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RAILWAY CONVENTION COMMITTEE

(1991)

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†14. Shri Madhavsinh Solanki
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*Shri Nitish Kumar, MP, nominated on 17 December, 1991 *vice* resignation of Shri Srikanta Jena w.e.f. 16 December, 1991.

#Shri C.K. Jaffer Sharief, MP, nominated on 18 April, 1994 *vice* resignation of Shri V. Krishna Rao, MP, w.e.f. 17 March, 1994.

@Shri Lokanath Choudhury, MP, nominated on 30 January, 1992, *vice* resignation of Shri Surya Narayan Singh w.e.f. 28 January, 1992.

$Shri O. Rajagopal, MP, nominated on 18 May, 1994, *vice* resignation of Shri Pramod Mahajan, MP, w.e.f. 17 May, 1994.

†S/Shri Manmohan Singh, Madhavsinh Solanki & Ajit P.K. Jogi, MPs nominated on 18 May, 1994 *vice* S/Shri Ramsinh Rathwa, Dayanand Sahay and Ch. Hari Singh, MPs, ceased to be Members of the Committee consequent upon their retirement from Rajya Sabha on 2 April, 1994.

SECRETARIAT

1. Shri S.N. Mishra	—	*Additional Secretary*
2. Smt. Roli Srivastava	—	*Joint Secretary*
3. Shri T.R. Sharma	—	*Deputy Secretary*
4. Shri R.C. Gupta	—	*Under Secretary*

INTRODUCTION

I, the Chairman of Railway Convention Committee (1991), having been authorised by the Committee to submit the Report on their behalf, present this Tenth Report on the subject of 'Progress of Modernisation Programme in Railways including Energy Conservation Measures'.

2. The Committee took evidence of the representatives of the Ministry of Railways (Railway Board) on 15 September, 1994. The Committee wish to express their thanks to the Officers of the Ministry for placing before them the detailed written notes on the subject and for furnishing whatever information they desired in connection with the examination of the subject. The Committee also appreciate the frankness with which the representatives shared their views, perceptions and constraints with the Committee. This enabled the Committee to come to right conclusion in the matter.

3. The Report was considered and adopted by the Committee at their sitting held on 24 July, 1995. The Minutes of the sittings of the Committee held on 15.9.94 and 24.7.1995 form Part-II* of the Report.

4. For facility of reference, the observations and recommendations have been printed in thick type in the body of the Report.

NEW DELHI;
August 8, 1995
Sravana 17, 1917 (*S*)

M. BAGA REDDY,
Chairman,
Railway Convention Committee

*Not printed. A copy laid on the Table of both the Houses of Parliament and five copies placed in Parliament Library.

REPORT

The challenges before the Indian Railways today are of a more fundamental nature than ever before. In spite of the limitations of resources and inherent uncertainties in long term planning, the process of rehabilitation, development and building up of an increasingly productive and efficient railway system has to be achieved. The basic approach to be adopted by the Indian Railways for meeting these challenges should be the large scale improvement in productivity of assets and manpower and achievement of high levels of reliability of all equipments. This concept of asset utilisation has assumed the importance in examining the ongoing modernisation programmes in Indian Railways.

To sustain the modernisation efforts in Indian Railways, upgradation of the existing technologies has become almost imperative. That's why, Indian Railways have been trying to do tremendous technological upgradation in several areas such as electrification, rolling stock, track renewal, signal and telecommunication system, computerisation, etc. which would enable the Railways to improve their quality of service, conserve the energy, reduce the pollution, ensure safety and provide other amenities to the passengers.

The Committee have found that it was only during the seventh Plan that some serious efforts were made for the modernisation of Indian Railways. During this period, high speed and efficient locomotives for both electrical and diesel traction were introduced. New design technology for coaches, chopper control, solid state interlocking, optical fibre, digital communication technologies, computerisation etc. have also been introduced. In the 8th Five Year Plan, the modernising efforts in the Indian Railways have also been given priority. Some of the main objectives in the 8th Five Year Plan are:

(i) Generate adequate capacity.

(ii) Complete the process of rehabilitation/replacement and renewal of overaged assets.

(iii) Modernise and upgrade the system to reduce cost and improve reliability.

(iv) Adopt unigauge-6,000 km. of metre/narrow gauge to be converted to broad gauge.

(v) Phase out steam locomotives completely on broad and narrow gauges by 1996-97

(vi) Electrify 2,700 route km. of dense corridors to reduce dependence on diesel fuel.

(vii) Expand and upgrade inter-modal operations including containerisation.

(viii) Improve manpower productivity.

Traction

The Indian Railways are the main artery of the nations inland transport, extending over 62,462 route kilometres of the three traction systems, i.e., steam, diesel and electric, nearly 49% of freight is hauled by diesel and the remaining predominantly by electric traction. 91% of passenger services (in terms of train km.) are operated by diesel or electric power and the rest by steam. In an effort to cut costs and improve efficiency, Indian Railways are going ahead with its policy of converting all routes to diesel and electric tractions.

1.2 The following table shows the gradual shift to diesel and electric tractions since 1950-51:

Percentage of train km. by types of traction

Year	Passenger				Freight		
	Steam	Diesel	Electric		Steam	Diesel	Electric
			Loco	EMU			
1950-51	93	—	2	5	99	—	1
1960-61	91	—	2	7	94	5	1
1970-71	77	7	7	9	46	39	15
1980-81	49	25	14	12	18	62	20
1989-90	25.0	39.8	22.5	12.7	3.5	62.6	33.9
1990-91	21.8	42.4	22.6	13.2	3.0	60.6	36.4
1991-92	19.6	43.5	23.6	13.3	2.5	59.6	37.9
1992-93	14.7	45.7	26.2	13.4	1.6	57.4	41.0
1993-94	8.7	49.4	28.4	13.5	1.0	53.7	45.3

1.3 Steam traction in Indian Railways is being rapidly withdrawn and it is expected to be completely phased out by the end of the 8th Five year Plan, except the places of tourist interest. The Ministry of Railways have stated that in the Seventh Plan, 2766 steam locomotives were phased out and 1310 steam locomotives were in service in Indian Railways as on 1.6.1994.

1.4 When the Committee desired to know as to how the phased out steam locomotives have been disposed off and what was their plan for disposing off the remaining steam locomotives, the Railway Board submitted the following:

> "The steam locomotives withdrawn from service had already completed their economic life and therefore, these were condemned and disposed of through auction. The remaining steam locomotives are

planned to be withdrawn from service by 1996-97 except for a few places where steam traction may be retained as a tourist attraction".

In this connection, the Ministry added:

"The steam locomotives withdrawn from service and having economic life are being utilised productively. They are being disposed off as scrap."

Railway electrification has assumed national importance because of the growing emphasis on conservation and substitution of oil energy. As a consequence of heavy industrial and economic development in the country, the traffic on the railway system has been growing rapidly and the originating freight tonnage has been 358.72 million tonnes in 1993-94 and 364.96 million tonnes in 1994-95. Thus, Railway electrification is going to make a very significant contribution in this rapidly growing transport effort of the Indian Railways. However, the Railway Electrification could not get that much importance in the 8th Plan as compared to the earlier 6th & 7th Plans.

1.5 The following table indicates the progress of electrification on Indian Railway:

Period	Route km. electrified	Period	Route km. electrified
Upto 1978	4,723	1990-91	831
Annual Plans (1978-80)	195	1991-92	726
VI Plan (1980—85)	1,522	VIII Plan	
VII Plan (1985—90)	2,812	(1st year 1992-93)	479
		(2nd year 1993-94)	505
		(3rd year 1994-95)	473
		(4th year 1995-96)	600 (Target)
Total (as on 31.3.1995)	12,266		

1.6 In this connection, the Ministry of Railways have stated in their written replies that the original target of electrification of 3500 kms. during the VIII Plan has been revised to 2,700 kms. due to constraints of resources. Asked to justify the revised 8th Plan target in the electrification work, the Railway Board stated as follows:

"As against an allocation of Rs. 1709 crores for electrifying 3500 route kilometre in the VIII Plan envisaged then, only Rs. 1350 crores was allocated and therefore the target was reduced to 2700 route kilometre of electrification. In case the outlay is enhanced, a corresponding increase in route kilometre of electrification would be possible."

However, it has been stated that in the 6th as well as in the 7th Plan the amount asked for by the Railways has been allocated for completing the projects of Railway electrification taken in hand during those plan period.

1.7 On being asked to state the major considerations for sanctioning a railway electrification project, the Ministry of Railways replied:—

> "Electrification of railway tracks is a continuous process. Electrification projects are undertaken on techno-economic merits and operational requirements on a section-to-section basis. As the electrification project is a capital intensive, only high traffic density BG routes qualify for electrification within the prescribed guidelines. At present, the minimum rate of return on the investment is specified as 14% over diesel traction."

1.8 In regard to the total savings accrued to the Indian Railways an account of electrification, the Ministry submitted as under:—

> "The total savings likely to accrue as a result of electrification is not readily quantifiable. However, the latest cost of haulage per thousand GTKM on electric traction is Rs. 38.30 as against Rs. 43.31 on diesel traction. Further, every Rs. 100 crores invested on electrification results in a saving of approx. Rs. 27 crores worth of diesel oil at the prevailing prices."

1.9 As the electric locomotives have got less maintenance cost, less fuel consumption, longer life, less pollution, high spead potential over the steam and diesel locomotives, the Committee wanted to know as to why the Ministry of Railways have not taken a decision to replace the steam engines by electricity ones instead of diesel locomotives.

In their reply, the Railway Board stated as follows:—

> "As per present policy, the electrification of a route is taken up if the Rate of Return on the capital Investment is more than 14% when compared with diesel traction. This necessarily requires a certain level of traffic density. There are no routes at present working with steam traction exclusively and therefore the question of replacement of the same by electric traction does not arise. Replacement of steam locomotives directly by electric Locomotives even historically was not considered possible because of constraints of production capacity for electric locomotives, flexibility of diesel traction *vis-a-vis* traffic level and gestation period of capital intensive electrification projects."

1.10 On the supply of power for electric traction, the Committee enquired whether the Ministry of Railways have faced any problem in purchase of electricity from the State Electricity Boards. The Ministry, in thier reply, have stated the following:—

> "During the last few years, the State Electricity Boards have raised tariffs frequently, Such rises are disproportionate to the increase in

cost of generation and distribution. High tariff affects viability of electrification schemes."

1.11 In this context, it may be mentioned that, the Committee in their 9th Report on the 'Rate of Dividend' for 1995-96 and other ancillary matters, found that as on 30.11.1994 an amount of Rs. 1095.92 crores was recoverable from the various State Electricity Boards of which the NTPC Badarpur, DESU, Haryana Electricity Board, and Uttar Pradesh Electricity Board were major defaulters. The outstanding arrears had not been liquidated so far, despite repeated requests made to the concerned State Governments. This has invariably affected the net surplus and the ability of the Indian Railways to fund their developmental activities. Recent increases in the power tariff have also resulted in additional burden on railway revenues.

1.12 When the Committee wanted to know the steps taken to overcome the problem of high power tariff, the Railway Board stated:—

"It was decided to approach Ministry of Power to permit the Central Generating Agencies to sell power directly to the Railways, the tariff being cheaper. The Ministry of Power has since permitted direct sale of power by Central Generating Agencies to Railways, action is on hand to avail of direct supply of power from their switch-yards at locations which are conveniently proximate to the Railways' system. The first project taken up is to avail of NTPCs power supply from their Dadri and Auriya Switching Yard for the Delhi-Kanpur section which has Railway's own transmission lines."

1.13 In this connection, they further added:—

"The Power Purchase Agreement as well as the tariff for the power to be supplied by NTPC are yet to be finalised, negotiations with NTPC and Ministry of Power are in progress."

The State Electricity Boards from whom Railways purchase electricity and the rates thereof are given in the Appendix.

Rolling Stock

1.14 The fleet of rolling stock, consisting of locomotives, coaches and wagons, constitutes the bulwark of the railway assets. The adequacy of this fleet, together with its efficient upkeep and optimum serviceability, are matters vital to the operation of this system. The issues pertaining to production and maintenance of rolling stock have, therefore, assumed importance in any kind of appraisal of the modernisation in the railway system.

1.15 For a better understanding of the growing importance of the rolling stock in the Indian Railways, it will be helpful to get a birds eye views of

the rolling stock holdings. The following table brings out the comparative position at the end of 1950-51 and 1993-94:

Rolling Stock Holdings

Item	Holding in 1950-51	Holding in 1993-94
Steam Locomotives	8,120	911
Diesel Locomotives	17	4,174
Electric Locomotives	72	2,117
Electrical Multiple Units	460	3,527
Conventional Coaches	13,109	30,561
Wagons (in units)	2,05,596	3,12,405

Source: Railway Board's Year Book 1993-94.

The above table reflects only the quantitative change. There has also been a substantial change in technology. This is illustrated by the fact that the tractive effort of the locomotives has risen manifold; new coaches with better layout and more seating capacity are being manufactured and wagons having higher payload, and speed potential are put into service for optimum utilisation of line capacity. This also reflects a pace of investment in rolling stock that has been quite high.

1.16 The Ministry of Railways, in their Memorandum, have informed the Committee that the diesel locomotive technology is being updated to make it more energy efficient. Asked to state the steps taken in this regard, the Ministry submitted the following:—

> "Technology upgradation is a continuous process. At the moment we are upgrading diesel locomotive technology by fitment of fuel efficient kits on newly built 2600 HP locomotives as well as retro-fitment at Diesel Component Works, Patiala. All newly built diesel locomotives are being fitted with fuel efficient kit. This fitment has also commenced at Diesel Component Works, Patiala during mid-life rehabilitation of diesel locomotives. We are also upgrading the technology further by increasing the Horse Power to 3100 HP. The first prototype locomotive has been turned out from DLW, Varanasi in August 1994 and is under trial on Northern Railway.

1.17 On this issue, when the Committee wanted to know whether the present locomotives would be upgraded or new locomotives would be purchased, the Chairman, Railway Board, deposed duirng evidence:—

> "The locomotives of 3100 HP is the new generation of diesel locomotives which we have developed. It is still based on the same technology as the old diesel technology which we have. It is an indigenous effort of improving the technology used in those locomotives. We have now brought it up to 3100 HP capacity. The first loco suitable for both freight and passenger traffic was rolled out of the Diesel Locomotive Works on 22 of August. It is our attempt

that different passenger and freight versions of this locomotive should be manufactured so that these will perform all-out services and thus we can overcome the problems of 2600 HP locomotive which we had earlier as the mainstay of the diesel fleet of the Indian Railways. It is totally an indigenous effort. Therefore, there is no intention of importing this 3100 HP locomotive at all."

1.18 Regarding the upgradation of electric loco-technology, the Ministry of Railways have stated the following:—

"Electric loco-technology is being upgraded through use of thyristor control and the latest state of art, energy efficient three phase traction motors. Eighteen 6000 horse power locomotives with thyristor control have been introduced during Seventh Plan period. As for three phase technology, a letter of acceptance for import of 20 freight and 10 passenger locomotives, with transfer of technology, has been issued. The arrangements to be made for manufacture of these locomotives at CLW are being worked out by CLW in consultation with M/s. ABB under the transfer of technology agreement. Rs. 25 crores have been provided in current years budget for augmenting the CLW manufacturing capacity to 150 locos per annum and creating facilities for manufacture of three phase locomotives."

1.19 Asked to state the break-up of 25 crores provided in the budget for 1994-95 for augmentation of facilities for manufacturing 150 electric locomotives as well as series manufacture of 3-phase 6000 HP locomotives, the Railway Board, in their post evidence reply, stated as under:—

"The cost for augmentation of facilities for increasing the loco manufacturing capacity from 130 to 150 locomotives per year is about Rs. 8.53 crores. The balance amount is for augmenting/ modifying facilities to absorb the technology transferred so as to manufacture the 3-phase high horse power locomotives as envisaged initially."

1.20 When the Committee wanted to know by when coaches of new designs, lighter and longer requiring lesser maintenance would be introduced, the Ministry of Railways submitted the following:—

"A tender for modern coaches, with Transfer of Technology, which are lighter, reliable in operation and requiring lesser maintenance, is under consideration. Indigenous efforts to improve the existing design bring a continuous process, are also being pursued."

1.21 In this connection, they further added:—

"It is proposed that these coaches would be manufactured at Rail

Coach Factory, Kapurthala. Soon thereafter, Integral Coach Factory, Madras will also start manufacture to the new design. These coaches would be capable of universal use."

1.22 Elaborating the point further, the Chairman, Railway Board, stated the following during evidence:

"We are having a very active programme for improvement of coaches designs for higher speed capabilities. Hopefully, the first prototype coach from RCF will come out in the month of November or December this year for trial runs. It is also true that we have a tender under consideration for import of certain coaches but we have not yet taken any decision on that".

1.23 The Ministry of Railways have informed the Committee that manufacture of 2-axle wagons has been completely stopped and that new B.G. Stock being procured is all 8 wheel bogie stock, fitted with air brake, high capacity couplers and tapered roller bearings. Asked to state the details of the plants manufacturing 8 wheel bogies and the cost incurred thereon, the Railway Board have stated as under:

"There are 11 established wagon builders in the Public and Private sector engaged in manufacture of wagons apart from a small capacity in Railway Workshops. Production of 4 wheeled wagons was stopped from 1983-84. The output for BG stock from all these sources was partially changed to eight wheeled (Bogie) wagons in early sixties, while Air Brakes, Cartridge Type Taper Roller Bearings and high capacity Couplers were introduced in early eighties. The cost varies from wagon to wagon and typical BOXN wagons present day cost is Rs. 10.5 lakhs. The Brake vans are still four wheel wagons and these are being manufactured only in one Railway workshop".

1.24 The Ministry of Railways have stated that wagon procurement was revised from 1,50,000 to 1,20,000. When the Committee wanted to know the reasons for this revision, the Chairman, Railway Board, stated as under:

"Because of reduction in lead, our total transport output has not grown to the extent we thought it should be. As a result of this, this year, the requirement of wagons was not to the extent we anticipated. In fact, there is a distinct case for downward revision of the procurment of wagons during the Eighth Plan period if this particular trend of reduction in lead continues."

1.25 Explaining the reasons for such decline and the steps taken in this regard, he added:

"There is a particular problem in generation of traffic. In the railway language, we call it 'less than wagonload and less than trainload' as compared to the bulk transportation of raw materials like iron, steel, coal, cement and fertilisers. For this, we have

developed two strategies. One is that we are developing nodal goods sheds. A full-fledged terminal coupled with Container Corporation will serve an area of 150-200 sq. kms. so that with containerisation of such a less-than-wagonload and less-than-trainload traffic, we should be able to serve the customers who cannot produce a trainload. With this strategy, a change has been brought about. This is what we are going to expand so that we should be able to pick up such customers who are now in the manufacturing business and produce this type of traffic. This is the two-pronged strategy which we have."

1.26 On being asked whether the decline in the numerical strength of the wagons have hampered the efficiency of the system, the Chairman, Railway Board deposed the following during evidence:

"It is true that in numerical terms the number of wagons have not grown to the extent the track has grown. But, we have inducted a much superior technology into our wagons. We are in the process of phasing out old wagons. Now, most of our new fleets are on roller bearings. We are rapidly phasing out the four-wheeler wagons and we are getting bogie wagons which are more reliable and have better carrying capacity. Similarly, we are gradually phasing out the vaccum brake systems of our wagons. We are now inducting air-brakes to give much braking power. Therefore, with the much better braking power, the reliability of operations is going to improve.

1.27 Giving details about the private sector participation in 'own your wagon scheme', the Chairman, Railway Board stated:

"We have been trying to encourage our customers to have their own wagons. We call it 'own your wagon' system .... on 'own your wagon scheme', initially we had a few restrictions as a result of which we got very limited results. It is approximately 800 wagons which came up. Therefore, after reviewing the scheme in the month of February this year we have proposed another much more liberalised scheme and as a result of that scheme we hope that more people will get attracted to this particular scheme".

1.28 Elaborating this point further, he added:

"We have had a lot of enquiries about this because people are now re-evaluating their part because of the liberalised features which have been incorporated in the new scheme and as such now we have one of the main ideas of this particular scheme. It would be a direct transaction between the person who wishes to own a wagon and the wagon manufacturer. He need not go through the railways. So, presently we may not have the full details as to how many people have placed orders for these wagons. But my information is that, M/s Larsen and Toubro, M/s Indian Oil and to some extent some other cement factories have already come up with their demand for owing wagons".

1.29 When the Committee expressed their unhappiness over the progress achieved in this field, the Chairman, Railway Board clarified during the evidence:

> "I would like to submit that 800 wagons is a very substantial number and, moreover a rake of wagons involves an investment of Rs. 3-4 crore. It is also a substantial sum of money. Therefore, people do take a little time to frame up as to what should be the terms for transactions. That is why we found that there were some problems with the earlier scheme consequently leading to its liberalisation".

1.30 With regard to the upgradation of the design and technology of electrical multiple units (EMUs), the Committee were informed that the Ministry of Railways have approved the improvements in the existing design of EMU by incorporating provision of Chopper Control equipment in lieu of resistances for starting purposes in DC EMUs over Bombay area, development of 3 phase drive for AC EMUs to reduce maintenance/ operating cost, stainless steel in lieu of mildsteel for the corrosion prone sections and exhausy fans for improving the ventilation. Energy savings of upto 25% are expected with use of Chopper Control Technology.

1.31 In this connection, the Ministry added:

> "The chopper control technology for DC EMUs was developed indigenously by Indian Railways viz. RDSO, Central Railway and Bhabha Atomic Research Centre and Department of Electronics. The proto-type equipment has been manufactured indigenously by M/s BHEL, Bhopal and M/s ECIL, Hyderabad. As regards 3-phase drive for AC EMUs, a development order has been placed on M/s BHEL, Bhopal in April, 1994. RDSO frames the system specifications, approves designs, conducts stage inspections and proto-type testing of equipment and gives the clearance for running of systems".

1.32 On being asked about the steps taken to tap the export potential of rolling stock, the Railway Board in their reply stated as under:

> "Indian Railways have already taken steps to tap export potential of rolling stock. Recently, orders have been received for supply of 15 coaches to Vietnam. Further offers have been submitted to a number of countries in South East Asia and Africa for supply of coaches and locomotives".

1.33 However, the Committee during their study tour to DLW, Varanasi found that the Production Units did not enjoy the requisite amount of freedom in the field of export, marketing etc. which seriously limited the export potential of the locomotives and other rolling stock items of the Indian Railways.

Workshops and Sheds

1.34 It is a fact that beyond certain levels, productivity of assets rather than their numerical proliferation is the correct crucible of capacity, In this context, the neglect of maintenance infrastructure over a large number of years has had a serious effect on the productivity of Railway Workshops. That's why, the efficiency of maintenance has become a vital factor affecting the transport capacity.

1.35 Modernisation of the workshops was first identified in the Corporate Plan framed in 1976 and forms a major component of the Indian Railways Modernisation and maintenance project. To 'oversee the progess of procurement of the machinery and plant, the Railway Board had set up a Central Organisation for Modernisation of Workshops (COFMOW) in 1979. It has been entrusted with procurement of machines common to the various Zonal Railways. It has prepared 815 technical specifications for sophisticated tools from Indian and Foreign suppliers so far, and procured machinery and plant worth Rs. 514 crores. It is now extending its role to new areas, some of which are:

(i) Conversion of Metre Gauge machines for use on Broad Gauge in view of the "Unigauge" policy of IR.

(ii) Plan re-building/re-conditioning of older machines to avoid procurement of new machines.

(iii) Retro-fitment of modern controls for improving productivity of the existing machines.

1.36 Modernisation of Workshops is being carried out in a phased manner since 6th Five Year Plan. To obtain maximum benefits out of modernisation, efforts are being made to streamline the systems approach of the entire workshop, or even a chain of workshops, with application of the modern techniques of layout and projecting planning for securing both economy and efficiency of workshops. In this connection, the Ministry of Railways have pointed out that 52 locomotive and Rolling Stock Repairing Workshops on Indian Railways have been reduced to 44. Asked to state that rational behind this proposal, the Ministry stated the following:

> "The number of locomotive and rolling stock repair workshops on Indian Railways is currently 44. With the scale of operations in the following eight workshops being uneconomical, they have either been closed for converted for undertaking other repair activities during the Seventh and Eighth Plan periods—Andal (E. Rly.), Adra (S.E. Rly), Morvi (W. Rly.), Jaipur (W. Rly), Udaipur (W. Rly.), Gondal (W. Rly), Pandi (N.F. Rly.), Bagdogra (N.F. Rly.)".

1.37 When the Committee wanted to know the manner in which the surplus staff have been utilised, the Railway Board stated the following:

> "The surplus staff are being redeployed in areas where additional staff are needed, after imparting necessary training, as required."

Track Maintenance

1.38 With the introduction of high pay-load bogie, wagons, gradual replacement of steam by diesel/electric loco and the increase in both the number and load of goods/passenger trains, the track has been extensively subjected to heavier axle leads and speeds, even though in differing degrees. Therefore, maintenance of track to a high standard and their periodic renewal are essential not only to promote safety, but also to effectively handle the growing profile of rail-borne traffic.

1.39 The Railway network consists of Broad, Metre and Narrow gauges totalling 108.920 track km. gauge-wise breakup as on 31st March, 1994 is given in the following table:

Gauge	Route Km.	Running Track Km.	Total Track Km.
Broad Gauge	37,824	53,560	76,295
Metre Gauge	20,653	21,643	28,156
Narrow Gauges	3,985	3.985	4,469
Total:	62,462	79,188	108,920

In their memorandum submitted to the Committee, the Ministry of Railways have stated that about 4000 kms. of track has been brought under mechanised maintenance during the 7th plan period.

1.40 Asked to state the total cost involved and the recurring expenditures on this track, the Railway Board stated:

> "Mechanisation is an ongoing process, and planning for track tamping machines is done taking the holistic view, which includes requirement of tamping for track renewals, construction of new lines, gauge conversion works and for maintenance. Proportionately, for 4000 Km. of maintenance tamping, taking tamping cycle as once in two years, the requirement of high speed tampers would be four numbers at a cost of Rs. 12 crores. The recurring expenditures including that on staff, spares and fuel works out on an average to about Rs. 2500/- per km. of track tamped. For 4000 Kms., this would be Rs. 1 crore".

1.41 When the Committee wanted to know the target for track renewal in the 8th Five Year Plan, the Ministry of Railways submitted:

> "At the beginning of the VIII Five Year Plan (1.4.92), arrear of overdue track renewals stood at about 9600 kms. on BG and MG. However, with the adoption of unigauge policy in the first year of the VIII Plan itself, the planned renewals on MG routes became redundant except for a minimal reduced quantum input of renewals on safety considerations. Thus, the arrear of track renewals on BG at the beginning of the Plan (1.4.92) stood at about 4560 kms. which was reduced to 4320 kms. as on 1.4.93."

1.42 While framing VIII Plan, it was planned to complete and liquidate all overdue renewals during the VIII Plan itself. This would have amounted to carrying out 2980 kms. of track renewals per year (910 kms.- 4560/5 of overdue renewals per year on BG in addition to the current arisings of 1820 kms. on Bg and 250 kms. of minimal renewals on MG on safety considerations per annum) However, due to overall reduction in VIII Plan size, the present plan of action is, to liquidate track renewal arrear in A, B and C routes in the VIII Plan itself and for D & E routes by the end of IX Plan.

1.43 Year-wise targets and actual achievements during the VIII Plan as stated by the Railway Board are as under:

Year	Target (in km. CTR)	Actual
1992-93	2550	2938
1993-94	2420	2814
1994-95	2400	-

From the above table it is noted that the track renewal carried out in 1993-94 in much less than the previous year. The uniguage policy and the financial constraints accounted for the above shortfall.

1.44 Clarifying the position, the Chairman, Railway Board deposed during evidence:

> "Initially we submitted a Plan in very specific terms for consideration of Planning Commission involving an expenditure of Rs. 45,600 crores which was approved at the level of Rs. 27,202 crores. As a result, initially whatever we had envisaged had to be prioritised and finally included in the Plan which was approved by the Planning Commission. In certain spheres where the physical targets were earlier considered, had to be tailored down....We had to reduce track renewal from 21,000 km. to 12,500 km."

1.45 The Ministry of Railways, in their written replies, stated that Indian Railways formulated a 10 year action plan in 1987 for the rehabilitation of the weak formation. Out of the identified target of 2416 kms., 2159 kms., of weak formation. I have been rehabilitated by 30.4.1994 with the available technology.

1.46 When being asked about the research made to upgrade the existing technology in the field of rack renewal, the Railway Board stated:

> "For technology upgradation, the Indian Railways have in collaboration with IIT/Kanpur initiated studies on the effect of repetitive loading on railway formation and evolve a methodology for its design. The study has been completed and methods for implementation of the study are under planning at RDSO".

1.47 The Committee also desired to know the steps taken in improving the sub-grade system, inadequate depth of ballast and sub-ballast, lack of drainage etc. in the Railway formation, the Railway Board submitted the following:

> "Railways have been taken several steps to improve the formation and sub-grade. Some of the sailent area where action has been taken are:
>
> (i) Making up deficient formation width.
>
> (ii) Making up of ballast on such locations on important routes where it is found short.
>
> (iii) Improve quality and obtain consistent grading of ballast by using mechanically broken ballast.
>
> In regard to the sub-ballast, RDSO is continuously studying the problem and has evolved a new technological concept for providing sand blended with local soil as sub-ballast.
>
> Continous indentification of bad drainage area is carried out. During 1991-92, a special survey was made to locate such areas. 703 kms. of track was found having vitiated drainage system. Out of these, improvement has been made on 611 kms. Standard drawings for optimising the drainage arrangements have been prepared and circulated to all Railways".

1.48 Asked to state as to what extent, the track renewal in Indian Railways is mechanised, the Ministry of Railway stated:

> "Mechanisation of Track laying has been continuously increasing over last few years as seen from the following data:

Year	Total primary track renewal done	Length laid with machines			Length laid with m/c as % of primary renewals
		TRT[$]	PORS[@]	TOTAL	
1990-91	2709	696	35	737	27
1991-92	2656	766	160	926	35
1992-93	2364	1094	168	1232	53
1993-94	2316	1106	279	1285	55"

1.49 In this regard, the Committee wanted to know the contribution of Track Relaying Train (TRT) in the field of mechanised track renewal. The Ministry of Railways stated:

> "The Track Relaying Train (TRT) is used for mechanised track renewal. During 1993-94. 179 kms. and during 1992-93, 168 kms. of track was renewed with Track Relaying Train".

1.50 Enquired as to what perspective plan have been drawn to increase the line capacity so as to carry the additional traffic which will be thrown open to Indian Railways by the turn of the century, the Chairman, Railway Board replied as follows during evidence:

> "When a particular stretch of track starts having a train density of 60 Gross Million Tones and above, we consider it very heavy. There are about four of five sections of Indian Railways which have either reached or are reaching this level. All other sections are much below this figure. So, the yardstick has been fixed basically to utilize the track upto 60 GMT. In arriving at this particular figure, the track structure has been taken into account. For, a more intensive utilisation would tend to restrict the cycle of renewal. On the basis of the cycle of renewal, we have decided that this 60 GMT is the optimum level. As soon as the track starts reaching that level, we think of diverting the track or developing another route. So, presently, it appears to me that the system as such will be enough for dealing with this level of density".

Signalling and Telecommunication

To cope with rising traffic density on some routes and to meet better safety standards, Indian Railways is steadily modernising its signalling systems by introducing panel interlocking, multiple aspect signalling, track circuits etc.

1.52 Asked to state the salient features of each of these systems, the Ministry of Railways stated as under:

"**Panel Interlocking**

Centralised electrical operation of points and signals from a control panel in station master's office known as panel interlocking is provided for smaller stations on trunk routes and important main lines which are electrified or where reliable power supply is available. Use of electrical point machines for operation of points increases the range of operation, thus, adds to the flexibility of yard design. The operation of points and signals from a centralised panel makes the operation easier and faster reducing the time for arranging crossing etc. of trains, thus, improving the sectional capacity.

Multiple Aspect Signalling

Signalling system capable of displaying more than two aspects is known as multiple aspect signalling. In such a system, the train driver is adequately pre-warned while approaching a stop signal. With this additional information, the driver is in a better position to regulate the speed of his train for stopping short of the stop signal at 'ON'.

Multiple Aspect Colour Light Signalling (MACLS) making use of colour light signal is being provided in increasing number on important main lines and trunk routes. This provides better visibility and safety even at higher speeds.

Track Circuits

Electrical circuit using rails of the track monitors the presence of vehicles in the portion of track so maintained. This information is used to interlock the signals to prevent clearance of signals for such lines when occupied. By providing track circuiting the dependence of the Station Master personally verifying the clearance of the track for admitting the train is eliminated thus enhancing safety".

1.53 The Indian Railways is rapidly converting to digital microwave technology and optic fibre to bring about qualitative improvement in telecommunication network. When asked to state the utilities of digital microwave technology, the Ministry submitted:

"The Microwave technology enables transmission of information between two points following 'Line of sight' propagation. This system requires use of repeaters at regular intervals. Digital

technology which uses the latest state of art development results in a much more reliable and noise free communication on such links".

1.54. They added that the total cost involved in providing station to station digital microwave system on 18 GHz on Mughalsarai—Pradhankanta Section over a stretch of 400 kms. on Eastern Railway is Rs. 31.95 crores.

1.55 In this connection, the Committee wanted to know as to whether the Indian Railways is contemplating any proposal to introduce the above system in other areas. The Railway Board, in their reply, stated:

"Provision of station to station 18 GHz digital microwave system is in progress on Pradhankanta-Khana, Burdwan-Howrah (Main Line), Burdwan-Howrah (Chord) and Sealdah South sub-urban sections of Eastern Railway at a total cost of Rs. 93.26 crores".

1.56 Explaining the benefits of introducing the optical fibre communication system the Ministry of Railways stated:

"Telecommunication cables have generally been using copper conductors, which are prone to corrosion and thefts. Optical Fibre Cable consists of Silica Fibre Cables which can carry a larger volume of voice and data communication as compared to the conventional cables. These cables are also free from thefts as there is no metallic part. The fibres carry light signals and provide communication channels which are immune to electro-magnetic interference".

1.57 The Ministry of Railways further informed the Committee that optical fibre communication links have been commissioned on Bombay-Virar, Durg-Nagpur, Harsi-Bhusaval and Itarsi-Nagpur Sections and all these are working satisfactorily.

1.58 When the Committee desired to know the total cost for providing such optical fibre links, the Ministry submitted the following:

Link	Total cost
Churchgate-Virar	Rs. 10.93 cr.
Durg-Nagpur	Rs. 16.02 cr.
Itarasi-Bhusaval	Rs. 10.97 cr.
Itarasi-Nagpur	Rs. 15.28 cr.

1.59 The Committee also wanted to know as to whether the Indian Railways is considering any proposal to provide such type of fibre optical

communication links in other sections of the Indian Railways. The Railway Board, in their reply, stated the following:

"There is a proposal to provide optical fibre communication on the following Railways:

Railway	Section	Total Cost
Central	Bombay VT-Kalyan	Rs. 8.44 cr.
Northern	Allahabad-Mughalsarai	Rs. 18.75 cr.
Northern	Delhi area as part of FOIS Project	Rs. 15.00 cr.
South Eastern	Tatanagar—Chakradharpur	Rs.14.03 cr."

1.60 In reply to a question as to when the need to modernise the signalling and telecommunication was first felt in Indian Railways, the Ministry stated:

"Modernisation of signalling and telecommunication systems was initially felt in 1962 after recommendations of Kunzru Railway Accidents Enquiry Committee 1962. However, actual thrust for modernisation started from 6th Five Year Plan."

1.61 Furnishing the details about the progress made in the field of signalling and telecommunication, the Minister of Railways submitted the following:

"Growth of Modern Signalling & Telecommunication System on the Indian Railways

	As on 31.3.1985	As on 31.3.1990	As on 31.3.1993
1. Panel Inter-locked stns. (No. of stns.)	601	961	1266
2. Multiple aspect colour light signalling (No. of stns.)	1404	1999	2209
3. **Track Circuiting** (No. of stations)			
(a) Fouling Mark to Fouling Mark on run through lines	2026	2594	2813
(b) Fouling Mark to Block Section Limit	642	986	1212
(c) Fouling Mark to Fouling Mark on loop lines on Trunk route & important Main lines	708	1105	1213

On Indian Railways, initially, the communication was provided by the P&T Deptt. These consisted mainly of physical wires on overhead alignment running parallel to the Railway track. These were later on supplemented by high frequency radio circuits for long distance speech and wireless telegraphy.

In the sixties when AC electric traction was introduced, communication was provided by the Department of Telecommunication on underground cables to avoid electromagnetic interference. As the needs of the Indian Railways grew, and where the DOT was not able to fulfil Railways requirements, the Railways provided their own communication links. The Indian Railways gradually provided its own network of underground cables and microwave links and telephone exchanges to provide communication to their centres of activity."

1.62 Elaborating this point further, the Railway Board stated:

"In the Eighties, as new technologies of switching and transmission became available, electronic exchanges, ultra high frequency and very high frequency radio communication systems were introduced. Optic fibre cables have since been provided on some of the newly electrified sections of Indian Railways alongwith train radio communication giving the facility for the driver, guard and control to be in communication with each other.

Presently the following modern communication assets are provided on Indian Railways:

Digital Exchanges	36,055 lines
18 GHz. Microwave	437 route Kms.
Digital Microwave	313 route Kms.
Optic Fibre Cables	953 route Kms.

1.63 Asked as to how far these modernising efforts have been able to ensure safety in Railways, the Ministry of Railways stated the following:

"With gradual introduction of modern signalling devices, upgradation and modernisation of track structure, continuous rehabilitation of overaged assets, monitoring of the quality of out-turn of rolling stock, intensive inspections, counselling and training of vital categories of staff, both passenger and freight train accidents have been coming down steadily in the last ten years.

To bring about reduction in accidents caused due to staff failure and also to provide them more technical aids, certain signalling devices viz. panel interlocking, Multiple Aspect Colour Light Signalling and track circuiting etc., are being introduced progressively. The train passing staff are getting better equipped to facilitate safer and speedier train movement. Panel interlocking and track circuiting are gradually reducing dependence on human element. Though full coverage of these devices at all stations is not yet complete, their benefits have started accruing and the role of station staff in causing collisions and derailments at stations has been showing signs of decline. Multiple aspect colour light signalling gives additional and adequate pre-warning to the driver about the next signal and improves his level of confidence. It is significant to point out that number of train accidents caused by loco running staff has been declining over the past few years."

1.64 When the Committee wanted to know the factors accountable for accidents including derailment and collision in the Railways, the Ministry of Railways submitted:

> "The main factors responsible for train accidents are failure of railway staff, equipment failure, lapses of persons other than railway staff (such as road vehicle users) sabotage and other incidental causes. The main causes of collisions include non-observance of rules while passing signals, overshooting of 'danger' signals, loss of control, poor enginmanship by drivers, reception of train in an incorrect manner or on a line which is already occupied or by sending the train into occupied section by station staff of a train running into an obstruction etc. The main causes of derailments include maintenance lapses on the part of track maintenance staff, carriage and wagon maintenance staff, equipment failure related to loco, carriage and wagon and track etc."

1.65 Enquired as to what extent the Indian Railways are capable of taking care of these modernising efforts with its present state of R&D base, the Ministry of Railways stated:

> "RDSO is equipped to take care of design and development work relating to modern signalling systems like panel interlocking, multiple aspect colour light signalling and track circuting and modern telecommunication systems like Digital Microwave, Optical Fibre Communication and Digital Exchanges etc. A number of drawings and specifications have been issued. RDSO also undertake type approval and inspection of these items."

1.66 When the Committee wanted to know whether the Ministry of Railways had approached any public sector undertakings/multinational companies for providing R&D facilities for their modernising efforts, the Railway Board submitted the following:

> "Axle counter block working system has already been developed while solid state interlocking system is under development by the joint efforts of RDSO, Central Electronics Ltd. (CEL), Department of Electronics (DOE) and IIT, Delhi. Fibre Optic Railway Signalling and Communication System is under development jointly by RDSO, DOE, IIT, Madras and M/s. ECIL."

1.67 Asked to state the share of imported and indigenous technologies in the signalling and telecommunications modernisation, the Government replied as follows:

> "Share of imported technology in the present modernising process in the field of Signalling and Telecommuncation is very insignificant. Most of the signalling equipments used on the Indian Railways are indigenous, however, Remote Control and Train Information System (RTIS) recently installed in Delhi has been imported. Some of the suppliers of telecommunication equipment, both in private and public sector, have got tie-up with foreign collaborators for transfer of technology."

1.68 Regarding Remote Control Train Information System (RTIS) the Ministry of Railways explained as under:

> "RTIS introduced in Delhi Area as a pilot project is generally functioning satisfactorily. Under this system Remote Control of the stations is being done from time to time as and when required. Necessary information about running of trains is being relayed through split flap display boards at Delhi, New Delhi and Hazrat Nizamuddin Stations for the benefit of passengers. Video display units have been installed at enquiry offices including the centralised enquiry. The system is in experimental use."

1.69 Giving the details of foreign exchange involved in importing telecommunication equipments from abroad during the last 3 years, the Railway Board furnished the following figures:

Equipment	Foreign exchange involved
1. RTIS in Delhi area	£5,75,295
2. Track to train mobile communication equipment for Delhi-Mughalsarai section of Northern Railway	304.40 M Yen 15.5 M DKK
3. Main telecom cable for railway electrification from China	US $ 27,15,482
4. Procurement of digital Capacitance Unbalance Measuring sets for RE works	DM 456,876

1.70 Asked to state as to how the signalling and telecommunication system used by Indian Railways compare with such systems used elsewhere, the Ministry of Railways submitted the following:

> "Signalling systems in a number of developed countries of Europe and Asia are much advanced as these deploy, on large scale, facilities of centralised traffic control, automatic block working, automatic signalling and automatic train control and stop facility through cab signalling. On the Indian Railways also a beginning has been made towards this and subject to constraints of finances, the signalling systems are being modernised on priority sections.
>
> The telecommunication systems in advanced countries use the latest technologies for meeting voice and data transmission needs. These circuits permit computer networking and transmission of large volumes of data. Most advanced countries also have independent back up systems to achieve very high reliability of communication".

Computerisation

1.71 Computerisation is one of the corner stones of the broad strategy adopted to meet the demands for modernising the systems, flow of information and development of human resources. The Ministry of Railways have planned an ambitious computerisation programme for implementation. The application of computers in engineering, accounting and personnel administration, freight operation information, transportation, production planning, workshop service and reservations on Indian Railways is significant and sizeable.

1.72 One of the most spectacular application of computer technology in the service of common man has been the railway Passenger Reservation System (PRS). PRS started in 1985 as a pilot project at New Delhi. The avoid objective was to provide reserved accommodation on any train from any counter, preparation of train charts and accountal of the money collected. This system was enhanced in 1987 to cover the entire Delhi Metropolitian area. In the same year, computerised reservation facilities were provided in Bombay and Calcutta by setting up new computer centres with hardware similar to Delhi and the same software as at Delhi. Subsequently, Madras was also computerised on a similar pattern. By 1988, the four metropolitan cities had computerised railway reservation on four independent computer systems. In further expansions, it was decided that only one more computer centre would be set up at Secunderabad and all the locations will be computerised through provision of remote terminals.

1.73 Asked to state as to whether computerisation in the PRS increased the efficiency of the Indian Railways, the Railway Board stated:

> "The computerisation of passenger reservations has led to vast improvement in the quality of service offered to the passengers. It has reduced service time, to just 2 to 3 minutes, shortened queue lengths and waiting time, eliminated errors and substantially reduced the malpractices which had earlier been associated with reservation work. The passengers can obtain reservation tickets for all trains for any date in the advance reservation period at any counters. This universalisation of counters was not possible in the manual system. Due to this, the need for passengers to stand in different queues has been virtually eliminated. Computerisation has also enabled the opening of reservation counters in different locations in the metropolitan areas and thereby reduced travelling time required by the people to procure reservation tickets. The passenger reservation system (PRS) has increased the efficiency of Indian Railways by improving the productivity of the staff, and by optimising the utilisation of seats and berths."

1.74 When the Committee desired to know as to whether any study has been conducted on the efficiency and cost effectiveness achieved by the PRS, the Ministry of Railways submitted the following:

> "A study of the efficiency and cost effectivness of the computerised reservation system as compared to the manual reservation system has been got conducted by the Zonal Railways. The average cost of issue of a reservation ticket under these two systems has been adopted as the criterion of the study and for this purpose all the fixed and recurring cost under each system have been taken into consideration. The average cost of issuing a reservation ticket under the computeised reservation system is Rs. 10.76 as compared to the manual reservation system in which (on the basis of sample studies) it works out to be Rs. 4.73. The main reason why the computerised reservation ticket costs more than the manual reservation ticket is that the former is more capital intensive than the latter".

1.75 The Ministry of Railways have further stated that although the computerised reservation system costs more than the manual reservation system, it provides a variety of benefits both to the passengers as well as railways. These benefits are briefly brought out below:

"(i) with the introduction of computerisation, the yardstick of 150 passenger transactions in an 8-hours shift in the manual process has been revised to 200 passenger transactions in a shift of 6 hours. This roughly shows an improvement in man-hour productivity by 75%.

(ii) Considerable reduction in the waiting time of the intending passengers for obtaining reservations has been achieved.

(iii) Universalisation of counters enables passengers to get tickets from any counter for any destination by in any train/class of their choice. In case the accommodation in the first choice is full, the option to choose a different route or different train/class or a different date without changing his queue is also available to him.

(iv) Automatic updating of the reservation status of a passenger on the waiting list takes place whenever any cancellation is done.

(v) With the provision of remote terminals at a limited number of locations, obtaining of immediate onward and return journey reservations has become possible.

(vi) Computers have enabled the benefits of cancellation of reservations being passed on to the next persons on the waiting list without any extraneous interference.

(vii) The number of messages issued in connection with the provision of reservations has been considerably reduced.

(viii) Computer prepared charts are a definite improvement over typewritten charts, as they are legible and have larger letters. Typing errors in the manual process have been totally eliminated in computerised chart printing; charts can simultaneously be printed in bilingual form.

(ix) Refunds in respect of cancellations, are available across the counter for three days after the scheduled departure of the train;

(x) It is possible to obtain refund for tickets purchased from one computer terminal at another computer terminal which is not in that city. This major convenience has been widely appreciated by the passengers.

(xi) The scope for malpractices by tampering with the reservation records, has been virtually eliminated.

(xii) The accountal system has become easier with the introduction of the computerised system. All accounting reports are now generated by the system.

(xiii) Information is available to the management regarding any aspect of reservations done such as peak period reservations, variations in the waiting lists and destination-wise demand during different periods of the year. This is of considerable help in planning new trains and for attaching additional coaches on trains during the peak period.

(xiv) It has become possible to set up a much larger number of reservation counters at satellite reservation offices at different locations to cater to the increasing demand of passengers".

1.76 The Ministry of Railways have also stated in their written replies that the PRS has virtually eliminated the scope of malpractices by tampering with the reservation records. The Committee, however, wanted to know as to whether any fraud reservation racket has thrived in the recent time. They, in their reply, submitted:

"The system software has in built security measures which prevent any unauthorised access to the information stored in the computer, yet, it may be brought out that some anti-social element are taking advantage of scarcity of accommodation and buying tickets in fake names in advance and trying to sell them to ready passengers on premium. These are transferred tickets reuse of such tickets is illegal and is an offence. To prevent this, extensive checks are carried at reservation centres and on trains. As a result 2496 such tickets have been detected during 1994 upto August. The figures of 1993 and 1992 respectively are 7272 and 9054. Compared to the number of computer reserved tickets that are being sold daily, it will be appreciated that the incidence of these cases is extremely low".

1.77 On being asked whether railway employees were also involved in these rackets and if so, what action was taken against them, the Ministry of Railways stated:

> "The purchase of transferred tickets is generally by touts who sell them on premium and thus earn profit by submitting requisitions in false names. However, in some cases involvement of Railway Employees are found guilty of facilitating the sale of such tickets. Wherever such instances come to notice, serious view is taken by the Ministry and disciplinary action is taken against the staff".

1.78 Asked to state the eligibility conditions required for a station to qualify for having computerised PRS, the Railway Board apprised the Committee as under:

> "The stations are selected to the provision of computerised reservation system primarily on the basis of their volume of work load. In selected cases, other aspects such as the city being a State Capital or a place of tourist interest, etc. are also kept in view. The target for the provision of this system being pursued currently is to cover all stations with a reservation workload of 300 and above".

1.79 To another question as to how many stations are likely to be computerised during the 8th Plan, the Ministry of Railways replied:

> "Until July' 94 61 stations, accounting for about 82% of the total reservation work load on the Indian Railways had been provided with the computerised reservation facility. This number included 31 stations where this facility had been provided prior to the 8th Plan period. Out of 61 stations, at 45 stations full-fledged computer reservation facilities exist and at 16 stations the reservation work has been partially computerised. In addition, in 10 cities a total of 43 satellite locations have been opened. It is proposed to computerise the reservation work at about 120 locations in 1994-95 taking the percentage of computerised reservations to 92. During 1995-96 and 1996-97 a total of 25 more locations (including 10 stations) are proposed to be provided with this facility. During the 8th plan period, therefore, a total of 160 locations will have been provided the PRS facility".

1.80 When asked to state the total amount of fund earmarked for computerised PRS in the 8th Plan, the Ministry of Railways furnished the following details:

> "The requirement of funds during the 8th Plan Period was initially projected to be Rs. 45 crores. During the years 1992-93 and 1993-94 a total amount of Rs. 25.43 crores was spent on the execution of PRS works. In view of the need to provide reservation services of improved quality to the travelling public, which has received the computerised reservation system with appreciation, the provision of this facility has been planned on a more ambitious scale during the

current financial year, when it is proposed to cover all the stations having a workload of 300 reservation related transactions per day. This would involve an expenditure of about Rs. 40.40 crores. During 1995-96 and 1996-97 the various works relating to the computerised reservation system would call for a total expenditure of about Rs. 44 crores. The total amount already spent and what is projected to be spent during the 8th Plan Period would thus work out to about Rs. 110 crores".

1.81 For the networking of the Pssenger Reservation Systems a project has been undertaken. The trial of the new software has been completed in the stand-alone mode at Secundrabad and it is now being used for operational purposes regularly. The trial of the networking software will be taken up within a few months. The project is now slated to be completed by the end of December 1995.

Human Resource Management

182. Indian Railways is the biggest employer in the country. It had 16,23,158 regular employees and 83,000 casual labour as on 31st March, 1994. The managment development of officers has been restructured through executive, senior management and strategic management development programmes in phased manner. In house programmes are also being developed to keep the officers in touch with the latest technological and mangerial development.

183. Training of officers is conducted in the following 5 centralised training institutes:

(i) Railway Staff College, Vadodara

(ii) Indian Railway Institute of Civil Engineering, Pune;

(iii) Indian Railway Institute of Signal Engineering and Telecommunications, Secunderabad;

(iv) Indian Railways Institute of Mechanical and Electrical Engineering, Jamalpur; and

(v) Indian Railways Institute of Electrical Engineering, Nasik.

1.84 Apart from this, there are 160 training centres catering to the needs of the training of non-gazetted staff Modular system, simulators for training of loco-drivers, scientifically developed lesson plans and development of multiple skills formed the cove of training programmes for the non-gazetted staff. To aid training and redeployment, computerised man-power planning information system is being installed in all the divisions of Indian Railways.

1.85 It has been stated by the Ministry of Railways that introduction of new technology as well as upgradation of the existing ones is imperative for the modernisation of Indian Railways. When the Committee desired to know as to whether any perspective plan has been drawn to provide

appropriate training to the railway employees for this purpose, the Railway Board stated as follows:

> "To provide appropriate training to the railway employees to update their skill and knowledge to cater for new technology as well as upgradation of the existing one, Indian Railways have made considerable headway in developing structured training programmes for all categories of staff. The modular training programmes are being designed and developed in the form of training modules by nominated Senior Administrative Grade Officers of each railway for a particular department which constitutes working group for that department. Course content, duration and frequency of the courses have been planned keeping in view the entry level qualifications/ experience of the staff, technological upgradation taking place within and out of the railways and changing expectations of the Railway users. Training courses have been designed for various stages of the career of the staff *i.e.*, induction, promotion, refresher and conversion from one skill/trade to another.

1.86 To ensure that modules are implemented more effectively and gainfully in the shortest possible period, detailed lesson plans have been developed for most of the modules specifying the teaching methods to be used, aids required and detailed timings for individual topics.

In this connnection, the Ministry further added:

> "Training courses and techniques are continously updated by the members of the working groups on the basis of feed back received from the field on the staff performance, their deficiencies and specific requirments of individual areas of work centres. Special modules are immediately prepared and implemented as and when any technological upgradation or change in the work systems take place. The latest special modules developed are on air brake systems, fire fighting, accidents and disaster management.

1.87 Asked to state the steps taken by the Ministry of Railways to retain the staff rendered surplus an account of change of technology to facilitate their suitable redeployment, the Ministry stated:

> "For retraining of staff rendered surplus on account of change of technology or other reasons, Ministry of Railways has done detailed department wise and zone-wise evaluation of surplus staff not only in the past but for the future also. A study has also been done to locate the vacancies and new developing activities where these staff would be redeployed.
>
> Major arising of surplus staff is from steam traction, manual signal maintenance, of tracks and closure of yards owing to changes in the pattern of trains moment. Programme based trainng is given to these surplus staff to redeploy them in diesel and electrical maintenance depots/sheds, air brake systems, running category, electric signal

maintenance, mechanised maintenance of tracks, travelling ticket examinations and computerised ticket booking centres. 14485 number of surplus staff were retrained/redeployed in the new developing activities and against the vacancies in the year 1993-94."

1.88 Asked to state the total number of staff identified as surplus due to modernisation programme, the Member Staff, Railway Board, stated during evidence as under:

"The total number of staff who became surplus due to the closure of some steam sheds, some marshalling yards and some goods sheds was 20,076. Out of that around 15,000 people have been trained and redeployed. The balance of around 5,000 people are under different phases of training and would be absorbed in other activities after completion of the training."

1.89 In this connection, he added:

"There has not been any retrenchment either due to modernisation of the existing technology or due to introduction of new technology."

1.90 When the Committee wanted to know the nature of the training courses and techniques adopted in all the zonal Railways, the Railway Board stated as follows:

"A large proportion of the training relates to operations, safety and maintenance procedures. This is by and large common on the complete system. In such cases the Ministry introduces modules of training with a common syllabus for different categories and for different stages of career progression. However, Railways are given the options to modify the modules and training techniques to suit the local requirements of the Railways. They may in addition introduce special courses which may be necessary from time to time."

1.91 In reply to a question as to whether the trainers also get overseas training, the Railway Board stated:

"Depending upon the availability of opportunity of training abroad trainers have been sent for training abroad both in technical areas as well as training techniques. While technical training has mostly been confined either on the Railway system of advanced countries like UK, Japan or the suppliers of railway equipment, the training in training techniques have been in the professional institutes in U.K. like Thames Valley College, Slough."

Energy Conservation

1.92 Energy conservation is an issue of global concern since limited fuel resources are being rapidly exploited. For our developing economy, which is not self-sufficient in petroleum products, it is important to save on energy. The emphasis on Railway electrification and rapid phasing out of steam locomotives has enabled Railways to establish the falling trend in

the specific energy conservation. Railways are vigorously pursuing various measures for better utilisation of fuel for traction purposes and for controlling energy consumption in other sectors.

1.93 When the Committee wanted to know the specific steps taken to improve energy efficiency, the Ministry of Railways stated that some of the important measures taken in this regard are as under:

1. Phasing out of thermally inefficient Steam Locos during 1993-94, 811 Steam Locos were condemned and 361 more Steam Locos have been condemned upto Aug. '94 during the current year. It is proposed to completely phase out Steam Locos on B.G. by the end of 1994-95.
2. Intensive training of drivers through Simulators for ensuring that they acquire proper driving techniques to conserve fuel—For this purpose 2 Simulators have been installed on Indian Railways. These Simulators have been provided at Diesel Loco Shed, Tuglakabad and Electric Loco Shed, Kanpur.
3. Provision of fuel efficient kits on Diesel Locos, 104 Diesel Locos have already been provided with fuel efficient kits on Indian Railways.
4. Procurement of wheel-flance lubricators.
5. Energy Audit of several major establishments have been undertaken and recommendations are being implemented.
6. Provisions of Chopper Control for 1500 V DC EMU's—One EMU rake fitted with Chopper Control Unit has been commissioned on C.Rly. and 3 more rakes are proposed to be introduced during 1994-95.
7. Introduction of 3-Phase Invertor Drive on electric locos.
8. Steps are being taken to educate drivers to do coasting to save energy. Also trails of energy meters on electric locomotives are being carried out with a view to monitor electric consumption.
9. Improvement in Power Factor through installation of Capacitor Banks at feeding points.
10. Use of Long-Welded Rails for track—On Indian Railways 19318 Kms. of track has already been converted into long welded track.
11. (a) Switching off locomotives idling in the years.
    (b) Switching off blower motors when trains are waiting for signals.
    (c) Switching off trailing locos when only one loco in a multiple unit is capable of hauling loads.

1.94 To a question whether such measures have resulted in improving specific energy conservation in Indian Railways, the Railway Board

submitted the following year-wise break up of specific fuel consumption on different traction:

	Diesel Traction		Electric Traction	
	(in litres/'000 GTKM)		(KWH/'000 GTKM)	
	Pass.	Freight	Pass.	Frieght
1989-90	5.42	3.46	20.8	9.60
1990-91	5.37	3.46	20.6	8.96
1991-92	5.37	3.42	20.5	8.99
1992-93	5.29	3.41	20.1	8.97
1993-94*	5.23	3.25	19.5	8.60

1.95 In their Memorandum submitted to the Committee, the Ministry of Railways have stated that in order to arouse awareness for energy conservation in Indian Railways, the following steps have been taken:

"As part of the awareness campaign, posters and stickers have been put up in workshops and other consumption points, quiz programmes have been organised and scheme for suggestions from employees initiated. Massive awareness campaign has been launched."

It has also been stated in the Memorandum:

"Our efforts to make the railway staff aware of the importance of Energy Conservation continues. The salient features of the awareness campaign launched by different Zonal Railways are as follows:

(i) Training at all levels regarding energy conservation has been started.
(ii) Seminars displaying energy conservation possibilities are being displayed prominently.
(iii) Posters displaying energy conservation possibilities are being displayed prominently.
(iv) Essay and Quiz competitions are being held.
(v) News letters regarding the achievements of various Railways are being issued.
(vi) Schemes to motivate staff for Energy Conservation have been launched."

1.96 When the Committee wanted to know the overall spending of the Indian Railways on the publicity campaigns, the Railway Board furnished the following figures for the information:

1990-91	Rs. 1,41,796
1991-92	Rs. 1,97,081
1992-93	Rs. 1,30,000

1.97 Elaborating further on this point, the Ministry of Railways have stated as under:

> "The campaigns were successful in bringing about a positive awareness among the railway staff towards energy conservation. The media publicity in the Hindi, English and vernacular languages reached the message of importance of energy conservation to a large cross-section of the general public."

1.98 Asked to state whether the Ministry of Railways have made any effort to tap the solar energy for the consumption in the Indian Railways, the Railway Board submitted as follows:

> "Solar energy is being used on the Railways for electrification of Railway Stations, lighting of signals, heating of water in hospitals, running rooms, etc. Photo-voltaic cells are also used for distilled water plants for train lighting batteries, etc. At present more than 2000 signals have been provided with electric lighting fed from solar panels. Further, at 38 Railway Stations electrification has been done through solar photo-voltaic modules. During 1994-95, 26 stations have been programmed for electrification through SPV modules."

Recommendations and Observations

1.99 The Committee note that the challenges before the Indian Railways today are more of a fundamental nature than ever before. Inspite of the limitations of resources and inherent uncertainties in long term planning, the process of rehabilitation, development and building up of an increasingly productive and efficient railway system has to be achieved. The basic approach to be adopted by the Indian Railways for meeting these challenges should be the large scale improvement in productivity of assets and manpower and achievement of high levels of reliability of all equipments. This concept of optimum asset utilisation has assumed the importance in examining the on-going modernisation programmes in Indian Railways.

1.100 The Committee feel that in order to sustain the modernisation efforts in Indian Railways, upgradation of the existing technologies has become almost imperative. It is therefore necessary for the Indian Railways to make tremendous technological upgradation in areas such as electrification, rolling stock, track renewal, signal and telecomunication system, computerisation etc. which would enable the Railways to improve their quality of service, conserve energy, reduce pollution, ensure safety and provide other necessary amenities to the passengers.

1.101 The Indian Railways are the main artery of the nation's inland transport, extending over 62,462 route kilometres of the three traction systems, i.e. steam, diesel and electric. The Committee find that about 49% of freight is hauled by diesel and the remaining predominantly by

electric traction. 91% of passenger services are operated by diesel or electric power. The percentage of train kilometres moved by electric traction increased from 2% in 1950-51 to 28.4% in 1993-94 in respect of loco traffic and from 5% to 13.5% in respect of EMU traffic during the same period. Railway electrification has also assumed national importance because of the growing emphasis on conservation and substitution of oil energy. Every Rs. 100 crores invested on electrification results in a saving of approximately Rs. 27 crores worth of diesel oil at the prevailing prices. As a consequence of heavy industrial and economic development in the country the traffic on the railways has been growing rapidly and the originating freight tonnage has been 358.72 million tonnes in 1993-94 and 364.96 million tonnes in 1994-95. The Committee find that the railway electrification could not get that much importance in the Eighth Plan as compared to the earlier Sixth & Seventh plans as could be seen from the fact that the originating target of electrification of 3500 kilometres during the Eighth Plan has been revised to 2700 Kms owing to constraint of funds.

1.102 The electrification programmes envisaged for the Sixth and Seventh Five Year Plans were accorded high priority in view of the national considerations. The Committee have observed that there was no shortfall in allocation of fund as asked for by the Railways in these plan periods. However, the electrification was not given the same thrust in the Eighth Five Year Plan.

1.103 The Committee are constrained to find that only 984 route kilometres could be electrified in the first two years of the Eighth Five Year Plan and the target fixed for 1994-95 was only 500 route kilometres. The Committee would require the Ministry of Railways to achieve the target of electrification of 2700 route kilometres during the Eighth Five Year Plan and that the production capacity for electric locomotives need also to be augmented. The Ministry of Railways should also identify the routes which are likely to be taken up for electrification during the Ninth Five Year Plan.

1.104 From the material furnished and evidences tendered before the Committee they find that there is no control of the Ministry of Railways over the Electricity tariffs fixed by various State Electricity Boards. The average cost per unit of traction energy varied from Rs. 1.88 to 3.10 in 1994-95. Being a public utility service of national importance, the Railways are, instead of enjoying any benefits, made to pay a rate which is in some cases even higher then industrial tariffs.

1.105 In this connection, the Committee have been informed that the Ministry of Railways have taken a decision to approach the Ministry of Power to permit the Central Generating Agencies to sell power directly to the Railways at a cheaper rate. However, the Committee depricate the lackadaisical manner in which this issue has been taken up at the Railway

Board level. The power purchase agreements as well as the tariffs for the power to be supplied by NTPC/NHPC are yet to be finalised. The Committee, therefore, desire that the process of direct power purchase agreement may be finalised speadily so as to enable the Indian Railways to regulate the tariffs for railway traction in an uniform pattern throughout the Country.

1.106 The Committee note that there were 7202 locomotives with the Indian Railways as on 31.3.1994 and the import content in the Railway Production Units of locomotives as percentage of total production costs, excluding proforma charges varied from 4.8% to 8.63%. The Committee desire that all out efforts must be made by the Railway Production Units to meet the 100% requirement for manufacturing of locomotives indigeneously without resorting to further imports.

1.107 The Committee have also been informed that the Railways are importing 6000 HP 3-phase 'State-of-Art' loco technology and the necessary facility for series manufacturing of these locomotives is being provided at Chittaranjan Locomotive Works. They desire to know the latest position in this regard and are of the firm view that the diesel locomotives technology need also to be upgraded so that the requirement of Indian Railways could be met fully.

1.108 Keeping in view the transport requirements of the Railways, the Planning Commission agreed for procurement of 1,20,000 wagons during the Eighth Five Year Plan. However, the Committee find that the Ministry of Railways had further reduced it to 81,000 wagons. The Committee desire that the Ministry of Railways should endeavour to acquire 81,000 wagons during the Eighth Five Year Plan and place orders with the Wagon Manufacturing Units well in time so that they may not starve for orders.

1.109 There is also a need to upgrade the design and technology used in Wagon Industry. The Committee, therefore, desire RDSO, Lucknow to look into this aspect so that increasing trailing loads on most of the important routes could be increased.

1.110 From the information supplied by the Ministry of Railways the Committee have found that a tender for modern coaches, with Transfer of Technology, which are lighter, reliable in operation and requiring lesser maintenance, was under consideration of the Ministry of Railways. The Committee would like to know the lastest position in this regard. They need hardly to emphasize that continuous efforts should be made to improve the existing design of coaches indigenously.

1.111 As regards the upgradation of design and technology of Electrical Multiple Units (EMUs), the Committee have been informed that the Ministry of Railways have approved the improvements in the existing design such as incorporating provision of Chopper Control Equipment in lieu of resistances for starting purposes in DC EMUs, use of stainless steel in lieu of mild steel for the corrosion prone sections, development of 3 phase drive

for AC EMUs etc. The Committee could like to know the total expenditure incurred so far on this account and the total amount on energy savings etc.

1.112 The Ministry of Railways have informed the Committee that they have taken steps to tap export potential of rolling stock. The cumulative value of exports upto the end of March, 1994 was Rs. 102.49 crores. The exports included M.G./Air-Conditioned and ordinary sleeper coaches, M.G./N.G. diesel locos and reconditioned freight stock to Vietnam, Nepal, Bangladesh and Myanmar Railways. Offers have also been made to a number of Countries in South-East Asia and Africa for supply of coaches and locomotives. However, the Committee strongly feel that no conscious effort has been made to develop and nurse these markets by Indian Railways so far. In this Connection, the Committee were informed during their Study Tour to Diesel Locomotive Works, Varanasi that the Production Units do not have direct contact with the buyers for which the report about the performance of the exported locos is not available to them. Instead, RITES and IRCON have been keeping direct contact with the buyers. The committee are of the firm view that instead of obtaining orders through RITES and IRCON, Railways units should be allowed to take orders directly from the Countries. Till a decision in the matter is taken by the Ministry, the Committee, feel that a feed back cell needs to be set up in RITES and IRCON to apprise the Production Units of the performance of their exported locos, thereby enabling them to have a typical kind of business approach in the field of export and marketing. They also urge to have more transparent system in Indian Railways in the field of export especially at a time when the economic liberalisation demand autonomy to tackle the competitive market forces.

1.113 The Committee strongly feel that the rolling stock manufacturers of Indian Railways must step up their research and development work for developing appropriate design to tap the emerging export potential. The Committee during their visit to DLW, Varanasi were also informed about the dismal state of in-house R&D facilities of the plant. As poor R&D facilities hamper both the efficiency and productivity of the Indian Railways, the Committee recommend that the Ministry of Railways must take due care to enable the Production Units to absorb the latest State-of-Art technology in their own field of Production and Maintenance.

1.114 The Comittee observe that the workshops are still in the old era notwithstanding the current efforts of modernisation. The Railway Reforms Committee (RRC), 1982 in their Report on Production and Maintenance of Rolling Stock have located few perennial problems afflicting the Railway Workshops. They were of the view that the workshop and Shed Management are primarily out-turn oriented, and no proper planning cells are in existence. There is virtually no exposure to contemporary developments in the field of machine tool technology, production systems etc. at any level. Therefore, the RRC emphasized the need for

rationalisation, perspective planning, improvement in the material management system, economies of scale etc. to enable the workshops to keep viable lay-outs, plant and equipment and trained man-power.

1.115 The Railway Convention Committee during their visit to few workshops and Production Units have also found that, as of today, Workshops are not geared up to perform their modern role. The modernising efforts in the field of Planning and Management are still found wanting. Even, these Production Units/Workshops do not have any capability to exploit the export potential of their own products. In the present state of liberalisation and competitive market forces, these Workshops and Production Units do not enjoy any freedom in the field of marketing, export etc. Therefore, the Committee reiterate the recommendation of the Railway Reforms Committee and hope that Ministry of Railways will now implement those recommendations which are of paramount importance for the modernisation of Railway Workshops.

1.116 With the introduction of high pay-load bogie, wagons, gradual replacement of steam by diesel/electric locos and the increase in both the number and load of goods/Passenger trains, the track has been extensively subjected to heavier axle loads and speeds, even though in differing degrees. The Committee are of the view that maintenance of track to a high standard and their periodic renewal are essential not only to promote safety, but also to effectively handle the growing profile of rail-borne traffic. The Committee have been informed that as per the present action Plan of the Ministry of Railways it is proposed to liquidate track renewal arrear in A, B and C routes in the Eighth Plan itself and D and E routes by the end of Ninth Plan. Similarly, out of the identified length of 2416 Kms. of weak formation, 2159 Kms. have been rehabilitated by 30.4.1994. The Committee desire that every effort should be made to liquidate track renewals during the Eighth Plan and to rehabilitate remaining weak formations.

1.117 Signalling promotes safety in train operations. It is an essential means for optimising the usage of rolling stock and track capacity. Modernisation of signalling and telecommunication systems was initially felt in 1962 after recommendations of Kunzru Railway Accidents Enquiry Committee, 1962. However, actual thrust for modernisation started from Sixth Five Year Plan itself. Though, the Committee note that there has been an increasing demand for growth of modern signalling and telecommunication system on the Indian Railways *viz.* Panel Interlocking, Multiple Aspect Colour Light Signalling, Track Circuiting, Optical Fibre Communication etc., yet they feel that such systems have so far been provided only to a limited extent.

1.118 One of the factors responsible for accidents including derailment and collusion is poor signalling and telecommunication system. The Committee, therefore, desire that the main thrust of the Indian Railways should be on modernisation of signalling and telecommunications system. As

the Indian Railways are not capable of taking care of the modernisation efforts with its present state of R&D base, the Committee recommend that the Indian Railways should approach Public Sector Undertakings/ Universities, I.I.Ts and other Institutes of excellence for providing R&D facilities.

1.119 The Committee observe with satisfaction that the computerisation came to the rescue of the Railways at a time when the manual system for reservation was threatening to break down with increasing volume of traffic. However, they note that Computerized passenger Reservation System has not been able to check fraud as the CPRS has never been a fool proof system. The increasing incidence of fraud computerized reservation tickets have questioned the very rationale of the system, notwithstanding its relative advantages over the manual one. Moreover, the CPRS is highly capital intensive as per the result of the study undertaken by the Zonal Railways. The average cost of issuing a reservation ticket under the computerized reservation system is Rs.10.76 as compared to the manual reservation system in which it works out to be Rs.4.73. The Committee, therefore, desire the Indian Railways to take steps to reduce the overhead cost. The Committee also feel that given the present state of resource crunch in the Indian Railways, such capital intensive projects need to have been uniformly studied at the central level so as to determine economic viability and productivity of the system.

1.120 Indian Railways is the biggest employer in the country with 16,23,158 employees and 83,000 casual labourers as on 31.3.1994. Although in-house programmes are deveioped to keep the officers in touch with the latest technological and managerial development, yet the Committee have found that the present 5 centralised training institutes and 160 training centres are too meagre to meet their training efforts. As introduction of new technology as well as upgradation of existing ones is imperative for the modernisation of the Indian Railways, the Committee desire that the Indian Railways should draw perspective plan to provide appropriate training to the railway employees for the purpose. Simultaneously, necessary steps should also be taken to retrain the staff rendered surplus on account of change of technology so that this staff could be suitably re-deployed.

1.121 The Committee note that the energy conservation is an issue of global concern since limited fuel resources are being rapidly exploited. For our developing economy which itself is not self-suffcient in petroleum products, it is important to save on energy. The emphasis on railway electrification and rapid phasing out of steam locomotives has enabled Railways to establish the falling trend in the specific energy conservation. Inspite of the fact that the Railways are vigorously pursuing various measures for better utilisation of fuel for traction purposes and for controlling energy consumption in other sectors, continuous efforts have not been made to arouse awareness for energy conservation. The Committee are also concerned to note that the overall spending of the Indian Railways on

the publicity campaigns for energy conservation have come down from Rs.1.97 lakhs in 1991-92 to Rs.1.30 lakhs in 1992-93. The Committee desire that more funds should be allocated for publicity campaigns for energy conservation. The Ministry of Railways should also make vigorous efforts to tap the solar energy for their consumption so that the limited fuel resources available with the Country would be utilised for a longer period.

NEW DELHI;
August 8, 1995

Sravana 17, 1917(S)

M. BAGA REDDY,
Chairman,
Railway Convention Committee.

APPENDIX

(Vide Para No. 1.13)

State Electricity Board-wise Average Cost per Unit of Traction Energy

(Figs. in Rs.)

State Electricity Board/Power Supply Authority	Average Cost (as in 1994-95)
Haryana State Electricity Board	2.34
Uttar Pradesh State Electricity Board	*2.89
Madhya Pradesh Electricity Board	3.10
Maharashtra State Electricity Board	2.47
Gujarat Electricity Board	2.47
Rajasthan State Electricity Board	2.10
Andhra Pradesh State Electricity Board	2.15
Tamil Nadu Electricity Board	2.56
Karnataka Electricity Board	2.76
Delhi Electricity Supply Undertaking	2.96
Bihar State Electricity Board	2.68
Damodar Valley Corporation	1.88
Orissa State Electricity Board	2.24
West Bengal State Electricity Board	2.13
M/s. TATA	2.36

*For the first 6 months of year 1994-95.