



## Domestic BTG Equipment Industry: Strong headwinds in the near term

### Summary Opinion

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Given the existing energy deficit situation and likelihood of continued growth in energy requirements in the country, ICRA expects incremental power generation capacity requirements until March 2022 to amount to about 2,50,000 mega watts (MW) of which coal-based capacity would account for about 65%. Thus, on an aggregate basis, the demand outlook for power generation equipment (such as boiler-turbine-generator, BTG) manufacturers is favourable.

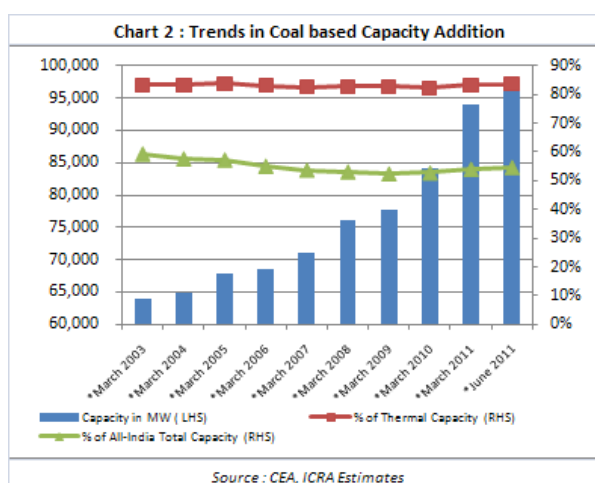
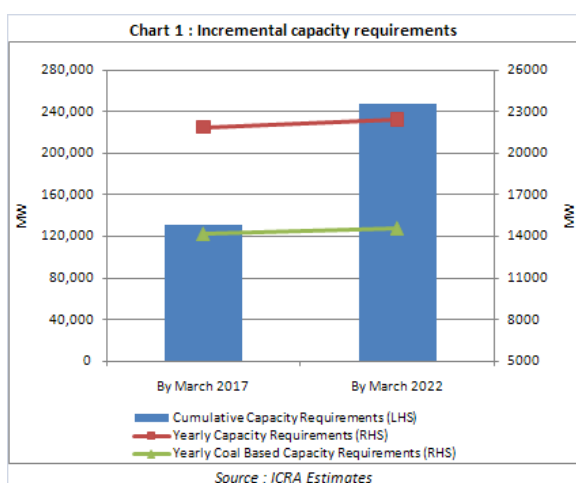
- While the demand outlook is favourable, the domestic BTG industry is faced with strong competition from original equipment manufacturers (OEMs) based in China, as several private sector players have preferred to import boiler-turbine-generator (BTG) sets from China on the grounds of relatively faster delivery schedule and competitive cost of sourcing. Also, with government efforts to encourage domestic manufacturing facilities, leading global technology majors have entered into the domestic BTG market and are currently setting up manufacturing facilities through the JV route. Thus, there is a strong possibility of overcapacity, given that the annual demand for coal-based capacity until FY 2022 is estimated at 15,000 MW, as against the estimated capacity available of 35,000 MW, which would further intensify the competitive pressures. In addition, competitive pressures from OEMs in China may increase further, given the likelihood of slowdown in the new orders for coal-based capacity in China, and availability of cost-competitive financing support from State-owned Chinese banks and financial institutions.
- Domestic OEMs (including JVs) are however expected to benefit significantly from Government of India (GoI)'s initiated efforts to go for bulk tendering of super-critical units for the projects being developed by NTPC and DVC, with eligibility clause for bidders specifying mandatory domestic manufacturing presence and with a valid technology transfer arrangement. ICRA also expects that such eligibility clauses may be followed by State-owned generation entities as well in the near future. Overall, the ability of domestic OEMs (including JVs) to bag orders from private sector IPPs will remain critical, given the increasing share of capacity addition from private sector IPPs.
- There are also a number of constraints that may temper capacity addition plans in the power sector and hence order placements on BTG suppliers. The most important constraint is the vastly increased fuel supply risk with domestic coal shortages expected to increase significantly, thus necessitating dependence on costlier imported coal sources. This in turn has increased overall risk profile of the coal based power projects, especially based on competitively bid/merchant PPAs, where fuel cost is not a pass-through, given the sharp rise in coal prices internationally over the last 18 month period and the growing geo-political and regulatory risks for imports of coal.

Further, the funding risks have increased due to prevailing volatility in the equity markets since November 2010 and increasingly cautious approach of lenders which may affect the financial closures of the projects.

- As for green-field BTG projects that are implemented by domestic participants through JVs, ICRA notes that the break-even capacity utilisation level for debt servicing is estimated at 45% and 55%, respectively, for boilers and BTG facilities. However, with low utilisation levels, these projects may book losses in the initial years of operation until they achieve break-even levels. As a result, the financial strength of the promoter would be an important determinant of credit quality. We also derive comfort from the globally strong track record of licensors and the domain expertise of Indian JV partners either in related equipment manufacturing or EPC business.

This note discusses the demand outlook and key trends for the domestic BTG equipment industry.

**Significant capacity requirements in the long run; annual BTG demand estimated at 15,000 MW over the next 10-year period**



The coal-based generation capacity of 96,000 MW contributes to about 54% of overall installed capacity and about 83% of thermal-based installed capacity in the country as on 30 June 2011. ICRA notes that the dominance of coal in the energy mix is likely to continue, as coal-based capacity of over 90,000 MW is under implementation by state/central government sector as well as the private sector over the next five-to-seven year period. Also, the share of coal is expected to increase in the overall energy mix from the current level of 55% to about 65% by March 2017 due to uncertainties over gas availability; long gestation period and significant execution risks for implementation of hydro-projects. Assuming an average growth rate of 7.5% in energy demand (which is in line with the actuals over CY 2002-2010) and improvement in transmission and distribution loss levels from the current level of 32% to 21%<sup>1</sup>, ICRA expects the country to require additional power generation capacity of around 130,000 MW and 250,000 MW by FY 2017 and FY 2022, respectively. This implies capacity addition requirement of about 22,000 MW per year over the next ten-year period, of which about 65% is expected to remain coal-based (Refer Chart 1).

**Focus on super-critical technology based BTG units to continue, aided by the efficiency benefits; expected to contribute to about 40% of thermal capacity addition in the XII Plan Period**

While the capital costs of super-critical units are marginally higher than those of sub-critical units, it is more than compensated by reduction in full life cycle costs due to benefits of super-critical technology over subcritical technology because of its better fuel efficiency (by about 5% over sub-critical technology<sup>2</sup>), resulting in reduction in the overall fuel consumption cost as well as associated fuel handling/usage and ash disposal

<sup>1</sup> Assuming loss reduction of 1% per YoY basis by 2022

<sup>2</sup> In traditional, sub-critical, coal-based plants, the coal is ground to a fine powder before being blown with air into the boiler plant; steam is then generated, driving a steam generator and turbine. In a supercritical, coal-based plant, the supercritical boiler has higher pressure (3,600 psi versus 2,400 psi) and higher operating temperature (600 degrees centigrade rather than 538 degrees centigrade) than a standard sub-critical boiler. The higher temperature and pressure increase thermal efficiency, that is, a supercritical boiler can add 5 to 6 percentage points to plant efficiency while lowering fuel costs; this also lowers CO2 emissions by 10-12%. While supercritical technology has already established itself as a technology, ultra-supercritical technologies — with temperatures of 700 degrees centigrade promising efficiencies of up to 55% — are now being developed.

costs. Also, potential benefits arise from grant of Certified Emission Reductions (CERs),<sup>3</sup> subject to approval by the Clean Development Mechanism (CDM) because of reduction in CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> emission levels associated from use of technology. The focus has hence shifted towards super-critical technology based units, which is also evident from the fact that the orders for BTG units with aggregate capacity of about 50,000 MW (kindly refer **Table 1**) based on super-critical technology have been placed. The list in Table 1 pertains to projects that are likely to be commissioned in the XII Plan Period (2012-2017). Even assuming timely completion for 70% of the capacity in the projects under execution, ICRA expects the overall share of super-critical based projects in thermal capacity addition during the XII Plan Period to be about 40% and also expects the share to increase further in the subsequent Plan Period.

Name of Project Developer	Capacity Under Execution (MW)
Reliance Power Ltd	8000
Adani Power Ltd	3960
Lanco Infratech Ltd	7920
Sterlite Energy Ltd	1980
Athena Energy	1320
Essar Power Ltd	1320
Ind-Bharat Group	660
Tata Power Company Ltd	4000
Jaiprakash Power Ltd	5280
Bajaj Hindustan Ltd	1980
L&T Power Ltd	1320
Thermal Powertech Corp. India Ltd	1320
<b>Sub-total Private Sector</b>	<b>39060</b>
NTPC	2640
APGENCO	1600
MSPGCL	1980
KPCL-BHEL JV	1600
KPCL	700
RRVUNL	1320
<b>Sub-total State Sector</b>	<b>9840</b>
<b>Total</b>	<b>48900</b>

Source : ICRA Research

**China-based OEMs are well-positioned in the domestic BTG market**

Name of IPP/State Entity	Capacity in MW
Rosa Power Supply Company Ltd	600
Adani Power Ltd	2640
JSW Energy Ratnagiri Ltd	600
JSW Energy Vijayanagar Ltd	600
Raj West Power Ltd	270
Wardha Power Ltd	405
Sterlite Energy Ltd	1200
Udipi Power Corporation Ltd	1200
Lanco Anpara Power Ltd	600
Lanco Amarkantak Power Ltd	600
Haryana Power Generation Company Ltd	1200
West Bengal Power Development Corporation Ltd	600
<b>Sub-Total</b>	<b>10515</b>
Capacity Addition during XI Plan Period so far (till June 2011)	37826
<b>% Share of China based BTG Units in the Capacity Addition</b>	<b>28%</b>

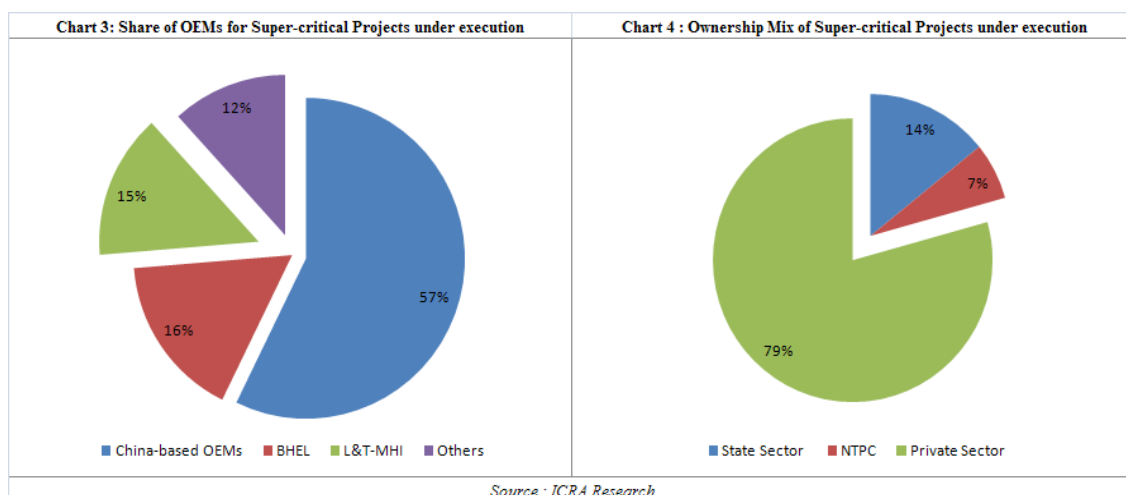
Based on our assessment of the projects under execution for the XII Plan Period, China-based OEMs (mainly Shanghai Electric Corporation Ltd, Dongfang Electric Group and Harbin Power Equipments) have been able to establish a strong position in the domestic BTG market (both in the super-critical and sub-critical segment). This is reflected from the fact that about 28% of the capacity addition during the current Plan Period so far is based on supplies from China as shown herewith in **Table 2**. Also, the orders placed on them are estimated at 30,000 MW, which corresponds to about 57% of the overall BTG orders in super-critical projects (kindly refer **Chart 3**). The preference<sup>4</sup> by private IPP segment is mainly on account of relatively cost-

competitive sourcing (about 15~25% cheaper for the entire project on EPC basis); faster delivery (that is,

<sup>3</sup> E.g. projects including UMPPs such as Sasan UMPP and Krishnapattanam UMPP with capacity of 4000 MW each (using Super-critical Technology), both being developed by Reliance Power Ltd, are approved by UNFCCC to grant CER benefits.

<sup>4</sup> As per the amendment in Mega Power Policy by the Government of India in October 2009, the requirement of undertaking international competitive bidding (ICB) by the developers for procurement of equipment for mega power projects would not be mandatory, if the requisite quantum of power has been tied up through tariff-based competitive bidding or if the project has been awarded through tariff-based competitive bidding.

within 36-40 months) than available domestically and lack of manufacturing experience of domestic participants with respect to super-critical based units. As for the orders tendered by the private IPP segment, ICRA observed stiff price competition from China-based OEMs. The prices quoted by China-based OEMs for BTG sets were below Rs. 2 Cr./ MW while those of domestic OEMs were in the range of Rs. 2.8 ~ 3.2 Cr./MW. Among the domestic participants, both BHEL<sup>5</sup>, a market leader in domestic BTG market, (which had undertaken a capacity expansion programme and also had technology collaborations with foreign majors for super-critical technology transfer) and L&T-MHI JVs (which were incorporated in April 2007 for setting up integrated facility for manufacturing BTGs at Hazira, Gujarat), have been able to win their first orders in the super-critical segment in FY 2009 only from state sector generating companies. Thereafter, BHEL and L&T-MHI have been able to build their order-book positions in the super-critical segment from state-owned companies as well as private sector IPPs.



**With the entry of global majors through JVs, competition has intensified in the domestic BTG market and, therefore, the risk of overcapacity is likely to persist ...**

		FY 2011	FY 2012	FY 2013	FY 2014
Technology Supplier		Boiler			
		As On End of Financial Year			
<b>Operational</b>					
BHEL	Alstoms, France	15000	15000	20000	20000
L&T-MHI	Mitsubishi Heavy Industries, Korea	4000	4000	4000	4000
<b>Under Execution</b>					
Thermax - Babcock	Babcock & Wilcox Power Generation Group, USA				3000
BGR Energy - Hitachi	Hitachi, Japan				4000
GB Engineering - Ansaldo (Now, Gammon)	Ansaldo, Italy		1000	1000	1000
Doosan Heavy Industries	Doosan Heavy Industries, Korea				3000
<b>Sub-total</b>		<b>19000</b>	<b>20000</b>	<b>25000</b>	<b>35000</b>
		TG			
		As on End of Financial Year			
<b>Operational</b>					
BHEL	Siemens, Germany	15000	15000	20000	20000
L&T-MHI	MHI, Korea	4000	4000	4000	4000
<b>Under Execution</b>					
Bharat Forge - Alstoms	Alstoms, France			5000	5000
JSW - Toshiba	Toshiba, Japan			3000	3000
BGR Energy - Hitachi	Hitachi, Japan				4000
<b>Sub-total</b>		<b>19000</b>	<b>19000</b>	<b>32000</b>	<b>36000</b>

Source : ICRA Research

<sup>5</sup> BHEL has ongoing collaboration agreements with Alstom, France and Siemens, Germany, with a technology transfer arrangement for supercritical boilers and TG units, respectively. The company has established the capability to deliver 15,000 MW of power equipment per annum by the end of FY 2010 (as part of the second phase of expansion programme from 10,000 MW to 15,000 MW) and further augmentation to 20,000 MW per annum is underway and planned to be completed by March 2012.

Given the strong demand outlook, globally leading technology majors have entered into the domestic BTG market and are currently setting up manufacturing facilities through the JV route. L&T-MHI is the first such JV that commenced operations at its greenfield manufacturing facility at Hazira in FY 2011 with an annual capacity of 4000 MW. With the planned investments for BTG as shown in Table 3, the overall annual capacity for BTG is expected to rise considerably over the next two years to about ~ 35,000 MW by the end of FY 2014 from the level of 19,000 MW by the end of FY 2011. Given the expected annual demand at ~ 15,000 MW for capacity addition, this would imply over-capacity in the segment over the long term. We also see that the competitive pressures from leading OEMs in China may increase further, given the likelihood of slowdown in new orders for coal-based capacity in China arising from a) faster pace of capacity addition in the past over demand growth rate resulting into fall in PLF (to 58% in CY 2010 from CY 70% in CY 2004), b) continued uncertainty over tariff setting measures in China (which are not being adequate to pass on fuel cost increases), and c) increased focus towards investments in renewable energy in China. Further, cost-competitive financing options that are extended by Chinese banks and financial Institutions to finance purchase of such equipments may also support the process.

**Clause of domestic manufacturing presence in bulk tendering orders by NTPC likely to benefit domestic OEMs**

<b>Table 4 : Requirements for eligibility in the bids and participation in bulk tender</b>
<ul style="list-style-type: none"> <li>• The bidder can be a) Indian subsidiary of qualified super-critical boiler manufacturer, with minimum 51% holding and lock-in period of 7 years, b) JV between Indian company and Qualified super-critical boiler manufacturer, where Qualified super-critical boiler manufacturer &amp; Indian partner will hold min. 26% and 51% respectively with lock-in period of 7 years, c) Indian company having manufacturing experience of sub-critical boilers of 500 MW and having valid technology transfer agreement.</li> <li>• Firm commitment from bidder to indigenize manufacturing of supercritical boiler in India in phased manner as per Phased Manufacturing Program (PMP) stipulated</li> <li>• The JV should have a valid technology transfer agreement including license to manufacture and supply in India with a qualified supercritical boiler manufacturer. The technology transfer agreement shall necessarily cover transfer of technological knowhow in form of complete design dossier, design softwares, drawings and documentation, quality system manuals and imparting relevant personnel training to the JV. Such agreement must have provision that the transfer of technology to the Indian manufacturing unit shall be complete by the time eighth supercritical unit is supplied by the bidder.</li> <li>• Roadmap for ensuring absorption of technology and indigenization of manufacturing</li> <li>• Firm commitment for establishing manufacturing base in India and technology transfer from the technology provider to the Indian manufacturer shall be sought from the bidders in the bid in form of an undertaking supported by a board resolution.</li> <li>• The PMP will be clearly specified in the tender with provision of liquidation damages (LD) for failure to meet various milestones of manufacturing. The total LD levied on this account will be upto 5% of the total contract value. This 5% will be distributed over various major milestones.</li> </ul>
<i>Source: CEA</i>

With an objective to promote the development of indigenous manufacturing capacity, transfer of supercritical technology as well as rapid capacity addition in the country, Government of India (GoI) has initiated efforts towards bulk tendering of super-critical units for the projects being developed by NTPC and DVC. ICRA also expects the clause for eligibility of bidders in bulk tendering (mentioned in Box 1) to benefit domestic participants and offset the competition from China to some extent, especially if State-owned utilities also implement such moves. The progress over award of contracts through bulk tendering by NTPC has, however, been slow and witnessed considerable delays so far, partly because of litigations. For instance, in case of bulk tendering

for 11 sets of 660 MW each which was initiated in October 2009, while LOAs for TG sets have been awarded in November 2010, the contract for award of boilers is yet to be awarded. In another case of bulk tendering for 9 sets of 800 MW each, technical bids have been invited by NTPC in June 2011 and LOAs are expected to be awarded by the end of March 2012. While only a few private sector IPPs (such as Bajaj Hindusthan Ltd and Jaiprakash Power Ventures Ltd) have awarded orders to domestic participants in the super-critical segment so far, the quantum of such orders still remains low. Hence, the ability of domestic OEMs to bag such orders from private sector IPPs remains important.

**Increased concerns over coal shortages and dependence upon costlier sources of imported coal, besides the execution challenges, may constrain capacity expansion plans in the power sector, and affect order inflows for domestic BTG participants**

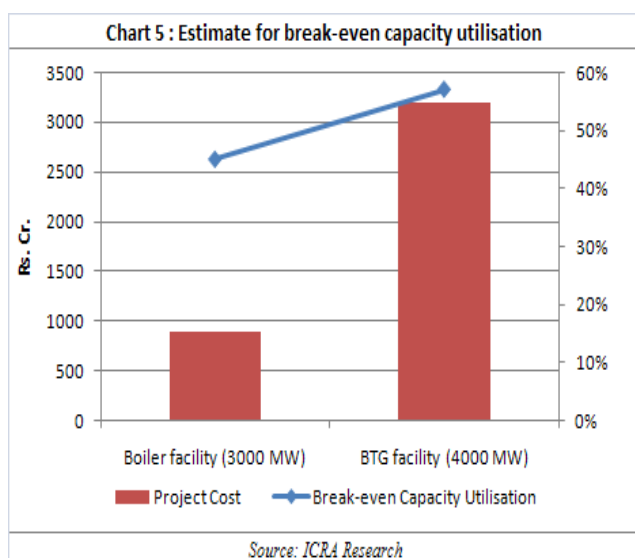
While the demand outlook augurs well for capacity expansion and also for demand for BTG equipment from the domestic industry, ICRA observes a number of constraints that may hamper project execution and hence order placements on BTG suppliers. A key constraining factor is the vastly increased fuel supply risk, with domestic coal shortages expected to increase significantly due to a) the fact that the incremental output of CIL is likely to fall significantly short of the incremental demand, b) overall slow progress in development of captive coal blocks allotted to both government & private sector companies, and c) increased uncertainty on future coal availability due to the initiative by the Ministry of Environment & Forest (MoEF) for notifying No Go

blocks. Developers would, therefore, necessarily have to rely on procuring coal from alternative sources, including imports, to achieve the desired Plant Load Factors (PLFs); and in most cases, the cost of such alternative procurement is likely to be significantly high. Given that the projects are being set up mainly through the competitive bidding route, where costs cannot be passed on, their viability is questionable in a scenario of rising coal prices. Also, IPPs based on imported coal in case of competitively bid (Case I) projects remain exposed to significant fuel price risks due to possible mismatches in tariff bid assumptions and actual coal supply terms. Moreover, IPPs are increasingly exposed to execution, regulatory and geo-political risks in case of coal assets acquired abroad. Also, the sharp rise in coal prices internationally during the last 18-month period have been accompanied by growing political and regulatory risks, as observed in countries such as Australia and Indonesia. These issues also need to be seen in conjunction with the increasing preference by State utilities for Case I bidding route over Case II bidding route, wherein the entire onus of land acquisition, seeking of clearances and tie-up of fuel lies on the project developer and involves significant execution challenges. Further, the funding risks have increased due to prevailing volatility in the equity markets since November 2010 and increasingly cautious approach of lenders (with respect to ensuring fuel linkage and/or certain portion of the capacity to be tied-up through the long-term PPA route), which may thus affect the financial closures of the projects, and in turn affect order-inflows for participants in the domestic BTG market.

**Exposure to commodity price risk fluctuations**

As per our estimates, raw material costs (including bought-out components) comprise a significant portion (about 70~75%) of overall costs for BTG sets. In case of boilers, key raw materials required are pressure parts like steel tubes and pipes and non-pressure parts like various structurals/fabricated items. In the case of turbine-generators, the key raw materials may include alloy steel forgings and castings in addition to various bought-out components required for both. Given that orders are usually based on fixed price, operations of OEMs in the BTG segment would remain exposed to commodity price risks with respect to basic raw materials, that is, primarily for steel items (structural steel and speciality alloy steel). Besides price risks, timely availability of items like imported steel items for boilers and turbine-generators, which typically have long lead times, also remains critical for execution of projects by OEMs. As the JV partners of domestic OEMs in the BTG segment are well-known technology licensors, these JVs are expected to benefit from the established supply chain worldwide in terms of approved vendors and the fact that their technology partners have manufacturing facilities in other countries. Nonetheless, the ability to manage costs within the budgeted level and execute orders in a timely manner so as to maintain the desired profitability remains important from the credit perspective.

**Strong financial & technology support from promoters remains crucial for domestic OEMs**



Green-field projects, being implemented by domestic OEMs, are capital-intensive in nature with a gestation period of about two-to-three years. For illustrative purposes as shown in **Chart 5**, we have assumed green-field project facilities that are expected to be ready for commissioning by the end FY 2013. Also, under the assumptions with respect to a) realisation of 1.5 Cr./MW for supercritical boiler and 2.8 Cr./MW for supercritical BTG set, b) operating profitability before interest, depreciation & tax of 9%, and c) debt funding at 70% of the project cost (which has door-to-door maturity of 10 years including construction period of 2 years and moratorium period of 1 year) repayable @ 12% interest rate; we see that break-even capacity utilisation level for debt servicing is expected to be at about 45% and 55% for boiler and BTG facility, respectively.

However, with low utilisation levels, these projects may book losses in the initial years of operation until they achieve break-even levels. As a result, the financial strength of the promoters remains important from the credit perspective. As most domestic OEMs of boilers and/or turbine-generators are joint ventures between well-established domestic companies (holding majority stakes) and leading technology licensors, the

technology transfer from the JV partner, including technology absorption for design engineering & manufacturing of power equipment, remains the critical success factor. While these OEMs are responsible for providing performance warranty for a period of 12-18 months post supply as part of the equipment supply contract terms, the ability to ensure satisfactory performance at the PG test run and avoid any warranty claim risks would remain crucial, given that it may not be covered back-to-back with the licensors in the technology transfer agreement. Nevertheless, the strong, worldwide, track record of licensors and the domain expertise of Indian JV partners either in related equipment manufacturing or EPC business provide a source of comfort against technology and execution related risks to a large extent.

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