CHAPTER - I

BIOMASS POWER PLANTS & STRATEGIC MANAGEMENT: AN OVERVIEW

Energy is the most vital factor of economic development and social transformation for all developed and developing countries. Without readily available cheaper energy, the great strides taken by the society in industry, transport and agriculture would have been unimaginable. Energy in one form or other enters practically every single economic activity and its availability and costs determine the economic features and well being of the nation as well as the quality of life of its people. Energy is at the root of civilization and we cannot live without energy. We need energy to cook our food, to light our homes at night and to run irrigation pumps in the field. Industrial plants need power to run machinery that produce goods.

The energy requirements in India are met by two different forms of energy sources i.e. non-commercial sources like firewood, agricultural wastes, animal dung, etc., and commercial sources such as electricity, coal, oil and nuclear power. While the commercial sources are mostly used for the economic build up, the non-commercial sources are traditionally being used to meet the bulk of rural energy demand. Among the commercial forms of energy, electricity is the most convenient, versatile and relatively cheap source.

Electricity plays a crucial role both in the industrial and agricultural sectors. The consumption of electricity is one of the major indicators of national economic growth. The development of electricity industry is concomitant with the nation's economic and industrial development. It has been an index of prosperity and development of a society. The power output from electricity industry has become a convenient form of energy for use by agriculturists, industrialists, business and domestic consumers. The scientific research and development of appropriate technology in respect of improved production and distribution of electricity has helped the electric power to become a key input into the

national development process and electricity is critical to achieve economic, social and environmental objectives of sustainable development. In the present digital age electricity constitutes the most crucial and critical input for sustaining the process of economic as well as social development. Development of different sectors of economy is not possible without the matching development of the power sector.

1.1 TYPES OF ELECTRICITY GENERATION

The generation of electricity in India is being done by four different sources viz., Hydro, Thermal, Nuclear and Non-conventional Energy sources such as Biomass, Wind and Solar energy. While the generation of electricity from the first source depends upon water resources, the second depends upon coal resources and the third depends upon nuclear power resources. The generation of electricity from hydro and thermal has been in existence for decades in India, whereas the nuclear, solar, wind and biomass power generation is of a recent origin. The electricity generation in hydro power projects depends upon the availability of water resources and monsoons, which are uncertain. Whereas, the generation of thermal, nuclear, solar, wind and biomass power stations can be done under relatively easy conditions. Power generation through different forms of energy sources is briefly explained below:

Hydro Generation

Hydro Power is a renewable, non-polluting and environmentally safe source of energy. It is perhaps the oldest renewable energy technique known to mankind for mechanical energy conversion as well as electricity generation. Hydropower represents use of water resources which have no fuel cost with mature technology characterized by highest prime moving efficiency and spectacular operational flexibility. Hydropower is a renewable, non-polluting and environmentally benign source of energy. Hydropower represents use of water resources towards inflation free energy due to absence of fuel cost with mature technology characterized by highest prime moving efficiency and spectacular operational flexibility.

Hydroelectricity generation, which enhances India's energy security, is ideal for meeting the peak demand and is not linked to issues concerning fuel supply, especially the price volatility of imported fuels. About 20 per cent of the vast hydel potential of 150,000 MW in India has been tapped so far. Maximum emphasis is laid on the full development of the feasible hydro potential in the country. 50,000 MW hydro initiatives which have been already launched are being vigorously pursued. This involves 162 projects to be developed during 2007-2017. Hydel projects call for comparatively larger capital investment. Therefore, debt finance of longer tenure would need to be made available for hydro projects. Central Government is providing equity funds to Central Public Sector Undertakings (CPSUs) for Hydro-projects.

Thermal Generation

Thermal Power generation depends on the availability of the major inputs like Coal, Gas and Oil. India is endowed with huge coal reserves, i.e. more than 200 Billion tonnes. Even with the total development of the feasible hydro potential in the country, coal would necessarily continue to remain the major fuel for meeting the future electricity demand. Imported coal based thermal power stations, particularly at coastal location, are encouraged based on their economic viability and with use of low ash content coal, which would help in reducing the probability of fly ash emissions. Significant Lignite resources in the country are located in Tamilnadu, Gujarat and Rajasthan and these are increasingly utilized for power generation. Lignite mining technology is being improved to reduce costs. Use of gas as a fuel for power generation depends upon its availability at reasonable prices. Natural Gas is being used in Gas turbine/Combined Cycle Gas Turbine stations, which currently account for about 10 per cent of total capacity. Gas reserve discoveries made indicate that more than 25,000 MW of capacity could be developed. A national gas grid covering various parts of the country could facilitate development of such capacities.

Nuclear Power

India is poised to embark upon a massive nuclear power programme with a series of nuclear power plants, including some of higher capacities. In a bid to achieve rapid growth in the installed nuclear power capacity, a revised Nuclear Power Programme is being formulated. In India, the total nuclear installed capacity is 3900 MW, as compared to 3,46,000 MW of the world.

In India, fourteen nuclear power plants are producing about 3900 MW constituting 3 per cent in the overall capacity profile. Nuclear power is considered a reliable source of energy to meet base load demand. Nuclear power plants are being set up at locations far away from coal mines. Nuclear power generation in India is going to get a big push with the Government putting in place an ambitious expansion programme to increase it to about 10, 000 MW by the year 2012 and about 20,000 MW by the year 2020. In 'Vision-2020', it was deemed possible and necessary to have an installed Nuclear Power Capacity of 20,000 MW by the year 2020. Consequently the share of nuclear power will increase in the overall generation profile.

Non-conventional Energy Sources

Non-conventional energy sources such as biomass, wind, solar and hydro (particularly small hydro) are receiving increased attention in developed as well as developing countries. Such non-conventional energies offer developing countries the prospect of increasing their energy supplies in a self-reliant way at national and local levels along with the attendant economic, social and security benefits (WRI 1994). Long term sustainable development in all countries, and particularly in the developing world, requires a gradual shift towards non-conventional sources of energy that are more equitably distributed and less environmentally destructive than fossil fuel sources (Goldemberg et al. 1988). Non-conventional energy technologies have evolved markedly over the past two decades while the costs of all renewable have declined significantly (WB 1992) and are projected to decline even further in the next 5-10 years (Ahmed 1994). Thus the commercial development of non-conventional energies may be justified

even on non-environmental grounds. In India, for example, the goals of energy planning include the promotion of decentralized energy technologies based on non-conventional resources in the medium term and the promotion of energy supply systems based on non-conventional sources of energy in the long term (PC 1992).

Though the Indian power sector has achieved substantial growth during the post-independence era, the sector has been sick with serious functional problems during the past few decades. India, today, has an installed capacity of 1, 59,398 MW. Despite the recent slowdown, the country experienced a peak deficit of 12 per cent during 2010-11. Power is one area of infrastructure where India lags far behind even other developing countries. India's per capita consumption of power stands at 706 kWh. As compared to this, the per capita consumption in China and US is 2,060 kWh and 13515 kWh respectively.

1.2 INDIA'S INSTALLED POWER GENERATION CAPACITY

To understand the context of biomass power industry, a brief review of power industry in India, in general, is not out of place. Although biomass power industry is worthy of promotion in the fossil fuel dependent countries like India, there is a long way to go to achieve satisfactory dependence on renewable energy sources. Table 1.1 presents source-wise installed power generating capacity in India during 1970-71 to 2013-14.

Table 1.1 - Installed Generation Capacity in India during 1970-71 to 2013-14

Year	Hydro	Thermal	Nuclear, Biomass & Others	Total Capacity
1970-71	5,883 (40.00)	8,406 (57.14)	420 (2086)	14,709 (100.00)
1980-81	11,791 (35.39)	20,665 (62.03)	860 (2.58)	33,316 (100.00)
1990-91	18,753 25.67)	51,768 (70.84)	2,552 (3.49)	73,073 (100.00)
2000-01	25,153 (24.75)	73,613 (72.44)	2,860 (2.81)	1,01,626 (100.00)
2005-06	34,086 (26.50)	84,405 (65.65)	10,090 (7.85)	1,28,581 (100.00)
2010-11	37567	112824	23235	173626

	(21.63)	(64.98)	(13.39)	(100.00)
2011-12	38990 (19.50)	131603 (65.84)	29284 (14.66)	199877 (100.00)
2012-13	39491 (17.68)	151531 (67.84)	32322 (14.48)	223344 (100.00)
2013-14	40549 (16.60)	168298 (68.90)	35423 (14.50)	244180 (100.00)

Source: Centre for Monitoring Indian Economy Pvt. Ltd., Mumbai.

Note: Figures in the parenthesis indicate the percentage to the corresponding total.

Table 1.2 - Total Installed Power Generation Capacity in India as on 31-1-2010

Source	Total Capacity (MW)	Per cent
Coal	148,478.39	59.51
Hydroelectricity	40,730.09	16.33
Renewable energy source	31,692.14	12.7
Natural Gas	22,607.95	9.06
Nuclear	4,780.00	1.92
Oil	1,199.75	0.48
Total	**249,488.32**	

Source: Ministry of New Renewable Energy website

As may be seen from Table 1.2, India now heavily depends on thermal and hydro power as a source of energy. Table 1.2 shows that 59.51 per cent of the power generated comes from coal, 16.33 per cent from water and 12.7 per cent from the renewable energy sources.

It may not be out of place to mention here that India's total installed capacity of electricity generation has expanded from 105,045.96 MW at the end of 2001–02 to 1,57,229 MW at the end of February, 2010. In fact, India ranks sixth globally in terms of total electricity generation. Thermal power comprises 64.6 per cent of the total installed capacity, producing 1,00,598.40 MW. Hydro electricity power plants come next with 24.7 per cent of the total installed capacity of 36,863.40 MW and renewable energy sources contribute around 10 per cent to the total power generation in the country producing 15,789 MW (as on 31.1.2010).

1.3 RENEWABLE POWER - FOCUS ON BIOMASS POWER

Renewable energy is derived from natural processes that are replenished continuously. In its various forms, it derives directly from the sun, or from heat generated deep within the earth. Included in the definition are electricity and heat generated from solar, wind, ocean, hydropower, biomass, geothermal resources, and bio fuels and hydrogen derived from renewable resources.

Based on Renewable Energy News 21's 2014 report, renewable power contributed 19 percent to our energy consumption and 22 percent to our electricity generation in 2012 and 2013, respectively. Modern renewable, such as hydro, wind, solar and bio-fuels, as well as traditional biomass, contributed in about equal parts to the global energy supply. Worldwide investments in renewable technologies amounted to more than US$214 billion in 2013, with countries like China and the United States heavily investing in wind, hydro, solar and bio-fuels.

Total Installed capacity of Renewable Power in India

India has got the total installed renewable power capacity of 33,791.70MW. The breakup of various renewable sources is: Wind (66 per cent), Solar (9 per cent), Small Hydro (12 per cent), Biomass (4.40 per cent), Bagasse - Cogen (8.30 per cent) and Waste to Power (0.3 per cent) as shown in Table 1.3

Table 1.3 - Total Installed capacity of Renewable Power in India as on

Source	Total Installed Capacity (MW)	Percentage
Wind Power	22,465.03	66.00
Solar Power (SPV)	3,062.68	9.00
Small Hydro Power	3,990.83	12.00
Biomass Power	1,365.20	4.40
Bagasse Cogeneration	2,800.35	8.30
Waste to Power	107.58	0.30
Total	**33,791.70**	**100.00**

Source: Compiled from Ministry of New Renewable Energy and Central Electrical Authority websites

1.4 POWER CONSUMPTION IN INDIA

India's annual electricity consumption comprises about four per cent of the world's total electricity consumption. Towards achieving the annual GDP growth rate of 8 -10 per cent, the generation capacity must grow at a minimum of 8 to 9 per cent annually. According to the Expert Committee on Integrated Energy Policy, there would be 778 GWh of capacity requirement and energy requirement of 3,880 billion kWh by 2031-32 if the country's GDP grows at the rate of 8 per cent. At 9 per cent GDP growth rate, the capacity requirement will be 960 GWh and energy requirement will be 4,806 billion kWh by 2031-32.This translates into a capacity addition of over 30,000 MW every year for the next 22 years. The Planning Commission's 12^{th} Plan expects total domestic energy production to reach 669.6 million tonnes of oil equivalent (MTOE) by 2016 – 17 and 844 MTOE by 2021–22.By 2030-35, energy demand in India is projected to be the highest among all countries according to the 2014 energy outlook report by British oil giant BP.

As per the International Energy Agency (IEA) publication on World Energy Statistics 2013, India ranks 5^{th} in Electricity production and 110^{th} in the per-capita consumption of electricity. The energy deficit in India has reduced from 9.5 per cent in 2010-11 to 4.5 per cent in 2013-14.

The Indian power sector is undergoing a significant change that is redefining the industry outlook. Sustained economic growth continues to drive power demand in India. The Government of India's focus to attain 'Power for All' has accelerated capacity addition in the country. At the same time, the competitive intensity is increasing on both market side as well as supply side (fuel, logistics, finances and manpower).

Electricity production in India (excluding captive generation) stood at 911.6 TWh in FY 2013, a four per cent growth over the previous fiscal. During FY2014, electricity production stood at 967 TWh. Over FY 2007–2014, electricity production expanded at a compound annual growth rate (CAGR) of 5.6 per cent. As of April 2014, total thermal

installed capacity stood at 168.4 gigawatt (GWh) while hydro and renewable energy installed capacity totaled to 40.5 GWh and 31.7 GWh, respectively. At 4.8 GWh, nuclear energy capacity remained broadly constant from that in the previous year.

Indian solar installations are forecasted to be approximately 1,000 megawatt (MW) in 2014, according to Mercom Capital Group, a global clean energy communications and consulting firm. Wind energy market of India is expected to attract about Rs 20,000 Crores (US$ 3.24 billion) of investments next year, as companies across sectors plan to add 3,000 MW of capacity powered by wind energy.

1.5 INVESTMENTS IN POWER SECTOR

Table 1.4 depicts the total outlay and power sector outlay during various Five Year Plans and Annual Plans. The outlay on power sector in the First-Five year plan was to the tune of Rs. 260.00 Crores whereas during the Second Five Year Plan, the outlay increased to Rs. 460.00 Crores. In the Third Five Year Plan, an amount of Rs. 1,252.30 Crores was earmarked. The allocation during the three annual plans was Rs. 1,212.60 Crores. In the Fourth Five-Year plan, the outlay was more than doubled (Rs. 2,931.70 Crores) over the previous plans. In the Fifth Five-Year Plan, the outlay was more than the total sum of previous (7,399.50 Crores) and in the Sixth Five-Year Plan, the allocation was increased substantially to Rs. 19,265.40 Crores.

In the Seventh Five-Year Plan an amount of Rs. 34,273.50 Crores was allocated, whereas in the two annual plans, the allocation was Rs. 25,906 Crores and in the Eighth Five-Year Plan, the allocation was increased substantially to Rs. 79,589 Crores. The share of power sector in Ninth Five-Year Plan was Rs. 2,21,973 Crores, out of the total outlay of Rs. 8,75,000 Crores. The percentage to the total outlay was registered at maximum i.e. 25.40. Much emphasis was laid in the Tenth Five-Year Plan for the development of power sector.

It is interesting to note that the outlay on power sector in the Tenth Five-Year plan was higher than all the Five Year Plan outlays on power sector at Rs. 2,70,276 Crores. Though it increased by Rs. 48,303 Crores, the percentage of power sector outlay to the total was decreased by 7.19 per cent. The share of power sector in the total outlay has varied between 10 per cent and 25.40 during the successive Five-Year Plans while the Second Five-Year Plan registered the minimum share (10 per cent), the Ninth Five Year Plan recorded the maximum (25.40 per cent).

Table 1.4 - Financial Outlays on Power Plan wise under Five Year Plans in India

Plan	Period	Total Outlay	Power Sector Outlay	Power Sector Outlay as percentage of total outlay
First Plan	1951-56	1,960.00	260.00	13.26
Second Plan	1956-61	4,600.00	460.00	10.00
Third Plan	1961-66	8576.30	1252.30	14.60
3 Annual Plans	1966-69	6625.40	1212.60	18.30
Fourth Plan	1969-74	15,778.80	2,931.70	18.60
Fifth Plan	1974-79	39,426.20	7,399.50	18.80
Sixth Plan	1980-85	97,500.00	19,265.40	19.80
Seventh Plan	1985-90	1,80,000.00	34,273.50	19.50
2 Annual Plans	1990-92	1,23,362.00	25,906.00	21.00
Eight Plan	1992-97	7,98,000.00	79,589.00	18.30
Ninth Plan	1997-2002	8,75,000.00	2,21,973.00	25.40
Tenth Plan	2002-2007	14,84,131.00	2,70,276.00	18.20

Source: Directorate of Economics and Statistics handbook, Department of Agriculture, New Delhi.

The investment climate is positive in the power sector. Due to the policy of liberalization, the sector has witnessed higher investment flows than envisaged. The Ministry of Power has sent its proposal for the addition of 76,000 MW of power capacity in the 12th Five Year plan (2012-17), to the Planning Commission. The Ministry has set a target of adding 93,000 MW in the 13th Five Year Plan (2017-2022). The industry has attracted FDI worth US$ 9,309.96 million during the period April 2000 to September 2014.

1.6 GOVERNMENT INITIATIVES TO BOOST POWER SECTOR

The Government of India has identified power sector as a key sector of focus to promote sustained industrial growth. Some of the initiatives taken by the Government of India to boost the power sector of India are as follows:

i. India and Bhutan have signed a power project pact to provide a major boost to the 600 MW Kholongchu hydroelectric projects. It will be the first hydroelectric project to be developed by a joint venture (JV) between public sector units (PSUs) of the two countries.

ii. India and Nepal have signed the power trade agreement (PTA). The agreement will be effective for the next 25 years and deals with power trade, cross-border transmission lines and grid connectivity.

iii. The Ministry of New and Renewable Energy (MNRE) has initiated the scheme for setting up of 25 Solar Parks, each with the capacity of 500 MW and above, to be developed over the next 5 years in various states.

iv. Indian Renewable Energy Development Agency Ltd (IREDA) has signed a MoU with the US Exim Bank with respect to cooperation on clean energy investment.

v. In line with the government's plans to boost domestic output of coal, India's largest thermal power producer, NTPC Ltd, could soon become one of the major coal-producers of the country as well. NTPC plans to produce up to 300 million tonnes (MT) of coal within the next four to five years, said Mr. Arup Roy Choudhury, Chairman and MD, NTPC.

vi. The Competition Commission of India (CCI) has given its approval to Adani Power's deal with Lanco Infratech to buy the latter's 1,200 MW imported coal-

fired power plant at Udupi in Karnataka for more than Rs 6,000 Crores (US$ 973.79 million).

1.7 BIOMASS POWER INDUSTRY IN INDIA

Biomass is one of the important energy sources of India as it offers many benefits. It is renewable, widely available, carbon-neutral and has the potential to provide significant employment in the rural areas. Biomass is also capable of providing firm energy. About 32 per cent of the total primary energy use in the country is still derived from biomass and more than 70 per cent of the country's population depends upon it for its energy needs. Ministry of New and Renewable Energy has realized the potential and role of biomass energy in the Indian context and hence has initiated a number of programmes for promotion of efficient technologies for its use in various sectors of the economy to ensure derivation of maximum benefits Biomass power generation in India is an industry that attracts investments of over Rs.600 Crores every year, generating more than 5000 million units of electricity and yearly employment of more than 10 million man-days in the rural areas. For efficient utilization of biomass, bagasse based cogeneration in sugar mills and biomass power generation have been taken up under biomass power and cogeneration programme.

Electricity is a basic necessity for both developed and developing economies. But most of the electricity is produced from non-renewable fossil fuels, confronting human community with imminent shortage and exhaustion of these feed stocks. That apart, the use of these fuels is fast leading to the worst kind of pollution, greenhouse gasses, climate change, and global warming. But biomass power generation is CO_2 neutral, since only a minimal amount of carbon is emitted during combustion. Government of India supports renewable energy generation like biomass power since carbon emissions are low from such operations and they reduce dependence on nonrenewable resources. Table 1.5 depicts the total power and renewable power generation status in India.

Table 1.5 Power Generation (Renewable and Non-Renewable) Status in India

Date	Total Power Generation	Renewable Power Generation	Per cent of Renewable Power in the Total Power
31.03.1990	63636	18	0.03
31.03.1992	69065	32	0.05
31.03.2002	105046	1658	1.58
31.03.2007	132329	7761	5.86
31.03.2008	143061	11125	7.78
31.03.2009	147965	13242	8.95
31.03.2010	159398	15521	9.74
31.03.2011	173626	18455	10.63
31.03.2012	199877	24503	12.26
31.03.2017 (Projection)	318414	54503	17.12

Source: compiled from Biomass Atlas by IISc, Bangalore and MNRE website

1.8 SIGNIFICANCE OF BIOMASS POWER GENERATION

The agricultural wastes which were earlier being burnt in the fields are now being effectively utilized for producing electricity in Biomass power plants. Farmers collect the agricultural waste from their fields and sell it to the power plants, for which they realize considerable income on such wastes. Power generation from these agricultural wastes provides employment, direct as well as indirect, to rural population. Biomass power plants are eco-friendly. They will not pollute the atmosphere. They are helping grid stabilization, improve voltages in rural areas and reduce burden on thermal and hydel power plants. The Government of India is encouraging renewable power as there is huge shortage of power all over the country.

Biomass power programme is implemented with the main objective of promoting technologies for optimum use of country's biomass resources for grid power generation.

Biomass power production gives social, economic and environmental benefits to the community, particularly where agricultural waste like paddy husk, top ends of sugarcane stalks, pulse husk, ground nut shells, side branches of orchard plantations, maize cobs, palm oil bunches, coconut fiber, chilly/cotton plant stocks, soya husk, de-oiled cakes, coffee waste, jute wastes, saw dust and any other agricultural and forest waste collected after the main produce harvest are abundantly available.

Potential for Biomass Power

The current availability of biomass in India is estimated at about 500 million metric tons per year. Studies sponsored by the Ministry have estimated surplus biomass availability at about 120 – 150 million metric tons per annum covering agricultural and forestry residues corresponding to a potential of about 18,000 MW.

Technology used for generation of biomass power.

Combustion: The thermo chemical processes for conversion of biomass to useful products involve combustion, gasification or pyrolysis. The most commonly used route is combustion. The advantage is that the technology used is similar to that of a thermal plant based on coal, except for the boiler. The cycle used is the conventional ranking cycle with biomass being burnt in high pressure boiler to generate steam and operating a turbine with generated steam. The net power cycle efficiencies that can be achieved are about 23-25 per cent. The exhaust of the steam turbine can either be fully condensed to produce power, or used partly or fully for another useful heating activity.

1.9 INSTALLATION OF BIOMASS POWER PLANTS

The Ministry of New and Renewable Energy has been implementing biomass power/co-generation programme since mid nineties. A total of 288 biomass power and cogeneration projects aggregating to 2665 MW capacity have been installed in the country. In addition, around 30 biomass power projects aggregating to about 350 MW are under various stages of implementation. Around 70 cogeneration projects are under

implementation with surplus capacity aggregating to 800 MW. States which have taken the leadership position in implementation of bagasse cogeneration projects are

Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Uttar Pradesh. The leading States for biomass power projects are Andhra Pradesh, Chhattisgarh, Maharashtra, Madhya Pradesh, Gujarat and Tamil Nadu.

1.10 PROMOTIONAL POLICIES

The Govt. of India has provided the following incentives for promotion of Biomass Power Plants in view of their significance and contribution for production of electricity to overcome shortages, use of agriculture waster material, generate employment, protect environment, etc.

i. Full Excise Duty exemption and Customs Duty Exemption/Reduction on parts of Biomass Operated Electricity Generator
ii. Exemption from Central Sales Tax
iii. 100 per cent accelerated depreciation
iv. Income Tax Holiday for ten years (can be availed within 15 years).
v. Power sector reforms have encouraged investment in grid-connected biomass projects.

Besides the Central Financial Assistance, fiscal incentives such as 80 per cent accelerated depreciation, concessional import duty, excise duty, tax holiday for 10 years, etc., are available for Biomass power projects. The benefit of concessional custom duty and excise duty exemption are available on equipment required for initial setting up of biomass projects based on certification by Ministry. In addition, State Electricity Regulatory Commissions have determined preferential tariffs and Renewable Purchase Standards (RPS). Indian Renewable Energy Development Agency (IREDA) provides loan for setting up of biomass power and bagasse cogeneration projects. Central financial assistance and fiscal incentives for Biomass power plants are presented in Table 1.6 and Table 1.7.

Table 1.6 - Central Financial Assistance for Biomass Power Projects

Project Type	Special Category States(NE Region, Sikkim, J&K, HP & Uttaranchal)	Other States
Biomass Power projects	Capital Subsidy	Capital Subsidy
	Rs.25 lakh X(C MW)^0.646	Rs.20 lakh X (C MW)^0.646

Note: CFA and Fiscal Incentives are subject to change.

Table 1.7 - Fiscal Incentives for Biomass Power Generation

Item	Description
Accelerated Depreciation	80 per cent depreciation in the first year can be claimed for the following equipment required for co-generation systems: 1. Back pressure, pass-out, controlled extraction, extraction–cum-condensing turbine for co-generation with pressure boilers 2. Vapour absorption refrigeration systems 3. Organic rankine cycle power systems 4. Low inlet pressures small steam turbines
Income Tax Holiday	Ten years tax holidays.
Customs / Excise Duty	Concessional customs and excise duty exemption for machinery and components for initial setting up of Biomass power projects.
General Sales Tax	Exemption is available in certain States

1.11 BIOMASS POWER TARIFF ACROSS STATES IN INDIA

Biomass Power Tariff across States and list of Commissioned Biomass and Cogen Power Projects in India (State-wise/Year-wise) are presented in Table 1.8.

Table 1.8 - Biomass Power Tariff across States (AS ON 31.03.2011)

State	Tariff fixed by Commissions	RP0 per cent
Andhra Pradesh	@Rs.4.28/kWh, (2010- 11)	Min 3.75
Chhattisgarh	@Rs.3.93/unit (2010-11)	5
Gujarat	@ Rs.4.40/unit (with accelerated depreciation.)	10
Haryana	@ Rs.4.00/unit (base year 2007-08)	1
Karnataka	@Rs.3.66 per unit (PPA signing date) Rs.4.13 (10^{th} year)	Min.10
Kerala	@ Rs.2.80/unit escalated at 5 per cent for five years (2000-01)	3
Maharashtra	@ Rs. 4.98 (2010-11)	6
Madhya Pradesh	@ Rs.3.33 to 5.14 /unit paisa for 20 yrs. With escalation of 3- 8paise	0.8
Punjab	@Rs.5.05 /unit, (2010-11) with escalation of 5 per cent	Min. 3
Rajasthan	@ Rs.4.72 / unit-water cooled (2010-11)- & Rs.5.17-air cooled (2010-11)	1.75
Tamil Nadu	@ Rs.4.50-4.74/unit (2010-11) – (Escalation 2 per cent)	Min. 13
Uttaranchal	@ Rs.3.06/unit. (2010-11)	9
U.P.	@ Rs.4.29 / unit, for existing and 4.38 for new with escalated at 4 paisa/year, base year (2006)	4
West Bengal	Rs. 4.36/unit fixed for 10 years	4
Bihar	Rs. 4.17/unit (2010-11)	1.5
Orissa	Rs.4.09/unit	

Source: Ministry of New and Renewable Energy website

1.12 COMMISSIONED BIOMASS AND COGEN POWER PROJECTS IN INDIA

The details of biomass and cogeneration power projects that are established in different states of India are given in Table 1.9.

Table 1.9 - List of Commissioned Biomass and Cogeneration Power Projects in India State-Wise/Year-Wise (As on 31.3.2011) in MW

State	Up to 31.3.03	2003 - 04	2004 -05	2005 -06	2006 -07	2007 -08	2008 -09	2009 - 10	2010 -11	Total
Andhra Pradesh	160.05	37.70	69.5	12.00	22.00	33.00	9.00	20.00	..	363.25
Bihar		--	--	--	--	--	--	--	9.50	9.50
Chhattisgarh	11.00	--	--	16.50	85.80	33.00	9.80	43.80	32.00	231.90
Gujarat	0.50	--	--	--	--	--	--	--	--	0.50
Haryana	4.00	--	2.00	--	--	--	--	1.8	28.00	35.80
Karnataka	109.38	26.00	16.60	72.50	29.80	8.00	31.90	42.00	29.00	365.18
Madhya Pradesh		1.00	--	--	--	--	--	--	--	1.00
Maharashtra	24.50	--	11.50	--	40.00	38.00	71.50	33	184.50	403.0
Punjab	22.00	--	--	6.00	--	--	--	34.50	12.00	74.50
Rajasthan		7.80	--	7.50	8.00	--	8.00	--	42.00	73.30
Tamil Nadu	106.00	44.50	22.50	--	42.50	75.00	43.20	62.00	92.50	488.20
Uttarakhand	--	--	--	--	--	--	--	--	10.00	10.00
Uttar Pradesh	46.50	12.50	14.00	48.50	--	79.00	172.00	194.50	25.50	592.50
West Bengal		--	--	--	--	--	--	16.00	--	16.00
Total	**483.93**	**129.50**	**136.10**	**163.00**	**228**	**266.0**	**345.4**	**447.6**	**465.0**	**2665**

Source: Compiled from Biomass Atlas by IISc, Bangalore and Ministry of New and Renewable Energy websites

1.13 BIOMASS POWER PLANTS - RAW MATERIAL AVAILABILITY

Biomass power generation in India attracts investments of over Rs.600 Crores per annum, producing more than 5000 million units of electricity and yearly employment of more than 10 million man-days in the rural areas.

Notably, due to technological advances in energy conversion, now a variety of biomass feedstock is available, due to which the industry has a wider choice of raw materials such as Wheat and Rice Straw, Rice Husk, Sugar Cane Tops and Bagasse, Oil Seed Wastes, etc., on the one hand and better opportunities for farmers. Similarly, small lot sizes benefit the biomass plants. Table 1.10 presents various variety-wise biomass generations, the actual use and surplus thereupon. As it can be seen from the Table, out of the total 630 MMT of biomass material only 458.9 MMT of Biomass is used for Biomass power plants in India. Thus it clearly indicates that at the present level of generation and use of biomass, about 165 million tonnes of biomass is available as surplus. This facilitates establishment of additional biomass power plants at the appropriate locations to generate additional electrical power.

Table 1.10 - Biomass Energy Generation Potential Availability in India

Sl. No	Biomass	Generation (MMT)	Used (MMT)	Surplus (MMT)
1	Rice Straw	112	103.5	8.5
2	Wheat Straw	109.9	100.8	9.1
3	Sugar Cane Bagasse	101.3	94.9	6.4
4	Sugar Cane Tops	97.8	18.3	79.5
5	Oil Seed Wastes	57.7	40.4	17.3
6	Maize Stover	22.7	21.6	1.1
7	Rice Husk	22.4	22.0	0.4
8	Cotton Stalk	18.9	7.5	11.4

Sl. No	Biomass	Generation (MMT)	Used (MMT)	Surplus (MMT)
9	Pulses Wastes	18.9	13.2	5.7
10	Sorghum Stover	15.6	14.0	1.6
11	Water Hyacinth (Whole)	15.0	1.0	14
12	Bajra Stalk	12.2	11.0	1.2
13	Bamboo (Top, Root and Leaves)	5.4	2.1	3.3
14	Ragi Stalk	4.6	4.1	0.5
15	Maize Cob	4.2	2.5	1.7
16	Maize Husk	2.7	1.6	1.1
17	Pine needles	1.6	0.4	1.2
18	Chillies Stalk	0.6	0.1	0.5
Total		**623.4**	**458.9**	**164.5**

Source: Compiled from Biomass Atlas by IISc, Bangalore and Ministry of New and Renewable Energy websites

Three technological advancements in biomass power generations viz., enhanced efficiency of biomass energy conversion technologies, improved fuel processing technologies and enhanced efficiency of end-use technologies have substantially contributed to increase in biomass power generation. Further, modern biomass technologies using a variety of biomass feedstock have also enhanced the supply potential of biomass. Small economic size and co-firing with other fuels have also opened up additional application (Shukla, www. e2analytics.com). According to Shukla of e2analysis Biomass integrated gasifier/combined cycle (BIG/CC) technology has potential to be competitive since biomass as a feedstock is more promising than coal for gasification due to its low sulfur content and less reactive character. The biomass fuels are suitable for the highly efficient power generation cycles. For electricity generation, two most competitive technologies are direct combustion and gasification.

1.14 BIOMASS POTENTIAL AND INSTALLED CAPACITY

In India, the most commonly used biomass power technology is combustion technology. With this, the biomass is incinerated (burning into ash) in a high pressure boiler to

produce steam, which is then used to spin a turbine to generate power. Gasifier-based power plants, biomass power plants, are a wonderful solution for off-grid decentralized power and supplying power to many homes in several Indian states. Biomass power production does not fluctuate like wind power and does not require storage like solar power.

Table 1.11 - Biomass Potential and Installed Capacity in Key Indian States in 2010

State	Power Potential (MWe)	Installed Capacity(MWe)
Punjab	2413.2	74.5
Uttar Pradesh	1594.3	592.5
Haryana	1120.8	35.8
Rajasthan	1093.5	73.3
Maharashtra	1014.2	403
Madhya Pradesh	841.7	1.0
Karnataka	631.9	365.18
Andhra Pradesh (Undivided)	625.0	363.25
Gujarat	457.7	0.5
Chhattisgarh	248.5	231.9
Kerala	195.9	-

Source: Biomass Atlas by IISc, Bangalore and MNRE website

Table 1.11 shows that although a lot of agricultural wastes are available in certain agricultural states like Punjab, the potential for biomass power has not been fully utilized. For example, Punjab has the potential to produce 2413 MWe from biomass; it currently has an installed capacity of 74.5 MWe. The same is the case with Haryana and Rajasthan states too. In states like Madhya Pradesh and Kerala no biomass power plants have so far been set up. It is interesting to note that states like Uttar Pradesh, Karnataka, Andhra Pradesh, and Maharashtra top the list of states where a good number of biomass power plants have come up registering an appreciable installed capacity. Strangely, states like West Bengal, Tamil Nadu, Punjab, etc., which depend heavily on agriculture and where large feed stocks are turned out, have a lesser number of biomass power plants registering a low installed capacity of biomass power plants.

Thus it can be inferred from the above analysis that majority of the states have a large power potential generation whereas the installed capacity is very low. This clearly indicates that the respective state governments have to initiate appropriate measures including giving incentives for promotion of biomass power plants in their states.

In view of the availability of biomass material, shortage of electrical power, it is desirable to provide incentives for promotion of Biomass power plants in all the States.

1.15 SOCIO-ECONOMIC AND ENVIRONMENTAL BENEFITS OF BIOMASS POWER PLANTS

Biomass power production gives socio-economic and environmental benefits to the community, particularly where agricultural waste like paddy husk, top ends of sugarcane stalks, cotton plant stocks, etc., are economically used in power plants. Biomass power production, which uses greener and sustainable material, is a solution to augment energy resources in India and also protect the environment.

Before the advent of biomass power industry, farmers used to incur substantial cost for disposal of the biomass material generated as a waste after harvesting. After biomass power generation started in India, the power plants are going around different villages educating the farmers not to destroy the agricultural waste material which has some economic value and sell it to biomass power plants. This has benefited the Indian farmers in increasing their revenues by selling the biomass to the power plants rather than wasting it or disposing it otherwise.

Presently, the biomass materials contribute 14 per cent of global energy and 38 per cent of energy in developing countries (Woods and Hall, 1994, cited in Shukla, e2analytics). According to FAO Report (1997), share of biomass in energy varies - from more than 75 per cent in Nepal, Laos, Bhutan, Cambodia, Sri Lanka and Myanmar to nearly 50 per

cent in Vietnam, Pakistan and Philippines. It is nearly 33.33 per cent in India and Indonesia, to a low 10 per cent in China and 7 per cent in Malaysia.

Many places in India have no access to electricity. This has become an impediment for their progress and development. Biomass electricity has the potential to reach them as biomass is a cheaper source of energy available in large quantities in most such villages in India.

The following are the benefits which accrue to the farmers, biomass suppliers, and the rural areas as a whole.

i. Boost for rural economy

Since farmers and rural people see more money coming into their hands owing to these wastes getting converted into money, this industry is a boon to the rural community. There are other ancillary activities related to the industry, which engage the rural people in some kind of income-generation activities like raw material collection, sorting, transporting etc. Thus, this industry has the potential to create employment and self-employment.

ii. Rural employment:

Each plant is creating both direct and indirect employment opportunities. There are about 70-80 employees working on permanent basis and about 100-125 are working on contract basis. All the contract workers are either semi-skilled or unskilled. But the regular employees are basically working in shifts having specific skill set. As there are 34 biomass plants set up in the state of Andhra Pradesh, about 1200 employees are working on permanent basis and about 4000 on contract basis. Apart from the regular work force, there are also a good number of opportunities created for the village youth to work indirectly for various purposes, viz., raw material collection, suppliers, and raw material transporters. Hence, standard of living of the rural population in and around the location of the plants has considerably improved.

iii. Grid stabilization:

As the biomass power plants are basically located in rural areas and distributed across the state of Andhra Pradesh, the power generated is exported to the local grid. The advantage of this is that low voltage problems in rural areas are addressed, which used to be a major problem in the rural areas; these voltage problems badly interrupt the operations of various domestic, agriculture, small and tiny industries. Thanks to biomass power plants, power transmission and power transformation losses are arrested to a greater extent.

iv. Additional revenue sources for farmers:

Biomass power industry turns waste material into gold for farmers. The biomass power production gives social, economical and environmental benefits to the community, particularly where agricultural waste like rice husk, cotton plant stalks, rice straw, wheat straw, sugar cane tops, sugar cane bagasse, maize stover, maize cob, maize husk, sorghum stover, bajra stalk, chillies stalk, ragi stalk, pulses wastes, oil seed wastes, bamboo - top, root and leaves, pine needles, water hyacinth etc. are available and waiting to be disposed of. It is quite heartening to note that the material whose disposal entails costs before the advent of biomass power industry is now a source of substantial revenue for the farmers.

Most of the agriculture wastes mentioned above are considered real waste material with limited usage before setting up of biomass power plants. Now, the biomass power industry turns waste material into gold for farmers as the biomass was used productively to generate power. As a result, farmers are earning additional income while supplying the agriculture waste to the biomass power plants.

v. Reducing environmental pollution with low carbon emissions

Use of biomass fuels adds very little to the greenhouse emissions which are already enormously released by the other industries using fossil-fuels. Use of fossil fuels transfers carbon which lies underground, to the atmosphere. Biomass is a part of the carbon cycle. Carbon from the atmosphere is absorbed into plants during photosynthesis and when the plant decays or is burnt carbon goes back into the atmosphere thus creating a closed carbon cycle. Because it is a cycle, the next crop of plants absorbs that carbon over again. So there is a balance between the amount of carbon that the biomass fuel releases into the atmosphere and the amount that they extract from it. This is why biomass fuels do not contribute to global warming. Biomass fuels are clean.

vi. Green Energy from agriculture and forest waste

Biomass energy, when used in commercial businesses such as airlines, receives tax credit from the US government. This is good for the environment and good for business. It does release carbon dioxide but captures carbon dioxide for its own growth. Contrarily, carbon dioxide released by fossil fuel is released into the atmosphere and is harmful to the environment. Importantly, this industry converts into green energy the agri-waste and forest waste which otherwise is useless and moreover entails costs to dispose of.

vii. Additional revenue for rice millers

Rice husk used to lie in huge mounds in the premises of the rice millers posing a big challenge for its disposal, before the advent of this industry. It used to occupy a huge area of the mill premises. The millers had to spend money to get husk off from their premises. Now such husk brings money to millers around Rs.3,000 per tonne which is a substantial income to the millers.

viii. Waste land is utilized for energy plantation

Plants like juliflora and subabul are highly useful as bio fuels to the biomass industry and hence they are considered as ‘energy plantations’. These generally grow on wastelands. Now the wasteland became productive assets since the biomass industry is using the

energy plantations as raw material to produce power. What was once a wasteland is now a productive land after the advent of biomass industry.

ix. Solution for disposal of garbage and industrial waste

Industry byproducts and wastes like bagasse, various types of de-oiled cakes etc. are conveniently used as raw materials by the biomass industries to produce power. Similarly, municipal garbage and other wastes are made into pellets and used as raw material for the biomass plants to produce power. Hence this is an effective solution for the disposal of garbage, industrial wastes, and other unwanted wastes which posed a major challenge.

x. Conserving the fast depleting fossil fuels

The main reason as to why people started looking towards biomass as an alternative source of energy is because we need an alternative to the conventional sources of energy since they are finite and cannot be practically recycled. Coal and petroleum are formed as a result of the natural actions of heat and pressure on fossilized bio matter for millions of years underground. It is for this reason that these two cannot be recycled anytime soon. What this means is that fossil fuels will be all used up at some point in the future and that point would signify the end of human civilization as we know it; unless, alternative and sustainable resources like biomass energy are put to good use. The more our energy needs (mainly residential, agricultural and industrial) are met by forms of energy generated from biomass, the longer the fossil fuels will last; which may ultimately give humans the time to learn new ways for facing such a crisis.

xi. Recycling Potential

Waste products from agricultural fields, paper and wood mills, sewage, landfill disposals and every other form of biodegradable trash can be turned into usable power via different forms of chemical, biochemical and heat induced procedures. This clears up space, reduces dumping issues associated with trash and more importantly, this is a part of a

continuous recycling chain. It has even been estimated that growing bio energy crops can actually help in reducing air pollution as they suck the carbon dioxide and monoxide from the air and release oxygen into it. It can be said that they might actually be acting as air filters for the entire ecosystem.

1.16 BIOMASS POWER PLANTS – CHALLENGES

Entrepreneurs in India are scared of the problems that arise from feedstock supply whose availability all the through the year is uncertain. Feedstock is agro-based and so is available in harvesting season only which lasts hardly for three to four months. This raw material has to be procured during the short spell of the year and stored for the whole year.

In spite of several incentives given by the central government as well as various state governments, the biomass power plants are facing several problems. The problems and challenges faced by the Biomass Power Plants are given below:

i. Biomass materials constitute nearly 70 per cent of the cost of power generation and the farmers are demanding higher prices year after year.

ii. The regular availability of raw material continuously in some locations is becoming a major problem to several plants. As such they are forced to operate the plant for three to six months in a year or go to faraway places to procure biomass incurring heavy transport costs.

iii. Due to increase in diesel and other fuel costs, transportation costs are continuously increasing, resulting in heavy financial burden on the plants.

iv. Biomass, if not processed in time, will become bulky and results in a lot of unusable material, besides increasing the transport costs.

v. Indian agriculture sector is characterized by small holdings and low mechanization, which results in providing unreliable feedstock supply.
vi. Government policy support is not up to the expectations of the biomass power plants. For example, capital subsidy is not adequate, the power tariffs do not match with the cost of production, etc.

vii. The biomass power plants are not allowed to use coal as a substitute for biomass during shortage periods.

India has the potential to produce a good amount of power through biomass which constitutes a sizable proportion of power requirements of India. India has the potential to produce biomass energy of about 18,000 MW to 50,000 depending on the availability and quality of biomass. Government of India (GOI) formulated a policy framework in 1993-94 for promotion of generating electricity from non-conventional energy (NCE) sources with the objective of conserving fossil fuels and to reduce environmental pollution arising out of the emissions following the combustion of fossil fuels. Moreover, the policy also facilitated to create many other socio-economic advantages in rural areas. The policy framework provided for certain incentives and facilities for promoting capacity addition through the non- conventional energy sources, including renewable ones. The incentives included subsidy, capital/interest for setting up power generating plants.

In order to formulate necessary policy framework to support the plan, Ministry of Non-Conventional Energy Sources (MNES) was constituted. In addition, government of India also set up Indian Renewable Energy Development Agency (IREDA) to extend financial assistance on “Softer Terms” to the non-conventional energy projects, based on the policy framework of the government. Various state governments were also requested to formulate their policy framework including the tariff payable for encouraging generation from non-conventional energy sources, keeping in view the tariff guidelines laid down by Government of India.

1.17 NEED FOR STRATEGIC APPROACH

Today, the business environment is changing at an ever-increasing pace and the globalization of markets, the revolution in information and communication technologies, the volatility of financial markets, and the war for talent are only a few of the change drivers in our current business climate. Firms that respond to these trends have been found to improve their performance (Knight, 2000). This implies that organizations need to become more proactive to the changing environments. There is no doubt that the responsibility of making the organization agile and resilient lies with the top management. It is imperative for top managers to consider that organizational change and renewals are a necessity and they need to acknowledge the fact that what they might have done in the past and the way in which they did it, may not be appropriate anymore and there is a need to change it. Drucker (1970) opined that the nature of management has undergone a dramatic change with increasing global competition, breakthroughs in technology, changing business practices and increasing social responsibility of organizations.

Therefore, there is “no more business as usual”. Senge (1999) stated that building a new world of work and in the process regrouping and rearranging organizations and what they are doing to get on the right track, creating new enthusiasm, energy and belief amongst the people, with a sense of direction and purpose is now the order of the day. In this ever-changing world, there is tremendous pressure on managers at all levels to improve the competitiveness of the company. In the quest for creating value, organizations are becoming more and more complex. The present organizations have implemented many innovative practices, like total quality management, organization development, restructuring, continuous improvement, employee engagement and re-engineering to improve the efficiency and effectiveness. Apart from tangible assets, the intangible assets like knowledge, patents, copyrights, and brand have become the major sources of competitive advantage. This has challenged the operating industry assumptions leading to an increased focus on innovation to capture new markets or to develop new products.

In such a rapidly changing and complex environment, being complacent and sitting over the laurels of past performance could be highly destructive and hazardous for any

organization. Furthermore, the consequences of making 'wrong' decisions can be long lasting and in the worst case could result in the demise of an organization.

Normally, a firm can sustain a competitive advantage for only a certain period due to rival firms imitating and undermining that advantage. Thus it is not adequate to simply obtain competitive advantage. A firm must strive to achieve sustained competitive advantage by continually adapting to changes in external trends and events and internal capabilities, competencies, and resources; and by effectively formulating, implementing, and evaluating strategies that capitalize upon those factors.

It is imperative for today's managers to keep pace with changing business models, find ways to incorporate e-business into their strategies and strive to remain competitive in the face of increasingly tough global competition, uncertain environment, cutbacks in resources, and massive worldwide economic, political and social shifts (Hitt, et.al., 2007). In such global competitive environment, any business, large or small, that is not thinking and acting strategically is extremely vulnerable. There are, of course, many reasons why organizations are not able to meet their performance expectations. One of the most obvious reasons is the inability of organizations to efficiently and effectively define a clear vision and well-defined strategy. Research shows that the most effective vision statement results when the CEO involves a host of people (e.g., other top-level managers, employees working in different parts of the organization, suppliers, and customers) to develop it (Hitt, et.al. 2007). In addition, to help the firm reach its desired future state, a vision statement should be clearly tied to the conditions in the firm's external and internal environments and it must be achievable.

Organizations that develop or acquire the internal skills needed to implement strategies required by the external environment are likely to succeed, while those that do not are likely to fail. Thus, organizations need to build core competencies aligned to their external environment in an effort to attain sustained competitive advantage.

A strategy enables an organization to balance its resources and capabilities to the needs of the external environment in order to achieve competitive advantage. In such fast-paced markets, to catch up with competition, organizations need to seize opportunities, capitalize on strengths, overcome weaknesses and counter threats. Therefore, it is imperative for organizations to constantly be vigilant and formulate and implement strategies resulting in long-lasting survival and success of the organization. In short, there was a need felt to develop a body of knowledge to understand why some firms fail and some firms succeed in using environmental opportunities and limiting the adverse effects of environmental threats. This body of knowledge has come to be known as strategic management.

1.18 CONCEPT OF STRATEGIC MANAGEMENT

Pearce II and Robinson (1994) defined strategic management as the set of decisions and actions that result in the design and activation of strategies to achieve the objectives of an organization. Grunig and Repper (1992) maintained that it was the way to keep the balance between internal activities and strategies to manage responses to external factors, or the environment. David (2001) defined strategic management as the art and science of the organization in formulating, implementing, and evaluating cross functional decisions that will enable them to achieve their objectives. In addition, Lynch (2006) defined strategic management as the identification of the purpose of the organization and the plans and actions to achieve that purpose.

The above definitions bring out strategic management as a process of organizational analysis where the present situation and future direction and way of the organization's profile and external environment are examined to set objectives, develop strategies to achieve the objectives, as well as to monitor and assess the organization's performance and the results that the strategies bring forth. Strategic management is concerned with complexity arising out of ambiguous and non-routine situations with organization-wide implications.

Strategy is a long term plan or a course of action to achieve organizational goals. Hill and Jones (2004) defined strategy as an action that a company takes to attain one or more of its goals. It entails managerial choice among alternative actions, commitment to specific product market, competitive moves and business approaches to achieve organizational objectives. In short, it may be called the 'game plan of management'. The strategy of a business organization consists of what management decides about the future direction and scope of the business.

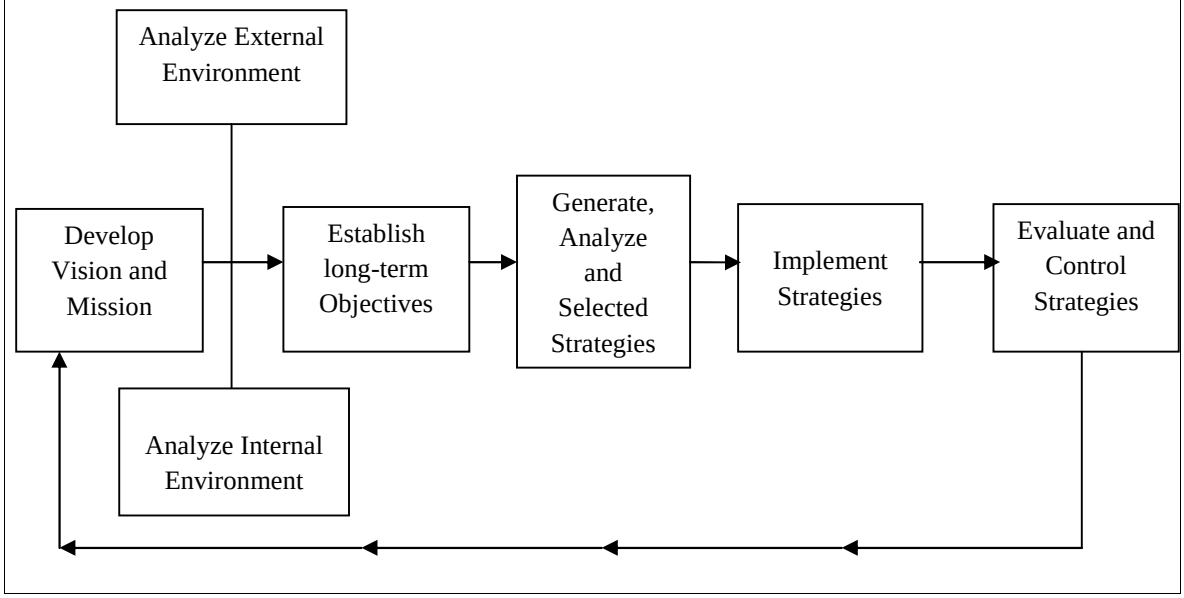
The strategic-management process involves three stages namely, strategy formulation, strategy implementation, and strategy evaluation. Strategy formulation includes developing a vision and mission, identifying an organization's external opportunities and threats, determining internal strengths and weaknesses, establishing long-term objectives, generating alternative strategies, and choosing particular strategies to pursue.

The stage of Strategy-formulation includes taking decisions on various aspects like what new businesses to enter, what businesses to abandon, how to allocate resources, whether to expand operations or diversify, whether to enter international markets, whether to merge or form a joint venture, and how to avoid a hostile takeover (David, 2001). Strategy implementation requires a firm to establish annual objectives, devise policies, motivate employees, and allocate resources so that formulated strategies can be executed. In short, strategic management is about envisioning the future and realizing it.

1.19 PROCESS OF STRATEGIC MANAGEMENT

The strategic management process can be better understood by using a model as shown in the Exhibit 1.1.

Exhibit 1.1 - Strategic Management Process



Source: C.Appa Rao, et.al, Basic Concepts and Strategic Management, Excel Books, New Delhi pg.35.

Every model represents some kind of process. The model in the above figure represents the strategic management process, which consists of seven interrelated managerial tasks. The components of the model are:

i. Develop vision and mission statements
ii. Analyze external environment
iii. Analyze internal environment
iv. Establish long-term objectives
v. Generate, analyze and select strategies
vi. Implement the chosen strategies
vii. Evaluate the control implementation.

The above components are briefly explained below:

i. Develop Vision and Mission

This is the first step in the strategic management process. Every organization should have a vision and/or a mission statement. While the vision reflects the management's aspirations about what it wants to become in the long run, the mission statement defines a company's reason for existence. Thus, a company's vision and mission statement provide guidelines for setting objectives and generating alternative strategies.

ii. Analyze External Environment

This is the second step in the strategic management process. It involves analysis of macro-environment for assessing opportunities and threats in the environment. Macro-environment consists of such factors as political, economic, socio-cultural, demographic, technological and ecological factors, which affect the business. Some other factors that need to be analyzed are suppliers, customers, competitors, creditors, etc., which directly affect the organization, and are referred to as 'operating environment'. In addition, industry and competitive environment should also be analyzed to get an in-depth understanding of the industry characteristics and competitive forces affecting the firm.

iii. Analyze Internal Environment

After analyzing the external environment, the next step for the organization is to assess the internal environment. This involves identifying the strengths and weaknesses of the resources and functional areas of the organization. It involves analyzing the financial, physical, human and technological resources to build distinctive competencies and a competitive advantage.

iv. Establish Long-term Objectives

Given the vision and mission statements and upon analyzing the external and internal environments, the firm has to set long-term objectives and goals. These must be specific, measurable and achievable.

v. Generate, Evaluate and Select Strategies

After analyzing external and internal environment and setting long-term objectives, the next step for the organization is to generate number of strategic options at the corporate and business levels. The alternatives generated need to be analyzed through techniques likes portfolio analysis, industry life cycle, etc., and appropriate strategies should be implemented.

vi. Implement the Chosen Strategies

The most crucial and difficult part of strategic management process is the implementation of strategies. Unless the chosen strategies are put into action, even the best formulated strategies are of no value. But implementation of strategies involves a number of decisions and actions. Resources need to be allocated; functional and operational strategies and policies need to be formulated, and a number of adjustments need to be made in the organizational structure, culture, and leadership, etc., to make them supportive of the strategy. This basically involves change management within the organization.

vii. Evaluate and Control the Strategy

This is the last step of strategic management process. It is concerned with tracking a strategy as it is being implemented, detecting problems or changes in its underlying assumptions, and making necessary adjustments. In contrast to post-action control, it seeks to guide action on behalf of the strategies as they are taking place and when the end results are still several years away.

The components discussed in the aforesaid strategic management process are all inter-related. While it is convenient to discuss them as if they were a sequential step-by-step series of activities, in reality they are not as clearly divided and neatly performed, as the strategic management model suggests.

Strategic management is continuous process, rather than a series of steps. The parts of the process are interacting. Analytically, we can separate them; in reality we cannot. A change in any one for the components may necessitate change in any or all of the components. For example, a shift in economy may present a major opportunity and require a change in long-term are to be done on a continuous basis, not just at the end of a year. The strategic management process never really ends.

1.20 STRATEGIC MANAGEMENT - BENEFITS

Research indicates that organizations using the concepts of strategic management are far more successful and profitable than those that do not. Organizations using strategic management concepts show significant improvement in sales, profitability, and productivity compared to firms without effective strategic planning activities. It is imperative for organizations in today's volatile environment to focus time and effort in strategic planning activities to prepare for future fluctuations in their external and internal environment.

Organizations focusing on strategic management activities are not only able to manage the financial risks but are also able to achieve certain tangible benefits, such as an enhanced capability to counter external threats, improved awareness of competitors' strategies, increased employee productivity and reduced resistance to change.

Effective strategic management also enhances problem-solving capabilities of the organization as it cuts across all functional departments and thus promotes interaction among managers at all divisional and functional levels. Thompson & Strickland (1998) identified the following benefits of strategic thinking and conscious strategy management that highlight the importance of strategic management namely:

- It provides better guidance to the entire organization on the crucial point of what it is trying to do and achieve;

- It makes managers within the organization more vigilant about the changing environment, new opportunities, and threatening developments;
- It provides managers with the rationale for taking decisions on resource allocation requests;
- It also helps to integrate the various strategic decisions by managers across the organization; and
- It creates a more proactive approach to management practices within the organization and thus counteracting tendencies for decisions to be reactive and defensive.

All the above stated benefits would lead to more effective decision making and greater achievement of organizational objectives, resource utilization and personnel motivation. Strategic management allows organizations to initiate and influence (rather than just respond to) activities, and thus to exert control over its own destiny. Strategic management also ensures fully informed employees at all organizational levels. It is important for every manager to inform employees at all levels about the organization's objectives, the direction of the organization, the progress towards achieving objectives, and its clients, and operational plans. A major aim of the process is to achieve understanding and gaining commitment from all managers and employees.

Understanding may be the most important benefit of strategic management, followed by commitment (David, 2004; Thompson & Strickland, 1998). This is especially true when members also understand linkages between their own reward and organizational performance (Bowman, l998). According to Pearce & Robinson (2003), a benefit of strategic management is the opportunity that the process provides to empower individuals by means of strengthening members' sense of effectiveness through the encouragement and rewarding of members' to participate in decision-making and the use of initiative and imagination.

In the present context, therefore, strategic management has become a part of every successful business enterprise and contributes to the long-term growth of the company. Research indicates that it helps the firm to be more proactive than reactive in shaping its

own future. It serves as a road map for the firm. It allows managers to take decisions concerning the future with a greater awareness of their implications. Strategic planning offers a systematic means of coping with uncertainty and adapting to change in an increasingly competitive environment.

Hence, there is a great need for strategic management in all enterprises. Whether the business managers are pro-active or reactive in their decisions, they all recognize strategic management as an integral part of business activity.

In the present study, an attempt has been made to examine the strategic management process, the strategies adopted and their impact on the organizational performance of select biomass power plants in the states of Andhra Pradesh and Telangana. Strategic Management Practices should shift gears in accordance with the industry scenario. A broad understanding of the industry, the power sector, which comprises the external environment of power plants enable a ringside view of the possibilities and challenges that require strategic management practices to address.

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