] for limited number of hours (about 10 hours) [23] and single phase for a few more hours (about 4 hours) with power cuts for the remaining hours (about 10 hours) in a day. This method of limiting the number of hours to three phase and single phase supply was called rostering.

In NJY, the concept was to segregate the agricultural loads and non-agricultural loads by bifurcation of feeders (11 kV) at the substations. This was achieved by drawing a new independent line (11 kV) feeder, called 'NJY feeder' and shifting the non-agricultural load[24] onto this feeder. The existing feeder, which would then have only agricultural (IP) loads on it, was called 'IP feeder'. Thus, the pre-NJY 'mixed/rural feeder' was bifurcated into 'NJY feeder' and 'IP feeder'. An illustration of pre and post NJY is given below.

Chart No.2.1.1: Schematic diagram showing the pre-NJY and post-NJY connection



[20] As RLMS scheme had failed, the pre-NJY scenario refers to the supply of power prior to implementation of RLMS and NJY.

[21] The substation is located in the premises of Karnataka Power Transmission Corporation Limited (KPTCL), the Public Sector Undertaking vested with transmission of power, wherever the step down voltage was more than 66 kV.

[22] Three phase power supply (denoted as R,Y,B with N as neutral) is required to run Irrigation motors and for industries with motive power. For purposes of domestic lighting, single phase supply would suffice.

[23] The number of hours of supply in *three phase*, *single phase* and *no power* in different ESCOMs, prior to implementation of NJY, as per DPR were : BESCOM and CESC (10 hours, 4 hours, 10 hours); GESCOM (6 hours, 8 hours, 10 hours); HESCOM (6 hours, 12 hours, 6 hours).

[24] These are also referred as Low Tension (LT side) load works.

2.1.3. The objectives or benefits sought to be achieved through NJY were as under:

- to provide 24 hours of uninterrupted and reliable power supply to non-agricultural consumers;
- to have better control on agricultural load;
- increase in billed energy and demand;
- reduction in peak load on the system/improved load management and
- reduction in distribution losses.

The Government of Karnataka (GoK) proposed (October 2010) to fund the NJY with 40 *per cent* equity support, while the balance 60 *per cent* was to be funded by ESCOMs, which they did through debt.

Audit Objectives

2.1.4. The objectives of the performance audit were to assess whether the NJY

- was planned and implemented after assessing the technical advantages and funding arrangements and
- has achieved its intended objectives.

Scope of Audit

2.1.5. The Performance Audit covering planning, implementation and evaluation of the achievements of the objectives of NJY in four[25] ESCOMs was conducted between November 2014 and June 2015. The examination involved scrutiny of records at the Corporate Office of the ESCOMs and 17 divisions[26] (31 *per cent*) out of the 54 divisions, which were selected based on probability proportional to size of the number of feeders commissioned in each division. Further, the data on supply of power, distribution losses, peak voltage *etc*., for 88 feeders[27] and its corresponding 161 IP feeders in these 17 divisions were analysed to evaluate the extent of achievement of the objectives of NJY. In addition, in order to assess the performance of NJY with respect to load management of IP feeders during peak hours, data in respect 118 IP

[25] BESCOM, CESC, GESCOM and HESCOM. MESCOM did not implement NJY, as the objective of supplying 24 hours power supply was met through RLMS Scheme.

[26] Chitradurga, Davanagere, Harihara, Ramanagara, Tumakuru in BESCOM; Arasikere, Hassan, Pandavapura, RAD Mysuru (Nanjangud) in CESC; Kalaburgi-I, Hosapete, Koppal, Yadgir in GESCOM; and Vijapura, Jamakhandi, Ranebennur, Haveri in HESCOM.

[27] 100 feeders were selected (25 feeders in each ESCOM) in the 17 divisions. Comparable data was however, made available by ESCOMs only in respect of 88 NJY feeders and corresponding 161 IP feeders. The reason for excluding 12 feeders is given in **Appendix-7.**

feeders (of the 161 feeders) captured by SCADA/ALDC,[28] were also analysed. The Performance Audit covered the period from the inception (2008-09) of NJY up to 2014-15.

Audit Methodology

2.1.6. The methodology adopted for attaining the audit objectives involved explaining audit objectives to the top management, scrutiny of records at ESCOMs and their divisions, analysis of power supply data and issue of audit observations.

Audit explained the objectives of the Performance Audit to the Government and to the Management of the ESCOMs during an 'Entry Conference' held in March 2015. The draft Performance Audit Report was issued to the Government in October 2015. The Exit Conference was held in December 2015 wherein the audit findings were discussed with the Government represented by the Additional Chief Secretary to the GoK, Energy Department and the Managing Directors of the ESCOMs. The views of the Management and Government have been incorporated in the Report.

Audit Criteria

2.1.7. The audit criteria considered for assessing the achievement of the audit objectives were derived from instructions/circulars/orders of GoK and Karnataka Electricity Regulatory Commission (KERC), minutes of the Board of Directors (BoDs) of ESCOMs, Detailed Project Reports (DPR), Letter of Intent (LoI), Detailed Work Awards (DWA), Demand Collection Balance (DCB) statements, Load Management Records and good practices adopted in other States, which implemented similar schemes.

Acknowledgement

2.1.8. Audit acknowledges the co-operation extended by the Energy Department of the GoK and the Management of the ESCOMs in facilitating the conduct of Performance Audit.

Audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

Audit Findings

2.1.9. The audit findings are discussed in succeeding paragraphs.

Status of NJY

2.1.10. Based on the results of pilot study at Malur, the GoK decided (November 2008 /January 2009) to extend NJY to the entire State.

[28] SCADA/ALDC i.e. Supervisory Control and Data Acquisition (SCADA)/ Area Load Dispatch Centres (ALDC) are centres from where the power situation on the feeders is monitored for the entire State. However, as SCADA is still under implementation, data for only 32 of the 88 NJY feeders and 118 of 162 test checked IP feeders were found captured by it.

A total of 1,614 feeders[29] in 126 taluks at an estimated cost of ₹ 2,123.73 crore were planned for implementation in the four ESCOMs. The total additional revenue per annum, envisaged to accrue to the ESCOMs after implementing NJY was ₹ 725 crore with an average payback period of three years for the ESCOMs, as a whole.

2.1.11. The physical and financial progress achieved for the first two phases[30] as on 31 March 2015 are given below:

Table No.2.1.1: Physical and financial progress of NJY

Particulars	BESCOM		CESC		GESCOM		HESCOM	
	Phase-I	Phase-II	Phase-I	Phase-II	Phase-I	Phase-II	Phase-I	Phase-II
No. of taluks covered	19	23	10	14	20	10	20	14
No. of existing rural feeders	555	542	270	369	467	198	695	692
No. of NJY feeders proposed	271*	281	161#	235	235	109	246	210
No. of villages covered	4,691	4,607	3,358	3,440	2,765	1,087	1,972	1,464
Estimated cost of NJY (₹ in crore)	374.53	385.72	248.47	356.12	286.90	153.26	276.60	219.51
BoD approval date for implementation	February 2009		June 2009		March 2009		June 2009	
Envisaged time frame for completion	March 2010	March 2012	March 2010	March 2011	March 2010	March 2011	March 2010	March 2011
Scheduled date of completion[31] as per contracts awarded	May 2010 to Aug. 2010	June 2012 to Dec. 2015	July 2011 to Feb. 2012	May 2013 to June 2015	Apr. 2011 to Dec. 2014	Mar. 2012 to Dec. 2014	Feb. 2012 to June 2012	July 2012 to Sep. 2012
No of feeders commissioned within the scheduled date of completion	5	7	0	8	0	3	1	1
Revised date of completion	-	-	April 2013	Mar. 2015 to June 2016	-	-	Sept. 2015	Sept. 2015
Number of feeders commissioned as at March 2015	271	229	105	70	138	54	169	143
No of feeders pending completion	-	52	56	165	97	55	77	67
Expenditure incurred (₹ in crore)	305.68	367.67	180.59	259.46	252.87	115.86	165.84	116.35

* Including feeders proposed under Malur Pilot Project.
# Including 26 feeders which were short-closed subsequently.
(Source: Details as furnished by the respective ESCOMs, Records of ESCOMs and Energy Department, GoK.)

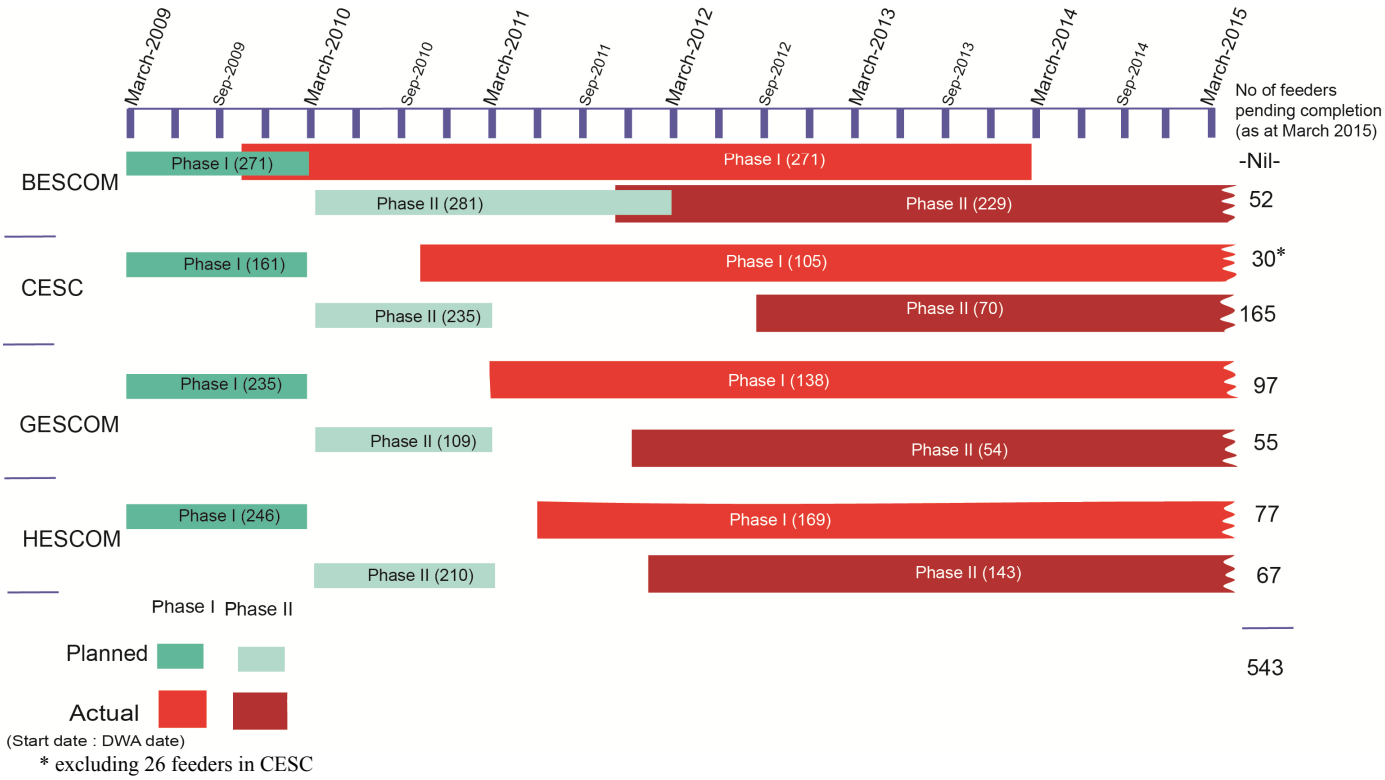
As could be observed from Table 2.1.1 above, the implementation of NJY was much below expectation, with only 25 of the 1,748 feeders being commissioned within the scheduled date. The implementation is already delayed by three to four years and as at the end of March 2015, only 1,179 feeders have been commissioned with 543 feeders yet to be completed (March 2015). A Gantt chart of the timelines for implementation *vis-à-vis* actual implementation is given below:

[29] This was periodically modified subsequently, and the actual position as at end of March 2015 is given in Table 2.1.1.

[30] In addition to the two phases, a total of 371 feeders, which included coverage of implementing NJY in RLMS feeders, are proposed under third phase of NJY, under the Deendayal Upadhyaya Gram Jyoti Yojana sponsored by Government of India. Third phase is yet to be taken up (March 2015).

[31] Tenders for few packages of phase-I were awarded after inviting tenders for more than once owing to high rates in bids, necessitating cancellation of tenders/re-inviting tenders. Later, tenders (packages) called for works under phase-II were finalised, while phase-I works remained without being awarded. This is the reason for scheduled date of completion for phase-I being later than phase-II.

Chart No.2.1.2: Timeline for implementation of NJY as at March 2015



The loss of energy savings due to delay in completion was ₹ 569.63 crore.

2.1.11.1. As could be seen from the Chart 2.1.2 above, even after a delay of three to four years, the NJY is not fully implemented, with 543 feeders yet to be completed (as at March 2015). Reasons for the delay are given in paragraph 2.1.11.2. The loss of energy savings in the four ESCOMs for the delay between the scheduled date of completion[32] *vis-à-vis* actual date of completion was 1,128.70 MUs and the revenue loss to the ESCOMs was ₹ 569.63 crore[33].

Though BESCOM was nominated as a Nodal agency for implementation of NJY on behalf of all ESCOMs and the Chief Engineer, BESCOM was to monitor the NJY, co-ordination meetings were not held after May 2009.

In compliance to the directives of KERC, BESCOM and GESCOM had given commitment that the NJY would be completed by March 2015 while CESC had stated that NJY would be completed by June 2015. HESCOM had not given any commitment.

Audit, however, noticed that even these commitments had not been adhered to. At the current rate of implementation, it would take another two years to commission all the NJY feeders.

2.1.11.2. The delay in implementation of NJY has limited the coverage of the achievement of the objectives of NJY. The achievement of the objectives of NJY is brought out in paragraph 2.1.21. The main factors responsible for delay in implementation of NJY are as under:

[32] Scheduled date of completion refers to date given in the LoI/DWA. The delay from the envisaged time-frame for completion of NJY up to DWA is not considered.

[33] Loss of energy savings and loss of revenue were BESCOM (174.33 MUs, ₹ 86.12 crore); CESC (559.41 MUs, ₹ 273.48 crore); GESCOM (148.38 MUs, ₹ 78.37 crore), HESCOM (246.58 MUs, ₹ 131.66 crore).

Table No.2.1.2: Factors responsible for the delay in implementing NJY

As per ESCOMs	Additional factors, noticed in Audit (referred in paragraph)
BESCOM ➢ Short supply of poles and insulators to the partial turnkey contractors. ➢ LT bifurcation work not included in the scope of DWAs. ➢ Delay in obtaining approval for railway crossings, highway crossings and Electrical Inspectorate.	➢ Delay in completion of load bifurcation work (paragraph 2.1.16). ➢ Failure of Special Design Transformers (paragraph 2.1.18.1 to 2.1.18.2).
CESC ➢ Difficulty in availability of labour, as different projects were under execution at the same time in all ESCOMs. ➢ Shortage of Reinforced Cement Concrete (RCC) square poles. ➢ Right of Way (RoW) problems.	➢ Deficiencies in estimates warranting periodical revisions (paragraph 2.1.13). ➢ Delay in completion of load bifurcation work (paragraph 2.1.16).
GESCOM ➢ Incorrect estimates of works, which led to the estimated materials getting exhausted by usage in lesser number of feeders. ➢ Delay in supply of poles and insulators.	➢ Deficiencies in conducting the pilot study (paragraph 2.1.12). ➢ Delay in finalising tenders (paragraph 2.1.14). ➢ Delay in completion of load bifurcation work (paragraph 2.1.16).
HESCOM ➢ Non-availability of skilled labour as NJY and other development works were going on simultaneously in Karnataka and Maharashtra. ➢ Objection by farmers for erecting poles.	➢ Deficiencies in conducting the pilot study (paragraph 2.1.12). ➢ Contractors having financial difficulties (paragraph 2.1.15). ➢ Delay in completion of load bifurcation works (paragraph 2.1.16). ➢ Clubbing of NJY feeders with Non-NJY feeders (paragraph 2.1.17).

Planning

Deficiencies in conducting pilot study

2.1.12. A Pilot Study is a preliminary study conducted on a small scale, whose results provide valuable insights, before taking up a project on a full scale.

In a meeting chaired by the Minister for Energy, it was decided (July 2008) to conduct pilot study of the separation of feeders at Malur taluk in BESCOM and the process be told to other ESCOMs so that they can also take up one such project in their areas.

BESCOM conducted (August 2008) pilot study of the NJY at Malur taluk and after analysing the results, the GoK decided (November 2008/January 2009) to implement NJY. Accordingly, BESCOM had invited tenders in June 2009 for implementation NJY in other taluks (large scale). Similarly, CESC had taken up (December 2008) a pilot study in Malavalli taluk and completed it in November 2009. The results were analysed in March 2010 and tenders for large scale implementation were invited in April 2010.

The results of Pilot Study were not analysed before going in for large scale implementation of NJY.

Audit, however, observed that HESCOM and GESCOM had invited tenders for large scale implementation before analysing the test results of the Pilot Study. HESCOM had taken up (February 2009) pilot studies, initially in one taluk (Bailahongal) and later in Savanoor and Shiggaon taluks (six feeders). As at end of March 2015, while the pilot study in Bailahongal taluk was completed (July 2009), the pilot studies in the other two taluks were pending. HESCOM, however, had invited tenders for large scale implementation in August 2009. Similarly, in GESCOM, the pilot study was taken up in Kusthagi taluk in January 2009 and completed in February 2014, while tenders for large scale implementation had been invited in August 2009. The results of the pilot study were yet to be assessed (March 2015).

Thus, the purpose of conducting the pilot studies in HESCOM and GESCOM was defeated.

GoK replied (January 2016) that results of pilot study in HESCOM were analysed in September 2009, while GESCOM had taken action to appoint (February 2015) a third party for evaluation of Pilot Study. The fact, however, remains that tenders for large scale implementation were invited much before the results of pilot study were analysed in these two ESCOMs.

Recommendation No.1: The ESCOMs may analyse the results of pilot study before implementing projects on a large scale.

Deficiencies in preparation of estimates

2.1.13. A sound estimate provides a fair assessment of the cost of the work. The following deficiencies were noticed in the preparation of estimates:

2.1.13.1. In the BoD meeting held in May 2009 in CESC, it was proposed to implement NJY in 341 new feeders at a cost of ₹ 496.24 crore in 24 taluks, in two phases *i.e.* by December 2010 and June 2011. Notice Inviting Tenders was invited in June 2009 for 21 taluks[34]. The BoD, considering the budget provision of ₹ 100 crore, decided (June 2009) to limit NJY works to about 70 feeders. In the Action Taken Note submitted to BoD in October 2009, it was, however, intimated that NJY works were initiated in 161 feeders (10 taluks in phase-I), at a total cost of ₹ 246.37 crore, and the remaining 14 taluks were planned for phase-II, as the entire amount would not be required in the same financial year and expenditure would be spread over next financial year.

In March 2010, the BoD was informed that discrepancies were noticed between the tendered quantities and quantities mentioned in the DPR for the 161 feeders. The DPR cost for the 161 feeders was revised to ₹ 208.86 crore. The DWAs for the 10 taluks were issued in October 2010, December 2010 and May 2011.

Subsequently, in December 2011, the DPR cost of these 161 feeders was again revised to ₹ 306.48 crore considering re-arrangements of load bifurcation and providing new breakers at substations. Again in March 2012, the DPR cost

[34] Tenders for remaining three taluks were invited in November 2009 (Arisikere and T.N.Pura) and March 2012 (Arkalgudu taluk - Phase-II).

was revised to ₹ 248.47 crore, considering the fact that earlier DPR (₹ 208.86 crore) was prepared with limitation in cost per feeder and without considering the site conditions.

CESC had prepared estimates for the NJY works in an unrealistic manner, necessitating periodic revisions, thereby delaying implementation.

The materials issued for the envisaged works[35] were used in lesser number of works due to the deficiencies in estimates necessitating periodical revisions. This affected the implementation of the first stage of NJY and also had a cumulative effect on the phase-II. As at end of March 2015, a total of 105 feeders of the 161 have been commissioned, with delays ranging from 15 days to 1,353 days, from their scheduled completion. This resulted in foregoing of energy savings of 521.51 MUs[36] (up to March 2015) valued ₹ 253.41 crore.

CESC informed (July 2015) that the DPR/estimates were prepared based on the guidelines given by BESCOM with criteria to ensure that cost per feeder was within ₹ 1.5 crore and one transformer was proposed per village. CESC admitted that the delay was not only due to improper estimates but also due to Right of Way (RoW) issues from various departments/farmers, quantity variations as per field conditions and other reasons[37]. GoK replied (January 2016) that the nature of works involved drastic and dynamic changes in field conditions of distribution network due to various other ongoing schemes.

The reply is not acceptable as the delay in implementation due to deficient estimates was controllable by CESC with proper survey and estimation. Further, CESC should have taken cognizance of other ongoing works while preparing the estimates.

2.1.13.2. Further, considering the progress of implementation of NJY, the BoD of CESC, approved (June 2014) short-closure of the work of 26 feeders (of the 161 awarded in phase-I), where the work had not started. The reason attributed was the periodic revision of estimates resulting in exhausting the materials that were estimated for the work as there were variations in quantities by more than 25 *per cent* as compared to DPR quantities and also for the reason that the contractors were requesting for new rates.

Short closure of the work had resulted in depriving 24 hour power supply to the consumers living in those rural areas. The energy savings expected in 17 of the 26 short closed feeders was 9.57 MUs, whereas in 17 executed works, the energy savings was 0.97 MUs, indicating poor prioritisation of works, as works with lower energy savings had been taken up for execution rather than selecting works, which had higher energy savings.

GoK attributed (January 2016) the short closure of works to reasons beyond the control of ESCOMs, such as agitation from farmers, quality variations, not obtaining forest clearances. The reply is not acceptable as there was no justification for not taking up works, which had higher energy savings.

[35] The works were awarded on partial turnkey (ESCOMs provided the contractor with major materials).

[36] Worked out considering taluk wise average savings (as per DPR) per feeder and the average cost of short term purchase of power for the respective years.

[37] Contractors starting work in many feeders simultaneously, shortage of labour of contractors, non-availability of sand/jelly, non-supply of poles by the Pole manufactures and were levied heavy penalty for delay.

2.1.13.3. In GESCOM, though the scheduled date of completion of drawing 11 NJY feeders in H.B Halli taluk of Hosapete division was July 2011, the work was commissioned (January 2013/May 2014) only in respect of six[38] feeders (cost: ₹ 3 crore). Poor estimation of the length of feeders (six numbers), which increased from 145.70 kilometres (estimated) to 213.80 kms, was a cause for the delay in completion of works.

Further, three feeders[39] were yet (March 2015) to be commissioned, while works in respect of two[40] feeders, which were not started, were re-tendered (July 2014) and the work was under progress (March 2015).

Government replied (January 2016) that during execution of works / detailed survey, the field officers had reported that quantities provided in DPR were inadequate. This had arisen as water works, Thandas/Hamlets had been excluded while preparing the estimates. The reply confirms the observation that there were deficiencies in the preparation of estimates.

Recommendation No.2: ESCOMs need to prepare estimates after survey, investigation and duly taking cognizance of works being implemented under other schemes.

Implementation

Delay in finalisation of tender

2.1.14. GESCOM invited (August 2009) tenders for NJY works in five taluks[41]. In respect of one taluk (Manvi), a lone bidder had quoted ₹ 8.92 crore, which was 61 *per cent* above the DPR cost (₹ 5.54 crore) on partial turn-key basis. The total estimated cost for the work (Manvi) on turn-key basis was ₹18.47 crore. The validity of the bid was up to March 2010.

The BoD decided (December 2009) to award the work at 26 *per cent* above (estimated cost: ₹ 5.54 crore), based on the Schedule of Rates of 2009-10, subject to achieving financial tie-up. GESCOM approached REC and banks in April 2010 for financial assistance. Meanwhile, as the work was not awarded even as on March 2010, GESCOM requested (March 2010) the bidder to extend the validity of his bid up to September 2010, which was agreed to by him. However, instead of placing DWA, the GESCOM again requested, first in September 2010 and later in December 2010 to extend the validity of bid up to December 2010 and March 2011 respectively. The bidder, however, did not respond to these two requests.

Tenders re-invited in August 2011, November 2011 and April 2012 did not materialise as either no bid was received or a single bid was received with high rates and the tenders had to be cancelled.

[38] Kadelebalu, Enigi, Gaddikeri, Anekal, Marabihal, Magimavinahalli.
[39] Chilagode, Teligoli, Nelkudri.
[40] Ulvathi, Varlahalli.
[41] Manvi, Sindhanoor, Deodurga, Raichuru, Siraguppa.

In spite of GoK's directions (January 2009) to avail financial assistance from REC/bankers for NJY works, GESCOM approached bankers only in April 2010. Meanwhile, the tenders invited in August 2009 lapsed and the works had to be re-tendered resulting in extra cost and delays.

Tenders were invited again in January 2013 on total turn-key basis and after negotiations, the LoI was issued (September 2013) to a contractor for ₹ 28.82 crore for the same work (Manvi taluk). The work, which was to be completed by July 2014, was not completed as of March 2015.

GESCOM stated (August 2015) that the delay in awarding the tenders was due to the absence of a financial tie up, and it had requested (August 2010) the GoK for full funding since it would not be in a position to repay huge amount of loan availed from REC/Commercial banks. GoK replied (January 2016) that loan sanctioned by Bank was not availed as the interest rates were higher than the REC loan. GoK further stated that it was ultimately decided to avail loan from REC, which led to delay in issuance of Letter of Intent to the contractor. As a result of two years of delay in project implementation, the project cost, quoted price of second award went up significantly.

The contention is not acceptable as GoK had directed the ESCOMs to avail financial assistance from Rural Electrification Corporation (REC)/ Power Finance Corporation (PFC)/Financial Institutions as early as in January 2009. In the BoD meeting held in December 2009 wherein it was decided to award the works, the BoD had also authorised the Managing Director to approach banks and issue LoI for supply of materials for NJY, subject to tie-up of funds. It was only in April 2010 that GESCOM had requested REC for loan, which was sanctioned in October 2010, but the same was not availed. GESCOM also had (December 2010) a Letter of Arrangement from a Bank, but had not availed the same citing high interest rates. Finally, as the request (August 2010) of GESCOM for additional equity support was not forthcoming from GoK, it again approached (August 2012) the REC for revalidating its earlier sanctioned loan. Finally, the loan was availed in June 2013 from REC to meet the funding requirements.

Thus, failure of GESCOM to award the work within the validity of the tender resulted in denial of the envisaged benefit of 24 hours of quality power supply to the consumers in Manvi taluk from July 2010 to March 2015, apart from incurring additional cost of ₹ 8.92 crore[42] on the work, due to time over-run.

Similar developments were noticed in the other four taluks **(Appendix-4)** covering 47 NJY feeders, resulting in incurring extra expenditure of ₹ 22.69 crore, apart from denial of 24 hour power supply.

Recommendation No.3: ESCOMs need to adhere to the directions of GoK to have financial tie-ups with REC and Financial institutions well in advance so as to avoid extension of validity periods/re-tendering and consequent delays and cost overruns.

Delay in execution by contractors

2.1.15. HESCOM placed (May / September 2011, January / March 2012) DWAs for construction of 246 feeders covering 20 taluks in phase-I and for

[42] ₹ 28.82 crore *less* ₹ 18.47 crore *less* tender premium in the original tender ₹ 1.43 crore.

210 feeders covering 14 taluks in phase II with a stipulation to complete the work by February / June 2012 and February/September 2012 respectively.

At the end of scheduled date of completion (July/September 2012), only two out of the 456 feeders were commissioned. The contractors cited the non-availability of skilled labour, taking up of works simultaneously in the neighboring State, objections by farmers as the reasons for the slow progress (refer Table 2.1.2) and this was appraised to the BoD of HESCOM while seeking extension. The contractors also expressed (August/September 2012) that they had financial difficulties because of investment in procuring the material and increased labour cost. They requested HESCOM to arrange release of additional 30 *per cent* payment, which was approved (February 2013) by the BoD, subject to completion of all works by March 2013, failing which, penal interest was to be levied.

The work was not completed by March 2013. In fact, even after two years *i.e.* as at March 2015, only 169 out of 246 feeders in the phase-I and 143 feeders out of 210 feeders in the phase-II have been completed. Thus, undue delay in completion of the work resulted in loss in envisaged energy savings (246.58 MUs) and revenue loss of ₹ 131.66 crore. Incidentally, the penal interest of ₹ 1.07 crore on the additional advance of ₹ 7.39 crore, had not been raised/recovered in three test checked divisions[43].

GoK replied (January 2016) that the progress of work as at end of November 2012, *i.e*. before payment of additional advance, was 10.09 *per cent* (both phases) and this had increased to 93 *per cent* as at end of April 2015.

The fact, however remains that in spite of paying additional advance the works were not completed within the committed date of March 2013 and even two years later (April 2015), the work was still pending completion. The issue of delay in spite of providing additional advances needs to be analysed and responsibility fixed for delays and non-recovery of penalties.

Recommendation No.4: ESCOMs need to award the works only after assessing the financial ability of the contractors to execute the works so that implementation of works are not delayed.

Non-completion of bifurcation work before commissioning of feeders

2.1.16. In order to achieve the objectives of NJY *i.e.,* 24 hours of power supply to all non agricultural consumers and restricted hours of power to IP set consumers, it was necessary to bifurcate the load from the existing rural feeders into agricultural and non-agricultural consumers. This is achieved by releasing the existing Low Tension (LT) lines and restringing them on the new NJY feeders.

In the 17 test checked divisions, Audit observed that there were differences in the date of commissioning of NJY feeders as per the data of Corporate Offices

[43] In test checked divisions of Vijapura (₹ 14.57 lakh), Haveri (₹ 71.34 lakh) and Jamakhandi (₹ 21.50 lakh).

There were delays in load bifurcation works.

of the ESCOMs (received from Divisions) and the actual commissioning date as per the Division, in respect of 71 of the 346 feeders[44]. This difference in dates ranged from 4 days to 771 days. This indicated that though the bifurcation of LT work was not complete, whereas all the associated works are to be completed and line charged for declaring the feeder commissioned, it was intimated so to the Corporate Office of the ESCOMs. As the data of the Corporate Office were used for monthly meetings with GoK, the achievement of NJY depicted in the meetings stood inflated.

GoK replied (January 2016) that in BESCOM there was difficulty in bifurcating the feeders due to corridor issues and objection from farmers. In CESC and HESCOM, initially, the date of charging of the substation was considered as 'date of commissioning' but later, the shifting of loads or bifurcation works were taken up and completed, and hence the difference in dates. The reply further stated that action has now been taken to rectify this aspect and the feeder was declared as 'commissioned' by the Divisions/Corporate Office only after 100 *per cent* bifurcation, *i.e*. after the last consumer or the IP set was bifurcated.

The fact, however remains that the achievement of NJY projected in the meetings of the Top Management of ESCOMs, was exaggerated.

2.1.16.1. In HESCOM, the work of bifurcation of load works (LT side), valued at ₹ 5.83 crore[45] was awarded subsequent to award of construction of NJY feeders. Thus, this cost (₹ 5.83 crore) was not included in the projections for claiming equity support from the GoK. As a result, HESCOM had to bear the 40 *per cent* equity component (₹ 2.33 crore) as debt.

Non-bifurcation of load

2.1.16.2. The work of construction of 57 feeders in Bagalkot, Mudhol and Vijapura Taluks of HESCOM were awarded (January 2012) for ₹ 49.17 crore. The work was to be completed within six months from the date of award. In respect of eight[46] feeders which were commissioned between June 2012 and July 2014, bifurcation of load (IP and Non-IP) was not done till March 2015, which enabled IP sets in the feeder to get power for more than the stipulated supply time of six hours. In a power deficit State, providing power to IP sets beyond the scheduled hours and during peak hours indicated poor load management, as brought out in paragraph 2.1.25 and 2.1.26.

[44] BESCOM (39 out of 155 feeders) with delay ranging from 5 to 771 days, CESC (25 out of 63 feeders) with delay ranging from 4 to 312 days, and HESCOM (14 out of 83 feeders) with delay ranging from 5 to 365 days. In GESCOM, the data on date of commissioning of the divisions were matching with Corporate Office records.

[45] In four subdivisions and four divisions (including two divisions selected). The other divisions/subdivisions had not submitted the estimates for LT line bifurcation works as at March 2015.

[46] Manahalli, Katageri/Hangaragi, Belur, Nagur, Kaladgi, Hallur, Shirur, Simikeri. Further, of the 57 feeders, four feeders were pending completion as at March 2015.

Clubbing of other feeders with NJY feeders

2.1.17. The work of constructing the NJY feeder was an important task for segregating the IP consumers and non-agricultural consumers. In respect of the five[47] out of 19 selected feeders in three test checked divisions[48] (out of 17 divisions with 88 feeders selected for test check), Audit observed that commissioned NJY feeders were clubbed with other feeders for periods ranging from 2 to 33 months. Further, even after the release of clubbed feeders from these NJY feeders, the load on the LT side of NJY feeders had not been bifurcated, for periods ranging from 12 months to 33 months. Thus, the objective of segregation of feeders under NJY had been defeated.

GoK replied (January 2016) that in the event of completion of line works of new feeder and non-availability of idle breaker/new breaker for commissioning, feeders were commissioned by clubbing with existing breakers in town or rural feeder breakers, in order to ensure early commissioning the new NJY feeders. The reply further states that action was now taken to provide separate breakers by co-ordination with KPTCL. The reply confirms the clubbing of feeders as a result of inaction of the ESCOMs to procure and install breakers, defeating the objective of NJY.

Recommendation No.5: ESCOMs need to ensure that the bifurcated NJY feeders are not clubbed with non-NJY feeders. Action needs to be taken to install breakers at the earliest on the bifurcated feeders, else the objective of bifurcating the feeders under NJY would be defeated.

Special Design Transformer

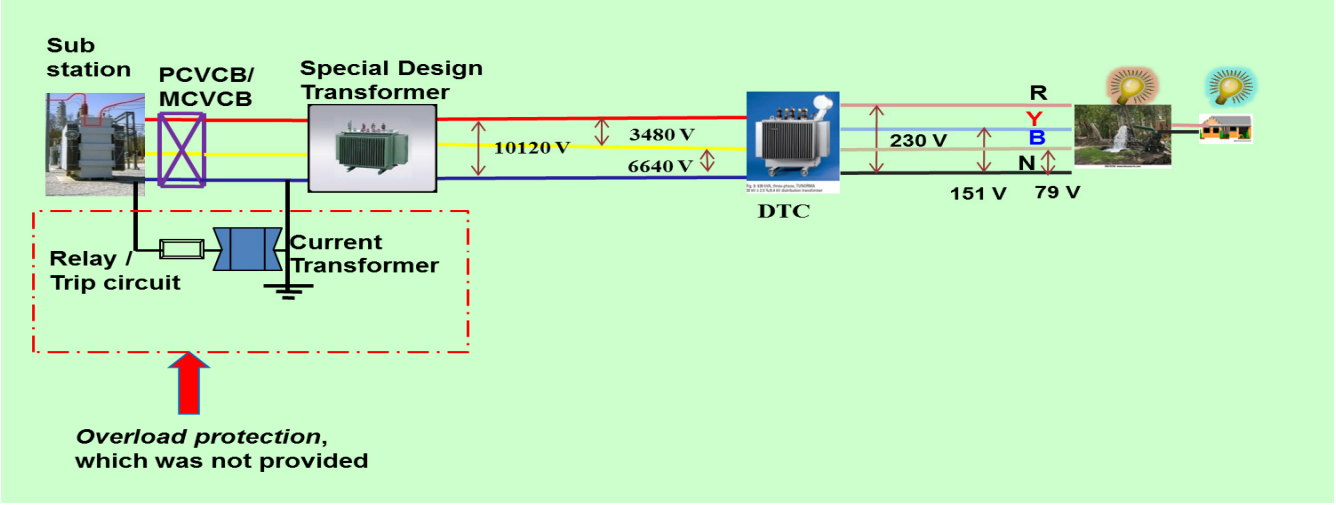
2.1.18.1. With the implementation of NJY, it was envisaged to control the power supply to each category of consumers from the substation. IP set consumers had to be provided with the scheduled 6 to 7 hours of supply a day[49]. In the pre-NJY period, the ESCOMs resorted to 'rostering' (refer **Appendix-5)** limiting the power supply to two phases. But, the IP consumers used to install phase shifters to get three phase supply and hence, under NJY, it was a challenge to provide power supply to farmhouses[50] connected to the IP feeders beyond the scheduled hours (6 to 7 hours), without providing enough power for IP sets to operate. This was made possible by installing Special Design Transformers (SDT) on IP feeders, at the substations.

The SDT was to be so designed that a Current Transformer (CT) was fitted to the phase (230 Volts), with a maximum current limit[51]. In the event of current flowing more than the designed level (happens when consumers use phase shifters to obtain three phase supply), the CT would send a signal to the relay to break the circuit, thereby tripping the IP feeder.

[47] Belur, Chatra, Gundenahally, Kittur and Handigannur.
[48] Ranebennur, Havrei taluk in HESCOM and Nanjangud taluk in CESC. In respect of other 14 divisions test checked, the data on clubbing of feeders is awaited.
[49] Seven hours with effect from November 2014.
[50] Farmhouses are small hutments near the agricultural fields, where farmers store their tools and equipment and also they keep their farm animals, poultry *etc*.
[51] A pre-determined limit of 35 amperes.

An illustrative connection of SDT on an IP feeder, along with voltage profile is given below:

Chart No.2.1.3: Schematic diagram of the SDT including overload protection on IP feeder



Non-inclusion of overload protection in the design of SDTs

2.1.18.2. KAVIKA (a State Government Public Sector Undertaking) supplied 416 SDTs to BESCOM which were installed at the substations, on the IP feeders. The maximum load current for the circuit to trip was 35 amperes.

During the period of single phase power supply, BESCOM[52] observed overloading of the SDTs, which burnt off the fuses. BESCOM, finding SDTs faulty, kept them out of service/ idle charged (connected to circuit, but idle). All the SDTs remained idle charged[53] at the end of March 2015.

Overlooking the need to provide *overload protection* to the Special Design Transformer put the entire NJY at risk.

The actual reason for the failure of the circuit to trip was the absence of *overload protection*. The SDTs were envisaged in the DPR/Estimates of NJY, but there was no mention about the overload protection. The SDTs manufactured by KAVIKA were based on the design approved (July 2010) by BESCOM and the design had formed part of the purchase order.[54] The design sheet/technical parameters (given with purchase order to KAVIKA) did not make a mention about the requirement of overload protection[55].

Thus, overlooking the need to provide *overload protection* circuit in the design for the SDTs put the entire NJY at risk, as any supply beyond scheduled hours of supply (for IP sets) could be tapped by IP consumers using phase shifters (pre-NJY situation). Further, it also resulted in infructuous expenditure of ₹ 5.37 crore[56] being the cost of SDTs lying idle. Though the failure to provide

[52] The other ESCOMs had not installed SDTs till then.
[53] Of the 416 SDTs, 403 were installed. Of the 403 SDTs, 345 have been already idle charged and 58 SDTs were to be idle charged.
[54] Purchase Order of September 2009.
[55] The cost per overload protection was about ₹ 60,000.
[56] ₹ 1.29 lakh per transformer x 416 Transformers = ₹ 5.37 crore. In addition, idle energy charges of 1.37 MUs of energy from the date of idle charge of SDTs till date (March 2015), was lost.

overload protection was reported from January 2012 onwards, the matter has not been brought to the notice of the BoD of BESCOM till date (March 2015) for corrective action.

2.1.18.3. In HESCOM, proposal to install SDT was placed (September 2011) before the Technical Advisory Committee (TAC) of the Company, which opined that before going in for procurement of SDTs, the performance of SDT with respect to design and effect on the system, protection and safety should be reviewed.

The officers of HESCOM visited (September 2011) Maharashtra State Electricity Development Corporation Limited (MSEDCL), where a similar scheme was implemented. The team *inter alia* noted that MSEDCL had expressed its satisfaction about the performance of SDTs. As far as the protection and safety of the line and SDTs were concerned, it was noted that a CT provided in the phase (overload protection), was earthed, which in turn was connected to the control panel through relays to take care of earth fault and over current.

However, HESCOM placed (December 2011) Letter of Intent on KAVIKA for 50 SDTs (value: ₹ 64.50 lakh) without overload protection but did not install them upon receipt.

2.1.18.4. The other two ESCOMs (CESC and GESCOM) had also procured 96 and 10 SDTs at a cost of ₹ 1.24 crore and ₹ 12.90 lakh respectively, but had not installed them. Non-installation of SDTs was as a result of receiving directions after the State level NJY review meeting held in September 2012, not to install SDTs, where such works had not been taken up.

As a result of non-installation of SDTs with overload protection on the IP feeders, the agricultural consumers (farmhouses) were deprived of single phase supply during non-scheduled hours. Resultantly, the ESCOMs were deprived of the revenue by supply of single phase power amounting to ₹ 59.71 crore[57].

CESC and HESCOM replied (July and August 2015) that the power supply was given through *open delta* method (refer paragraph 2.1.19 for definition of *open delta*) to farmhouses and hence revenue was not foregone. The reply of CESC is factually incorrect as the examination of records indicated that single phase power was provided in 14 feeders during various months (June 2013 to January 2015). HESCOM stated that IP feeders were switched off after three-phase supply in certain areas. This confirms the audit observation that power was not provided to farmhouses on IP feeders during non-scheduled hours.

2.1.18.5. Instead of opting to install the overload protection to SDT, the ESCOMs have opted for supply of power under the *open delta* method

[57] IP feeders corresponding to 175 NJY feeders commissioned in CESC (₹ 14.61 crore), on 192 feeders commissioned in GESCOM (₹ 16.95 crore), on 312 NJY feeders in HESCOM (₹ 28.16 crore). Worked out based on consumption for six hours a day for the period from the date of commissioning of the IP feeders to up to March 2015, with the average realised cost of energy at ₹ 3.26 per unit. BESCOM is not considered, as power was supplied under open delta.

(paragraph 2.1.19), by providing overload relay for the circuit to trip, in the event of excess drawal of current in the IP feeders.

The JGY scheme, which was similar to NJY, implemented with SDTs (provided with overload protection) was stated to have delivered quality services to citizens of Gujarat in a cost efficient and innovative way. The Madhya Gujarat Vij Company Limited (MGVCL), Gujarat had obtained (February 2010) a patent for the SDT design. The ESCOMs, had not taken any action to explore the options to purchase or enter into technical collaboration with MGVCL/other agencies until November 2014, when the GoK, citing that two agencies[58] had developed Pilot Advance Transformer-PAT (a form of SDTs) in Gujarat, directed ESCOMs to purchase and analyse their performance and submit results. HESCOM had placed (April 2015) Purchase Order for PAT, but supplies were yet to be received (September 2015).

Thus, failure to provide overload protection to the SDTs coupled with inaction to study the working models in Gujarat and Maharashtra (paragraph 2.1.18.3), resulted in denial of power to farmhouses, besides putting the entire NJY at risk.

GoK replied (January 2016) that:

- There was no revenue loss as power was provided under *open delta* method for farmhouses.
- Provision for SDT was part and parcel of the NJY scheme. During the State Level NJY review meeting in September 2012, it was decided not to take up installation of SDTs, wherever works had not yet started. The concept of SDT has been discontinued in phase-II because of its numerous disadvantages. An effective solution has been developed by BESCOM with the provision of over load protection relay for the segregated IP feeders by limiting the current drawn (open delta with protection relay).

The reply is not acceptable due to the following:

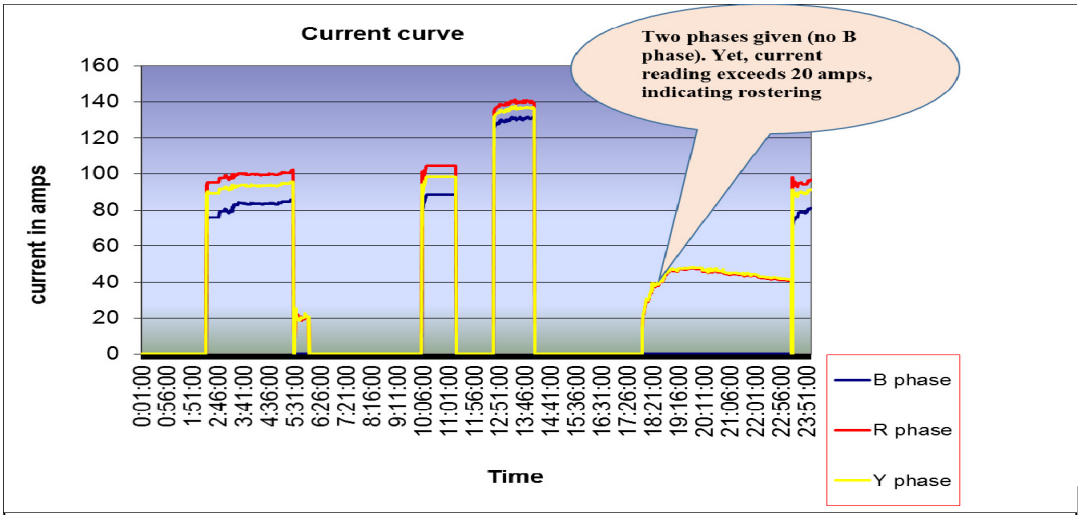
- There was revenue loss due to non-supply to farmhouses as CESC had not supplied power in all the IP feeders and HESCOM had admitted to switching off power in IP feeders after the scheduled hours of supply, as mentioned in paragraph 2.1.18.4.
- The reply is silent on the failure to provide the design of the *overload protection* to KAVIKA alongwith the design of SDT.
- The reply of GoK that an effective solution has been found in *open delta* confirms the observation that SDTs were lying idle and the benefits of NJY were not being realised. On a further analysis of supply under open delta model, we observed that there were evidences of manual intervention at the substation level indicating that open delta is not entirely fool proof. This is described in the following paragraph.

[58] Uttara Gujarat Vij Company Limited and Vidhia Electronics Limited.

2.1.19. In open delta system[59] one phase of power supply is kept open. A protection relay is installed in the system so that the system trips automatically, if the current carried by the feeders exceeds the pre-set levels.

Audit observed that though the current curve[60] in the IP feeder had exceeded the pre-set limit[61] (20 amps), the system had not tripped indicating that open delta system was also prone to risk of failure. An illustrative sample is given below:

Chart No.2.1.4: Illustrative graph of the Current curve on an IP feeder



(Source: SCADA, Anegogal_66 MUSS, F4-Doddatharahalli IP feeder, record date 1.2.2015, Date of commissioning: 1.8.2014).

It can be seen that after about 17:26 hours, there is a change from three phase power supply (three colors) to two phase (two colors). The feeder should have tripped as the current had exceeded pre-set level of 20 amps. However, this had not happened and the current had gone up to almost 45 amps. Evidently, the feeder was operated under 'rostering' method, by manual intervention as done in pre-NJY period. When such two phase supply is provided during non-scheduled hours, it enables the farmers to use phase shifters and operate the IP sets.

Recommendation No.6: The ESCOMs need to undertake a study to analyse the pros and cons of installing overload protection with SDTs *vis-à-vis* the open delta model and explore the feasibility of using the idling SDTs to realise the benefits of NJY.

Recommendation No.7: ESCOMs and KPTCL should devise a mechanism to ensure that staff posted at substations do not resort to 'rostering' in IP feeders during non-scheduled hours of supply, by monitoring and analysing SCADA data.

[59] A write-up of the open delta with schematic diagram is given in **Appendix-6.**

[60] The current curve captures the current and the phase of current that flows through the feeders.

[61] Pre-set limits are in the range of 10 amps to 20 amps, based on consumption of the farmhouses on the feeders.

Funding

2.1.20. GoK issued (October 2010) an order intimating that it would fund 40 *per cent* of the total cost of implementation of NJY as equity investment while the ESCOMs had to bear the remaining 60 *per cent* of the cost.

On a review of the equity releases by the GoK, Audit noticed that BESCOM and CESC had not received the requisite equity support totaling ₹ 42.80 crore and ₹ 32.87 crore, respectively. BESCOM replied (July 2015) that it was pursuing with GoK for release of funds. Thus, failure to provide funds would have a bearing on the implementation of NJY.

In respect of GESCOM, however, funds of ₹ 104.22 crore were released in excess. The GoK advised GESCOM to propose a 'New Scheme' to utilise the funds. Release of funds without specific purpose, and then directing to propose 'a new scheme' to utilise the funds, was against the canons of financial propriety.

GoK replied (January 2016) that in GESCOM the funds of ₹ 35 crore released during 2008-09 had been utilised for system improvement works since NJY works had not started and tendering was under progress. After adjusting this amount, and considering the present awarded cost (₹ 562.90 crore), the amount released almost meets the required support of 40 *per cent* equity. The reply is not acceptable as 40 *per cent* equity support was based on the project cost (₹ 388.17 crore) and an amount of ₹ 104.22 crore represents excess releases for which the GoK itself had advised GESCOM to propose a 'New Scheme' for its utilisation.

Evaluation of the objectives of NJY

2.1.21. In order to assess the extent of achievement of the objectives, Audit conducted test check with the data from divisions/subdivisions in respect of 88 NJY feeders[62] and its corresponding 161 IP feeders for one year pre and post implementation of NJY.

The feeder wise details of the achievement of objectives of NJY are given in **Appendix-7**. The extent of achievement of the objectives are discussed below:

[62] Data in respect of all parameters is not available for the 88 test checked feeders.

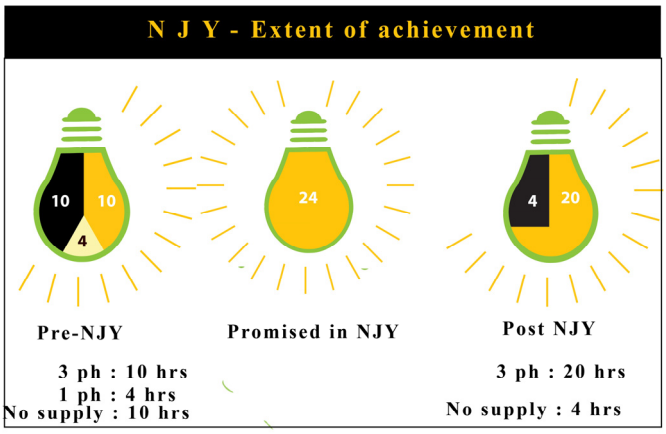
Uninterrupted supply to non-agricultural consumers

2.1.22. The results of test checked divisions are given in the following table:

Table No.2.1.3 : Number of hours of power supply in NJY feeders in test checked divisions

ESCOM	Division	No of feeders analysed	No. of feeders, where power supply data was made available	Average 3 phase power supply per day (31 days month)
BESCOM	Ramanagara	5	5	20.34
	Tumakuru	4	4	21.58
	Chitradurga	4	4	19.60
	Harihara	4	4	21.40
	Davangere	5	5	20.86
				20.76
CESC	Arasikere	5	5	19.41
	Hassan	6	6	22.47
	Pandavapura	5	2	18.81
	Nanjangudu	6	6	12.81[63]
				18.37
GESCOM	Hosapete	6	6	20.73
	Koppal	5	5	21.99
	Yadgir	5	5	23.45
	Kalaburgi	7	7	21.86
				22.01
HESCOM	Vijapura	6	6	21.58
	Jamakhandi	5	5	21.16
	Haveri	7	6	20.68
	Ranebennur	3	3	20.90
				21.08
	Total	**88**	**84**	**20.57**

Post-NJY, the power supply to rural areas had improved.



Audit noticed that the power supply position has improved to 20 ½ hours of three phase supply, from 10 hours provided in the pre-NJY situation. However, Audit observed that the supply was still lower when compared to the assured supply of 24 hours projected in the DPR. A graphical representation is given alongside. The number of hours of power supply can be further improved with better load management as brought out in paragraph 2.1.25 to 2.1.27.

2.1.23. Regarding the objective of providing *uninterrupted and reliable power supply,* it was seen that the number of interruptions in the post NJY period continued unabated with only 13 out of 84 test checked feeders,

[63] It was seen that single phase power supply was provided in the test checked feeders.

Quality of power supply remained poor as the interruptions had increased.

showing a decreasing trend. The number of interruptions in 13 feeders decreased from 1,381 instances in pre-NJY period to 968 in the post NJY period. In 71 feeders, it increased from 6,076 instances to 11,522 instances. In short, over test checked 84 feeders, the total interruptions increased from 7,457 to 12,490 instances *i.e.,* an increase of 67 *per cent* from pre-NJY period. Hence, the objective of providing uninterrupted and reliable power supply was not fully achieved.

GoK replied (January 2016) that during power deficit scenarios, as per instructions from Load Dispatch Centres, the power supply was restricted to control the load. The interruptions had increased as line clearance had to be taken on NJY feeders while attending to faults of other feeders crossing it. GoK further stated that action was taken to split the NJY feeders, whenever new substations are constructed to avoid crossing and reduce the interruptions. The fact however remains that the objective of providing uninterrupted and reliable power supply was yet to be achieved.

Recommendation No.8: In order to improve quality of supply by having minimal interruptions, the ESCOMs need to identify and replace NJY feeders that have crossovers with other feeders.

Providing scheduled hours of supply to IP consumers

2.1.24. One of the objectives of the NJY was to have better control over the agricultural load. The Managing Director of BESCOM, had informed the GoK in July 2012 that the stipulated hours of three phase power supply to agricultural loads could be provided. In the Organisational Review Meeting held in September / October 2012, it was noted that as per discussion with Karnataka Electricity Regulatory Commission, six hours of continuous power supply should be given to IP feeders under NJY.

On a test check of data for IP feeders (161 numbers) corresponding to the 88 NJY feeders, Audit observed that three phase supply for scheduled number of hours (six to seven hours) was provided in 138 feeders, while the remaining 23 feeders were given power ranging from 5 to 6 hours.

Audit also noticed that in BESCOM, CESC and HESCOM, the schedule for three phase power supply to IP consumers was not continuous and was provided many times over the course of the day/night to meet the scheduled hours (6 to 7 hours). In GESCOM, there was a larger degree of compliance in the scheduling to provide continuous supply of power to IP consumers for the scheduled hours. In GESCOM, however, the supply of single phase supply during non-scheduled hours, for use of farmhouses was not maintained.

GoK replied (January 2016) that power supply to IP sets was as per its policy. It further stated that in CESC/HESCOM/GESCOM in order to manage the load, the power supply has not been given continuously and given in two batches of 3 hours to 4 hours per day. During power deficit situations, as per instructions from Load Dispatch Centres, the power supply was restricted to control the load.

The reply is not tenable as (i) the NJY is modelled to work in a power deficit scenario (ii) supply of power *continuously* (during scheduled hours) to IP feeders is a policy assurance of GoK (iii) there are no power deficits during non-peak hours.

Improvement in load management

Post NJY, the Peak load showed improvement.

2.1.25. Improvement in peak load was an objective of NJY. Audit observed that in 77 of the 86 test checked NJY feeders, the peak load had shown improvement.

In order to analyse whether the load management was optimum, Audit analysed data of IP feeders from SCADA. Of the test checked 161 IP feeders, the SCADA was capturing data of only 118 feeders. Audit analysed the data of these 118 IP feeders to check whether the feeders were recording power supply during peak hours (6 am to 9 am and 6 pm to 9 pm) during 2014-15. During these hours, there would be huge demand for power on the system and supply of power to IP feeders during this time would indicate improper load management.

Audit noticed that IP feeders were recording peak demand during these peak hours, indicating that power was supplied to IP feeders during peak hours. The Graphical representation given below (Chart 2.1.5) for a few test checked feeders (illustrative cases) indicate the number of times (in a month) the IP feeders had recorded peak demand during peak hours.

Chart No.2.1.5: Number of days in a month, wherein peak load was recorded during peak hours in IP feeders.

+ Severity -

Feeder	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
F4-Santemagenahalli					14	7	7		16	4	4	12
F2-Ancheberanahalli					9	13	13		3		10	11
F3-Kodambahalli					13	12	5		9	10	7	2
F1-Bolamaranahalli					2	12	8		7	2	7	13
F10-Udagatti	6	6	4	1	3	4	2		6	14	6	16
F5-Singarajapura		8	7	8	2		8		11	3	5	12
F4-Doddatharahalli						5	6		10		6	11
F11-Ratnakatti	10	12	6				1			9	9	17

Providing power to IP sets during peak hours and for more than the scheduled hours, in a power deficit scenario, indicated that load management was not optimum.

On further examination, Audit also noticed that there were supplies to IP sets in the month of March. The period from March to May is summer season, during which periods, the State reels under huge power deficits. The supply of power to IP feeders during peak hours in these months indicates poor load management.

2.1.26. The IP feeders had to be supplied three phase power for the scheduled hours (6 to 7 hours) everyday and supply of power beyond this period must be after considering the power deficit scenario prevailing in the State.
Audit observed supply of power to IP feeders for more than 12 hours everyday throughout the year (2014-15) and it ranged from 14 hours to 23 hours. Illustrative cases for a few IP feeders are given below (Chart 2.1.6):

Chart No.2.1.6: Average number of hours of supply (per day) in IP feeders.

+ **Severity** -

Feeder	April	May	June	July	Aug	Sep	Oct	Nov		Dec	Jan	Feb	Mar	Avg
F2-Ankasamudra	22:25	21:26	22:08	22:47	21:24	19:07	19:38	20:33		21:30	22:17	21:51	21:49	21:25
F3-Kopparasi Koppa	19:31	18:02	18:40	22:28	21:06	22:04	22:14	21:28		22:49				20:56
F5-Jevangi	20:48	20:45	19:46	20:15	21:10	22:02	21:30	20:57		19:53	19:59	20:36	22:05	20:49
F11-Agri-Sanaba	19:21	18:48	19:48	20:50	17:49	14:06		14:30		21:26	20:01	19:12	20:47	18:47

Overall, while reduction in peak load is commendable (paragraph 2.1.25), the practice of providing power to IP feeders during peak hours in a power deficit scenario (Chart 2.1.5) and also the supply of power for more than 12 hours in a day to IP feeders (Chart 2.1.6) was imbibed with poor load management. With the State going in for short term power purchases at high costs to meet the deficit, the use of such high cost power for supply to IP feeders during peak hours was not a healthy proposition for the ESCOMs.

GoK replied (January 2016) that the observation to restrict the peak load during peak hours by cutting power to IP sets will be incorporated in future load management.

Recommendation No.9: In order to have better load management, the ESCOMs may issue instructions to its staff at substations not to supply power to IP sets during peak hours and for more than scheduled hours of supply, in a power deficit scenario and also ensure its observance.

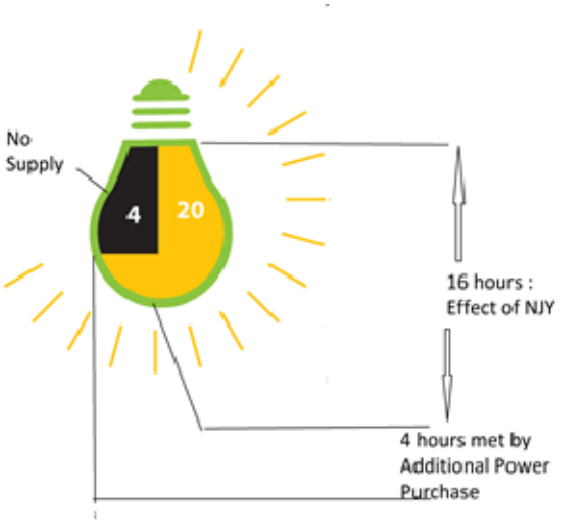
Reduction of power losses

2.1.27. NJY contemplated reduction in T & D losses. The savings in T & D losses was to be utilised to increase the number of hours of supply to NJY feeders.

There was no reduction in T&D losses in 34 of 71 feeders test checked.

On examination of the results of 71 of the 88 feeders for which data was provided, it was noticed that in 34 feeders, the distribution losses had not reduced, but had rather increased.

With power deficit in the State continuing, the power supply to fill the deficit of the increased distribution losses as well as increased consumption of power in the feeders (metered category) would be from additional power purchases. The quantum of power purchased to meet the gap was in the range of average four hours of consumption (every day) in respect of the test checked



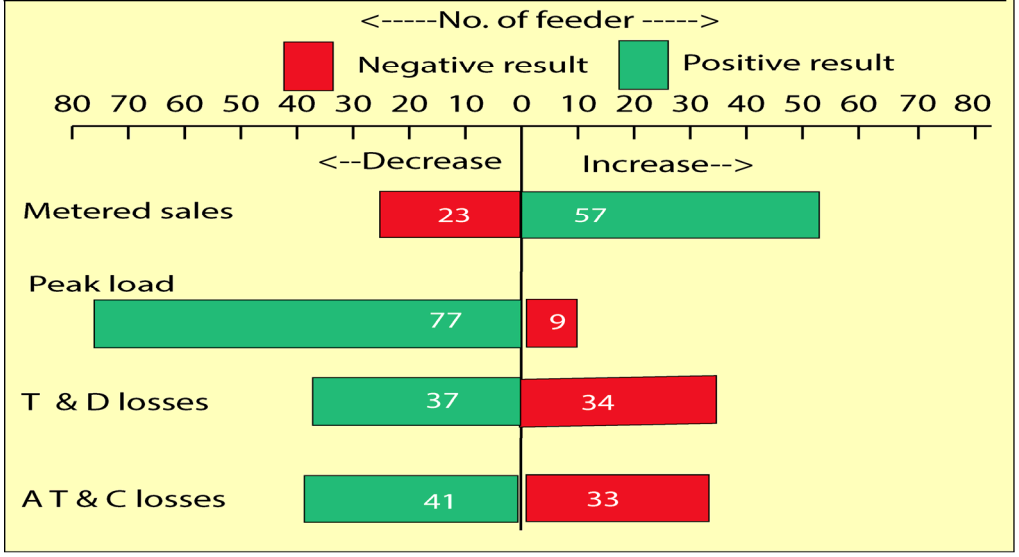
feeders[64].

Therefore, while there was an improvement in three phase power supply from the pre-NJY period of 10 hours *plus* single phase supply of 4 hours, compared with three phase supply of about 20 ½ hours, every day, in the post NJY period, the achievement was not solely on account of bifurcation of feeders under NJY scheme, but also on account of additional power purchases.

Also, the T&D losses could not be relied upon in totality, as it was calculated on assumption basis, as brought out in paragraph 2.1.29.

Another objective of NJY linked to reduction in distribution losses was the increased metered sales. The results of test check of feeders for metered sales, peak load, T&D and AT&C losses are graphically represented below. An increased metered sales coupled with improvement in AT&C losses, increases the financial efficiency of NJY.

Chart No.2.1.7: Evaluation of other objectives of NJY including metered sales, peak load, T&D and AT&C losses



GoK stated (January 2016) that assessment of distribution loss was yet to be done due to incomplete indexing of consumers, incomplete migration of metered installations to billing software and clubbing of feeders. Further, it stated that BESCOM was taking positive steps to resolve the issues.

Recommendation No.10: The ESCOMs need to address the reasons for non-reduction of T&D losses in the bifurcated feeders so as to reduce the additional power purchases at higher costs and also make available 24 hours of power supply as envisaged under NJY.

Financial viability of NJY

2.1.28. The total estimated cost of implementing NJY (two phases) by the four ESCOMs for 1,614 feeders was ₹ 2,123.73 crore. The total additional revenue per annum, envisaged to accrue to the ESCOMs after implementing the NJY

[64] Where T& D losses had not reduced (34 feeders).

was ₹ 725 crore mainly with the improvement in metered sales, reduction in T&D losses and transformer failures, and savings in Unscheduled Interchange (UI) charges. The payback period was an average of 3 years[65] for the ESCOMs, as a whole.

While the metered sales showed an improvement with 57 of the 80 test checked feeders, the envisaged reduction in energy sent out and distribution losses had not been met.

MECON Limited, Bengaluru, which was awarded (February 2014) the work of pre and post analysis of NJY phase-I and concurrent audit of NJY phase-II in Davanagere, Kolar, Bengaluru Rural and Tumakuru Circles of BESCOM in its Report (August 2014) for Davanagere Circle, indicated that there was increase in metered energy consumption, reduction in energy sent out from substation and had noted that commercial losses had remained near about the same while transformer failure was on the higher side.

Thus, as a result of the cumulative effect of non-achievement of these objectives, the envisaged savings in energy would not be achieved, affecting the revenue model. The payback period would increase from the present envisaged time-frame of three years.

In such a scenario, the ESCOMs can meet the envisaged objective of providing 24 hours of power supply to non-agricultural consumers and scheduled hours of power supply to IP consumers only through additional power purchases. As the cost of power purchase was in the range of ₹ 5 per unit, while the average realisation is in the range of ₹ 3.26 per unit, there would be loss to the ESCOMs for every unit of additional power purchased.

GoK replied (January 2016) that it had 'noted' the audit observation.

Recommendation No.11: The GoK needs to re-assess the financial model of funding the NJY as the ESCOMs have not been able to fully meet the objective of NJY in terms of reduction of T&D losses, delays in implementation and additional purchase of power.

Effect of NJY on IP subsidy

2.1.29. The GoK announced free power supply to all IP set consumers with motor-rating up to and less than 10 Horse Power (HP) with effect from August 2008. As per KERC orders, the GoK had to release the subsidy in advance to the ESCOMs. As majority of the IP sets are not metered, the ESCOMs prefer demand for subsidy on the GoK based on the assessed consumption with the tariff rates approved by KERC. The assessed consumption of IP sets and distribution losses were arrived at based on meter reading of feeders *predominantly* supplying power to IP sets, which was then extrapolated for the ESCOM. The details of subsidy are as under:

[65] The cost of implementing NJY for both phases, the total revenue envisaged and payback period were: BESCOM (₹ 732.41 crore, ₹ 217.86 crore, 3.40 years); CESC (₹ 495.16 crore, ₹ 301.80 crore, 1.60 years); HESCOM (₹ 465.60 crore, ₹ 87.81 crore, 5.30 years); GESCOM (₹ 440.70crore, ₹ 117.47 crore, 3.75years).

Table No.2.1.4: Details of IP subsidy

	2010-11	2011-12	2012-13	2013-14	2014-15
No. of IP consumers (in lakh)	18.66	19.58	20.43	20.90	22.34
Consumption (MUs)	12,646	15,502	16,697	16,616	17,580
Subsidy claimed (₹ in crore)	3,973.58	5,230.28	5,513.52	5,321.24	6,504.05
Subsidy released by GoK (₹ in crore)	3,536.14	4,468.89	5,334.73	5,482.02	5,564.52

The KERC, while conducting the Annual Performance Review for 2012-13 had directed each of the ESCOMs to henceforth report the actual IP sets consumption on the basis of data from feeder meters.

The ESCOMs, however, continued to prefer the subsidy claims on the GoK, based on assessment of the predominant feeders while preferring the claim for 2014-15. The subsidy claimed from GoK was, thus, not transparent and the distribution losses were not realistic.

Further, there are large number of IP sets, which remain unauthorised and the consumption of these also affect the assessed consumption and distribution losses.

Photo showing an unauthorised IP connection (including motors and portable transformers) – dated April 2015

Compliance with the directions of KERC is awaited.

In the Tariff Order 2015 dated 2 March 2015 including Annual Performance Review for 2013-14, KERC noted that several consumers had expressed before the Commission their view that ESCOMs might be showing part of their AT&C losses against IP set consumption reported by them. KERC noted that it had earlier issued several directives for Energy Auditing at the transformer level to enable detection and prevention of commercial losses and to assess the consumption of power by IP sets more accurately, but ESCOMs had not complied with the directions. KERC advised GoK to release 10 *per cent* of IP subsidy, from 2015-16 only if feeder level metering/consumption was recorded in the segregated feeders.

GoK replied (January 2016) that BESCOM had provided a software to its subdivisions to calculate technical losses and arrive at the consumption of IP sets, so that it could be used for claiming subsidy from GoK. GoK further stated that action had been taken to comply with the directions of KERC in other ESCOMs.

Recommendation No.12: ESCOMs need to comply with the directives of KERC on assessing the IP consumption based on meter readings in DTCs and IP feeders, so that the subsidy claim and distribution losses are realistic.

Conclusions

Audit concluded that:

- **NJY is showing positive results with the ESCOMs being able to provide about 20 hours of three phase power supply to non-agricultural feeders, as against 10 hours earlier. The achievement is partly owing to increased purchase of power. However, it did not achieve the envisaged supply for 24 hours a day.**

- **The quality of power supply had not improved with the interruptions continuing unabated.**

- **The reduction of distribution losses to enable supply for enhanced hours (24 hours) is yet to materialise to the extent envisaged under NJY.**

- **There was delay in implementation of NJY, mainly on account of deficiencies in preparation of estimates, delay in tendering, delay in bifurcation of loads from existing feeders, apart from constraints in labour and obtaining statutory clearances.**

- **The risk areas hampering the realisation of the success of NJY include :**

    - **failure to reduce the T&D losses in the NJY feeders as compared to rural/ mixed feeders,**

    - **failure of Special Design Transformer for providing single phase supply in IP feeders, due to non-installation of the overload protection,**

    - **resorting to manual operation at substation (Group Operating Switch) to provide power under rostering method, taking the situation to pre-NJY period,**

    - **clubbing of NJY feeders with other feeders and non-completion of LT side works, and**

    - **supply of power to IP feeders during peak hours and more than scheduled hours, even when the State faced a deficit in power.**

- **The directive of KERC to assess the consumption of IP sets with metering under NJY has not been complied with. As a consequence, the subsidy for IP set consumers, claimed from GoK was not transparent and the distribution losses were not realistic.**