Company In-Depth

22 May 2007 | 40 pages

Thermax (THMX.BO)

Initiate With Buy: Captivating Growth

- **Leader in small & medium-sized boilers in India** – Thermax has a 21% share of the overall boiler market in India, and is the only scale player other than BHEL (which has 69% of the overall market). With BHEL focusing on higher capacity utility boilers, Thermax is poised to capture a larger share of the market in industrial boilers and smaller capacity utility boilers.

- **Play on power and industrial capex** – Thermax is in a sweet spot given 1) India's captive power capacity is set to grow by 63% in the next five years due to a lack of quality power supply and high industrial tariffs; 2) Industrial capex is expected to grow 181% in FY06-10E driven by strong demand and peak capacity utilizations.

- **Niche player in environment-friendly technologies** – A key revenue driver for Thermax will be its products and solutions for industrial and waste water treatment, waste heat recovery and air pollution control. Globally and domestically, demand is rising for environment-friendly technologies as a result of tightening emission norms under global initiatives like the Kyoto Protocol.

- **Buy/Low Risk, target price of Rs562 (20x FY09E EPS)** – Our target price for Thermax is based on the target multiple we use for BHEL. Our rating is supported by: 1) EPS CAGR of 34% over FY07E-10E; 2) projected ROEs of ~35%; 3) a growing share in India's boiler market.

- **Key risks** — Pending lawsuit in the US, low pricing flexibility, rising interest rates, increasing competition, manpower shortages, rupee appreciation, decline in oil prices.

See page 36 for Analyst Certification and important disclosures.

Buy/Low Risk	**1L**
Price (22 May 07)	Rs448.50
Target price	Rs562.00
Expected share price return	25.3%
Expected dividend yield	0.8%
Expected total return	**26.1%**
Market Cap	Rs53,442M
	US$1,326M

Price Performance (RIC: THMX.BO, BB: TMX IN)

Statistical Abstract

Year to 31 Mar	Net Profit (RsM)	Diluted EPS (Rs)	EPS growth (%)	P/E (x)	P/B (x)	ROE (%)	Yield (%)
2005A	654	5.49	-2.4	81.7	11.7	15.0	0.5
2006A	1,016	8.53	55.3	52.6	11.6	22.2	0.8
2007E	1,817	15.25	78.8	29.4	9.0	34.5	0.8
2008E	2,446	20.53	34.6	21.8	6.7	35.3	0.8
2009E	3,349	28.11	36.9	16.0	4.9	35.7	0.8

Source: Powered by dataCentral

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Fiscal year end 31-Mar	2005	2006	2007E	2008E	2009E
Valuation Ratios					
P/E adjusted (x)	81.7	52.6	29.4	21.8	16.0
EV/EBITDA adjusted (x)	48.3	28.3	18.3	13.2	9.2
P/BV (x)	11.7	11.6	9.0	6.7	4.9
Dividend yield (%)	0.5	0.8	0.8	0.8	0.8
Per Share Data (Rs)					
EPS adjusted	5.49	8.53	15.25	20.53	28.11
EPS reported	5.49	8.53	15.25	20.53	28.11
BVPS	38.25	38.53	49.91	66.55	90.77
DPS	2.40	3.40	3.40	3.40	3.40
Profit & Loss (RsM)					
Net sales	12,696	16,261	21,960	30,022	40,229
Operating expenses	-11,767	-14,653	-19,460	-26,631	-35,535
EBIT	**929**	**1,608**	**2,500**	**3,390**	**4,694**
Net interest expense	-10	-16	-17	-8	-8
Non-operating/exceptionals	118	137	270	324	389
Pre-tax profit	**1,037**	**1,728**	**2,753**	**3,706**	**5,074**
Tax	-365	-703	-936	-1,260	-1,725
Extraord./Min.Int./Pref.div.	-18	-9	0	0	0
Reported net income	**654**	**1,016**	**1,817**	**2,446**	**3,349**
Adjusted earnings	654	1,016	1,817	2,446	3,349
Adjusted EBITDA	1,048	1,768	2,702	3,689	5,043
Growth Rates (%)					
Sales	58.0	28.1	35.0	36.7	34.0
EBIT adjusted	31.4	73.1	55.5	35.6	38.4
EBITDA adjusted	26.3	68.7	52.9	36.5	36.7
EPS adjusted	-2.4	55.3	78.8	34.6	36.9
Cash Flow (RsM)					
Operating cash flow	**1,163**	**2,299**	**2,572**	**3,177**	**4,144**
Depreciation/amortization	119	160	203	299	350
Net working capital	368	1,090	552	432	445
Investing cash flow	**-754**	**-1,047**	**-1,700**	**-1,500**	**-200**
Capital expenditure	-435	-261	-1,700	-1,500	-200
Acquisitions/disposals	-319	-785	0	0	0
Financing cash flow	**-456**	**-985**	**-461**	**-464**	**-464**
Borrowings	-24	3	0	0	0
Dividends paid	-360	-540	-464	-464	-464
Change in cash	**-47**	**267**	**411**	**1,213**	**3,480**
Balance Sheet (RsM)					
Total assets	**9,877**	**11,315**	**14,717**	**19,258**	**25,280**
Cash & cash equivalent	281	547	958	2,172	5,652
Accounts receivable	2,605	2,412	3,268	4,479	6,012
Net fixed assets	1,338	1,439	2,936	4,138	3,988
Total liabilities	**5,320**	**6,724**	**8,770**	**11,328**	**14,464**
Accounts payable	2,072	1,654	2,227	3,052	4,097
Total Debt	67	70	70	70	70
Shareholders' funds	**4,558**	**4,591**	**5,947**	**7,930**	**10,815**
Profitability/Solvency Ratios (%)					
EBITDA margin adjusted	8.3	10.9	12.3	12.3	12.5
ROE adjusted	15.0	22.2	34.5	35.3	35.7
ROIC adjusted	28.7	50.1	67.4	58.5	69.9
Net debt to equity	-4.7	-10.4	-14.9	-26.5	-51.6
Total debt to capital	1.5	1.5	1.2	0.9	0.6

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Investment Thesis

Thermax specializes in energy and environment engineering solutions. It offers products and services in heating, cooling, waste heat recovery, captive power, water treatment and recycling, waste management and performance chemicals. We initiate coverage on Thermax with a Buy/Low Risk rating and a target price of Rs562. Our rating is supported by our forecast for a FD EPS CAGR of 34% for FY07E-10E and ROE of ~35%.

Strong industry outlook

- Captive power capacity to increase by 63% over current base — Lack of an adequate and quality power supply and high industrial tariffs are driving many industries to set up captive power plants. According to government estimates, an additional 12000 MW of captive power plants are slated to come on stream in the next five years, implying 63% growth over current installed capacity of 19000 MW.

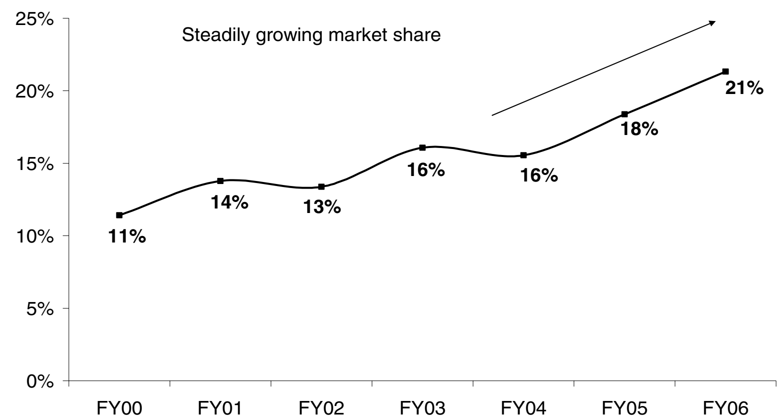
- Industrial capex to grow 181% in FY06-10E — India's industrial capex is set to take off on the back of a strong macroeconomic tail-wind and peak capacity utilization in most industries. According to CRISINFAC, industrial capex is set increase to Rs4,326bn in FY06-10, up 181% from Rs1,541bn in FY99-FY05.

- Environment-friendly policies key driver for growth — Environment-friendly policies, such as tightening emission norms and global initiatives like the Kyoto Protocol, are key revenue drivers for Thermax.

Market leader in small and medium-sized boilers in India

Heat, usually in the form of steam at high temperature and pressure, is used in many industrial processes. To service this demand, Thermax's process heat division offers packaged boilers and heaters, energy recovery systems and power boilers. While BHEL is the market leader in the large boiler market, Thermax has the largest market share of around 35% in small and medium-sized boilers and is strong in EPC of captive power plants of less than 100MW.

Figure 1. Thermax: Overall Market Share in Boilers in India



Source: CMIE, Citigroup Investment Research

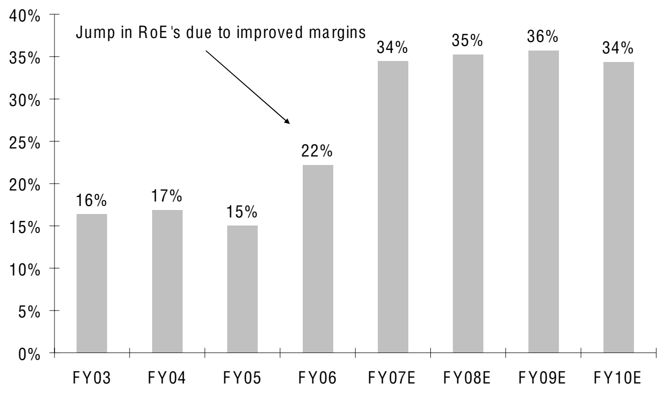
High Demand + Overflowing Order Book of BHEL => Opportunity

BHEL is the key beneficiary of all the power capex that takes place in India. BHEL is currently focusing on higher capacity utility range boilers, which paves way for players like Thermax to capture a larger share of the industrial range boiler market, as well as the smaller capacity utility range boiler market. Thermax is considering entering the sub-critical range of boilers, and expects to make a decision in this regard in the next 3-4 months.

Strong ROEs and Free Cash Flow Generation

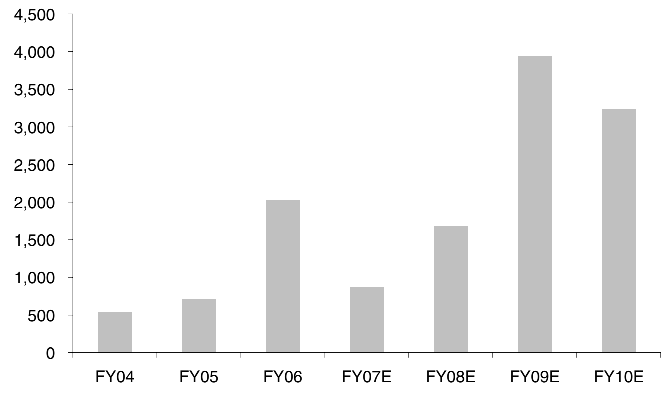
Thermax's ROEs have structurally improved from 15% in FY05 to 22% in FY06 on the back of margin expansion. We expect ROEs to further improve as margins remain stable and asset turnover improves. Free cash flow generation also is strong.

Figure 2. Thermax: ROE, FY03-FY10E



Source: Thermax, Citigroup Investment Research estimates

Figure 3. Thermax: Free Cash Flow (Rsmn), FY04-FY10E



Source: Thermax, Citigroup Investment Research estimates

Earnings to grow at 34% CAGR over FY07E-10E

We expect Thermax's consolidated profits to grow by a 34% CAGR over FY07E-10E. Strong topline growth, stable margins and low capital costs will help Thermax achieve a net profit margin of 8%-8.5% over FY07E-10E, on our forecasts.

Valuations

We value Thermax at an FY09E P/E of 20x

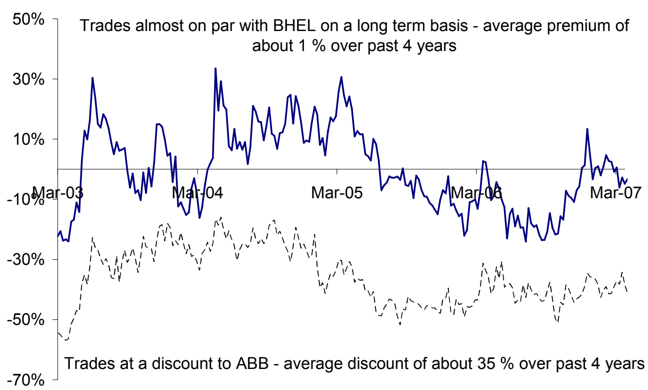
Figure 4. Thermax: Target Price

	FY09E
FD EPS	28.11
Multiple	20
Target Price	**562**
Current Price	448.5
Upside	25%

Source: Citigroup Investment Research estimates

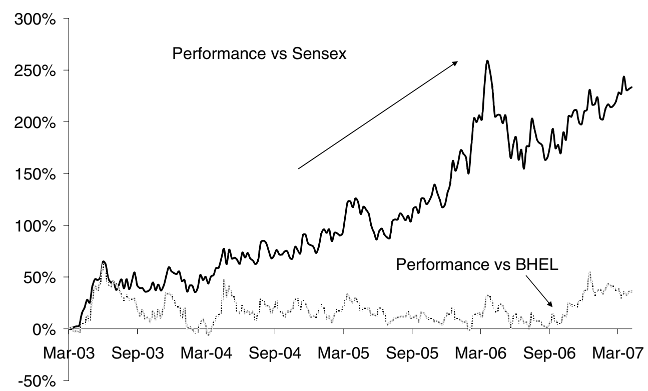
- **In line with BHEL/ at a discount to ABB target multiples** – Our target multiple of 20x FY09E EPS for Thermax is set in line with BHEL's and equates to a ~35% discount to ABB India. Despite its superior earnings growth and ROE, we believe Thermax should not command a premium over BHEL given that BHEL is the market leader and is a direct beneficiary of all power capex in India. Thermax has traded at an average discount of 35% to ABB as ABB has had superior earnings growth and access to its parent's technology.

Figure 5. Thermax: Trading History vs. BHEL and ABB India



Source: Citigroup Investment Research

Figure 6. Thermax: Performance vs. Sensex, BHEL



Source: Citigroup Investment Research

Figure 7. Thermax: Valuation Comparables

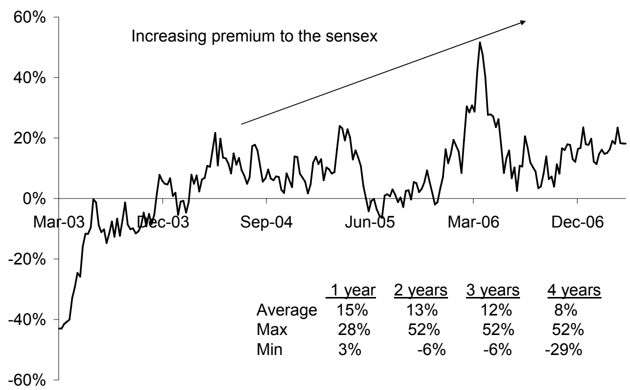
	Rating	Price May 21	Earnings CAGR*	ROE FY07E	ROE FY08E	ROE FY09E	P/E FY07E	P/E FY08E	P/E FY09E	EV / EBITDA FY07E	EV / EBITDA FY08E	EV / EBITDA FY09E
International Companies												
ABB	2M	24	39%	29.2	33.0	28.3	38.8	22.8	20.1	9.6	9.6	8.4
Siemens	1M	88	NM	13.2	20.4	21.1	23.4	14.7	12.3	9.5	7.8	6.7
Schneider	2M	103	13%	15.4	16.2	16.3	17.7	15.7	13.8	10.0	10.7	10.3
Spectris	2M	10	18%	20.8	24.0	25.9	21.4	17.7	15.3	8.7	10.5	9.8
GE	1L	37	12%	18.6	19.9	21.1	18.4	16.5	14.7	20.9	23.7	18.9
Alstom	2M	114	43%	19.9	21.1	21.9	34.7	21.0	17.0	12.5	12.0	9.9
Invensys	2H	3	39%	22.8	29.0	27.1	27.3	16.2	14.1	12.7	10.7	11.7
Average			**27%**	**20.0**	**23.4**	**23.1**	**26.0**	**17.8**	**15.3**	**12.0**	**12.2**	**10.8**
Domestic Companies												
ABB India	1L	4,234	45%	32.1	34.6	35.6	54.1	37.0	25.8	37.3	24.6	16.7
Siemens India #	NR	1,240	47%	36.8	33.0	37.0	57.0	41.7	26.4	29.8	21.8	13.0
BHEL	1L	2,580	21%	28.4	27.7	25.7	26.8	21.5	18.3	16.4	13.1	10.8
L&T	2L	1,356	29%	24.9	27.3	28.3	31.6	24.0	18.9	18.9	14.0	10.9
Crompton Greaves #	NR	225	26%	32.55	33.3	32.63	43.8	35.0	27.4	19.8	15.6	11.8
Average			**34%**	**30.9**	**31.2**	**31.8**	**42.6**	**31.8**	**23.4**	**24.4**	**17.8**	**12.6**
Thermax	**1L**	**448.5**	**36%**	**34.5**	**35.3**	**35.7**	**29.4**	**21.8**	**16.0**	**19.4**	**13.9**	**9.5**

Source: Bloomberg, Citigroup Investment Research estimates Note: # = IBES Estimates * Earnings CAGR over FY07-09E

- **At a ~ 30% premium to global peers:** As seen in the table above, international companies trade at an average of 15.3x FY09E FD EPS. At our target multiple of 20x FY09E, Thermax would trade at a ~ 30% premium to its international peers, which we believe is justified given its superior earnings growth of 36% CAGR over FY07-09E, vs. an international peer average of 27%, and ROEs of 35% vs. 20-23% for global peers.

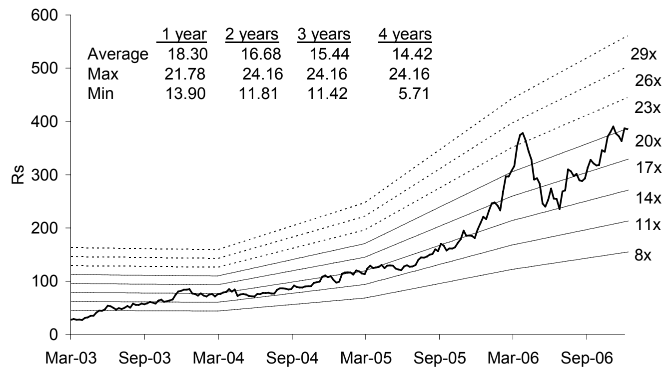
- **At a premium to the Sensex and its own trading range:** Thermax has traded at a premium to the Sensex over the past 4 years, a premium that has increasing due to superior earnings growth. At 20x FY09E FD EPS, Thermax would trade at ~ 31% premium to the Sensex.

Figure 8. Thermax: Premium to BSE Sensex



Source: Citigroup Investment Research

Figure 9. Thermax: PE Chart

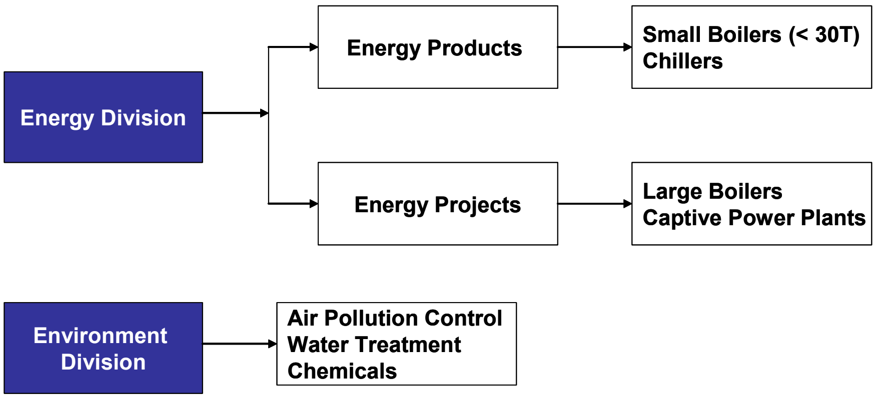


Source: Citigroup Investment Research

Company Background and Divisional Analysis

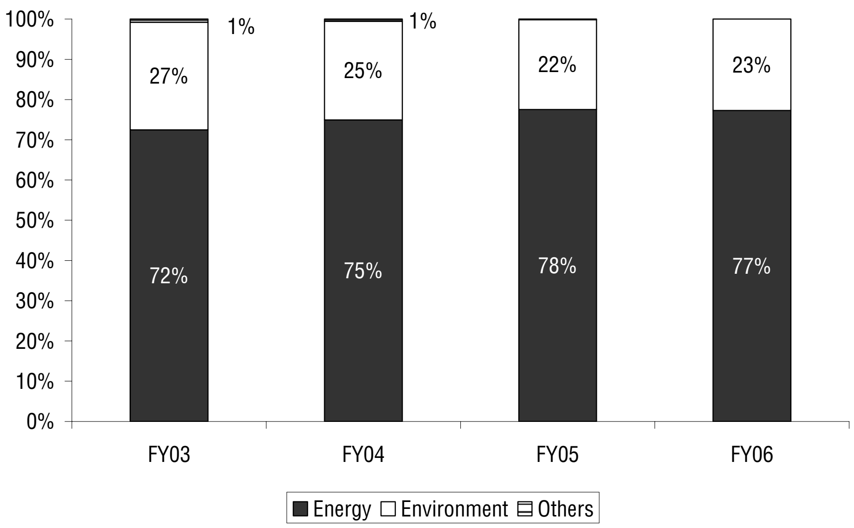
Thermax Limited is an Indian company specializing in energy and environment engineering solutions. It offers products and services in heating, cooling, waste heat recovery, captive power, water treatment and recycling, waste management and performance chemicals. The company is divided into two broad segments (1) Energy and (2) Environment.

Figure 10. Thermax: Business Structure



Source: Thermax, Citigroup Investment Research

Figure 11. Thermax:: Revenues by Division

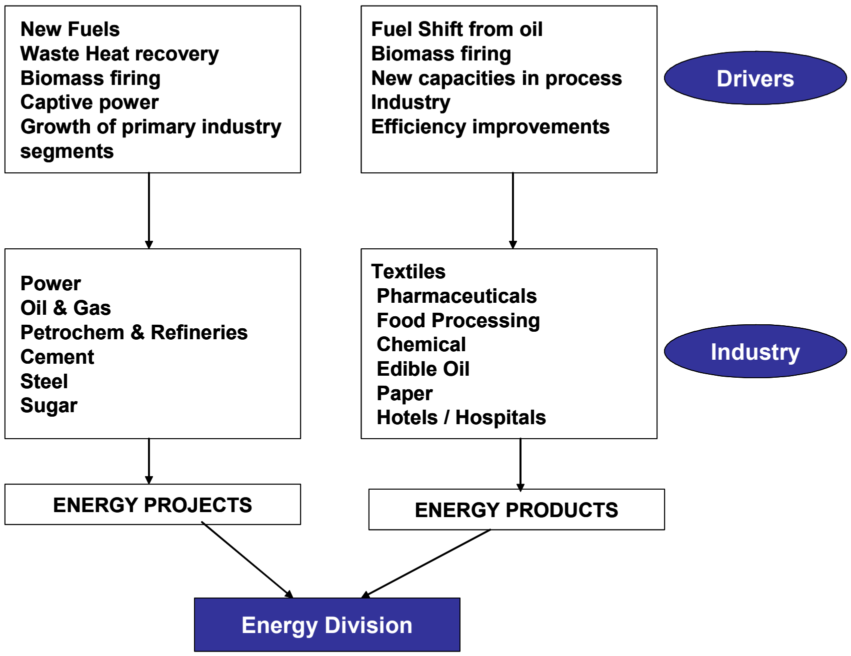


Source: Thermax, Citigroup Investment Research

Energy Segment (77% of Consolidated Sales)

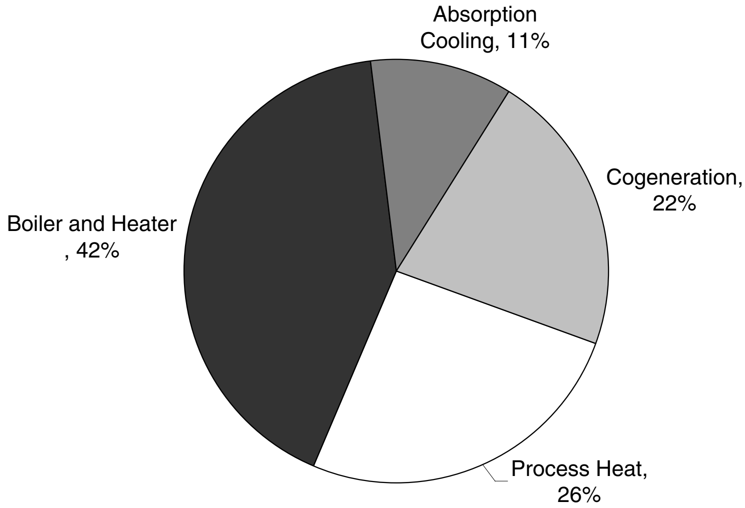
Thermax's energy division is further subdivided into (1) process heat; (2) boiler and heater; (3) absorption cooling; and (4) power.

Figure 12. Drivers of the Energy Division



Source: Thermax, Citigroup Investment Research

Figure 13. Energy Segment Revenue Mix FY06



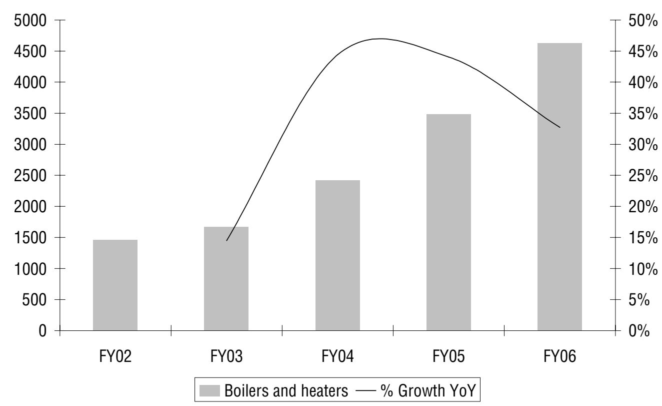
Source: Citigroup Investment Research

Boiler and Heater Division (~31% of Total Sales)

- ~42% of energy segment sales
- Expected growth – 45% CAGR over FY07-09E
- Indicative margins – 12%-13%
- Main customers –- refineries & metals
- Exports – 25% of sales

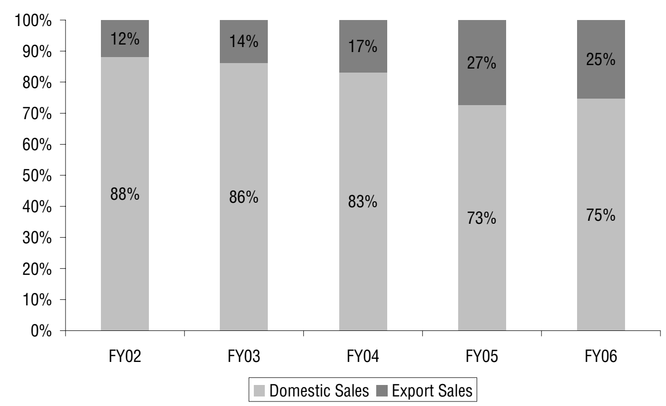
- The Boiler and Heater Group (B&H) was formed after the consolidation of the erstwhile wholly owned subsidiary Thermax Babcock & Wilcox and the Energy Systems division of the company. TBW manufactures boilers ranging from 30tph- 500tph (up to 100MW).
- Thermax is predominantly present in industrial boilers – i.e. used in process applications. However, given the huge power capex in India, Thermax is considering entering in to sub-critical utility range boilers.
- Thermax is in the process of setting up a new facility in Baroda with an investment of Rs1.25bn to meet increased demand for boilers.
- Key end user sectors – iron and steel, refineries, chemicals, sugar and paper. Competitors include BHEL, Cethar Vessels, Walchandnagar, Alstom, Dongfang Electric.

Figure 14. Boilers and Heater Division: Sales and Growth %



Source: Thermax, Citigroup Investment Research

Figure 15. Boilers and Heater Division: Revenue Split by Geography



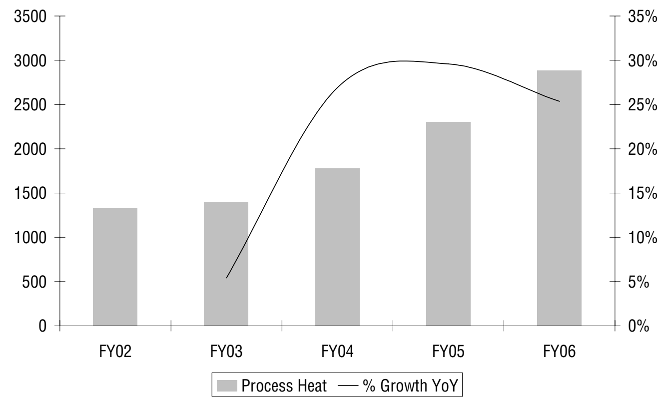
Source: Thermax, Citigroup Investment Research

Process Heat Division (~20% of Total Sales)

- ~26% of energy segment sales
- Leader with 35% share in small and medium boilers
- Expected growth – 22-25% CAGR over next 2-3 years
- Main customers – textiles, pharma, chemicals, food processing
- Exports – 30% of sales

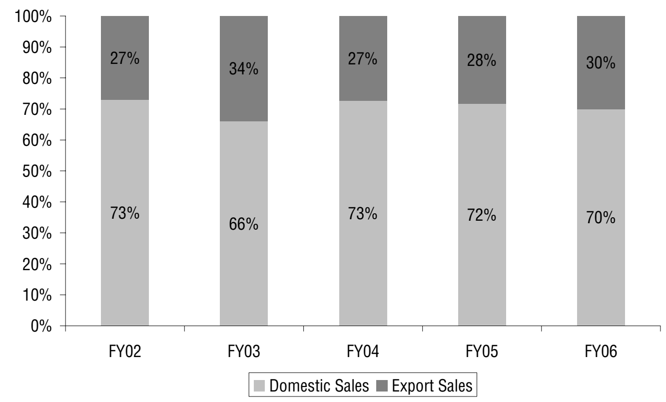
- Heat, usually in the form of steam at high temperature and pressure, is used in many industrial processes. To service this demand, Thermax's process heat division offers packaged boilers and heaters, energy recovery systems and power boilers.
- Thermax is a market leader in small and medium boilers with capacity less than 30tph.
- Soaring prices of traditional fuels have prompted a shift to alternative fuels — Thermax boilers use a wide range of solid, liquid and gaseous fuels, including light and heavy oil (FO, HSD and LSHS), gas (natural gas, LPG, propane, biogas); and solid fuel (coal, lignite, wood, bagasse, rice husk, etc).
- Thermax is in the process of setting up a new facility in Baroda with an investment of Rs500mn to meet increased demand for boilers.

Figure 16. Process Heat Division: Sales and Growth %



Source: Thermax, Citigroup Investment Research

Figure 17. Process Heat Division: Revenue Split by Geography



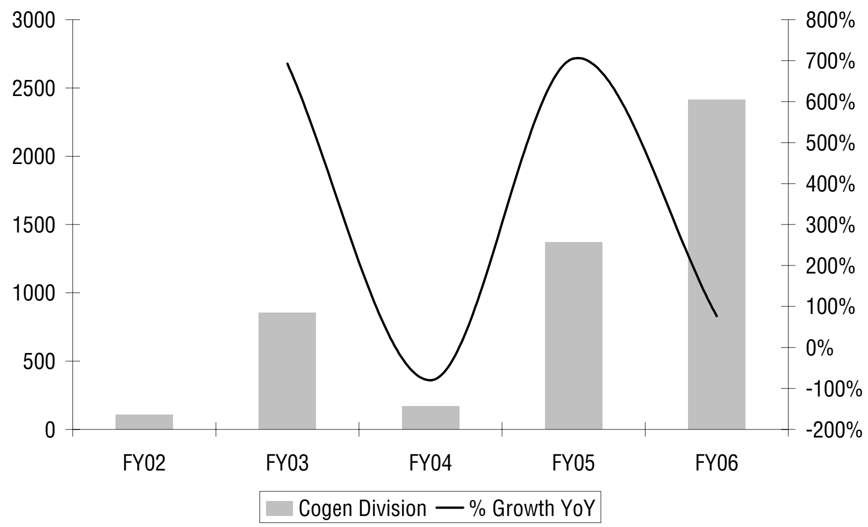
Source: Thermax, Citigroup Investment Research

Cogeneration Division (~16% of Total Sales)

- ~22% of energy segment sales
- High growth – 100% CAGR over FY07E-09E
- Indicative margins – 10%
- Key customers – Chemicals & Cement sector

- High cost of power supplied by state electricity boards, rising prices of conventional fuels used in DG sets and favorable policy environment have made power-intensive industries look for captive power generation.
- Thermax offers turnkey solutions in captive power and cogeneration using a variety of fuels, technologies and system configurations to provide customized solutions. Thermax undertakes EPC contracts up to 50-100MW, with 230 MW of captive power capacity already successfully commissioned.
- The outlook for the division remains very strong with an order backlog to execute nearly 265MW. Thermax expects this division to continue growing at a rate of more than 100% YoY for the next 2 years.
- Key end user segments – cement and chemicals sectors. Competitors – L&T, Cethar Vessels, Desin.

Figure 18. Cogen Division: Sales and Growth %



Source: Thermax Citigroup Investment Research

Absorption Cooling Division (~8% of Total Sales)

- ~11% of energy segment sales
- ~85% market share in India
- Expected growth – 18-20% YoY
- Indicative margins – 12-13%
- Main markets – China, Japan, Korea
- Exports – 37% of sales

- Absorption cooling technology produces cooling by using heat energy as an input, rather than by using mechanical energy.
- Thermax is considered to be among the pioneers in absorption cooling technology in India. This division of Thermax offers absorption cooling for industrial applications, with the chemical and textile sectors being the main growth drivers.
- In India, demand for chillers has not taken off due to a shortage of natural gas, although domestic revenues have grown at a reasonable clip of ~18%-20% over the last two years. Thermax has ~85% market share in India. Another key player is Voltas.
- Global market for absorption chillers is ~$600mn. China is the world's largest market for absorption chilling, followed by Japan and Korea.
- Thermax is setting up a manufacturing plant in China with a capacity of ~300 units and has already sold ~4 chillers in China. Thermax is also increasing its focus on Southeast Asian markets and the Middle East for this business.
- Rising prices of oil and natural gas in key export markets remain a risk for incremental demand for absorption chillers.

Environmental Segment (23% of Consolidated Revenues)

The environmental segment is subdivided into 1) water and waste solutions, 2) enviro division (air pollution control) and 3) chemicals units. Deterioration of air water quality and pollution have led to concrete steps being undertaken to tighten tighter norms on emission and waste disposal. These factors drive demand for Thermax's environment segment.

Water and Waste Solutions Division (~7% of Total Sales)

- ~29% of environmental segment sales
- Expected growth – 50% CAGR FY07-09E
- Indicative margins – 8-9%

- Thermax is a leading player in the industrial water and wastewater management space. The market for industrial wastewater treatment is likely to grow as is evident from the compliance trends of water pollution intensive sectors.
- The division also offers solutions in demineralization, water pre-treatment and clarification for refinery applications and municipal sewage treatment. Recently, the company also entered into the product business, especially with the reverse osmosis plants for pharmaceutical applications.
- Competitors – VA Tech, ION Exchange

Enviro Division (~10% of Total Sales)

- ~41% of environmental segment sales
- Expected growth – 25% CAGR FY07-09E
- Indicative margins – 9-10%

- Thermax's enviro division is focused on air pollution control and the company offers standard air pollution control products, systems for industrial applications in air pollution control and air purification systems for removal of corrosive / toxic / odorous gases.
- The company is looking to focus on markets like Southeast Asia and the Middle East for these products.
- Key customers – Steel, cement, paper, fertilizer sectors. Competitors – Alstom and Thermax are major players in this segment.

Chemicals Division (7% of Total Sales)

- ~30% of environmental segment sales
- Expected growth – 18-20% CAGR FY07-09E
- Indicative margins – 12-13%

- Thermax makes ion exchange resins, specialty polymers, oil field chemicals, and fuel & water treatment chemicals for industrial applications.
- Thermax also does captive consumption of the water treatment chemicals – they are used by its water treatment division.
- Thermax has strengthened its front-end team in the US, the largest overseas market for resins. Almost half of all exports are to the US.

Business Analysis and Competitive Position

Play on Power and Industrial Capex

1) CPP and CHP - A compelling growth story

Power generation entities in India can be divided into two broad categories: generation utilities and generation non utilities or captive power plants (CPP). Lack of adequate and quality grid power and high tariffs has prompted industrial customers to substitute utility power with captive power.

At present, the installed capacity of CPPs is about 19,000 MW. Further, a capacity addition of about 12,000 MW from captive plants is expected during the 11th Plan, which implies ~63% growth over the installed base[1].

According to Ministry of Non-Conventional Energy sources[2], there is about 15,000MW co-generation potential in core industries. This includes 5000 MW in the sugar industry. Around 404MW surplus capacity is being installed in ~40 mills.

Figure 19. Thermax: CPP and CHP Clientele

Client	MW	Fuel	Commissioning (Months)
Metallurgy			
Tata Sponge Iron	18.5	Waste Heat	17
Bhaskar Steel and Ferrous Alloys	12	Waste Heat +Coal and char	16
Sree Metaliks (P) Ltd	20	Waste Heat, Coal	19
Cement			
Madras Cements	36(2 x 18)	Coal	17
Madras Cements	18	Coal	18
Shree Cements	36(2 x 18)	Petcoke and Imported Coal	17
Laxmi Cement	36	Petcoke and Imported Coal	17 & 19
JK Cement 1	22	Coal and Petcoke	17
JK Cement 2	15	Cement Plant Waste Heat	21
Arasmeta CPCPL A/c Lafarge India	43	Coal	17
Textile			
Arvind Mills	27.5	Naphtha	18
Arvind Mills	27.5	Naphtha	18
Welspun	43	Lignite, Imported Coal	17
Maral Overseas	8.5	Coal	16
IPP			
Kalpataru Power Transmission	8	Mustard Stalk & Husk	14
CESC	40	Washery Reject	24
Chemical			
Kanoria Chemicals ltd.	25	Coal	21
Indian Rayon	20 + Steam	Imported Coal, Lignite	18.5
DCW	50 + Steam	Coal	20
Chemplast	50 + Steam	Coal	18 & 19

Source: Thermax, Citigroup Investment Research

2) Riding the industrial capex wave

India's industrial capex has taken off on the back of a strong macroeconomic tail-wind and peak capacity utilization in most industries.

[1] Working Group on Power for 11^{th} plan

[2] Workshop on captive power plants New Delhi, March 20, 2006

Figure 20. India: Industry Peak Capacity Utilizations

Industry	FY01	FY02	FY03	FY04	FY05	FY06
Oil Refining	93%	96%	94%	93%	100%	98%
Petrochemicals	81%	88%	99%	102%	105%	98%
Cement	87%	84%	86%	88%	91%	94%
Steel	79%	82%	88%	92%	95%	95%
Aluminum	94%	92%	93%	96%	92%	90%
Paper	80%	80%	84%	84%	86%	89%
Textile - Denim	97%	99%	94%	83%	92%	84%
Textiles - Worsted	94%	99%	93%	97%	93%	99%

Source: Citigroup Investment Research

According to CRISINFAC, industrial capex is set to increase to Rs4,326bn in FY06-10, up 181% from Rs1,541bn in FY99-FY05.

Figure 21. India: Industrial Capex (Rsbn)

Industry	FY99-FY05	FY06-FY10	% Change
Aluminum	20	347	1635%
Steel	141	1,180	737%
Automobiles	181	400	121%
Petrochemicals	20	105	425%
Textiles	26	396	1423%
Cement	60	93	55%
Paper	56	62	11%
Fertilisers	40	41	2%
Oil and Gas	998	1,702	71%
Total	**1,541**	**4,326**	**181%**

Source: CRISINFAC and Citigroup Investment Research

Thermax, with its diversified product and application range, is riding on this sustained capex momentum in the industrial and infrastructure sectors. The driving force has been capacity expansion and related projects in core sectors. Apart from India, there is also an increase in external demand for Thermax's products.

Market leader in small and medium-sized boilers in India

While BHEL remains the market leader in the large boilers, Thermax has the largest market share of around 35% in the small and medium-sized boilers and is strong in CPPs of less than 100MW. As can be seen in table below, Thermax and BHEL are the only scale players, with the other players and imports together accounting for only 10% of the market.

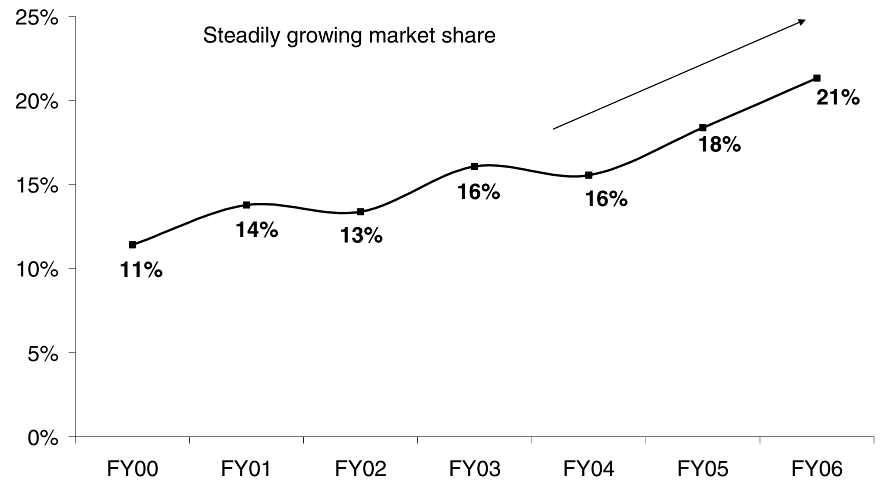
Figure 22. India: Boiler Market Share

	FY00	FY01	FY02	FY03	FY04	FY05	FY06
BHEL	69.4%	68.2%	70.3%	67.8%	66.4%	64.7%	69.4%
Thermax	11.4%	12.2%	11.0%	12.5%	12.3%	18.4%	21.3%
Alstom Projects India	0.0%	0.0%	0.0%	2.2%	4.4%	1.9%	1.3%
Walchandnagar Industries	1.3%	1.7%	2.1%	0.9%	1.9%	1.3%	1.6%
Industrial Boilers	0.0%	0.0%	0.0%	0.7%	0.7%	0.6%	0.0%
Others	15.7%	16.9%	15.1%	14.7%	11.3%	9.5%	1.3%
Imports	2.2%	1.1%	1.6%	1.1%	3.1%	3.6%	5.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: CMIE, Citigroup Investment Research

BHEL and Thermax account for 90% of overall boiler market in India

Figure 23. Thermax: Overall Market Share in Boilers



Source: CMIE, Citigroup Investment Research

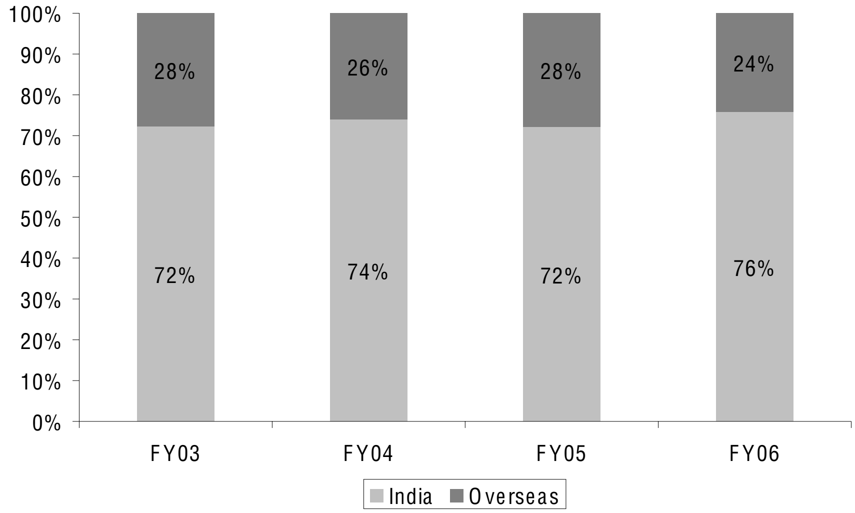
High Demand + Overflowing Order Book of BHEL => Opportunity

BHEL is the key beneficiary of all power capex in India. BHEL is currently focusing on higher capacity utility range boilers, which paves the way for players like Thermax to capture a larger share of the industrial range boiler market as well as the smaller capacity utility range boiler market. Thermax is considering entering the sub-critical range of boilers and expects a decision in this regard to be taken within the next 3-4 months.

Global Player

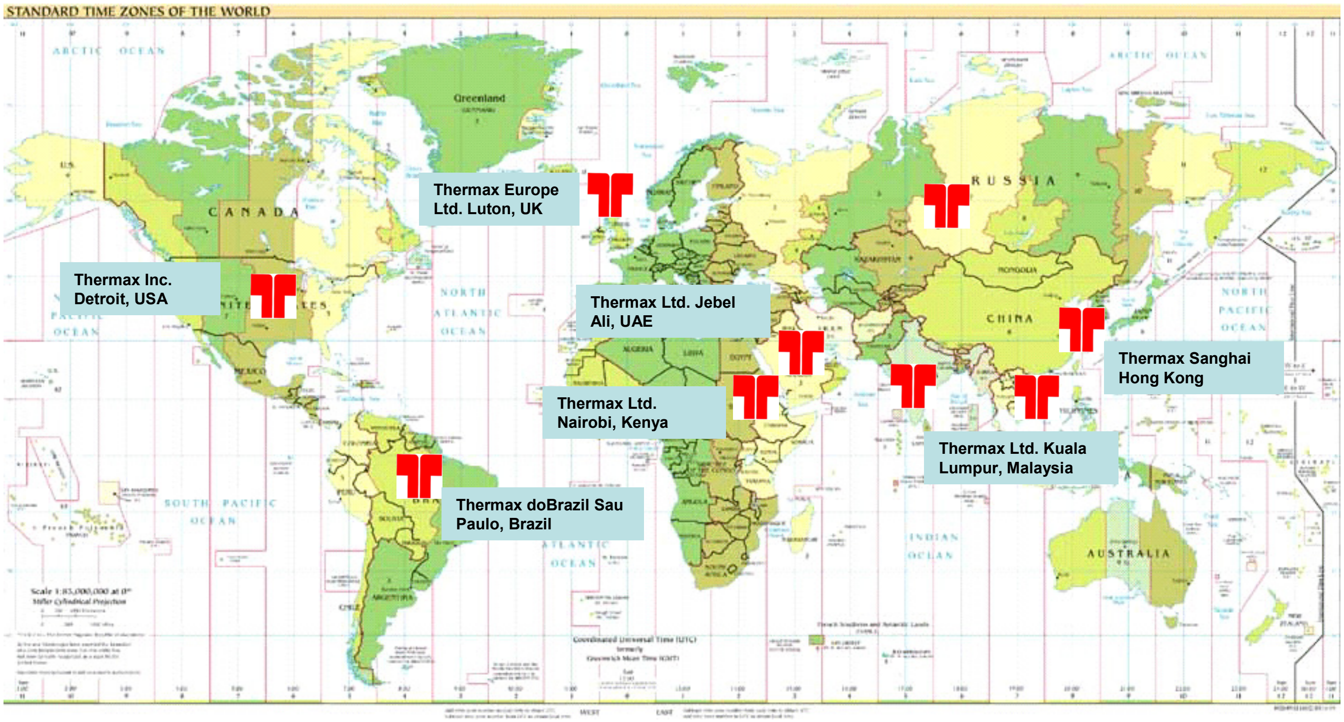
Thermax has increased its global footprint by setting up front end offices in key markets to capitalize on opportunities in these regions or to overcome country specific trade barriers. For example, Thermax entered the EU by establishing subsidiaries in the UK. These subsidiaries were set up to enable business with countries where direct export was not possible because of country specific entry barriers. Offices have been set up in the US, the UK, UAE, China, Malaysia, Brazil and Nairobi. Also, an absorption chillers manufacturing facility is being set up in China.

Figure 24. Thermax: Consolidated Revenues Split by Geography



Source: Thermax, Citigroup Investment Research

Figure 25. Thermax: Global Presence



Source: Thermax, Citigroup Investment Research

Chinese manufacturing facility for absorption cooling

The worldwide market for absorption chillers is ~$600mn. ~50% of it in China and ~25% in Japan and Korea combined. Thermax is setting up a plant in China for manufacturing absorption chillers with an investment of US$8mn. The plant would start manufacturing 100units/year and go up to 300units/year in 2-3 years. The Chinese operations would cater to the requirements of the absorption chiller market in China, Japan and Korea. Thermax has been exploring the China market for two years through its Hong Kong-based subsidiary, and it has been exporting chillers to China from its Pune plant. Thermax has already received orders for ~4 chillers from China and is leveraging its superior technology to make inroads into this market. According to the management, no local manufacturing presence has been a deterrent to growth. The Chinese plant would reduce the logistic challenges, the cost of exporting from India and the 17% duties.

Alliances for market access and technology

Figure 26. Thermax: Tie-ups

Process Licensors	OEMs
Lurgi	Wartsila
IBI	GE
Shell	Doosan
Black & Veatch	Caterpillar
Outokumpu	MAN B & W
UHDE	Cummins

Source: Citigroup Investment Research

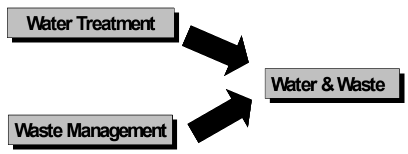
The company has formed subsidiaries, alliances and joint ventures in many countries to access key markets and technology for its products. To increase its competitiveness, it has in the past sourced cutting-edge technologies from world technology majors, among them: (1) Babcock & Wilcox USA, (2) Kawasaki Thermal Engineering Company – Japan, (3) Eco Tech – Canada, (4) Honeywell – USA, (5) Bloom Engineering – Germany, (6) Struthers Wells – USA, and (6) Ozone Systems – USA. It has also tied-up with process licensors and OEMs to improve its products and service offering.

Actively restructuring towards better performance

Thermax management has been active in recognizing business challenges and in its responsiveness to the same.

- Restructuring initiatives post the FY01 losses: The recession of the 1990's resulted in Thermax posting a loss in FY2001, which propelled the company to restructure its business. The business portfolio was remodeled and non-core activities exited. The company:
  - Sold surface coating and software units, shut down electronics unit and sold the bottled water plant. Remodeled the business into the energy and environment segments. Cut down the number of sub segments to 7.
  - Cut manpower by ~20% through a Voluntary Retirement Scheme
  - Reorganized its channel network to improve its reach and offer single source solutions and value added services to the customers.

Figure 27. Thermax: Front End Rationalization



Source: Thermax, Citigroup Investment Research

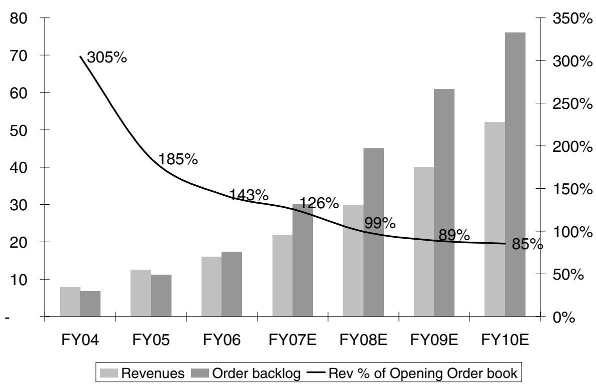
- Winding up of loss making subsidiaries
  - ME Engineering - was acquired by Thermax in 2000. It provided solutions in the field of energy-related engineering and the management of projects. Cost overruns, delays in 4 large projects, and depressed packaged boiler business sales in the EU led to a loss in FY06. Thermax is currently in the process of winding up of the company.
  - Thermax Energy Performance Services - was set up in a JV with EPS Asia Inc. However, lack of acceptance of the business model and differences with the joint venture partner prompted Thermax to wind up operations.

Financial Analysis

34% Revenue CAGR Over FY07E-10E

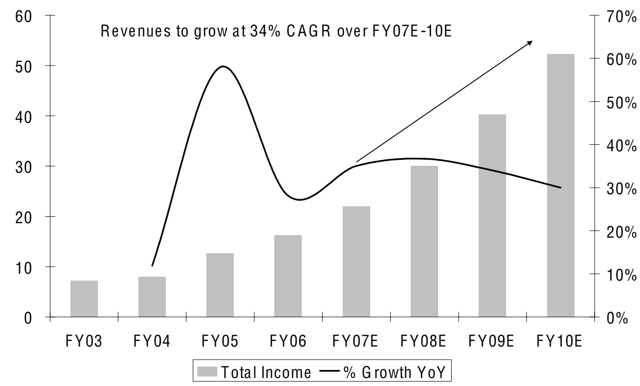
We expect Thermax to grow its revenues at 34% CAGR over FY07E-10E. Its current order backlog is ~Rs30bn and almost 70% of the order-backlog is due to get executed in FY08E. We expect a revenue CAGR for the Energy division of 34% over FY07E-10E, driven by high growth in the Boiler and Heater division and the Cogeneration division. Given that the air and water treatment businesses are still fairly nascent in India, we expect a 30% revenue CAGR for the Environment division over FY07E-10E.

Figure 28. Thermax: Revenues to Opening Order Book



Source: Thermax, Citigroup Investment Research

Figure 29. Thermax: Consolidated Revenues



Source: Thermax, Citigroup Investment Research

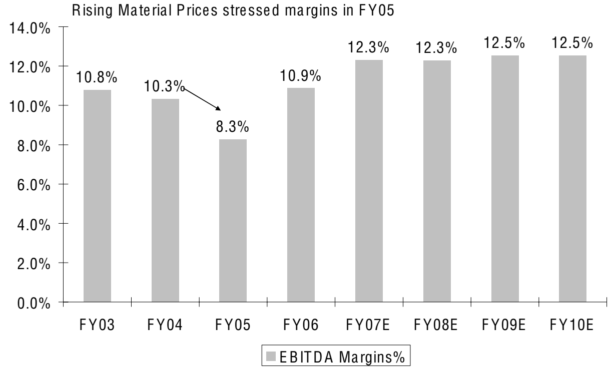
EBITDA Margins to Remain Steady at 12-12.5%

Thermax will maintain its margins in the 12%-12.5% range, according to our model. While we note that these are peak margin levels, we expect them to be sustainable given the company's ability to cherry-pick higher margin orders and continued cost control initiatives.

34% CAGR For Recurring PAT Over FY07E-10E

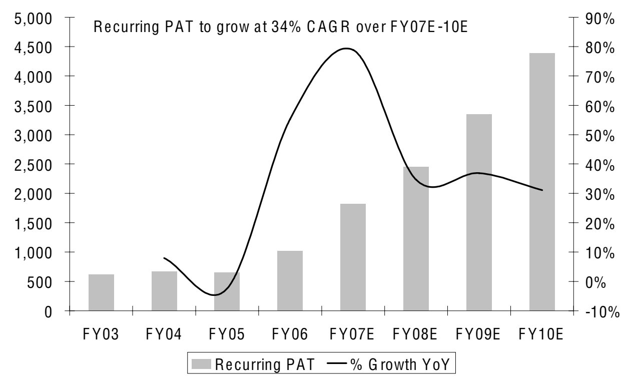
We expect Thermax's consolidated profits to grow at a 34% CAGR over FY07E-10E. Strong topline growth, stable margins and low capital costs should help Thermax achieve a 8%-8.5% net profit margin over FY07E-10E.

Figure 30. Thermax: Consolidated EBITDA Margins



Source: Thermax, Citigroup Investment Research estimates

Figure 31. Thermax: Consolidated Recurring PAT

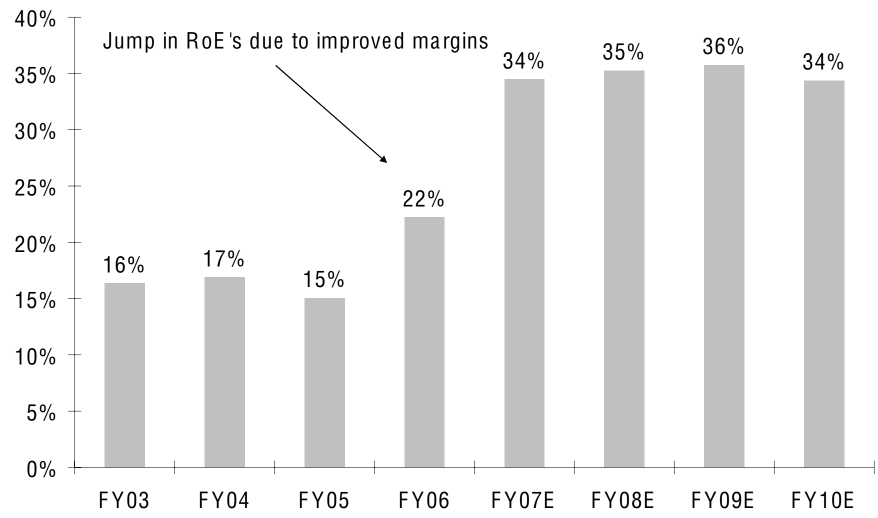


Source: Thermax, Citigroup Investment Research estimates

Unlevered ROEs to Improve to 34-35%

We expect Thermax's ROE to improve significantly from 23% in FY06 to 34-35% from FY07E, driven by stable margins and higher asset turnover. We feel that these levels of ROE are commendable given that they are on an unlevered balance sheet. Thermax is practically debt free.

Figure 32. Thermax: ROE



Source: Thermax, Citigroup Investment Research

PAT Grew By 106% in 9MFY07

Thermax's revenues in the first nine months of FY07 grew by 33%YoY, its EBITDA margins expanded by 263bps and recurring PAT grew by 106%YoY. Thermax ended Q307 with an order backlog of Rs32bn. Revenues grew by 30%YoY for the energy segment and by 22%YoY for the environment segment.

Figure 33. Thermax: Highlights of 9M07 Results

	9M06	9M07	Growth %
Revenue	11,069	14,701	33%
EBITDA	1,085	1,829	68%
EBITDA Margin	9.8%	12.4%	263bp
Recurring PAT	642	1,324	106%

Source: Thermax, Citigroup Investment Research

Financial Statements

Figure 34. Key Assumptions

Net Sales	FY03	FY04	FY05	FY06	FY07E	FY08E	FY09E	FY10E
Energy	5,204	6,025	9,841	12,567	17,343	24,020	32,427	42,155
% Growth YoY		16%	63%	28%	38%	39%	35%	30%
Environment	1,920	1,970	2,838	3,692	4,616	6,000	7,800	10,140
% Growth YoY		3%	44%	30%	25%	30%	30%	30%
Others	57	42	16	1	2	2	2	2
% Growth YoY		-26%	-61%	-91%	43%	0%	0%	0%
Total Net Sales	**7,182**	**8,037**	**12,696**	**16,261**	**21,960**	**30,022**	**40,229**	**52,297**
% Growth YoY		**12%**	**58%**	**28%**	**35%**	**37%**	**34%**	**30%**

Source: Thermax, Citigroup Investment Research

Figure 35. Thermax: Order Backlog Details

Order Backlog details	FY04	FY05	FY06	FY07E	FY08E	FY09E	FY10E
Order backlog (beginning)	2,552	6,732	11,230	17,300	30,000	44,976	60,946
Order Inflows	12,140	16,969	22,132	34,460	44,798	55,998	67,197
Order Inflows Growth % YoY		40%	30%	56%	30%	25%	20%
Revenues	**7,772**	**12,471**	**16,062**	**21,760**	**29,822**	**40,029**	**52,097**
Revenue Growth YoY%	11%	60%	29%	35%	37%	34%	30%
Order backlog (end)	**6,732**	**11,230**	**17,300**	**30000**	**44,976**	**60,946**	**76,046**
Exec. Rate (Rev/beg. Orders)	305%	185%	143%	126%	99%	89%	85%
Exec. Rate (Rev/beg Orders + inflows)	53%	53%	48%	42%	40%	40%	41%

Source: Thermax, Citigroup Investment Research

Figure 36. Thermax – Consolidated Profit and Loss Statement

Year End Mar31 (Rsmn)	FY03	FY04	FY05	FY06	FY07E	FY08E	FY09E	FY10E
Total Sales	6,991	7,772	12,471	16,062	21,760	29,822	40,029	52,097
% growth YoY		11%	60%	29%	35%	37%	34%	30%
Other Operating Income	191	265	224	199	200	200	200	200
Total Income	**7,182**	**8,037**	**12,696**	**16,261**	**21,960**	**30,022**	**40,229**	**52,297**
% growth YoY		**12%**	**58%**	**28%**	**35%**	**37%**	**34%**	**30%**
Material Costs	(4,186)	(4,685)	(8,250)	(9,972)	(13,274)	(18,191)	(24,418)	(31,779)
Increase /Decrease in stock	12	(5)	31	114				
as a % of Sales	60%	60%	66%	61%	61%	61%	61%	61%
Personnel Costs	(836)	(949)	(1,146)	(1,599)	(2,285)	(3,221)	(4,163)	(5,366)
as a % of Sales	12%	12%	9%	10%	11%	11%	10%	10%
Other Expenses	(1,398)	(1,569)	(2,283)	(3,037)	(3,699)	(4,921)	(6,605)	(8,596)
as a % of Sales	20%	20%	18%	19%	17%	17%	17%	17%
Total Expenses	(6,408)	(7,208)	(11,648)	(14,494)	(19,258)	(26,333)	(35,185)	(45,741)
EBITDA	**774**	**829**	**1,048**	**1,768**	**2,702**	**3,689**	**5,043**	**6,556**
EBITDA margin%	**10.8%**	**10.3%**	**8.3%**	**10.9%**	**12.3%**	**12.3%**	**12.5%**	**12.5%**
Change bps		(46)	(207)	261	144	(2)	25	(0)
Depreciation	(145)	(123)	(119)	(160)	(203)	(299)	(350)	(362)
EBIT	**629**	**707**	**929**	**1,608**	**2,500**	**3,390**	**4,694**	**6,194**
EBIT margin%	**9%**	**9%**	**7%**	**10%**	**11%**	**11%**	**12%**	**12%**
Interest	(7)	(5)	(10)	(16)	(17)	(8)	(8)	(8)
Other Income	229	249	118	137	270	324	389	467
Profit Before Tax	**851**	**951**	**1,037**	**1,728**	**2,753**	**3,706**	**5,074**	**6,652**
Provision for Taxation	(201)	(232)	(365)	(703)	(936)	(1,260)	(1,725)	(2,261)
Tax rate %	24%	24%	35%	41%	34%	34%	34%	34%
Minority Interest	(29)	(33)	11					
Preference Dividend		(15)	(29)	(9)				
Recurring PAT	**621**	**670**	**654**	**1,016**	**1,817**	**2,446**	**3,349**	**4,391**
Margin%	**9%**	**8%**	**5%**	**6%**	**8.3%**	**8.1%**	**8.3%**	**8.4%**
% Growth YoY		**8%**	**-2%**	**55%**	**79%**	**35%**	**37%**	**31%**
Extraordinary items	(64)	(64)						
Reported PAT	**557**	**607**	**654**	**1,016**	**1,817**	**2,446**	**3,349**	**4,391**

Source: Thermax, Citigroup Investment Research estimates

Figure 37. Thermax – Consolidated Balance Sheet

Year End Mar31 (Rsmn)	FY03	FY04	FY05	FY06	FY07E	FY08E	FY09E	FY10E
Share Capital	238	715	715	238	238	238	238	238
Reserves	3,636	3,441	3,850	4,356	5,709	7,691	10,577	14,504
Misc Expenditure	(81)	(11)	(7)	(3)				
Total Networth	**3,794**	**4,145**	**4,558**	**4,591**	**5,947**	**7,930**	**10,815**	**14,743**
Total Loans	17	91	67	70	70	70	70	70
Minority Interest	134	169	(3)					
Deferred Tax Liability	87	65	69	92	92	92	92	92
Total Liabilities	**4,031**	**4,470**	**4,690**	**4,754**	**6,109**	**8,092**	**10,978**	**14,905**
Gross Fixed Assets	2,145	2,073	2,318	2,528	4,228	5,728	5,928	6,128
Less Depreciation	(1,144)	(1,076)	(1,076)	(1,139)	(1,342)	(1,640)	(1,990)	(2,352)
Net Block Assets	1,002	997	1,242	1,389	2,886	4,088	3,938	3,776
CWIP	16	25	96	50	50	50	50	50
Net Fixed Assets	**1,017**	**1,022**	**1,337.6**	**1,439**	**2,936**	**4,138**	**3,988**	**3,826**
Investments	2,422	2,865	3,184	3,970	3,970	3,970	3,970	3,970
Inventories	553	721	1,042	1,283	1,730	2,370	3,182	4,141
Contracts in Progress	58	345	578	549	740	1,014	1,361	1,771
Sundry Debtors	1,167	1,766	2,605	2,412	3,268	4,479	6,012	7,968
Cash and Bank Balances	370	327	281	547	958	2,172	5,652	8,420
Other Current Assets	68	82	88	215	215	215	215	215
Loans and Advances	479	548	762	901	901	901	901	901
Total Current Assets	**2,695**	**3,790**	**5,356**	**5,907**	**7,811**	**11,151**	**17,322**	**23,415**
Acceptances	62	78	55	112	151	207	278	361
Customer Advances	345	987	1,828	2,600	3,563	4,782	6,224	6,224
Sundry Creditors	951	1,111	2,072	1,654	2,227	3,052	4,097	5,332
Other liabilities	347	363	445	806	806	806	806	806
Trade deposits	15	15	12	13	13	13	13	13
Hire purchase /lease rentals	3	1						
Current Liabilities	1,722	2,555	4,412	5,185	6,760	8,860	11,417	12,736
Contracts in Progress		246	312	765	1,235	1,692	2,272	2,956
Provisions	382	406	464	612	613	613	613	613
Total Current Liabilities and Provisions	**2,104**	**3,207**	**5,187**	**6,562**	**8,608**	**11,166**	**14,302**	**16,306**
Net Current Assets	**592**	**583**	**168**	**(655)**	**(796)**	**(15)**	**3,020**	**7,109**
Total Assets	**4,031**	**4,470**	**4,690**	**4,754**	**6,109**	**8,092**	**10,978**	**14,905**

Source: Thermax, Citigroup Investment Research estimates

Figure 38. Thermax – Consolidated Cash Flow Statement

Year End Mar31 (Rsmn)	FY04	FY05	FY06	FY07E	FY08E	FY09E	FY09E
Reported PAT	607	654	1,016	1,817	2,446	3,349	4,391
Change in DTL	(22)	4	24	0	0	0	0
Add: D&A	123	119	160	203	299	350	362
Chg in Inventories	(167)	(321)	(241)	(447)	(641)	(811)	(959)
Change in Contracts in Progress	(287)	(233)	29	(190)	(274)	(347)	(410)
Chg in Debtors	(600)	(839)	193	(856)	(1,211)	(1,533)	(1,955)
Chg in Loans & Advances	(69)	(214)	(139)	0	0	0	0
Chg in other CA	(14)	(6)	(127)	0	0	0	0
Chg in CL	1,079	1,923	1,226	2,045	2,558	3,136	2,004
Chg in Provisions	25	57	149	1	0	0	0
Change in Working Capital	(34)	368	1,090	552	432	445	(1,321)
Cash Flow from Operations	**673**	**1,145**	**2,290**	**2,572**	**3,177**	**4,144**	**3,432**
Capex	(128)	(435)	(261)	(1,700)	(1,500)	(200)	(200)
Change in Investments/Assets	(443)	(319)	(785)	0	0	0	0
Cash Flow from Investing Activities	**(571)**	**(754)**	**(1,047)**	**(1,700)**	**(1,500)**	**(200)**	**(200)**
Change in Debt	74	(24)	3	0	0	0	0
Change in Equity & Preference shares	477	0	(477)	0	0	0	0
Change in Minority Interest	35	(172)	3	0	0	0	0
Change in Reserves	(406)	89	25	3	0	0	0
Dividend and Dividend Tax	(325)	(331)	(531)	(464)	(464)	(464)	(464)
Cash Flow from Financing Activities	**(146)**	**(438)**	**(976)**	**(461)**	**(464)**	**(464)**	**(464)**
Increase/(Decrease) in Cash	**(43)**	**(47)**	**267**	**411**	**1,213**	**3,480**	**2,768**
Opening Cash and Bank Balance	370	327	281	547	958	2,172	5,652
Closing Cash and Bank Balance	327	281	547	958	2,172	5,652	8,420

Source: Thermax, Citigroup Investment Research estimates

Risks

We rate Thermax as Low Risk. The rating differs from the Medium Risk rating assigned by our quantitative risk-rating system, which tracks 260-day historical share price volatility. We believe that our risk rating correctly reflects earnings visibility of more than a year out for Thermax and its growing importance as a key player in the electrical equipment sector in India. The key downside risks to our positive view on the stocks are:

Rising interest rates, cyclical business: Thermax is primarily an engineering company and its business prospects depend on the general health of the Indian economy. Rising interest rates could adversely impact corporate investment plans and thus could hurt Thermax's business prospects. While the project business has higher cyclical volatility, it is lower for the product business.

Rupee appreciation: Almost 24% of Thermax sales are from international markets – this could be impacted if the Indian rupee continues to appreciate, making Indian exports costlier compared to those of other countries.

Manpower shortages: Most engineering & construction companies in India, including Thermax, are face acute shortages of engineers and technicians. Thermax is addressing this issue by increasing salaries, and by giving younger managers leadership roles and advancing their education at foreign universities.

Increasing competition: Falling tariffs are making it easier for Indian companies to import cheaper products in Thermax's markets, while the growing size of orders has attracted large international players. Thermax has already seen the entry of Chinese competitors in larger range of boilers and captive power plants.

Decline in oil prices: Rising oil prices have driven a shift from liquid to solid fuels. A steep fall in oil prices could lead to a reversal of the trend if the economics favor oil over other forms of fuel. This could adversely impact the demand for Thermax's range of solid fuel fired boilers.

Low pricing flexibility: Rising material prices could exert downward pressure on Thermax's margins. For example, a steep rise in input costs (primarily steel prices) in FY 2004-05 caused the Thermax' EBITDA margins to dip sharply. While a robust order book has improved Thermax's bargaining power, a large part of the contracts are still on fixed price basis.

International operations: Thermax has been increasing its presence in international markets for growth opportunities. Aggressive international expansion could bring with it the likes of currency risk, geopolitical risk and execution risk. For example, Thermax acquired ME Engineering, UK, in FY00. The company had been making losses till FY07 and is now being wound up.

Litigation in the US: US water-treatment company Purolite has launched legal action against Thermax and a team of senior executives for allegedly "stealing intellectual property". The dispute dates back to mid-2005 when a senior team quit Purolite to join Thermax. Thermax has said that it has never used, and has no need to use, any Purolite information in any of its products. Thermax has filed a counter motion against Purolite in the US claiming business interference. If a court decision were to go against Thermax, any financial penalty imposed could have negative impact on the company's profitability.

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Quant View: Glamour

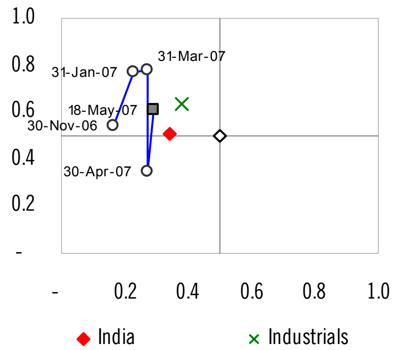
Thermax lies in the Glamour quadrant of our value-momentum map with weak relative valuation and strong momentum scores. In spite of a trend earnings growth of 43%, a trailing PE of 29x gives it a weak valuation score (expensive) relative to the region. Negative earnings estimates revisions fails to offset the positive effects of strong and improving price momentum, the sole reason behind its move from the Unattractive quadrant into the high-momentum Glamour quadrant. Thermax ranks above its country peers on momentum and below both its country and sector peers on valuation.

Risk analysis shows Thermax has a unitary beta to the regional market implying an almost perfect sensitivity to regional equity market performance. Apart from a moderate tilt towards favoring rises in Asian short rates, the stock does not seem to show any significant exposure to other major macro factors.

Radar Screen Quadrant Definitions

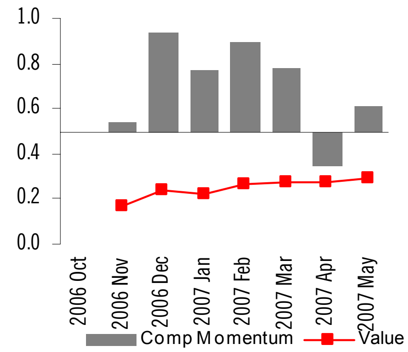
Glamor *Poor relative value but superior relative momentum*	Attractive *Superior relative value and superior relative momentum*
Unattractive *Poor relative value and poor relative momentum*	Contrarian *Superior relative value but poor relative momentum*

Figure 39. Radar Quadrant Chart History



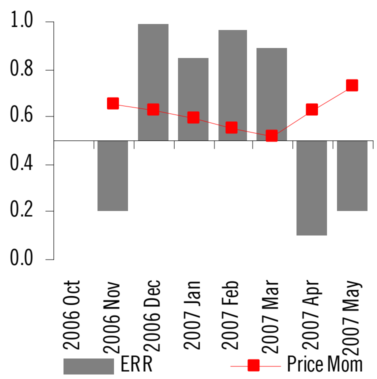
Source: Citigroup Investment Research

Figure 40. Radar Valuation Momentum Ranks



Source: Citigroup Investment Research

Figure 41. Radar Momentum Components



Source: Citigroup Investment Research

Figure 42. Radar Model Inputs

IBES EPS (Actual and Estimates)

FY(-2)	5.28	Implied Trend Growth % (3+2)	42.7
FY(-1)	5.46	Trailing PE (x)	28.7
FY0	1.59	Implied Cost of Debt (%)	8.99
FY1	15.78	StdMktCap	(0.28)
FY2	21.14		

Source: Worldscope, I/B/E/S

Figure 43. Macro Sensitivity

Region	0.99	Commodity ex Oil	(0.09)
Local Market	0.77	Rising Oil Prices	(0.01)
Sector	(0.96)	Rising Asian IR's	0.23
Growth Outperforms Value	(0.17)	Rising EM Yields	0.03
SmallCaps Outperform LargeCaps	0.25	Stronger US$ (vs Asia)	1.92
Widening US Credit Spreads	(0.00)	Weaker ¥ (vs US$)	0.74

Source: Citigroup Investment Research

Key Industry Drivers - CPP/CHP, Cooling and Environment

Reasons for growth of captive power plants

Electricity Act 2003 provides a fillip to Captive Power Plants (CPP)

Power generation entities in India can be divided into two broad categories: generation utilities and generation non utilities or captive power plants (CPP). Generation utilities sell the electricity produced by them to the transmission and distribution entities. Over the years, and for numerous reasons, industrial customers have been substituting utility power with power from CPPs. This trend has showed a sudden jump post the passing of the Electricity Act 2003 which enabled and encouraged the setting up of captive power plants to aid in reducing power deficits in the country.

India might continue to have a peak load deficit of 5.1% and base demand deficit of 4.6% in FY17E

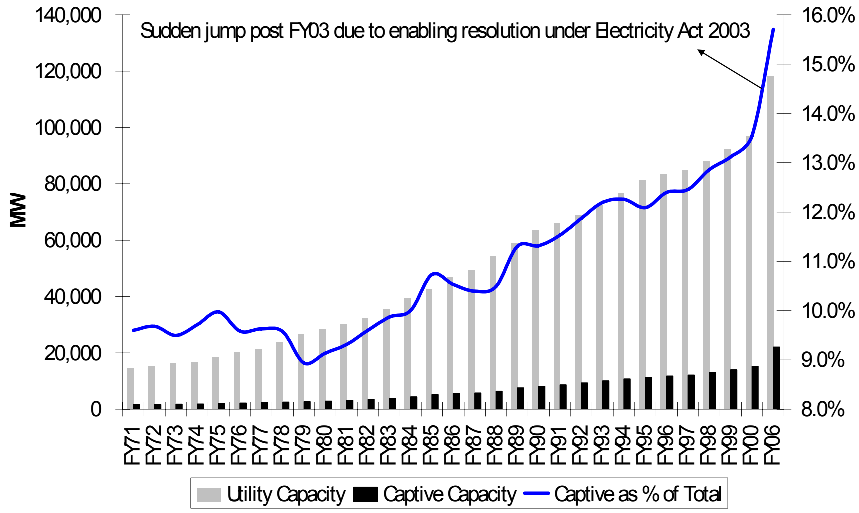
According to our latest estimates in our "India Power Sector Model" post adding 24GW and 54GW in the Xth Plan and XIth Plan, respectively, India would continue to have a peak load deficit of 8.7%, a base demand deficit of 7.6% and per capita consumption of power of 824kwh in FY12E. The Ministry of Power's target for the XIIth Plan has to be at least 71GW so that an 85% achievement can take per capita consumption to more than 1000kwh. However, even if these targets are achieved, India might continue to have a peak load deficit of 5.1% and a base demand deficit of 4.6% in FY17E.

Figure 44. India: Planned Utility Capacity Additions and Targets

Plan Period	Target (GW)	Actual (GW)	Achievement	Growth
V (74-79)	12	10	82%	
VI (80-85)	20	14	72%	39.4%
VII (85-90)	22	21	96%	50.4%
VII (92-97)	31	16	54%	-23.3%
IX (97-02)	40	19	47%	15.8%
X (02-07)	41	24	58%	26.2%
XI (07-12E)	76	54	71%	125.0%
XII (12-17E)	87	65	75%	20.1%

Source: CEA, Ministry of Power and Citigroup Investment Research

Figure 45. Captive Capacity Growth in India



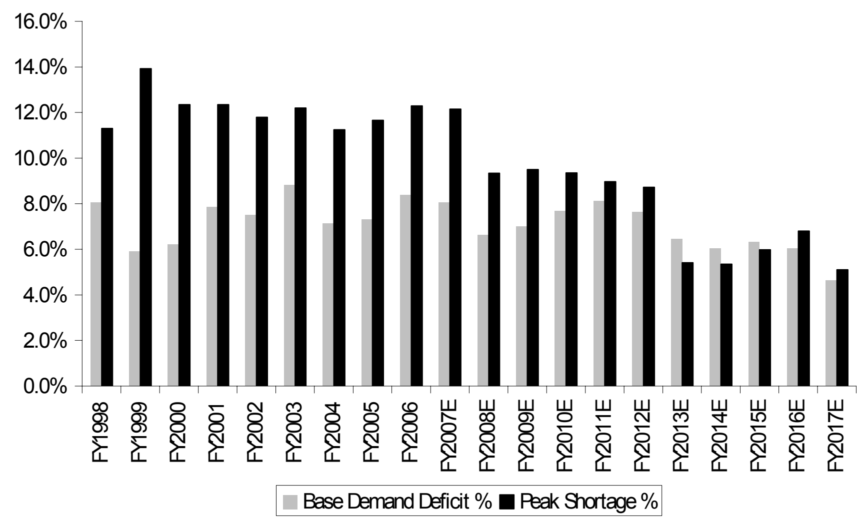
Source: CEA, Ministry of Power and Citigroup Investment Research

The key reasons for the growth of CPPs in the country are:

(1) Non-availability of adequate grid supply

In India, power shortages are a severe problem. While absolute generation capacities have been increasing, the demand supply gap remains quite large. Inadequate power supply hurts production and can impact profitability. Many companies choose captive power plants when the expected cumulative production losses are greater than the installation and operational cost of the captive power plants.

Figure 46. India: Peak Load and Base Demand Deficits



Source: Citigroup Investment Research estimates

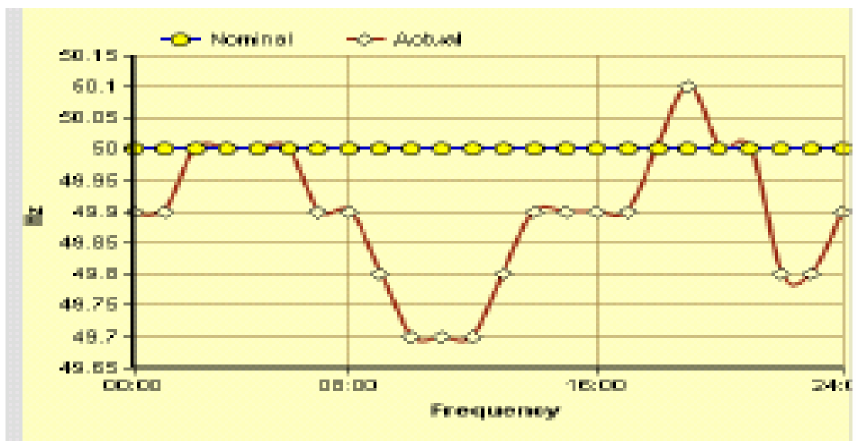
(2) Poor quality and reliability of grid supply

Poor quality and reliability of grid supply is another reason why industry is installing captive power plants. In many industries, the production capability of machines directly depends on the frequency of the electricity. Thus, if the frequency of the electricity is low the production volume gets reduced.

For example, some textile looms work best if the frequency of electricity is 50 Hertz. The normal grid frequency of India is about 48.5 Hertz. Thus, there is a production loss of 3% each day due to this factor.[3]

Voltage fluctuations in electricity supply can damage machines and result in loss of production time.

Figure 47. India – Illustrative Grid Frequencies



Source: Kalkitech, CERC and Citigroup Investment Research

(3) Combined Heat and Power (CHP)

In industries like sugar mills and ceramics, steam is one of the important input raw materials, and captive power plants are used for generating both steam and electricity. The cost advantages from this dual generation make the captive power plant economically viable.

CHP is an efficient, clean, and reliable approach to generating power and thermal energy from onsite facilities. It uses heat that is otherwise discarded from conventional power generation to produce thermal energy. By providing electricity and steam from the same source, CHP significantly reduces the total fuel used to supply energy to the plant, along with the corresponding emissions of CO_2 and other pollutants.

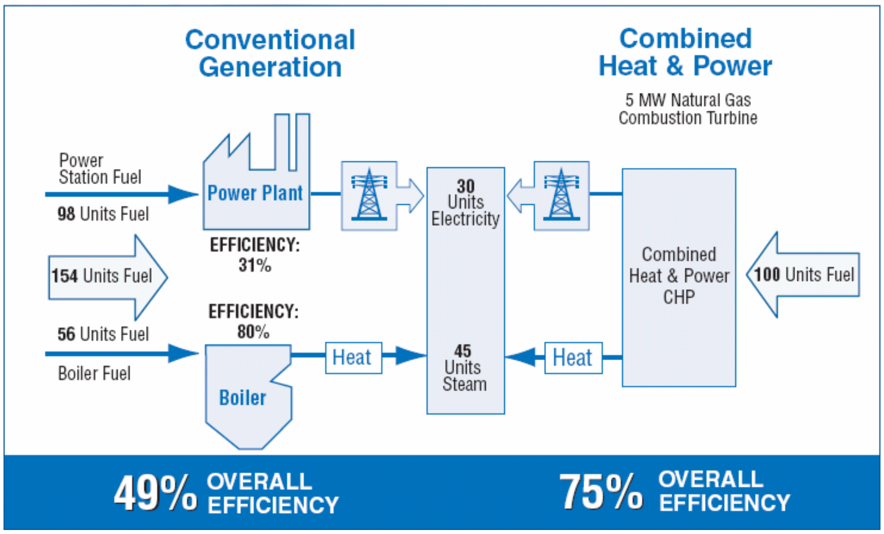
CO_2 is the leading greenhouse gas associated with climate change. The figure below compares the typical efficiency and fuel use of a CHP facility to the typical efficiency and fuel use of a conventional system that provides the same amount of energy.

[3] Captive Power Plants: Case Study of Gujarat, India. P.R. Shukla, Debashish Biswas, Tirthankar Nag, Amee Yajnik, Thomas Heller and David G. Victor

In conventional systems, plants purchase electricity from the central grid and produce steam using an on-site boiler. Together, the two systems typically use 154 units of fuel to produce 30 units of electricity and 45 units of steam at an overall efficiency of 49 percent.

With CHP, one system provides the same amount of electricity and steam using only 100 units of fuel. This system is 75% efficient, compared to the conventional system's 49% efficiency. Because the CHP system uses nearly 35% less fuel, it produces much lower emissions than the conventional system. When CHP systems replace aging conventional systems, the emission reductions can be even greater. The CHP system shown below would produce about half the emissions of the conventional system.

Figure 48. Combined Heat and Power



Source: EPA

(4) High industrial tariffs

In India, industrial and commercial users of electricity subsidize agricultural and the residential users. For this reason the industrial tariff is much higher than the average cost of production of electricity.

Due to this distortion in the price of electricity, the industry finds it economical to invest in a captive power plant. The cost of generation of the captive power plant becomes much less than the tariff that the industry has to pay.

Figure 49. India - Industrial and Commercial Consumers Cross Subsidize Domestic and Agriculture Consumers

Utility (Paise/kwh)	Dom 1KW	Dom 4KW	Dom 10KW	Com 2KW	Com 10KW	Com 30KW	Com 50KW	Agri 2HP	Agri 5HP	Agri 10HP	Small Ind 10KW	Medium Ind 50KW	Large Ind 1MW	Heavy Ind 10MW	Heavy Ind 20MW	Rail 12.5MW
AP	239	397	492	599	625	629	630	29	24	22	415	414	380	419	408	420
Assam	277	389	438	528	545	548	549	174	216	276	346	428	389	388	378	
											268					
Bihar	207	237	280	744	806	806	806	41	41	41	704	744	469	469	460	531
Chhatisgarh	178	277	318	442	525	525	525	33	33	38	275	296	481	481	472	478
Gujarat	392	517	589	590	626	632	632	58	58	58	450	466	519	557	557	549
Haryana	333	379	415	429	429	429	429	18	18	18	438	438	419	419	407	444
HP	201	242	260	441	427	437	436	188	185	184	376	395	317	305	303	
J&K	122	222	222	277	277	277	277	102	102	102	157	157	157	157		
Jharkhand	163	183	182	439	439	439	439	29	29	29	406	406	413	413	393	517
Karnataka	292	418	482	638	651	653	654	45	45	45	418	522	491	501	499	486
Kerala	187	399	518	728	890	963	970	75	75	75	391	391	385	385		361
MP	336	424	443	646	647	648	648	183	205	213	396	521	509	509	503	468
Maharashtra	417	456	520	565	618	631	634	163	163	163	343	343	488	488		473
Meghalaya	180	246	276	409	447	453	454	116	116	116	393	409	254	254		
Orissa	135	247	286	385	443	453	455	102	102	102	322	336	357	357	357	413
Punjab	247	374	409	469	469	469	469	0	0	0	375	413	413	413	401	447
Rajasthan	418	397	393	557	554	556	556	79	76	75	421	460	464	464	461	451
TN	120	216	270	602	608	608	609	0	0	0	459	487	452	463	452	526
UP	282	340	351	452	452	452	452	224	224	224	452	452	438	438	419	472
Uttaranchal	215	215	215	315	315	315	315	82	78	77	305	305	282	282	276	
WB	218	299	369	363	526	586	598	191	191	191	342	469	471	442	442	454
ArunP	163	212	232	370	390	393	394				345	353	394	395		
Goa	122	171	217	327	357	374	377	102	102	102	257	297	342	342	342	
Manipur	262	300	302	302	302	382	382	272	272	272	287	382	336	336	336	
Mizoram	170	248	249	267	267	267	267	70	70	70	208	208	71	71	71	
Nagaland	272	310	338	398	432	437	438	150	150	150	280	296	315	315		
Sikkim	106	266	322	335	396	408	410	180	248	326	414	288	312	312		
Tripura	200	270	460	320	400	400	400	75	75	120	240	270				
A & N Islands	130	275	326	407	465	475	477	90	90	90	317	327				
Chandigarh	179	304	304	347	347	347	347	165	165	165	350	387	361	361	350	
DNH	130	173	204	270	270	270	270	55	55	55	230	243	270	271		
Daman & Diu	130	173	204	248	266	269	269	55	55	55	230	262	260	261		
BSES/NDPL	277	347	435	597	597	623	623	162	162	162	560	560	560	560	547	518
Delhi-NDMC	158	252	328	462	525	525	525				431	431				576
Lakshadweep	100	300	300	480	480	480	480				330	330				
Pondicherry	55	114	151	275	325	334	335	0	21	20	248	258	320	333		
AEC	389	450	782	614	682	689	691	328	328	328	397	446	430	430		
CESC	281	460	530	448	576	594	598				390	480	461	461	444	388
DVC-Bihar													365	365	351	451
DVC-WB													389	389	374	433
DPL	231	292	292	281	306	305	305	277	271	269	281	302	319	319		
Mumbai BEST	99	288	410	583	741	987	987				635	804	505	505		
RELE- Mumbai	172	419	518	600	618	650	745	195	195	195	526	704	511	511		
TPWR-Mumbai	203	359	431	544	499	499	499				470	470	446	446	446	478

Source: CEA and Citigroup Investment Research

CPP Market Segmentation

Thus, captive power plants can be segmented into four categories with respect to the objective of their installation.

Figure 50. Captive Market Segmentation

Objective	CPP Segment	Size	Fuel	Consumer
Hedging against interrupted power supply	Back Up	Small	Oil (HSO, HO, LDO)	Small units - Textiles & Paints
Better control, quality power	Quality Power	Small - Medium	Gas, Naphtha	Sensitive Equipments
Joint production of steam and electricity, cost cutting	Cogeneration	Small - Medium	Gas, Naphtha, Bagasse	Sugar, Ceramic, Cotton Textile
Reduced cost of generation, generation cost < industrial tariff	Cost of Power	Medium - Large	Coal, Gas, Naphtha	Petrochemicals, Steel Plants

Source: Citigroup Investment Research

Absorption cooling – niche market growing at a steady clip

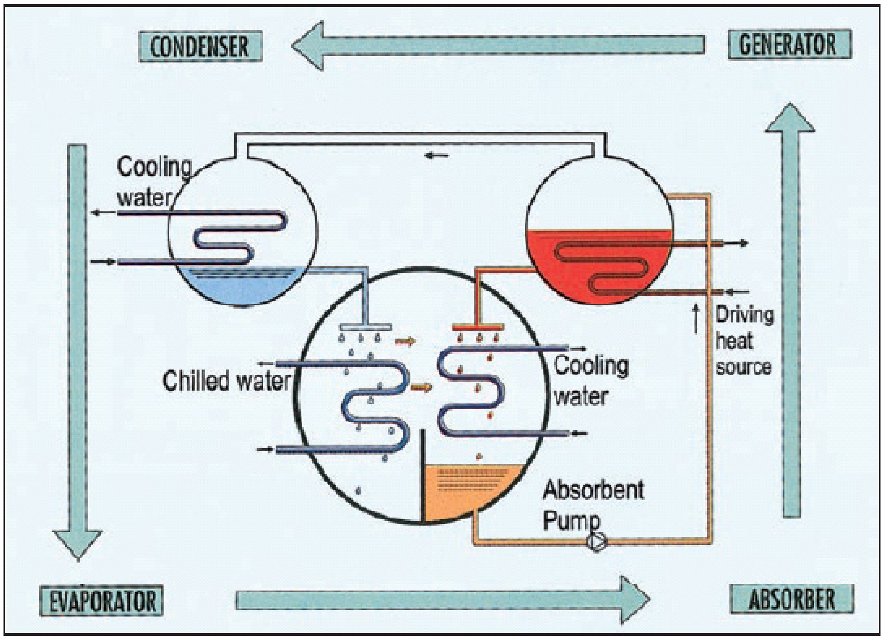
Absorption chillers are used in many applications for process water cooling. Instead of mechanically compressing a refrigerant gas, as in the familiar vapor compression process, absorption cooling uses a thermo-chemical process. Two different fluids are used, a refrigerant and an absorbent. Heat directly from natural gas combustion, or indirectly from a boiler, or other waste-heat source, drives the process. The high affinity of the refrigerant, water, for the absorbent (usually lithium bromide or ammonia) causes the refrigerant to boil at a lower temperature and pressure than it normally would and transfers heat from one place to another.

Figure 51. Key Absorption Cooling Players

Carrier (USA)
York (USA)
Trane (USA)
McQuay (USA)
Yazaki (Japan)
Sanyo (Japan)
Ebara (Japan)
Mitsubishi Heavy Industries (Japan)
Toshiba (Japan)
Hitachi (Japan)
Kawasaki Heavy Industries (Japan)
Thermax (India)
Entropie (France/Germany)
LG Machinery (Korea)
Kyung Won Century (Korea)
Broad (China)

Source: Citigroup Investment Research

Figure 52. Basic Operation Cycle of a Single Effect Absorption Chiller



Source: Gas airconditioning and Citigroup Investment Research

Figure 53. Advantages of Absorption Cooling

Conventional Electric Machines	Absorption Machines
Operated on electricity	Uses heat energy
High operating costs	Low operating costs
High maintenance	Negligible maintenance
Noisy operation	Noiseless operations
High life cycle costs	Low life cycle costs
Uses CFC/HFC leading to ozone depletion	Uses water
More moving parts	No moving parts

Source: Industry and Citigroup Investment Research

Absorption cooling technology is clearly superior to conventional electrical machines, especially with regards to being a more environmental-friendly technology. Many companies are now replacing old systems with more environment-friendly systems. The only constraint to the widespread use of absorption cooling is the economical fuel availability (gas or others)

Conditions where absorption technology becomes viable

- Electric energy rates are high or uncertain.
- Need for chilled water coincides with the utility's peak electric demand.
- Economical fuel options are available – natural gas or other fuels.
- Steam is available from a process boiler or a waste heat boiler.
- Cogeneration heat is available.
- Waste heat is available from process hot water.
- Low acoustic profile or low vibration solutions are needed.

Absorption chiller market is only ~$600mn — out of which 50% is in China, 25% in Japan + Korea, and 25% in the rest of world. The original absorption chiller machine was invented in the US but developed in Japan. India has less than 10% of the market.

Environmental compliance could be a key business driver

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) came into force on February 16, 2005, and is now fully operational. Most of the industrialized countries have committed to reducing their aggregate emissions by 5.2 % below 1990 levels during the first commitment period (2008–12); the US and Australia have so far declined to ratify the protocol. To make the process cost-effective, the protocol established the following three flexible mechanisms:

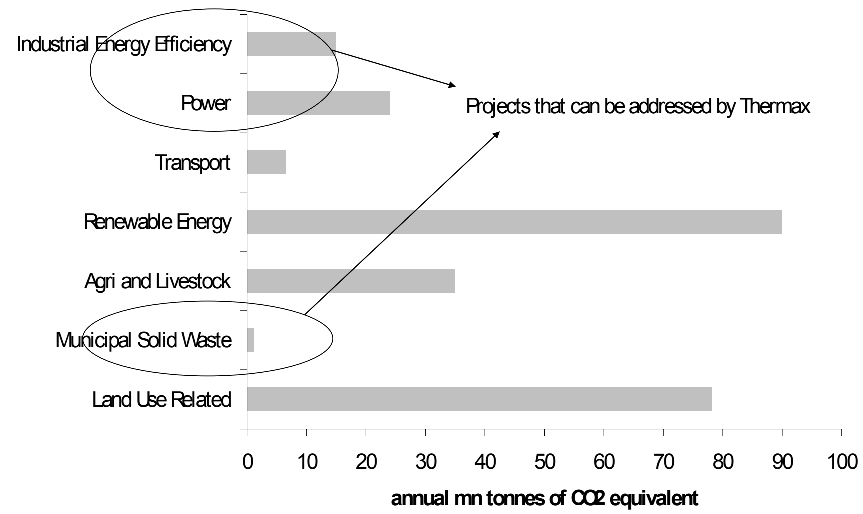
- Joint Implementation (JI): This involves projects between two Annex I countries that reduce emissions and the two countries share the carbon credits.
- Clean Development Mechanism (CDM): Here, Annex I (developed) countries can implement projects in non-Annex I (developing) countries that reduce emissions and use the resulting credits to help meet their own targets.

Carbon credits awarded under the CDM are known as Certified Emission Reductions, or CERs.

- Carbon trading: Carbon trading among Annex I countries

The CDM provides opportunities for emission reductions as well as sustainable development in developing countries. India's economic growth is mainly based on energy from fossil fuels like coal and therefore has considerable potential to reduce its greenhouse gas (GHG) emissions as well in CDM participation. CDM projects starting after January 1, 2000, are eligible to earn certified emission reductions (CERs).

Figure 54. India Annual CDM Potential



Source: UNFCCC and Citigroup Investment Research

Water Treatment Potential in India

In India there is a huge potential for waste water treatment as a growing population, urbanization and industrialization have accelerated water pollution and necessitated actions to control pollution and reverse the effects.

Domestic sewage — refers to waste water that is discarded from households. Also referred to as sanitary sewage, such water contains a wide variety of dissolved and suspended impurities. Only about 25% of domestic wastewater is treated. [4]

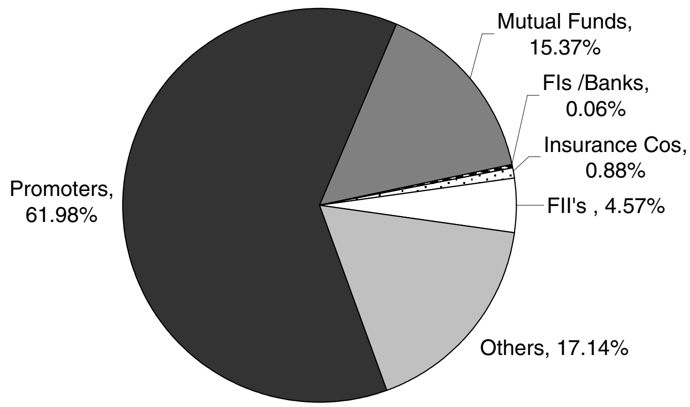
Industrial waste — Waste water from manufacturing or chemical processes in industries contributes to water pollution. Industrial waste water usually contains specific and readily identifiable chemical compounds. About 57,000 polluting industries in India generate about 13,468mld of wastewater out off which nearly 60% (generated from large & medium industries) is treated.

[4] CSE Conference on Health and Environment

Shareholding Structure

The Aga and Pudumjee family members and their associate companies hold about 62% of Thermax. FII's hold about 4.57% of the company.

Figure 55. Thermax: Shareholding Structure



Source: Thermax, Citigroup Investment Research

Analyst Certification Appendix A-1

We, Venkatesh Balasubramaniam and Deepal Delivala, research analysts and the authors of this report, hereby certify that all of the views expressed in this research report accurately reflect our personal views about any and all of the subject issuer(s) or securities. We also certify that no part of our compensation was, is, or will be directly or indirectly related to the specific recommendation(s) or view(s) in this report.

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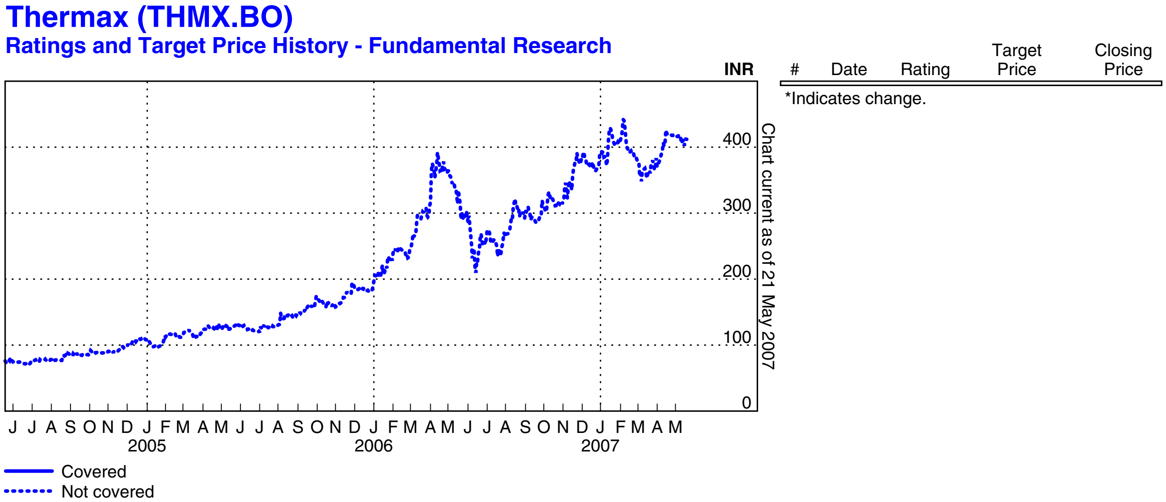

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A seat on the Advisory board of General Electric is held by one or more employees of Citigroup Global Markets or its affiliates.
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Citigroup Investment Research Global Fundamental Coverage (3215)	45%	40%	15%
% of companies in each rating category that are investment banking clients	45%	42%	32%
Electrical Equipment -- Europe (9)	33%	44%	22%
% of companies in each rating category that are investment banking clients	0%	0%	0%
Engineering -- Europe (32)	28%	66%	6%
% of companies in each rating category that are investment banking clients	33%	48%	50%
India -- Asia Pacific (130)	58%	14%	28%
% of companies in each rating category that are investment banking clients	42%	50%	42%
Multi-industry -- North America (14)	29%	64%	7%
% of companies in each rating category that are investment banking clients	100%	56%	100%
Citigroup Investment Research Quantitative World Radar Screen Model Coverage (6249)	32%	40%	28%
% of companies in each rating category that are investment banking clients	30%	25%	23%
Citigroup Investment Research Quantitative Decision Tree Model Coverage (330)	48%	0%	52%
% of companies in each rating category that are investment banking clients	47%	0%	50%
Citigroup Investment Research Quantitative European Value & Momentum Screen (602)	30%	41%	30%
% of companies in each rating category that are investment banking clients	51%	40%	35%
Citigroup Investment Research Asia Quantitative Radar Screen Model Coverage (1861)	20%	60%	20%
% of companies in each rating category that are investment banking clients	23%	19%	17%
Citigroup Investment Research Quant Emerging Markets Radar Screen Model Coverage (1252)	20%	60%	20%
% of companies in each rating category that are investment banking clients	27%	26%	31%
Citigroup Investment Research Australia Quantitative Top 100 Model Coverage (99)	29%	40%	30%
% of companies in each rating category that are investment banking clients	41%	43%	40%
Citigroup Investment Research Australia Quantitative Bottom 200 Model Coverage (168)	30%	40%	30%
% of companies in each rating category that are investment banking clients	8%	10%	6%
Citigroup Investment Research Australia Quantitative Scoring Stocks Model Coverage (10)	50%	0%	50%
% of companies in each rating category that are investment banking clients	40%	0%	20%

Guide to Fundamental Research Investment Ratings:

Citigroup Investment Research's stock recommendations include a risk rating and an investment rating.

Risk ratings, which take into account both price volatility and fundamental criteria, are: Low (L), Medium (M), High (H), and Speculative (S).

Investment ratings are a function of Citigroup Investment Research's expectation of total return (forecast price appreciation and dividend yield within the next 12 months) and risk rating.

For securities in developed markets (US, UK, Europe, Japan, and Australia/New Zealand), investment ratings are: Buy (1) (expected total return of 10% or more for Low-Risk stocks, 15% or more for Medium-Risk stocks, 20% or more for High-Risk stocks, and 35% or more for Speculative stocks); Hold (2) (0%-10% for Low-Risk stocks, 0%-15% for Medium-Risk stocks, 0%-20% for High-Risk stocks, and 0%-35% for Speculative stocks); and Sell (3) (negative total return).

For securities in emerging markets (Asia Pacific, Emerging Europe/Middle East/Africa, and Latin America), investment ratings are: Buy (1) (expected total return of 15% or more for Low-Risk stocks, 20% or more for Medium-Risk stocks, 30% or more for High-Risk stocks, and 40% or more for Speculative stocks); Hold (2) (5%-15% for Low-Risk stocks, 10%-20% for Medium-Risk stocks, 15%-30% for High-Risk stocks, and 20%-40% for Speculative stocks); and Sell (3) (5% or less for Low-Risk stocks, 10% or less for Medium-Risk stocks, 15% or less for High-Risk stocks, and 20% or less for Speculative stocks).

Investment ratings are determined by the ranges described above at the time of initiation of coverage, a change in investment and/or risk rating, or a change in target price (subject to limited management discretion). At other times, the expected total returns may fall outside of these ranges because of market price movements and/or other short-term volatility or trading patterns. Such interim deviations from specified ranges will be permitted but will become subject to review by Research Management. Your decision to buy or sell a security should be based upon your personal investment objectives and should be made only after evaluating the stock's expected performance and risk.

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Citigroup Investment Research Quantitative Decision Tree model recommendations are based on a predetermined set of factors to rate the relative attractiveness of stocks. These factors are detailed in the text of the report. Each month, the Decision Tree model forecasts whether stocks are attractive or unattractive relative to other stocks in the same sector (based on the Russell 1000 sector classifications).
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