SOLAR CITY MASTER PLAN SURAT CITY

Surat Municipal Corporation

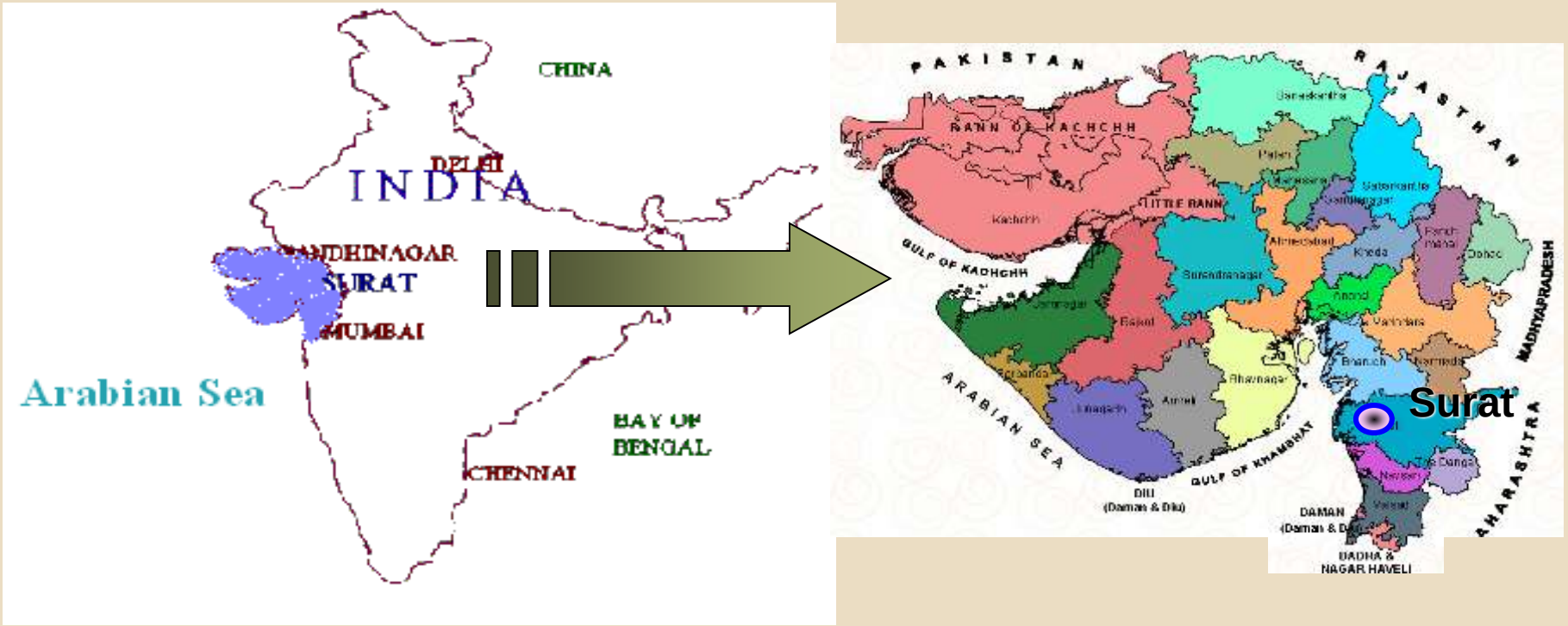
Content of Presentation

- Surat City
- Surat Municipal Corporation... An Energy Conscious Urban Local Body
- Solar City Master Plan... Targets, Planning & Schedules
- Challenges, submissions & way-forward

SURAT CITY

Surat Municipal Corporation

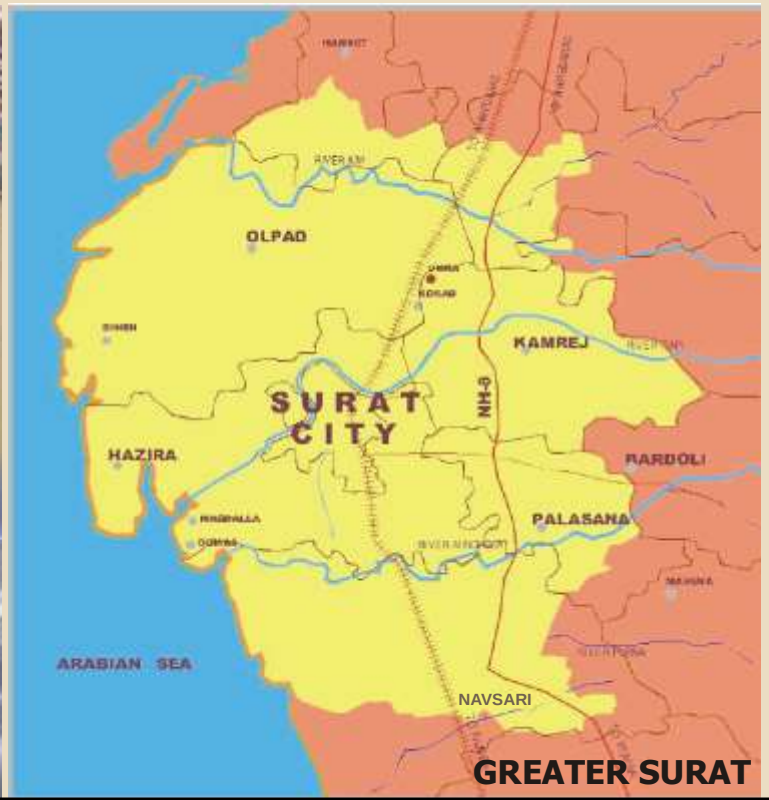
Location of Surat



Surat City

- 8th largest in India
- 2nd largest city in Gujarat

Among the fastest growing cities in India.

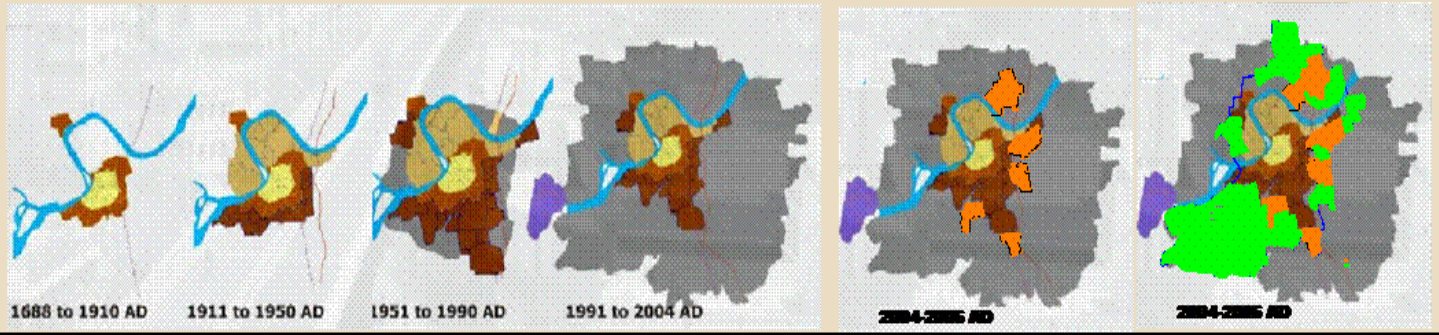


- 42 % of the world's total rough diamond cutting and polishing,
- 70 % of the nation's total rough diamond cutting and polishing,
- 40 % of the nation's total diamond exports,
- 40 % of the nation's total man made fabric production,
- 28 % of the nation's total man made fibre production
- 18 % of the nation's total man made fibre export, and
- 12 % of the nation's total fabric production.
- Large number of textile process houses.

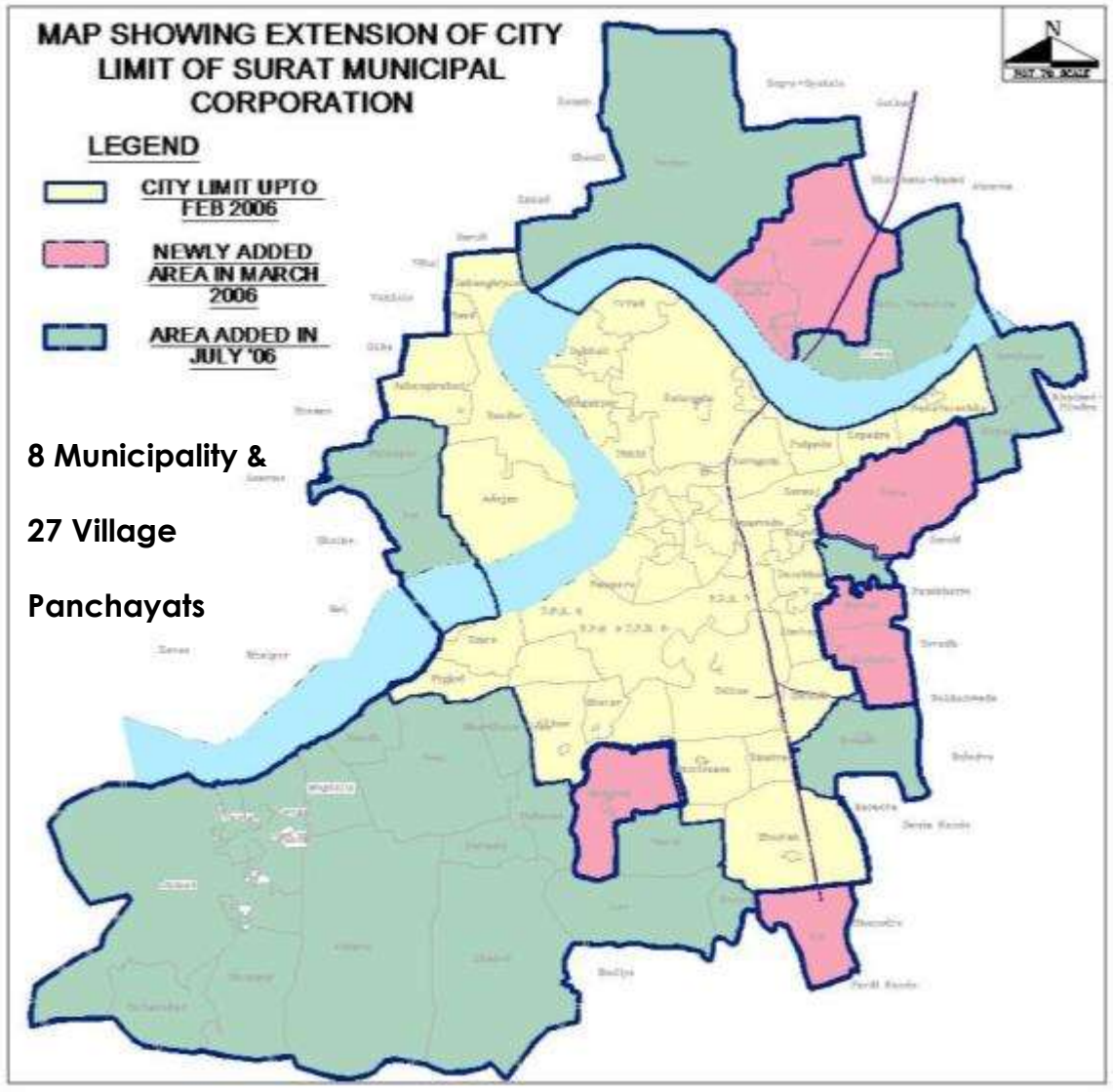
Growth of City

Year	Area in Sq. Km	Population (in Million)
1951	8.18	0.223
1961	8.18	0.288
1971	33.85	0.472
1981	55.56	0.776
1991	111.16	1.499
2001	112.27	2.434
2001*	326.51	2.877
2011	326.51	~ 4.451

- Historical Development Of Surat Dates Back To 300 BC.
- Municipality Established In 1852 AD.
- Municipal Corporation Formed In 1966.



City Expansion



- Unprecedented growth in last four decades.
- 10-fold population rise.
- Now ranks the 8th largest city in the country.
- Jurisdictional limits extended to 3 fold.

Municipal Administration Overview

Area	326.51 sq kms
Population	~ 4.45 Million (2011)
Density	13,629 persons per sq. km
Decadal Growth Rate	62%
Admn. Zones	7
Ward Offices	83
Civic centres	16
Election Wards	38

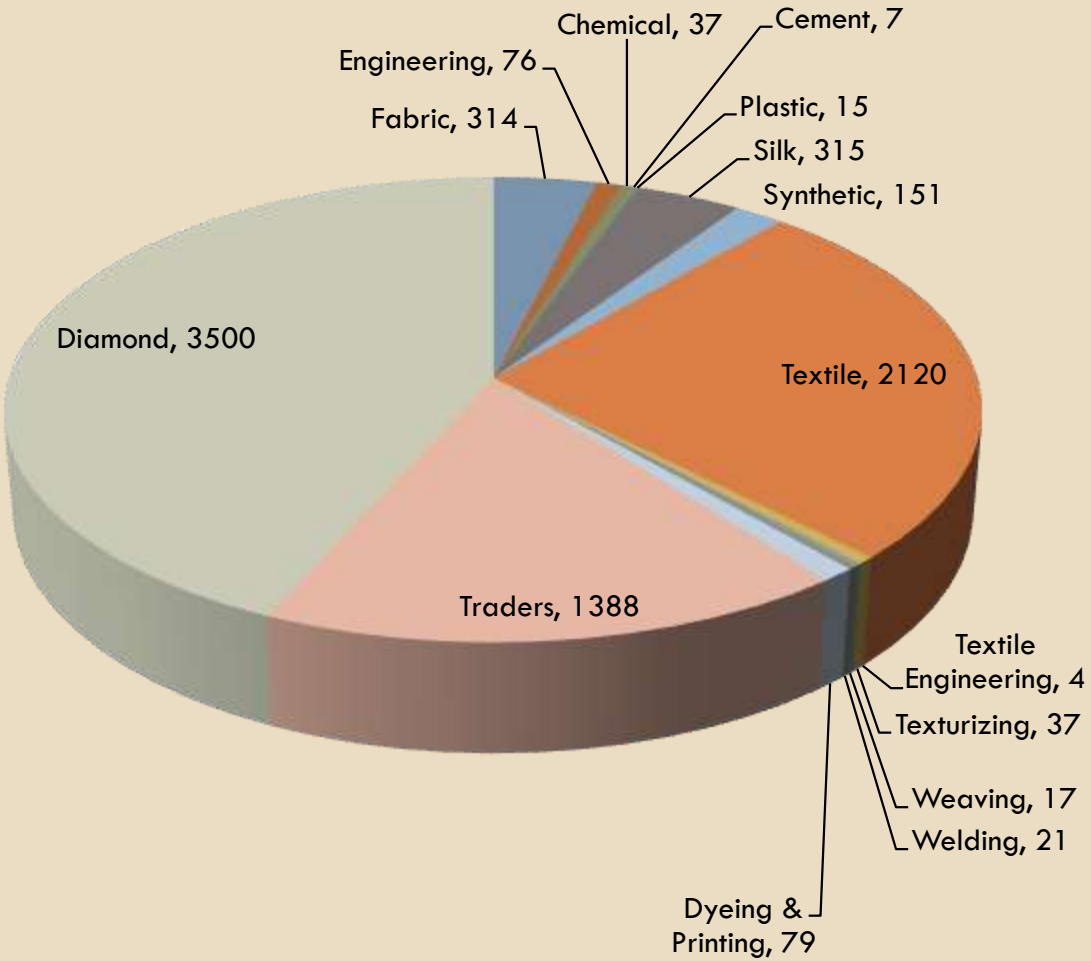
Social Infrastructure

Schools	270 (MSB) 1.45 lac students 9 SUMAN 5,000 students
Hospitals	2 [120 beds and 750 beds]
Health Centers & Maternity Homes	29 [18 + 11]
Mobile Dispensaries	8
Medical College	1
Aanganwadi	516
Gardens:	88
Swimming pools	10
Community halls	10
Library	2
Reading Rooms	38
Fire Stations	12

Municipal Infrastructure Overview

Sector	Mar-2006	Feb-2013
Water treatment capacity	628 MLD	1,178 MLD
Water storage capacity	450.25 Million Litres	650.25 Million Litres
T & D network	2,370 kms	2,750 kms
STP capacity	562.5 MLD	726.5 MLD
Collection network	998.1 kms	1,300.0 kms
Streetlights	57,849 Nos.	94,441 Nos.
Storm drainage	321 kms	577 kms
Solid waste Collection	900 TPD	1,447 TPD

Economic & Commercial overview of Surat City



There are more than 8000 units (Industrial and Trade Houses)

Major Sector

- Textile
- Diamond Cutting & Polishing
- Jari, embroidery works
- Engineering
- Other Small Scale and Medium Scale Industries

Source:- Southern Gujarat Chamber of Commerce & Industries, Surat,

FY 2012-13

SURAT MUNICIPAL CORPORATION... AN ENERGY CONSCIOUS URBAN LOCAL BODY

Surat Municipal Corporation

SMC- A Energy Conscious ULB

- Pump sets are being designed considering the future requirements since so many years.
- First energy auditing was conducted at Head Water Works & Khatodara WDS of Water Supply System covering 25 pump sets well before enforcement of Gujarat Use of Electrical Energy (Regulation) Act- 1999.
- SMC had successfully represented before GERC to give power factor rebate for HT services in 1999.
- SMC had been maintaining average power factor @ 0.988 for 34 HT services since 2001.
- Switching “on” & “off” of streetlights are done as per local sunrise & sunset timings since so many years.
- Street lighting is done as per NEC code/ IS: 1944 and hadn't installed HPMV/ HPSV luminaires below 12 m wide road since 1996.
- By the end of 2001, all HPMV luminaires were removed from the street lighting system.
- Practice of switching “off” 33% streetlights during low traffic hours was implemented on major roads since 2000.

Creation of Energy Efficiency Cell

- Increasing volume of services provided & energy rates, electricity budget increased to 450% within 6 years i.e. 1995-96 to 2000-01.
- Manifold rise in electricity expenses, compel SMC to create Energy Efficiency Cell in 2001 for dedicated efforts towards efficient utilization and reducing electricity expenses.
- Energy Efficiency Cell is created in Nov-2001 with following intensions & functions:-
  - To conduct in house Energy Audit & External Energy Audit as per Act/ Order of Governments
  - To identify energy conservation projects and feasibility
  - To find out sources for procuring power at lowest possible price
  - Feasibility study for captive power generation
  - To protect the interest of SMC in GERC for tariff related maters
  - Scrutiny of file having more than or equal to 30 kW power loading
  - To monitor the usages of electricity through Energy Bill Monitoring System
  - Activities related to MNRE's programme of "Development of Solar Cities"
  - Wind Power & Solar Power Generation Projects

Roles of Various Departments

Water Supply, Drainage, Streetlight & Others:

- Implementation of energy conservation suggestions given by/ through EEC.
- Assist EEC in finding out energy conservation areas
- Energy Generation from Bio-Gas {Produced from Liquid Sewage Waste} based Power Plant is done by Drainage Department
- Energy Generation from Solid Waste based Power Plant is done by Solid Waste Department

Energy Efficiency & Renewable Energy Generation Activities

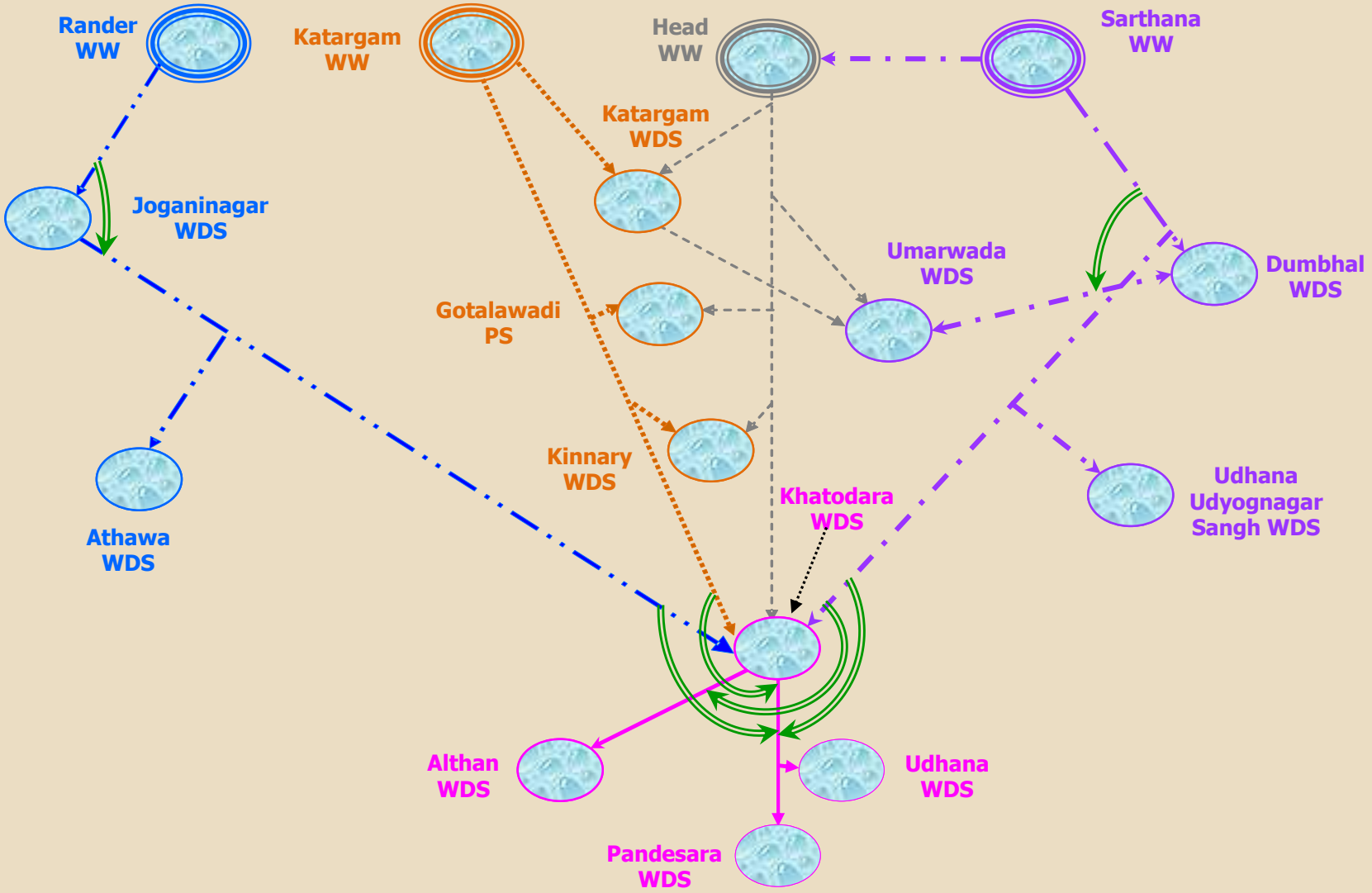
Water Supply System: -

- TRENDS OF ENERGY IN WATER SUPPLY IN 2003-04: -

Financial Year	Average Water Supply (MLD)	Electricity Bill for Water Supply (Crore Rs.)	Electricity Bill for Other Services etc. (Crore Rs.)	Electricity Bill of SMC (Crore Rs.)	% of Water Supply
1996-97	199	8.29	4.37	12.66	65.48%
2003-04	479	26.40	16.78	43.18	61.14%
% Rise	140.70%	218.46%	283.98%	241.07%	-----

- Contribution of energy bill is about ~66% in O&M cost of water supply (2003-04).
- SMC has adopted the following measures for energy conservation:
  - Re-Engineering in Water Supply Routes
  - Increasing pumping efficiency
- Every day 479 MLD water was being supplied
- Grid network consist of;
  - 4 nos. of Water Works having installed water treatment capacity of 628 MLD.
  - 9 nos. of water distribution stations and 4 nos. of pumping stations.

Re-engineering of Water Supply Routes



Achievements in EE Activities

Summary of EE Activities: -

- Recurring Energy Saving: 18.58 GWH per annum
- Saving Amount: Rs. 7.86 Crores per annum
- Total Investment made: Rs. 6.97 Crores

Department/ Area	Energy Saving/ Generation		Net Investment (Rs.)
	KWH/ annum	Rs./ annum	
Water Supply System			
Re-engineering of Water Transmission Routes	82,29,123	3,43,95,689.00	1,65,37,142.66
Replacement of inefficient pump sets	39,79,937	1,67,00,095.00	2,51,98,716.70
Contract Demand Rationalisation & Improvement of power factor	0	24,29,545.60	8,83,500.00
Coating of impeller, replacement of impeller & bowl assembly	2,32,619	10,19,426.20	5,44,520.00
Replacement of Zero Velocity Valve	10,04,854	51,32,952.00	9,00,000.00
Sub Total (Energy Conservation) 1	**1,34,46,533**	**5,96,77,707.80**	**4,40,63,879.36**
Street Lighting System			
Conversion of conventional fluorescent luminaires in to energy efficient luminaires having electronic ballasts & hi-lumen T-8 fl lamps	27,29,381	88,70,487.40	87,08,650.00
Switching "OFF" Streetlights During Low Traffic Period	15,38,462	50,00,000.00	7,50,000.00
Installation of Energy Conservation Feeder Pillar based on Central Voltage Reduction Method	2,73,580	10,94,320.00	31,33,653.00
Sub Total (Energy Conservation) 2	**45,41,423**	**1,49,64,807.40**	**1,25,92,303.00**
Others			
Rationalisation CD & Improvement of PF at HT Services	0	16,46,706.00	14,50,000.00
Replacement of inefficient pump sets & trimming of impellers	2,75,961	12,01,358.00	69,30,730.00
Installation of LED Based Traffic Signals	2,76,923	9,00,000.00	47,00,000.00
Switching "OFF" Filtration Plant during non-usage hours at Rustampura Swimming Pool	46,828	2,81,157.00	0.00
Sub Total (Energy Conservation) 3	**5,99,712**	**40,29,221.00**	**1,30,80,730.00**
Grand Total (Energy Conservation)	**1,85,87,668**	**7,86,71,736.20**	**6,97,36,912.36**

Major Achievements in RE generation

(1) 3 MW Wind Power Plant

- Commissioned on 02-Nov-2010
- Energy Generation Till 18-Feb-2013: 18.07 GWH
- Benefits Received in Electricity Bill (Gross): Rs. 8.66 Crores

(2) 3.5 MWe Bio-gas based Power Plants

- 1st Commissioned in Oct-2003 (0.5 MWe), Other 3 commissioned in 2008
- Energy Generation Till Jan-2013: 38.98 GWH
- Saving in Electricity Bill (Gross): Rs. 18.09 Crores

Awards & Recognitions received

- National Energy Conservation Awards 2011 under “Municipality” category for Wind Power Generation for Water Supply (Certificate of Merit).
- Energy generation from Bio-Gas produced from liquid waste was awarded First Prize by Bureau of Energy Efficiency for National Energy Conservation Awards 2009 under “Municipality” category.
- National Urban Water Awards 2009 for the activity of water supply management & energy generation from bio-gas (Second Price under category of Technical Innovation).
- Activity named “Re-engineering of Water Supply Routes for Effective Energy Savings” was among total 16 Finalists in National Water Urban Awards 2008.

SOLAR CITY MASTER PLAN… TARGETS, PLANNING AND SCHEDULES

Surat Municipal Corporation

Different Stages of Development of Master Plan

- 1st Solar City Stake Holder Committee's meeting held on 15/07/2011
- Draft Master Plan Submitted to SMC on 30/09/2011
- 2nd Solar City Stake Holder Committee's meeting held on 29/11/2011
- 1st Draft of Master Plan Submitted to SMC on 25/01/2012
- 3rd Solar City Stake Holder Committee's meeting held on 24/02/2012
- 2nd Draft of Master Plan submitted to SMC on 08/10/2012
- 4th Solar City Stake Holder Committee's meeting held on 09/11/2012
- 5th Solar City Stake Holder Committee's meeting held on 09-10/01/2013
- Final Master Plan submitted to SMC on 06/02/2013.

Different Stages of Development of Master Plan

SMC had made resolution in Aug 2010 and formed Solar City Stake Holder's Committee and Solar City Cell

Solar City Stake Holder Committee Members

- Mayor- Surat Municipal Corporation
- Commissioner- Surat Municipal Corporation
- Standing Committee Chairman- Surat Municipal Corporation
- Light and Fire (Ext.) Committee Chairman- Surat Municipal Corporation
- South Gujarat Chamber of Commerce & Industries (SGCCI),
- SVNIT
- SCET
- Surat Builders Association
- Dakshin Gujarat Vij Company Ltd. (DGVCL)
- Torrent Power Ltd. (TPL)
- MANTRA
- Surat Diamond Association
- Pandesara Industrial Association
- Sachin Industrial Co-operative Society Ltd.
- Kataragam Industrial Shed Holders Association

Different Stages of Development of Master Plan

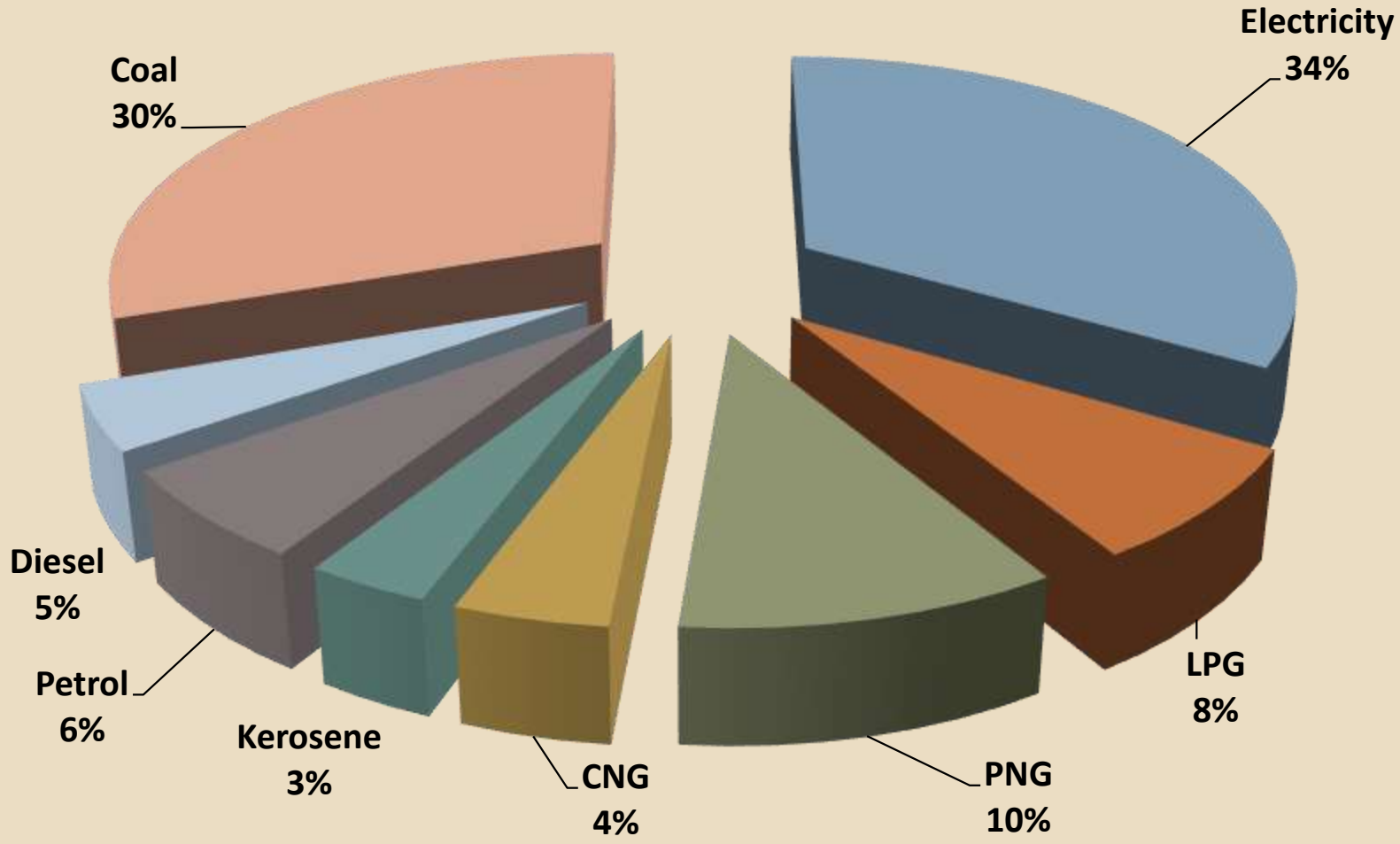
Solar City Cell Members

- City Engineer- Chairman
- Deputy Commissioner (Planning and Development)
- Additional City Engineer (Ele/ Ele and Mech)
- Hydraulic Engineer
- Executive Engineer (Ele)- Head Water Works
- Executive Engineer- Drainage Department
- Executive Engineer- Road Development Department
- Executive Engineer- Bridge Cell
- Executive Engineer- Workshop
- Energy Efficiency Cell (Coordinator)

Growth Rate in Energy Consumption across different Sectors

Sector	Yearly Growth Rate in Energy Consumption				
	Energy Consumption (MU) 2010-11	%age	Projected Annual Growth Rate	Projected Energy Consumption (MU) 2015-16	%age
Residential	3,143.82	16.14	4.60%	3,865.69	14.71
Industrial	12,006.26	61.64	5.90%	15,173.18	57.74
Commercial	1,404.25	7.21	10.30%	2,132.07	8.11
Municipal	144.84	0.74	3.80%	179.70	0.68
Transportation	2,779.69	14.27	10.50%	4,929.94	18.76
Total	**19,478.86**	**100.00**	**6.90%**	**26,280.57**	**100.00**

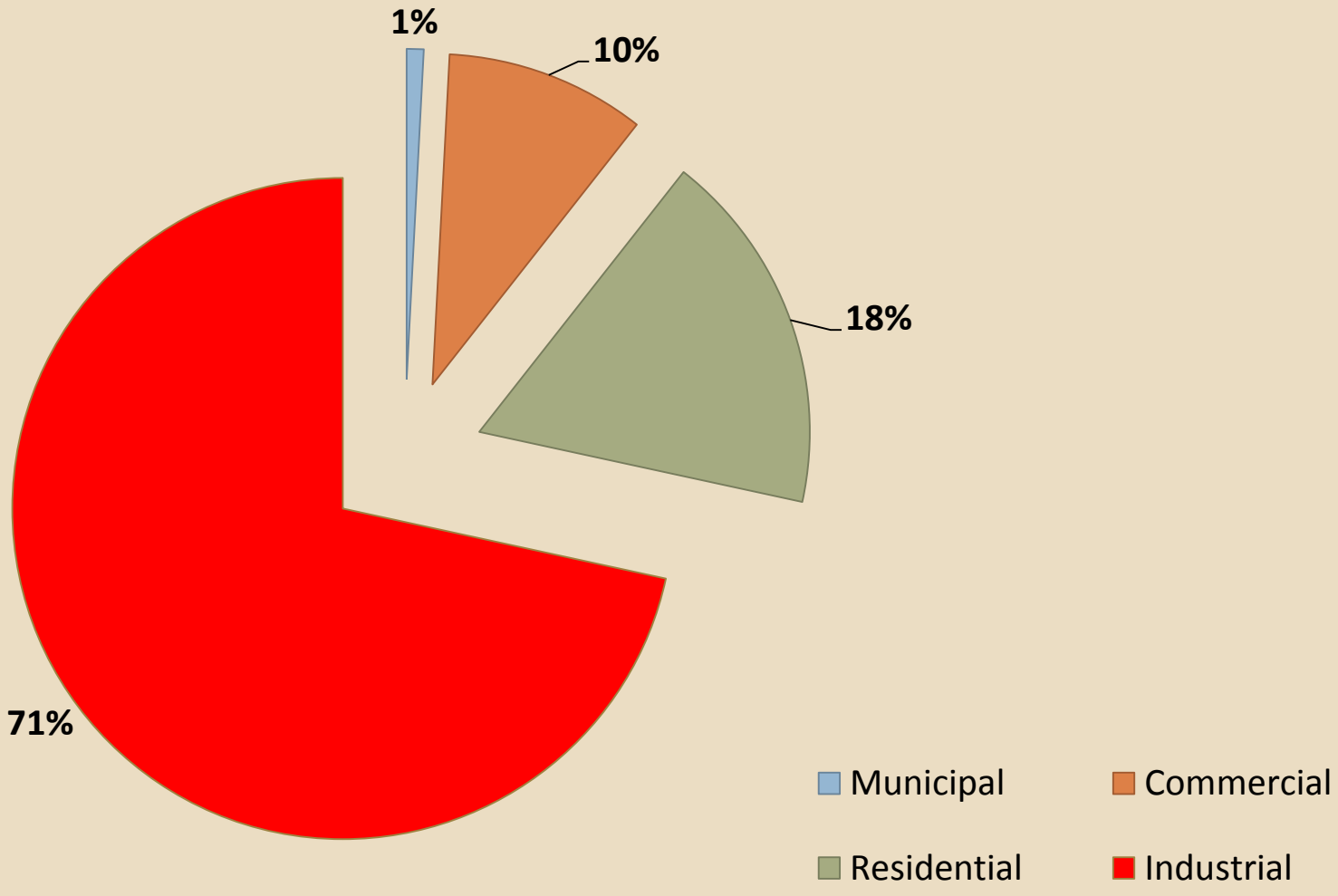
Fuel Type Energy Consumption (Including Transportation sector) in base year, 2010-11



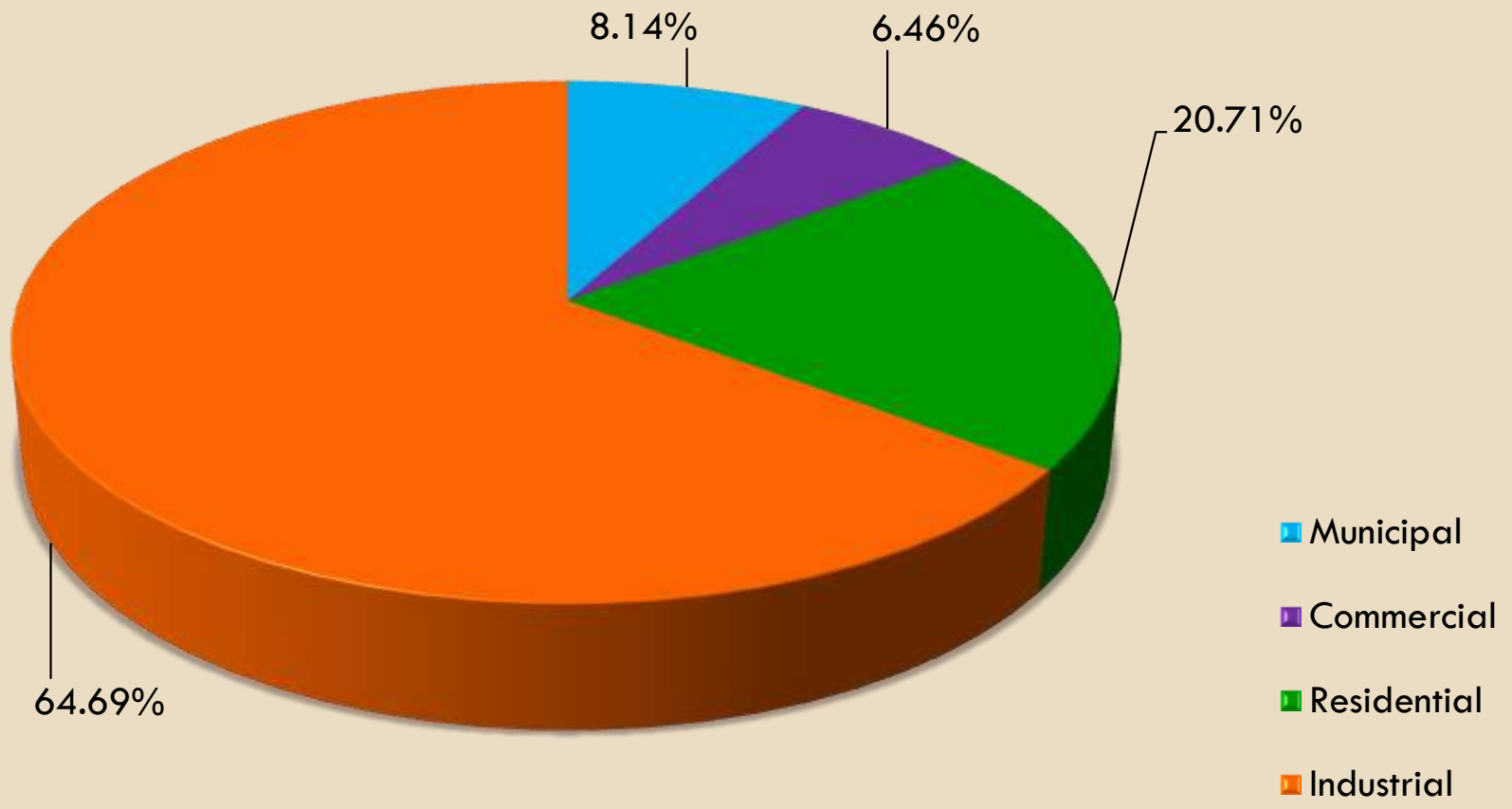
Energy Consumption in Various Sectors and 5 Year Reduction Targets (Proposed)

Sector	Projected Energy Cons. 2015-16 (EQ. GWH)	Share	5 year Reduction Target (EQ. GWH)	% of Projected Energy Cons.	5 year Reduction Target {EE} (EQ. GWH)	Share	5 year Reduction Target {RE} (EQ. GWH)	Share
Municipal	179.70	**0.84%**	173.97	**0.81%**	7.85	**0.37%**	166.12	**7.78%**
Commercial	2,132.07	**9.99%**	137.91	**0.65%**	91.46	**4.28%**	46.45	**2.17%**
Residential	3,865.69	**18.11%**	442.41	**2.07%**	101.52	**4.75%**	340.89	**15.96%**
Industrial	15,173.18	**71.07%**	1,382.08	**6.47%**	167.32	**7.83%**	1,214.76	**56.86%**
Total	**21,350.63**	**100.00%**	**2,136.38**	**10.01%**	**368.15**	**17.23%**	**1,768.23**	**82.77%**

Break-up of Proposed Energy Consumption in 2015-16



Sector-Wise Reduction Target



Reduction Target for Sectors (Year Wise)

Sectors	Reduction Target (GWH)						Total Reduction of GHG emission in five years ('000 tCO_2e)
	2011-12	2012-13	2013-14	2014-15	2015-16	Total	
	1st Year (0%)	2nd Year (10%)	3rd Year (25%)	4th Year (35%)	5th Year (30%)		
Municipal	--	17.40	43.49	60.89	52.19	173.97	146.13
Commercial	--	13.79	34.48	48.27	41.37	137.91	115.84
Residential	--	44.24	110.60	154.84	132.72	442.41	371.62
Industrial	--	138.21	345.52	483.73	414.62	1,382.08	1,160.95
Total	**Nil**	**213.64**	**534.09**	**747.73**	**640.90**	**2,136.38**	**1,794.56**

Municipal Sector

Inter-vention Type	Intervention Description	Target Number	Energy Savings (MU)
EE	Replacement of inefficient pump sets (150 HP)	100	6.21
	Replacement of T-12 FL Lamps with T-8 & T-5 Fl lamps	10,000	0.35
	Replacement of 70 W HPSV luminaires with 45 W LED luminaires	3,500	0.49
	Replacement of 36 W FL luminaires with 25 W LED luminaires	40,000	0.80
RE	MSW based Power Plant (10 MW)	1	67.98
	MSW based Power Plant (6.25 MW)	1	42.49
	Bio Gas based Power Plant (0.575 MW)	4	8.06
	SPV Power Plant (100 kWp)	20	3.05
	SPV Power Plant (150 kWp)	20	4.58
	Solar Water Heating Systems (200 LPD)	95	0.24
	Wind Power Plant (2.1MW)	10	39.74
	Total Energy Savings		**173.97**

Commercial Sector

Inter-vention Type	Intervention Description	Target Number	Energy Savings (MU)
EE	Replacement of T-12 FL Lamps with T-8 & T-5 Fl lamps	4,40,624	19.30
	Replacement of T-12 FL Lamps with T-8 & T-5 Fl lamps	4,40,624	19.30
	Replacement of Existing AC by Energy Efficiency 5* Rated	44,062	48.41
	Replacement of Existing AC by Energy Efficiency 5* Rated	4,050	4.45
RE	Solar Water Heating Systems (200 LPD)	5,060	12.65
	Solar Steam Cooking for Hostels & Hotels (500 Persons)	25	1.50
	Biogas for Hostels, Hotels and Restaurants etc.	100	0.58
	SPV Power Plant (5kW)	4,160	31.72
	Total Energy Savings		**137.90**

Residential Sector

Inter-vention Type	Intervention Description	Target Number	Energy Savings (MU)
EE	Replacement of T-12 FL Lamps with T-8 & T-5 Fl lamps	10,96,116	32.01
	Replacement of Incandescent (GLS) Bulb with CFL/ T-5 lamps	10,96,116	48.01
	Replacement of Existing AC by Energy Efficiency 5* Rated (1.5 Tr)	54,806	21.50
RE	Solar Water Heating Systems (200 LPD)	1,09,612	274.03
	SPV Power Plant(1kW)	43,845	66.86
	Total Energy Savings		**442.41**

Industrial Sector

Inter-vention Type	Intervention Description	Target Number	Energy Savings (MU)
EE	Replacement of T-12 FL Lamps with T-8 & T-5 Fl lamps	4,90,210	25.77
	Replacement of Existing AC by Energy Efficiency 5* Rated (2 Tr)	49,020	61.55
	Energy Efficiency improvement in various industrial processes	100	80.00
RE	Solar Water Heating Systems (500 LPD)	4,956	30.98
	SPV Power Plant (10 kWp)	4,902	74.76
	SPV Power Plant (1 MW)	50	76.25
	SPV Power Plant (5 MW)	30	228.75
	SPV Power Plant (10 MW)	10	152.50
	Wind Power Plant(0.8 MW)	80	116.05
	Wind Power Plant(1.5 MW)	80	217.60
	Wind Power Plant (2.1 MW)	80	317.88
Total Savings due to RE and EE			**1,382.09**

Budgetary Estimation

Sector	Government Subsidy (Million INR)	Users Contribution (Million INR)	Total Budget required (Million INR)
Municipal	361	4,277	4,638
Commercial	998	2,865	3,863
Residential	4,406	9,076	13,482
Industrial	13,757	37,462	51,218
Total value	19,523	53,680	73,202
Percentage	**26.67%**	**73.33%**	**100.00%**

Actions Initiated in Municipal Sector

- Installation of 100 kWp Solar Photovoltaic based Power Plant at Science Centre is completed
- Installation of 8.4 MW Wind Power Plant is already under progress and it is expected to be operational in Mar-2013
- Work of generation of 16 MW power from 1,000 TPD of Un-segregated MSW is already awarded
- Energy Audit of sites having contract demand of 75 kW or more conducted regularly and energy conservation measures implemented regularly
- Demonstration of LED luminaries for streetlights is near completion and positive results are achieved
- Mass awareness for residential sector through distributing > 2 lakhs handbills on energy conservation

CHALLENGES, SUBMISSIONS & WAY-FORWARD

Surat Municipal Corporation

Challenges

- Assessment of Energy Consumption & Conservation of motive power usages in industrial sector as it is major component of energy consumption
- Use of Solar Power in Industrial Applications
- Massive fund required over Rs. 7320.00 Crores over period of 4 years
- Enforcement of energy conservation policies for various sectors
- Use of renewable sources/ devices like Solar Photovoltaic Power Plants & SWH systems as sufficient space/ land isn't available, land prices are very high
- Natural gas based heating is cheaper than SWH system for residential sector

Challenges

- Projected Coal consumption accounting for 36%
- Projected consumption of other various fuels/ energy sources except electricity is 58% i.e. other sources contributing 1.38 times of electricity.
- Projected industrial energy demand is 71%, which may be much higher than most of the Solar Cities
- **As most of the EE & RE targets (10%) are to be met with electricity; hence, RE generation required over 16% of electricity demand.**
- Overall of 791 MW of RE generation (Solar- 418 MW, Wind- 373 MW) is required to met the targets.
- **Expected Renewable Power Purchase Obligations (RPPO) applicable to discoms & open access consumers is up to 2015-16 is 8.5% (Wind 6%, Solar 1.5%, Others 1%) only.**

Challenges

- RPPO can be met by discoms/ open access consumers
  - through RE sources installed before 2011-12
  - REC can be purchased from anywhere within India
  - RE can be purchased from outside Surat city

  Which makes available RPPO purchase for Solar City targets for Surat city even less by 2% (min.)

  Hence, RPPO available is only 6.5% {max.} and required to be generated is around 16% and therefore, discoms may not purchase additional RE generated under "Solar City".
- Therefore, additional 70% subsidy is demanded to achieve targets.
- To encourage RE generation, special provisions/ policies/ changes in Act etc. are necessary to be made.

Considering all of the above, special considerations as well as subsidies should be given to Surat City as well as other Solar Cities for Making Them Real "Solar Cities"

Challenges

- How accounts of the usages of various energy sources/ fuels in the city shall be monitored and how the targeted energy/ fuel consumption in the city as well as EE & RE measures shall be verified?
- Who will bear the cost of these activities? How much grant shall be provided by MNRE for doing these activities to ULBs?
- How much grant shall be provided by MNRE to encourage energy efficiency and energy auditing in various sectors?
- What help will be provided by MNRE regarding EE (energy efficiency) in the various industrial processes and motive power usages in various sectors?
- Total proposed investment is huge amounting Rs. 7320/- Cr. for achieving these targets. As relaxation in tariffs for Solar & Wind, subsidies/ financial assistances are also given for the same. But, how much additional grant shall be given by MNRE to achieving targets for renewable energy sources?
- What are the consequences of not achieving the EE & RE targets?

Submission & way-forward for City as a Whole

- Wind power generation: 373 MW
- Solar power generation: 419 MW
- SWH System: 25.4 MLD
- Bio Gas & Solid waste power: 18.55 MW
- All above will cause expenditure of Rs. 7320/- Cr.

Therefore, provision of capital subsidies and other encouragements as appropriate to Ministry must be provided to really serve the purposes as are envisaged in the Jawaharlal Nehru National Solar Mission.

Submission & way-forward for Surat Municipal Corporation in particular

- Wind power generation: 21 MW
- Solar power generation: 5 MW
- Bio Gas power: 2.3 MW
- Energy Efficient Luminaires: 53,500 nos.
- All above will cause huge expenditure of > Rs. 145/- Cr.

Against total connected load of 55 MW, **if appropriately encouraged by the Ministry, more than 96% can be catered through RE/EE measures**

Surat Municipal Corporation is already struggling to meet the challenges of 100% recovery of O & M cost in all essential services of Water Supply, Sewage & Solid Waste Disposal.

Therefore, in the circumstances, unless capital subsidies/ GBI/ and other incentives are provided, it will be difficult way-forward.

Like JNNURM mission, appeal is to sanction DPR in JNNSM Solar Mission also for the RE/EE proposals planned in the programme.

RPPO limits must be increased & all ULBs must be in particular preferred by the Power Distribution Companies.

THANKS

Surat Municipal Corporation