REPORT OF THE WORKING GROUP
ON THE TELECOM SECTOR FOR THE
TWELFTH FIVE YEAR PLAN
(2012-2017)

GOVERNMENT OF INDIA
DEPARTMENT OF TELECOMMUNICATIONS
MINISTRY OF COMMUNICATIONS & INFORMATION TECHNOLOGY
(August, 2011)

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CHAPTER-1

1.0 Introduction

Planning Commission constituted a Working Group on the Telecom Sector to make recommendations on the various policy matters for the preparation of the Twelfth Five Year Plan for Telecommunications Sector vide their O.M. No. 13040/27/2011-CIT&I-WG (DOT) dated 21-06-2011 (Annexure-I). The composition of the committee and terms of reference of the working group are as given below:

1.1 Composition

1.	Shri R. Chandrashekhar, Secretary, Telecom	Chairman
2.	Secretary, Department of IT or representative	Member
3.	Secretary, Ministry of Finance or representative	Member
4.	Secretary, Ministry of Defence or representative	Member
5.	Secretary, Department of Space or representative	Member
6.	Secretary, Department of Commerce or representative	Member
7.	Secretary, Health or representative	Member
8.	Secretary Home or representative	Member
9.	Secretary, Department of Industrial Policy Promotion or representative	Member
10.	Secretary , Rural Development or representative	Member
11.	Secretary, Deptt. of Higher Education or representative	Member
12.	Secretary, School Education and Literacy or representative	Member
13.	Shri Chandra Prakash, Member ,Telecom Commission	Member
14.	Shri S.C. Misra, Member (Services), Telecom Commission	Member
15.	Shri Ajay Bhatacharya, Administrator (USOF)	Member
16.	Ms. Sadhana Dikshit, Member/Adviser (Finance), Telecom	Member

17.	Director General, NIC	Member
18.	CMD, BSNL	Member
19.	CMD, MTNL	Member
20.	Dr. C. Muralikrishna Kumar, Sr. Adviser (CIT&I), Planning Commission	Member
21.	Executive Director, C DoT	Member
22.	Sr.DDG, TEC	Member
23.	Shri Malay Shrivatava, JS, Telecom	Member-Convenor

Non Official Member

24.	Prof. Balakrishnan, IISc, Bangalore	Member
25.	Shri B. K. Zutsi, Former Vice Chairperson, TRAI	Member
26.	Prof. A. Jhunjhunwala, IIT Chennai	Member
27.	Prof. Bhaskar Ramamurthi, IIT Chennai	Member
28.	Prof. Karandikar, IIT Mumbai	Member
29.	Director General, COAI	Member
30.	Secretary General, AUSPI	Member
31.	Representative , FICCI	Member
32.	Representative , CII	Member
33.	Representative, ASSOCHAM	Member
34.	President, TEMA	Member
35.	Secretary General, ISPAI	Member

1.3   Terms of Reference of the Working Group on Telecom Sector –

i)   To evolve a strategy for telecom sector for the 12th Plan with the basic objective of development of world class infrastructure for supporting accelerated growth of all sectors of the economy.

ii) To review the existing policies/schemes of the sector and recommend the schemes to be retained/included in the Twelfth Plan.

iii) To make specific recommendations for roll out of rural broadband connectivity through strengthening augmentation, re-farming of spectrum and harnessing technology.

iv) To make recommendations of optimum utilisation of scarce spectrum resource and examine the possibility of creation of a Spectrum Relocation Fund. Indicate likely source and quantum of resources so generated and guidelines for the operation of the fund.

v) To evolve a Pricing Policy for service delivery looking at both the spectral efficiency and sectoral business viability. Also, suggest guidelines to encourage and incentivize introduction of spectrum efficient technologies.

vi) To make recommendations on further restructuring/reforms required in the post-convergence scenario including availability of spectrum, expansion of broad band and promotion of R&D.

vii) To suggest measures for further promotion of private sector investment and encourage entrepreneurship in the sector.

viii) To review the performance of telecom equipment manufacturing sector with identification of constraints and make recommendations for evolving an appropriate policy to promote indigenous manufacturing.

ix) To evolve strategy for making the conformance to national standards as mandatory for all telecom products, setting up of labs carrying out testing, certification and development of framework of Conformity Assessment Bodies (CAB) for testing, as well as furthering the activities under Mutual Recognition Agreement (MRA).

x) Skill Development: To evolve strategy for capacity building in telecom field through the newly constituted National Telecom Institute for Policy Research, Innovation and Training.

xi) Security related issues in Telecom: Implementation of the scheme for setting up of Centre for Communications Security Research and Monitoring and establishment of Centralised Monitoring System (CMS) and Centre for Telecom Testing and Security Certification.

xii) Implementation of Wireless Phone and Security Network.

xiii) The C-DOT projects related to development of GPoN, Technologies for rural areas, Broadband Technologies, Shared GSM Radio Access Network (SGRAN) etc.

xiv) Power is a major constraint in the country. Wind, solar and hybrid technologies could be leveraged through effective incentive packages for reducing carbon footprint.

xv)   Disaster Management: Building effective communication networks for providing effective communication during various Natural/Man-made Disasters.

xvi)   Issues related to PSUs: Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving Q&S, Planning and discovery of synergy amongst various units of DOT.

xvii)   Restoration of Budgetary allocation towards of USOF under Non-plan Budget.

xviii) Any other issue of importance to policy formulation for the telecom sector including creation of a consolidated database.

1.4   In the first meeting of the Working Group held on 18.07.2011 under the Chairmanship of Secretary, Telecom, it was decided to constitute following Sub Groups:-

  i)   Licensing and Spectrum Issues
 ii)   Broadband and Rural Telephony
iii)   Manufacturing, R&D, Product Standards and IPR
 iv)   Network Security Issues
  v)   HRD & Skill Development
 vi)   Schemes and Financing of Telecom Sector

The Terms of reference of Sub-Groups with composition is given in Annexure-II.

1.5   In the 2nd meeting of the Working Group held on 8th August, 2011, the six Sub-groups presented their reports followed by discussions. Based on the deliberations held in the meeting of the Chairpersons of Sub-groups on 30th August 2011, the Report of the working group has been prepared.

1.6   The Report contains 11 chapters. Chapter 11 summarizes the observations and recommendations of the Working Group.

CHAPTER-2

Current Status of the Telecom Sector

2.1   Introduction

Telecom sector has emerged as a major sector of growth in India during the last decade. This sector has significantly contributed to socio-economic development of the country. Indian telecom sector has achieved exponential growth particularly during the Eleventh Plan period resulting in growth of teledensity from 18.22 to 73.97 (as on 30.06.11). However, this is marked by disparities with rural areas exhibiting teledensity of about 35.64 as against urban teledensity of 162.74 during the same period. With 852 million mobile connections, mobile phones are no more a device in the hands of rich or upper middle class alone but are significantly emerging as a common man's device not only for voice telephony but also for accessing variety of services such as market information, health and education, financial services, entertainment and much more.

With just 12.32 million broadband subscriber base as of June 2011, Internet penetration (19.69 million) in India is abysmally low by contrast. Internet is, however, slowly emerging as an integral component of service delivery in number of sectors. Government services are beginning to be delivered through electronic channels making these services more and more transparent and efficient. ICT infrastructure and services are becoming all pervasive. This scenario offers a unique opportunity to leverage upon this strength of the country in all facets of ICT in next five years. A focused and coordinated push in the ICT sector during 12th Plan period will help India achieve inclusive and accelerated growth not only in knowledge and service sectors, but equally in industrial, economic and social sectors.

2.2   Expansion of the network

The telecom sector has shown robust growth during the past few years. It has also witnessed a significant shift from wireline to wireless phones as well as share of public sector vis a vis private sector in provisioning of telecom services. The following table shows the growth of telecom sector since March 2007:

Subscribers	Subscriber base (in million)					
	March'07	March'08	March'09	March'10	March'11	June'11
Wireline	40.77	39.41	37.96	36.96	34.73	34.29
Wireless	165.09	261.08	391.76	584.29	811.60	851.70
Total Phones	205.87	300.49	429.73	621.25	846.33	886.00
Internet	9.21	11.05	13.65	16.10	19.69	19.69
Broadband	2.29	3.81	6.22	8.77	11.79	12.32

Thus, the number of telephones has increased from 205.87 million as on 31.03.2007 to 846.33 million as on 31.03.2011 and further to 886.00 million as on 30.06.11, exhibiting a CAGR of 40.97% since March'07. Wireless subscribers increased from 165.09 million as on 31.03.2007 to 851.70 million as on 31.06.2011, exhibiting a CAGR of 47.12% since March'07.

During 2010-11, the wireless connections grew by 38.90%, whereas landlines registered a negative growth. The number of Internet subscribers grew by 22.30 %, while the broadband subscribers grew by 34.43%.

2.3 Present Status of Telecom Network

India's 886 million (June'11) robust telecom network is the 2nd largest (after China) with a wide range of services like basic, wireless, internet etc. The status of the network is as shown below:

Telecom Network Status

Items	March'2011	June'2011
Number of Telephone Subscribers (In million)	846.33	886.00
Number of Telephone Exchanges *	38526	38473
Switching Capacity * (In million)	137.68	138.07
Village Public Telephones (VPTs)*	575663	575996
Number of Wireless Subscribers (In million)	811.60	851.70
Broadband Subscribers (In million)	11.79	12.32
Optical Fibre Cable Rkms *	698557	700852
Microwave Systems Rkms (Digital) *	50430	50430

* Only of PSUs'

Further, National Internet Exchange of India (NIXI) has been set up by DIT to ensure that Internet traffic, originating and destined for India is routed within India. This has substantially brought down the cost of Internet usage.

2.4 Number of Licensees

The number of licensees in various categories as on 31.03.2011.

Number of Licenses (As on 31-03-2011) (Registrations/Licenses issued)		
Purpose/Area	No. of Licenses	
	31.03.2006	31.03.2011
Unified Access/ Cellular Mobile	134	279
National Long Distance	4	30
Infrastructure Provider-I	105	351
International Long Distance	5	25
Internet Service	399	376

Public Mobile Radio Trunk Service	37	42
VSAT Service	11	13

With the enabling policy and regulatory framework in the telecom sector, the share of private sector operators has been steadily increasing, as can be seen in the following table:

Number of Telephones (in million)

Year	PSUs' Network			Private Network			Total	%age Share of PSUs'
	Wireline	Wireless	Total	Wireline	Wireless	Total		
2007	37.46	33.93	71.39	3.31	131.16	134.48	205.87	34.68
2008	35.23	44.32	79.55	4.19	216.76	220.94	300.49	26.47
2009	32.92	56.63	89.55	5.04	335.13	340.18	429.73	20.84
2010	31.33	74.54	105.87	5.63	509.75	515.38	621.25	17.04
2011	28.69	97.31	126.00	6.04	714.29	720.33	846.33	14.89
June'11	28.17	99.23	127.40	6.12	752.48	758.60	886.00	14.38

The share of private sector in the number of telephones has increased from 65.32% (134.48 million telephones) in March 2007 to 85.62% (758.60 million telephones) in June 2011.

2.5 Wireless vis-a-vis Wireline

The preference for use of wireless phones has been predominant in the sector. This is confirmed from the rising share of wireless phones, which increased from 80.19% (165.09 million) in March 2007 to 96.13% (851.71 million) in June 2011.

Distribution of Telephones in March 2007
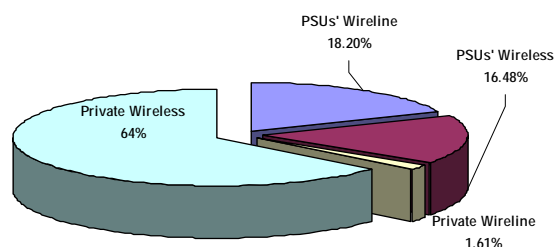
Distribution of Telephones in June'2011
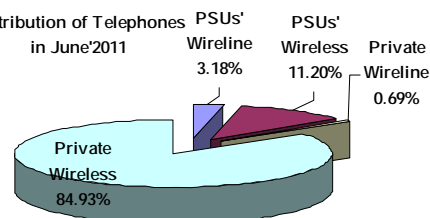
2.6 Trend in teledensity

Teledensity in the country is steadily increasing from 18.22 as on 31.3.07 to 70.89 as on 31.03.11 and currently stands at 73.97 as on 30.06.11.

However, there is a wide gap between urban teledensity (162.74) and rural teledensity (35.64). The rural telephony has not kept pace with the impressive growth in urban connectivity.

2.7 Rural Telephony

Over and above 298.10 million connections provided in the rural areas, 5,79,421 VPTs[1] have been provided till 30.06.11. Thus, 97.61% of the villages in India have been covered by the VPTs.

2.8 Tariff Changes

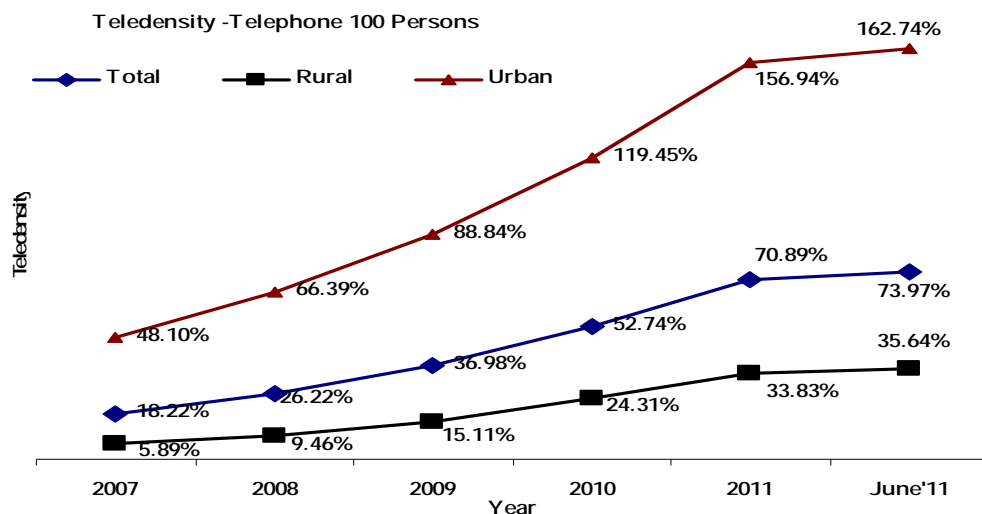The Indian Telecommunication sector has witnessed major changes in the tariff structure. The telecommunication tariff order (TTO) 1999, issued by the Regulator (TRAI), had begun the process of tariff rebalancing with a view to bringing them closer to the costs. Subsequent amendments to TTO 1999 coupled with enhanced competition has resulted in gradual and substantial reduction in the tariffs. Some of the packages offered by operators provide local calls as low as ½ paisa per second and STD as 1 paisa per minute. International call charges have also reduced significantly.

2.9 Status of Telecom Equipment Manufacturing, R&D, Product Development and IPR in Telecom sector

During the 11th Plan period, it was projected that 75% of telecom equipment demand would be met from indigenous sources; however the actual production was much lower. During this period, mobile handset manufacturing began but the production as well as value addition has been limited in numbers. Also, some of the indigenous brands of mobile phone have also made their mark though their design and manufacturing are still being done outside India. A number of world renowned manufacturers have set up their manufacturing base in the country. The Government is concerned about low value addition, lack of R&D and IPR and availability of integrated circuits, components / piece-parts in the country. There is an urgent need to promote telecom R&D, IPR creation, design and development of products in India, so that we may achieve not only higher value addition but also become self-reliant in critical telecom product categories, especially those with security implications. Fortunately, some indigenous R&D and manufacturing companies have emerged in the country and demonstrated that world-class products can indeed be developed in India. At the same time, some key IPRs have been created in futuristic wireless technologies by R&D centers such as Centre for Excellence in Wireless Technology (CeWiT) and premier academic institutions such as IITs, IISc, IIITs, thereby demonstrating its capability in the field of telecom R&D.

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[1] Village Public Telephones

2.10   Telecom Development – International Comparison

Viewed in the context of global growth pattern and indicators, Indian telecom sector need to make substantial progress in terms of broadband penetration. There is a positive co-relation between the teledensity as well as broadband penetration and the GDP[2] of a country. The growth in the telecommunication services acts as a force multiplier and has a significant impact in the growth of other sectors of the economy. It is therefore, imperative that this sector continues to grow at a rapid rate so that the access is available in all parts of the country specially in rural and remote areas.

Despite a fair progress made in respect of teledensity during past few years, a lot is still required to be done. The status of teledensity along with other indicators like broadband subscribers at an international level are given in the table below:

Status of Telephones Indicators in Some Countries 2010

Sl. No.	Countries	Telephones (Million)	Teledensity	Broadband Subscribers ('000)
1	Australia	31160	139.93	5165.00
2	Brazil	245085	125.74	14086.70
3	China	1153386	86.00	126337.00
4	India *	787280	64.39	10990.00
5	Indonesia	257960	107.57	1900.30
6	Japan	161127	127.33	34055.30
7	Korea(Rep.)	79310	164.60	17649.50
8	Mexico	111254	98.10	11325.00
9	Pakistan	106197	61.18	531.80
10	Sri Lanka	20938	100.34	213.80
11	U.K.	114119	183.95	19468.00
12	U.S.A.	430071	138.55	81744.00

*   June 2011 Telephones 886 Million and Teledensity 73.97,
March'11-Internet Subscribers 19694.813('000),
June'11-Broadband Subscribers 12.32 Million
Source: ITU, 2010

2.11 Achievements during 11th Plan Period

For a dynamic sector, reforms are necessitated by dynamics of changes including technological innovations. The telecom sector in India has been witnessing a continuous process of reforms since 1991. During the recent years, various policy initiatives have been carried out to give boost to the sector. Some of them are as under:

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[2] Gross Domestic Product

a.   Auction of 3G and BWA Spectrum: The auction of 3G and BWA Spectrum have been successfully conducted. In June 2010, the Government has allocated 3 blocks of 2x5MHz 3G spectrum each in eighteen service areas, and 4 blocks each in four service areas through auction. In July 2010, the Government has allocated 2 blocks each of 20MHz Broad Band Wireless Access (BWA) spectrum in all the twenty two service areas based on the auction results. The Government realized a sum of Rs. 106204.73 crores from these auctions. The operators have started rolling out the wireless broadband networks in the country and very soon the services will be available in the entire country.

b.   Foreign direct investment: (FDI) is one of the important sources to meet the requirement of huge funds for rapid network expansion. The FDI policy provides an investor-friendly environment for the growth of the telecom sector. Today, telecom is the third major sector attracting FDI inflows after services and computer software sector. At present 74% to 100% FDI is permitted for various telecom services. This investment has helped telecom sector to grow.

c.   Declining Tariff: The telephone tariffs have declined dramatically over the last two years making the mobile telephone affordable to the common man. The prepaid tariffs have gone as low as ½ paisa per second.

d.   Recent initiatives undertaken by USOF: The strategy for network expansion in rural areas mainly involves provision of phones in the viable areas through market mechanism and through Universal Service Obligation Fund (USOF) in the non-viable areas. While Village Public Telephones (VPTs) will enable public access, a scheme of Infrastructure sharing scheme Infrastructure Provider(IP) and Universal Service Provider(USPs) has been launched under USOF to create infrastructure in rural and remote areas. The achievements of various schemes under USOF, as on 30.06.2011, are as under:-

- 5,79,421 villages i.e. 97.61% of the Census 2001 inhabited revenue villages have been covered with Village Public Telephones (VPTs).
- 7289 towers i.e. about 99.13% have been set up under shared mobile infrastructure scheme. The infrastructure so created is being shared by three service providers for provision of mobile services. 15209 BTSs (Base Transceiver Stations) have been commissioned by Service Providers and mobile services are being provided.
- A total of 2,88,454 broadband connections have been provided and 4903 kiosks have been set up in rural and remote areas under Rural Broadband Scheme for expanding provision of Wire-line Broadband Connectivity upto village level.
- A scheme has been launched in Assam to provide sufficient back-haul capacity to integrate the voice and data traffic from the access network in the rural areas to their core network by strengthening the OFC network. This scheme considers OFC Network augmentation between the blocks' HQ and Districts' HQ to begin with. USOF, through this Scheme, shall provide subsidy support for augmentation, creation and management of intra-district SDHQ-DHQ OFC Network on the condition

that it will be shared with other Telecom Operators at the rates prescribed in the Agreement. Agreements for other states of North East are in pipeline.

- Support is also being extended for Pilot projects to establish new technological developments in the telecom sector, which can be deployed in the rural & remote area. Some of pilot projects undertaken by USOF are given as follows:-

  (i)   Support is being provided for mobile charging stations in 5000 villages through TERI project of Lighting a Billion Lives (LaBL). The solar mobile charging stations in these 5000 villages are to be provided in a phased manner over a period of two years from the date of signing of the Agreement. Till 30.04.2011, mobile charging stations have been established in 322 villages.

  (ii)   A Memorandum of Understanding (MoU) has been signed with BSNL for financial support from USO Fund for provision of Broadband enabled Rural Public Service Terminals (RPSTs) to eligible Woman SHGs (Self Help Groups) on pilot basis in the states of HP and Rajasthan. BSNL shall provide an RPST to one eligible SHG from each of its eligible rural wire-line exchanges under the MoU an agreed terms & conditions with subsidy support from USO Fund. At present, 150 RPSTs (100 in Rajasthan and 50 in HP) have been provided under this scheme.

  (iii)   Recognizing the vital role that Information Communication Technology (ICT) can play in the empowerment of rural women, a scheme has been launched for pilot projects aimed at facilitating Self Help Groups (SHGs) access to ICT enabled services. Financial support from USO Fund is to be provided towards VAS subscriptions for SHGs in accordance with the provisions of underlying subsidy Agreements. At present MoUs have been signed for Proof of Concept (PoC) for 8 mobile VAS projects in the state of Tamilnadu, Kerala, Maharashtra, Uttar Pradesh, Uttarakhand, Andhra Pradesh, Rajasthan and the Union Territory of Puducherry.

  (iv)   Support is also being considered for renewable energy resources (Solar, Wind, Hybrid solutions) for some existing USOF supported Shared Infrastructure sites on pilot basis.

CHAPTER-3

11th Five Year Plan (2007-12) - A review

3.1 Introduction

The Indian Telecom revolution is recognized as an international success story. With an overall subscriber base of 886 million and a teledensity of 73.95, the sector continues to grow from strength to strength. With the urban teledensity reaching more than 150, the market has been showing signs of maturity. Rural India is the key target market likely to drive the next round of growth, particularly for voice based services. Roll out of 3G and BWA networks is expected to reinvigorate the saturating urban markets and help in bridging digital divide. The impressive growth observed by mobile services needs to be replicated in case of broadband service, where the subscriber base currently stands just at about 12 million against target of 20 million.

The 11th plan had envisaged target to reach 600 million connections by March 2012. However, during 2007-11 itself, the total telephone connections increased by 640.46 million exhibiting the achievement of 311.09%. The wireless connections have grown from 165.09 million as on 31.3.2007 to 851.70 million as on 30.6.2011. Overall teledensity reached to 73.97 as on 30.06.2011 where as rural teledensity has surpassed the target of 25 of Eleventh plan and now stand at 35.64.

Thus, the major objectives envisaged in the Eleventh plan have been achieved well in advance. Affordable and effective communication services could be offered as tariff declined substantially due to intense competition among the operators. Government has taken several steps to encourage the participation of private players to create competitive environment in telecom sector.

3.2   Growth of Telephone Connections

The number of wireline connections decreased from 40.77 million (at the beginning of 11th Plan) to 34.29 million in 2011-12 (as on 30.06.2011). However, the total telephone subscribers during the same period increased from 205.87 million (as on 30.06.2011) to 886 million. The tele-density increased from 18.22 (as on 31.3.2007) to 73.97 (as on 30.06.2011).

Growth of Wireline, Wireless, Teledensity and Internet during 11th Plan (2007-12)

Item	Subscriber base (in million)					
	2006-07	2007-08	2008-09	2009-10	2010-11	June'11
Wireline Subscribers	40.77	39.41	37.96	36.96	34.73	34.29
Wireless Subscribers	165.09	261.08	391.76	584.29	811.60	851.70

Total telephone Subscribers	205.87	300.49	429.73	621.25	846.33	886.00
Additions during the year-Wireline	0.55	-1.36	-1.45	-1.01	-2.23	-0.44
Additions during the year-Wireless	63.23	95.99	130.68	192.53	227.31	40.11
Additions during the year-Total	63.78	94.63	129.23	191.52	225.08	39.67
Teledensity - per 100 persons	18.22	26.22	36.98	52.74	70.89	73.97
Internet Subscribers	9.21	11.05	13.65	16.10	19.69	19.69

3.3   Rural Telephony

The wireless led growth in the country contributed to expansion of subscribers in rural areas during 11th Plan (2007-12). The number of telephones in the rural area increased from 47.10 million in March, 2007 to 298.10 million by June, 2011. The rural teledensity increased from 5.89 in 2007 to 35.64 in June, 2011 against 11th Plan target of 25 only.

Status of Rural telephones and Teledensity during 11th Plan (2007-12)

Item	Subscriber base (in million)					
	2006-07	2007-08	2008-09	2009-10	2010-11	June'11
Rural Telephones	47.10	76.50	123.51	202.48	282.29	298.10
Rural Teledensity - per 100 persons	5.89	9.46	15.11	24.51	33.83	35.64
% Share of Rural Phones in Total	22.88	25.46	28.74	32.59	33.35	33.65

3.4   Investments during 11th Plan

The total estimated investments by the public sector and private sector operators during the Eleventh Plan (2007-2012) in telecom sector is Rs. 398700 crore. The details are as under.

(In Rs. Crore)

Year	Investment @	11th Five Year Plan #		
		Total	Centre	Private
2007-08	37900	31900	7894	24007
2008-09	59200	52295	11048	41248
2009-10	77700	64206	13186	51019
2010-11	103900*	84339	13988	70351
2011-12	120000*	103900	15387	97007
Total	**398700**	**345134**	**61503**	**283631**

@ Source: TRAI,

 # Source: Planning Commission

Annex: Year-wise Status of Telecom Sector as on June 2011

Item		Position at the End of					
		March'07	March'08	March'09	March'10	March'11	June'11
Phones (In Lakh)	**Total**	2058.68	3004.92	4297.25	6212.80	8463.28	8859.97
	Wireline	407.74	394.13	379.65	369.57	347.30	342.93
	Wireless	1650.94	2610.79	3917.61	5843.23	8115.98	8517.04
	Public	713.91	795.49	895.46	1058.71	1260.02	1274.02
	Private	1344.77	2209.44	3401.79	5154.09	7203.26	7585.95
	Rural	471.00	765.00	1235.13	2007.73	2822.89	2980.99
	Urban	1587.68	2239.93	3062.12	4205.07	5640.39	5878.98
Tele-density	**Overall**	18.22	26.22	36.98	52.74	70.89	73.97
	Public	6.32	6.94	7.71	8.99	10.55	10.64
	Private	11.90	19.28	29.27	43.75	60.34	63.34
	Rural	5.89	9.46	15.11	24.31	33.83	35.64
	Urban	48.10	66.39	90.76	119.45	156.94	162.74
% share of	**Public**	34.68	26.47	20.84	17.04	14.89	14.38
	Private	65.32	73.53	79.16	82.96	85.11	85.62
	Rural	22.88	25.46	28.74	32.32	33.35	33.65
	Urban	77.12	74.54	71.26	67.68	66.65	66.35
Switching Capacity (In Lakh)	**Public**	888.17	959.76	1103.68	1242.49	1376.75	1380.72
Village Public Telephones [VPTs]	**Public**	564610	532281	549294	565960	575663	575996
PCOs (In Lakh)	**Public**	23.65	22.91	20.89	18.58	15.71	15.03
OFC Route kms	**Public**	519155	564166	609223	658548	698557	700852
Foreign Direct Investment (FDI) (in million US$)		478	1261	2558	2554	1665	1212

CHAPTER-4

Approach to the 12th Five Year Plan Period (2012-2017)

4.1 Introduction: The Draft Approach Paper circulated by Planning Commission for the 12th Plan has not sufficiently emphasized importance of ICTs which have the potential of bringing about radical transformation in social and economic sectors of the country as also in process of governance. The fundamental and cross cutting importance of this sector as a whole to all other sector and its centrality to the entire economic and developmental agenda of 12th Five Year Plan needs to be clearly spelt out. The achievement in terms of penetration of voice telephony in the telecom sector as well as unprecedented growth of the IT sector, potential and the expected exponential growth of the Broadband as well as primacy of the whole ICT Sector needs to be duly highlighted in approach paper.

Transparency in the Government is the prime expectation of the citizen today for ensuring efficiency, accountability and effectiveness of the delivery system at cutting edge which is not possible without the support of this sector. Importance of this aspect across the board needs to be mentioned in the document. It is necessary to bring out these aspects clearly for conveying the intention, focus and strategy of the Government of this important crucial sector which is backbone for all the sectors and key growth enabler for the economy of the country.

Telecom has emerged as a key driver of economic and social development in an increasingly knowledge intensive global scenario, in which India will play a leadership role. Imagining a credibly optimistic future and designing ICT policy to realize this vision could therefore be a self- fulfilling prophesy. Right ICT policy will ensure that India plays this role effectively and also transform the socio economic scenario through accelerating inclusive economic growth by laying special emphasis on providing quality and affordable telecommunication services in rural and remote areas.

It provides the cost effective and faster service delivery mechanism for the business to sustain in highly competitive global market. The necessity, importance and usefulness of the ICT sector cuts across all the sectors including industry, agriculture, services and social sector. Use of ICT results in providing connectivity which results in digitalized, ecosystem leading to more efficient and competitive delivery system.

4.2 Objectives of the 12th Plan

To facilitate inclusive growth of telecommunications by formulating coherent policies in the following areas, for,:

4.2.1   Optimum utilization of scarce spectrum resource.

4.2.2   Ensure security in telecom networks and adopt effective measures to deal with cyber threats.

4.2.3   Grant of telecom licences in an objective and transparent manner.

4.2.4   Promotion of robust competitive Market for telecom services

4.2.5   Convergence of technologies, services and harmonization of regulatory framework

4.2.6   Convergence of IT, Broadcasting & Telecom

4.2.7   Refarming of radio frequency spectrum including increased availability for telecom services

4.2.8   Rapid expansion of Telecom infrastructure for Voice, Data & Video with special emphasis on rural and remote areas.

4.2.9   To have a responsive consumer grievances redressal mechanism.

4.2.10   Promoting R&D and indigenous manufacturing of telecom related equipment.

4.2.11   Facilitate Migration of networks from IPV 4 to IPV 6.

4.2.12   Encourage deployment of green/renewable energy sources for telecom equipment.

4.2.13   To introduce testing and certification of all telecom products.

4.2.14   Promotion of R&D and indigenous manufacture of telecom equipment for domestic and international market.

4.3 Outline of the Plan

The journey of Indian telecom from low density/high tariff to high density /low tariff offers valuable learning's. Even with sharp rise in mobile services, further deepening the penetration of telecom services remains an important challenge. The future thrust of policy in telecom sector has to be on raising the competitiveness of India's telecom sector, to make it a world leader. In view of the situation analysis and the identified needs of the key stakeholders, the following approach is suggested for 12th Plan period.

4.3.1 Spectrum Availability, Management and Policy

4.3.1.1   Review of the Spectrum management

4.3.1.2   Development of a framework for using white spaces

4.3.1.3   Vacation of Spectrum

4.3.1.4   Disclosure of spectrum availability

4.3.1.5   Incentive mechanism for effective usage of spectrum.

4.3.2 Licensing Reforms

This is an area requiring attention for facilitating orderly growth of the telecom sector.

4.3.2.1 De-linking license and spectrum

4.3.2.2 License renewal terms

4.3.2.3 Technology neutrality

4.3.2.4 Rationalization of licensing regime

4.3.2.5 Enabling convergence

4.3.3 Broadband Expansion

There are just 12.32 million broadband connections in the country at the end of June 2011 as against the target of 20 million broadband subscribers set for year 2010. This indicates need for extra thrust on broadband expansion in the country.

Following key thrust areas are relevant in this regard:

4.3.3.1 Broadband penetration: 'Broadband for all' be made a reality by increasing availability of high speed broadband in all Gram Panchayats.

4.3.3.2 Allocation of resources for broadband: Ensure sufficient allocation of resources like spectrum, right of way management and infrastructure sharing for broadband.

4.3.3.3 Provide incentives to encourage the uptake of broadband in sectors like education, healthcare, public safety, government operations, etc. by subsidizing customer premise equipment.

4.3.3.4 Expansion of broadband in rural areas: Provide funding and support to encourage the rollout of mobile broadband on 3G/BWA spectrum speedily in rural and remote areas.

4.3.4 USOF activities

4.3.4.1 Incentives for pilot projects

4.3.4.2 Incentives for fixed wireline/wireless phones

4.3.4.3 Incentives for backhaul

4.3.4.4 Incentives for use of renewal energy sources in USOF supported schemes

4.3.4.5 Incentives for telecom infrastructure

4.3.4.6 Policy on revision of National Charging Plan for improvement of QoS

4.3.5 Strengthening of PSU/Autonomous organization

4.3.6 Strengthening of R&D and Promotion of Telecom Equipment Manufacturing

4.3.6.1 Creation of R&D, IPR and product development Fund

4.3.6.2 IPR Generation

4.3.6.3 R&D and product development

4.3.6.4   Development of Testing Labs

4.3.6.5   Telecom Centres of Excellence (TCoE)

4.3.6.6   Incentives for indigenous manufacturing

4.4.6.7   Market-pull for Indian Products

4.3.7   **Development of Human Resources**

4.4 Targets for the 12th Plan

In consonance with the above approach, the thrust areas identified by Department of Telecom are:

4.4.1.   **Network expansion**

- Provision of 1200 million connections by 2017.

4.4.2.   **Rural Telephony**

- Mobile access to all villages and rural teledensity of atleast 60% by 2017.

4.4.3.   **Broadband**

- Broadband connection of 175 million by 2017.

4.4.4.   **Manufacturing and R&D**

- Making India a hub for telecom manufacturing by incentivizing domestic manufacturers with thrust on IPR, product development and commercialization.
- Preferential market access for indigenously manufactured products.
- Increasing local content in manufacturing
- Thrust for R&D, IPR and Product commercialization.

CHAPTER-5

Licensing and Spectrum

5.1   Introduction:

Since the opening of telecom sector in 1991-92 for private sector participation in delivery of telecommunications services, there have been many policy changes with the objective of supporting growth in telecommunication, to enhance competition and to make available telecom services at affordable price.

The duopoly regime of telecom service providers in respect of licences issued in 1994, 1996 & 1997 was changed to multipoly regime in 1999 which brought in more operators and thus enhanced competition. Keeping pace with technology, unified access licensing regime was introduced in 2003 whereby the service providers could offer fixed line and mobile services under the same licence. This promoted use of core infrastructure for both types of services and helped in cutting down costs.

Due to phenomenal growth in subscriber base and technological advancements which are on the horizon, new challenges have been posed which have to be addressed. A huge demand has been created for spectrum in different bands. Further advancement of technology and the current stage of the development of telecom networks in India have made it possible to deliver converged services including audio/video broadcast services in a seamless manner.

Therefore, our efforts now should be directed to meet the demands of telecommunication sector and convergence of services. Hence focus has to be on refarming of spectrum, efficient use of spectrum, appropriate pricing of spectrum, creation of licensing and regulatory framework for delivery of converged services and other enabling provisions which remove the bottlenecks in setting up the networks etc.

5.2   Recommendations on Re-farming of Spectrum and Harnessing Technology

The future technological developments in mobile/ broadband are all focused on higher data speeds, as the need of the future would be higher and higher data speeds. Therefore, with the introduction of new technologies, high bandwidth applications and increasing user base, there will be requirement of significant amount of additional licensed spectrum which is estimated at 500 MHz by 2020 out of which 320 MHz will be required during the 12th Plan itself. During this period, the estimated requirement of additional spectrum shall be around 20 MHz in 450 MHz band, 80 MHz in 700 MHz band, 20 MHz in 1800 MHz band, 15 MHz in 1900 MHz band, , 30 MHz in 2.1 GHz band, 20 MHz in 2.3 GHz band, 100 MHz in 3.5 GHz band, 20 MHz in 1700 MHz band and 15 MHz in 2.01 GHz band.

Also a need is being felt to make spectrum available in 60 GHz and above bands for backhaul purposes.

The existing policy provides the review of the spectrum utilisation from time to time, keeping in view the emerging scenario of spectrum availability, optimal use of spectrum and market requirement. Keeping in view the requirement of additional spectrum, there is a need for re-farming of spectrum to make the required amount of spectrum available for such services especially in the bands 450, 700, 800, 900, 1800, 1900 MHz and 2.1, 2.3, 2.5 and 3.5 GHz. While earmarking the spectrum in IMT band priority for allocation of spectrum for defence will be kept in view and defence band will continue to be identified and allocated based on inter-ministerial consultation. Similarly, the requirements of other users / services will be given due consideration.

There is a need to identify certain bands within the commercial / non-commercial bands to promote indigenous manufacturing.

To workout the exact requirement for spectrum in near future, there is urgent need for carrying out audit of spectrum usage. For conducting the audit of spectrum usage an appropriate mechanism will have to be put in place at the earliest. The audit should be conducted to study and recommend the specific bands of spectrum for re-farming. Audit of the usage of resources by the users should be conducted and steps taken to ensure efficient utilisation of spectrum.

The re-farming of the spectrum should be in harmony with the advancement in technology. A path for introduction of wireless technologies in future may also be defined and spectrum may be allocated based on the same.

5.3   Recommendations on optimum utilisation of scarce spectrum resource and examine the possibility of creation of a Spectrum Relocation Fund. Indicate likely source and quantum of resources so generated and guidelines for the operation of the fund.

Optimum utilisation can be enforced by use of spectrum efficient technologies, pricing and spectrum sharing. Newer technologies are becoming more and more efficient. There are certain technologies which have already been inducted in the network & will continue for quite some time. Hence, spectrum sharing is the next best method of ensuring optimal usage of the spectrum. A policy in this regard will be required to be framed. Pricing of spectrum separately from licence will also need to be adopted as a policy instead of the present policy of bundling with licence so that the users have incentive for maximisation of spectrum utilisation. However, while determining spectrum pricing policy, care will have to

be taken that primary objective of increased penetration of telecom services and affordability to the consumers are not lost sight of.

Even to permit spectrum sharing, there will be a need for making available adequate spectrum through refarming. Refarming will be an exercise which may continue for relatively longer period as the existing users will have to select alterative technologies and migrate. Therefore for quite some time even after surrender of spectrum is agreed by any user it will remain locked up till migration is over.

It is noticed that Government agencies are major users of the spectrum which is required to be freed for IMT 2000 applications. Therefore, the concerned agencies may be suitably compensated through appropriate mechanism to ensure vacation of spectrum through migration to other bands/media as the case may be.

In view of this and also the fact that estimated amount of spectrum which can be actually refarmed at different points in time is not known, it will be difficult to work out the size of the fund which needs to be created. Hence, after formulation of policy in the matter and based on the spectrum to be refarmed from time to time required funds can be requested from consolidated fund of India.

5.4   To evolve a Pricing Policy for service delivery looking at both the spectral efficiency and sectoral business viability. Also, suggest guidelines to encourage and incentivize introduction of spectrum efficient technologies.

The pricing for service delivery in Telecom is regulated by TRAI. It has been observed that in most cases the actual tariffs are governed by market forces. Since there is already an intense competition in telecom sector, the sectoral business viability and spectral efficiency will be taken care of by the market forces. However, certain administrative measures may also be required for efficient utilisation of spectrum.

While allocation of spectrum for IMT 2000 applications may be delinked with the issue of license for operation of telecom services, the pricing policy need to be so designed that it meets the following objectives:
(i) penetration of services to rural and remote areas is not inhibited and services remain affordable
(ii) sharing of spectrum is encouraged leading to improved spectrum utilisation.
(iii) consolidation in the telecom services market is incentivised without adversely affecting the competition

There is also a need to have a re-look at the pricing policy for spectrum in non-commercial band to ensure that allocated spectrum is efficiently utilised. Further, a similar re-look is required for spectrum used for satellite and terrestrial communication links.

Development of technologies is primarily dependent on development of global standards/ specifications. Further, the deployment of technologies is also dependent upon the availability of equipment on commercially viable prices and expected volumes of business. Hence, incentivisation of spectrum efficient technologies through spectrum pricing policies does not appear to be driving force for this objective.

5.5   To make recommendations on convergence of services and also reforms required in the post-convergence scenario including availability of spectrum, expansion of broadband.

With the introduction of Broadband services and 3G technologies the convergence in telecom services has already begun. With proliferation of next generation networks which deliver IP based services convergence will gather momentum. Broadcast services will also need to be brought on the same platform so that the benefit of full convergence can be enjoyed by the people of this country.

The convergence could be of following three types:
(i) Convergence of services i.e. convergence of voice telephony, data transmission, video telephony, value added services, audio broadcast and video broadcast
(ii) Convergence of network i.e. convergence of access network, carriage network (NLD/ ILD) and broadcast network
(iii) Convergence of devices i.e. telephone, Personal Computer, Television and Radio

The licensing and regulatory framework will need to be modified and streamlined in manner which enables seamless delivery of converged services. At the same time it will have to be ensured that rural areas are not left behind especially due to viability/ investment constraints. Licensing framework will have to take care that new type of service providers, if necessary, may be introduced which could ride on the network backbone created by large service providers. Entry cost will have to be kept low. Care will have to be taken that while there is competition in provision of services, the number of competitors is such that the viability of service provision is ensured.

Legal framework for content delivery shall be required to regulate the content of the converged services.

5.6   Other issue of importance to Licensing and Spectrum Issues.

(i)   The infrastructure development in the telecom services is dependent on the policy of State Governments/ Local bodies for allocation of land, power supply, grant of right of way and policy/ by-laws for erection of towers etc.. Difficulties have been reported in creation of telecom infrastructure due to non-availability of these resources in a timely manner and also due to divergent policies across states and within the states. Therefore, there is a need for national level effort to harmonise the policies of various state governments/ local bodies. If required, a suitable legal framework may also be created.

(ii)   Telecom is on the threshold of leveraging benefits of high speed data networks which may get extended to rural areas thereby fuelling the economic growth in rural areas. For supporting such growth, fiscal and other benefits of infrastructure sector have to be granted to telecom sector.

(iii)   There is requirement to promote wireless connectivity for private use within estates/ campuses/ buildings for which bands will need to be identified including in IMT 2000 bands. This will enable use of the same mobile handsets in commercial and private networks. Suitable pricing for spectrum for such uses will be worked out.

5.7   Recommendations :

i)   Around 320 MHz of additional spectrum should be made available during the 12th Plan period and action should be taken so that another 180 MHz of spectrum becomes available during 13th Plan period.

ii)   Backhaul spectrum in 60 GHz and above band should be made available.

iii)   To meet the requirement of spectrum for telecom services, refarming of spectrum should be taken up specially in bands 450, 700, 800, 900, 1800, 1900 MHz and 2.1, 2.3, 2.5 & 3.5 GHz.   Bands of spectrum should also be identified to promote indigenous development/manufacturing.

iv)   Spectrum audit should be conducted to ensure efficient spectrum utilization by the users.

v)   Spectrum sharing should be encouraged to enable efficient utilization of spectrum.

vi)   Pricing of spectrum should be delinked from issue of licence.   Spectrum pricing should be determined in such a way that the primary objective of increased penetration of telecom services and availability to consumers are not lost sight of.   Pricing policy for spectrum in non-commercial bands and those used in satellite and terrestrial links should be relooked to ensure that spectrum is efficiently utilized.

vii)   There is a need for convergence of voice, data and video services, value added service, audio broadcast and video broadcast services. Action should be initiated for creation of required licensing and regulatory framework for enabling this convergence and seamless delivery of converged services.

viii)   There is a need for national level effort to harmonise the policies of various state governments/local bodies for allocation of land, power supply, grant of right of way and policy/by-laws for erection of towers etc. If required, a suitable legal framework may also be created.

ix)   Fiscal and other benefits of infrastructure sector needs to be granted to both wireline as well as wireless.

x)   Wireless connectivity for private use within estates/campuses/buildings may be promoted. Suitable pricing for spectrum for such uses may be worked out.

CHAPTER-6

Broadband and Rural Telephony

6.0 Introduction

Recognizing the potential of ubiquitous Broadband service in growth of GDP and enhancement in quality of life through societal applications including tele-education, tele-medicine, e-governance, entertainment as well as employment generation by way of high speed access to information and web based communication; Government had announced Broadband Policy 2004. Well-developed information and communication network infrastructure and applications, adapted to regional, national and local conditions, through easily-accessible and affordable broadband can accelerate the social and economic progress of country, and the well-being of all individuals, communities and peoples.

6.1 Current Status of Broadband in India

Broadband is slowly emerging as an integral component of service delivery in number of sectors including Government services. However, Rural areas have in general lagged behind as far as access to Broadband connectivity and services to such areas is concerned. In such a scenario, it becomes imperative to have focused and coordinated push in proliferation of Broadband and Telephony services in rural areas during 12th Plan period.

6.1.2   As on 30th June 2011, 12.32 million broadband connections (256 Kbps & above) have been provided i.e. broadband penetration is just 1.0% when compared with Tele-density of 73.97. These broadband connections have been provided in 4283 cities, 5767 block headquarters, 627 district headquarters covering 169201 villages.

6.1.3   However, compared to growth of telephony in India, growth in Broadband has lagged behind. From a tele-density of 3.8, Indian telecom sector has grown to achieve exponential growth in the last ten years with overall tele-density of 73.97 in June 2011, though rural areas (at tele-density of 35.64) require more efforts to bring it at par with urban areas (tele-density 162.74).

At figures of 851.70 million mobile connections (June 2011) with 594.77 million active subscribers, mobile phones are no more a device in the hands of rich or upper middle class alone but are slowly emerging as a common man's device not only for voice telephony but also for accessing variety of services such as entertainment and financial services.

6.2   12th Plan Projections for Broadband

The estimated investment in the 12th Plan for expansion of Broadband is expected to be Rs. 1,25,000 Crore. This includes investment of Rs. 75,000 Crore for Broadband network roll out and Rs. 50,000 Crore for Customer Premises Equipment like USB Dongles, Modems etc. The

existing subscribers' base of 12.32 million (June 2011)is expected to grow to 175 million by March 2017.

6.3   Drivers for Broadband Growth

The World Bank has found that in low- and middle-income countries every 10 percentage point increase in broadband penetration accelerates economic growth by 1.38 percentage points—more than in high-income countries and more than for other telecommunications services. With a huge population of 720 million in 630,000 villages across 3.2 million square kilo metres, and a massive economy accounting for over 50 per cent of India's total GDP, rural India clearly presents a huge growth opportunity for the entire telecom ecosystem including telecom operators, value-added services providers, and handset and equipment vendors. Addressing the issues of Accessibility, Affordability and Attractiveness of services in these areas will prove to be major drivers for spurring the demand for Broadband services.

6.3.1   Accessibility:

The issue of accessibility to Broadband services in Rural Areas may be addressed by following means:

- Setting up of broadband access centers, telecenters, kiosks, and other public access points and PCOs

- Connecting educational institutions to broadband networks

- Providing wireless Internet services as primary means of rural Broadband access.

- Utilizing existing infrastructure of Private, Govt (Central & State) Cable Operators to provide broadband service in rural areas

- Training all citizens to access and use broadband through digital literacy programs

6.3.2   Attractiveness:

Attractiveness of Broadband services in Rural Areas can be enhanced by following means:
- Supporting local, relevant Internet content in local languages

- Putting government and public information online and creating e-government and other e-applications (such as for health, education, and agriculture)

- Providing a legal framework for e-commerce and other applications

- Educating citizens about the benefits of broadband

- Promoting broadband use to businesses and communities

- Programs to create Awareness

6.3.3   Affordability:

The various steps that will go a long way in improving the affordability of Broadband Services are:

- Low cost end-user devices,

- Affordable tariffs

- Low cost Bandwidth, Leased Lines and sharing of infrastructure

- Subsidizing broadband equipment used in educational institutions

- Providing consumers with information on providers, pricing options, and available technology

The triple drivers of Accessibility, Affordability and Attractiveness can create the ecosystem required for unleashing the wave of growth in rural areas of the country and meet the objective of inclusive growth.

6.3.4   Promoting Digital Literacy:

6.3.4.1 Digital literacy is an important driver for growth of Broadband on the demand side. For creating awareness and promoting digital literacy programs similar to the (The Cyber Cafe Association of India) CCAOI Project Gyan, a 10 day Internet learning Program which is offered for Free from Cybercafés/ CSC's and taught in the preferred language of the citizen, could be promoted by the Government. To further reach out to the non-English and assistance seeking community, TRAI has also recommended that Government should ensure availability of the Government services in the local languages and Cybercafés/CSC's and public access systems should be encouraged to promote local language Internet.

6.3.4.2 Providing Broadband access to all schools, particularly in the rural areas, can help promote digital literacy. At the same time it can also be an important means for fulfilling the objectives of the Right to Education. Promoting the use of e-learning mode and tools that provide a platform for enhanced learning, cost effective delivery, flexibility of learning at the convenience of learner, uniform quality content delivery, promotion of collaborative learning even between members not living at same location, reusability of the content etc. also needs to be encouraged. Creation of e-infrastructure for e-Learning is very important aspect to promote this mode of learning.

6.3.4.3 A pan-India internet awareness campaign needs to be undertaken by the key stakeholders (government, operators/ISPs, VAS providers and NGOs) to develop the basic ICT skills among rural population

6.4   Infrastructure: Existing Scenario & Optimum Utilization:

6.4.1   Spectrum Availability:

On the supply side spectrum availability is the biggest driver for ensuring broadband availability for the masses. Wireless technologies to provide broadband coverage to the majority of population are generally more cost effective than deploying fiber in access network. TRAI has indicated the estimated traffic calculations by 2014 in its Report (May 2010), and concludes that for voice and data services, India needs about 660 MHz. However, as per the industry study reports, the data traffic has increased by about 40 percent per year during last few years and this trend is likely to continue, if not increased further. Moreover, the increasing trend may be much sharper in India, where adoption of such technologies is even more rapid. Therefore, the expected bandwidth needed in India may be of the order of 800 MHz by 2014/15 and much higher by 2020; this may necessitate additional frequency bands to be identified and harmonized for Broadband. Hence, the Government should seek to release as much spectrum into the market as possible, in large and usable amounts. There is large amount of spectrum in the 700 MHz band (digital dividend band), of which some amount is with government agencies and rest is being used for commercial services. The rest is with Doordarshan. This spectrum along with 2.5 GHz and 450 MHz band should also be considered for vacation by various Government Agencies for provision of Broadband services.

6.4.2   With successful conclusion of auction & grant of 3G & BWA spectrum, rapid growth in wireless broadband is now expected. However, most of the private operators are expected to focus on urban areas and viable / prosperous rural areas and employ techniques of efficient and optimum utilization of spectrum.

6.4.3   Utilization of Tower Infrastructure:

6.4.3.1 There are about 6.5 Lakh telecom towers in India installed by various operators over the years. Out of these, about 3.9 Lakh towers are in rural areas. This infrastructure can be readily leveraged for proliferation of Broadband network in rural areas. However, rural India is plagued by the non-availability of backhaul and last mile connectivity. These issues need to be addressed for making optimum utilization of existing tower infrastructure. Sharing of Tower infrastructure has been useful in reducing the costs and increasing the proliferation of mobile services. Sharing of active infrastructure can also further help in making viable business models, particularly, for rural and remote areas.

6.4.3.2 The Tower sites could also be considered as potential sites for CSC's as they already have adequate infrastructure including land and power. Convergence of IT and Telecom Infrastructure can leverage the benefits of both and optimize their usage.

6.5   On-going Initiatives for Broadband

In order to ensure development of Broadband networks in rural areas, Hon'ble President of India, in her Address to joint session of the Parliament on 4th June 2009, had mentioned that every panchayat will be connected to broadband network within next three years and the scheme for CSC or e-kiosks will be suitably repositioned in order to create a broadband network of panchayats under Bharat Nirman Common Service Centers to provide government services to citizens in rural areas. The various initiatives undertaken by the Government for expansion of Broadband services in rural areas are as follows:

6.5.1 Bharat Nirman-II

The program envisages Broadband coverage of all 250,000 village Pachayats by 2012. As of June 2011 1,33,712 GPs out of 2,47,864 GPs have already been covered with Broadband.

6.5.2 National Optical Fibre Network

6.5.2.1 Broadband penetration in rural areas has been low. Just 5% of the present broadband connections are in rural areas as compared to about 31% of total mobile telephone connections. The primary cause of low penetration of broadband in rural areas is non-availability of required transmission media connectivity upto villages, high cost of service roll out and lack of viable business model. Presently about 11,50,000 route Km of optical fibre network is available in India. It includes 6,46,000 Km optical fibre network of state owned BSNL. Other operators include Reliance (1.9 lakh R Km), Bharti (1.25 Lakh R Km), TTSL (0.7 lakh R Km), Railtel (0.52 lakh R km), VSNL (0.36 Lakh R Km) & PGCIL 0.2 lakh R Km).

6.5.2.2 Internationally, it is observed that there are national level broadband plans to increase the reach of broadband upto rural and remote areas. All these national plans are initiated by government with a significant contribution. Majority of countries have created optical fibre network capable to support high speed bandwidth hungry applications.

6.5.2.3 Among the various available technologies, Optical fibre is robust, stable and scalable. However, creating countrywide optical fibre connectivity will require a lot of funds, efforts and planning as Creation of optical fibre network involves digging of trenches, laying of Horizontal Directional Drilling (HDD) pipes (Plastic ducts), pulling the optical fibre cables in the said ducts, their jointing and finally connecting to the optical fibre terminal equipments.

6.5.2.4 Presently, availability of optical fibre from major service providers is largely restricted up to the district headquarters and in some cases upto block headquarters. Considering various issues Government has decided for creation of national Optical Fiber Network (NOFN) for providing Broadband Connectivity initially to 250,000 Gram Panchayats. Further coverage to villages habitation would be considered in subsequent phases. The

objective of the NOFN scheme is to extend initially the existing optical fiber network which extends upto districts HQ's/ Block HQ's upto the Gram Panchayat level. This will bridge the gap in the Aggregation Layer by extending the network to the Panchayats. Subsequently, extension of fiber to the Shared towers providing Broadband services in rural areas could also be considered.

6.6   Content and VAS

6.6.1 India is witnessing an era when users buy mobile phones not just to be in touch, but to express themselves, their attitude, feelings & interests. Coupled with scenario of very low tariffs for voice telephony, Value Added Services (VAS) presents an opportunity for telecom operators to enhance their revenues. The Mobile VAS industry is expected to touch Rs. 100,000 crore by 2020 from Rs. 15,000 crore now - With the launch of 3G, Mobile Broadband Services, Mobile Commerce & Rural VAS fuelling this growth, content developers are burning the midnight oil to come up with better and newer concepts and services - 3G would be the driver of MVAS in India in the future with 3G service revenues being expected to generate $15.8 billion by 2013 accounting for a share of 46% in the overall wireless service revenue.

6.6.2 Currently majority of the available content /applications is in English and mostly targeted towards the urban population. Low number of local language sites reflects the poor availability of localized online content to be accessed by semi-urban and rural masses. There is, therefore, a need to develop relevant content for the rural areas. Thrust on initiatives like e-governance, e-health, tele-medicine, m-banking, e-education can provide necessary push to Broadband in rural areas. Coupled with UID programme of Government, payments in NREGA through e-transfer will not only bring in efficiency but ensure transparency as well. While, entertainment will add value, the other content will gradually grow.

6.6.3 Opening up BPOs / Call Centres involving local people and providing information in local languages on various issues concerning rural population will help improve Broadband penetration while simultaneously generating employment opportunities. Content creation would be a specialized area requiring thorough understanding of the local requirements and language which can only be done through local entrepreneurs.

6.7   Sanchar Shakti

The important contribution that ICT can make in bridging the gender divide and empowering women has been recognized by the International Telecommunications Union of which India is a member. Recognizing the vital role that ICT can play in the empowerment of Rural women, the Gender Budget Cell and the USO Fund of DoT have launched pilot projects aimed at facilitating (Self Help Groups) SHGs' access to ICT enabled services. These pilot projects address the common impediments to rural ICT connectivity while

simultaneously providing employment opportunities to rural women. One category of projects in Sanchar Shakti scheme, the Gender Budget initiative of DoT-USOF, relates to provision of a mobile connectivity bundle consisting of discounted handset, prepaid tariff plan and VAS subscription to SHGs with a service validity/warranty of at least one year. Further, promotion of these types of initiatives is envisaged for growth of Broadband and Rural telephony in the 12th Plan.

6.8   Telephony and VAS for Differently Abled

6.8.1   It is believed that there are at least 70 million persons with disabilities in India. Many of these persons live in rural areas and have no access to basic means of communication and accessing information. They are left out of mainstream education and employment opportunities and are unable to lead a life of inclusion, independence and dignity. In the information society, enjoyment of all other rights, such as education, employment, recreation, access to public information, etc are inextricably interwoven with access to electronics and information and communication technologies (ICTs). This is especially so in the context of persons with disabilities, since many of them depend solely upon the availability of assistive technology and Internet connectivity to access information.

6.8.2   The use of assistive technologies combined with Internet connectivity on computers and mobile phones offer tremendous scope for India to bridge the digital divide, especially in the context of persons living in remote and rural areas. There are several accessibility features which could be added to landline and wireless phones to make them useable for persons with disabilities. Accessibility considerations need to be taken into account in four aspects, namely, hardware, software, services and content. Initiatives like Subsidies for broadband, Billing in accessible formats, Special measures of access for emergency situations, Text to speech facility to read aloud the text, Screen Readers, Clear Audio, etc. can provide the required impetus for inclusion of the differently abled in the mainstream.

6.9   Rural Telephony

6.9.1 The rural subscriber base primarily comprises customers with low disposable incomes. This increases the downward pressure on ARPUs and leads to an overall reduced return on investment. Operators now need to redefine their business models to reduce operational costs and promote savings in capital expenditure, as providing low-cost network coverage in these regions is the only way forward.

6.9.2 Another issue is that the rural population is sparse and scattered. The low population density, thereby, increases costs. Maximizing the coverage per site and/or minimizing the cost per site are required. The power infrastructure in the country is extremely inadequate and non-availability of stable and continuous power supply could actually negate all other investments and efforts made to provide connectivity in rural India. The use of low power

solutions can help reduce the costs per site in this regard. Judicious use of renewable energy solutions has the promise of reducing the operational costs in the long run.

6.9.3 India has pioneered the use of managed services model to realize exponential telecom growth. Now, Indian companies should take a lead in ushering in innovative approaches for remote and rural areas.

6.10   Recommendations

6.10.1 India should utilize the opportunity offered by Broadband to give further push to its GDP.

i)   Roll out of rural broadband connectivity through strengthening augmentation and harnessing technology

6.10.2 Government should seek to release as much spectrum into the market as possible, in large and usable amounts.

6.10.3 Government should encourage Broadband proliferation through technology-neutral approach.

6.10.4 Necessary Policy changes should be initiated to encourage Cable Operators to provide Broadband Services especially in remote and rural areas by allowing them to use existing infrastructure.

6.10.5 Large part of the cost of deploying fibre networks is in form of Right of Way (RoW). Operators have to approach multiple agencies for obtaining RoW clearance, which not only delays the rollout plans of the service providers but also increases the cost. The state governments, therefore, need to address the following aspects for promoting/development of telecom infrastructure:

    a. Speedy acquisition of sites

    b. Reliable uninterrupted power supply

    c. Phase out multiple approvals from various state agencies and replace by a single window clearance solution.

    d. The essential Right of Way (RoW) to telecom service

6.10.6 Government projects like National Optical fibre Network (NOFN) and other infrastructure projects should be rolled out in a time bound manner.

6.10.7 Use of Broadband through Satellite should be promoted for remote areas, like Andaman & Nicobar islands & Lakshadweep.

ii. Optimum Utilization of Infrastructure

6.10.8 Necessary policy changes should be introduced for encouraging the sharing of active and passive infrastructure in order to address the various Infrastructure issues related to rural areas.

6.10.9 Development of Broadband kiosks, on the lines of STD PCOs, should be encouraged in the Rural Areas to provide easy access to rural people to Broadband services. Common Service Centres (CSCs) being set up can play a vital role in this.

6.10.10 CSCs may be positioned as distribution channels. They may tie up with various service providers in this regard.

iii. Applications, Value added services and devices

6.10.11 Government projects like e-governance projects can provide the necessary trigger for the growth of Broadband in Rural Areas. Encouragement of use of facilities like m-banking and secured transactions will play a vital role in this regard.

6.10.12 Low cost internet enabled customer equipment and Applications with Vernacular content are critical for the growth and success of Broadband and Rural Telephony. Inclusion of vernacular content for Government's various e-initiatives will provide necessary fillip to the industry in this regard. Also lower cost availability of internet access through policy initiatives such as reduction in taxes on devices including customer premises equipment will help in reducing the costs.

6.10.13 BPOs / Call Centres involving local people and providing information in local languages on subjects like Crop Advisory, Weather, health, education opportunities, Mandi rates, etc. will help improve Broadband penetration while simultaneously generating employment opportunities.

iv. Other issue of importance for the growth of Broadband and rural telephony and related infrastructure

6.10.14 To tap the Cable TV segment for proliferation of Broadband, synergy should be developed between Ministry of Communications & Information Technology and Ministry of Information & Broadcasting.

6.10.15 Providing Broadband access to all schools, particularly in the rural areas, may be taken up to help promote literacy through e-learning programs.

6.10.16 Concerted and coordinated efforts by various departments of the Government should address the Gender issues and the needs of the differently abled.

6.10.17 For providing telecom connectivity to rural areas with low ARPU, low population and low population density and lack of adequate grid power, use of low power solutions and renewable energy technologies should be encouraged.

6.10.18 Broadband Definition:

Broadband connection may be defined as

"A data connection using any technology that is able to support interactive services including Internet access and support a minimum download speed of 512 Kilo bits per second (Kbps)".

The upload speed will atleast be half the download speed.
- This definition of broadband (Both Wireline and Wireless) will be effective from 1st January 2011.
- The download speed of 2 Mbps will be effective from 1st January 2015.

CHAPTER -7

Telecom equipment Manufacturing, R&D, Product Standards and IPR

7.0   Introduction

Telecommunication infrastructure is a critical-asset of any country and it is a key growth enabler. Telecom networks are mission-critical elements for secure and timely communications. It is the delivery vehicle for a large number of IT and IT-enabled services including health-care, education, financial services, e-governance etc. both to the urban as well as rural masses. While telecommunication networks could be set-up with imported equipment, it becomes a concern when a large network, such as that of India, require continuous large imports, draining the foreign exchange of the country. Besides, a telecom network today is vulnerable to security and espionage threat, compromising the security and independence of a nation. Complete dependence on imported equipment, in which malware could have been designed in and implanted at the component (IC) level or at the level of hardware or at the level of BIOS (Basic Input Output System) or Operating System or at the application level, makes the nation highly vulnerable. The issue of security can be dealt comprehensively only when we have sound manufacturing base, higher order skills in telecom technologies and skills to deal with security related issues, which can be developed only when we start doing R&D, design and development including manufacturing of the equipment indigenously.

On the other hand, the design, development and manufacturing of its own telecom equipment is a big opportunity for India, creating huge value as well as large employment, and it is not that India does not have an option; it certainly has the design capabilities, as reflected in large amount of telecom design and development work that is carried out in India for multinational companies. With the right policies to promote R&D, IPR creation and manufacturing, India can certainly deliver. According to TRAI, the demand for telecom equipment in India was Rs. 54765 crore (US$12 billion) in 2009-10 which was about 5.5% of the global demand. This is projected to grow to Rs 96514 crore (US$ 21 billion) in 2015 and Rs 170,091 crore (US$ 37 billion) in 2020. This large domestic demand may be a perfect launch pad for Indian Product industry. A thriving telecom manufacturing industry would have a large positive impact on many other elements of the electronics manufacturing value chain. This will also provide employment, increased share of manufacturing in GDP and export of equipment and services. Moreover, technical knowledge and IPR creation will also have spillover effects for other industries. India has missed having stake in technology standardisation, development and commercialisation so far and a couple of more years of apathy would seal the fate of telecom manufacturing in the country forever.

Further, the scenario for telecom equipment design and manufacturing has been fast changing. The Western companies, which did well in the past, are contracting, with many of them going out of business. Very few have survived. The void has been filled by the Chinese companies, which have emerged on the scene only in the last ten years, and have already acquired leadership in telecom equipment manufacturing[3]. If India does not strengthen its own telecom product industry, it will increasingly depend on importing equipment from one country, that is China. It is imperative that India moves rapidly in nurturing and strengthening its telecom R&D, IPR creation and product industry.

Despite significant growth of the telecom network and the subscriber base over the last decade, the telecom manufacturing sector has not shown corresponding increase. The contribution of all domestic products have been 12-13% in the year 2009-10 while Indian Products could meet just 3% of the Indian demand. It is quite clear that the telecom equipment manufacturing ecosystem has so far failed to adequately spur the manufacturing segment and as a result, the domestic telecom equipment manufacturing segment has not been able to meet the demand forcing the telecom operators to import most of the equipment required for their network.

There are reasons for the Indian manufacturing Industry not being able to meet the demand through domestic equipment manufacture. It includes weak links in the complete chain from basic research to IPR generation, product design and development, product commercialization and achieving economies of scales so that the product can compete with the imported one. Manufacturing needs support of other components of the value chain to flourish. Manufacture of components and sub-assemblies in India would help both the Indian Product companies and Indian manufactured product companies. Large global EMS vendors need to be encouraged to set-up competitive large scale operations in India. This would not only reduce the input cost but also enable the same infrastructure to be used across the entire electronics sector. It is very important to have a tax structure that encourages manufacturing. Today, import of some components invites custom duty whereas the finished products attract zero duty. Smaller domestic players face the problem of not having economies of scale and availability of long term financing at low interest rates.

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[3] China's policies for protecting and nurturing Chinese product industries is well known. But even as it acquires dominance in telecom product manufacturing, it continues to enhance its support to Chinese products and industries. On Nov 15, 2009 it released public draft of the "Circular on Carrying out the work on Accreditation of National Indigenous Innovation Products," known as Circular 618. Through this it announced a creation of a new national-level catalogue of products that will receive preferential treatment in government procurement. It defines an indigenous innovation as one which has IPR owned by a Chinese company and a commercial trademark initially registered within China. It defined a "domestic product" as made within China's borders with "domestic manufacturing costs exceeding a certain percentage of the final price." Way back in 1999, MOF had said that products with less than 50% of their value produced in China were considered imports. [China's Drive for "Indigenous Innovation" by James McGregor, Global Regulatory Cooperation Project, US Chamber of Commerce]

R&D facilities, access to low cost funds and testing and certification are other areas which need to be strengthened to make the manufacturing environment more conducive. Several measures need to be taken to increase domestic production and enhance the value addition to the products being manufactured in the country. A robust telecom network needs a strong telecom manufacturing base which will in turn contribute handsomely to the GDP and employment in the country. There is, therefore, need for a comprehensive Telecom Equipment Manufacturing Policy that would give the country a definite direction and facilitate it becoming a strong telecom manufacturing hub. We have not been able to leverage our market for spurring manufacturing till date.

Planning Commission has proposed that the strategic objectives for the manufacturing sector in the next 15 years should be to bring about a quantitative and qualitative change via a set of policy choices with following core objectives:

i)   Increasing the growth of manufacturing sector to 12-14% over medium term so as to contribute at least 25% to the National GDP by 2025;

ii)   Increasing the rate of job creation in manufacturing to create 100 million additional jobs by 2025;

iii)   Increasing domestic value addition;

iv)   Enhance global competitiveness of Indian manufacturing through appropriate policy support;

v)   Ensure sustainability of growth, particularly with regard to environment.

A strategic sector like telecom should give a befitting contribution to this target. With the expansion of the manufacturing base, development of ancillaries, support facilities like electronic design and manufacturing clusters, there would be employment for hundreds of thousands of skilled, semi-skilled and unskilled workers. Similarly Department of Industrial Policy and Promotion (DIPP) is in the process of framing a National Manufacturing Policy (NMP) in which it has been envisaged to create National Investment and Manufacturing Zones (NIMZs) which will be developed as integrated industrial township with the state-of-the-art infrastructure and favorable export-import policies. These Zones can play the role of a facilitator for the entrepreneurs who want to set up their business in the Telecom Sector.

India has the capability to create global telecom product companies of its own if it can tap the next wave of telecom growth that would happen in the areas of broadband, Next Generation Networks and Next Generation Mobile Networks.

7.1   TRAI has proposed that the telecom equipment manufacturing policy be an integral and significant part of the new Telecom Policy. In the suggested measures for promotion of domestically manufactured products comprising both the Indian Products, which have product IPR in India, and Indian Manufactured Products in which case IPR resides outside India, it has proposed preferential market access for domestically manufactured telecom products of 30% in the first year, which goes up to 80% in 8th year, and also the minimum

value addition of 25% in the first year to minimum value addition of 65% in 8th year[4]. It has stated that the products which are merely being assembled based on CKD/SKD /imported components should not be regarded as manufactured in India till they achieve the minimum value addition recommended by them. The recommendation to give market access in telecom licensee (public as well as private) will result in assured market to Indian equipment manufacturers for achieving economies of scales and also units set up by multinational companies in India.

Before delving deeper into terms of reference and recommendations, it may be worthwhile to examine what constitutes value addition in telecom equipment today. Time Magazine in its May 16, 2011 issue published the various value contributions that go in today's USD 500 iPhone. The total components and subsystems of the iPhone contributes to USD 174, whereas manufacturing (assembly and testing) consist of mere USD 6. The rest of USD 320 goes to Apple towards design, development, software and IPR as well as sales, distribution, finance charges and profits. This example goes on to show that there is very little value-add in mere manufacturing, or PCB fabrication, test and assembly. The value lies in design, development, IPR and in system software. Without strengthening these aspects, India's gains will be limited.

7.2   Factors Impeding the Growth of Telecom Equipment Manufacturing in India

The factors impeding the growth of domestic manufacturing are
- Poor infrastructure

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[4]Market Preference for domestically designed and produced telecom goods is being used today by most large nations, where the local industry is weak. Earlier this month, Brazil came up with a decree to support domestic industry as reflected in the technical regulations, Brazilian technical standards, limited to twenty-five per cent above the price of the foreign manufactured goods and foreign services. The domestic manufactured products and the domestic services resulting from development and technological innovation made in the Country may have additional margin of preference, defined in the decree, pursuant to the art. 5th, which accumulated to the normal margin of preference, may not exceed the limit of twenty-five per cent… the Ministries of Science and Technology and Development, Industry and Foreign Trade will establish the requirements and criteria for verification of products and services resulting from technological development and innovation conducted in Brazil..**DECREE NR. 7,546, AS OF 08/02/2011 – DOU (UNION'S OFFICIAL DAILY) AS OF 08/03/2011: Article 3** (defines) margin of preference for domestic manufactured goods and domestic services, that meet, besides the relevant …

- Weak links in the complete chain from basic research to IPR generation, product design and development, product commercialization and achieving economies of scales so that the product can compete with the imported one.
- support of other components of the value chain to flourish
- Absence of Manufacture of components and sub-assemblies in India
- Absence of large global EMS (Engineering Manufacturing Service) vendors
- Stable fiscal policies
- tax structure that encourages manufacturing
- Market pull for domestic manufacturers
- Not having economies of scale and availability of long term financing at low interest rates
- R&D facilities, access to low cost funds and testing and certification
- Support for R&D, IPR, Standards and Product commercialization

7.3   Measures to be taken for Promoting Domestic Manufacturing

A robust telecom network needs a strong telecom manufacturing base which will in turn contribute handsomely to the GDP and employment in the country. There is, therefore, need for a comprehensive Telecom Equipment Manufacturing Policy that would give the country a definite direction and facilitate in becoming a strong telecom manufacturing hub.

7.4   Innovation and R&D during 12th Plan:

Recognizing the strategic (network security and huge national imports) disadvantage of being fully dependent on foreign telecom/ICT equipment and with the goal of India becoming a developed nation by 2020, the 12th Plan should accord significant focus to build a national capability to achieve self-reliance in telecom/ICT equipment design & manufacturing. The Government is intending to prescribe that the domestic industry should start meeting about 30% of the demand from the beginning of the 12th plan and reach to a level by 70-80% by the end of 12th Plan. The volume of this business is estimated to be of the order of Rs 2,50,000 crore by the end of 12th Plan.

TRAI recommendations have stressed the need of creating Market Pull for indigenous products while incentivizing the operators for its use. It has also recommended having strong R&D, Product development and commercialization flow; further it has recommended financial support and tax incentives for Indian products, to help them overcome financial handicaps and long term working capital at international rates, for domestic and export sales.

The sub-group noted that as a country having large talent base must leverage its huge domestic market towards strengthening the Indian Product industry. Product industry requires less capital as compared to simple assembling / manufacturing industry, and is therefore ideally suitable for India. There was a considerable discussion on using

preferential market access. It was unanimously agreed that government procurement and government funded projects should have clear preference for Indian Products to the fullest extent possible. It was also agreed that telecom operators should have an obligation to buy Indian Products or Indian Manufactured product and work out a plan to gradually increase indigenous product content in their network. The operators should be given incentives (in form of concessions in license fees) as they increase indigenous content in their network. It was however felt that penalties would not be the preferred option and instead the operators should commit to support and nurture Indian products. However one or two members felt that failure of the operators to meet indigenous content target in their network should attract a penalty of up to 5% of their revenue in form of a cess on license fees.

7.5   Recommendation: National Telecom Manufacturing Cell

The task of creating and nurturing an Indian Product industry, where design development and IPR generation takes place within India, so that it meets 70 to 80% of domestic demand for telecom equipment is indeed a complex one. Even with right policies, coordination between different government departments and telecom operators will be required. This will not happen on its own. Therefore it is recommended that an inter-departmental National Telecom Manufacturing cell may be created to work in a mission mode with members of academia and industry as its members. The cell would be the body to define, manage, fund and oversee the progress of the entire sector so as to meet the mission objective.

The cell should see that current products, developed in India and comparable with those outside India in terms of the price and performance, be deployed widely. The cell should see that translational R&D towards state-of-art telecom products is supported amongst academia and in industry, with strong collaborations, and IPR generated and introduced in next-generation international standards. It should ensure that design and development of next generation products is carried out extensively. It should ensure that the products are trialled and nurtured by operators to make them robust and pilot orders are given. It should see that the products are provided preferential access in Government and non-government procurement. It should ensure that the incentives are provided to the manufacturing companies as well as to the buyers. It should ensure that timely finance is available for Indian Product companies, both for R&D as well as working capital. It should help companies reach economies of scale and export the products. All this needs to be done as a mission so that Indian products meet 70 to 80% of domestic demand.

7.6   Goal to Make India a Telecom Product Manufacturing Hub

- Progressively increase indigenous content in telecom manufacturing to over 80% in next ten years in line with TRAI recommendations.

- Create R&D thrust to deliver "Indian Products where product IPR resides in India" which would compete in quality and price to the best in the world.
- Recognition that unless an industry gets high volumes and reaches economies of scale, it cannot become price competitive, no matter how efficient is the R&D and design.

7.6.1 Recommendations

a) Leverage large domestic market to provide preferential market access to Indian Products.

b) A potent policy support to stimulate domestic product manufacturing without adverse financial impact to the government.
   o 100% Preference for Indian products in government procurement and projects funded by government / USO.
   o Obligation for Telecom operators to buy Indian Products (IP) and Indian manufactured Products (IMP)
   o Increase Indian content in network over next ten years.
   o Incentives for telecom operators to buy Indian Products and progressively increase indigenous content in network.
   o Any future decrease in license fee for operators would come in the form of incentives for procuring Indian products and Indian Manufactured Products.

c) Penalties not preferable option, but operators need to commit to support Indian Products by
   o Commitment to purchase Indian products when they are comparable in price and performance to imported products.
   o Commitment to participate in trials of newly created Indian products, nurture them and place pilot orders.
   o Funding R&D and support Indian IPR creation and driving in standards.

7.6.2 Recommendations

Indian Products suffers from disadvantage due to poorer infrastructure, poor and higher cost power supply, higher interest rates, longer custom clearance times (22% as per CII report and TRAI). The committee recommends

a) Deemed export status to sales of Indian Products in India (since import duty of the corresponding product is anyway zero).

b) To make Indian Product companies competitive, they should be given a subsidy of 10% of their sales (domestic and export) for the next 5 years.

c) Create National Investment and Manufacturing Zones (NIMZs) as proposed by DIPP and also incentivise manufacturers in line with Modified Special Incentive Program

scheme (MSIPs) & Electronic Design and manufacturing Cluster (EDMC) of Department of IT.

- o Incentivise to set up system assembly, components, piece-parts and entire manufacturing ecosystem within the cluster.

- o Develop Supply chain within the country.

d) Support companies with good track record to become strong global players by creating a Telecom Promotion Fund of Rs 10,000 Crores for soft loans (at interest rates of 3-5%) to manufacturers of Indian products for domestic as well as exports and for operators who deploy these products.

e) Income tax exemption for Indian Product companies for a period of 5 years (on the lines for software exports).

7.7 Recommendations to Encourage Entrepreneurship

India has tremendous entrepreneurial energy which must be harnessed for the cause of R&D. There is a need to encourage our bright young entrepreneurs and give them needed funding (pre-venture and venture capital), management and mentoring support. Entrepreneurship Model is particularly suitable to set up new Telecom Product companies. Also creating a market pull would encourage venture capital to invest in such start-ups. The committee recommends:

- o Promote entrepreneurs to develop and commercialize Indian products (both system as well as Service products)
  - ➢ Create Telecom Entrepreneurship Development Fund of Rs 2500 crore in 12th plan.
  - ➢ Combination of venture funding and low-interest loans.
  - ➢ Active support and funding to promote Indian Telecom Product brands in international trade shows and target markets.

7.8 R&D, IPR and Standardisation

India has witnessed a tremendous growth in the telecom sector in the last decade. However, despite this significant growth, most of the technology and equipment used by Indian service providers are imported. India's influence in International telecom technology development is practically non-existent, though Indian software companies do a significant level of outsourcing for foreign technology companies. The software companies implement sophisticated and current technologies, but own little IPR. The Indian presence in International telecom standards is also marginal. There is no thriving R&D ecosystem either – leading to a significant outflow of IPR. The parts that could make up a functioning whole are available. What is missing, are the linkages and what is needed, is growing and nurturing of the various efforts so that critical mass is reached in more than one effort in every major area.

IPR are a significant value add in today's telecom systems. The top four companies in telecom manufacturing each filed for a significant fraction of the total telecom-related international patents in 2010. Of these, two were Chinese companies. The contribution of IPR could be close to 15% of the sale price, when the systems are first introduced, and goes down as time goes on. This value is realizable, however, only when the IPR goes into standards, based on which the systems are deployed. The design and development of the systems add further value. In the early days of any new standard, significant part of the sale price is thus contributed by the R&D. There is clear need to promote Indian interests, service providers' requirements, and Indian IPR, into International standards and products/services. This will also help to create an ecosystem for telecom equipment manufacturing in India, which today is not a viable business proposition due to significant outflow for IPR licensing.

India must significantly scale up its influence on telecom technology growth urgently. Most large countries/markets that seek to influence the trajectory of telecommunications evolution, and play a role commensurate with their size and capability, have a Telecommunication's Standards Development Organization (TSDO), an autonomous body, recognized by the government, under the leadership of industry and with strong participation of the academia and the government. India too needs a TSDO to be set up at the earliest. The TSDO of India would be a national body with a responsibility towards facilitating active participation in and contributions to International standards. It should consolidate various efforts in the country and work towards influencing International standards to incorporate Indian requirements/IPR into telecom standards. It should continuously drive consensus regarding national requirements and articulate these in international bodies, and facilitate access for the Indian industry to international standards' fora. The TSDO should be a Public-Private Partnership (PPP), drawing on both public and private expertise.

There is intense work going on all over the world on creating standards in telecom. It is essential for Indian companies and organizations to be aware of, to be involved in, and influence standardization developments in the respective areas. Currently India is represented by just a few individual organizations, if at all, in the international standardization bodies. The participation is intermittent and concerted efforts, such as they exist, are more driven voluntarily on need basis.

Recommendations:

a) Promote companies/institutions to develop capabilities in Technology forecasting for Indian requirements. DOT should set up a council headed by Member of Telecom Commission consisting of

- o Technical experts as members from Telecom Service Providers, Public and Private Telecom Manufacturing Industry, Government, Academia and R&D institutions.
- o Function as permanent team of experts, to work on collaborative and contribution driven professional model.
- o Technology and Product development forecast.
- o Evolve, and periodic updates of the national five year rolling program of technology/product development and its field absorption.
- o Be a nodal group to monitor and ensure the implementations of various recommendations made for promoting Indian Products, manufacturing and IPR.

b) Fund Telecom R&D towards IPR generation and Product Development and Commercialization
   - o DOT should create Telecom Research Development Fund (TRDF) of Rs. 5000 Crores in 12th Plan.

     - ➤ TRDF should be managed by a council, consisting of two Government representatives including Secretary DOT, who will chair the council, 2 professionals from telecom operation industry, 2 professionals from Telecom Equipment Companies, 4 telecom Scientists/faculty from leading Indian institutes, 1 person with financial/VC background. The council should have a small secretariat.

     - ➤ TRDF to fund research with clear focus towards tangible patents/IPRs, which would go into international standards and for development of high end products for future telecom systems and services. Incremental research innovations will not be supported through this fund, as other funding sources from science and technology ministries are available for this. Blue sky research may sometime be funded, however, when there is a clear road-map to convert such research towards next generation standards, culminating into commercial products, and it appears that it is critical to move fast in an integrated manner from basic research to product development.

     - ➤ TRDF to fund technology/product development, for which there is current/future market by Private and Government companies and R&D institutions as grants and soft loans.

     - ➤ TRDF to fund Academic research with grants for futurist technology development with emphasis on IPR Creation.

     - ➤ Preference will be given to fund projects involving industry – academia consortium.

     - ➤ TRDF will fund Indian participation in international standards bodies, upto 75% fees for filing and maintaining patents.

c) Strengthen public R&D institutions like CDOT. Encourage and enable them to collaborate with public as well as private industry and with academia for technology development

   o Allow projects where an Industry (public or private) could retain exclusive technology rights for initial three years provided they are jointly funding development along with the R&D institution. The R&D institution could in return get royalty.

d) Enable Creation of IPRs and push into Standards

   o Create Telecom Standards Development Organization (TSDO) led by industry and telecom service providers and with academia, R&D centers and government participation

      ➢ Drive IPR creation and global standards to meet India-specific requirements

      ➢ DOT will vet the final standards before promoting them in ITU as international standards and decide on adopting them as national standards.

   o Reorient Academic R&D and R&D centers towards IPR generation for telecom standards, leading to development and commercialization of Indian Products. This IPR should be both essential IPR that goes into international standards, as well as implementational IPR that goes into products. Funding support should also be given for the researchers to attend standards meetings regularly so that their IPR can be promoted for inclusion in the standards. These meetings take place seven to eight times a year all over the world. As India becomes active, such meetings should take place regularly in India as well.

      ➢ Augment TCOEs for this purpose

      ➢ Support as many R&D centres as possible, both in public, PPP and private spheres. Continued support should depend on track record of quality of output, IPRs successfully incorporated in standards or products, ability to launch work in emerging areas.

e) Strengthen TEC to coordinate setting up labs for testing and certification of products as per international best practices.

   o Create some private and Public-private bodies to set up accredited test to test products for conformance, performance, inter-operability and security.

      ➢ Desirable to set up such labs in vicinity of strong R&D clusters and academia to assist in development process. A lot of the test equipment, particularly software, for emerging technologies are also developed in

parallel with products. These tend to be very expensive in the initial years, acting as a roadblock for entrepreneurs and industry. Involving academia in close proximity is a very cost-effective way to bring the cost of tester development down, and leverage the ability of academia to quickly understand new concepts.

o Fund Creation of live test-beds for next generation technologies, particularly by consortia of industry and academia. Such test beds should be widely available for industry and entrepreneurs for assisting them in fine-tuning their products.

o Reserve certain spectrum for R&D and field trials (pilots).

o Reserve certain spectrum where only indigenously developed products can be deployed.

7.9 Green Telecom, use of Wind, Solar & Hybrid Technologies for reducing carbon footprints

Telecom initiatives in rural India face problems due to dismal state of rural electrification. The grid power is not available in many areas, and even where the grid supply is available the power quality is poor (sudden change in voltage, under-voltage/ over-voltage, voltage fluctuation) and erratic. When availability of quality power is not assured, battery is used as to provide power back-up for certain number of hours. Two of the most common alternate power solutions are diesel generator and inverter-battery systems. While supply, storage, cost of diesel and the resulting pollution (noise and environmental) pose major hurdles in operating diesel generator set, low-voltage and intermittent supply of electricity renders inverter battery ineffective.

There are about 300,000 mobile BTS towers in the country, having 15-20 KVA diesel generator as power back-up. Two billion liters of diesel[5] is consumed every year, generating 5.4 million tons of carbon. The mobile subscriber base in India has already crossed the 800 million mark. Add to it the non-diesel electrical consumption in the telecom network and it is found that the average per subscriber CO_2 emission is around 22 kg in India as compared to the international average of 8 kg of CO_2 emission per subscriber. The primary culprit is diesel powering of these remote base station and efforts are required to be taken for reduction of carbon footprint in the telecom industry.

One of the approaches is to design and develop low energy-consuming and low radio-emission telecom systems. In India, where the wired line network is limited, a customer will depend more and more on wireless to get broadband Internet services. It will therefore look for more and more spectrum to provide services and technologies with enhanced spectral efficiency (number of bit per Hz per tower). It is imperative that, as the amount of spectrum usage goes up and the number of bits transmitted per Hz goes up, the amount of energy

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[5]one liter diesel emits 2.68 kg of CO_2 and 1 KWh of grid power consumed emits around 0.84 kg of CO_2

used per bit significantly goes down. This is important both from the view of energy used (Green Telecom) as well as the potential harmful effect that increasing electromagnetic (EM) emission may have. Wireless Telecom has to be thought of differently as we get to the next generation of wireless. R&D in India need to focus or architecture and technologies which would significantly reduce energy consumption per bit and power transmitted per bit.

A second approach would be to reduce energy consumption required and cell-phone towers for cooling. The air-conditioners installed to cool the chambers housing base stations, power converters and batteries in the summer-heat consume much of the power. Alternatives are possible in terms of designing outdoor base-stations and alternate cooling solutions.

A third approach will be to use alternative energy sources for telecom. Use of decentralized solar energy[6]and wind energy[7] for powering towers and rural exchanges could be an answer. Its suitability for decentralized applications and its environment-friendly nature make it an attractive option to supplement the energy supply from other sources. Solar Photovoltaic Cells could meet the power needs adequately, even as it cuts down harmful greenhouse gases. Alternatively Wind Turbine Generator with a cut-in speed of 3-3.5 m/s and generating power at speeds 4.5 m/s could be used. Hybrid Wind-Solar System could be another answer, as they make an ideal alternative as solar-wind power generations are complementary and non-polluting. The problem is reliability and cost of these technologies. It may be unfair to put the additional cost burden on telecom operators, who are already feeling the pinch. The renewable energy usage may have to be subsidised. Another problem is that this renewable energy storage requires energy storage (like batteries). The batteries have proven to be unreliable. One alternative could be get some Renewable Energy Service Companies (RESCOs) to supply electricity to operators and take the subsidy. Alternatively, DOT has to coordinate so that the operators who install renewable energy system get the subsidy as per the Government of India policy.

Recommendations

Keeping in view the above, followings is recommended:

a) Prioritise IPR generation and R&D in development of products for Low-energy, low Electro Magnetic (EM) Emission, High Performance Wireless Systems
   o Push these IPR in next generation (5G) wireless standards
   o Aim to reduce EM emissions per bit by a factor of 100
   o Aim to reduce energy consumption by a factor of 10

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[6]In India the annual global solar radiation is about 5 KWh/ sq.m. per day with about 2300-3200 sun-shine hours per year.

[7]In India the best wind speed is available during monsoon from May to September and low wind speed during November to March. The annual national average wind speed considered is 5-6 m/s. Wherever average wind speed of 4.5 m/s. and above is available it is also an attractive option to supplement the energy supply. 1 KW WTG generates around 3 units (KWhr) per day.

b) Prioritise IPR generation, R&D and product development in low-emissions in-building wireless solutions.

c) Prioritise R&D and product development in distributed, renewable and hybrid energy sources for telecom equipment.

d) Promote R&D in energy storage and energy savings.

e) Adopt internationally developed and accepted benchmarks for methods in evaluating Energy Efficiency in the national Telecom Networks.

f) Goal to progressively reduce Carbon emission for the mobile network by 8% by the year 2012-2013, 12% by the year 2014-2015, 17% by the year 2016-2017 and 25% by the year 2018-19.

g) Aim to power at least 50% of all rural towers and 33% of the urban towers by hybrid power (Renewable Energy Technologies (RET) + Grid power) in the next five years, while all rural towers and 50% of urban towers are to be hybrid powered by 2020.

h) Service providers should endeavour to ensure that the total power consumption of each BTS will not exceed 500W by the year 2020.

7.10   Recommendations on Environment, Radiation and Health related issues

a) Ensure Compliance against existing EM emission standards

   o Spread awareness on current globally accepted norms and practices with respect to electromagnetic radiation

   o Electromagnetic Wireless Emission needs to be handled with Caution. Promote education that wireless emissions need not be hazardous if prescribed norms are observed.

   o Promote Studies on Low emission deployments.

b) Promote Studies on health effects of low power radiation from wireless systems and devices

   o Fund several such studies to acquire new knowledge, especially on long-term potential impact.

7.11 Recommendations on Urban Planning with regard to Telecom Infrastructure

i) Develop transparent Right of Way Policy for telecom cables.

ii)   Develop safety and aesthetic standards for wireless towers.

iii) Declare Telecom sector as Infrastructure Sector (both wireline and wireless).

   o Provide all the benefits available to infrastructure sectors to telecom sector also to realize true potential of ICT for development.

iv) Promote sharing of the tower infrastructure using passive as well active methodologies to minimize the eventuality of locating new sites within the vicinity of existing towers. [Say within 200m, in urban areas & within 2 Km, in rural areas]. Service providers should plan to have at least 10% of their sites actively shared by the year 2014.

7.12 The C-DOT projects related to the development of GPoN, Technologies for rural areas, Broadband Technologies, Shared GSM Radio Access Network (SGRAN), etc.

During the 11th plan period, C-DOT undertook technology development programs in-line with the broad objectives of the planned period, which laid emphasis on the emerging areas such as Next Generation Networks (NGN), wireless broadband, telecom network security, infrastructure sharing to accelerate the penetration of telecom network in the rural sector, and indigenous manufacturing of telecom equipment.

C-DOT made significant progress in the execution of its technology road-map set-out for the 11th plan period. Many of research programs are either in field /pilot technology trial phase or in the advance stage of development. Some of the major technology achievements are summarized as follows.

o MAX-NG - Migration of C-DOT-based fixed-line technology to packet-based Next Generations Networks (NGN). The technology will help BSNL to extend the life of legacy networks based on C-DOT circuit-switched technology and provide services of the next generations networks

o GPON (Gigabit Passive Optical Network) indigenous development, useful for the broadband delivery over Optical Fibre Cable (OFC) network catering to high bandwidth solution for the business applications in Metros and e-governance solution in Rural areas

o SG-RAN (Shared GSM Radio Access Networks) technology allows mobile active infrastructure sharing to give affordable mobility to rural India thereby expanding the telecom penetration to rural sector.

o C-DOT ATM technology customization / adaptation for defence applications caters to requirements of strategic sector like naval programs for setting-up onboard communication network completely based on indigenous technology.

o CMS (Centralized Monitoring System) technology caters to the requirements of security management for law enforcement agencies for interception, monitoring, data analysis /mining, anti-social-networking using the country's telecom infrastructure for unlawful activities.

These technology programs as well as on-going technology enhancements of the deployed technology are expected to yield desired commercial results during last year of the 11th plan and first two years of the 12th plan. With more and more innovative

services and network technologies appearing on the horizon, It is recommended that C-DOT be strengthened to pursue major technology schemes and solutions in the forthcoming 12th Plan period (2012-2017) in partnership with academia, and public and private industry.

C-DOT: List of Major Technology Development Scheme planned in the 12th Plan

S. No.	C-DOT Major Technology Development Schemes planned in the 12th Five Year Plan period	
	Technology Schemes	Major Project Activities
A1	11th Plan Scheme(s) planned to be retained in the 12th Plan	
1.	Communication & Security Research & Monitoring	Centralized Monitoring System (CMS) – Implementation & Roll-out in the field
2.	Broadband Technologies	R&D for Terabit Router
3.	Campus	Construction of residential complex – hostels & dwelling units
4.	Technology Enhancements / Upgradation and adaptations & Technical Support	Shared GSM Radio, MAX-NG / NGN, ATM Support, NMS Support, Software intensive Applications, etc.
A2	New Schemes proposed for the 12th Plan	
1.	Next Generation Mobile Technology	R&D for emerging Wireless Technologies for Broadband/& Adhoc Mesh Networks - 4G Technology etc.
2.	Career Networks' Transport Technology	Optical Technologies – XGPON-1/2, WDM-PON, DWDM, all Optical Network Platform
3.	Secure Wireless & Wire-line Networks	Development for a secure Mobile Communication Network namely WiPS based GSM technologies like EDGE & 3G, pan India implementation for fixed-line Secure & Dedicated Communication Network (SDCN) etc.
4.	Satellite based Technology	Satellite based Products to meet the requirements of region having tough terrains, hilly areas, scattered population over different & distant areas of the region, such as, North East, Tribal, etc.
5.	Telecom Services & Applications	R&D for converged NMS, Software intensive Applications for new services, service

		delivery platform to support multiple applications and Value Added Services (VAS)
6.	Enabling Technologies & Telecom Networks	Feasibility studies/pilots/consultancy on emerging telecom technologies & piloting trials to gain operational insights & applications of technologies and related issues
7.	Power efficient and Green Technologies for Rural	R&D for exploring alternative sources of energy, design optimization to enhance the systems' power efficiency and technology trials for rural sectors
8.	Next Generation security for Telecom & Data Networks	R&D for enhancing the present interception techniques, encryption/decryption, data-mining, etc., to enhance the network security to combat the emerging security threats

Technology Mnemonics:

XGPON-1/2 : Next Generation GPON (Gigabit Passive Optical Network); WDM: Wavelength Division Multiplexing; CMS : Centralized Monitoring System; WiPS : Wireless in Phone Service;   SDCN : Secure and Dedicated Communication Network   NMS : Network Management System;   EDGE: Enhanced Data for GSM Evolution; ATM: Asynchronous Transfer mode

<div align="right">**Annex**</div>

Telecom Technology areas for R & D funding

Broad Area	Segment which is addressed	Products that can be developed	Core technologies involved
Wireless	Wireless Broadband Access / Backhaul	HSPA+ 4G/5G systems IBS/DAS systems Pico cells/femto cells based products Multi protocol low range compact base stations IP/Hybrid microwave radios E Band Radios in 60/70/80GHz for 1/10Gbps links	Smart Antennas Cognitive radios Software Defined Radios Advanced DSP Coding &Modulation techniques mm-Wave wireless systems Switching/packet processing
	Active Infrastructure sharing	Shared small size GSM Radio Access Network	Sharing of BSS (BSC, BTS, TRAU and OMCR)
	Wireless Network Planning	Software tools for wireless network planning and optimization Software tools for Wireless service assurance and network performance monitoring/reporting	Wireless RF propagation models for Indian terrain (keeping in mind high density, vegetation & spectrum allocated) Algorithms for KPIs keeping in mind Indian regulatory requirements Spectrum efficiency optimization
Optical	Broadband Access	10G/40G PON systems WDM-PON systems Hybrid WDM-TDM-PON systems Carrier Ethernet	Burst Mode optical transmitters and receivers at 10G/40G Injection locked optical sources Broadband light sources Cyclic AWGs Switching/packet processing
	Backbone networks	Ultra dense WDM systems All optical network platform ASON software platform for ROADM	Raman amplifiers Coherent optical transmitters/receivers Integrated optical devices

			like switches All optical wavelength convertors
	Metro/Aggre gation network	Next-Gen SDH with packet transport & OTN compliant interfaces Packet Optical Transport Platform	IP cores for packet & OTN compliant interfaces leading to FPGAs, ASICs, TDM and IP switching, Mappers, Framers etc.
IP	Ethernet transport/ag gregation – carrier grade	PBT based on PBB-TE and MPLS-TP SIP application servers and soft-switches Session border controllers Terabit routers	IP Switching, Cores leading to ASICs, protocols, algorithms and software stacks
	Multi service platform	MSPP with MEN/xDSL/XPON interfaces with Gbps backhaul supported by MPLS-TP profile	IP Cores leading to ASICs, protocols, algorithms and software stacks
Telecom Security	Network Security	Lawful intercept monitoring systems supporting voice/video/data services Location based monitoring systems Secure IP communication devices and equipments, Hardware-based Encryptors	Algorithm for interception of connection oriented networks, Algorithms for interception of VoIP , Video over IP, GPS based monitoring systems Encryption technologies
	Common criterion certification lab	NE level security conformance testing from cyber attacks Application level security conformance testing from cyber attacks	Telecom Product testing & infrastructure building
Telecom Services & Applicati ons	Converged Network Managemen t System	Service Provisioning and Management System Decentralized Mediation Systems	Mediation support for both legacy and standard based NEs Core architecture to support Multi-vendor, multi technology, multi-browser, multiple platforms
	Virtual data centres		Virtualization and cloud computing
	Account settling for	Data Clearing House	TAP procedures

	TSPs		
	Service Delivery Platforms for supporting multiple applications and VAS	North and South band interfaces to TSPs NOC to support OSS & BSS Future proof solution supporting education, entertainment, enterprise applications for delivery over wireless infrastructure to the smart-phones/tablets/ embedded laptop devices	
Public safety	Bio engineering studies on EMF radiation impact	Base stations with less than 1W emissions Handsets with few microwatt SAR	
Mobile hand-held devices and CPEs	3G/4G handsets CPEs	Indian OS to replace Android, Symbion Low power consuming rugged handsets with innovative charging stations Smart phone, tablets & other handheld devices Mobile VAS Customer Premises Equipment for broadband	Algorithms for conversion to vernacular languages Charging with Embedded solar cells, low power electronics etc. SoC, DSP algorithms
Telecom related electronics	Network powering	Solar Hybrid power solution systems Enhanced high capacity and efficient batteries for networking equipments and devices	Reliable, efficient and cost effective solar cells Battery design; material engineering

Acronyms:

ASIC: Application Specific Integrated Circuit
ASON: Automatically Switched Optical Network
AWG: Arrayed Wave Guide
BSC: Base Station Controller
BSS: Business Support Systems or Base Station
Subsystem depending upon the context
BTS: Base Transceiver Station
DAS: Distributed Antenna Solution

DSL: Digital Subscriber Line
DSP: Digital Signal Processing
GPS: Global Positioning System
HSPA: High Speed Packet Access
IBS: In Building Solution
IP: Internet Protocol or Intellectual Property
depending upon the context
KPI: Key Performance Indicators

MEN: Metro Ethernet Network

MPLS-TP: Multi Protocol Label Switching – Transport Profile

MSPP: Multi Service Provisioning Platform

NE: Network Element

NOC: Network Operating Centre

OMC-R: Operations and Maintenance Centre – Radio

OS: Operating System

OSS: Operations Support Systems

OTN: Optical Transport Network

PBB-TE: Provider Backbone Bridge – Traffic Engineered

PBT: Provider Backbone Transport

PON: Passive Optical Networks

ROADM: Reconfigurable Optical Add Drop Multiplexer

SAR: Specific Absorption Rate

SoC: System on Chip

SDH: Synchronous Digital Hierarchy

SIP: Session Initiation Protocol

TDM: Time Division Multiplexing

TRAU: Transcoder and Rate Adaptation Unit

TSP: Telecom Service Providers

VoIP: Voice over Internet Protocol

WDM: Wavelength Division Multiplexing

CHAPTER-8
Telecom Network Security

8.1   Guidelines for Cost sharing and Allocation of R &D funds.

The security of the network and communication flowing through the network is not the responsibility of only the Government. It is a shared goal of the Government, Telecom Service Providers, Security Agencies and even of citizens of the country. However, security comes at a cost. The two main stakeholders who play vital role and through whom cost will be incurred on security related issues are Government and the Telecom Service Providers (TSP, ISP, UASL, CMTS ILD, NLD etc), although ultimately it will be borne by the citizens or the customers. Nevertheless, it may be appropriate, if some broad guidelines are laid for sharing of cost between these two main stakeholders. Following guiding principles can help in determining the cost/fund sharing between these stakeholders.

   a.   For a system with only security dimensions and which connects at both ends i.e. at Service Provider end and Security Agency end, system connectivity and system development cost at agency end would be borne by Government and for creating the facilities at service providers end cost will be borne by the service provider e.g. Lawful Interception and Monitoring Systems.
   b.   For a system or facility, which has dual use that it is used for or has the potential of use for security and commercial, cost would be borne by TSPs e.g. Location Based Services (LBS).
   c.   For system or facilities not connected to TSPs and created for sole use of Government, cost would be borne by Government i.e. Secured Network.
   d.   For security sensitive R&D activities, funds would be generally allocated to Government controlled organization. However, for public safety and less security sensitive R &D activities, funds could be allocated to private sector also at its discretion through a transparent and fair process. In such a situation, Government would have the right to share the commercial benefit of the technologies so developed as agreed before financing such R &D activities.

In the matter of security, however, Government has the discretion to lay down any security condition for which cost may have to be borne by TSPs.

8.2   The Issues and Recommendations:

   (i) **Security related issues in Telecom: Implementation of the scheme for setting up of Centre for Communications Security Research and Monitoring and establishment of Centralized Monitoring System (CMS) and Centre for Telecom Testing and Security Certification**

Telecommunication has become one of the basic needs in the modern age and telecommunication infrastructure the lifeline of a nation. In the modern age, it is not only

used for mere talking locally or long distance, all the economic activities of a nation and of the society at large have become dependent on telecommunication services. Because of this dependence of other sectors on telecom infrastructure, it has become important even for the security of the society and the country and, hence, has grown from being a service sector to almost a strategic one.

Due to the liberalization of the telecom sector and opening of FDI in the sector upto 74%, it is served by a wide spectrum of companies, including by those companies which have substantial foreign holding and controlled by foreign entities registered in India. Exponential growth and quick technological development in the telecom sector further compound the security challenges because, the expanding reach of the sophisticated telecom networks has also led to the communication systems being used by, however a small number, individuals, clans and groups, from within the country and outside, for anti-social and criminal activities.

The antisocial or antinational elements can use the communication facilities either to communicate their plans, coordinate and execute the crime or they can attack the network, steal the confidential or private information contained in the network devices or flowing through the network. These two types of threats require distinct and different handling of the issues.

To address the first threat, security agencies would like to intercept and monitor the communication made by these threat elements. Since, there are lot of other information also available in the system about the communication, which could be handy for the security agencies for analysis and taking proactive action, if a system could be built to use the information, with some check and balance, it can be very useful to these agencies in containment, control and busting of crimes. At present this is done through manual taking of authorization at multiple places at the premises of telecom Service Providers. The system is time consuming and fraught with dangers of loosing the secrecy. Further, there is hardly any analytical capability in the system. This is known as communication assistance to the law enforcement.

For the assistance to the law enforcement, in 11th five years plan, a Centralized Monitoring System (CMS) was envisioned. A proposal for setting up of a Centre for Communication Security Research and Monitoring' has already been approved by the Cabinet Committee on Security with the Government funding of Rs 450 crores. The CMS is one of the two modules of the Scheme. A good amount of research work on CMS has already been done and roll out has begun during the year 2011-12. In 12th Five Years Plan further research work will be done and facility for centralized monitoring will be created throughout the country across the different telecom and Broadband technologies and services by completing all the phases, which have been approved. This would cost around Rs 350 crore. The system would be further up-scaled to take care of expanded network and by creating more facilities at an

estimated cost of Rs 150 crores. For operation and maintenance of the system, an expenditure of about Rs 300 crores would be required during the 12th Five Years Plan, which will include the enhanced manpower to maintain and operate the system. Thus total funding for CMS from Government is proposed to be around Rs 800 crores during the 12th five years Plan as an overall outlay for the execution and maintenance of the project. For execution of the project, Telecom Service Providers (UASL, CMTS, TSPs, ISPs, and other) at their own cost would be required to create facilities at their end to connect with CMS.

The second threat is related to network itself and is more direct. In a multi operator and multi vendor environment, there are possibilities of theft and misuse of database, leakage of secure and personal information passing through the networks due to possible presence of malwares/security bugs in the network elements etc. There are considerable dangers to the network and services offered through the network due to service denial attacks on the networks, which are becoming more open and accessible remotely.

The threat is more serious and need to be tackled through promulgation of security policy, inducting 'safe to connect' devices into the network, periodical security audit of the network, monitoring intrusions and attacks and taking effective steps to ward-off and mitigate these attacks. The telecom network now a days is owned by both private and public sector; largely by private sector. Even in the public sector, it is operated on commercial basis. The above-mentioned threats to network security would have to be taken care of by the network operators, and the Government would need to create an environment, capacity for testing and standardization. With this in view, Telecom Testing and Security Certification centre was included as the second module in the scheme of 'Setting up of Centre for Communication Security Research and Monitoring', which stands approved by CCS. A provision of government funding of Rs 50 crore has been kept for development of security test standards, procedures and test tools. Since due to changing technologies and new security threats emerging, field is evolving, new suits would have to be developed. Therefore, a provision of Rs 100 Crores (including Rs 50 crore already approved) is proposed to be made during the 12th Five Years Plan for Telecom Testing and Security Certification Centre, under the control of Department of Telecommunication (DOT).

The Telecom Security Testing Labs would be set up for testing of telecom equipment based on the security test standards, procedures and tools in public, or joint ventures where telecom service providers and vendors would get their equipment tested on payment basis. These labs would be certified by Telecom Testing and Security Certification Centre on payment of fee.

 Recommendation:

Up scaling of the two modules of Centre for Communication Security Research and Monitoring centre a Government funding of Rs 900 Crore is proposed during the 12th Five Years Plan for the following:

a) Centralized Monitoring System with a Government funding of Rs 800 Crores and

b) Telecom Testing and Security Certification Centre with Government funding of Rs 100 crore. Hence, total for the scheme of setting 'Centre for Communication Security Research and Monitoring' during the 12th five years Plan.

(ii) Implementation of Wireless Phone and Security Network:

Many email and VoIP users in India rely on services of foreign origin such as Yahoo Mail, Google Mail Skype etc. These services use proprietary encryptions, which are considered to be secure. The service may be secure from hackers, antisocial elements, rivals etc but still the communication made through these services can be accessed by the Government of other countries, where the servers for providing these services are hosted, by invoking the provisions of their laws. That is why for the security of communication flowing within the country, it is desired that this traffic should not flow outside the country and should be routed through NIXI. However, due to capacity constraint and non-enforcement of this, much of the country traffic flows outside the country. For the security of communication, it is proposed that it is mandated that within country traffic should be routed through NIXI and the provision is enforced legally after creation of necessary capacity.

A lot of intra-government communication is classified. The security of this communication has to be ensured by alternative mechanism because neither it is advisable to wait for such a mandating and capacity building nor it may be appropriate to rely on the level of security provided by such a scheme as communication would still remain in open domain of Internet. For high security of classified Government communication, secured communication network is proposed to be established for fixed and wireless communication at an estimated capital cost of Rs 300 crores. Further, Rs 100 crores for five years are proposed to be earmarked for operational expenditure and Rs 50 crore for R&D. BSNL and MTNL would be reimbursed full capital cost they incur for building the secured communication fixed network, which is being rolled out by them on commercial basis. In long run building and maintaining the network on commercial basis is neither practical nor desirable. Even when the expenditure is borne by user departments they have to make provision in their budget, and hence, amount of outlay provision would still remains the same. Thus budget outlay of Rs 450 crore is proposed for this activity.

Recommendation:
To develop and deploy a Pan India secure network and network-based services such as email, VoIP, mobile communication through a survivable and available network architecture for secured communication for Government use with a Government funding of Rs 450 Crores.

(iii) Disaster Management: Building effective communication networks for providing effective communication during various Natural / Man-made Disasters:

Whenever natural or manmade disasters occur, the most stressed infrastructure is the communication. Most systems do not degrade gracefully leading to non-availability of communication at critical times. Further in most situations irreparable damage may occur to the communication system itself, like in the case of cyclones or floods. In such situations, a rapidly deployable cell system catering to multitude of services is a must. These base stations should be able to switch calls from police, civil services, medical teams and also connect to public network and commercial phones. Further, they should be capable of supporting Asynchronous and synchronous communication, VoIP, data transfers from PDA, Laptop etc and also to Satellite phones so that all the agencies deployed during the disaster management could communicate seamlessly across within and with each other groups. They in effect support Interoperability Solutions w/PSTN, DISN, IP, SATCOM, & First Responder Comms and vehicle data and tracking systems. Many such operational systems that can be deployed within two hours are available across the world. The capability to build such rapidly deployable systems exists within the Indian Industry and the Governmental Laboratories such as CDOT and BEL.

Further, the development of indoor positioning systems that are rapidly deployable in the buildings under siege also need to be developed.

The NDMA is creating the necessary telecom infrastructure for mitigating the aftermath of disasters. The ministry of Home Affairs, the designated nodal agency for coordinating relief in the aftermath of natural disaster, directed all central ministries concerned to prepare detailed Standard Operating Procedure (SOP) to the above effect. The objectives of the SOP for the Department of Telecommunications are:

(a)   Co-ordination of national actions to assure the provision of telecommunication support to the centre, state and district.
(b)   Co-ordinate the requirement of temporary telecommunication in the affected areas.
(c)   Provide human services under the ministry of communications.

Telecommunication Engineering Centre (TEC) has prepared the SOP laying down the specific actions required to be taken by the Department of Telecommunications and PSUs under its control and Private Telecom Service providers for restoration of telecommunication services. This SOP also lays down the procedure to be followed for receiving reports, analysing them and thereafter issuing follow up action for cohesive action for restoration of telecom services.

Recommendation:

I) A Rapidly Deployable Multi Protocol Wireless Communication system interoperable across all the services that are engaged in disaster management should be developed.

ii) An indoor positioning system to fix positions of men engaged in disaster management within a building to an accuracy of a few centimeters should be developed.

iii) As a policy, there should be at least 100 cells phone and fixed line numbers given to disaster management agencies by every service provider who should receive guaranteed service like hot line services during disasters.

iv) A budget of Rs 50 crores is proposed for development of systems mentioned at recommendation i) and ii) above and allocated to public or private organization as decided by a focus group set up by Government.

iv) Implementation of LBS Facilities that can Assist the Law Enforcement Agencies:

Location based service (LBS) can help the security agencies in locating the criminal or the site of the crime, which facilitates them to prevent, control, detect and analyze the crime. The location accuracy has already been mandated for the Telecom service Providers, up to 2013-14 and could be revised as per national needs keeping in view practicability. The Location Based Solutions are going to become necessary not only for security reasons but these are going to become popular for rendering commercial services also. The solution could be hardware or software based. Software based solutions could turn out to be cost effective. There is a strong case to research and develop local LBS solution, particularly software based. Organization like C-DoT in public or private sector should take up the development of solution for LBS and budget of Rs 50 Crore should be allotted for development of LBS solution.

Recommendation:

Already mandated location accuracy is to be implemented and depending upon the national needs and practicability based on available technologies, it could be revised. For development of indigenous and cost effective technologies and solutions a provision of Rs 50 crores is proposed in the 12th five Years Plan.

CHAPTER-9
HRD and Skill Development

9.1   Scenario Analysis

a) Deregulation, increasing privatization, competition, and technological advancements have country's telecom to grow exponentially from tele-density of 2.32 in 1999 to tele-density of 73.97 in 2011(June 2011). During the last couple of years, the yearly growth has been around 40%.

b) Current Subscriber base is of approx. 886 million (June 2011) subscribers and is the second largest mobile network in the world with approx. 852 million (June 2011) wireless subscribers.

c) Roll out of services in more than 8000 towns and cities and over 5,90,000 villages with 12 to 14 mobile operators in most of the service areas.

d) Telecom sector has contributed significantly to the GDP of the country and is expected to grow further in view of ambitious targets to bring connectivity and Broadband to unconnected India.

e) More services are getting introduced by exploiting the telecom network capabilities. This trend of fast technological change along with introduction of a host of new services is likely to continue in future also.

9.2   Analysis of Problems

a) Though for the telecom sector as a whole authentic Human Resource statistics could not be readily obtained, however, as per study by National Skill Development Corporation (NSDC), incremental human resource requirement for telecom equipment industry has been projected as follows:

Projected human resource requirement 2008-2022 (in `000s)	2008	2012	2018	2022	incremental
Telecom Equipment	184	400	880	759	575

b) Further, incremental human resource requirement, education-wise, till 2022 (in 000s) for telecom equipment segment has been projected by NIDC as below:-

Incremental human resource requirement (in'000s)	Ph. D and Research scholars	Engineers	Diploma and other equally certified skills	ITI and other vocational courses	Other graduates such as B.Sc	MBA/ CA/C WA	10th/ 12th
Telecom equipment	29	230	115	38	86	32	45

(b) It is expected that the telecom sector itself would need around one million additional skilled human resources during the 12th Plan period. These skills would span the domain of vocation, engineering, technical, R&D, etc., at multi levels of granularities. The skill description, the associated job definitions, the corresponding content evolution and finally the certification process would require being in place for successfully addressing of the issues of skill gap.

(c) In the context of contribution towards global standards, generation of Indian IPR and becoming a leader in manufacturing we need right and competent manpower in specialized areas to handle high skill work profiles. Further, from organizational perspective, fast changing technological as well as service scenario not only requires higher level of technical skills but a higher organizational capability than before for handling more complex tasks that require multi-functional skills, ability to use IT effectively, high degree of communication skills etc.

(d) While there are few institutes providing "work ready" human resources that suit for standardization, Indian IPR needs, still significant gap exists in the higher education (M.Tech & PhD levels). Further, huge demand gaps exist, on a qualitative basis at all levels due to lack of required competencies (viz. ability to apply knowledge, design skills, problem solving skills, technical competence etc.) in making fresh engineering graduates to be "work ready".

(e) Therefore, there is a need to focus on aligning the engineering/technology curriculum of various undergraduate/ postgraduate programmes for meeting the human resource requirements in the fast evolving technologies in the telecom market. Further, huge investments would also be required to buy test equipments, handling new standards/technologies for learning in specialized courses.

(f) The end-to-end eco system of telecom in the country, leading upto high-end indigenous manufacturing, Indian IPR, etc. would need promotional initiatives for entrepreneurship development in the country. The establishment of state-of-art labs in the Government/private domain along with other support from Government/private bodies would enhance success on this aspect.

9.3   Skill Development: To evolve strategy for capacity building in telecom sector

a) The presently available human resource projections relating to telecom sector basically provide input with regard to human resource requirements only for telecom equipment industry. There is an urgent need to undertake study about current level of directly or indirectly deployed human resources and their skill

sets as well as demand projections about incremental requirement of human resources and their skill sets for at least another 10 years period for the entire telecom sector.

b) The present technical education is not adequate to meet the skill requirements of the telecom sector. There is a need to put in place a high level   Apex body within the telecom department to oversee and act as guiding/enabling source for aspects relating to skill and learning development in Telecom field in the country. This apex body should be supported by appropriate advisory group(s) consisting of representatives from industry, academia, PSUs and other stakeholders.

c) There is a need for creation of appropriate mechanism which acts as a single point source/repository of various aspects linked with telecom knowledge domain, which is updated periodically and is available across the country through web so that this information can be used by institutions at various levels to update their curriculum based on emerging trends, by various stakeholders of telecom Industry, and by the user groups for awareness related initiatives etc.

d) Further, above suggested single point information source may also act as a potential facilitator to disseminate knowledge in rural areas about various user applications and facilities as well as establishing skill development centres in rural areas.

e) There is also a need of accreditation of skill certificate. Active participation of industry, academia supported by government and PSUs infrastructure to play a vital role in this regard. Acceptance of such certification by the industry as recognition of possession of requisite knowledge will be a great enabler for job or business opportunities in the telecom sector in general and in operation and service support in rural areas in particular.

f) There is a need for regular and continuous up gradation of knowledge, skill and capabilities within the government to understand telecom issues arising in the fast changing technical & business scenario to effectively administer the sector.

g) The training infrastructure available with the Government bodies should be strengthened, continuously upgraded and the training resources should be made available to the entire telecom industry. These training centres should conduct training programme open to common people, entrepreneurs/private sector to take the training to rural masses so that required skilled manpower becomes widely available at District/Block/ Village level to provide installation, operation and service support across the country

h) There is a strong need to strengthen the research facilities with the government and private sector in the country through appropriate funding and coordinate

their efforts for being in sync with national requirements through an enabling body. Research facilities can be strengthened by setting up higher education institutes dedicated to telecom and by actively supporting telecom streams of B.Tech., M.Tech. and PhD in existing institutions.

9.4 Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving QoS, Planning and discovery of synergy amongst various units of DOT.

a) Strategic synergistic alliance amongst PSUs and other DOT organisations holds tremendous potential for sector as a whole and in turn their own viability/relevance. The capabilities of product development by C-DOT, its manufacture by ITI & utilisation by BSNL/MTNL/TCIL reflect potential impact of combination synergies which can be brought about through appropriate facilitating mechanism.

b) To harness their respective strength and for optimal utilisation of the resources to the mutual advantage of alliance partners, DOT needs to mandate utilisation of each organisations resources by any of the organisation of the alliance on mutually agreed terms and conditions. This will hugely facilitate unhindered use of products and services available within the alliance.

c) Production infrastructure in existing factories of ITI need to be upgraded to the state-of-Art level so that they can provide world class and cost effective manufacturing services to Indian Manufacturing companies.

d) TCIL has potential to be one of the Nodal agencies for executing/promoting bilateral projects funded by Government of India in friendly countries. TCIL can also take the role of major System Integrator (SI) from India for taking Indian products and technologies to other countries.

9.5 RECOMMENDATIONS

A. Skill Development: To evolve strategy for capacity building in telecom sector

a) A study should be undertaken on priority to assess current level of directly or indirectly deployed Human Resources and their skill sets as well as demand projections for at least another 10 year period about incremental human resource requirements and their skill sets for the entire telecom sector.

b) An Apex body, comprising of 5 to 7 members, drawn from within the Department/MHRD, academia and Telecom Industry may be set up under the chairmanship of Secretary(T) to oversee and act as guiding/enabling source for different aspects relating to monitoring, regulating and managing all the skill development related framework required for the telecom sector.

c) The above Apex body may be supported by appropriate advisory groups consisting of representatives from service providers and their associations, service users and consumer associations, manufacturing industry and their associations, PSUs and other organisations of DOT etc. to provide required inputs for effective functioning of the Apex Body.

d) Create a framework for

(i) Developing national occupation standards in collaboration with industry for mapping job profiles and competency standards.

(ii) Grading of competencies required for each job profile and setting of certification level for each competency standard.

(iii) Organise certification tests for employees, trainers as per industry requirements and acceptance.

(iv) A career guide for telecom industry

(v) Sharing of work place, experience, machinery and equipment

(vi) Facilitating employment of trained graduates

(vii) Promotion of academic excellence.

The same framework will also assist the already employed manpower, either within DOT and its organisations or Telecom industry as a whole, in further acquisition of specific and mandatory skills. This is proposed to be implemented through vast training infrastructure available across the country with DOT as well as its organisations. The same infrastructure is also recommended for evolution into delivery of formal higher education up to post doctoral study/research, as no such exclusive telecom institution exists in the country. This will set benchmark in long term for integration of studies with R&D in telecom.

e) A comprehensive repository of all telecom related information/ standards/benchmarks/resources/programme curriculum, etc. may be created and regularly updated by National Telecom Institute of Policy Research, Innovation & Training (NTIPRIT) to work as the main point source for Telecom field related information dissemination. This would help in homogeneous spread of standard telecom education, generating single window reference data, quality information dissemination and availability of a data base of skilled, certified manpower proposed above. This repository will also be available for all those involved in providing school/higher education/vocational training. This will also provide a single window reference point for all consumer awareness related initiatives.

f) Setting up of state-of-art telecom labs in all high-end technology areas including the emerging technologies, besides upgrading the existing ones, with the appropriate support from the government for skill/capacity upgradation of

associated manpower. Such high-end infrastructure would also facilitate R&D activities, entrepreneurship initiatives in the country,   as well as enhance innovative practices in line/sync with the available international benchmarks. The visibility of India in the International standards space would be bolstered through support from such labs. This state-of-the-art labs/infrastructure would be available to designated willing premier engineering/academic institutions to assist the scholars in appreciating/visualising the real time telecom environment.

g) Presuming the availability of manpower already with DOT shall be available for above initiatives, additional funding to the tune of around Rs. 455 crores as capex and 238 crores as opex,   is estimated to be required during the 12th Five Year Plan to support setting up of above facilities and meeting other related expenses.

h) The institutions available with DOT organisations are already proposed to be upgraded suitably to facilitate   higher level learning and research dimensions. However, research facilities in Telecom domain need to be significantly augmented in the existing IITs and other premier institutions for which HRD Ministry needs to provide the required support.

i) Intervention of HRD Ministry may also be sought for inclusion of Electronics and Telecom to be part of the curriculum at the polytechnic level and in Industrial Training Institutes for trades specific to telecom. These can be utilised by entrepreneurs, manufacturers, service providers etc. for training their employees in trades specific to Telecom.

B.   Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving QoS, Planning and discovery of synergy amongst various units of DOT.

a) For ensuring DOT organisations, viz. BSNL/MTNL/ITI/TCIL and C-DOT, to effectively flourish in the competitive telecom market, there is a need that individual strengths of these organisations be exploited to their mutual benefit. For this, as a policy, this alliance needs to be recognised for according preferential treatment for procurement of products and services rendered by individual organisations. They may adopt any of the models, viz. Managed Services, Managed Capacity, or any other mutually agreed terms and conditions for procurement of the products available within the alliance with   necessary checks and balances.

b) An appropriate body may be formed within DOT for identification of products having commercial potential, developed through R&D by C-DOT, TCOEs and even in private sector. The selected products need to be appropriately supported for going through production phase.

c) Production infrastructure in existing factories of ITI need to be upgraded to the state-of-Art level so that they can provide world class and cost effective manufacturing services to all. A Capex of Rs. 300 crores and opex of Rs. 78 crores is estimated to be required.

d) The product and services available with the organisations of the alliance may be preferentially considered for execution of projects funded by Government of India.

e) TCIL may be recognised as the nodal agency in respect of product/services available within the alliance for executing/promoting bilateral projects funded by Government of India in friendly countries. This will also facilitate reach of Indian products and services to other countries through TCIL.

9.6   Results expected to be achieved during the 12th Plan Period

i) Direct and indirect new job opportunities for approx. 1.0 million people
ii) Strategising skill needs in Telecom for approx. 3 million people expected to be directly or indirectly involved in telecom sector.
iii) Framework for awareness need for approx. 400 million telecom service users.
iv) Providing framework for under-graduates, post-graduates and Doctoral studies
v) Creation of support framework for telecom R&D, entrepreneurship & innovation promotion.
vi) Creation of international benchmarks and standards in skill development and education
vii) Address skill needs for indigenous manufacturing
viii) Availability of work ready manpower in rural areas.
ix) Effectively enabling synergistic alliance of DOT organisations in the competitive telecom market.

CHAPTER -10
Schemes and Financing of Telecom sector

10.1   Background

Telecommunications has been recognized the world over as an important tool for socio-economic development for a nation. It is one of the prime support services needed for the rapid growth and modernization of various sectors of the economy. The Government of India has always recognized that the development of world-class telecommunication infrastructure is the key to rapid economic growth and social development of the country driven by various policy initiatives of the Govt.

The Indian Telecom sector has witnessed a complete transformation in the last decade and half. Though the growth has been phenomenal there is still a need to further expand those services especially in rural areas where a large population is yet to have access to the benefits of this growth story. The rural market is expected to drive the next round of growth for the voice-based services while the data services will create the much needed churn within maturing urban markets. It is necessary to increase the broad band connectivity for the knowledge based society to grow quickly and for reaping the consequent economic benefits.

Keeping in view the importance of telecom services on the economy as a whole, faster expansion of the telecom sector especially in the rural and remote areas should be the primary criteria in formulating schemes and investments in the sector.

It has been recognized that financial inclusion through mobile platform, enhancing the reach of fibre cable and broadband connections to Panchayats, leveraging cable infrastructure to improve connectivity at grassroot level, encouraging domestic manufacturing are some of the major challenges which need to be addressed during the Plan.

The real success story of the telecommunication revolution is the growth of a robust private sector which has played an important role in the expansion of telecom services. During the next Plan period also a major part of the growth would be financed by the Private sector.

The areas where investment would be required in the 12th Plan would be network expansion, especially in rural and remote areas, network upgrades because of shrinking technology cycle /customer demand cycle. 3G is expected to account for about 25% of subscriber base by 2017. Other major areas needing investment would be Broadband expansion (BWA), Value Added Services, Manufacturing and R&D.

10.2 Estimated Investment

The estimated capacity addition for Telecom equipment during the 12th Plan period in both 2G and 3G segment would be about 500 million lines each. At an estimated Rs 2,700 per line for 2G equipment and about Rs 3,000 per line for 3G the total cost for core telecom equipment would come to about Rs 1,35,000 crores and Rs 1,50,000 crores for 2G and 3G segment respectively.

The cost of transmission network and access network would be about Rs 40,000 crores (about 14% of the core equipment) and Rs 1, 00,000 crores respectively during the 12th Plan.

Another important area where significant investment is envisaged is the Broadband segment. The total cost of broadband rollout is expected to be around Rs 75,000 crores. The cost of manufacturing CPEs is estimated to be around Rs 50,000 crores.

These estimates are made taking into consideration the increase in network capacity from approximately 875 million to about 1200 million by the end of 12th Plan i.e. March 2017. About 25% of this would be 3G/4G subscribers. The number of Broadband subscribers is expected to be around 175 million by the end of the 12th Plan.

Spectrum charges, on account of renewals/fresh releases due in the 12th Plan period, are expected to be around Rs 1, 00,000 crores. This would also be a major area of investment during the 12th Plan period.

Thus the total investment required for the 12th Plan period would be around Rs 6,50,000 crores inclusive of both Private and Central sector investments. Taking into account the total Central sector investment of about Rs 1,10,000 crores the private sector investments during the 12th Plan would be about Rs 5,40,000 crores.

10.3 Concerns raised by the Industry

The concerns raised by the industry representatives through their written submissions are summarized as below:

- Large scale additional investments required for:
  i. Rolling out services to the unconnected
  ii. To take the benefits of 3G &BWA to the masses
- Significant slowdown in FDI & Capex in Telecom Sector explained to a great extent by poor deteriorating fundamentals- operating and financial parameters – of operators
- Fall in the Minutes of Use per connection per month
- Steep fall in ARPU and Stagnation in telecom market revenues
- Inadequate availability of funds to plough back into expansion of service
- Declining investments in expansion of service

- Telecom does not fall within the purview of the definition of Infrastructure Projects to qualify for funding from IIFCL
- Data services are now growing significantly, the bandwidth charges should also be allowed as pass through similar to the per minute access charge being considered for voice
- There is a significant burden of different levies and duties including service tax, sales tax, Octroi, VAT, Stamp duty, entry tax, levies on towers, license fees, spectrum charges etc. that works out to around 30% of the Adjusted Gross Revenue. There is a case for rationalisation of levies in the sector to make services more affordable to the consumer.

10.4   Central Sector Investment in the Telecom Sector

The Central sector comprises of Public Sector and Government sector funded through Gross Budgetary Support. The main investment in the public sector is by the PSEs BSNL& MTNL. The finances for the investments to be made by these PSEs would be generated through their Internal Resources and also extra budgetary resources such as bonds, debentures etc.

During the 11th Plan the total Public sector outlay as approved by the Planning Commission is depicted in the table given below:

(Rs. in Crores)

Government/Public Sector	Total 11th Plan Outlay
BSNL-IEBR	80607.78
MTNL-IEBR	8636.31
Total - IEBR	89244.09
DoT - GBS	1752.01
Grand Total	**90996.10**

During the 12th Plan the main focus of the public sector investment would be on schemes for up-gradation/augmentation of existing network to NGN solution, fixed mobile convergence, broadband penetration in rural areas etc.

The other component of Government Sector spending is through the schemes/plans of the Department and its various units. This is fully financed through the budgetary support of Government of India. Some of the schemes proposed to be financed through the budgetary support system are the schemes of USOF, OFC based network for Defence Service, R&D programmes & the Central Monitoring System (CMS) Project of C-DOT etc. The support from USOF has become part of the plan funded expenditure since 2011-12. An estimated expenditure of about Rs 35,350 crores is likely to be incurred on USOF subsidy spending during the 12th Plan period which includes a component of Rs 21,000 crores on account of

National Optical Fibre Network (NOFN) and Rs 12,000 crores for Wireless Broadband project.

The schemes and estimated investment for the PSEs (funded through IEBR) and the Government schemes/units (funded through GBS) are detailed in Annexure II-Annexure XIII at the end of this Chapter.

The total Central Sector investment during the 12th Plan is expected to be around Rs 1,10,000 crores. The outlay of two PSUs viz. BSNL & MTNL would be about Rs 53,581 crores and the outlay of DOT and its units would be about Rs 56,000 crores. This would be inclusive of the subsidy support of Rs 35,350 crores through the Universal Service Obligation Fund during the 12th Plan Period. A substantial amount of this subsidy support would be for financing the roll out of National Optical Fibre Network (NOFN) and also for Wireless Broadband project. Schemes/Plans of the Government/Public sector would be formulated in such a manner so as to fulfill the objectives envisaged for the 12th Plan. The estimated outlay for the 12th Plan for the Central sector amounting to Rs 1,10,000 crores is an increase of over 21% from the approved Plan outlay for the 11th Five year Plan (of Rs 90996.10 crores).

The total proposed outlay for the Central sector for the 12th Plan is depicted in the table below:

(Rs in Crores)

Government/Public Sector	Total 12th Plan Outlay Estimates
IEBR of the PSUs + C-DOT	54681.40
GBS of DoT & Units	53523.43
Grand Total	108204.83

Say Rs 1,10,000 crores

Thus the total investment expected during the 12th Five Year Plan would be about Rs 6,50,000 crores out of which the Central sector investment would be about Rs 1,10,000 crores and investment from Private Sector would be about Rs 5,40,000 crores.

The table below depicts the total sectoral investments expected during the 12th Plan period:

Telecom Sector	Total 12th Plan Outlay Estimates (`in crores)
Private Sector	540000.00
Central Sector inclusive of PSU investments	110000.00
Grand Total	650000.00

10.5 In addition three funds as indicated below have been proposed to be created during the 12th Plan requiring Rs 17,500 crores taking the total GBS to Rs 1,27,500 crores:

Telecom Promotion Fund –	Rs 10,000 crores
Telecom Entrepreneurship Promotion Fund-	Rs 2,500 crores
Telecom Research Development Fund –	Rs 5,000 crores

10.6 Recommendations

- The grant of infrastructure status for the telecom sector is essential for further growth and expansion for both wireless and wireline.
- Telecom sector may also be allowed to access funding from Indian Infrastructure Finance Company Ltd. (IIFCL).
- In addition, Telecom Finance Corporation may be created as a vehicle to access funds at competitive rates to facilitate the funding needs of the sector if found necessary.
- Rationalization of levies and taxes in the sector may be reviewed from time to time to ensure affordable delivery of services to the consumer

10.7   Anticipated Fund requirements for Skill Development

The details of anticipated fund requirements (in Rs. crores) for above initiatives in respect of DOT and its organisations during the 12th Plan period are as below:

items	Anticipated requirement of funds (in Rs. Crores)											
	2012-13		2013-14		2014-15		2015-16		2016-17		Total	
	Capex	Opex	Capex	Opex	Capex	Opex	Capex	Opex	Capex	Opex	capex	Opex
Information Repository*	0	2	0	2	0	2	0	3	0	3	**0**	**12**
NTIPRIT	15	17	65	28	75	35	15	38	5	43	**175**	**161**
Labs in Training Centres	20	3	50	5	90	10	70	20	50	27	**280**	**65**
ITI Infrastructure Upgradation	50	1	100	6	100	17	50	27	0	27	**300**	**78**
Total	**85**	**23**	**215**	**41**	**265**	**64**	**135**	**88**	**55**	**100**	**755**	**316**

*capex included in NTIPRIT

Government Sector (DoT & Units) Schemes for the 12th Plan: Funded Through GBS

TEC

(` in Crores)

Unit	Schemes	Name of Scheme		2012-13	2013-14	2014-15	2015-16	2016-17	Total
TEC	Existing Schemes retained in the 12th Plan	NGN Labs	Transport Lab	3.00				1.00	4.00
			W/L Lab	10.00					10.00
			IMS Lab		10.00				10.00
			CPE Lab			5.00			5.00
			4G Lab				5.00		5.00
	New Schemes 12th Plan	SAR Lab Mumbai		4.00					4.00
		NTI	Infra	5.00					5.00
			Lab	1.00					1.00
		NE Region	Fuel Cell Project	10.00	9.00				19.0
		TSATL	Model TSATL Lab	8.00					8.0
			TSATL to cover other security related areas					14.00	14.00
	Total								**85.00**

C-DOT

(in Crores)

Unit	Schemes	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
C-DOT	Existing Schemes retained in 12th Plan	Communication & Security Research & Monitoring (CMS)			500.00			500.00
		Broadband Technologies			205.00			205.00
		Campus			25.00			25.00
		Technology Enhancements etc			230.00			230.00
	New Schemes 12th Plan	Next Generation Mobile Technology			750.00			750.00
		Career Networks' Transport Technology			200.00			200.00
		Secure Wireless & Wire-line Networks			50.00			50.00
		Satellite based Technology			135.00			135.00
		Telecom Services & Applications			100.00			100.00
		Enabling Technologies & Telecom Networks			105.00			105.00
		Power efficient and Green Technologies for Rural			100.00			100.00
		Next Generation security for Telecom & Data Networks			250.00			250.00
		Total						**2650.00**
		Funds expected to be generated from internal resources						**1100.00**
		Total GBS						**1550.00**

(in Rs. Crore)

Unit	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
USOF	MARR-A	66.00	0.00	0.00	0.00	0.00	**66.00**
	RCPs	1.00	0.00	0.00	0.00	0.00	**1.00**
	Uncovered - I	25.00	0.00	0.00	0.00	0.00	**25.00**
	Uncovered - II	81.40	20.80	20.80	20.80	0.00	**143.80**
	Wireline Broadband	100.00	200.00	300.00	200.0	200.00	**1000.00**
	Mobile Phase - I	100.00	100.00	100.00	100.00	100.00	**500.00**
	OFC Assam	24.75	24.75	16.80	16.80	16.80	**99.90**
	OFC NE-I	17.90	17.90	10.75	10.75	10.75	**68.05**
	OFC NE-II	59.70	59.70	35.82	35.82	35.82	**226.86**
	Wireless Broadband	3200.00	3200.00	1920.00	1920.00	1920.00	**12160.00**
	Satellite Broadband	0.00	10.00	10.00	10.00	10.00	**40.00**
	SMCF	8.00	8.00	0.00	0.00	0.00	**16.00**
	Sanchar Shakti	4.00	0.00	0.00	0.00	0.00	**4.00**
	OFC Village Panchayat	2000.00	5500.00	5500.00	4000.00	4000.00	**21000.00**
	Total	**5687.75**	**9141.15**	**7914.17**	**6314.17**	**6293.37**	**35350.61**

V

WMO

(₹ in Crores)

Unit	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
WMO	**Technical Schemes:**						
	Type approval & testing of Radio equipment						
	Procurement of M/w monitoring terminal facilities(27 SHF terminals including 1 for T&D centre)						
	Terminals for network analysis and coverage measurement of public commercial services (28 in no.)						
	Procurement of C-band and other Satellite monitoring facilities			350.00			**350.00**
	Augmentation of HF/V/UHF and DF monitoring facilities (27 in no.)						
	Establishment of 6 wireless monitoring stations						
	Sea-borne monitoring facilities (4 in no.)						
	Air-borne monitoring facilities (6 in no.)						
	Specialized Radio monitoring						
	Special measurement setups						
	Civil Works Schemes:						
	Construction of 15 office buildings						
	Construction of other civil infrastructure for WMS			150.00			**150.00**
	Construction of 6 new WMS						
	Total						**500.00**

WPC   (` in Crores)

Unit	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
WPC	**NRSMMS- AMC**	22.20	6.36	6.46	6.46	6.46	**48.24**
	IARSEMS #	24.20	30.50	15.00	20.00	24.00	**113.70**

Institute of Advanced Radio Spectrum Engineering and Management Studies Society

NICF   (`in Crores)

Unit	Schemes	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
NICF	Schemes in the 12th Plan	Mid-Career Training for IP&TAFS	2.75	3.25	4.00	4.50	5.00	**19.50**
		Setting up of Physical Infrastructure for NICF	23.11	34.22	25.27	20.00	11.78	**114.38**
		Total						**133.88**

ITI - Projected Capital Expenditure

(` in Crores)

Unit		Name of Scheme/Products	2012-13	2013-14	2014-15	2015-16	2016-17	Total
ITI	A.	Projects under Diversification & non Telecom Products						
	•	NPR/MNID	135.00	25.00				**160.00**
	•	NGN+LTE		100.00	80.00			**180.00**
	•	Semiconductor FAB		600.00	300.00			**900.00**
	•	Solar Panel	10.00	2.00				**12.00**
	•	Contract manufacturing	100.00	60.00	40.00			**200.00**
	•	IT, Cloud Computing, Managed IT services & BOOT Projects	200.00	200.00	200.00			**600.00**
	•	Security lab	70.00					**70.00**
	•	Data Centre	200.00	200.00				**400.00**
	•	SCADA	7.00					**7.00**
	•	LED Based Products	10.0	2.00				**12.00**
	•	SDR		60.00				**60.00**
	B.	Projects under Government &Telecom Products						
	•	GSM (West & South Zone)	75.00					**75.00**
	•	G-PON/GE-PON	15.00	15.0				**30.00**
	•	ADSL-CPE	5.00	10.00				**15.00**
	•	Transmission equipments like DWDM, STMs (1,4,16,64), Carrier Ethernet etc.	10.00	10.00	5.00			**25.00**
	•	Defence Projects	120.00	300.00	300.00			**720.00**
	•	DSLAM	10.00	5.00				**15.00**
	•	Broadband for Rural Panchayat	20.00	80.00				**100.00**
	•	SMPS	5.00	1.00				**6.00**
	•	Rural Infrastructure Sites	10.00	5.00	5.00			**20.00**
		Total	**1002.00**	**1675.00**	**930.00**			**3607.00**

ITI Funding Support from Government

Sl. No.	Items	` in Crores
1	Capital expenditure as per Revival Plan	3607.00
2	Redemption of Preference Share Capital	300.00
3	Arrears related to 2007 Pay Revision (up to 2011)	635.00
4	Arrears related to 1997 Pay Revision (for 39 months)	165.00
5	Reimbursement of VRS expenses	155.00
6	Reimbursement of overdue statutory payments (March 2011)	270.00
7	Repayment of old overdue liabilities	400.00
8	Establishment cost during implementation of Revival Plan (one year)	408.00
9	Replenishment of Bank Borrowing	490.00
10	Funds required for Vendor Financing	400.00
	Total	**6830.00**

Budgetary support of the Ministry is required through:

i. Equity which would enhance the equity base, improve the debt equity ratio and increase the financial flexibility of the Company for borrowings

ii. Grants which would help the Company to cope up the outstanding financial commitments and payouts in the short run till the Company is revived

iii. Soft loan (interest-free)which would reduce the burden of financing charges and would also be treated as quasi-equity by the Financial Institutions

Public Sector Schemes (PSUs) for the 12th Plan: Funded Through IEBR

MTNL (` in Crores)

Unit	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
MTNL	NGN / IMS Core (New Project)	30.00	60.00	50.00	75.00	0.00	**215.00**
	NGN / IMS Access including / MSAN / PON / SIP etc. (New Project)	10.50	52.50	52.50	52.50	48.00	**216.00**
	GSM / 3G Networks (On going Scheme)	116.00	125.00	125.00	90.00	100.00	**556.00**
	Creation of additional PoPs on IP/MPLS network(On going Scheme)	20.00	20.00	20.00	20.00	20.00	**100.00**
	FTTH /Metro Ethernet Ports / DSLAM (On going Scheme)	20.00	20.00	30.00	35.00	40.00	**145.00**
	Fibre-Km addition(On going Scheme)	18.00	18.00	18.00	18.00	18.00	**90.00**
	Sub Total	**257.40**	**354.60**	**354.60**	**348.60**	**271.20**	**1586.40**
	Other Miscellaneous Projects (On going Scheme/new initiatives as per requirement)	60.00	60.00	65.00	67.00	70.00	**322.00**
	IT based Services (On going Scheme/new initiatives as per requirement)	50.00	50.00	50.00	50.00	50.00	**250.00**
	Building & Civil Works(On going Scheme)	50.00	50.00	50.00	50.00	50.00	**250.00**
	Total Capital Outlay	**417.40**	**514.60**	**519.60**	**515.60**	**441.20**	**2408.40**
	Investment in JVs/Subsidiaries(On going Scheme)	50.00	50.00	50.00	50.00	50.00	**250.00**
	Total Financial Outlay	**467.40**	**564.60**	**569.60**	**565.60**	**491.20**	**2658.40**

BSNL

(₹ in Crores)

Annexure XI

Unit	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
BSNL	Internal Resources	7434.00	8966.00	9677.00	9701.00	9658.00	**45436.00**
	Bonds/Borrowings/EBR	5166.00	1979.00	235.00	-1235.00	-658.00	**5487.00**
	Total IEBR	12600.00	10945.00	9912.00	8466.00	9000.00	**50923.00**

Unit	Schemes	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
BSNL	Fixed Line Segment	• IP enabling of entire Wireline network • Conversion/up gradation of RLUs with NGN solutions • Fixed-Mobile Convergence						
	Mobile Segment	Procurement & Commissioning of 15m GSM lines						
	Wireline Broadband Segment	• NMEICT • CSC • USOF	1711.00 *(742.49) 1760.00 *(605.00) # 1800.00 *(105.71)					
	Core Network Segment	OFC RKM	750.00	600.00	450.00	450.00	450.00	**2700.00**
		Trans. Equipment (STM, DWDM)	100.00	50.00	50.00	50.00	50.00	**300.00**
		CPAN Carrier Ethernet	125.00	100.00	100.00	100.00	100.00	**525.00**
		FTTH (Port)	500.00	500.00	500.00	250.00	250.00	**2000.00**
		MPLS						
		Routers (New)	100.00	100.00	100.00	100.00	100.00	**500.00**
		Routers	150.00	150.00	0.00	0.00	0.00	**300.00**
		Radio(6GHz/Radio Modem)	50.00	50.00	15.00	15.00	15.00	**145.00**
		Satellite (Eqpts./VSATs)	75.00	50.00	50.00	50.00	50.00	**275.00**
		Total	1850.00	1600.00	1265.00	1015.00	1015.00	**6745.00**

*Amount already received; # Out of the total amount 50% funding is by DIT (i.e. ₹ 880 crores)

Annexure XI Contd.

BSNL

Unit	Schemes	Name of Scheme	2012-13	2013-14	2014-15	2015-16	2016-17	Total
BSNL	IT-CFA Segment	• Customer Fixed Access-CDR based Convergent Billing & Customer Care System • Zonal Printing Systems • Internet Data Centre						
	BP-CM Segment	Migration to IPV6 based network						
		National Ducting						
		3G mobile system from WCDMA to HSPA & to LTE						
		NGN Roll Out						
		Fixed-Mobile Convergence						

Unit wise total proposed investments through Department Schemes & its Units in the 12th Plan Period Funded through GBS

(₹ in Crores)

Unit	2012-13	2013-14	2014-15	2015-16	2016-17	Total
ITI			6830.00			6830.00
WMO			500.00			500.00
WPC – NRSMMS (AMC)	22.50	6.36	6.46	6.46	6.46	48.24
WPC- IARSEMS #	24.20	30.50	15.00	20.00	24.00	113.70
TRAI	9.00	10.00	11.00	12.00	14.00	56.00
TDSAT	1.40	1.50	1.60	1.70	1.80	8.00
TEC	41.00	23.00	9.00	9.00	3.00	85.00
C-DoT			1550.00			1550.00
DS			8098.00			8098.00
NICF	23.11	34.22	25.27	20.00	11.78	114.38
MCT	2.75	3.25	4.00	4.50	5.00	19.50
USOF	5687.75	9141.15	7914.17	6314.17	6293.37	35350.61
Total						**52773.43**

Institute of Advanced Radio Spectrum Engineering and Management Studies Society

Proposed PSU Investments in the 12th Plan Period through IEBR

(` in Crores)

Unit	2012-13	2013-14	2014-15	2015-16	2016-17	Total
BSNL	12600.00	10945.00	9912.00	8466.00	9000.00	**50923.00**
MTNL	467.40	564.60	569.60	565.60	491.20	**2658.40**
C-DOT						**1100.00**
Total	13067.40	11509.60	10481.60	9031.60	9491.20	**54681.40**

Chapter 11
Summary of Recommendations

Based on consultation with stakeholders, the Working Group has followings recommendations for the 12th Five year plan.

11.1   Licensing and Spectrum

Recommendations:

i)   Around 320 MHz of additional spectrum should be made available during the 12th Plan period and action should be taken so that another 180 MHz of spectrum becomes available during 13th Plan period.

ii)   Backhaul spectrum in 60 GHz and above band should be made available.

iii)   To meet the requirement of spectrum for telecom services, refarming of spectrum should be taken up specially in bands 450, 700, 800, 900, 1800, 1900 MHz and 2.1, 2.3, 2.5 & 3.5 GHz. Bands of spectrum should also be identified to promote indigenous development/manufacturing.

iv)   Spectrum audit should be conducted to ensure efficient spectrum utilization by the users.

v)   Spectrum sharing should be encouraged to enable efficient utilization of spectrum.

vi)   Pricing of spectrum should be delinked from issue of licence. Spectrum pricing should be determined in such a way that the primary objective of increased penetration of telecom services and availability to consumers are not lost sight of. Pricing policy for spectrum in non-commercial bands and those used in satellite and terrestrial links should be relooked to ensure that spectrum is efficiently utilized.

vii)   There is a need for convergence of voice, data and video services, value added service, audio broadcast and video broadcast services. Action should be initiated for creation of required licensing and regulatory framework for enabling this convergence and seamless delivery of converged services.

viii)   There is a need for national level effort to harmonise the policies of various state governments/local bodies for allocation of land, power supply, grant of right of way and policy/by-laws for erection of towers etc. If required, a suitable legal framework may also be created.

ix)   Fiscal and other benefits of infrastructure sector needs to be granted to telecom sector.

x)   Wireless connectivity for private use within estates/campuses/buildings may be promoted. Suitable pricing for spectrum for such uses may be worked out.

11.2   Broadband and Rural Telephony

India should utilize the opportunity offered by Broadband to give further push to its GDP.

i.   Roll out of rural broadband connectivity through strengthening augmentation and harnessing technology

i)   Government should seek to release as much spectrum into the market as possible, in large and usable amounts.

ii) Government should encourage Broadband proliferation through technology-neutral approach.

iii) Necessary Policy changes should be initiated to encourage Cable Operators to provide Broadband Services especially in remote and rural areas by allowing them to use existing infrastructure.

iv) Large part of the cost of deploying fibre networks is in form of Right of Way (RoW). Operators have to approach multiple agencies for obtaining RoW clearance, which not only delays the rollout plans of the service providers but also increases the cost. The state governments, therefore, need to address the following aspects for promoting/development of telecom infrastructure:

a. Speedy acquisition of sites

b. Reliable uninterrupted power supply

c. Phase out multiple approvals from various state agencies and replace by a single window clearance solution.

d. The essential Right of Way (RoW) to telecom service

v)   Government projects like National Optical fibre Network (NOFN) and other infrastructure projects should be rolled out in a time bound manner.

vi) Use of Broadband through Satellite should be promoted for remote areas, Andaman & Nicobar islands & Lakshadweep.

ii. Optimum Utilization of Infrastructure

i)   Necessary policy changes should be introduced for encouraging the sharing of active and passive infrastructure in order to address the various Infrastructure issues related to rural areas.

ii) Development of Broadband kiosks, on the lines of STD PCOs, should be encouraged in the Rural Areas to provide easy access to rural people to Broadband services. Common Service Centres (CSCs) being set up can play a vital role in this.

iii) CSCs may be positioned as distribution channels. They may tie up with various service providers in this regard.

iii. Applications, Value added services and devices

i) Government projects like e-governance projects can provide the necessary trigger for the growth of Broadband in Rural Areas. Encouragement of use of facilities like m-banking and secured transactions will play a vital role in this regard.

ii) Low cost internet enabled customer equipment and Applications with Vernacular content are critical for the growth and success of Broadband and Rural Telephony. Inclusion of vernacular content for Government's various e-initiatives will provide necessary fillip to the industry in this regard. Also lower cost availability of internet access through policy initiatives such as reduction in taxes on devices including customer premises equipment will help in reducing the costs.

iii) BPOs / Call Centres involving local people and providing information in local languages on subjects like Crop Advisory, Weather, health, education opportunities, Mandi rates, etc. will help improve Broadband penetration while simultaneously generating employment opportunities.

iv. Other issue of importance for the growth of Broadband and rural telephony and related infrastructure

i) To tap the Cable TV segment for proliferation of Broadband, synergy should be developed between Ministry of Communications & Information Technology and Ministry of Information & Broadcasting.

ii) Providing Broadband access to all schools, particularly in the rural areas, may be taken up to help promote literacy through e-learning programs.

iii) Concerted and coordinated efforts by various departments of the Government should address the Gender issues and the needs of the differently abled.

iv) For providing telecom connectivity to rural areas with low ARPU, low population and low population density and lack of adequate grid power, use of low power solutions and renewable energy technologies should be encouraged.

11.3   Telecom equipment Manufacturing, R&D, Product Standards and IPR

Recommendations: Leveraging Domestic Market

i) Leverage large domestic market to provide preferential market access to Indian Products.

ii) A potent policy support to stimulate domestic product manufacturing without adverse financial impact to the government.
  o   100% Preference for Indian products in government procurement and projects funded by government / USO.

o   Obligation for Telecom operators to buy Indian Products (IP) and Indian manufactured Products (IMP)

o   increase Indian content in network over next ten years.

o   Incentives for telecom operators to buy Indian Products and progressively increase indigenous content in network.

o   Any future decrease in license fee for operators would come in the form of incentives for procuring Indian products and Indian Manufactured Products only.

iii)   Penalties not preferable option, but operators need to commit to support Indian Products by

o   Commitment to purchase Indian products when they are comparable in price and performance to imported products.

o   Commitment to participate in trials of newly created Indian products, nurture them and place pilot orders.

o   Funding R&D and support Indian IPR creation and driving in standards.

11.3.1 Recommendations: Fiscal & Infrastructure Development

Indian Products suffers from disadvantage due to poorer infrastructure, poor and higher cost power supply, higher interest rates, longer custom clearance times. It is recommended that

i)   Deemed export status to sales of Indian Products in India (since import duty of the corresponding product is anyway zero).

ii)   To make Indian Product companies competitive, they should be given a subsidy of 10% of their sales (domestic and export) for the next 5 years.

iii)   Create National Investment and Manufacturing Zones (NIMZs) as proposed by DIPP and also incentivise manufacturers in line with Modified Special Incentive Program scheme (MSIPs) & Electronic Design and manufacturing Cluster (EDMC) of Department of IT.

   a.   Incentivise to set up system assembly, components, piece-parts and entire manufacturing ecosystem within the cluster.

   b.   Develop Supply chain within the country.

iv)   Support companies with good track record to become strong global players by creating a Telecom Promotion Fund of Rs 10,000 Crores for soft loans (at interest rates of 3-5%) to manufacturers of Indian products for domestic as well as exports and for operators who deploy these products.

v)   Income tax exemption for Indian Product companies for a period of 5 years (on the lines for software exports).

11.3.2 Recommendations to Encourage Entrepreneurship

India has tremendous entrepreneurial energy which must be harnessed for the cause of R&D. There is a need to encourage our bright young entrepreneurs and give them needed funding (pre-venture and venture capital), management and mentoring support. Entrepreneurship Model is particularly suitable to set up new Telecom Product companies. Also creating a market pull would encourage venture capital to invest in such start-ups. It is recommended that

- ➢ Promote entrepreneurs to develop and commercialize Indian products (both system as well as Service products)
- ➢ Create Telecom Entrepreneurship Development Fund of Rs 2500 crore in 12th plan.
- ➢ Combination of venture funding and low-interest loans.
- ➢ Active support and funding to promote Indian Telecom Product brands in international trade shows and target markets.

11.3.3 R&D, IPR and Standardisation

India has witnessed a tremendous growth in the telecom sector in the last decade. The Indian presence in International telecom standards is also marginal. There is clear need to promote Indian interests, service providers' requirements, and Indian IPR, into International standards and products/services. This will also help to create an ecosystem for telecom equipment manufacturing in India, which today is not a viable business proposition due to significant outflow for IPR licensing.

India should have Telecommunication's Standards Development Organization (TSDO), an autonomous body, recognized by the government, under the leadership of industry and with strong participation of the academia and the government. It should consolidate various efforts in the country and work towards influencing International standards to incorporate Indian requirements/IPR into telecom standards. The TSDO should be a Public-Private Partnership (PPP), drawing on both public and private expertise.

Recommendations:

a) Promote companies/institutions to develop capabilities in Technology forecasting for Indian requirements. DOT should set up a council headed by Member of Telecom Commission consisting of

- o Technical experts as members from Telecom Service Providers, Public and Private Telecom Manufacturing Industry, Government, Academia and R&D institutions.

- o Function as permanent team of experts, to work on collaborative and contribution driven professional model.

- o Technology and Product development forecast.

o Evolve, and periodic updates of the national five year rolling program of technology/product development and its field absorption.

o Be a nodal group to monitor and ensure the implementations of various recommendations made for promoting Indian Products, manufacturing and IPR.

b) Fund Telecom R&D towards IPR generation and Product Development and Commercialization

o DOT should create Telecom Research Development Fund (TRDF) of Rs. 5000 Crores in 12th Plan.

> TRDF should be managed by a council, consisting of two Government representatives including Secretary DOT, who will chair the council, 2 professionals from telecom operation industry, 2 professionals from Telecom Equipment Companies, 4 telecom Scientists/faculty from leading Indian institutes, 1 person with financial/VC background. The council should have a small secretariat.

> TRDF to fund research with clear focus towards tangible patents/IPRs, which would go into international standards and for development of high end products for future telecom systems and services. Incremental research innovations will not be supported through this fund, as other funding sources from science and technology ministries are available for this. Blue sky research may sometime be funded, however, when there is a clear road-map to convert such research towards next generation standards, culminating into commercial products, and it appears that it is critical to move fast in an integrated manner from basic research to product development.

> TRDF to fund technology/product development, for which there is current/future market by Private and Government companies and R&D institutions as grants and soft loans.

> TRDF to fund Academic research with grants for futurist technology development with emphasis on IPR Creation.

> Preference will be given to fund projects involving industry – academia consortium.

> TRDF will fund Indian participation in international standards bodies, upto 75% fees for filing and maintaining patents.

c) Strengthen public R&D institutions like CDOT. Encourage and enable them to collaborate with public as well as private industry and with academia for technology development

- o Allow projects where an Industry (public or private) could retain exclusive technology rights for initial three years provided they are jointly funding development along with the R&D institution. The R&D institution could in return get royalty.

d) Enable Creation of IPRs and push into Standards

- o Create Telecom Standards Development Organization (TSDO) led by industry and telecom service providers and with academia, R&D centers and government participation

  - ➢ Drive IPR creation and global standards to meet India-specific requirements

  - ➢ DOT will vet the final standards before promoting them in ITU as international standards and decide on adopting them as national standards.

- o Reorient Academic R&D and R&D centers towards IPR generation for telecom standards, leading to development and commercialization of Indian Products. This IPR should be both essential IPR that goes into international standards, as well as implementational IPR that goes into products. Funding support should also be given for the researchers to attend standards meetings regularly so that their IPR can be promoted for inclusion in the standards. These meetings take place seven to eight times a year all over the world. As India becomes active, such meetings should take place regularly in India as well.

  - ➢ Augment TCOEs for this purpose

  - ➢ Support as many R&D centres as possible, both in public, PPP and private spheres. Continued support should depend on track record of quality of output, IPRs successfully incorporated in standards or products, ability to launch work in emerging areas.

e) Strengthen TEC to coordinate setting up labs for testing and certification of products as per international best practices.

- o Create some private and Public-private bodies to set up accredited test to test products for conformance, performance, inter-operability and security.

  - ➢ Desirable to set up such labs in vicinity of strong R&D clusters and academia to assist in development process. A lot of the test equipment, particularly software, for emerging technologies are also developed in parallel with products. These tend to be very expensive in the initial

years, acting as a roadblock for entrepreneurs and industry. Involving academia in close proximity is a very cost-effective way to bring the cost of tester development down, and leverage the ability of academia to quickly understand new concepts.

o Fund Creation of live test-beds for next generation technologies, particularly by consortia of industry and academia. Such test beds should be widely available for industry and entrepreneurs for assisting them in fine-tuning their products.

o Reserve certain spectrum for R&D and field trials (pilots).

o Reserve certain spectrum where only indigenously developed products can be deployed.

11.3.4 Green Telecom, use of Wind, Solar & Hybrid Technologies for reducing carbon footprints

Telecom initiatives in rural India face problems due to dismal state of availability of power. The grid power is not available in many areas, and even where the grid supply is available the power quality is poor (sudden change in voltage, under-voltage/ over-voltage, voltage fluctuation) and erratic.

Recommendations
Keeping in view the above, followings is recommended:

a) Prioritise IPR generation and R&D in development of products for Low-energy, low Electro Magnetic (EM) Emission, High Performance Wireless Systems
   o Push these IPR in next generation (5G) wireless standards
   o Aim to reduce EM emissions per bit by a factor of 100
   o Aim to reduce energy consumption by a factor of 10

b) Prioritise IPR generation, R&D and product development in low-emissions in-building wireless solutions.

c) Prioritise R&D and product development in distributed, renewable and hybrid energy sources for telecom equipment.

d) Promote R&D in energy storage and energy savings.

e) Adopt internationally developed and accepted benchmarks for methods in evaluating Energy Efficiency in the national Telecom Networks.

f) Goal to progressively reduce Carbon emission for the mobile network by 8% by the year 2012-2013, 12% by the year 2014-2015, 17% by the year 2016-2017 and 25% by the year 2018-19.

g) Aim to power at least 50% of all rural towers and 33% of the urban towers by hybrid power (Renewable Energy Technologies (RET) + Grid power) in the next five years, while all rural towers and 50% of urban towers are to be hybrid powered by 2020.

h) Service providers should endeavour to ensure that the total power consumption of each BTS will not exceed 500W by the year 2020.

11.3.5 Recommendations on Environment, Radiation and Health related issues

i) Ensure Compliance against existing EM emission standards

- Spread awareness on current globally accepted norms and practices with respect to electromagnetic radiation
- Electromagnetic Wireless Emission needs to be handled with Caution. Promote education that wireless emissions need not be hazardous if prescribed norms are observed.
- Promote Studies on Low emission deployments.

ii) Promote Studies on health effects of low power radiation from wireless systems and devices

- Fund several such studies to acquire new knowledge, especially on long-term potential impact.

11.3.6 Recommendations on Urban Planning with regard to Telecom Infrastructure

i) Develop transparent Right of Way Policy for telecom cables

ii) Develop safety and aesthetic standards for wireless towers

iii) Declare Telecom sector as Infrastructure Sector(both wireline and wireless).

- Provide all the benefits available to infrastructure sectors to telecom sector also to realize true potential of ICT for development.

v) Promote sharing of the tower infrastructure using passive as well active methodologies to minimize the eventuality of locating new sites within the vicinity of existing towers. [Say within 200m, in urban areas & within 2 Km, in rural areas]. Service providers should plan to have at least 10% of their sites actively shared by the year 2014.

11.3.7 The C-DOT projects related to the development of GPoN, Technologies for rural areas, Broadband Technologies, Shared GSM Radio Access Network (SGRAN), etc.

During the 11th plan period, C-DOT undertook technology development programs in-line with the broad objectives of the planned period, which laid emphasis on the emerging areas such as Next Generation Networks (NGN), wireless broadband, telecom network security, infrastructure sharing to accelerate the penetration of telecom network in the rural sector, and indigenous manufacturing of telecom equipment.

C-DOT made significant progress in the execution of its technology road-map set-out for the 11th planned period. It is recommended that C-DOT be strengthened to pursue major technology schemes and solutions in the forthcoming 12th Plan period (2012-2017) in partnership with academia, and public and private industry.

11.4 Telecom Network Security

11.4.1 Security related issues in Telecom: Implementation of the scheme for setting up of Centre for Communications Security Research and Monitoring and establishment of Centralized Monitoring System (CMS) and Centre for Telecom Testing and Security Certification

Recommendation:

Up scaling of the two modules of Centre for Communication Security Research and Monitoring centre a Government funding of Rs 900 Crore is proposed during the 12th Five Years Plan for the following:

a) Centralized Monitoring System with a Government funding of Rs 800 Crores and

b) Telecom Testing and Security Certification Centre with Government funding of Rs 100 crore. Hence, total for the scheme of setting 'Centre for Communication Security Research and Monitoring' during the 12th five years Plan.

11.4.2 Implementation of Wireless Phone and Security Network:

Recommendation:

To develop and deploy a Pan India secure network and network-based services such as email, VoIP, mobile communication through a survivable and available network architecture for secured communication for Government use with a Government funding of Rs 450 Crores.

11.4.3 Disaster Management: Building effective communication networks for providing effective communication during various Natural / Man-made Disasters:

Whenever natural or manmade disasters occur, the most stressed infrastructure is the communication. Most systems do not degrade gracefully leading to non-availability of communication at critical times. Further in most situations irreparable damage may occur to the communication system itself, like in the case of cyclones or floods. In such situations, a rapidly deployable cell system catering to multitude of services is a must.

The NDMA is creating the necessary telecom infrastructure for mitigating the aftermath of disasters. The ministry of Home Affairs, the designated nodal agency for coordinating relief in the aftermath of natural disaster, directed all central ministries concerned to prepare detailed Standard Operating Procedure (SOP) to the above effect. The objectives of the SOP for the Department of Telecommunications are:

(a)   Co-ordination of national actions to assure the provision of telecommunication support to the centre, state and district.

(b)   Co-ordinate the requirement of temporary telecommunication in the affected areas.

(c)   Provide human services under the ministry of communications.

Recommendation:

I) A Rapidly Deployable Multi Protocol Wireless Communication system interoperable across all the services that are engaged in disaster management should be developed.

ii) An indoor positioning system to fix positions of men engaged in disaster management within a building to an accuracy of a few centimeters should be developed.

iii) As a policy, there should be at least 100 cells phone and fixed line numbers given to disaster management agencies by every service provider who should receive guaranteed service like hot line services during disasters.

iv) A budget of Rs 50 crores is proposed for development of systems mentioned at recommendation i) and ii) above and allocated to public or private organization as decided by a focus group set up by Government.

iv) Implementation of LBS Facilities that can Assist the Law Enforcement Agencies:

Recommendation:

Already mandated location accuracy is to be implemented and depending upon the national needs and practicability based on available technologies, it could be revised. For development of indigenous and cost effective technologies and solutions a provision of Rs 50 crores is proposed in the 12th five Years Plan.

11.5   HRD and Skill Development

   a)   Skill Development: To evolve strategy for capacity building in telecom sector

   i)   A study should be undertaken on priority to assess current level of directly or indirectly deployed Human Resources and their skill sets as well as demand projections for at least another 10 year period   about incremental human resource requirements and their skill sets for the entire telecom sector.

   ii)   An Apex body, comprising of 5 to 7 members, drawn from within the Department/MHRD, academia and Telecom Industry may be set up under the chairmanship of Secretary(T) to oversee and act as guiding/enabling source   for   different aspects relating   to monitoring, regulating and

managing all the skill development related framework required for the telecom sector.

iii) The above Apex body may be supported by appropriate advisory groups consisting of representatives from service providers and their associations, service users and consumer associations, manufacturing industry and their associations, PSUs and other organisations of DOT etc. to provide required inputs for effective functioning of the Apex Body.

iv) Create a framework for

- Developing national occupation standards in collaboration with industry for mapping job profiles and competency standards.

- Grading of competencies required for each job profile and setting of certification level for each competency standard.

- Organise certification tests for employees, trainers as per industry requirements and acceptance.

- A career guide for telecom industry

- Sharing of work place, experience, machinery and equipment

- Facilitating employment of trained graduates

- Promotion of academic excellence.

v) The same framework will also assist the already employed manpower, either within DOT and its organisations or Telecom industry as a whole, in further acquisition of specific and mandatory skills. This is proposed to be implemented through vast training infrastructure available across the country with DOT as well as its organisations. The same infrastructure is also recommended for evolution into delivery of formal higher education up to post doctoral study/research, as no such exclusive telecom institution exists in the country. This will set benchmark in long term for integration of studies with R&D in telecom.

vi) A comprehensive repository of all telecom related information/ standards/benchmarks/resources/programme curriculum, etc. may be created and regularly updated by National Telecom Institute of Policy Research, Innovation & Training (NTIPRIT) to work as the main point source for Telecom field related information dissemination. This would help in homogeneous spread of standard telecom education, generating single window reference data, quality information dissemination and availability of a data base of skilled, certified manpower proposed above. This repository will also be available for all those involved in providing

school/higher education/vocational training. This will also provide a single window reference point for all consumer awareness related initiatives.

vii) Setting up of state-of-art telecom labs in all high-end technology areas including the emerging technologies, besides upgrading the existing ones, with the appropriate support from the government for skill/capacity upgradation of associated manpower. Such high-end infrastructure would also facilitate R&D activities, entrepreneurship initiatives in the country, as well as enhance innovative practices in line/sync with the available international benchmarks. The visibility of India in the International standards space would be bolstered through support from such labs. This state-of-the-art labs/infrastructure would be available to designated willing premier engineering/academic institutions to assist the scholars in appreciating/visualising the real time telecom environment.

viii) Presuming the availability of manpower already with DOT shall be available for above initiatives, additional funding to the tune of around Rs. 455 crores as capex and 238 crores as opex, is estimated to be required during the 12th Five Year Plan to support setting up of above facilities and meeting other related expenses.

ix) The institutions available with DOT organisations are already proposed to be upgraded suitably to facilitate higher level learning and research dimensions. However, research facilities in Telecom domain need to be significantly augmented in the existing IITs and other premier institutions for which HRD Ministry needs to provide the required support.

x) Intervention of HRD Ministry may also be sought for inclusion of Electronics and Telecom to be part of the curriculum at the polytechnic level and in Industrial Training Institutes for trades specific to telecom. These can be utilised by entrepreneurs, manufacturers, service providers etc. for training their employees in trades specific to Telecom.

b) **Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving QoS, Planning and discovery of synergy amongst various units of DOT.**

i) For ensuring DOT organisations, viz. BSNL/MTNL/ITI/TCIL and C-DOT, to effectively flourish in the competitive telecom market, there is a need that individual strengths of these organisations be exploited to their mutual benefit. For this, as a policy, this alliance needs to be recognised for according preferential treatment for procurement of products and services rendered by individual organisations. They may adopt any of the models, viz. Managed Services, Managed Capacity, or any other mutually agreed terms and

conditions for procurement of the products available within the alliance with necessary checks and balances.

ii) An appropriate body may be formed within DOT for identification of products having commercial potential, developed through R&D by C-DOT, TCOEs and even in private sector. The selected products need to be appropriately supported for going through production phase.

iii) Production infrastructure in existing factories of ITI need to be upgraded to the state-of-Art level so that they can provide world class and cost effective manufacturing services to all. A Capex of Rs. 300 crores and opex of Rs. 78 crores is estimated to be required.

iv) The product and services available with the organisations of the alliance may be preferentially considered for execution of projects funded by Government of India.

v) TCIL may be recognised as the nodal agency in respect of product/services available within the alliance for executing/promoting bilateral projects funded by Government of India in friendly countries. This will also facilitate reach of Indian products and services to other countries through TCIL.

11.6 Schemes and Financing of Telecom sector

Recommendations

- The grant of infrastructure status for the telecom sector is essential for further growth and expansion for both wireline and wireless.
- Telecom sector may also be allowed to access funding from Indian Infrastructure Finance Company Ltd. (IIFCL).
- In addition, Telecom Finance Corporation may be created as a vehicle to access funds at competitive rates to facilitate the funding needs of this sector if found necessary.
- Rationalization of levies and taxes in the sector may be reviewed from time to time to ensure affordable delivery of services to the consumers.

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Annexure-I

OM of Planning Commission dated 21st June 2011
(3 page document)

F.No-M-13040/27/2011-CIT&I-WG (DOT)
Planning Commission
(CIT&I Division)

Yojana Bhawan, Sansad Marg
New Delhi -110001
Dated - 21st June, 2011

OFFICE MEMORANDUM

Subject: Constitution of Working Group on Telecommunication Sector for Twelfth Five Year Plan (2012-17).

In the context of preparation of the Twelfth Five Year Plan (2012-17), it has been decided to constitute a Working Group on Telecommunication Sector to make recommendations on the various policy matters relevant to the formulation of the Twelfth Five Year Plan for CIT&I Sector. The composition and ToR for the Working Group on Telecommunication Sector is indicated below:-

Composition and ToR for Working Group on Telecommunication Sector

1. Composition

1.	Shri R. Chandrashekhar, Secretary, Telecom	Chairman
2.	Secretary, Department of IT or representative	Member
3.	Secretary, Ministry of Finance or representative	Member
4.	Secretary, Ministry of Defence or representative	Member
5.	Secretary, Department of Space or representative	Member
6.	Secretary, Department of Commerce or representative	Member
7.	Secretary, Health or representative	Member
8.	Secretary Home or representative	Member
9.	Secretary, Deptt. of Industrial Policy & Promotion or representative	Member
10.	Secretary, Rural Development or representative	Member
11.	Secretary, Deptt. of Higher Education or representative	Member
12.	Secretary, School Education and Literacy or representative	Member
13.	Shri Chandra Prakash, Member (Tech),Telecom Commission	Member
14.	Shri S.C. Misra, Member (Services), Telecom Commission	Member
15.	Shri Ajay Bhatacharya, Administrator (USOF)	Member
16.	Ms. Sadhana Dikshit, Member/Adviser(Finance), Telecom Commission	Member
17.	Director General, NIC	Member
18.	CMD, BSNL	Member
19.	CMD, MTNL	Member
20.	Dr. C. Muralikrishna Kumar, Sr. Adviser (CIT&I), Planning Commission	Member
21.	Executive Director, C-DOT	Member
22.	Sr. DDG, TEC	Member
23.	Shri Malay Shrivastava, JS, Telecom	Member – Convenor
Non Official Members		
24.	Prof. Balakrishnan, IISc, Bangalore	Member
25.	Shri B. K. Zutshi, Former Vice-Chairperson, TRAI	Member
26.	Prof. A. Jhunjhunwala, IIT Chennai	Member

27.	Prof. Bhaskar Ramamurthi, IIT Chennai	Member
28.	Prof. Karandikar, IIT Mumbai	Member
29.	Director General, COAI	Member
30.	Secretary General, AUSPI	Member
31.	Representative, FICCI	Member
32.	Representative, CII	Member
33.	Representative, ASSOCHAM	Member
34.	President, TEMA	Member
35.	Secretary General, ISPAI	Member

2. The Terms of Reference to the Working Group

i. To evolve a strategy for telecom sector for the 12th Plan with the basic objective of development of world class infrastructure for supporting accelerated growth of all sectors of the economy.

ii. To review the existing policies/schemes of the sector and recommend the schemes to be retained/included in the Twelfth Plan.

iii. To make specific recommendations for roll out of rural broadband connectivity through strengthening augmentation, re-farming of spectrum and harnessing technology.

iv. To make recommendations of optimum utilisation of scarce spectrum resource and examine the possibility of creation of a Spectrum Relocation Fund. Indicate likely source and quantum of resources so generated and guidelines for the operation of the fund.

v. To evolve a Pricing Policy for service delivery looking at both the spectral efficiency and sectoral business viability. Also, suggest guidelines to encourage and incentivize introduction of spectrum efficient technologies.

vi. To make recommendations on further restructuring/reforms required in the post-convergence scenario including availability of spectrum, expansion of broad band and promotion of R&D.

vii. To suggest measures for further promotion of private sector investment and encourage entrepreneurship in the sector.

viii. To review the performance of telecom equipment manufacturing sector with identification of constraints and make recommendations for evolving an appropriate policy to promote indigenous manufacturing.

ix. To evolve strategy for making the conformance to national standards as mandatory for all telecom products, setting up of labs carrying out testing, certification and development of framework of Conformity Assessment Bodies (CAB) for testing, as well as furthering the activities under Mutual Recognition Agreement (MRA).

x. Skill Development: To evolve strategy for capacity building in telecom field through the newly constituted National Telecom Institute for Policy Research, Innovation and Training.

xi. Security related issues in Telecom: Implementation of the scheme for setting up of Centre for Communications Security Research and Monitoring and establishment of Centralised Monitoring System (CMS) and Centre for Telecom Testing and Security Certification

xii. Implementation of Wireless Phone and Security Network

xiii. The C-DOT projects related to development of GPoN, Technologies for rural areas, Broadband Technologies, Shared GSM Radio Access Network (SGRAN) etc.

xiv. Power is a major constraint in the country. Wind, solar and hybrid technologies could be leveraged through effective incentive packages for reducing carbon footprint.

xv. Disaster Management: Building effective communication networks for providing effective communication during various Natural/Man-made Disasters.

xvi. Issues related to PSUs: Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving Q&S, Planning and discovery of synergy amongst various units of DOT.

xvii. Restoration of Budgetary allocation towards of USOF under Non-plan Budget.

xviii. Any other issue of importance to policy formulation for the telecom sector including creation of a consolidated database.

3.   The Working Group on Telecommunication may set up Sub Groups to go into specific issues/areas in the sector and or for detailed information gathering and analysis. The Chairman of the Working Group may co-opt any person whose knowledge or expertise is considered to be useful to the Working Group or the Sub Groups and may invite any such person to specific meetings.

4.   The expenditure towards TA/DA in connection with the meetings of the Working Group on Telecommunication in respect of the official members will be borne by Department of Telecommunication. Expenditure towards TA/DA of non Official Members of the Working Group will be met by the Planning Commission as admissible to the Class I officers of the Government of India.

5.   The Working Group shall be serviced by Department of Telecommunication and Joint Secretary will be the coordinating Officer for the work relating to the Working Group and may be contacted at.

Joint Secretary, Telecom
Sanchar Bhawan, Asoka Road, New Delhi-110001
Tel 011-23717411

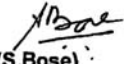**6. The Working Group shall submit its report by 31st August, 2011.**

(S.Bose)
Under Secretary (CIT & I)
Tel.No:- 23096513

To

The Chairman and all Members of the Working Group

Copy for information to:-
1. PS to Deputy Chairman, Planning Commission
2. PS to Minister of State (Planning, Parliamentary Affairs, Science & Technology and Earth Sciences)
3. PS to all Members, Planning Commission
4. PS to Member Secretary, Planning Commission
5. All Principal Advisors/ Sr. Advisors/ JS (Admin.)/ HODs
6. Director(PC)
7. IF Cell/ Admin-1/ Accounts-I/ General I&II Section, Planning Commission
8. Assistant Information Officer, Planning Commission - For uploading in the website of Planning Commission

(S.Bose)
Under Secretary (CIT & I)
Tel.No:- 23096513

Annexure-II
Terms of Reference and composition of Sub-groups

i) Sub- Group on Licensing and Spectrum Issues

Terms of Reference

i)   To make specific recommendations on re-farming of spectrum and harnessing technology.

ii)   To make recommendations of optimum utilisation of scarce spectrum resource and examine the possibility of creation of a Spectrum Relocation Fund. Indicate likely source and quantum of resources so generated and guidelines for the operation of the fund.

iii) To evolve a Pricing Policy for service delivery looking at both the spectral efficiency and sectoral business viability. Also, suggest guidelines to encourage and incentivize introduction of spectrum efficient technologies.

iv)   To make recommendations on convergence of services and also reforms required in the post-convergence scenario including availability of spectrum, expansion of broadband.

v)   Any other issue of importance to Licensing and Spectrum Issues.

Sub- Group on Licensing and Spectrum Issues Composition of the Sub Group

Sl No.	Name (Sh/Mr. /Mrs./Ms.
1.	**Chandra Prakash, Member(T)- Chair**
2.	S C Misra, Member(Services)
3.	Shadhna Dikshit, Member(F)
4.	Ashok Chandra, Wireless Advisor
5.	B K Zutsi, Ex- Chairperson, TRAI
6.	N Neelakantan, D/O Space
7.	Ministry of Finance- Representative
8.	Brig L B Chand, VSM, M/o Defence
9.	Dr C Murli Krishna Kumar, Sr Adv, Planning Commission
10.	V V R Sastry, C DoT
11.	R K Upadhyay, CMD
12.	Kuldeep Singh
13.	Ram Narain, DDG(Security)
14.	R S Mathews, COAI
15.	S C KHANNA, AUSPI
16.	B K Syngal, FICCI
17.	Arvind Kumar, JS, M/o I & B
18.	Arunima Sharma, CII
19.	Rajiv Mehrotra, TEMA
20.	Prof Abhay Karandikar, IIT , Bombay
21.	Prof A Jhunjhunwala, IIT, Madras
22.	Rajesh Chharia
23.	Ajay Sharma
24.	A K Mittal, Sr. DDG(AS), Member-Secretary

ii) Sub- Group on Broadband and Rural Telephony

Terms of Reference

i) To make specific recommendations for roll out of rural broadband connectivity through strengthening augmentation and harnessing technology.
ii) Applications, Value added services and devices
iii) Optimum Utilisation of Infrastructure
iv) Any other issue of importance for the growth of Broadband and rural telephony and related infrastructure.

Sub- Group on Broadband and Rural Telephony

Sl No.	Name (Sh/Mr. /Mrs./Ms.
1.	Ajay Bhattacharya(Administrator USOF)- Chair
2.	B.K. Gairola, DG NIC
3.	Shankar Aggarwal Additional Secretary DIT
4.	Dr. R. S. Sharma ICMR,D/O Health New Delhi
5.	B K Zutsi, Ex- Chairperson, TRAI
6.	N Neelakantan, D/O Space
7.	Ministry of Rural Development- Representative
8.	Ministry of Finance-Representative
9.	N. K. Sinha Addl Secretary D/O Higher Education
10.	Dr C Murli Krishna Kumar, Sr Adv, Planning Commission
11.	V V R Sastry, C DoT
12.	R K Upadhyay, CMD BSNL
13.	A K Pathak, ED(Tech), MTNL
14.	Nitin Jain, DDG (DS), DoT
15.	Radha Chauhan JS (SE& L) M/O HRD
16.	R S Mathews, COAI
17.	S C KHANNA, AUSPI
18.	Rajesh Chharia
19.	B K Syngal, FICCI
20.	N. K. Srivastava Sr. DDG TEC
21.	Arunima Sharma, CII
22.	Rajiv Mehrotra, TEMA
23.	Prof Abhay Karandikar, IIT , Bombay
24.	Prof A Jhunjhunwala, IIT, Madras
25.	Saurabh K. Tiwari DDG (LF-II), DoT
26.	G. P. Srivastava, DDG (CS), DoT
27.	Ramakrishnan Srinivasan
28.	K.K. Minocha DDG (BB), Member-Secretary

iii) Sub- Group on Manufacturing, R&D, Product Standards and IPR

Terms of Reference

i) To review the performance of telecom equipment manufacturing sector with identification of constraints and make recommendations for evolving an appropriate policy to promote indigenous manufacturing;

ii) To evolve strategy for making the conformance to national standards as mandatory for all telecom products, setting up of labs carrying out testing, certification and development of framework of Conformity Assessment Bodies (CAB) for testing, as well as furthering the activities under Mutual Recognition Agreement (MRA);

iii) Green Telecom, use of Wind, solar and hybrid technologies for reducing carbon footprint;

iv) Environment, radiation and health related issues;

v) Issues related to urban planning with regard to Telecom Infrastructure

vi) The C-DOT projects related to development of GPoN, Technologies for rural areas, Broadband Technologies, Shared GSM Radio Access Network (SGRAN) etc;

vii) To suggest measures for further promotion of private sector investment and encourage entrepreneurship in the sector;

viii) Any other issue of importance on the above subject.

Sub- Group on Manufacturing, R&D, Product Standards and IPR

Sl. No.	Name (Sh/Mr. /Mrs./Ms.)
1.	Prof A Jhunjhunwala, IIT, Madras-Chair
2.	Secretary Department of Economic Affairs (Representative)
3.	Dr C Murli Krishna Kumar, Sr Adv, Planning Commission
4.	Dr. Gulshan Rai, DG CERT
5.	J. S. Deepak JS D/O Commerce
6.	Dr. Ajay Kumar JS DIT
7.	Arvind Kumar, JS, M/o I & B
8.	A K Mittal, Sr. DDG(AS)
9.	P. K. Panigrahi Sr. DDG (BW)
10.	Ram Narain, DDG(Security)
11.	V V R Sastry, C DoT
12.	R S Mathews, COAI
13.	S C KHANNA, AUSPI
14.	B K Syngal, FICCI
15.	R.K. Pathak, DDG (IP) DoT-Member Secretary
16.	Gopal Prasad, Deputy Secretary, DIPP
17.	Arunima Sharma, CII
18.	Rajiv Mehrotra, TEMA
19.	Rajesh Chharia ISPAI

20.	Prof Abhay Karandikar, IIT , Bombay
21.	Prof Bhaskar Ramamurthi IIT Chennai
22.	Prof N. Balakrishnan IISC Bangalore
23.	Dr. R. S. Sharma ICMR,D/O Health New Delhi
24.	N. K. Srivastava Sr. DDG TEC

iii) Sub-Group on Network Security Issues

Terms of Reference

i) Security related issues in Telecom: Implementation of the scheme for setting up of Centre for Communications Security Research and Monitoring and establishment of Centralised Monitoring System (CMS) and Centre for Telecom Testing and Security Certification;

ii) Implementation of Wireless Phone and Security Network.

iii) Disaster Management: Building effective communication networks for providing effective communication during various Natural/Man-made Disasters.

iv) Any other issue of importance to security of telecom infrastructure and policy formulation for the telecom sector.

Sub-Group on Network Security Issues
Composition of Sub-Group

Sl. No.	Name (Sh/Mr. /Mrs./Ms.)
1.	Prof N. Balakrishnan IISC Bangalore
2.	Dr. Gulshan Rai, DG CERT
3.	Ministry of Home Affairs- Representative
4.	A K Mittal, Sr. DDG(AS),
5.	Nitin Jain DDG (DS) DoT
6.	Brig L B Chand, VSM, M/o Defence
7.	V V R Sastry, C DoT
8.	R S Mathews, COAI
9.	S C KHANNA, AUSPI
10.	N. K. Srivastava Sr. DDG TEC
11.	Rajiv Mehrotra, TEMA
12.	National Disaster Management Authority
13.	Ram Narain, DDG(Security)-Member Secretary

v) Sub- Group on HRD & Skill Development

Terms of Reference

i) Skill Development: To evolve strategy for capacity building in telecom sector

ii) Issues related to PSUs: Reformulate strategy for enabling DOT organisations to effectively flourish in a competitive world through improving Q&S, Planning and discovery of synergy amongst various units of DOT.

iii) Any other issue of importance on the above subject.

Sub- Group on HRD & Skill Development-

Composition of the Sub-Group

Sl. No.	Name (Sh/Mr. /Mrs./Ms.)
1.	S C Misra
2.	Dr. R. S. Sharma ICMR,D/O Health New Delhi
3.	N. K. Sinha Additional Secretary D/O Higher Education
4.	Radha Chauhan JS (SE& L) M/O HRD
5.	N. K. Srivastava Sr. DDG TEC
6.	R K Upadhyay, CMD BSNL
7.	S P Pachauri, DIR(HR), MTNL
8.	N.K. Joshi DDG (SU)
9.	V V R Sastry, C DoT
10.	R S Mathews, COAI
11.	S C KHANNA, AUSPI
12.	Rajiv Mehrotra, TEMA
13.	Dr. Rekha Jain IIM Ahmedabad
14.	Rajesh Chharia ISPAI
15.	Arunima Sharma, CII
16.	Sanjeev Gupta Director (PSU-I)- Member Secretary

vi) Sub- Group on Schemes and Financing of Telecom Sector for 12th Plan

Terms of Reference

i) To review the existing policies/schemes of the sector and recommend the schemes to be retained/included in the Twelfth Plan.

ii) Financing of Telecom Sector for the 12th Five Year Plan

iii) Any other issue of importance on the above subject.

Sub-Group on Schemes and Financing of Telecom Sector for 12th Plan
Composition of Sub-Group

Sl. No.	Name (Sh/Mr. /Mrs./Ms.)
1.	Shadhna Dikshit, Member(F)
2.	Department of Economic Affairs -Representative
3.	Dr C Murli Krishna Kumar, Sr Adv, Planning Commission
4.	Ashok Chandra, Wireless Advisor
5.	R K Upadhyay, CMD BSNL
6.	Ms Anita Soni, DIR(F), MTNL
7.	K.L. Dhingra CMD ITI
8.	K.K. Minocha DDG (BB),
9.	Ram Narain, DDG(Security)
10.	N.K. Joshi DDG (SU)
11.	R S Mathews, COAI
12.	S C KHANNA, AUSPI
13.	Rajiv Mehrotra, TEMA
14.	Rajesh Chharia ISPAI
15.	Arunima Sharma, CII
16.	Shahbaz Ali DDG (TPF), DoT-Member Secretary