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FROM THE EDITOR'S DESK

India's energy demand is increasing very rapidly with ever increasing population. The process of urbanization and industrialization also adds to this demand. This could also be largely due to movement and growth of India's economy, which has steadily advanced over the last 30 years, averaging a very healthy 7 percent per year growth since 2000. In 2005, India ranked fourth in world energy consumption, after the United States, China, and Russia. By 2030, however, India is expected to surpass Russia and become the third-largest energy consumer in the world, after China and the United States. The Expert Committee on Integrated Energy Policy in its Report (IEPR 2006) has estimated that by 2032, primary commercial energy requirement in the country would need to go up 4-5 times the current level, Also 11,463 MW deficit in energy production was recorded in 2006, equivalent to 12.3 percent of its peak demand. Hence the most urgent technical challenge faced by mankind is the development of low cost, non polluting energy production technologies. The clean energy technologies produce power using no fuel or less fuel than fossil-fuel-based technologies. A variety of technologies are being developed and improved that includes biomass and biofuels, waste-to-energy, solar power, wind power, geothermal, hydropower & other low carbon technology. In this issue emphasis is being given on the technologies for recovery of energy form wastes since significant amount of waste is being generated in India. Waste-to-energy (WtE) refers to any waste treatment that creates energy in the form of electricity and/or heat from a waste source by either thermochemical or biochemical processes. Technologies avavilable in comverting waste to enenrgy include Anaerobic digestion (Bio-methanation),Gasification/Pyrolysis, Incineration and Methane recovery from landfill. According to survey done by TEDDY the energy recovery potential of MSW is 900 MWe out of total 1700 MWe amounting to about 53%. With the estimated global land filling of 1.5 billion tones annually, the corresponding rate of methane generation at landfills is 75billion Nm^3.Less than 10% of this potential is captured and utilized at this time. However, the growing use of waste-to-energy as a method to dispose off solid and liquid wastes and generate power has greatly reduced environmental impacts of municipal solid waste management, including emissions of greenhouse gases besides generating substantial quantity of energy thereby helping in capital raising and debt recovery from the wastes as a resource.

Dr. Amiya Kumar Sahu
President-NSWAI

Clean Energy and Waste to Energy: India's Scenario

Energy and its use can not be more emphasized in country like India, where large population still does not get enough electricity for its minimum needs. Most of the energy use within the household currently gets used for cooking food and transportation. Colour of energy also becomes important as the source of energy decides the level of pollutants that it emits in atmosphere and its possible impacts.

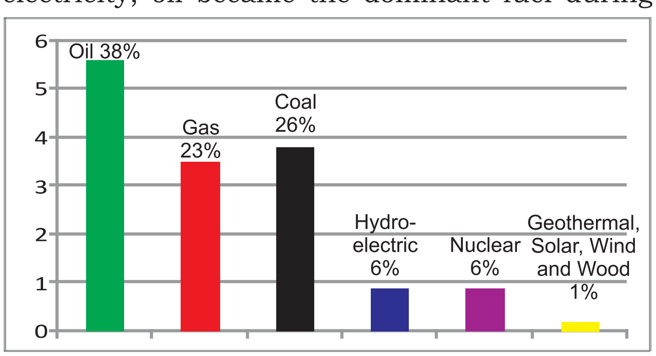
Clean Energy

Clean energy is the term used to describe sources of energy that are considered to be environmentally friendly, non-polluting and are renewable. The goal of clean energy is to have a low environmental impact, with low or zero emissions, and a minimal impact on the physical surroundings.

The twentieth century saw a rapid twenty fold increase in the use of fossil fuels. Between 1980 and 2006, the worldwide annual growth rate was 2%. According to the US Energy Information Administration's 2006 estimate, the estimated 471.8 EJ total consumption in 2004 was divided as follows, with fossil fuels supplying 86% of the world's energy:

World wide energy sources:

Coal fueled the industrial revolution in the 18th and 19th century. With the advent of the automobile, airplanes and the spreading use of electricity, oil became the dominant fuel during



the twentieth century. The growth of oil as the largest fossil fuel was further enabled by steadily dropping prices from 1920 until 1973. After the oil shocks of 1973 and 1979, during which the price of oil increased from 5 to 45 US dollars per barrel, there was a shift away from oil. Coal, natural gas, and nuclear became the fuels of choice for electricity generation and conservation measures increased energy efficiency. From 1965 to 2008, the use of fossil fuels has continued to grow and their share of the energy supply has increased. From 2003 to 2008, coal, which is one of the dirtiest sources of energy, was the fastest growing fossil fuel. However, these sources of energy are from natural resources and are non renewable. The world energy demand is increasing day by day, hence the development of low cost, non polluting energy production technologies is most urgent technical challenge currently facing mankind. Both government and private industry have been dragging their feet on in this area. Fortunately many researchers throughout the world are working on this problem.

A variety of technologies are being developed and improved that includes the following.

- biomass and biofuels
- waste-to-energy
- solar power
- wind power
- geothermal
- hydropower
- other low carbon technology

Differences with other technologies

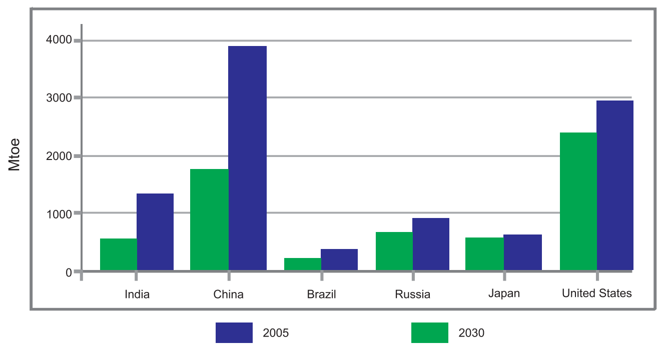
- Clean energy technologies produce power using no fuel or less fuel than fossil-fuel-based technologies.
- These technologies produce no or fewer pollutants than conventional technologies
- These can use renewable energy sources, which, unlike fossil fuels, are not depleted over time.

India: Energy Overview

India's energy demand is increasing much more steeply over over last decade. This is largely due to India's economy, which has steadily advanced over the last 30 years, averaging a 7 percent per year growth since 2000. During 2004 and 2005, only China's economy grew faster. With 1.1 billion people, India is the world's second most populous country behind China and is expected to have the world's largest population by 2030. Further population increases and the country's continued economic growth are expected to increase India's energy demand from 537 million tons of oil equivalent (Mtoe) in 2005 to 770 Mtoe in 2015 and to 1,299 mToe by 2030.

Energy Supply and Demand

Primary Energy Demand in Selected Countries



Source: International Energy Agency, *World Energy Outlook 2007: China and India Insights* (Paris, France: OCED / IEA, 2007).

The figure above shows that in 2005, India ranked fourth in world energy consumption, after the United States, China, and Russia. By 2030, however, India is expected to surpass Russia and become the third-largest energy consumer in the world, after China and the United States.

Over the period 1990–2005, demand grew by 3.5 percent per year. As indicated by the above figure, coal is expected to remain the dominant fuel in India's energy mix over the next 25 years. Demand for oil will steadily increase to a projected 328 mToe by the year 2030, still one-half the projected demand for coal. Other renewables, mostly wind power, are projected to grow 12 percent per year, albeit from a relatively low baseline. Nuclear and hydropower supplies grow in absolute terms, but they make only a minor contribution to primary energy demand in 2030—3 percent in the case of nuclear and 2 percent for hydropower. Demand for oil in India almost quadrupled from 1980 to 2005, with consumption in 1980 in the amount of 0.7 mb/d, increasing to 2.6 mb/d in 2005.

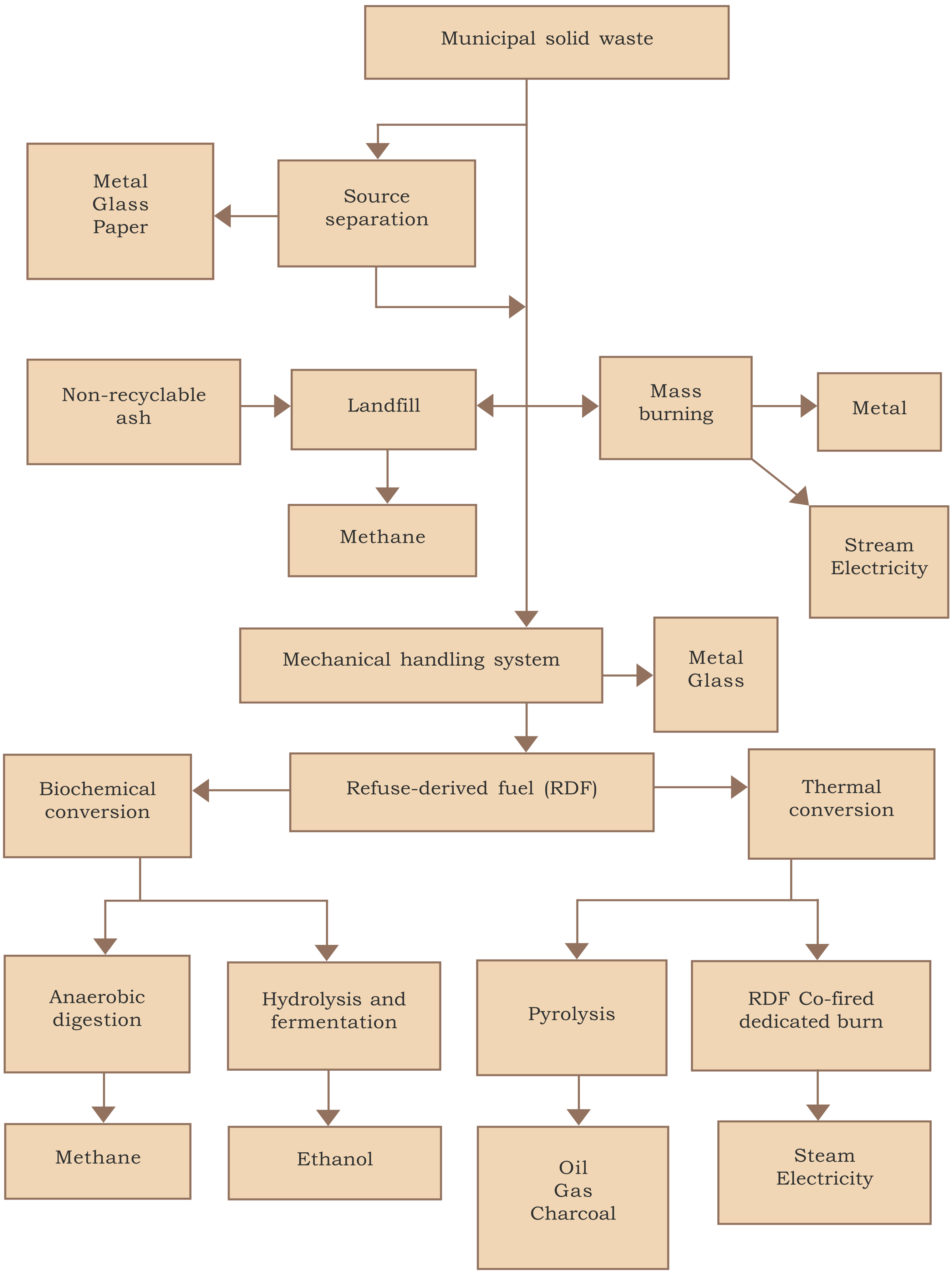
Energy Deficit

A 11,463 MW deficit was recorded in 2006, equivalent to 12.3 percent of peak demand. Gujarat, Maharashtra, Meghalaya, Jammu and Kashmir, Punjab, and Madhya Pradesh recorded more than a 20 percent deficit in availability of power during peak hours. Goa, Daman and Diu, Chandigarh, Dadra and Nagar Haveli, Puducherry, and Damodar Valley Corporation recorded negligible peak-hour deficits in electricity. However, all other states also noted electricity deficits during peak hours. At the regional level, the eastern region recorded the least peak hour deficits, while the western region recorded most.

Deficit of 52,938 million units (MU), equivalent to 8.4 percent of demand, was recorded in 2006. Maharashtra, Meghalaya, Jammu and Kashmir, and Uttar Pradesh each recorded more than a 15 percent deficit in availability of power during 2006. Except for Puducherry, all states and union territories recorded overall deficits in availability of electricity. At the regional level, the southern region recorded the least deficit, while the western region recorded the highest. The deficit is expected to increase in the future considering the future demand scenarios described in subsequent sections.

Waste to Energy

Waste-to-energy (WtE) refers to any waste treatment that creates energy in the form of electricity and/or heat from a waste source by either thermochemical or biochemical processes. The thermochemical techniques consist of Incineration, gasification, and pyrolysis that produce high heat in fast reaction times. The biochemical processes consist of anaerobic digestion, bioconversion of biomass to mixed alcohol fuels, hydrolysis, and fermentation using enzymes that produce low heat in slow reaction times. WtE processes result in usable fuel commodity, such as methane, methanol, ethanol or synthetic fuels upon completion of process. The possible processes which can happen with MSW is depicted in the figure (refer page 4).


Municipal solid waste
Source separation
Metal Glass Paper
Non-recyclable ash
Landfill
Mass burning
Metal
Methane
Stream Electricity
Mechanical handling system
Metal Glass
Refuse-derived fuel (RDF)
Biochemical conversion
Thermal conversion
Anaerobic digestion
Hydrolysis and fermentation
Pyrolysis
RDF Co-fired dedicated burn
Methane
Ethanol
Oil Gas Charcoal
Steam Electricity

Technologies avavilable in waste to enenrgy

The waste to energy technologies are many and are also complex as they are designed on the basis of waste characteristics and feed quantities. Some of these have been implemented in India with mixed levels of success, however, the experiences gained are proving useful in taking corrective measures for subsequent projects being planned and implemented in different parts of the country. The future of such technologies appears very promising as many of these can fill the energy gap to some extent.

- **Anaerobic digestion (Bio-methanation)**

- **Gasification/pyrolysis**

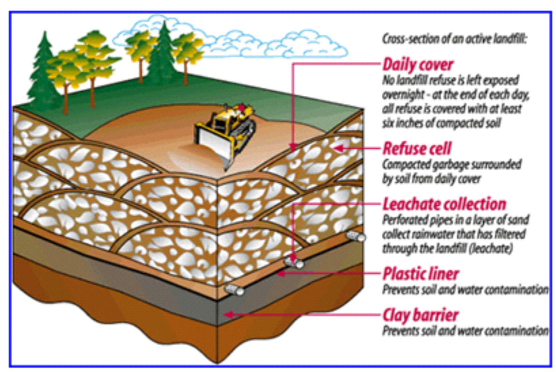
It has been estimated that methane emission in next two decades from landfill areas in the world would be almost at same level as of present emission from paddy fields . In India, due to rapid urbanization and economic development there is significant amount of waste being generated and the cities are facing serious issues of MSW (Municipal Solid Waste) management.

The methodology adopted by the Civic Authorities in India to dispose waste is predominantly unscientific and unprofessional in nature. MSW is being dumped into land (depressions, ditches, soaked ponds) or on the outskirts of the city in an unscientific manner with no compliance of regulations. Indian waste contains 40% of biodegradable matter and when disposed in the dumping ground undergoes various anaerobic reactions generating CH_4 emission into the atmosphere.

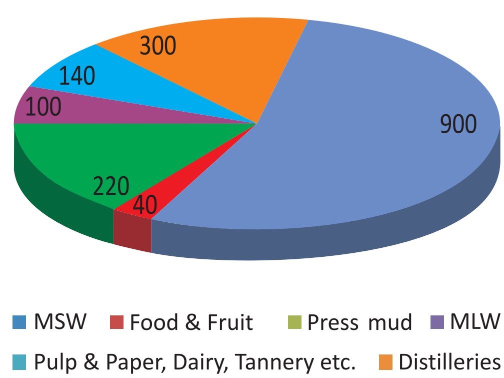
According to survey done by TEDDY the energy recovery potential of MSW is 900 MWe out of total 1700 MWe amounting to about 53%.

The estimated global land filling of 1.5 billion tones annually, the corresponding rate of methane generation at landfills is 75 billion Nm^3. Less than 10% of this potential is captured and utilized at this time.

- **Incineration**



- **Methane recovery from landfill**



Current Status of Indian Clean Energy Technology

Renewable Energy

Renewable energy resources are abundant in India, including hydropower, solar, wind, biomass, and waste-to-energy. The table given below presents the assessed potential for renewable energy development, estimated at 84,776 MW – this excludes solar and large hydropower. The breakdown indicates wind energy, biomass, and small hydropower constitute 97 percent of the total projected potential. Wind energy alone accounts for 54 percent followed by biomass/ co-generation and small hydropower.

Tables 2 shows the potential of renewable energy in India as estimated by MNRE along with installed capacities till the year 2007.

This table provides a breakdown of installed renewable capacity by resource. **As noted, the total installed capacity as of May 2007 was 10,297 MW, up from 3,241 MW in 2001. Wind constitutes 69 percent of the total, followed by small hydro (19 percent), biomass (co-generation, 11.5 percent), waste-to-energy (0.42 percent), and solar (0.03 percent). This table also demonstrates India's need to develop alternative forms of renewable energy and diversify its energy portfolio even further. The contributions of waste-to-energy and solar-energy, for instance are considerably less than their potential indicates**.

Table*:* Renewable Energy Development Potential in India

SOURCE	POTENTIAL
Small Hydropower	15,000 MW
Wind Power	45,195 MW
Biomass power/ Co-generation	21,881 MW
Solar	4-6 kwH/m2/day
Waste-to-energy	1,700 MW
Total	84,776 MW (excluding Solar)

Source : Government of India Ministry of New and Renewable energy http://mnes.nic.in

Table 2: Total Installed Capacity Based on Different Renewable Energy Sources from 2001–2007

RENEWABLE ENERGY SOURCE	TOTAL INSTALLED CAPACITY (MW)						
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Hydro	1,341	1,423	1,463	1,603	1,693	1,747	1,976
Wind	1,626	1,867	2,483	2,980	3,595	5,342	7,092
Solar PV	2	2	2	3	3	3	3
Solar Thermal	0	0	0	0	0	0	0
Biomass	273	358	468	613	727	797	1,184
Waste-to-energy	15	17	25	42	47	35	43
Geothermal	0	0	0	0	0	0	0
Tidal/ Ocean	0	0	0	0	0	0	0
Total	**3,241**	**3,650**	**4,441**	**5,240**	**6,065**	**7,995**	**10,297**

Source: Government of India, Annual Reports of Ministry of New and Renewable Energy, 2000 - 2001 to 2006 - 2007

A breakdown of distributed renewable energy is provided in table below:

Table 3 Breakout of Distributed Renewable Energy

BIOMASS POWER / CO- GEN. (NON-BAGASSE)	59.00 MW
Biomass gasifier	86.53 MWeq
Waste-to-energy	20.21 MWeq
Total	165.74 MWeq

Source: *Government of India, Annual Reports of Ministry of New and Renewable Energy http://mnes.nic.in*

As indicated, 166 MW equivalent renewable energy exists in distributed (non-grid-connected) sectors. Biomass-gasifier-based renewable energy contributes 52 percent, followed by 36 percent from biomass (co-generation) and 12.2 percent from waste-to-energy. These figures again indicate the lack of a mature market and demonstrate the potential opportunity.

State-based waste-to-energy potential

STATE	POTENTIAL (MW)
Maharashtra	1000
Uttar Pradesh	1000
Tamil Nadu	350
Karnataka	300
Andhra Pradesh	200
Bihar	200
Gujarat	200
Punjab	150
Others	100
Total	**3500**

Source: Confederation of Indian Industry, "Background Paper," 1st India Government of India, Clean Tech Forum, August 3, 2007.

The state-based waste-to-energy potential presented in the above table indicates that Maharashtra, Uttar Pradesh, Karnataka, Tamil Nadu, and West Bengal account for more than 53 percent of the projected waste-to-energy potential. Andhra Pradesh, Karnataka, Tamil Nadu, and Uttar Pradesh account for 77 percent of the total installed capacity, due to the availability of biomass and bagasse.

Market analysis: Current status

Clean energy technologies in India, including renewable energy and energy efficiency, have received unprecedented attention in the last few years as the country's energy demand grows each year. Increased use of clean energy technologies will help mitigate concerns that often accompany rapid economic development in areas that are already resource constrained—such as poor air quality, desertification, dependence on imported fuel, and exponential growth in demand.

Renewable Energy

There is a need for massive investment in the Indian renewable energy sector, provides the renewable energy targets under the 11th Five-Year Plan, The total investment required to meet the 15,000 MW goal would be about $19.5 billion, 19 times the proposed budgetary support. This includes 1,000 MW targeted from distributed renewable power systems with an outlay of $531.6 million and $6.3 million for performance testing. The detailed breakout is given below.

The Electricity Act of 2003 included a renewable portfolio standard, building on the precedent of those states that had already set targets of 5–10 percent to be realized by 2010. These targets virtually ensure a guaranteed market for renewable energy technologies in the country. While the target set out in the 10th Five-Year Plan for installed capacity is 3,075 MW, the actual achievement is likely to be in excess of 6,000 MW.

India has limited local capacity in available waste to energy technology options. The large-scale operations of any of these technologies require import of design, engineering, and equipment. There is also a need to demonstrate the usefulness of these technology options throughout the country.

Program Component	Physical Target (MW)	Proposed Outlay ($ Million)	Investment Requirement ($ Million)
Wind power	10,500	18.9*	15,530
Small Hydro	1,400	177.2	2,070
Co-generation	1,200	151.8	1,106
Biomass power	500	50.6	492
Urban waste-to-energy	200	37.9	295
Industrial waste-to-energy	200	18.9	
Sub-Total (A)	14,000	455.6	
Solar power (grid interactive/distributed generation)	50	50.6**	
Distributed RE power systems (excluding solar)	950	481	
Sub-Total (B)	1,000	531.6	
Total (renewable power) (A+B)	15,000	987.3	
Performance testing	-	632	
Grand Total	**15,000**	**993.6**	**19,493**

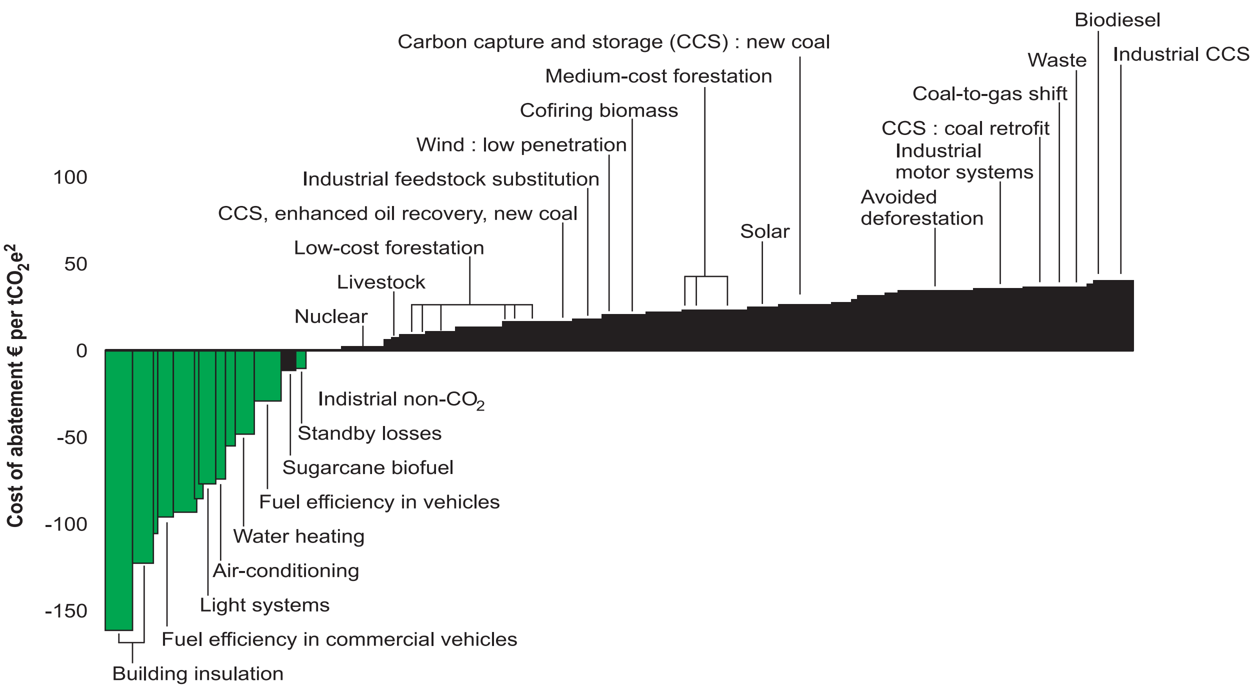
Source: Report of the Working Group on New and Renewable Energy for 11th Five Year Plan.
* For demonstration projects in states where there is sizable potential but where no commercial activity has commenced.
** Subsidy limited to $265.8 per household. Investment required is dependent on subsidy, which varies during the annual budget of the Government of India.

Cost Analysis of different technologies involved in Clean Energy Technology

One of the major requirements for developing energy sector is the availability of cost-effective technologies and successful demonstrations.The renewable energy targets correspond to a need for massive investment in the clean energy sector in India. In fact, the projected addition of 15,000 MW from renewable energy could lead to $21 billion in investment over the next ten years.

Cost effectiveness analysis of clean technologies are presented below. A pattern which emerges from this analysis shows that simpler and efficient systems are more cleaner than the conventional energy sources.

Cost Effectiveness of Clean Energy Technologies



The current capital cost of small hydro and wind in India is similar and ranges from $900–1300/kW and $950–1100/kW, respectively. Biomass is slightly less, at $800–1000/kW. Bagasse co-generation and biomass gasification range from $600–800/kW. PV is by far the highest at $5000–6500/kW. The delivery cost for all the above except for PV ranges from $0.045–7/kWh, with co-generation at the bottom of the range and wind at the top; PV is in the range of $0.19–40/kWh. on indigenous and renewable resources is thus an attractive countermeasure.

Cost of Clean Energy Technologies in India

TECHNOLOGY	CAPITAL COSTS (MILLION$/MW)	UNIT COSTS ($/KWH)
Small hydropower	1.27-1.53	0.038-0.064
Wind power	1.02-1.27	0.051-0.076
Biomass powder	1.02	0.64-0.089
Bagasse co-generation	0.89	0.64-0.076
Biomass gasifier	0.48-0.51	0.64-0.089
Solar potovoltaics	0.66-0.69	0.382-0.509
Waste-to-energy	0.64-2.55	0.64-0.191

Source: Planning Commission (Integrated Energy Policy: http://planningcommission.nic.in/reports/genrep/intengpol.pdf)

The above table provide the current costs of renewable energy technologies available in India, as well as their market value—derived from the current costs—as of March 2007.

	INSTALLED CAPACITY MARCH 2007 (MW)	VALUE OF INVESTMENT (MILLION $)
Small hydro	1,976	2,964
Wind power	7,092	8,865
Solar PV (Home lightening)	86	365
Solid biomass	569	569
Bagasse CHP	615	538
Waste-to-energy	43	65
Total		**13,366**

Source: Based on government projections and reports of the GOI's Planning Commission.

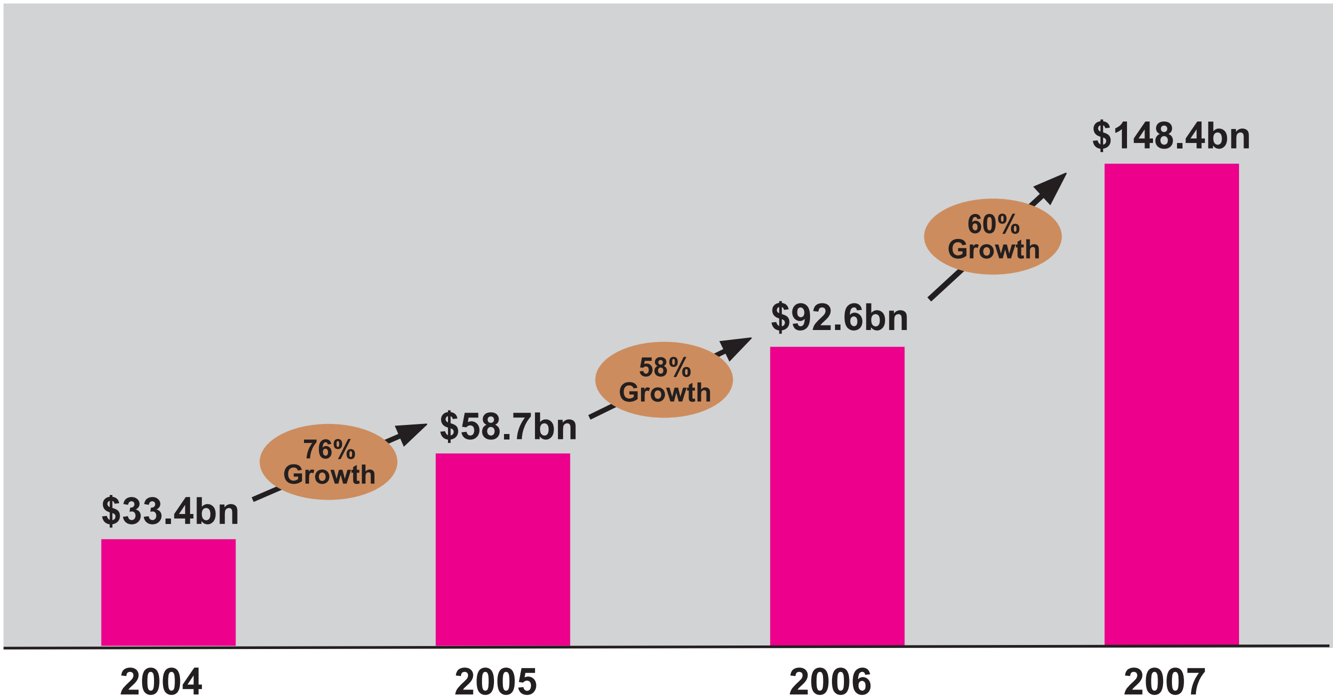
Table 6: Market Value of CETs as of March 2007

The existing market figure of clean energy technology is $13,366 million given in Table 6 based on estimating the value of the total investments in the installed capacity in each subsector, which has been estimated at today's costs per megawatt of installed capacity. These capacities have been installed over the last two decades, and this is a reflection of the value of investment in renewable energy at today's cost. At least 60 to 70 percent of the installed assets would have been depreciated by over 60–80 percent, and some would also have been upgraded with refurbishments or even replaced.

India's environmental, social, and health concerns are serious—India is one of the top five greenhouse gas (GHG) emitter in the world, with corresponding costs in health and productivity. Indoor air pollution in rural areas from reliance on biomass for cooking, for instance, causes serious health issues for women and children. Nonetheless, India enjoys significant resources for clean energy development including both human and ecological resources, and strong government support. These factors in themselves are important indicators of India's energy future.

By 2012—the completion of the 11th Five-Year Plan—the GOI has mandated that 10 percent of the nation's power supply comes from renewable energy sources, resulting in a 4–5 percent share of the electricity mix. As a result, the current 10,000 MW of installed renewable capacity is projected to reach 24,000 MW by 2012. This should translate from the current CET market size to more than $21 billion by 2012, in a best case scenario. Even under the realistic assumption of just a 50 percent capacity addition in the renewable and energy efficiency sub-sectors by 2012, the estimated market size would be $11 billion by 2012. No figures for export of CET are available for India as of early 2008. However, according to Indian Government sources, only solar photovoltaic components are exported from India. Wind energy equipment manufactured in India is not exported as it supplies the domestic market. Domestic SHP turbines and biomass gasifies manufactured in India are also used in-country.

Global New Investment in Clean Energy 2004 - 2007



The Expert Committee on Integrated Energy Policy in its Report (IEPR 2006) has estimated that by 2032, i.e., 25 years from now primary commercial energy requirement in the country would need to go up 4-5 times the current level, electricity generation installed capacity 5.6-7 times the current level and oil requirement by 3-6 times the current level. The need to diversify energy supply options is brought out in the IEPR 2006. Accordingly, increased focus is being laid on the deployment of renewable power that is likely to account for around 5 per cent in the electricity-mix by 2032. Apart from this, alternate fuels, essentially bio-fuels, are proposed to be progressively used for blending with diesel and petrol, mainly for transport applications.

In 2006, about 18% of global final energy consumption came from renewables, with 13% coming from traditional biomass, such as wood-burning. Hydroelectricity was the next largest renewable source, providing 3% of global energy consumption and 15% of global electricity generation.

In current market scenario of Indian clean energy technologies market Investment opportunities are available for corporate users of power, long-term investors in power, promoters of clean power, and trading credits for emission reductions. Private-sector companies can set up enterprises to operate as license or generating companies. A foreign investor can enter into a joint venture not only for renewable energy devices/products but also for manufacturing renewable-energy-based power generation projects on a build, own, and operate basis.

Example of European countries using W2E technologies

Across Europe, the public sector is the traditional owner of waste to energy (W2E) facilities The importance of electricity/heat generated from such plants is driving the attractiveness of investment and favouring partnerships with utility companies.As a result of this private sector companies are taking a greater responsibility in the sector.

At an operations level, the large waste management firms are also playing a very key role, especially where W2E plant operation is a part of a larger integrated waste management contract. The recent acquisition in September 2006 of Cleanaway UK Ltd by French giant Veolia is an example of the large global players continuing to snap up local players in high growth markets where they see a clear opportunity to drive value-added waste solutions. This followed the high profile acquisition of the UK's Waste Recycling Group by the Spanish company FCC for £1.4 billion in early 2006.

Meanwhile, the UK market has also seen considerable attention from the investment community in recent years, the most recent being the sale of Cory Environmental by Montagu Private Equity to a consortium of infrastructure investors (ABN AMRO Global Infrastructure Fund, Finpro SGPS and Santander Private Equity) for £588 million. As well as being among the leading UK waste management services companies, Cory has recently entered the W2E market by winning the contract to develop London's first river-served W2E plant at Belvedere.

The W2E market in Europe is growing and will continue to do so for at least 8 to 10 years. At the same time, public sector outsourcing is also on the increase and private sector capital is increasingly being sought.

Government-owned versus private W2E markets

The W2E services market supports about 200 to 250 players in 2007. Much of the reason behind this low number (low compared to other waste management service segments) is the use of large centralized facilities in many parts of Western Europe for the incineration of municipal solid waste (MSW). However the number of companies is expanding as the network of thermal units in many countries is expanded.

The majority of those active in the market are municipal-owned companies with a growing percentage of these being ventures with the private sector. Such private sector companies typically operate such facilities while also providing links with other areas of the waste market (W2E contracts are typically integrated with waste collection, transportation, treatment and final disposal). Their profile varies with some European markets, such as Denmark, to date retaining a strong public sector profile. However with costs for the construction of incinerators and their operation increasing this sector is assuming a steadily increasing profile.

With a high percentage of locally owned facilities, either direct or joint venture, the sector can be considered as highly fragmented. A number of multinationals have a strong national presence, as in France, while names such as Sita, Veolia, Remondis and TIRU are also active in a number of other national markets.

Country	Number of municipal W2E Plants	Opportunity for Private sector operation of municipal W2E Plants	Future trend for Private sector outsourcing	Plant ownership structure
United Kingdom	15	High	Stable	PPP
France	120	High	Stable	Mainly Public
Germany	58	Medium	Increasing	Mainly Public
scandinavia	81	Low	Increasing	Mainly Public
Netharlands	12	Low	Stable	Public
Belgium	17	Medium	Increasing	Mainly Public
Spain	11	High	Stable	PPP
Italy	49	Medium	Stable	Mainly Public
Switzerland	29	Medium	Stable	Mainly Public
Portugal	3	High	Stable	PPP

PPP = Public-Private-Partnership

Increasing private sector involvement

The table below shows indications of the level of private sector involvement in the operation of W2E facilities in the main European markets. Most countries have the private sector operation of at least some plants, although some in Northern Europe remain fairly committed to public sector management.

Private sector involvement in various EU countries

The bidding/tendering process for operation of plants (if the operation is to be outsourced) is almost always conducted at the same time as the tendering for the construction of the plant. As a result, build and operate contracts are common and many plants are operated by consortium companies.

The main private sector players in the market come from three main backgrounds and their relative presence varies by geography across Europe:

- The dedicated waste management players (e.g. Veolia, Sita, Remondis etc.) are strong across Europe, especially in the UK, France and parts of Germany.
- The civil engineering contractors (e.g. FCC, Cespa, Urbaser etc.) are especially strong in Southern Europe where they commonly form the main partner in a consortium to bring construction and operating expertise to infrastructure projects.
- Several of these engineering firms (FCC and Urbaser are good examples) have the capacity to make large investments, and also have dedicated waste management divisions or subsidiaries.
- The energy utility companies (e.g. EdF, EDP, RWE, Union Fenosa, etc.) play a big role in the countries where W2E is well established and the management of the energy/CHP facility is important. Many of the private sector consortia contain a utility partner. Indeed, EdF sees enough opportunity to have set up a dedicated subsidiary (TIRU) for W2E operations. Partnerships between TIRU and EdF are common across France and increasingly the rest of Europe.

Other Examples

A review by the University of California of studies that analyzed the economic and employment impacts of the clean energy technology industry in the USA and Europe found that clean energy technology development is not only good for energy self sufficiency and the environment it also has a significant positive impact on employment.

A European Commission study found that the key to Europe's future economic development lies in increasing resource and energy productivity and strong action to fight climate change is compatible with continued economic growth and prosperity. The development of clean energy is a good opportunity for the member states to finance environmental projects growth in the EU.

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