PRESENTATION
ON
POWER SECTOR IN INDIA

by

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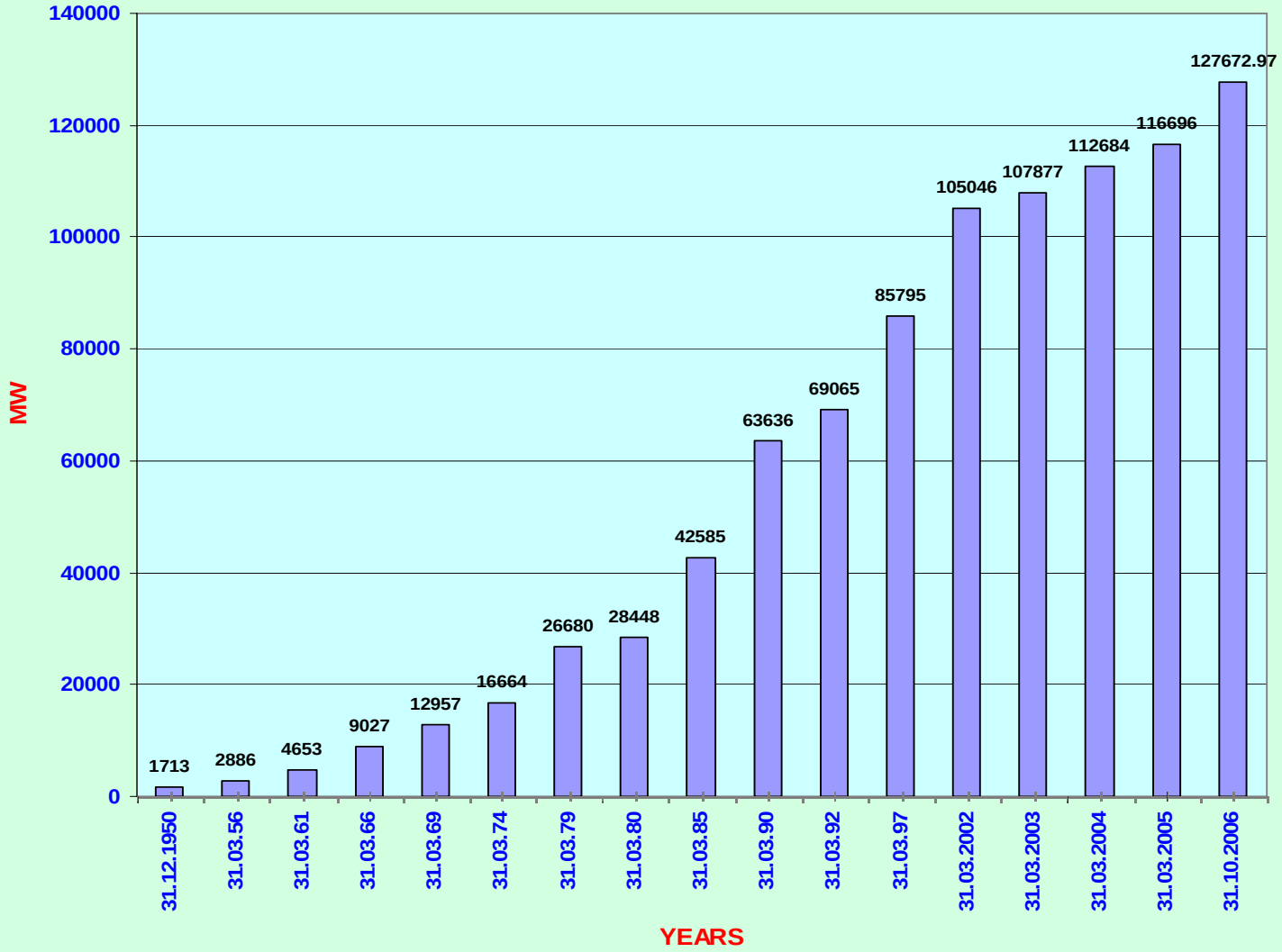
MINISTRY OF POWER

Central Electricity Authority

INDIA

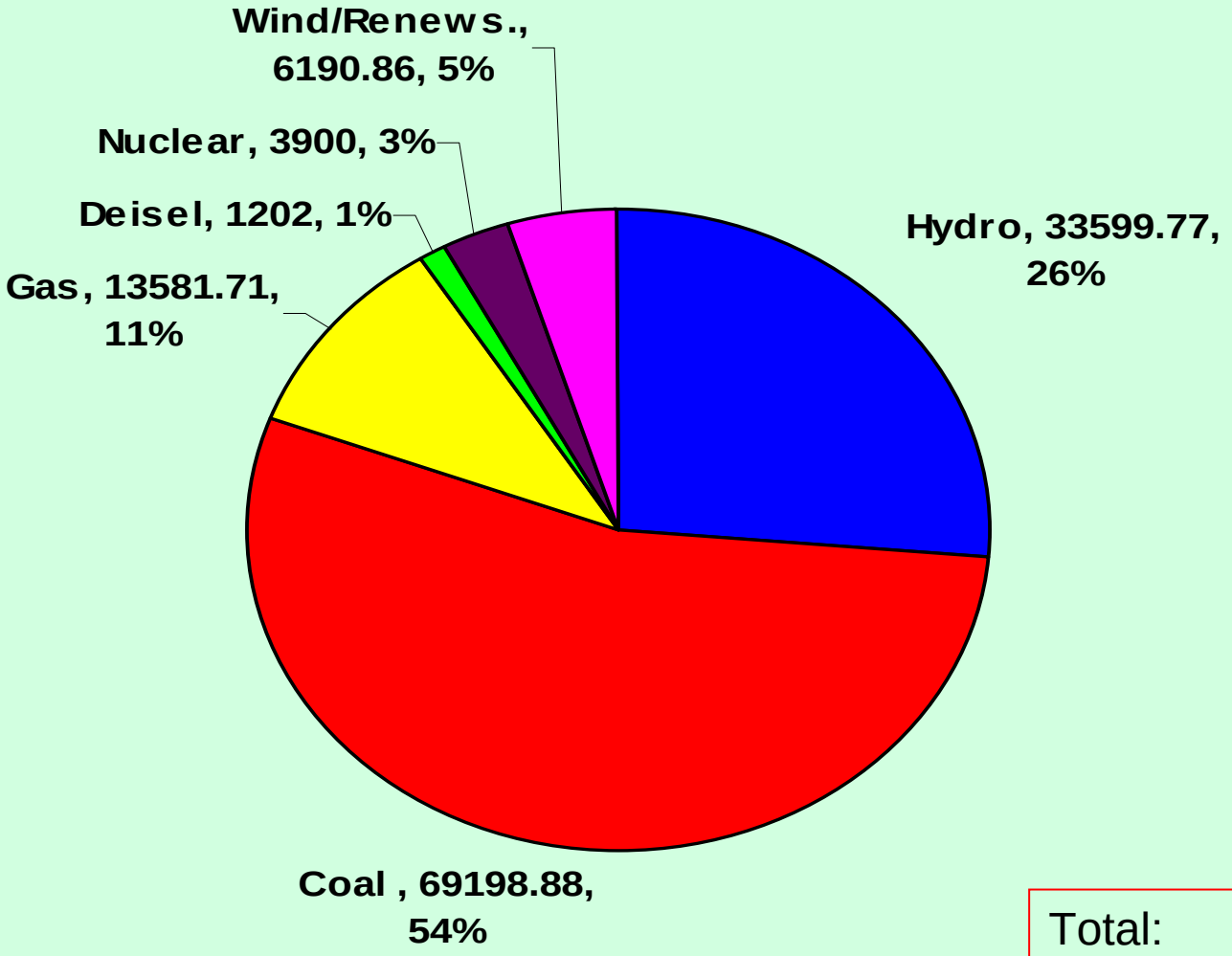
GROWTH OF INSTALLED GENERATING CAPACITY INDIA



INSTALLED CAPACITY(MW) AS ON 31-10-2006

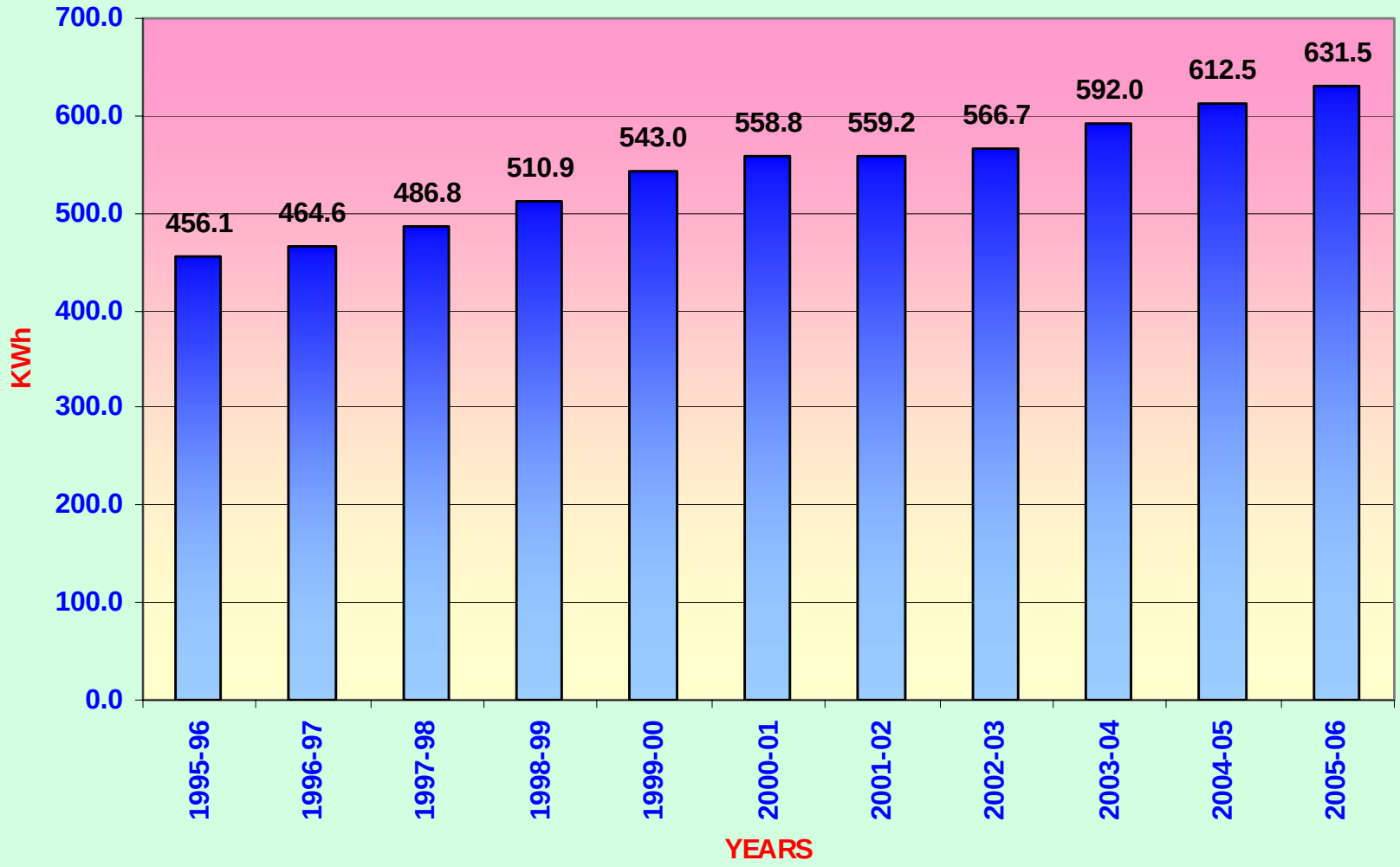
Sector	Hydro	Thermal					Nuc	Wind /RES	Total
		Coal	Lignite	Gas	Oil	Total			
STATE	25635	37141	465	3500	1239	42344	0	2568	70547
PRIVATE	1293	2831	500	5663	1507	10502	0	3523	15418
CENTRAL	6672	24228	2490	4419	0	31137	3900	0	41457
TOTAL	33599.7	64200	3455	13582	2746	83983	3900	6191	127673

INSTALLED CAPACITY
(AS ON 31.10.2006)



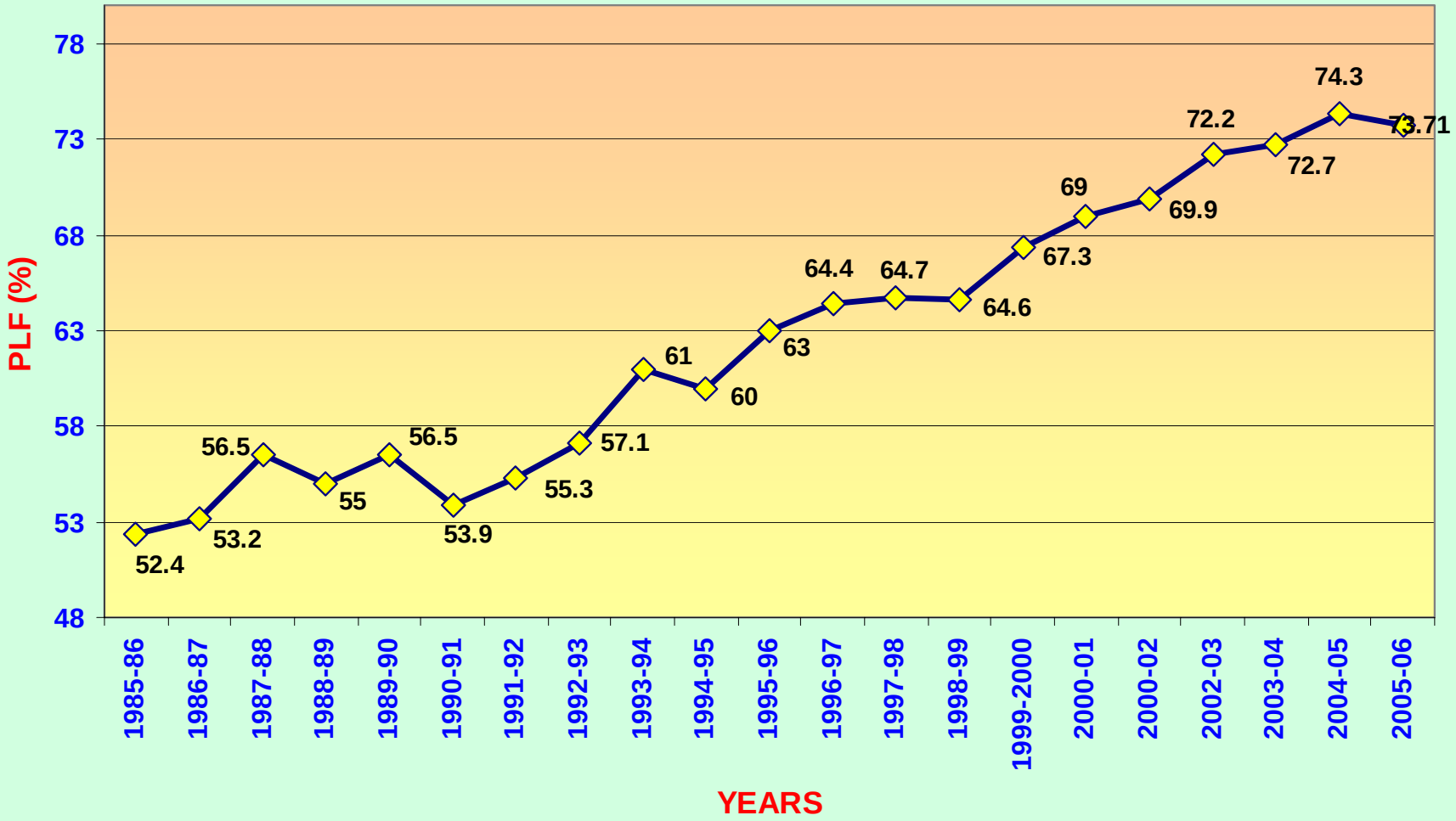
Total:
127672.97MW

GROWTH OF PER CAPITA ELECTRICITY CONSUMPTION (Kwh) IN INDIA



Per Capita Electricity Consumption (kWh) as per UN Definition

ALL INDIA PLANT LOAD FACTOR (%) OF THERMAL POWER STATIONS



- Adoption of good O&M practices.
- R & M
- Parternership in excellance.

Actual Power Supply Position

(April 06 - September 2006)

PEAK DEMAND

Region	Peak Demand (MW)	Peak Met (MW)	Surplus(+)/Deficit(-) (MW)	%
Northern Region	31516	26644	-4872	-15.5
Western Region	31049	24535	-6514	-21.0
Southern Region	25165	23520	-1645	- 6.5
Eastern Region	10491	9980	-511	-4.9
N. E. Region	1407	1165	-242	-17.2
All India	95583	83933	-11650	-12.2

Actual Power Supply Position

(April 06 – September 2006)

ENERGY

Region	Requirement (BU)	Availability (BU)	Surplus(+)/Deficit(-) (BU)	%
Northern Region	105	93.4	-12.36	-11.7
Western Region	103.65	91.20	-11.8	-11.5
Southern Region	87	86	-1.39	-1.6
Eastern Region	34	33.24	-0.8	-2.4
N. E. Region	3.99	3.63	-0.36	-9.0
All India	334.3	307.53	-26.79	-8.0

Future Plans

DEMAND – 16th EPS

Summary of All-India Demand Forecast

YEAR	Energy Requirement (BU)	Peak Load (GW)
2006-07	719.1	115.7
2011-12	975.2	157.1
2016-17	1318.6	212.7

YEAR WISE 10TH (2002-07) PLAN CAPACITY ADDITION

(Figures in MW)

Type	2002-03*	2003-04*	2004-05*	2005-06*	2006-07@			Total
					Commi s-sioned	Yet to be commission	Total	
Hydro	635	2,590	1,015	1,340	1024	2250	3274	8,854
Thermal	2,223	1,362	2,934	1,588	1602	10678	12280	20387
Nuclear	0	50	0	590	540	220	760	1,400
Total	2,858	4,002	3,949	3,518	3166	13148	16314	30,641

* Actual @ Tentative

Estimated Installed Capacity at the End of 10th Plan (2007)

(Figures in MW)

Sector	Hydro	Thermal					Nucl	Wind / RES	Total
		Coal	Lignite	Gas	Oil	Total			
STATE	26745	41631	665	3760	1239	47294	0	2568	76607
PRIVATE	1293	3081	500	7641	1507	12730	0	3623	17645
CENTRAL	7562	27728	2490	4419	0.0	34637	4120	0.0	46319
TOTAL	35600	72440 *	3655	15820	2746	94660	4120	6191	140571

* 25,972 MW Pithead & 46,468 MW Load Center /Non Pit Head

11TH PLAN (2007-12)CAPACITY ADDITION (TENTATIVE)

Figures in MW

	Central	State	Private	Total
Hydro	11289	2637	3263	17189
Thermal	25860	16152	4102	46114
Nuclear	3160	0	0	3160
Total	40309	18789	7365	66463

12TH PLAN (2012-17) CAPACITY ADDITION
(TENTATIVE)

Figures in MW

	Total
Hydro	30000
Thermal	44500
Nuclear	12000
Total	86500

Unit Sizes proposed to be installed during 11th Plan (2007-2012)

Aim: To adopt latest technology to address Environmental concerns apart from improved efficiency.

Coal Fired Units

- **500 MW – 47 no. of Units**
- **660 MW (Supercritical)- 10 no. of Units**
- **800MW(Supercritical) – 2 no. of Units**
- **Ultra Mega Projects(4000MW capacity)**

  3 No. of pithead Stations, 4 No. of coastal Stations

Parameters of 660/800 MW Coal fired Supercritical Units

Parameter	660MW	800MW
Main Steam Pressure Kg/cm2	247	247
Main Steam Temperature C	535	565
Reheat Temperature C	565	593

Captive Power Generation

Captive Power Generation Scenario

(As on 31.03.2005)

Total Existing Capacity MW – 19102.57MW

(1 MW & above)

(% Share)

Hydro – 0.31%

Steam – 46.61%

Diesel – 37.31%

Gas – 15.00%

Wind – 0.77%

Gross Generation from Captive Plants – 71414.62GWh

(2004-05) PLF = 42.7%

Total Installed Capacity likely to be 32000 MW by the end of March 2012.

Renewable Energy Sources

INSTALLED CAPACITY(IC) FROM RENEWABLE ENERGY SOURCES

- By end of 9th Plan – 3,475 MW
- By end of 2005-06 – 8,088 MW
- Programme for 2006-07 – 1,888 MW
- Programme for 11th Plan – 14,000 MW
- Total by end of 11th Plan – 23,976 MW

RENEWABLE ENERGY SOURCES- TENTATIVE PROGRAMME FOR 11TH PLAN (2007-2012)

Sector-wise details

Wind-	10,500 MW
SHP-	1,400 MW
Bio-Energy-	2,100 MW
	14,000 MW

The programme and fund requirement are expected to be finalized by the Working Group for 11th Plan for Non-Conventional Energy Sector .

RENEWABLE ENERGY SOURCES – TENTATIVE PROGRAMME FOR 2006-07

Sector-wise details

Wind-	**1515 MW**
Small Hydro-	**132 MW**
Bio-Energy-	**228 MW**
Industrial waste	**13 MW**

	1,888 MW

GOVERNMENT'S INITIATIVES

GOVERNMENT'S INITIATIVES

- Improvement in efficiency and performance of existing units.
- Partnership in excellence.(26 No. of Stations covered)
- Higher size thermal units (660/800 MW) for improved efficiency (Supercritical) and quick capacity addition.
- Energy Conservation through legislation
- Promotion to Renewable Energy Sources
- 50,000 MW Hydro Initiative launched

NATIONAL ELECTRICITY POLICY

Objectives -Perspective from demand of power

- **Access to Electricity – Available for all households in next five years.**
- **Availability of Power – Demand fully met by 2012. Energy and peaking shortages to be overcome, spinning reserve 5% at national level.**
- **Minimum lifeline consumption of 1 unit/household/day by 2012.**
- **Per capita availability of electricity - Over 1000 units by 2012.**

NATIONAL ELECTRICITY POLICY Contd..

Objectives - Perspective from supply of power

- Reliable and Quality Power of specified standards at reasonable rates.
- Full development of hydro potential of the country.
- Choice of fuel for thermal generation - based on economics of generation and supply of electricity.
- Development of National Grid.
- Availability based tariff (ABT) – to be extended to State level.
- All India transmission tariff - sensitive to distance, direction (to be introduced by CERC).

Energy Conservation Potential

Sector	Potential
Industrial	25%
Agricultural	30%
Domestic and Commercial	20%
Transport	20%
Economy as Whole	23%

Energy Conservation Awards

Energy Conservation Awards Instituted for various Industries

- 311 Industrial Units Participated in the year 2004-05
- Saved around 1316 Million Units of Electrical Power in 2004-05

Promotion of Nuclear Energy

- Energy, Electricity in particular, will always be central to Human Survival and Growth
- Usage of Energy will always be pitted against Environmental Issues
- Need greater promotion, though issues such as radiations will always worry and remain focus of active Research

ENVIRONMENT

National Environment Policy (Adopted in 2006)

Objectives:

- Conservation of critical Environmental Resources
- Intra-generational Equity :Livelihood Security for the Poor
- Inter-generational Equity
- Integration of Environmental concerns in Economic & Social Development
- Efficiency in Environmental Resource Use
- Environmental governance: (through Transparency, Rationality, Accountability, Reduction in time & costs, Participation and Regulatory independence)
- Enhancement of Resources for Environmental Conservation

CREP: Corporate Responsibility for Environmental Protection

(An initiative of the Government of India)

- Industrial development key to Economic Growth, Employment & Quality Life
- Industrial activities interfere with environment
- To check this interference, regulatory norms exist
- We urge our industries to go beyond compliance though the initiative “CREP” launched by the GOI in March 2003
  - a) To adopt cleaner technologies
  - b) To improve management practices
- For Power sector, in particular, new/expansion projects cleared after April 01, 2003 to limit particulate matter to 100 mg/Nm^3

Environmental norms in the context of Power Sector

STACK EMISSIONS

S. N.	Parameter	Unit	Limit	Remarks
1	SPM	mg/Nm^3	i) 350 ii) 150 iii) 100	(i)For <62.5 MW & commissioned before 1/1/1982 (ii)For > 62.5 MW (iii)For units getting Env. Clearance after 1/4/2003*
2	SO_x	mg/Nm^3	None yet	100 ppm by Gujrarat PCB
3	NO_x	mg/Nm^3	None yet	50 ppm by Gujrarat PCB

*** As per CREP guidelines. Source: EPA Notification SO (E) dt.3/1/1989**

LIQUID EFFLUENT DISCHARGE

(I) CONDENSATE COOLING WATER EFFLUENTS

SN	Parameter	Unit	Limit
I	Temperature Rise	^{0}C	<10 ^{0}C*
2	PH		6.5 to 8.5
3	Free available chlorine	mg/l	0.5

*Amended as per EPA Notification GSR 7 dt. 22/12/1998

(II) BOILER BLOW DOWN

SN	Parameter	Unit	Limit
1	Oil &Grease	mg/l	20
2	Copper	mg/l	1
3	Iron	mg/l	1
4	TSS	mg/l	100
5	Free available chlorine	mg/l	0.5

(III) COOLING TOWER WATER EFFLUENTS

SN	Parameter	Unit	Limit
1	Free Available Chlorine	mg/l	0.5
2	Zinc	mg/l	1.0
3	Chromium	mg/l	0.2
4	Phosphate	mg/l	5.0

(IV) ASH POND EFFLUENTS

SN	Parameter	Unit	Limit
1	PH		6.5 to 8.5
2	Oil &Grease	mg/l	20
3	Suspended Solid	mg/l	100

Environmental Norms -Comparison with World Standards

SN	Pollutant	Time weighted average	Concentration in Ambient Air($\mu g/m^3$)			World Bank Standards Effective July 1998	
			Industrial area	Residential/ Rural	Sensitive area	Moderate Air Quality	Poor Air Quality
1	SO_2 ($\mu g/m^3$)	Annual Average	80	60	15	<10	>100
		24 Hours	120	80	30	<150	>150
2	NO_x ($\mu g/m^3$)	Annual Average	80	60	15	<100	>100
		24 Hours	120	80	30	<150	>150
3	SPM ($\mu g/m^3$)	Annual Average	360	140	70	<80	>80
		24 Hours	500	200	100	<230	>230
4	RPM ($\mu g/m^3$)	Annual Average	120	60	50	<50	>50
		24 Hours	150	100	75	<150	>150
5	LEAD ($\mu g/m^3$)	Annual Average	1.0	0.75	0.50	-	-
		24 Hours	1.5	1.0	0.75	-	-
6	CO ($\mu g/m^3$)	8 Hours	5000	2000	1000	-	-
		1 Hour	10000	4000	2000	-	-

CLEAN DEVELOPMENT MECHANISM

Status of Clean Development Mechanism (CDM) in India

1. **National CDM Authority already given Host country Approvals to 391 Projects**
2. **120 Indian CDM projects already registered with CDM Executive Board.**
3. **Main Projects: Biomass based Power Generation, Energy Efficiency improvement, small hydro etc**

Potential CDM projects

(1) Renovation & Modernization of old plants

(2) Alternate Fuel use

(3) Advanced Coal-based Power Generation Technologies like Super critical, IGCC etc

(4) Energy Efficiency Improvement

(5) Demand Side Management

(6) Renewable Energy

(7) Solid Waste Management.

(8) Cogeneration in sectors like cement etc

Advantage India

- Government initiatives on Capacity Building through Bilateral & Multilateral activities
- India - Huge potential of CER's.
- Baseline Carbon di-oxide emissions from power sector already in place- First CDM country
- Wide spectrum of projects with different sizes
- Dynamic, Transparent & Speedy process processing by Indian DNA for Host Country Approval
- Vast Technical Human Resource
- Strong Industrial Base & Entrepreneurship

Baseline Carbon di-oxide Emissions from Indian Power Sector

Weighted average emission factor, simple operating margin (OM), build margin (BM) and combined margin (CM) of all Indian regional grids for FY 2004-05 (with inter-regional and cross-border electricity transfers in tCO2/MWh

	Average	OM	BM	CM
North	0.72	0.98	0.53	0.75
East	1.05	1.18	0.90	1.04
South	0.78	1.00	0.71	0.85
West	0.92	1.01	0.77	0.89
North-East	0.46	0.81	0.10	0.45
India	0.84	1.02	0.70	0.86

Weighted average emission factor, simple operating margin (OM), build margin (BM) and combined margin (CM) of all Indian regional grids for FY 2004-05 (inter-regional and cross-border electricity transfers included), in tCO2/MWh

Average is the average emissions of all stations in the grid

OM is the average emission from all the stations excluding the low cost/must run sources.

BM is the average emission of the 20% (by net generation) most recent capacity addition in the grid.

CM is a weighted average of the simple OM and BM.

Fossil Fuel Wise Carbon di oxide Emission in tCO2/MWh

Weighted average specific emissions fuel wise in 2004-05 (tCO2/MWh)

	Coal	Disl	Gas	Lign	Napt	Oil
North	1.08	-	0.46	-	-	-
East	1.21	-	-	-	-	-
South	1.01	0.55	0.46	1.41	0.70	-
West	1.13	-	0.46	1.37	0.65	0.80
North-East	-	-	0.66	-	-	-
India	1.11	0.55	0.47	1.40	0.67	0.80

Total CO2 Emissions (2004-05) – 461 Million Tonnes from Grid Connected Power Generation


THANK YOU