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**Cost of Independent Power Projects-  
Survey (Pricing Trends in IPP Power)**

*Prepared Under The*

THE UNITED STATES AGENCY  
for  
INTERNATIONAL DEVELOPMENT

EMCAT- REGULATORY REFORM AND RESTRUCTURING PROJECT

*Submitted to*  
Ministry of Power  
Government of India

*Prepared by The*

**IRG**

INTERNATIONAL RESOURCES GROUP

NEW DELHI- WASHINGTON, DC

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# Cost of Independent Power Projects Survey of Pricing Trends in IPP Power

Prepared By  
International Resources Group  
New Delhi-Washington D C

October 30, 1998

For  
USAID/India  
Mr N V Seshadri

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Task 17

**Cost of Independent Power Projects  
Survey of Pricing Trends  
in IPP Power**

*Submitted to*  
Ministry of Power  
Government of India

*Submitted by*  
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October 30, 1998

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ANNEX A Task Order 17, Final Report by Asia Consulting Group

# Executive Summary

India's Ministry of Power has requested assistance from International Resources Group (IRG) under the USAID-funded *India Regulatory Reform and Restructuring Power Sector* project to examine recent pricing trends in power from Independent Power Producers (IPPs). The objective of this report is to provide an analysis of IPP cost and tariff data and to determine the factors that contribute to the pricing of power. The analysis includes an examination of tariffs for a broad cross-section of IPPs in India and a comparison with IPP tariffs in other countries.

Many factors contribute to the cost of power, and consequently, the price that a developer bids for a project. Examples include the technology, fuel-type, fuel cost and characteristics, cost of equipment, cost of labor, level and cost of financing and required rate of return, basis for quoting the tariff, costs included in the tariff, risks transferred to the developer, taxes, etc. There is no standard format for reporting IPP tariffs around the world. This makes comparisons misleading, and because of the complex nature of power projects, it is difficult to document tariffs in a format that allows meaningful comparison between countries. Comparisons are particularly difficult at this point in time because many IPPs have been approached by Governments to re-negotiate tariffs (in some cases, Governments have been approached by the IPPs), and because of the dynamic changes in foreign exchange and interest rates owing to the financial crisis in Asia.

India's IPP tariffs are comparable to IPP tariffs in other Asian countries, but tend to be above average. This is, in part, due to the procurement process. Projects in India have been procured both through direct negotiation with project sponsors, and through competitive bidding, whereas projects in Bangladesh and Thailand have been secured only through competitive bidding.

The level of country risk also contributes to higher IPP costs in India. As IPP developers review the array of countries opening up their power sectors to foreign investment, India must compete not only against its neighbors in Asia, but also against countries throughout Latin America, Africa, and indeed, globally. Country risk in the form of sovereign ratings by agencies such as Moody's Investor Services and Standard & Poor's, constitute a significant input to an IPP's market analysis. Moody's assigns a sovereign rating of Ba2 to India's long-term bonds and notes while rating its long-term bank deposits Ba3. Thus, India is deemed a greater risk than Egypt, China, Malaysia and the Philippines, but a lesser risk than Pakistan and Indonesia.

International developers identified a number of additional contributors to higher power costs in India. These factors, listed below, undermine the attractiveness of the Indian power sector in more detailed analyses conducted by developers:

- Current fuel policy in India leads to increased costs of power. India does not have a domestic supply of low cost natural gas and the cost to import natural gas (i.e., as liquefied natural gas) is quite high. (Note: there is a possibility that India could import natural gas from Bangladesh via pipeline in the future.) India does have large domestic sources of coal, but the coal is of poor quality, having a high ash content and relatively low BTU value. Inadequate fuel policy and infrastructure compound the fuel quality problem. Domestic producers and transporters of fossil fuels in India are reluctant to take on supply risk. Thus, in a number of cases, in order to secure financing, developers are forced to import fuel and provide their own transportation facilities, leading to an increased cost of power.
- High import duties of 20% on equipment increase the cost of power. One developer indicates that removing the duty would reduce his levelized tariff by 6%.
- Frequent changes in Government policy (i.e., owing to changes in Government) and norms delays the project approval process and increases project development costs.
- The inadequacy of the transmission system increases risk premiums and can force developers to locate projects in locations that are less than ideal.
- Taxes on profits from incentive payments increase the required return incorporated in the tariff.
- Country risk for IPPs tends to be even higher in India owing to the absence of Government guarantees (except on the fast-track projects) and the poor financial condition of the State Electricity Boards (SEBs).
- Macro-economic considerations such as the recent Rupee devaluation and high interest rates increase the cost of power, although interest rates and foreign exchange have deteriorated in other Asian countries as well. One developer in India indicates that a 2% decrease in interest rates would reduce his levelized tariff by 9%.
- Greater cooperation from Government officials would reduce the plant construction period leading to reductions in the cost of power. One developer indicates that it should be possible to reduce the plant construction period by three to four months, which would reduce his levelized tariff by 10%.

Cumulatively, these factors add significantly to the cost of power.

India can reduce fuel supply costs by improving fuel supply infrastructure to take greater advantage of its vast coal resources. According to an Asia Consulting Group (ACG) analysis, India will have to depend on underground coal mining rather than open shaft mining to meet its future coal requirements. This will require huge investments in the coal sector. Therefore, policy changes are needed to increase private sector participation, and in fact, India is taking steps in this regard. The Government's focus on fuel supply infrastructure as evidenced by the new pipelines, LNG terminals, refineries etc. that are under development.

Likewise, India can reduce country risk by restructuring the power sector and rationalizing wholesale and retail tariffs. India is taking steps in this regard as well. The states of Orissa and Haryana have taken the lead in restructuring their respective State Electricity Boards by splitting the transmission and generation components into separate companies. They are also establishing state regulatory commissions in an effort to rationalize tariffs. A Central Electricity Regulatory Commission has been established as well. In an effort to increase private sector involvement in the power sector, the Government has passed the Transmission Bill and is proposing a new liquid fuel and hydel policy. Funding from USAID, World Bank, ADB, and other donor agencies has contributed substantially to the power sector restructuring and tariff rationalization efforts in India.

India could reduce the cost of power by eliminating or reducing duties on power equipment and reducing or eliminating taxes on power developers, owners and investors. Such actions might be viewed as zero-sum (i.e., the cost of power would be lower, but Government revenues would, in turn, be lower by an equivalent amount), but would send a positive signal to the IPP community.

By directing IPPs to lower their costs, India has benefited from recent cost reductions in power plant equipment, but in the meantime, generating capacity has not been brought on line in the quantities needed. Delays have increased project development costs and reduced investor confidence. It has also had a detrimental effect on the economy owing to reduced power quality and reliability.

Perhaps the most important step that India can take to reduce its cost of power and maximize benefits to the economy is to accelerate the approval process for those projects already in the pipeline. This will demonstrate to the world that India is serious about IPP development, that it can conduct a procurement process in a professional manner, and that it can pay for power delivered. Improving investor confidence will reduce country risk and investor's required rates of return, leading to reductions in the overall cost of power. New generating capacity should be procured on the basis of an open, fair and transparent competitive bidding process that allows the developer to determine a fair rate of return. This is consistent with current Government policy and will ultimately result in the lowest possible cost of power in India.

# I. Objectives and Structure of Report

Recent competitive awards for Independent Power Projects (IPPs) in Asia have attracted tariffs that appear much lower than those associated with awards made in India. This has led to a growing belief that the bid prices for power in India are significantly higher than that for similar projects in neighboring countries. There is a perception that global prices for generation equipment have fallen significantly in recent years and that the benefits have not been realized in India. There is also a perception that the policy implemented in February 1995 requiring competitive bidding for new generating capacity has not resulted in prices materially different from those obtained through the earlier policy which acquired generation through negotiation.

As a result, the Ministry of Power has requested assistance from International Resources Group (IRG) under the USAID-funded *India Regulatory Reform and Restructuring Power Sector* project to examine recent pricing trends in IPP power. The objective of this report is to provide an analysis of IPP cost and tariff data and attempt to determine the factors that contribute to the pricing of power. The analysis includes an examination of tariffs for a broad cross-section of IPPs in India and a comparison with the tariffs for projects in other countries. The primary cost features of the IPPs are compared and factors are identified which differentiate the costs of projects in other countries from the costs for similar projects proposed in India.

Section 2 of this report provides background information on IPP pricing. It discusses the difficulty of comparing project costs in various countries on the basis of quoted tariffs and explains why a transparent, competitive procurement process is the best means for ensuring that a purchaser receives the lowest cost power.

Section 3 compiles cost and non-cost data and information for the tenders selected for the India project study group. These projects represent a broad cross-section of projects in India based on the origin of developers (i.e., domestic, overseas, or joint venture), capacity, fuel type, geographic location, process of selection (i.e., competitive bidding or memorandum of understanding), type of project (i.e., fast-track or non fast-track) and success potential. This section includes the results of interviews with developers, equipment suppliers and fuel suppliers in an effort to obtain information on costs and other factors that contribute to the tariff price.

Section 4 identifies recent awards of international IPP projects. Project selection focuses on projects based in Asia, and emphasizes coal-fired steam projects, but includes gas-fired combined cycle projects as well. Information is also compiled for unsuccessful project proposals judged to be of relevance to India.

Section 5 includes a summary analysis of the information compiled in Sections 3 and 4 to discriminate the factors that contribute to the price of power. The analysis includes the

results of discussions with bid sponsors such as electric utilities government ministries etc to gain additional insight on the IPP procurement process in India

## II. Background

Many factors contribute to the cost of power, and consequently the price that a developer bids for a project For example

- Technology, i e , simple cycle, combined cycle, etc ,
- Type of fuel, i e , coal, natural gas hydro, oil, wind, etc ,
- Fuel cost and characteristics, i e , fuel price subsidization, transportation costs, fuel quality, etc ,
- Cost of equipment, i e , import duties, transportation costs, local manufacturing,
- Cost of labor, i e , percentage that can be completed locally,
- Level and cost of financing and required return, i e , required debt/equity ratio, country risk, availability of government guarantees, enhanced co-financing by donor agencies, etc ,
- Tariff loading and weighting given in the bid process, i e , heavy front-end loading of the tariff is more desirable to the developer but less desirable to the purchaser (some procurements give favorable weighting to bids which are less heavily front-end loaded), limiting band-width of tariff profile within 10%, etc ,
- Basis for quoting the tariff, i e , does the price include *all* costs, levelization methodology, capacity factor used to translate fixed costs on a per kWh basis,
- Costs included in the tariff, i e , some costs are not included in the tariff because the purchaser is covering the cost, such as incorporating transmission, land, fuel supply infrastructure, etc The developer may not be allowed other costs, i e , project development costs, although they are likely to be recovered elsewhere,
- Risks transferred to the developer, i e , a tariff will be higher if the producer must assume risk associated with fuel supply, or if the plant factor is not assured,
- Incentive payments, i e , for achieving availability or early completion targets, and
- Taxes, i e , some counties grant tax holidays for power plants

There is no standard format for reporting IPP tariffs around the world This makes comparisons misleading, and owing to the complex nature of power projects, it is difficult to document tariffs in a format that allows meaningful comparison between countries For example, India quotes its tariff on the basis of a 68.5% plant factor, an exchange rate of Rs 31.5/US\$ (the current exchange rate is closer to Rs 42/US\$), a return on equity of 16% a coal price of Rs 420/tonne etc In Bangladesh, tariffs are quoted on the basis of an 85% plant factor, an exchange rate of Takas 43.75/US\$ (the current

exchange rate is Takas 45 68/kWh) and a natural gas price of \$2 40/GJ There is no return on equity basis because the procurement was competitively bid

Sometimes, the quoted tariff is grossly misleading A project in China with a very low tariff quoted in literature did not include fuel costs, a component that can exceed 50% of the total Another project in Asia had a quoted tariff that included only the cost of the fuel and no capital costs Confidentiality considerations in a competitive market such as that in the Independent Power Project industry complicate matters further

Even if one were able to compare tariffs among different countries on a completely consistent and current basis with the dynamism in the Asian economy today the comparison could quickly become out-of-date For example, in the year ending June 1998, Malaysia, Philippines and Thailand experienced currency depreciation of around 35%, and interest rates in Malaysia and Philippines rose 50%, while interest rates in Thailand are nearly twice the year earlier levels Indonesia was hit even harder, experiencing currency devaluation of 80% and interest rates which are three times higher than before the financial crisis (see *Reference 13*)

Under a professionally conducted competitive procurement process, a purchaser will gain the lowest tariff for its particular power project Under a competitive procurement, a developer will bid the lowest price possible, while constructing the tariff in a manner that ensures it can gain the necessary financing to complete the project and make an adequate profit In effect, the developer's bid represents the tariff that it believes will cover capital and operating costs and achieve the return necessary to attract investors Investors seek the highest returns possible at their particular tolerance for risk Therefore, the project will be financeable only if the return to investors equals or exceeds the return available on other investments with comparable risks

In order for a competitive procurement to be successful, the competition must be transparent and marketed widely to both domestic and foreign developers As noted in *Reference 2*, India has the second most developers in the world involved in its power market, following only the United States India's market was ranked third world-wide (tied with China, following the United States and Brazil) based on a survey of developers Obviously, India has the market and reputation necessary to attract a wide range of investors and now, with the exception of the northeast, all states in India have experience with competitive procurement Over time, India will show that it can conduct fair and transparent procurements and that it can pay for power delivered This will make investors more comfortable with the market, reducing country risk and the required return, with a resultant positive impact on the cost of power

The nature of the project outlined in the bid documents determines the overall capital cost of the project Fuel costs depend on availability and price of domestic or imported fuels that may be determined by the international marketplace, or in some cases by the

Government i.e. Coal India which is wholly-owned by the Central Government sets the price of coal in India. The Government of India is allowing captive mines to be established for power projects but regardless, the developer has little control over the cost of fuel, except to the extent that it is able to negotiate the best price and locate the least cost source. The developer can also reduce its variable costs by installing efficient turbines, and by operating and maintaining the plant in a manner which ensures optimum heat rate.

Therefore, under the GOI's current IPP policy requiring competitive bidding for new generation IPP tariffs are by definition fair, and comparable to prices in other countries when one takes into account the nature of the project, timing and the perceived risk of doing business in India relative to other countries. Over time, there will be further reductions in the cost of power as investors become more comfortable doing business in India. However, India must honor the results of the competitive process. If India goes to the developer following the bid process and demands re-negotiation of the tariff, developers will factor this uncertainty into future project proposals by incorporating higher rates of return in their bids.

Competitive bidding motivates IPP sponsors to limit costs to the greatest extent possible including equipment costs. India has indeed benefited from the drop in equipment prices in recent years. As noted by Mr. Adolf Huttli, Member of the Managing Board of Siemens AG and President, Power Generation Group (KWU), Erlangen, Germany (see *Reference 3*),

*The increasing competition among power vendors has exerted considerable pressure on power plant prices, especially on the part of private power plant investors for whom the economic viability of a project is highly dependent on the investment volume. Because of their surplus capacities suppliers were not able to stand up to this price pressure and the prices of power plants have practically been halved within the space of only a few years!*

Mr. Huttli indicates later in the article that the innovation race among suppliers is particularly evident in the field of combined cycle power plants.

India is also benefiting from the fact that it is currently a buyer's market for power. However, at any given point in time, circumstances could change. In fact, according to *Reference 4*, many global power investors have come to the realization that they have assumed greater political risk than they anticipated. Cambridge Energy Research Associates forecasts that power investment outside the United States is likely to decline by more than 20% this year, while U.S. power investment is forecast to increase this year. At any given point in time, the market's perception of India as a place to invest could change, leaving India with continued power shortages that have plagued it in the past.

For example, Standard and Poor's changed its outlook on India's long term foreign and local currency issuer ratings to negative from stable on May 22 1998. S&P cited "the erosion of India's external financial position and warned that Sanctions and heightened regional tensions could also reduce the flow of foreign direct and equity investment" (Source: India's Credit Rating Affirmed, Outlook to Negative Standard and Poor's, <http://www.ratings.com/sovereigns/news/india.html>). Thus, evaluation of the risk of investing in India and its power sector is a continuous process, as ratings and outlook changes by firms such as S&P prompt detailed sector analysis by investors.

Another point that must be addressed relates to skepticism within India that the competitive procurements have truly been competitive. *Reference 5* states that "Even where the utilities opt for competitive bidding, there is a possibility that the large suppliers can collude to set higher prices." While there is a possibility that this has happened in India, the probability under competitive procurement seems remote. *Reference 2* indicates there are 69 project developers with interests in India. Also, as pointed out by Mr. Huttel in *Reference 3*,

*There is only one global market. The same globally active members compete with one another everywhere. No one can escape from the stiff competition since there are no protected home markets anymore to which one can retreat.*

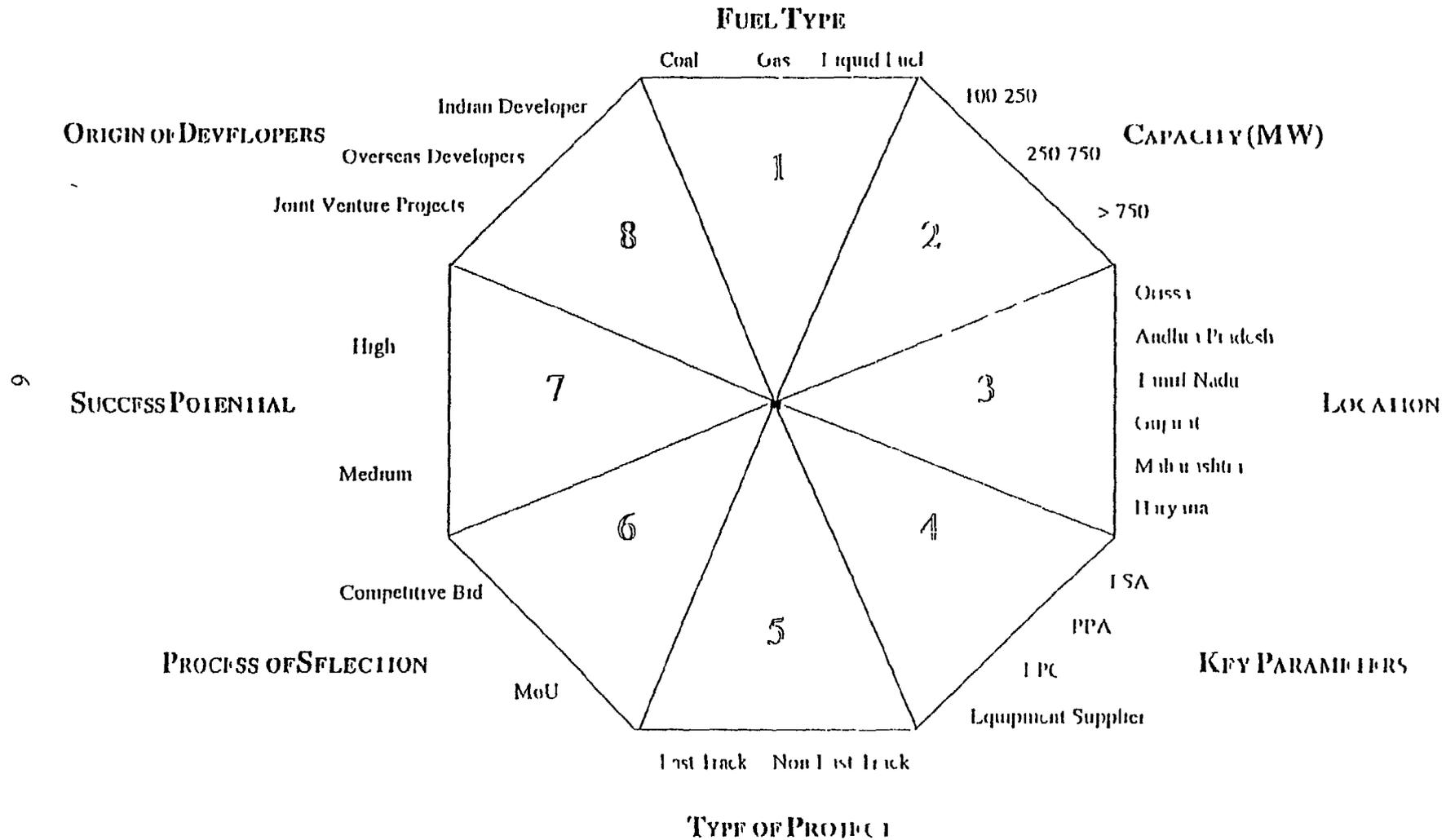
In summary, India will achieve the lowest tariffs for its generation projects provided it adheres to its current policy that power be procured on the basis of a transparent, competitively bid process. In this sense, India's IPP prices will be comparable to those in other countries when one takes into account the nature of the project and the market's perception of India as a place to do business. It is not the Government of India, or any government in the world for that matter, that sets the price of power. It is the market that establishes the price of power and the market is a fluid, constantly changing environment.

### **III. Data and Information on Selected Projects in India**

As discussed earlier, the objective of the study is to provide an analysis of IPP cost and tariff data and attempt to determine the factors that contribute to the cost of power. In this regard, Asia Consulting Group (New Delhi) was commissioned to select a representative sample of projects in India on which to base the analysis. ACG tracks all power projects that are installed or under development/consideration in India. ACG's vast database includes approximately 2400 power projects representing over 300,000 MW of installed capacity. ACG's overall approach to the selection process is shown in Exhibit 1. Phase I included determination of selection criteria, screening, development of preliminary portfolios and selection of projects. The selection criteria include

PROJECT SELECTION CRITERIA

Key parameters pertaining to projects have been considered by ACG for developing the selection criteria. Projects satisfying any four out of the eight sets of criteria are selected for the final analysis.



- Project size (greater than 100 MW),
- Fuel type (coal, gas and liquid fuel),
- Location,
- Success potential (high or medium),
- Progress on the project,
- Whether the project was competitively bid or the result of a memorandum of understanding,
- Fast-track or non fast-track and
- Origin of developers (Indian overseas or joint venture projects)

The selection criteria developed under Phase I produced 15 projects representative of a broad cross-section of IPP developments in India. Under Phase II, detailed profiles of each of the 15 projects were developed, and under Phase III, interviews were conducted with the project developers for the 15 projects, and a cross-section of equipment and fuel suppliers. The 15 project developers were interviewed with varying levels of success. Owing to competitive concerns, some developers were unwilling to provide all of the information being sought, even under the promise of strict confidentiality. One developer was reluctant to provide any information because litigation has been filed against the project with the Supreme Court. However, enough information was gathered to allow a quantitative evaluation of costs and identification of factors differentiating costs between similar projects in India. A report on ACG's analysis is provided in Annex A. Highlights from the developer interviews follow.

### **3.1 Interview Notes Concerning Key Challenges and Price Drivers for IPPs**

- There was some frustration expressed that each of the State Electricity Boards (SEBs) has its own style of negotiation and procurement, leading to inconsistencies and questions concerning credibility at the state level. It is claimed that the SEBs are slow to clear projects and attempt to apply a base figure (oft quoted figure of Rs 4 crore/MW) to each project without regard to project specifics, i.e., site soil conditions for foundations, fuel infrastructure requirements, cooling water requirements, etc.
- There is a cumbersome level of bureaucracy that delays the development process, increasing project development costs and the required tariffs. Frequent changes in Government policy (owing to changes in Government) and norms cause developers to experience further delays. Policy is inadequate, specifically with regard to fuel.
- Fuel is a negative driver of costs. Owing to poor infrastructure, most IPP developers prefer to use imported fuels while the Ministry encourages use of domestic fuel sources.

- Because of limited transmission capacity risk premiums are increased and many projects must be located at the coal mine rather than at the load center
- Financing is rated as a key challenge. The poor financial condition of the SEBs (power is provided virtually free, or much below cost to agricultural customers), the political scenario, India's credit rating (i.e., by Moody's and Standard & Poor's), and uncertainty of dispatch all make financing difficult and required rates of return high. Uncertainty regarding the security of the fuel supply also complicates financing.
- A positive price driver is the current level of power demand in India. Unlike some Asian countries, most areas of India have power deficits, providing confidence that there will be a market for the power. In one developer's words, "India represents growth. We have abandoned other Asian countries where growth in power demand has leveled off."
- Negative price drivers include the Rupee devaluation and higher interest rates.
- Low labor costs in India are a positive price driver.
- The policy requires that developers competitively bid their EPC contract before sending in documentation to the Central Electricity Authority (CEA). Following its technical and economic review, CEA often cuts the allowable price, forcing the developer to re-bid the EPC contract. As a result, initial competitive bids are often not serious and do not reflect the lowest cost.
- There is currently no national policy with regard to wheeling power. Each project must negotiate its own wheeling arrangements and tariff. This acts as a deterrent to new project development.

### **3.2 Interview Notes Concerning Project Costs**

- In a number of cases, the CEA and SEBs have requested developers to reduce costs. Developers claim that often there has been no logic or justification for the directive. Occasionally, developers have been requested to scale down their projects.
- Many developers have reduced costs when directed by CEA. This increases their price risk. There is a general feeling that once a developer agrees to reduce its cost, CEA approaches other developers with similar requests, attempting to "ratchet" down prices. When developers receive a request from CEA or the SEB to reduce costs, they generally go to their equipment suppliers and ask them to reduce their price.

- Developers claim that the fall in global equipment prices has been limited to gas turbines and has not affected costs for coal-fired steam plants
- Developers have the impression that “the PPA is an open book until final closure is attained”
- There is a general feeling that reductions in equipment prices have been more than offset by other factors such as the additional project development costs brought on by the time delays for bringing the project on-line, the recent Rupee devaluation and increase in interest rates. One developer indicated that project re-negotiation can take from two to three years to complete

### 3.3 CEA Response

CEA indicates that it does, indeed, give directives to developers to reduce costs. However, such directives are generally driven by CEA’s benchmark costs/kW for similar plants. CEA requires developers to submit costs by component according to a specific format. CEA reviews each developer’s costs to determine if they fall within a range of costs submitted by other developers taking into account project specifics such as soil quality for foundations, cooling water availability, etc. After taking into account project specifics, if the developer’s costs still appear to be high, CEA directs the developer to reduce costs. In some cases, if a developer has missed a cost item, or if its cost falls below the range of other projects, CEA will notify the developer and ask if the cost should be increased.

CEA denies that it attempts to “ratchet” down prices by pressuring a developer to reduce costs, and when successful, demanding similar reductions in price from other developers. However, CEA indicates that it is constantly reviewing project costs, and if a developer’s costs do not fall within the range of costs provided by other developers, the developer could be directed to review its costs.

With regard to the current market for power in India, CEA forecasts that 40,000 MW of generation capacity will be developed by 2002. This remains far short of India’s forecast capacity requirement of an additional 50,000 MW. Of the 40,000 MW forecast to be developed, 29,000 MW is forecast to be thermal generation, of which 17,000 MW is forecast to be developed by the private sector. CEA identifies transmission and fuel supply infrastructure as significant factors limiting the development of generating capacity. The SEBs have little money for generation, let alone transmission, and India’s fuel supply policy must be overhauled to promote additional private sector involvement.

### 3 4 Project Costs in India

Exhibit 2 shows the range of costs and tariffs for the projects of developers interviewed. These data are provided in a format that protects the identity of the developer because this was a condition the developers imposed in return for the information. The ranges are representative of costs and tariffs for coal steam and gas combined cycle technologies (on naphtha) in India. Some judgement was required in order to put these costs on a basis suitable for comparison, but it is the Consultant's opinion that the costs shown are representative of costs for the associated technologies in India.

#### Exhibit 2 Range of Project Costs and Tariffs Derived from Interviews With Developers

<u>TECHNOLOGY</u>	<u>FUEL</u>	<u>PROJECT COST (US\$/KW)</u>	<u>TARIFF (US CENTS/KWH)</u>
Steam	Coal	1050 - 1300	5.6 - 6.9
Combined Cycle	Naphtha/Gas	735 - 875	6.3 - 8.1

As shown in Exhibit 2, project costs and tariffs range widely. This is not surprising given the wide-ranging nature of the projects and wide range of reporting mechanisms. For example, project costs for a pit-head coal plant tend to be at the low end of the range, while project costs for a coal plant burning imported coal requiring extensive coal transport facilities tend to be at the high end of the range. Tariffs do not necessarily mirror project costs as the cost of fuel comes into play. Another important consideration influencing project costs and tariffs is the exchange rate and the timing of the estimates. Some of the estimates reported were based on earlier exchange rates, for example, Rs 31.5/US\$, while others are based on more recent exchange rates such as Rs 39.5/US\$. In the author's judgement, representative project costs in India for the two technologies listed above are shown in Exhibit 3.

### Exhibit 3 Representative Project Costs and Tariffs for Indian Power Projects

<u>TECHNOLOGY</u>	<u>FUEL</u>	<u>PROJECT COST (US\$/KW)</u>	<u>TARIFF (US CENTS/KWH)</u>
Steam	Coal	1175	6.2
Combined Cycle	Naphtha/Gas	800	7.2

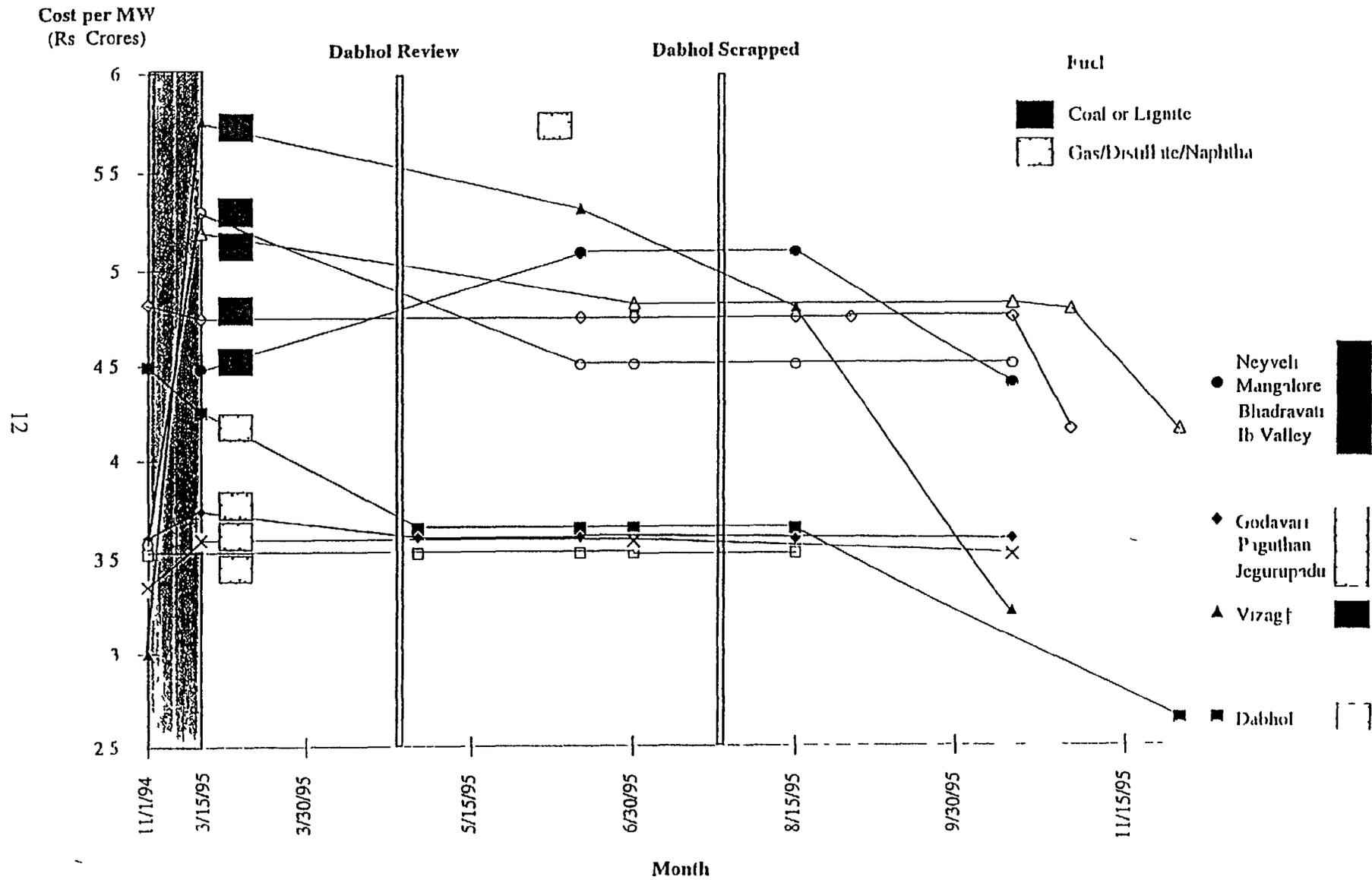
When calculated on the basis of the CEA guidelines the financial models of Tongia and Banerjee (see *Reference 5*) indicate project costs of US \$1463/kW for coal projects and US \$653/kW for gas projects. The corresponding tariffs determined by the financial models are quoted as US 7.64 cents/kWh and US 5.70 cents/kWh for coal and gas plant, respectively. It is interesting that the ACG survey indicates coal project costs and tariffs which are lower than CEA guidelines, while gas project costs and tariffs are higher than CEA guidelines.

As noted earlier, there is a perception that the policy requiring competitive bidding for new generating capacity has not resulted in prices materially different from those obtained through the earlier policy that acquired generation through negotiation. This is a difficult comparison to make in India because negotiations are still underway for many projects. Many IPP developers indicated in the surveys that they have been pressured to reduce equipment costs and tariffs. Certainly this is true of projects procured through negotiation, but some developers indicate that it is also true for projects that have been competitively bid. This impairs the competitive bid process in that developers are unlikely to take future competitions seriously. If, in fact, the competitive bid process becomes a negotiation, one would expect prices to be similar under the two procurement methodologies because they become more or less the same. In fact, upon review of the figures, there may be slightly lower prices for the projects that were competitively bid, but there are insufficient data to make a defensible statement in this regard. According to *Reference 1*, tariffs for Indonesian projects that were competitively bid were not significantly different than tariffs for projects that were directly negotiated.

Another point that should be discussed relates to the impact of Dabhol on project costs and tariffs for other fast-track projects in India. Since Dabhol was scrapped in mid-1995 (Dabhol is now back on track) project costs and tariffs have trended downward in India as shown in Exhibits 4 and 5. It is expected that this relates to pressure applied by the Indian Government on the IPPs to reduce the cost of power. In fact, developers support this statement, but it has been aided by reductions in equipment costs over this time frame and the fact that it has been a buyer's market. The Government pressure has resulted in a favorable impact on the cost of power in India, but these reductions have come at a cost to the Indian economy, as delays in bringing power projects on line have resulted in reduced power quality and reliability.

Exhibit 4

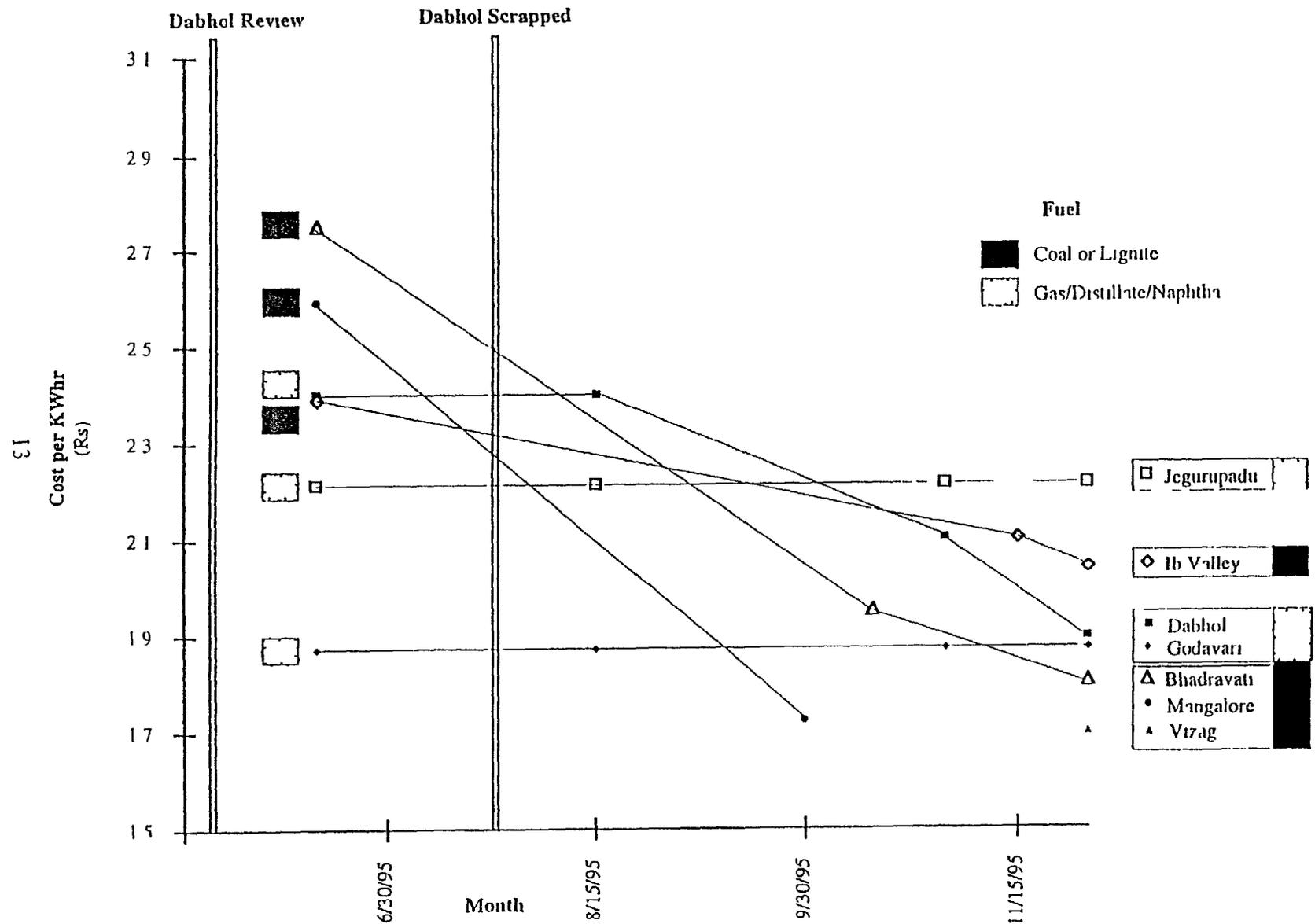
PROJECT COST DABHOL IMPACT? (FAST-TRACK PROJECTS)



Source: Industry & Government Reports, ACG Models & Databases, ACG Analysis

Exhibit 5

POWER PURCHASE TARIFF DABHOL IMPACT? (FAST-TRACK PROJECTS)



Source: Industry & Government Reports, ACG Models & Databases, ACG Analysis

## IV. RECENT AWARDS OF PROJECTS TENDERED INTERNATIONALLY

A number of projects in countries that have recently acquired independent power projects have been identified and selected for further analysis on the basis of the following factors

- Technology/size/fuel type i e , priority given to plant sizes of at least 100 MW and coal steam projects as many projects in India fall into this category However, combined cycle gas projects are also considered,
- Geographic location, i e , priority given to Asian projects,
- Timing of procurement process i e , priority given to projects acquired in past three years, and
- Availability of cost data and information on the project

The international competitive IPP procurements conducted in Bangladesh in 1997 are probably the most discussed procurements in recent years Both procurements were for single, combined cycle, natural gas projects with nominal outputs of 350 MW in one solicitation and 450 MW in the other solicitation The winning bid in both cases was the AES Corporation The tariffs in the winning bids caught the attention of the industry US 3 0 cents/kWh in the first solicitation and US 2 8 cents/kWh in the second solicitation These tariffs appeared to be considerably lower than tariffs in other Asian countries where tariffs often exceed US 6 0 cents/kWh For example, IFC states in a September 1996 publication (*Reference 1*)

*In the base load thermal power plants financed by IFC in recent years, the cost of power (including fuel) has ranged from 4 7 to 7 3 US cents per kWh, which is comparable with costs in OECD markets*

The publication also shows tariffs for several Indonesian power projects scheduled for service between 1997 and 2002 The tariffs range from a low of US 6 0 cents/kWh to a high of about US 7 3 cents/kWh with the higher tariffs associated with projects coming into service in the later years

IFC has significant involvement in the IPP programs of three Asian countries In Pakistan, IPPs were offered a tariff of US 6 5 cents/kWh The procurement which was not competitive, attracted more than 3000 MW of bids from a large number of international IPP developers IFC has also been involved with IPPs in the Philippines and India where tariffs have generally exceeded US 6 0 cents/kWh All three of these

countries and a number of other Asian countries have since approached developers in an attempt to re-negotiate the price prompted primarily by the Asian financial crisis reductions in equipment prices and the apparent lower tariffs being secured in other countries, specifically Bangladesh and more recently, Egypt. The 2x325 MW natural gas-fired Sidi Krir BOT project in Egypt was competitively bid and the winner was announced earlier this year. Reportedly, a consortium headed by Intergen of the United States will sell power to the Egyptian Electricity Authority at US 2.6 cents/kWh. The World Bank-sponsored project will burn locally available natural gas (Source: Ringing Up Business as Usual, Egypt Business Development March 1998).

In order to understand the principal drivers of IPP tariffs, the competitive procurement for the Meghnaghat project in Bangladesh is discussed in some detail. This project was competitively bid in 1997, and is a 450 MW combined cycle plant fuelled with natural gas produced locally and delivered to the plant gate. Bids received from five developers are shown in Exhibit 6. The names of the bidders are not shown for reasons of confidentiality, although it is public knowledge that AES Corporation won the procurement with a bid of US 3.0 cents/kWh. Even the highest bid at US 4.27 cents/kWh is far below the US 6.0 cents/kWh often seen in other Asian countries.

The low bids submitted in the Bangladesh procurement reflect a number of important considerations. First, it is a combined cycle facility fuelled with natural gas. There have been substantial cost reductions for equipment for this type of plant in recent years, and plant conversion efficiencies have improved to where they now exceed 50%. Second, a locally available low cost, environmentally acceptable fuel supply delivered to the plant gate results in lower fixed and variable costs. Third, transmission costs to incorporate the plant into the grid are to be paid by the purchaser. Fourth, a highly transparent IPP policy supported by the World Bank's Private Sector Energy Development Fund led to increased investor confidence. The commercial lenders provided longer-term finance at competitive interest rates.

## Exhibit 6 Bangladesh – Meghnaghat Power Project

COST COMPONENTS	AES	BID 2	BID 3	BID 4	BID 5	PERCENTAGES	
						AES	OTHERS
Levelized Tariff	3 02	3 41	3 82	4 06	4 27	100	100
Fixed Component	1 02	1 32	1 79	1 94	2 35	34	45
Variable Component	2 00	2 09	2 03	2 12	1 92	66	55
Relative to Base	Base	+13%	+26%	+34%	+41%		

### Notes

Plant details range from 430 to 450 MW, natural gas, combined cycle technology  
 Fixed costs include switchyard, but no transmission costs  
 Gas priced at \$2 40/GJ (to reflect World price)  
 Commercial operation July 1, 2000 Contract length 22 years  
 Assumed capacity factor for levelization calculation 85%  
 Tariff not to increase or decrease by more than 10% year-to-year  
 Project penalized if tariff front-end loaded

Part of the reason for the low cost of power in Bangladesh is the availability of a low cost fuel supply and technology Combined cycle technology with a locally available supply of natural gas is simply a lower cost power option compared to technologies such as coal steam plants fuelled with imported coal, particularly when environmental considerations are taken into account However, the low cost of power in Bangladesh can also be attributed to other factors related to the competitive procurement process, as follows (see *Reference 7*)

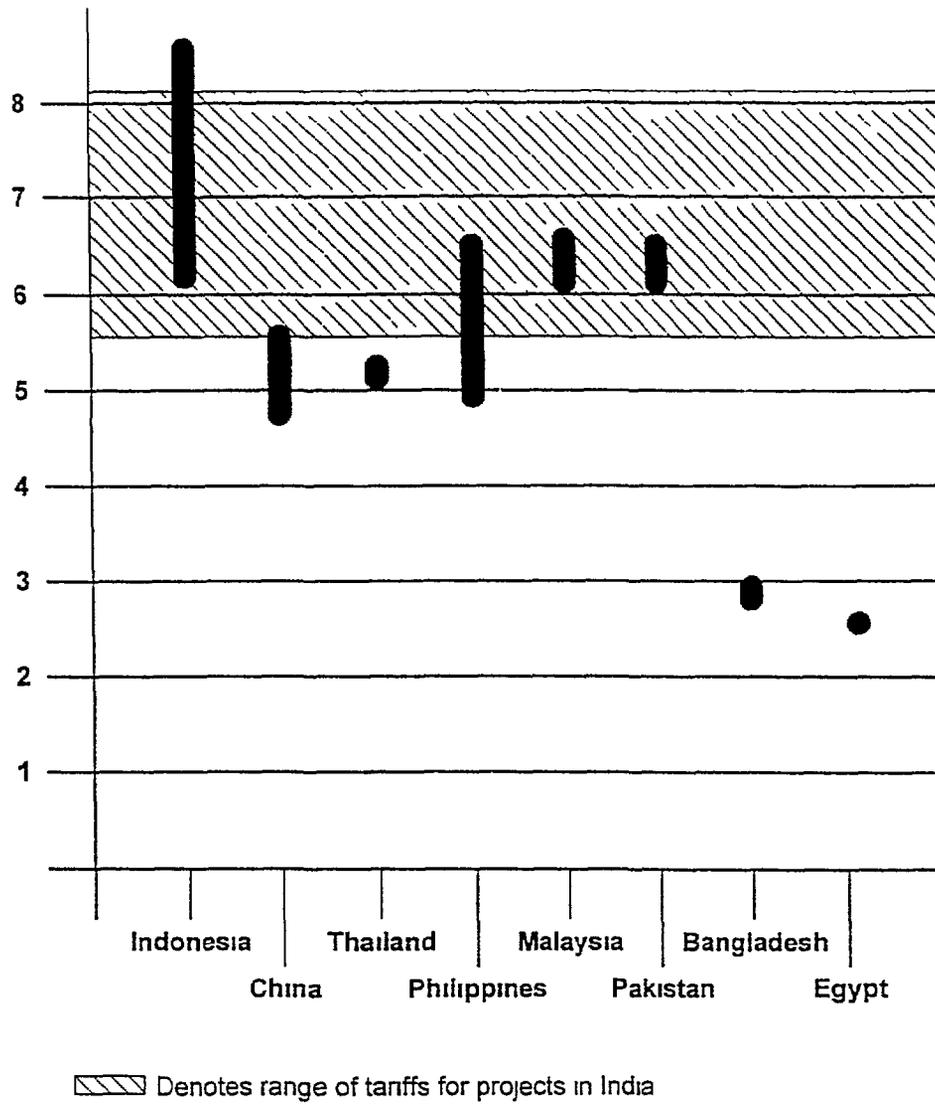
- There was little government interference in the procurement process,
- The procurement was price-based rather than cost-based, allowing developers rather than government to determine a fair return,
- The Power Purchase Agreement is guaranteed by the Government of Bangladesh for performance obligations of the concerned utilities,
- The performance of the fuel supplier is guaranteed by the Government of Bangladesh under the terms of the Fuel Supply Agreement,
- There is no customs duty, value added tax, or other surcharges on equipment (compared to 20% duties on equipment imported to India),
- Private power companies are exempt from corporate income tax for a period of 15 years (in India they generally have a five-year tax holiday on profits but tax implications vary by project),
- Foreign lenders to private power companies are exempted from income tax,
- Repatriation of equity along with dividends is allowed freely, and

- There is a tax exemption on capital gains from transfer of shares by the investing company

These factors lead to reduced construction costs, reduced project development costs, and reduced country risk, reducing the return required by investors. It should also be pointed out that the higher 85% capacity factor assumed in the levelization calculation makes the tariff appear lower as project fixed costs are spread out over more kWh. Assuming a capacity factor of 68.5% which is used as the basis for reporting IPP tariffs in India would add roughly 10% to the tariff of AES' winning bid.

Exhibit 7 shows a range of tariffs for IPP projects in various countries, with an emphasis on Asia. The range covers both coal and gas projects and includes only projects that have been procured over the past three years. Exhibit 8 shows what are judged to be representative project costs and tariffs in each country included in Exhibit 7. It shows country, fuel type, project cost and levelized tariff. Once again, in order to protect the confidentiality of the source, data are average, or typical, of projects of that fuel type in the specific country. Some of the tariffs are well known, having been quoted extensively in the literature, but others have been provided to the author under strict conditions related to confidentiality. The data for India are consistent with Exhibit 3.

# Exhibit 7 Range of IPP Tariffs on Various Countries

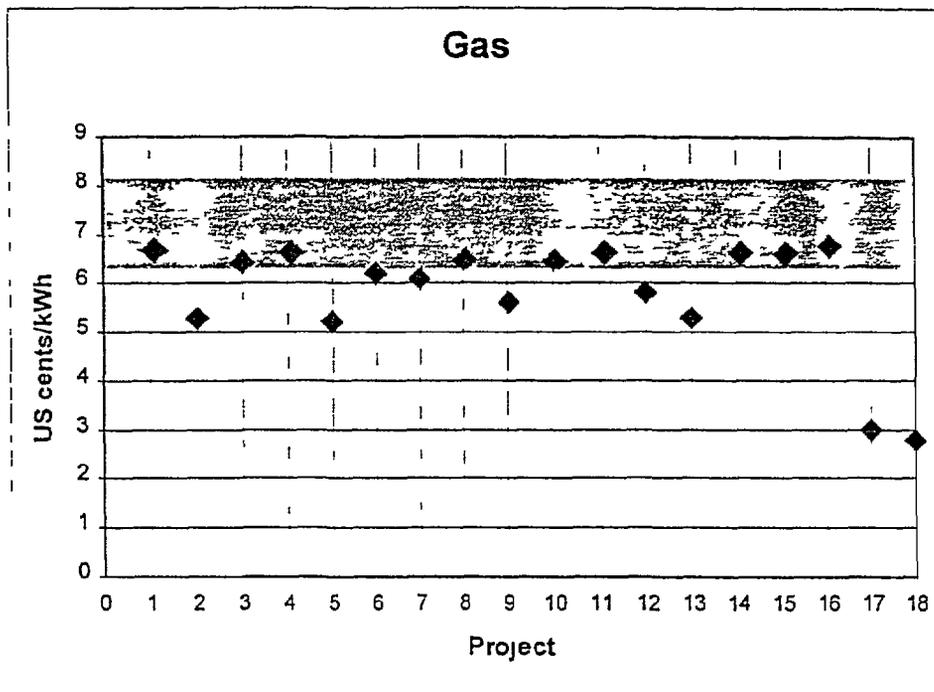
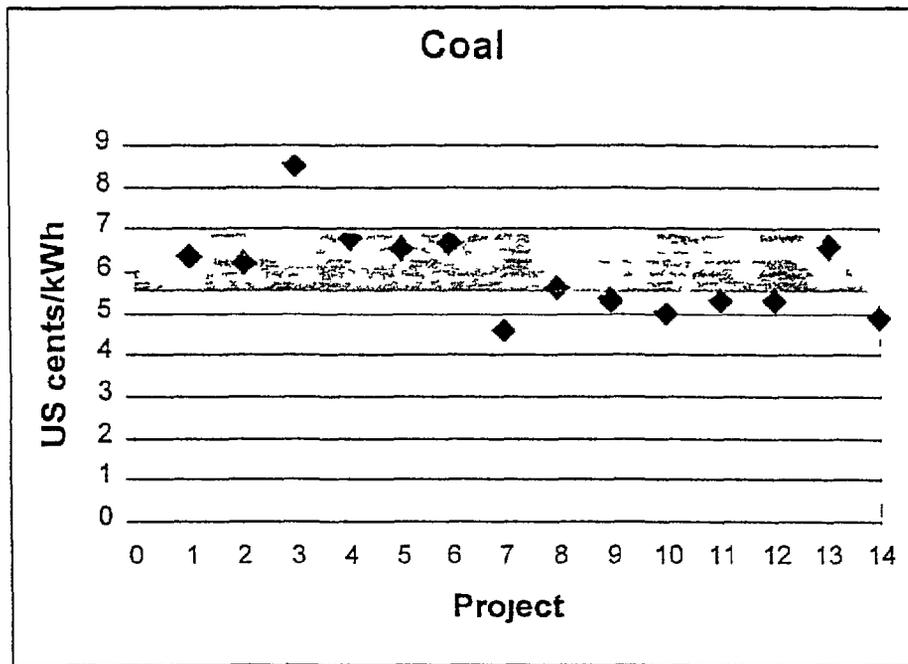


### Exhibit 8 Project Costs and Tariffs for Recently Awarded International Projects

COUNTRY	FUEL TYPE	PROJECT COST (US\$/KW)	TARIFF (US C/KWH)
Indonesia	Coal	1365	6 36
	Gas	1667	6 7
China	Coal	760	5 15
Thailand	Coal	1460	5 26
	Gas	764	5 26
Philippines	Coal	1165	5 7
	Gas	890	6 1
Malaysia	Gas	1150	6 6
Pakistan	Gas	1150	6 5
Bangladesh	Gas		2 9
Egypt	Gas		2 6
India	Coal	1050	6 2
	Gas	800	7 2

Finally, Exhibit 9 shows tariffs for a large number of IPP projects undertaken in recent years. Gas and coal projects are shown, and all projects are situated in Asia.

## Exhibit 9 Tariffs for Various Coal and Gas Projects Undertaken in Asia in Recent Years



--- Denotes range of tariffs for projects in India

## V. Summary Analysis

As discussed, it is misleading to compare tariffs between countries except as a general indication of relative power costs. There are many differences in reporting methodologies and what developers are required to incorporate in their costs. For example, in Pakistan's procurement, the developer is not responsible for arranging the fuel supply or providing the infrastructure necessary to deliver the fuel to the plant, whereas in India, the developer is expected to secure and arrange delivery of its own fuel supply. Obviously, power in India appears to have a higher cost under this scenario, particularly since fuel in India is often imported. Also, as noted earlier, owing to the Asian financial crisis, some tariffs may require re-calculation to account for changes in foreign exchange and interest rates, and many IPP projects in Asia, including India, are being re-negotiated, so it is possible that some of the reported tariffs are no longer valid. In fact, a number of IPP projects have been cancelled outright. In the Philippines alone, 16 projects have been cancelled and many had signed contracts (see *Reference 13*).

However, in spite of all the qualifiers, some general comparisons can be made. Exhibits 7, 8 and 9 show that project costs and tariffs vary widely from one country to the next. Certainly, tariffs for the projects awarded under competitive bidding in Bangladesh are substantially lower than tariffs shown for other Asian countries. Tariffs in Thailand are lower than average and they, too, were secured through competitive bidding. IPP project tariffs appear to be highest in Indonesia where most projects were concluded through direct negotiation with project sponsors. With the exception of Bangladesh, project costs and tariffs in India are comparable to awards made in other Asian countries, but do tend to be above the average. This may be, in part, due to the procurement process as India has secured power both through direct negotiation and through competitive bidding.

The level of country risk also contributes to higher IPP costs in India. As IPP developers review the array of countries opening up their power sectors to foreign investment, India must compete not only against its neighbors in Asia, but also against countries throughout Latin America, Africa, and indeed, globally. Country risk in the form of sovereign ratings by agencies such as Moody's Investor Services and Standard & Poor's, constitute a significant input to an IPP's market analysis. As can be seen in Exhibit 10, Moody's assigns a sovereign rating of Ba2 to India's long-term bonds and notes, while rating its long-term bank deposits Ba3. Thus, India is deemed a greater risk than Egypt, China, Malaysia and the Philippines, but a lesser risk than Pakistan or Indonesia (Source: Sovereign Ceilings for Foreign-Currency Ratings. Current as of 10/13/98, Moody's Investors Service <http://www.moody.com>).

## Exhibit 10 Sovereign Ceilings for Foreign Currency Ratings

	Sovereign Ceilings for Foreign-Currency Ratings	
Country (from highest to lowest ranked)	Long-Term Bonds and Notes	Long-Term Bank Deposits
China	A3**	Baa2**
Malaysia	Baa3**	Ba1**
Egypt	Ba1	Ba2
Philippines	Ba1	Ba2
Thailand	Ba1	B1
<i>India</i>	<i>Ba2</i>	<i>Ba3</i>
Pakistan	B3	Caa3
Indonesia	B3	Ca

\*\* under review for possible downgrade

In order to gain further insight into the cost of power in India, project costs for a coal plant in India are compared to the project costs for a coal plant in Thailand. Data provided by CEA indicate that a representative project cost for steam plant fired with imported coal in India is US\$ 1250/kW. This particular project will have external coal handling facilities and requires a jetty for coal transport. This compares to project costs for coal plant in Thailand of US\$ 950/kW. Coal projects in Thailand must also burn imported coal, so it appears that coal plant procured through competitive bidding in Thailand is less expensive than in India. Some of the reasons that project costs are lower in Thailand follow:

- The coal projects examined in Thailand are larger than the representative project considered in India, leading to economies of scale and reduced costs on a per kilowatt basis,
- Power equipment in Thailand is exempt from import duties (compared to 20% import duties in India),
- Country risk is judged to be lower in Thailand owing to the financial soundness of the buyers relative to India's SEBs, and
- Project development costs are lower in Thailand

International developers identified a number of additional contributors to higher power costs in India. These factors listed below undermine the attractiveness of the Indian power sector in more detailed analyses conducted by developers.

- The current fuel situation in India leads to increased cost of power. India does not have a domestic supply of low cost natural gas and the cost to import natural gas (i.e., as liquefied natural gas) is quite high. India does have large domestic sources of coal, but the coal is of poor quality, having a high ash content and relatively low BTU value. Inadequate fuel policy and infrastructure compounds the fuel quality problem. Domestic producers and transporters of fossil fuels in India are reluctant to take on supply risk. In a number of cases, in order to secure financing, developers are forced to import fuel and provide their own transportation facilities, leading to increased cost of power.
- High import duties of 20% on equipment increase the cost of power. One developer indicates that removing the duty would reduce his levelized tariff by 6%.
- Frequent changes in Government policy (i.e., owing to changes in Government) and norms delays the project approval process and increases project development costs.
- The inadequacy of the transmission system increases risk premiums and can force developers to locate projects in locations that are less than ideal.
- Taxes on profits from incentive payments increase the required return incorporated in the tariff.
- Country risk for IPPs tends to be even higher in India owing to the absence of Government guarantees (except on the fast-track projects) and the poor financial condition of the SEBs.
- Macro-economic considerations such as the recent Rupee devaluation and high interest rates increase the cost of power, although interest rates and foreign exchange have deteriorated in other Asian countries as well. One developer in India indicates that a 2% decrease in interest rates would reduce his levelized tariff by 9%.
- Greater cooperation from Government officials would reduce the plant construction period leading to reductions in the cost of power. One developer indicates that it should be possible to reduce the plant construction period by three to four months, which would reduce his levelized tariff by 10%.

Cumulatively, these factors add significantly to the cost of power in India.

In summary comparing the costs of IPPs from one country to the next is difficult and can be misleading, particularly in light of recent re-negotiations and turmoil in Asian financial markets. There are some specific reasons why the cost of power in India will be higher than elsewhere, for example, the absence of a domestically available low cost supply of fuel such as natural gas. Other factors driving the cost of power in India relate to country risk and the procurement process.

India can reduce fuel supply costs by improving fuel supply infrastructure to take greater advantage of its vast coal resources. According to an Asia Consulting Group (ACG) analysis, India will have to depend on underground coal mining rather than open shaft mining to meet its future coal requirements. This will require huge investments in the coal sector. Therefore, policy changes are needed to increase private sector participation, and in fact, India is taking steps in this regard. The Government's focus on fuel supply infrastructure as evidenced by the new pipelines, LNG terminals, refineries etc. that are under development.

Likewise, India can reduce country risk by restructuring the power sector and rationalizing wholesale and retail tariffs. India is taking steps in this regard as well. The states of Orissa and Haryana have taken the lead in restructuring their respective State Electricity Boards by splitting the transmission and generation components into separate companies. They are also establishing state regulatory commissions in an effort to rationalize tariffs. A Central Electricity Regulatory Commission has been established as well. In an effort to increase private sector involvement in the power sector, the Government has passed the Transmission Bill and is proposing a new liquid fuel and hydel policy. Funding from USAID, World Bank, ADB, and other donor agencies has contributed substantially to the power sector restructuring and tariff rationalization efforts in India.

India could reduce the cost of power by eliminating or reducing duties on power equipment and reducing or eliminating taxes on power developers, owners and investors. Such actions might be viewed as zero-sum (i.e., the cost of power would be lower, but Government revenues would also be lower by an equivalent amount), but would send a positive signal to the IPP community.

India has benefited from recent cost reductions in power plant equipment, but in the meantime, IPPs have not been brought on line in the amounts needed. Delays have increased project development costs and reduced investor confidence. It has also had a detrimental effect on the economy owing to reduced power quality and reliability.

Perhaps the most important step that India can take to reduce its cost of power and maximize benefits to the economy is to accelerate the approval process for those projects already in the pipeline. This will demonstrate to the world that India is serious about IPP development, that it can conduct a procurement process in a professional manner, and

that it can pay for power delivered. Improving investor confidence will reduce country risk and investor's required rates of return, leading to reductions in the overall cost of power. New generating capacity should be procured on the basis of an open, fair and transparent competitive bidding process that allows the developer to determine a fair rate of return. This is consistent with current Government policy, and will ultimately result in the lowest cost of power in India.

## List of References

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- 2 *190 Independent Power Companies – Profiles of Industry Players and Projects* Global Power Report, The McGraw Hill Companies, 1998
- 3 *Challenges of the Power Plant Market* by Adolf Huttli McGraw-Hill's World Energy, the Official Publication of the 17<sup>th</sup> Congress of the World Energy Council, 1998
- 4 *A New Focus on US Power Investment Opportunities* by Lawrence J Makovich McGraw-Hill's World Energy, the Official Publication of the 17<sup>th</sup> Congress of the World Energy Council 1998
- 5 *Price of Power In India* by Rahul Tongia and Rangan Banerjee Energy Policy, Volume 26, Number 7, pages 557 – 575, 1998
- 6 *Privatization Principles and Practice, Lessons of Experience Series Volume 1* International Finance Corporation, cataloged by the Library of Congress, United States of America, September, 1995
- 7 *Private Sector Power Generation Policy of Bangladesh* Ministry of Energy and Mineral Resources, Government of the People's Republic of Bangladesh, October 1996
- 8 *Global Private Power Generation Risks and Opportunities* By Martin Daniel, published and distributed by Financial Times Energy in Global Private Power Generation, 1997
- 9 *The Captive Report, 1998* Published and distributed by Power Line Research, a division of India Infrastructure Publishing Pvt Ltd, New Delhi
- 10 *India's Electricity Sector – Widening Scope for Private Participation* Ministry of Power, September 1997 (supplement to September 1996 edition)
- 11 *Asian Power Plays, Asia Pacific Utilities* Caroline A Rogers, Merrill Lynch, February 4, 1998

- 12 *Power Policy Survey & Analysis* USAID – EMCAT – R3 by Asia Consulting Group, June 19,1998
- 13 *The East Asian Financial Crisis – Fallout for Private Power Projects* By R David Gray and John Schuster, Public Policy for the Private Sector, The World Bank Group, September 1998

**Annex A**  
**Task Order 17**  
**Final Report by Asia Consulting Group**

Project entails producing approximately 83 slides



## INTERNATIONAL RESOURCE GROUP TARIFF STUDY OVERVIEW

Scope of Project	Expected Output	No of Slides
<b>Phase I Criteria, Screening, Preliminary Portfolios and Selection</b>	<b>Phase I</b>	
<ul style="list-style-type: none"> <li>Development of Selection Criteria                             <ul style="list-style-type: none"> <li>- MW of the Project (&gt; 50 MW)</li> <li>- Fuel (Coal, Gas and Liquid Fuel)                                     <ul style="list-style-type: none"> <li>Success Potential (High Medium or Low)</li> </ul> </li> <li>- Progress of the Project (PPA EPC TEC In-principle)</li> <li>- MoU or Competitive Bid Project</li> </ul> </li> <li>• Screening Preliminary Profiles &amp; Selection of Projects for detailed analysis                             <ul style="list-style-type: none"> <li>- Screening based on Criteria Developed</li> <li>- Preliminary Profiles of the Projects (Progress MoU, Fuel, MW and location)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Selection Criteria and ACG Methodology</li> <li>• Overview of the Projects</li> <li>• Project Lists</li> <li>• Profile of the Projects For Each Project                             <ul style="list-style-type: none"> <li>Overview                                     <ul style="list-style-type: none"> <li>- Project Cost / Tariff Renegotiation Timeline</li> <li>- Key Drivers of the Project</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>4</li> <li>1</li> <li>3</li> <li>45</li> </ul>
<b>Phase II Detailed Profile and Analysis of Selected Projects</b>	<b>Phase II</b>	
<ul style="list-style-type: none"> <li>Detailed Profiles of Selected Projects (2-3 page profiles)</li> <li>• EPC component cost study for the Indian Projects</li> <li>• Interview with the Equipment Suppliers</li> <li>• Fuel cost component study</li> <li>• Study of trend of the fuel prices of coal and gas</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment Supplier Profile                             <ul style="list-style-type: none"> <li>General Electric Asca Brown Boveri Wartsila BHEL, GEC Alsthom, Siemens, Rolls Royce White Westinghouse Ansaldo (Supplier List Not confirmed and might be changed)</li> </ul> </li> <li>• Fuel cost component v/s fuel price</li> <li>• Trends of fuel prices</li> </ul>	<ul style="list-style-type: none"> <li>10</li> <li>2</li> <li>3</li> </ul>
<b>Phase III Interviews with Developers</b>	<b>Phase III</b>	
<ul style="list-style-type: none"> <li>Developer Interviews                             <ul style="list-style-type: none"> <li>To ascertain the price drivers for power projects in India</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Developer Interview Profiles</li> </ul>	<ul style="list-style-type: none"> <li>15</li> </ul>

Total Slides = 83 Nos

Source ACG Methodology and Client Briefing ACG Models & Databases ACG Analysis

IRG Tariff Study Overview/10001/1st

0 Project Overview 0 1

Asia Consultum

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# PROJECT TEAM



## Client Management

Mr Ronald H Leasburg, Chief of Party, IRG Ltd  
Mr Doug Bowman, IRG



## ACG Project Team

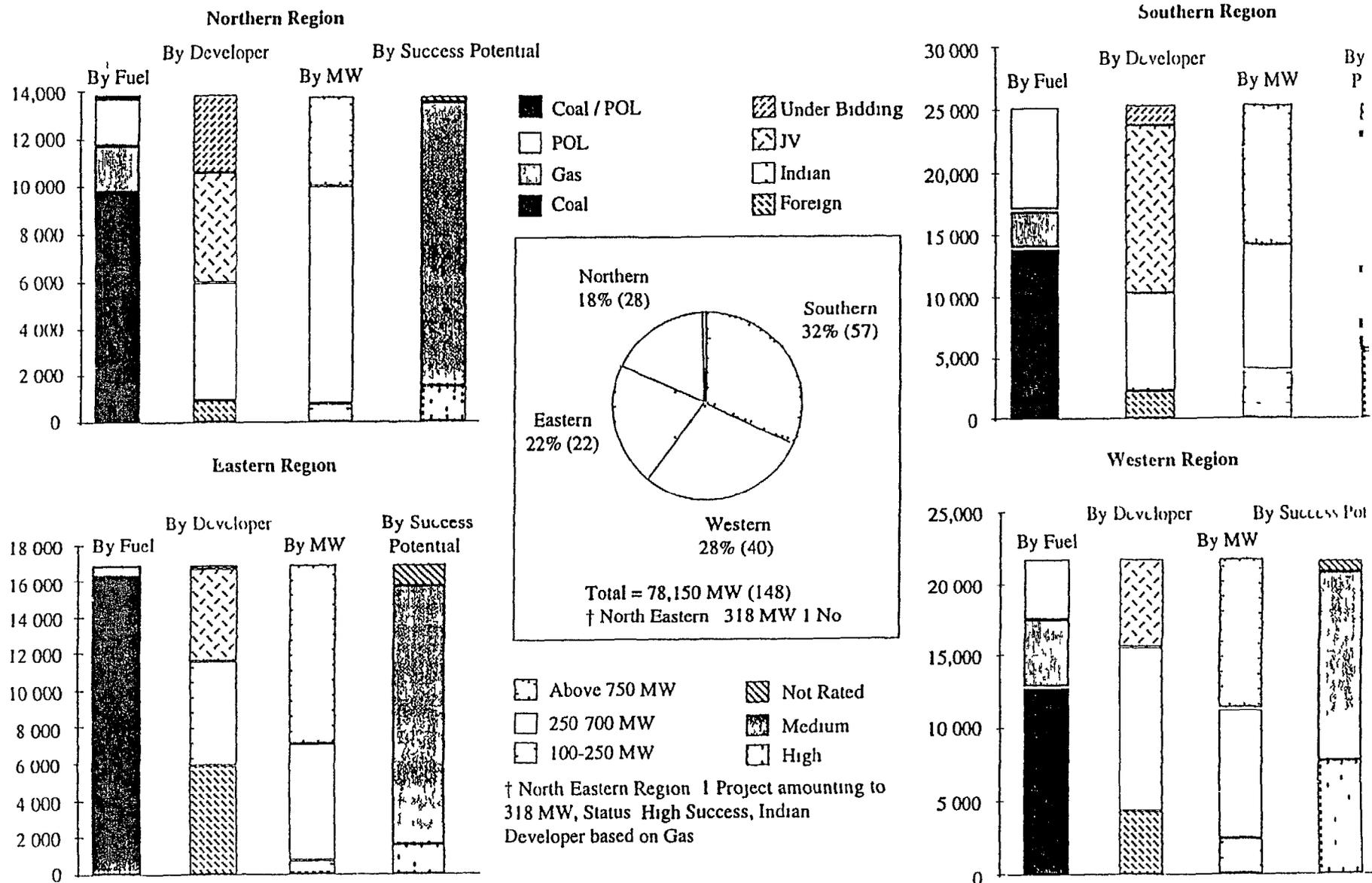
Mr V Kanwarpal Project Manager  
Mr JS Anand, Sr Analyst  
Mr G Lal, Analyst  
Mr G Varghese, Analyst

## ACG Advisors

At the level of former  
Chairman, MD or Chief Engineer of SEBs  
or Central Sector Undertakings

Approximately 148 projects amounting to 78 150 MW meet the client criteria

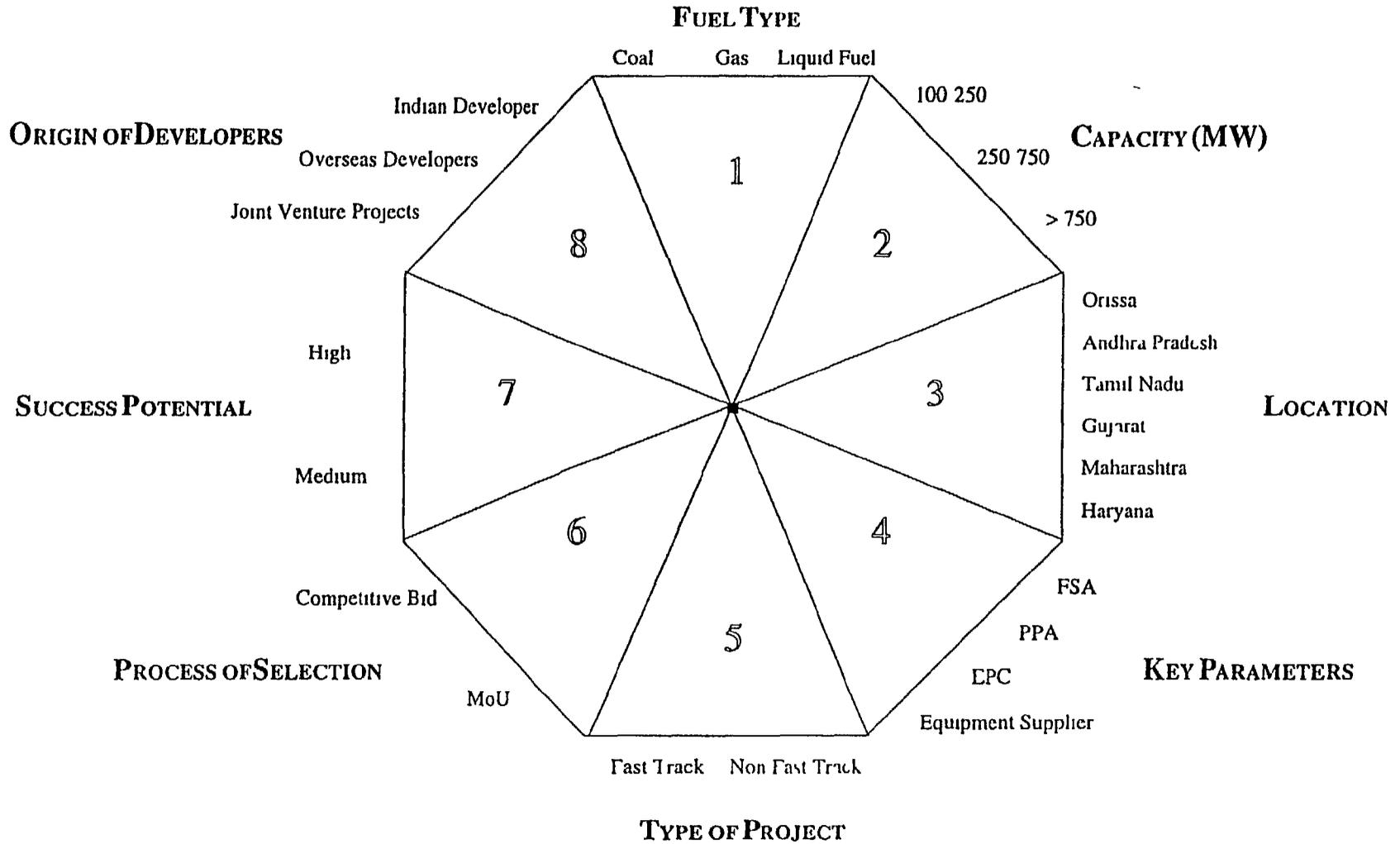
# NPT HIGH AND MEDIUM, COAL, GAS AND LIQUID FUEL PROJECTS > 100 MW



31

# PROJECT SELECTION CRITERIA

Key parameters pertaining to projects have been considered by ACG for developing the selection criteria  
 Projects satisfying any four out of the eight sets of criteria are selected for the final analysis



† The states selected are subjected to change

A total of 8 criteria set and 24 options have been used by ACG in order to select the projects for final analysis



## RATIONALE FOR CRITERIA FOR SELECTION OF PROJECTS

CRITERIA SET	OPTIONS	COMMENTS & RATIONALE
<b>Fuel Type</b>	Coal Gas Liquid Fuel	<ul style="list-style-type: none"> <li>• Coal Gas and Liquid fuel based projects constitute majority of projects under development in the country</li> <li>• Equipment using these fuels are subjected to the maximum fluctuation in price (The EPC contract for naphtha based power projects normally constitute roughly 80% of the project cost )</li> </ul>
<b>Capacity (MW)</b>	100 250 MW 250 750 MW > 750 MW	<ul style="list-style-type: none"> <li>• Client requirement</li> <li>• Projects are classified into three different categories of installed capacity in a view to analyze the cost dynamics in all the ranges of installed capacity</li> </ul>
<b>Location</b>	Orissa Andhra Pradesh Tamil Nadu Gujarat Maharashtra Haryana	<ul style="list-style-type: none"> <li>• Selection of states is done in a manner to represent all regions of the country</li> <li>• The states under consideration are those key states in different regions where maximum number of project are under development</li> <li>• States that have the maximum cost and tariff renegotiations are also considered (The list of states is subjected to change )</li> </ul>
<b>Key Parameters</b>	Finalization / Negotiations of  PPA FSA EPC Equipment Suppliers	<ul style="list-style-type: none"> <li>• PPA, FSA, EPC and Equipment Supply contracts are key from the perspective of project cost and tariff negotiated</li> <li>• Projects that have finalized or that are renegotiating these key contracts have been selected for final analysis</li> </ul>

ACG has incorporated all possible options under the 8 selection criteria for selecting the final projects for analysis

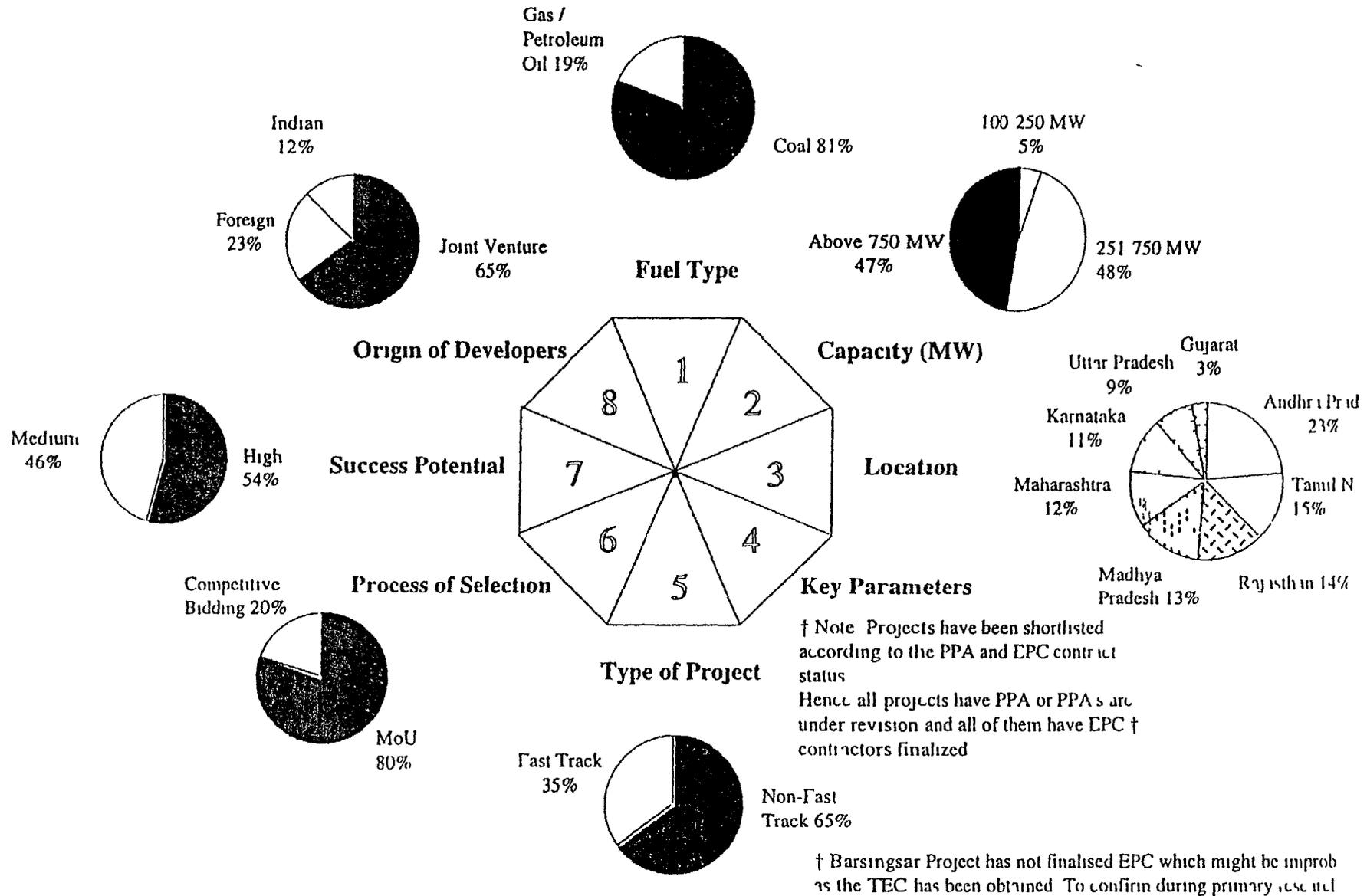
## RATIONALE FOR CRITERIA FOR SELECTION OF PROJECTS (CONTD . )

CRITERIA SET	OPTIONS	COMMENTS & RATIONALE
Project Type	Fast Track Non Fast Track	<ul style="list-style-type: none"> <li>• Projects are broadly classified into Fast Track and Non Fast Track</li> <li>• Due weightage has been given to both these categories while selecting the final projects for analysis</li> <li>• While Fast tracks may have had greater negotiations but Non-Fast Tracks have also been analyzed to anticipate the activity</li> </ul>
Process of Selection	Competitive Bid MoU	<ul style="list-style-type: none"> <li>• These are the two main selection procedures of developers for a project</li> <li>• In order to analyze the specific patterns followed in project cost and tariff renegotiation, projects under both these categories are considered in the final analysis</li> </ul>
Success Potential	High Medium	<ul style="list-style-type: none"> <li>• Project rated High and Medium (ACG Rating) have the highest level of activity among the projects under development</li> <li>• High and medium rated projects includes projects that were initiated or renegotiated in the last three years</li> </ul>
Origin of Developer	Indian Developer Overseas Developer Joint Venture Project	<ul style="list-style-type: none"> <li>• This selection criteria is used to analyze the impact if any, on cost of the project and tariff negotiation with respect to the origin of the developer</li> <li>• This criteria is expected to bring out the sensitivity in overall cost revisions on the basis of the rise in the input costs (like fuel costs, equipment costs) by the developer</li> </ul>

Approximately 15 projects amounting to 8 800 MW have been selected according to the ACG selection criteria



## SUMMARY OF SELECTED PROJECTS



Source: National Project Track™ ACG Methodology ACG Models & Databases, ACG Analysis

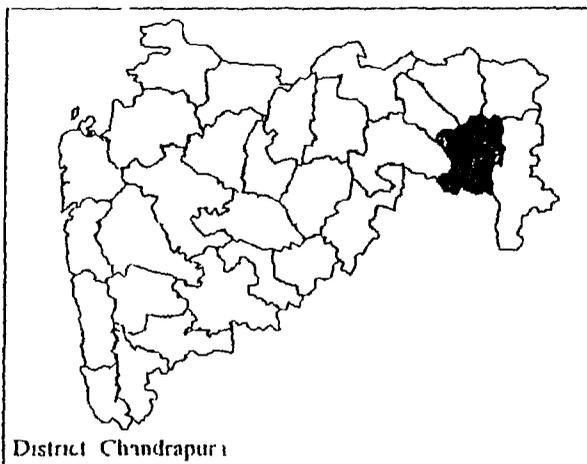
Summary of Selected Projects/100011/1st

35

Project is close to achieving a financial closure

## BHADRAWATI PROJECT OVERVIEW

### Location



### Project Progress

- MoU signed on June 18, 1993
  - Counter guarantee has been recently cleared by the Center and is expected to be formalized shortly with respective promoters
  - Financial Closure is expected to be achieved soon
  - Project to be linked to the captive coal mine for the fuel requirements
  - Project has received the clearances from the Maharashtra government for setting up the holding company proposal and the supply of coal
- The export import banks of UK (Export Credit and Guarantee Department) and France (Coface) will provide guarantees for the loans for the project

### Project Details

Location	Umred Village
Region	Western
Project Type	New IPP
Project MW	1,082 MW (2x541 MW)
Developer	Central India Power Company
Promoters with equity pattern	Ispat (53 %) GEC Alstom (31.8 %) Electricite De France (15.2 %)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	Above 750 MW
Fuel Type	Coal
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Fast Track Project
State	Maharashtra
Project Status	
■ EPC Contractor	GEC Alstom
■ Equipment Supplier	GEC Alstom
■ PPA	
■ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No

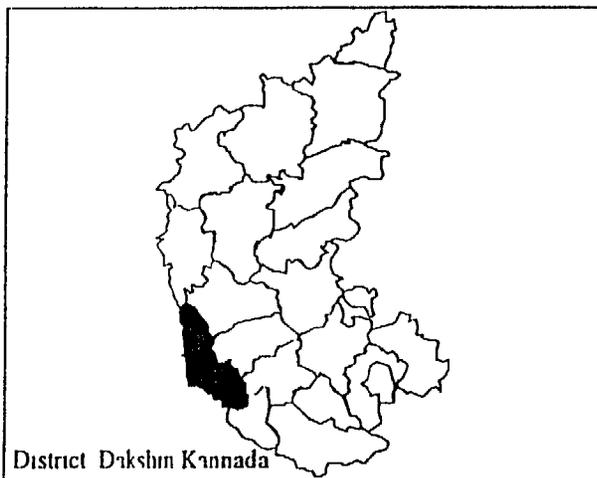




Counter guarantees to the project will be issued after the Supreme Court judgement on alleged bungling & bribery in awarding of the project to Cogentrix

## MANGALORE PROJECT OVERVIEW

### Location



### Project Progress

- MoU was signed on 30 July, 1992
- Supreme Court fixes August 18 1998 for final disposal of appeals filed by the Karnataka Government against a High Court order directing a CBI inquiry into alleged bungling and bribery in award of the project
- Project will be extended counter guarantee after the Supreme Court judgement
- TBV Power a consortium of Tarmac, UK, Black & Veatch USA and Deutsche Babcock Riley, Germany has been awarded the LPC contract after international competitive bidding process
- PPA may be reopened following issue of new norms under the revised counter guarantee terms for fast track power projects
- PowerGrid Corporation plans to tie up with UK-based National Grid for the proposed Rs 600 crore Mangalore power evacuation project
- Imported Coal is to be sourced from Australia & South Africa

### Project Details

Location	Nandikur near Mangalore
Region	Southern
Project Type	New IPP
Project MW	1,000 MW (4 x 250 MW STs)
Developer	Mangalore Power Company
Promoters with equity pattern	Cogentrix Energy Inc , USA (60%) China Light & Power, Hong Kong (40%)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	Above 750 MW
Fuel Type	Coal
Company Type	Foreign
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Fast Track
State	Karnataka
Project Status	TBV Power
<input checked="" type="checkbox"/> EPC Contractor	
<input type="checkbox"/> Equipment Supplier	
<input checked="" type="checkbox"/> PPA	
<input checked="" type="checkbox"/> FSA	
<input checked="" type="checkbox"/> Techno Economic Clearance	
<input checked="" type="checkbox"/> In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No



38

Project cost has been reduced from Rs 5 088 Crore to Rs 3 948 Crore since 1992

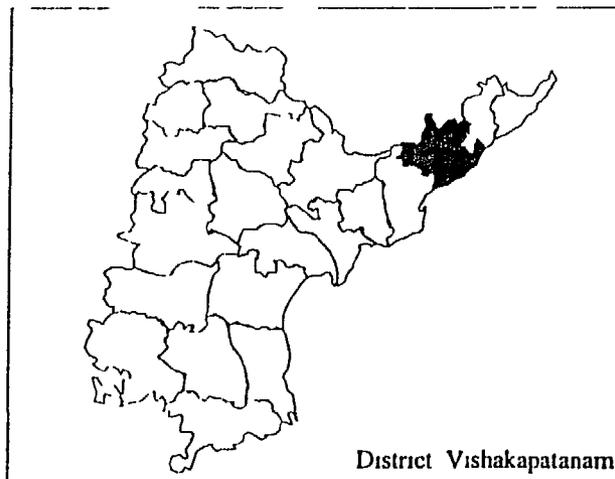
## MANGALORE COST AND TARIFF TIMELINES

	1992	1994	1995	1996	1997	1998
<b>Tariff</b>		<p><i>30 September</i></p> <ul style="list-style-type: none"> <li>• Draft PPA signed at Project tariff of Rs 2.54</li> </ul>	<p><i>August</i></p> <ul style="list-style-type: none"> <li>• Estimated Tariff of Rs 2.59</li> </ul>	<p><i>4 September</i></p> <ul style="list-style-type: none"> <li>• Tariff increased by Rs 0.17 from Rs 2.34 following installation of scrubber</li> </ul>	<p><i>25 October</i></p> <ul style="list-style-type: none"> <li>• Karnataka Cabinet clears Revised PPA</li> <li>• Tariff at Rs 2.42</li> <li>• Lowering of tariff &amp; capital cost was due to intense pressure by the finance ministry &amp; reduction in the import duty on coal</li> </ul>	<p><i>21 March</i></p> <ul style="list-style-type: none"> <li>• Tariff is Rs 2.27</li> </ul>
<b>Project Cost</b>	<p><i>July</i></p> <ul style="list-style-type: none"> <li>• MoU signed with Project Cost of Rs 5 088 Crore</li> </ul>	<p><i>30 September</i></p> <ul style="list-style-type: none"> <li>• Draft PPA signed at Project cost of Rs 4,378 Crore</li> </ul>		<p><i>18 January</i></p> <ul style="list-style-type: none"> <li>• Project cost reduced to Rs 4,298 Crore at the time of signing the revised PPA</li> </ul> <p><i>5 April</i></p> <ul style="list-style-type: none"> <li>• Revised project cost to Rs 3 948 Crore following CEA directive</li> </ul>	<p><i>13 March</i></p> <ul style="list-style-type: none"> <li>• Cost up by Rs 602 Crore after Government clearance from Rs 3,948 Crore to Rs 4 550 Crore</li> </ul> <p><i>25 October</i></p> <ul style="list-style-type: none"> <li>• Karnataka Cabinet clears Revised PPA</li> <li>• Project cost at Rs 3,948 Crore</li> <li>• Lowering of the tariff &amp; capital cost was due to intense pressure by the finance ministry &amp; reduction in the import duty on coal</li> <li>• The cost incorporates additional investment of Rs 250 Crore on a scrubber which reduces sulphur content and Rs 45 Crore on a desalination plant</li> <li>• It also includes Rs 73 Crore cost escalation approved by the Central Electricity Authority (CEA) due to extension of the EPC contract by six months</li> </ul>	<p><i>13 July</i></p> <ul style="list-style-type: none"> <li>• Power Ministry asks states to reduce project costs by selecting equipment suppliers through international competitive bids or renegotiating the costs in view of fall in the equipment prices in the international market</li> </ul>

Vishakapatnam is one of the first fast track projects conceived in the early days of liberalization

## VISHAKAPATANAM TPS PROJECT OVERVIEW

### Location



### Project Progress

- MoU was finalized on 17th July, 1992
- The Vishakapatnam project is one of the first fast track projects conceived in the early days of liberalization
- The falling rupee and clearance delays have considerably hiked the capital cost of the power project. The developers have finalized the EPC and the O&M contracts
- There has been considerable delay in the project, mainly due to the delay in obtaining the FSA clearance. As of date government has cleared the FSA in spite of the fact that coal Ministry is against the agreement
- Financial Closure of the project is expected in 3 months

### Project Details

Location	Vishakapatnam
Region	Southern
Project Type	Fast Track
Project MW	1040 (2 x 520 STs)
Developer	Hinduja National Power Corporation Ltd
Promoters with equity pattern	Hinduja (51%) National Power, UK (49%)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	Above 750
Fuel Type	Coal
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Fast Track
State	Andhra Pradesh

### Project Status

<input checked="" type="checkbox"/>	EPC Contractor	Sumitomo led Consortium
<input checked="" type="checkbox"/>	Equipment Supplier	Hitachi (Electrical)
<input checked="" type="checkbox"/>	PPA	
<input type="checkbox"/>	FSA	
<input checked="" type="checkbox"/>	Techno Economic Clearance	
<input checked="" type="checkbox"/>	In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No



Source: National Project Track™ ACG Models & Databases ACG Analysis

Facility: Vishakapatnam TPS/10001/cx

Project Profile 15

Asia Consultant

The developer selects fresh EPC partners in May 1998 while the contract values were maintained at earlier levels

## VISHAKAPATANAM TPS PROJECT COST AND TARIFF TIMELINES

Tariff	<p><i>October 1995</i></p> <ul style="list-style-type: none"> <li>• Levellised tariff Rs 1 70 per kwh</li> </ul> <p><i>December 1995</i></p> <ul style="list-style-type: none"> <li>• Levellised tariff of Rs 1 98 per kwh</li> </ul>	<p><i>July 1996</i></p> <ul style="list-style-type: none"> <li>• Andhra Pradesh State Electricity Board have been successful in reducing the tariff to Rs 1 79 per unit leverage tariff</li> </ul> <p><i>December 1996</i></p> <ul style="list-style-type: none"> <li>• Power ministry defers issuance of counter guarantee on the ground that the promoters of the project had not arrived at a consensus for finalizing the power purchase agreement (PPA) with the Andhra Pradesh State Electricity Board for fixing the power tariff</li> </ul>	<p><i>February 1997</i></p> <ul style="list-style-type: none"> <li>• Tariff for the first year to be Rs 2 6 per unit and the lowest at any point would be Rs 1 5 per unit</li> </ul>	<p>• Current Levelized Tariff Rs 2 10 / Unit</p>
	<p><i>June 1995</i></p> <ul style="list-style-type: none"> <li>• Project Cost Rs 4 80 Crore / MW</li> </ul>		<p><i>June 1997</i></p> <ul style="list-style-type: none"> <li>• Hinduja's approach Andhra Pradesh government to get a fresh techno economic clearance for their Rs 4 000 Crore project with an enhanced capital cost</li> </ul>	<p><i>Mar 20, 1998</i></p> <ul style="list-style-type: none"> <li>• Following differences over cost escalation the original EPC contractors retreated and the company selects fresh partners</li> <li>• EPC contract value has been maintained at the earlier level</li> </ul> <p><i>July 10 1998</i></p> <ul style="list-style-type: none"> <li>• Falling rupee and delay in clearances have increased the capital cost of the project by around Rs 2,000 crore up from Rs 4 100 crore to Rs 6 025 crore</li> </ul> <p><i>13 July</i></p> <ul style="list-style-type: none"> <li>• Power Ministry asks states to reduce project costs by selecting equipment suppliers through international competitive bids or re negotiating the costs in view of fall in the equipment prices in the international market</li> </ul> <p>• CEA approved project cost Rs 4 300 crore</p>
Project Cost	1995	1996	1997	1998

Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

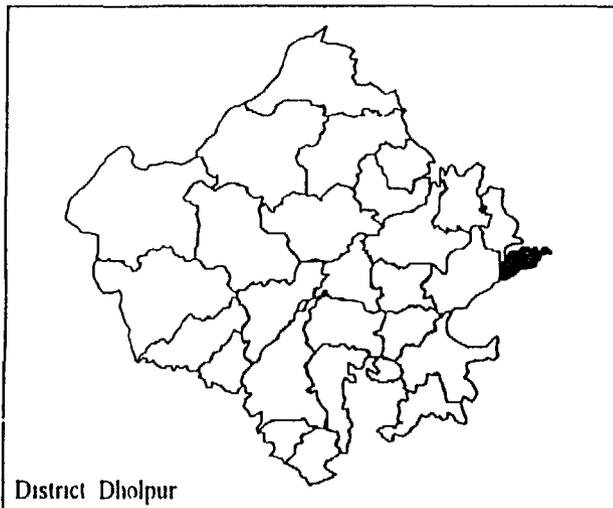
Cost & Tariff Timeline /10001/4 v

Project Profile | 6

Asia Consulting

## DHOLPUR PROJECT OVERVIEW

### Location



### Project Progress

- MoU for the project signed in February 1994  
Project was originally conceived to be a coal based project but was changed to naphtha based due to environmental considerations
- PPA for the project was signed on January 29 1996
- PPA may have to be reopened due to government desire to reduce the tariff as RPG has taken steps to reduce efficiency
- Original Project Capacity was envisaged to be 778 MW which was scaled down to 702 MW due to the fuel linkage.
- Group is in the process of short listing the O&M contractor  
ANZ Grindlays has given the mandate for arranging the foreign currency loan
- J P Morgan and I Sec have been given the mandate for selecting the foreign equity partners

### Project Details

Location	Surajpura
Region	Northern
Project Type	New IPP
Project MW	702 MW (3x234)
Developer	RPG Dholpur Power Co Ltd
Promoters with equity pattern	RPG (35%) Siemens (15%) O&M Contractor (10%) Foreign Investors (40%)
Primary Fuel	Petroleum Oil
Specific Fuel	Naphtha

### ACG 8 Point Criteria

MW Range	250-750 MW
Fuel Type	Petroleum Oil/Gas
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Rajasthan
Project Status	
■ EPC Contractor	Siemens
■ Equipment Supplier	Siemens
■ PPA	
■ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

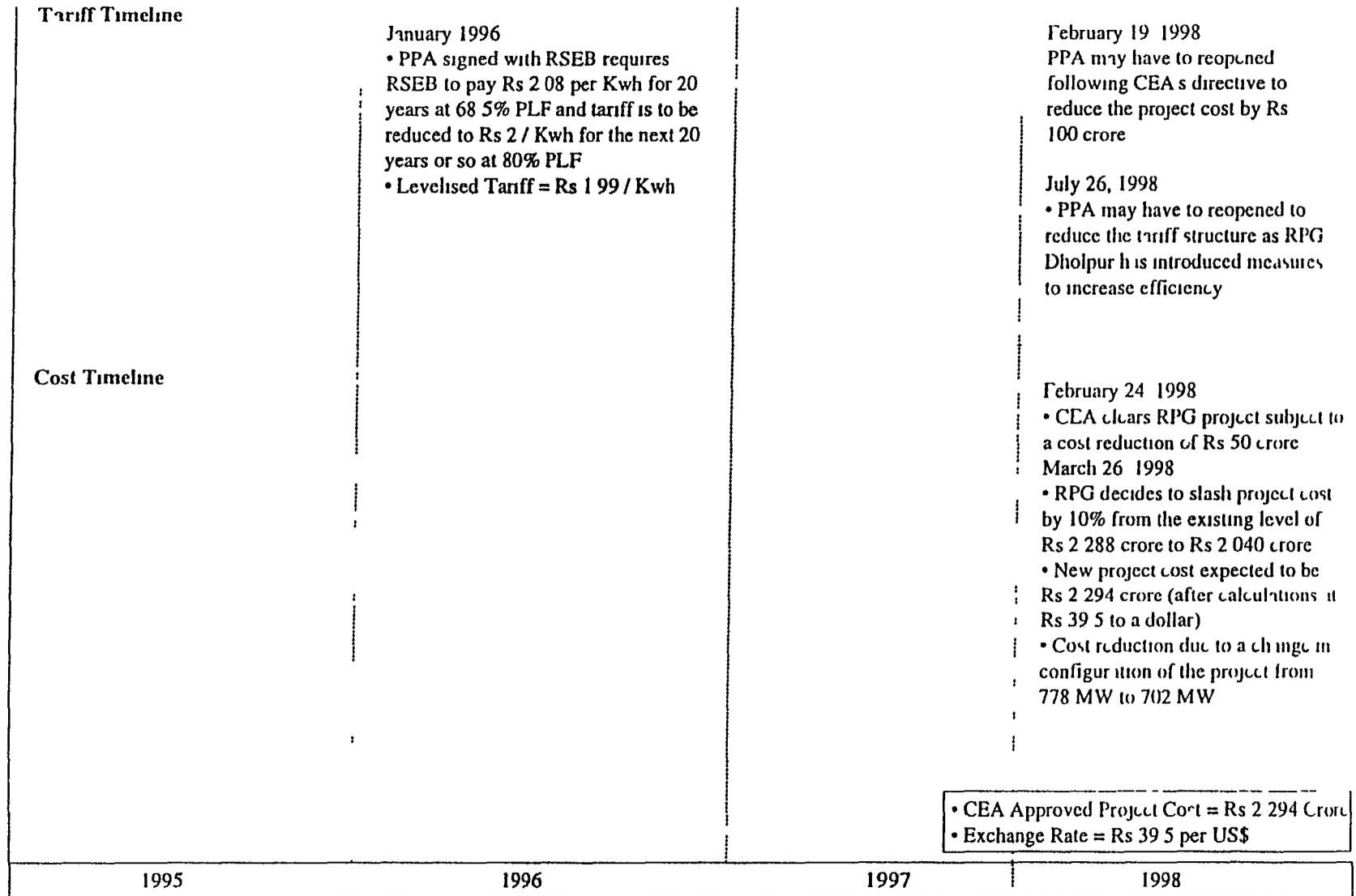
### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No



Project has revised its cost due to equipment price revisions

## DHOLPUR PROJECT COST AND TARIFF TIMELINES



Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

Dholpur Cost & Tariff/10001/psv

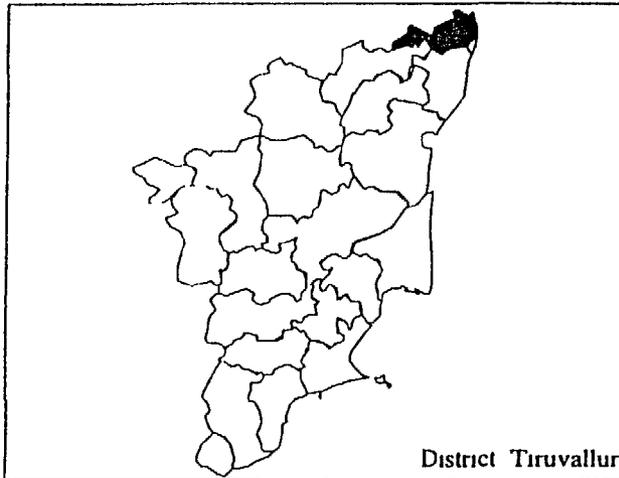
Project Profile 18

Asia Consulting

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## NORTH CHENNAI PROJECT OVERVIEW

### Location



### Project Progress

- MoU was signed on 18 February, 1995  
Project capacity changed from 1,000 MW to 1,050 MW  
Escrow agreement with TNEB for 37 days receivables at 68.5% PFI is expected to be signed this month
- Project allotted a 200 Million TPA captive coal mine at Talcher, Orissa  
Initially, coal is to be imported for which the company has shortlisted suppliers from South Africa & Australia  
Project to switch to Domestic coal as & when the coal is available from its captive mine
- Project received the Techno Economic Clearance on 3 April, 1996
- Company is in the process of tying up finance in domestic & international markets
- Financial Closure is expected within the next couple of months
- Expected to commission first unit by mid 2001
- Asea Brown Boveri has been awarded the EPC contract

### Project Details

Location	Ennore near Chennai
Region	Southern
Project Type	New IPP
Project MW	1,050 MW (2 x 525 STs)
Developer	Videocon Power
Promoters with equity pattern	Videocon International (55%) Asea Brown Boveri (45%)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	Above 750 MW
Fuel Type	Coal
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	Medium
Fast Track/Non Fast Track	Non Fast Track
State	Tamil Nadu
Project Status	Asea Brown Boveri

- EPC Contractor
- Equipment Supplier
- PPA
- FSA
- Techno Economic Clearance
- In Principle Clearance

### Legend

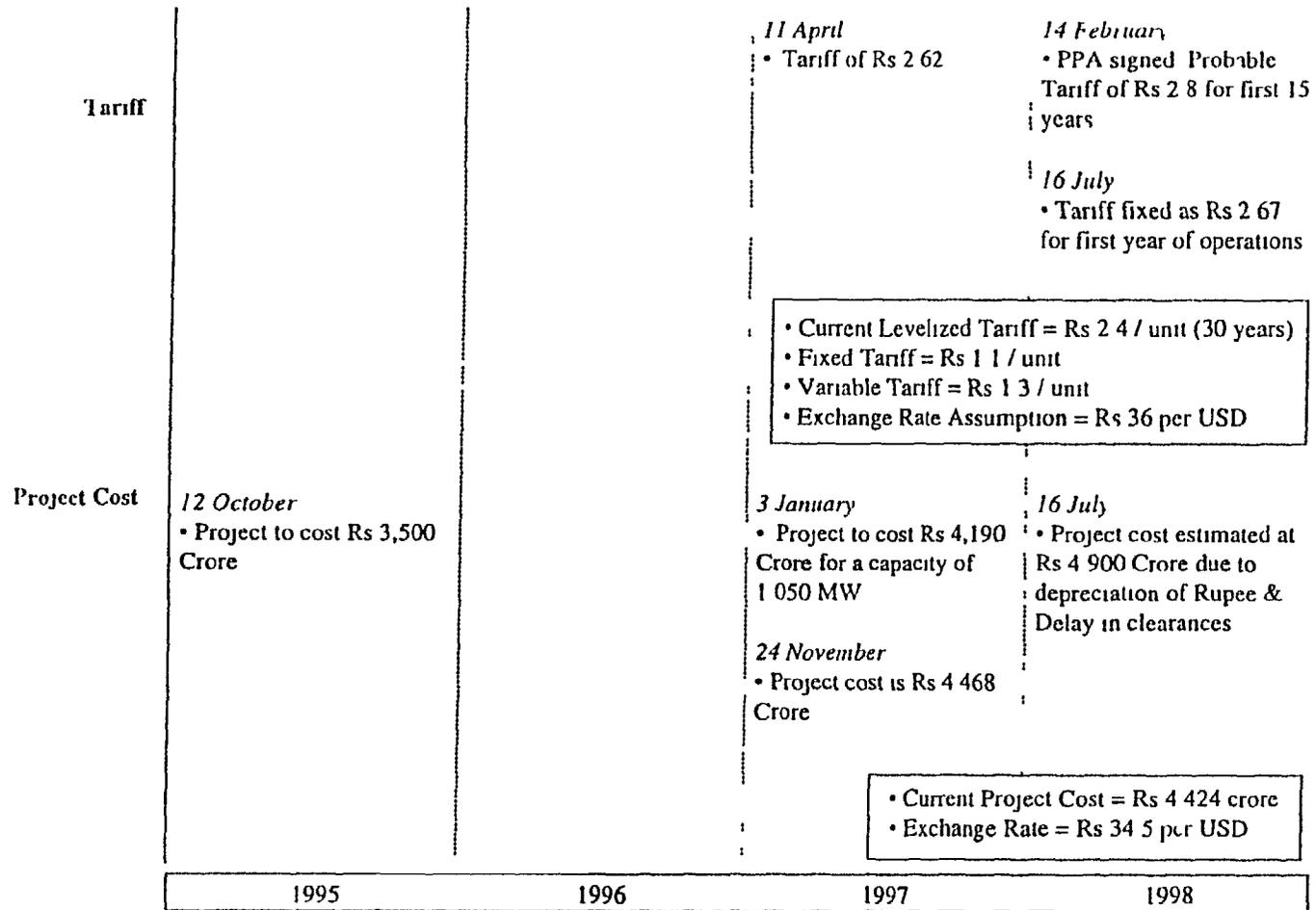
- Yes
- No

14 August 1997

44

Project cost has risen due to depreciation in rupee & delay in clearances

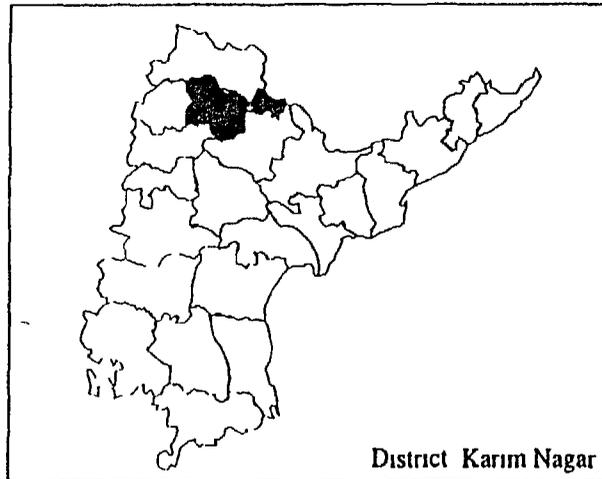
## NORTH CHENNAI PROJECT: COST AND TARIFF TIMELINES



The Ramagundam project has come under severe criticism regarding revision of capital cost

## RAMAGUNDAM TPS: PROJECT OVERVIEW

### Location



### Project Progress

- The project was awarded on international competitive bidding route
- APSEB had selected BPL for the project at a cost of Rs 1852.4 crores (1000 MW)  
PPA which was signed on October 31 1994 is currently being renegotiated
- FSA has not yet been finalized
- The project has come under severe criticism by the CAG regarding the cost revision
- The developer has finalized the EPC as well as the equipment suppliers for the project
- Project may be impacted by the Economic sanctions imposed by US on India

### Project Details

Location	Ramagundam
Region	Southern
Project Type	New IPP
Project MW	520 MW (2 x 260 STs)
Developer	BPL Group, India
Promoters with equity pattern	A new company is to be floated, whose equity pattern is not finalized
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	250-750 MW
Fuel Type	Coal
Company Type	Indian
MoU/Competitive Bid	International Competitive Bid
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Andhra Pradesh
Project Status	
■ EPC Contractor	KHEC, Black & Veatch
■ Equipment Supplier	KHEC, General Electric
■ PPA	
□ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

### Legend

■	Yes
□	No



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Capital Cost of BPL project has increased from Rs 1 852 4 in 1993 to 2384 59 in September 1997

## RAMAGUNDAM TPS PROJECT COST AND TARIFF TIMELINES

	1993 1995	1996	1997	1998
<b>Tariff</b>		November 1996 Levelling Tariff is Rs 1 80 a unit		
<b>Project Cost</b>	<p><i>1993</i></p> <ul style="list-style-type: none"> <li>BPL selected after valuation at a cost of Rs 1 852 4 crore, for 2 x 250 mw power project at Ramagundam</li> </ul> <p><i>July 1994</i></p> <ul style="list-style-type: none"> <li>APSEB issues a revised LOI on July 23 1994 by diluting certain clauses stipulated in the earlier LOI a new clause was introduced with a request to BPL to firm up the capital cost by following fresh competitive bidding procedure</li> </ul> <p><i>July 1995</i></p> <p>BPL submits a detailed project report (DPR) in July 1995 indicating the total cost of the project at Rs 2 691 83 crore with 1993 base rate of exchange and escalation factors of dollar inflation etc</p>	<p><i>August 1996</i></p> <ul style="list-style-type: none"> <li>After protracted negotiations BPL agrees to change the project cost to Rs 2 211 4 crore</li> </ul>	<p><i>September, 1997</i></p> <ul style="list-style-type: none"> <li>Central Electricity Authority (CEA) gives techno economic clearance to BPL's 520 mw thermal power project</li> <li>Clearance is for an approved capital cost as of July 2000, of \$369 3 million plus Rs 1 073 56 crore and a customs duty of 22 per cent which works out to Rs 2,384 59 crore at the exchange rate Rs 35 50 to a dollar</li> </ul>	<p><i>January 1998</i></p> <ul style="list-style-type: none"> <li>BPL project comes under sever criticism of Comptroller and Auditor General (CAG) for revising the cost estimates</li> </ul>

Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

Cost & Tariff Timeline /10001/1/s

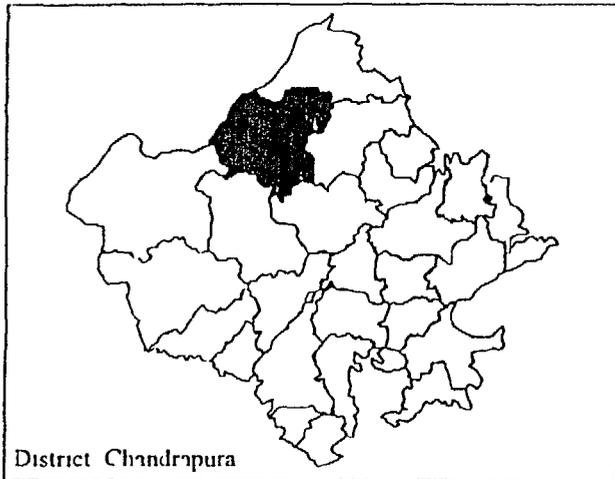
1 Project Profile 1 12

Asia Consulting

Project is one of the first project in the country which has been adopted through the competitive bidding route

## BARSINGSAR PROJECT OVERVIEW

### Location



### Project Progress

- Project was to be developed by NLC which backed out due to fund constraints
- All the necessary approvals had been obtained by NLC
- Bids were then invited for the project in 1994
- Project was awarded to Hindustan Development Corporation in September 1996
- Hindustan Development Corporation was expected to develop this project with Eastern Generation which pulled out due to RSEB's reluctance to include foreign exchange escalation clause in the PPA
- Project is expected to put up the 1st unit before 2000 and second by October 2000

### Project Details

Location	Barsingsar
Region	Bikaner
Project Type	New IPP
Project MW	480 MW (2x240 MW)
Developer	Hindustan Vidyut Corporation
Promoters with equity pattern	Pacificorp (USA) Rheinbraum Engg (Germany)
Primary Fuel	Coal
Specific Fuel	Lignite

### ACG 8 Point Criteria

MW Range	250 750 MW
Fuel Type	Coal
Company Type	Joint Venture
MoU/Competitive Bid	Competitive Bidding
ACG Success Potential	Medium
Fast Track/Non Fast Track	Non Fast Track
State	Rajasthan

### Project Status

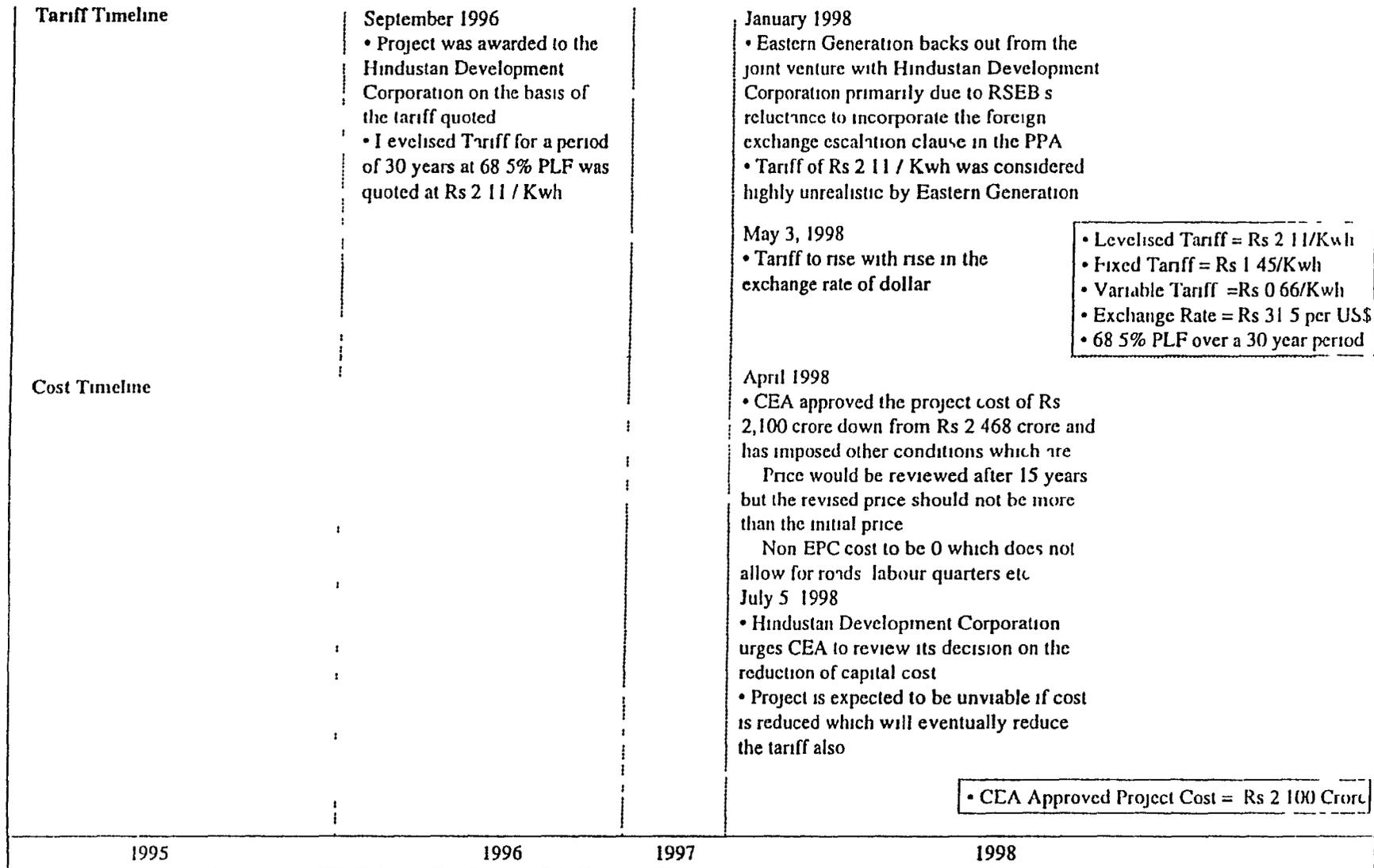
- EPC Contractor
- Equipment Supplier
- PPA
- FSA
- Techno Economic Clearance
- In Principle Clearance

### Legend

- Yes
- No



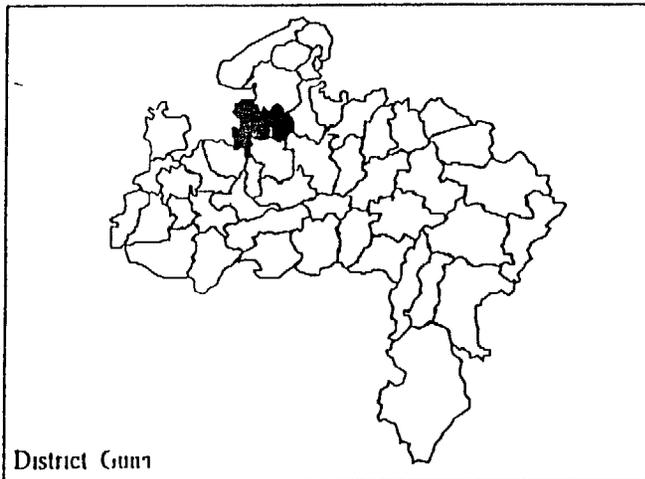
## BARSINGSAR COST & TARIFF TIMELINES



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## GUNA PROJECT OVERVIEW

### Location



### Project Progress

- Although the project has signed the PPA and the FSA, the project has been delayed due to the techno economic clearance of the CEA
  - TEC was given at the end of August 1997
  - CCFI approval for the foreign investment has been obtained
  - Acquisition of land is over and the project can operate both on Naphtha and Natural Gas
- Moreover CEA had also directed the developers to cut down the hard cost associated with this project in response to which cost was reduced by Rs 50 crore
- Project has been shortlisted for escrow account Escrow Mechanism to be finalized within 1 2 weeks
- FIPB clearance has been received
  - USEXIM is expected to contribute \$60 million, the Commonwealth Development Corporation which is also an equity investor as well as an Overseas Private Investment Corporation (OPIC) will be contributing \$ 95 million to the debt component while FIs and commercial banks will put in another \$ 70 million

### Project Details

Location	Guna
Region	Western
Project Type	New IPP
Project MW	330 MW (2 x GT + 1 x ST)
Developer	STI Power India Ltd
Promoters with equity pattern	STI India Commonwealth Development Corp , MCN Energy Group, Illionova Generating Com Central and Southwest Corp , Tenakasa International (84%)
Primary Fuel	Petroleum Oil
Specific Fuel	Naphtha

### ACG 8 Point Criteria

MW Range	250-750 MW
Fuel Type	Petroleum Oil / Gas
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Madhya Pradesh
<b>Project Status</b>	
■ EPC Contractor	Black & Veatch, Westing House
■ Equipment Supplier	Black & Veatch, Westing House
■ PPA	
■ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

### Legend

- Yes  
 No

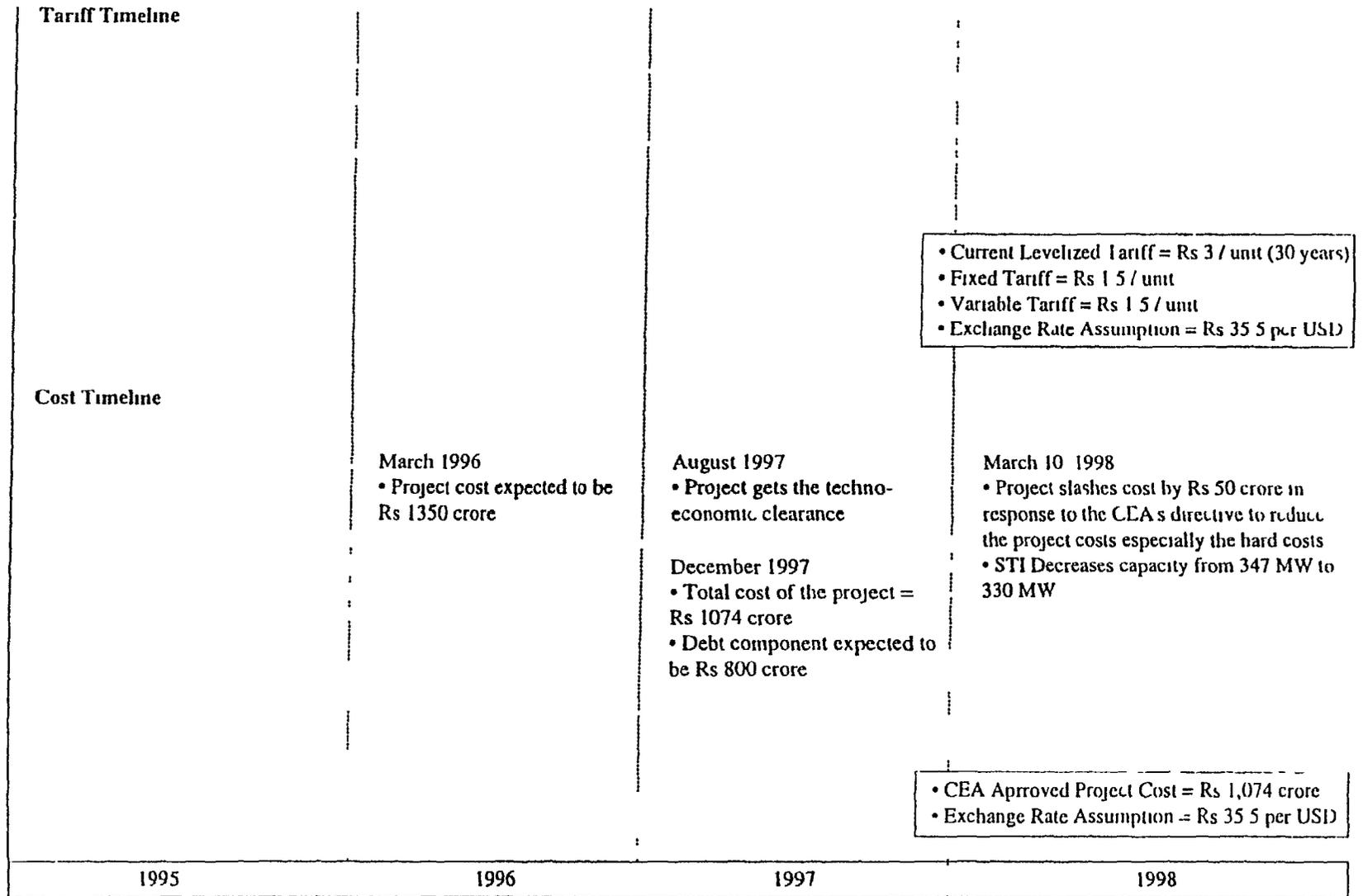


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Project slashed the cost by Rs 90 crore



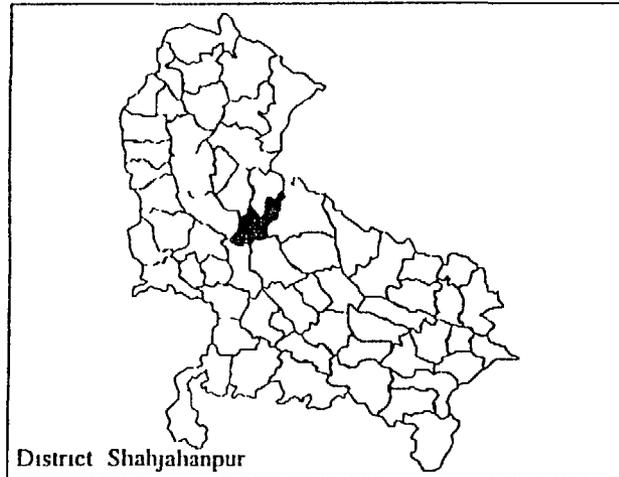
## GUNA COST & TARIFF TIMELINES



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## ROSA PROJECT OVERVIEW

### Location



### Project Progress

- MoU signed on 17 November 1993
- Project to be executed in 2 Phases Phase I of 567 MW & Phase II of 250 MW
- In Principle Clearance from CEA obtained on 7 November 1994
- Project has obtained the Coal Linkage amounting to 3 Million Tonnes
- PPA signed with UPSEB on 27 December 1996
- Techno Economic Clearance obtained from CEA on 21 August 1997
- EPC Contract amounting to Rs 1 625 Crore awarded to a consortium led by General Electric and comprising Foster Wheeler Sargent Lundy & L&I
- IDBI & PFC have agreed to finance the project

### Project Details

Location	Rosa
Region	Northern
Project Type	New IPP
Project MW	817 MW (2 x 283.5 + 1 x 250 SFs)
Developer	Rosa Power Supply Company
Promoters with equity pattern	Indo Gulf Fertilizer & Chemicals Ltd (27%) PowerGen, UK (26%) Financial Institutions/Public (47%)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	Above 750 MW
Fuel Type	Coal
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	Medium
Fast Track/Non Fast Track	Non Fast Track
State	Uttar Pradesh
Project Status	General Electric led Consortium
<input checked="" type="checkbox"/> EPC Contractor <input type="checkbox"/> Equipment Supplier <input checked="" type="checkbox"/> PPA <input type="checkbox"/> FSA <input checked="" type="checkbox"/> Techno Economic Clearance <input checked="" type="checkbox"/> In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No

Project cost has changed with capacity change from the initial 750 MW to the present 817 MW

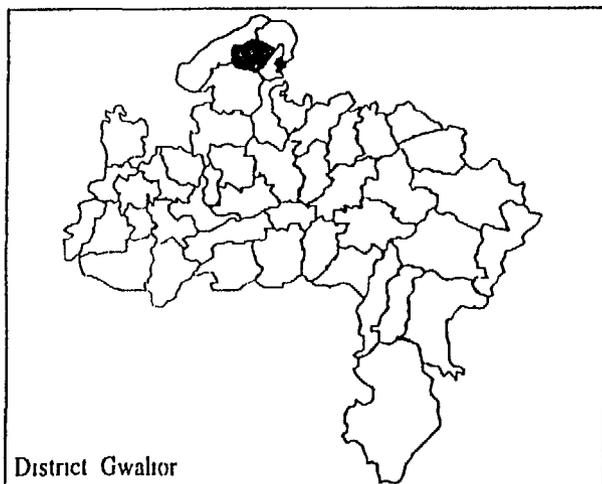


## ROSA PROJECT COST AND TARIFF TIMELINES

	1995	1996	1997	1998
<b>Tariff</b>		<p><i>25 June</i></p> <ul style="list-style-type: none"> <li>• Tariff to be Rs 2.75</li> </ul> <p><i>12 December</i></p> <ul style="list-style-type: none"> <li>• Project Tariff to be slightly less than Rs 2</li> </ul>		<p>Levelized tariff little under Rs 2 / Unit</p>
<b>Project Cost</b>	<p><i>30 March</i></p> <ul style="list-style-type: none"> <li>• Project to cost approximately Rs 3,000 Crore</li> </ul>	<p><i>7 February</i></p> <ul style="list-style-type: none"> <li>• Phase I of 567 MW to cost Rs 2,587.47 Crore</li> <li>• Phase II of 250 MW to cost Rs 1,500 Crore</li> </ul> <p><i>25 June</i></p> <ul style="list-style-type: none"> <li>• Project to cost Rs 3,553 Crore approximately</li> </ul> <p><i>12 December</i></p> <ul style="list-style-type: none"> <li>• Project to cost Rs 3,098 Crore approximately for a 750 MW Capacity</li> </ul>	<p><i>19 March</i></p> <ul style="list-style-type: none"> <li>• Phase I of 567 MW to cost Rs 2,700 Crore</li> </ul>	<p><i>8 May</i></p> <ul style="list-style-type: none"> <li>• Phase I of 567 MW to cost Rs 2,458 Crore</li> </ul> <p>CEA approved cost is Rs 2,500 crore</p>

## BHANDER CCGT PROJECT OVERVIEW

### Location



### Project Progress

- MoU was signed on October 12, 1994
- The project received In Principle clearance from CEA on August 18, 1995
- Essar has plans to pull out of the project by divesting almost its entire stake to Hanjung of South Korea
- Fuel linkage for the project is secured, and PPA has been signed with MPEB
- Project obtained FEC in the last week of December 1997
- The project has not yet received an escrow cover from MPEB
- The Essar group promoter of the Rs 1 048 72 crore project has sought the finance ministry's approval for sourcing its entire debt requirement of Rs 733 65 crore from abroad

### Project Details

Location	Bhander
Region	Western
Project Type	New IPP Project
Project MW	330 ( 2 x 110 GTs + 1 x 110 ST)
Developer	Essar Power Gwalior Ltd
Promoters with equity pattern	Owned by Essar Group (Plans to sell of equity to Hanjung of South Korea)
Primary Fuel	Petroleum Oil
Specific Fuel	Naphtha

### ACG 8 Point Criteria

MW Range	250-750 MW
Fuel Type	Gas/Petroleum Oil
Company Type	Indian
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Madhya Pradesh
Project Status	
<input checked="" type="checkbox"/> EPC Contractor <input type="checkbox"/> Equipment Supplier <input checked="" type="checkbox"/> PPA <input type="checkbox"/> FSA <input checked="" type="checkbox"/> Techno Economic Clearance <input checked="" type="checkbox"/> In Principle Clearance	Hanjung, South Korea

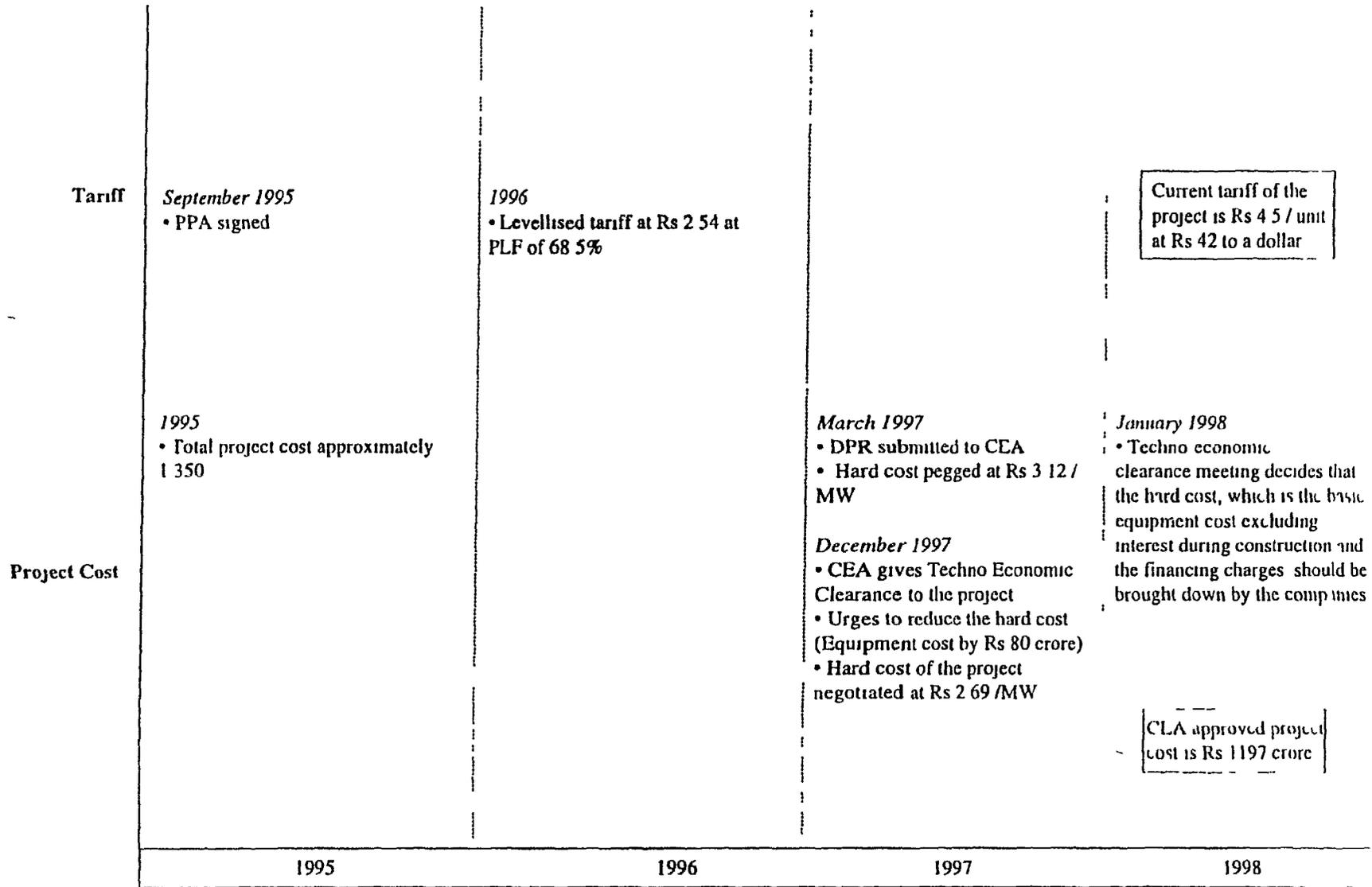
### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No



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# BHANDER CCGT. COST AND TARIFF TIMELINES



Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

Cost & Tariff Timeline /10001/1x

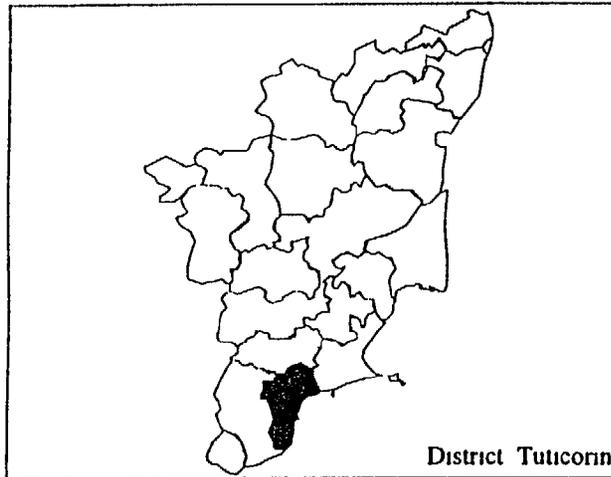
1 Project Profile 1 20

Asia Consultant

Tuticorin project was one of the first to sign the FSA in Tamil Nadu

## TUTICORIN PROJECT OVERVIEW

### Location



### Project Progress

- Project awarded to Sujana Steel Tenaga Nasional Berhad, Malaysia Deutche Babcock, Germany consortium by Tamil Nadu Industrial Development Corp Ltd, (TIDCO) on basis of International Competitive Bid
- Remco a subsidiary of Tenaga Nasional Berhad, Malaysia appointed as O&M Contractor
- Naphtha Linkages awarded to the project for 103 21 MW
- Fuel Supply Agreement signed with Indian Oil Corporation Ltd on November 21, 1997
- Techno Economic Clearance not required for the project

### Project Details

Location	Tuticorin
Region	Southern
Project Type	New IPP
Project MW	103 21 MW
Developer	Sujana Powergen Tuticorin Ltd
Promoters with equity pattern	Sujana Group (25%) NRI associates of Sujana Group (25%) Tenaga Nasional Berhad, Malaysia (25%) Deutche Babcock, Germany (25%)
Primary Fuel	Petroleum Oil
Specific Fuel	Naphtha

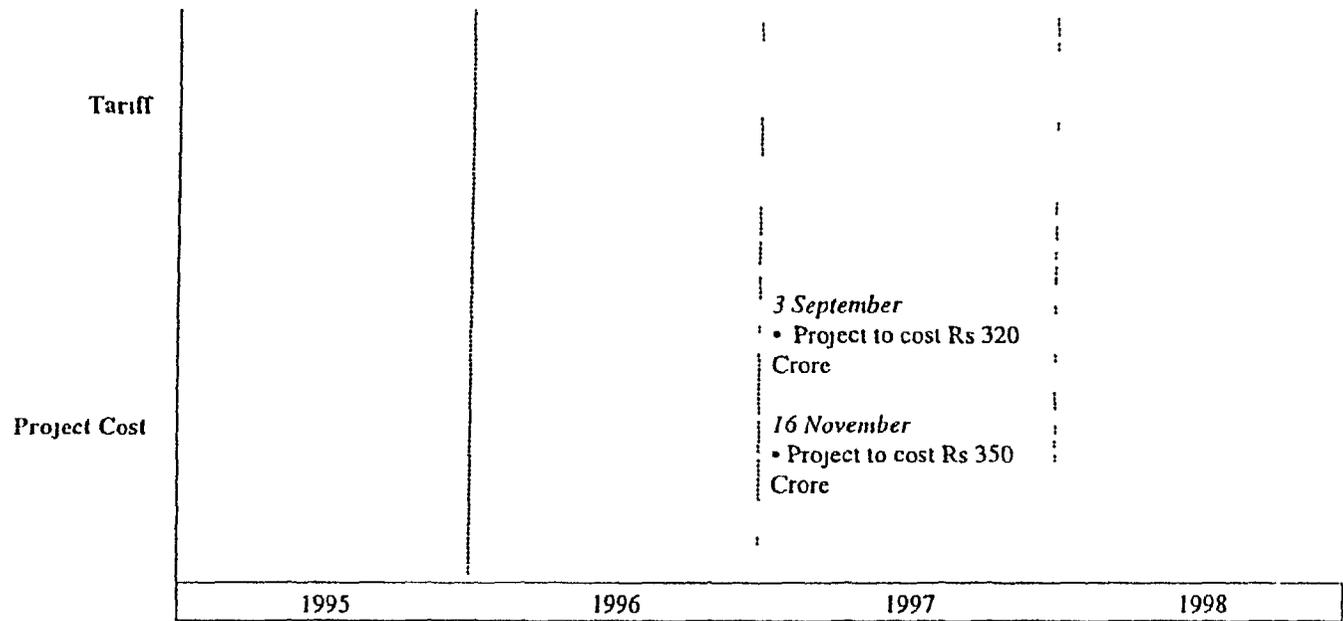
### ACG 8 Point Criteria

MW Range	100-250 MW
Fuel Type	Gas/Petroleum Oil
Company Type	Joint Venture
MoU/Competitive Bid	International Competitive Bid
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Tamil Nadu
Project Status	
<input checked="" type="checkbox"/> EPC Contractor	Deutche Babcock
<input checked="" type="checkbox"/> Equipment Supplier	General Electric
<input checked="" type="checkbox"/> PPA	
<input checked="" type="checkbox"/> FSA	
<input type="checkbox"/> Techno Economic Clearance	
<input type="checkbox"/> In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
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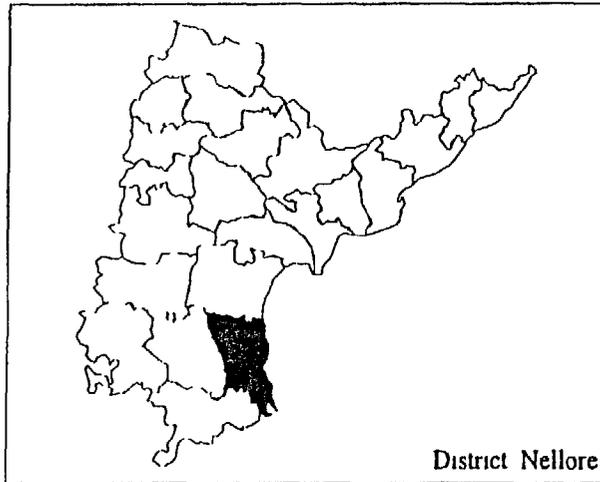
# TUTICORIN PROJECT COST AND TARIFF TIMELINES



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## KRISHNAPATNAM PROJECT OVERVIEW

### Location



### Project Progress

First PPA signed with APSEB on 24 November, 1994 but with change in Government a revised PPA is expected to be signed

Currently renegotiations are in progress with the CEA for revising the Project Cost Renegotiations to take 1-2 months

Financial Closure is expected to be achieved by December

1st unit of the Project expected to be commissioned 30 months after the financial closure

- EPC Contractor was finalized by bidding route with 4 companies participating— Black & Veatch, Hyundai, Mitsubishi & Sargent Lundy (in association with L&T & Westinghouse)
- Project is to be implemented under the Krishnapatnam B TPS scheme

Developer planning a separate jetty for coal imports in case the development of the Krishnapatnam port project is delayed

### Project Details

Location	Krishnapatnam
Region	Southern
Project Type	New IPP
Project MW	520 MW (2 x 260 STs)
Developer	BBI Power Inc, USA
Promoters with equity pattern	Besicorp International Power
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

MW Range	250-750 MW
Fuel Type	Coal
Company Type	Foreign
MoU/Competitive Bid	Competitive Bidding
ACG Success Potential	Medium
Fast Track/Non Fast Track	Non Fast Track
State	Andhra Pradesh

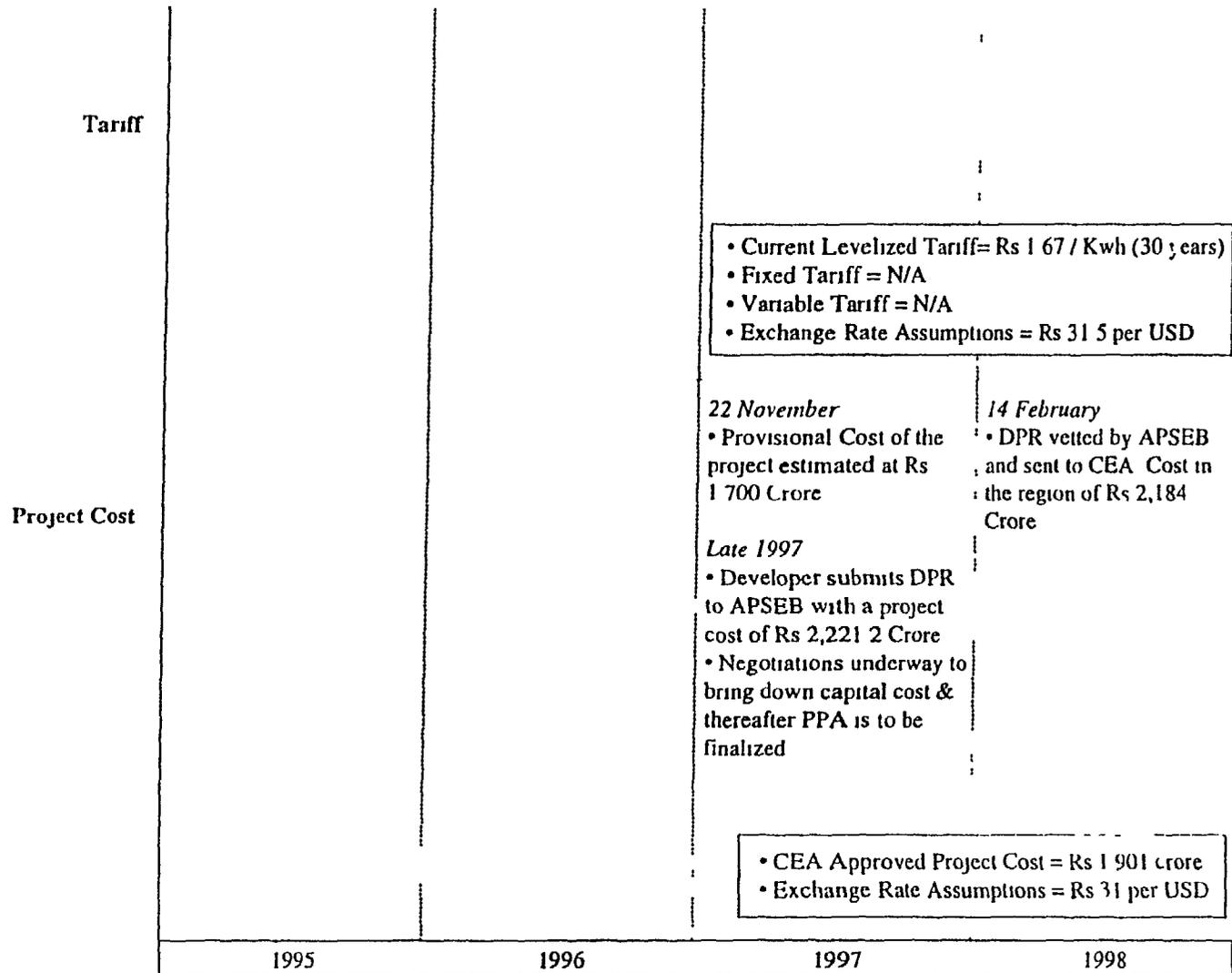
### Project Status

<input checked="" type="checkbox"/> EPC Contractor	Black & Veatch
<input type="checkbox"/> Equipment Supplier	Westing House (for turbines) & a Japanese Co (Boilers)
<input checked="" type="checkbox"/> PPA	
<input type="checkbox"/> FSA	
<input checked="" type="checkbox"/> Techno Economic Clearance	
<input checked="" type="checkbox"/> In Principle Clearance	

### Legend

<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No

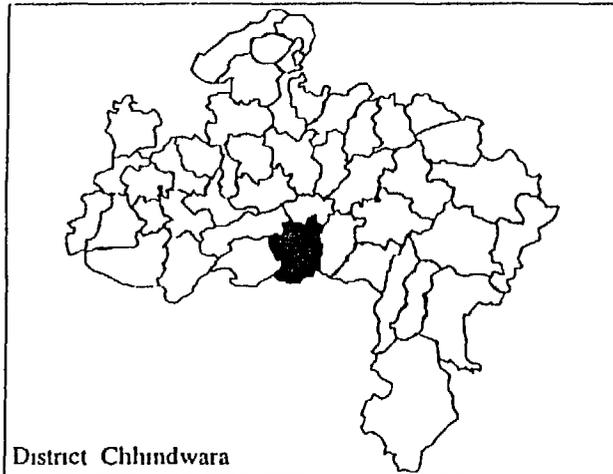
# KRISHNAPATNAM PROJECT COST AND TARIFF TIMELINES



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## PENCH PROJECT OVERVIEW

### Location



### Project Progress

- Originally project was to be promoted by Century Textile & Industries Ltd, a B K Birla Group company which withdrew in 1994 following objections by CEA on the cost structure of the project
- MoU signed with Soros Fund Management, USA on June 26, 1994
- In Principle clearance of CEA was obtained on 1 March, 1995
- PPA was signed with MPEB on 24 December, 1995
- Coal is to be sourced from Kanhan Coal fields of Western Coalfields Limited
- National Power UK which has been appointed the O&M contractor is to take up 26% of the equity with Soros Fund Management USA reducing its equity to 53%
- MPEB has drawn up plans for the 270 Km Transmission line for evacuating power from the project
- Project has been shortlisted for escrow cover to be provided by the Madhya Pradesh Government

### Project Details

Location	Chausara in Pench Valley
Region	Western
Project Type	New IPP
Project MW	500 MW (2 x 250 STs)
Developer	Pench Power Company Ltd
Promoters with equity pattern	Soros Fund Management, USA (79%) Asea Brown Boveri (21%)
Primary Fuel	Coal
Specific Fuel	Coal

### ACG 8 Point Criteria

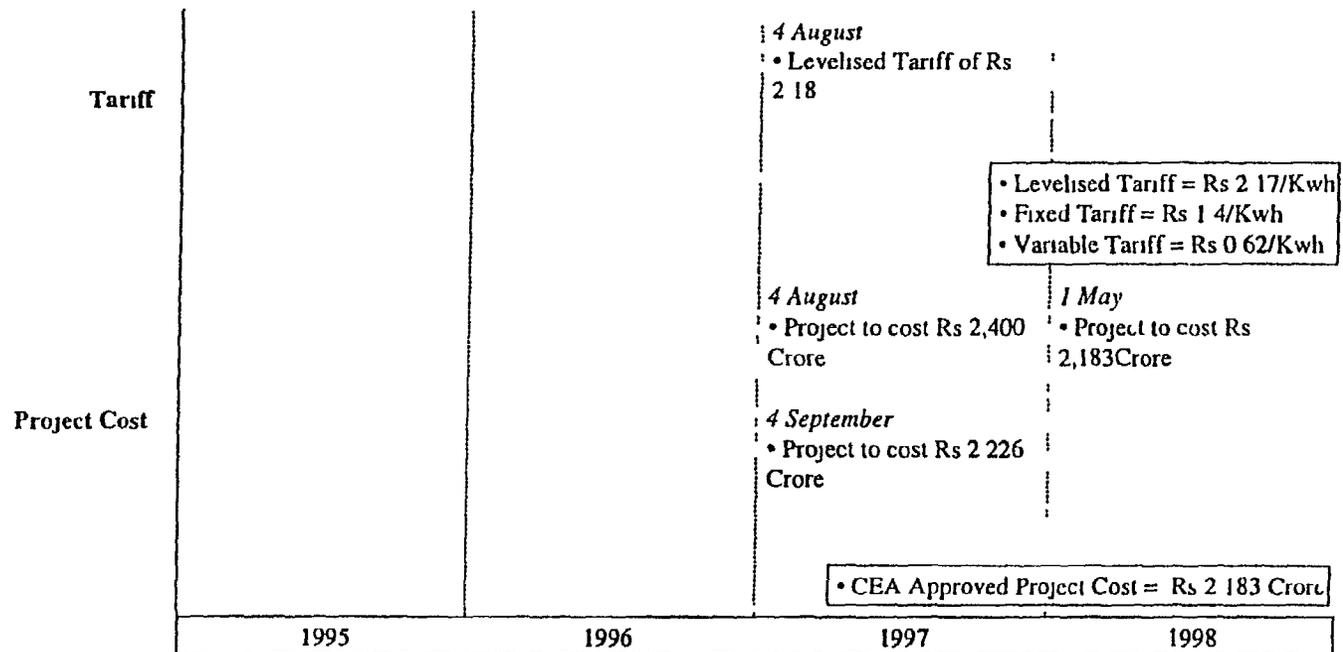
MW Range	250 750 MW
Fuel Type	Coal
Company Type	Foreign
MoU/Competitive Bid	MoU
ACG Success Potential	Medium
Fast Track/Non Fast Track	Non Fast Track
State	Madhya Pradesh
Project Status	
■ EPC Contractor	Asea Brown Boveri
■ Equipment Supplier	Asea Brown Boveri
■ PPA	
□ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

### Legend

- Yes  
 No



# PENCH PROJECT COST AND TARIFF TIMELINES

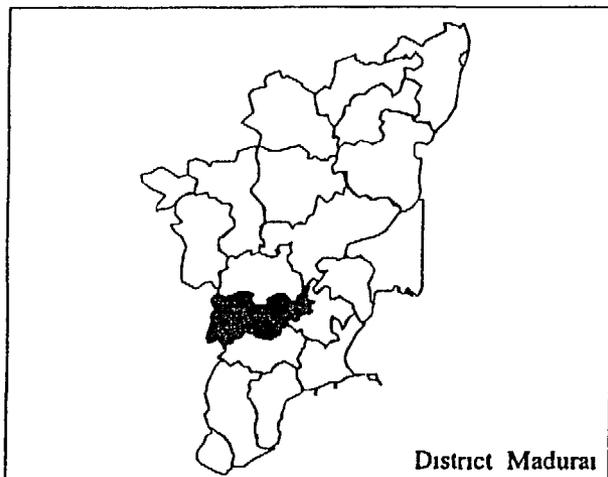


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Project is expected to achieve financial closure as all major clearances have been obtained

## SAMYANALLUR. PROJECT OVERVIEW

### Location



### Project Progress

- Tamil Nadu government had given the go ahead for the project in March 1997
- Balaji Power signed the Fuel Supply Agreement with Indian Oil Corporation in December, 1997
- Project received TEC in February 1998
- PPA was signed on May 21, 1998
- Project has obtained most of the clearances
- Wartsila is the EPC & O&M contractor for the project
- CEA had asked Balaji group to reduce the capital cost of the power project

### Project Details

Location	Samyanallur
Region	Southern
Project Type	New IPP Project
Project MW	106 MW
Developer	Balaji Group
Promoters with equity pattern	Balaji Power Corporation (Pvt) Ltd (Balaji Group plans to off load some portion of the equity to Wartsila)
Primary Fuel	Petroleum Oil
Specific Fuel	LSFO (Low Sulfur Furnace Oil)

### ACG 8 Point Criteria

MW Range	100-250 MW
Fuel Type	Gas/Petroleum Oil
Company Type	Joint Venture
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Tamil Nadu

### Project Status

■ EPC Contractor	Wartsila, Finland
■ Equipment Supplier	Wartsila Finland
■ PPA	
■ FSA	
■ Techno Economic Clearance	
■ In Principle Clearance	

### Legend

■	Yes
□	No

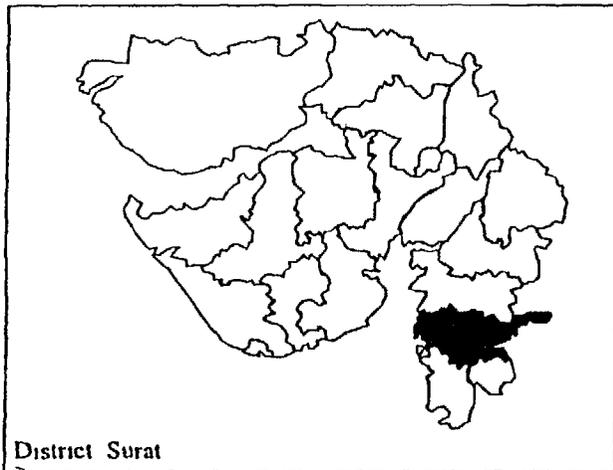


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## MANGROL PROJECT OVERVIEW

### Location



### Project Progress

- Surat Lignite project involves installation of 2 units of 125 MW each based on Circulatory Fluidized Bed Combustion (CFBC) technology
- GIPCL has a tie up with Rheinbraun Engineering of Germany for the captive mining project
- EPC contract has been awarded to Bharat Heavy Electricals Limited
- PPA for the project was signed in April 1997
- Approximately 85-90% of the civil work was completed by 1997 end
- The project is expected to be commissioned by the end of 1998

### Project Details

Location	Nani Naroli near Mangrol
Region	Western
Project Type	New IPP Project
Project MW	250 MW (2 x 125, STs)
Developer	Gujarat Industries Power Company Ltd
Promoters with equity pattern	Gujarat State Finance Corporation (27%) Gujarat Alkalies & Chemical Ltd (19%) Gujarat Electricity Board (19%) Petrofils (8%) & Public/FIs (27%)
Primary Fuel	Coal
Specific Fuel	Lignite

### ACG 8 Point Criteria

MW Range	100-250 MW
Fuel Type	Coal
Company Type	Indian
MoU/Competitive Bid	MoU
ACG Success Potential	High
Fast Track/Non Fast Track	Non Fast Track
State	Gujarat
Project Status	
<input checked="" type="checkbox"/> EPC Contractor <input type="checkbox"/> Equipment Supplier <input checked="" type="checkbox"/> PPA <input checked="" type="checkbox"/> FSA <input checked="" type="checkbox"/> Techno Economic Clearance <input checked="" type="checkbox"/> In Principle Clearance	BHEL

### Legend

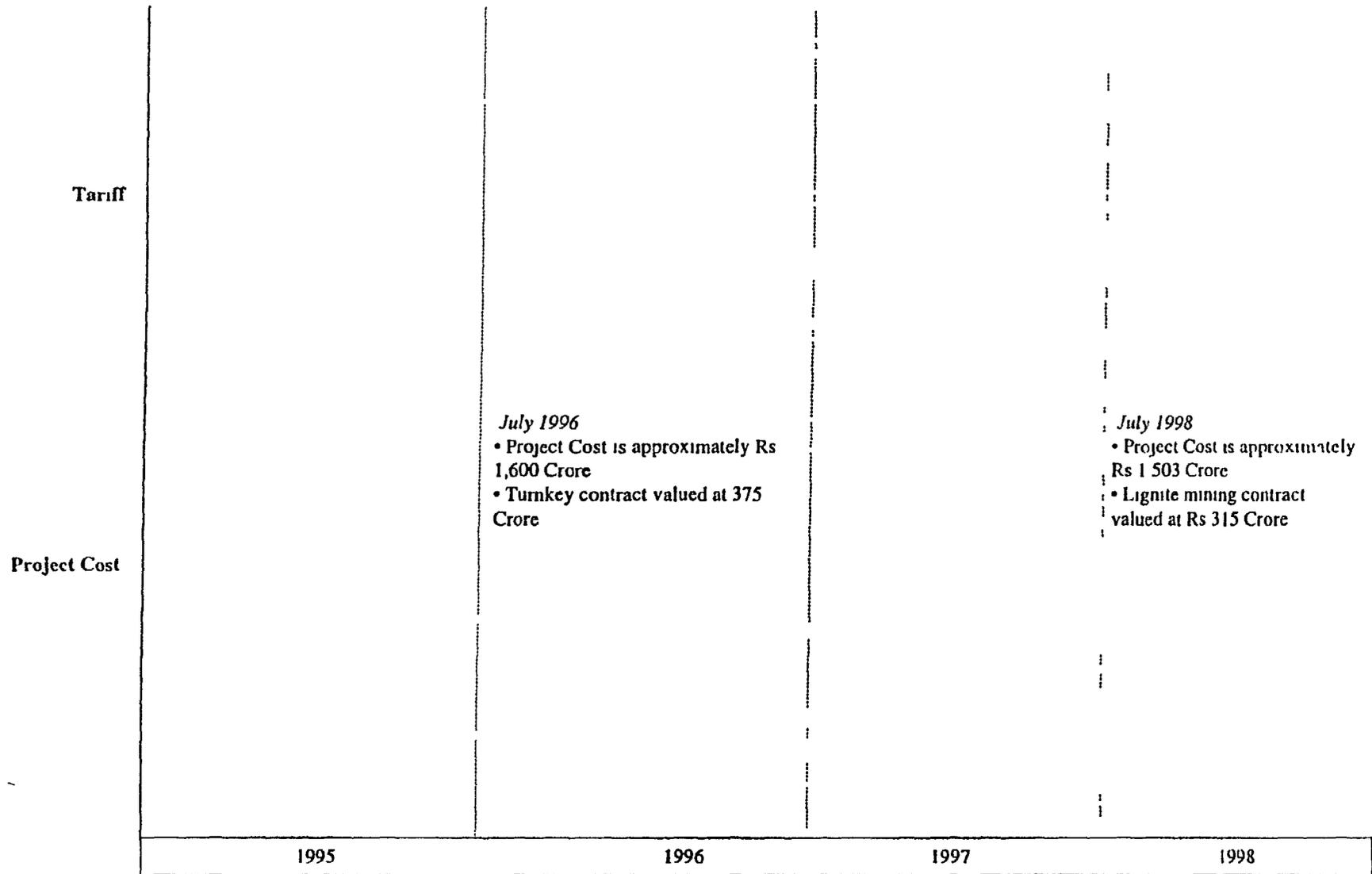
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No



Capital cost of Mangrol project is pegged at Rs 1 503 Crore



## MANGROL COST AND TARIFF TIMELINES



Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

Mangrol Cost & Tariff Timeline #10001/gv

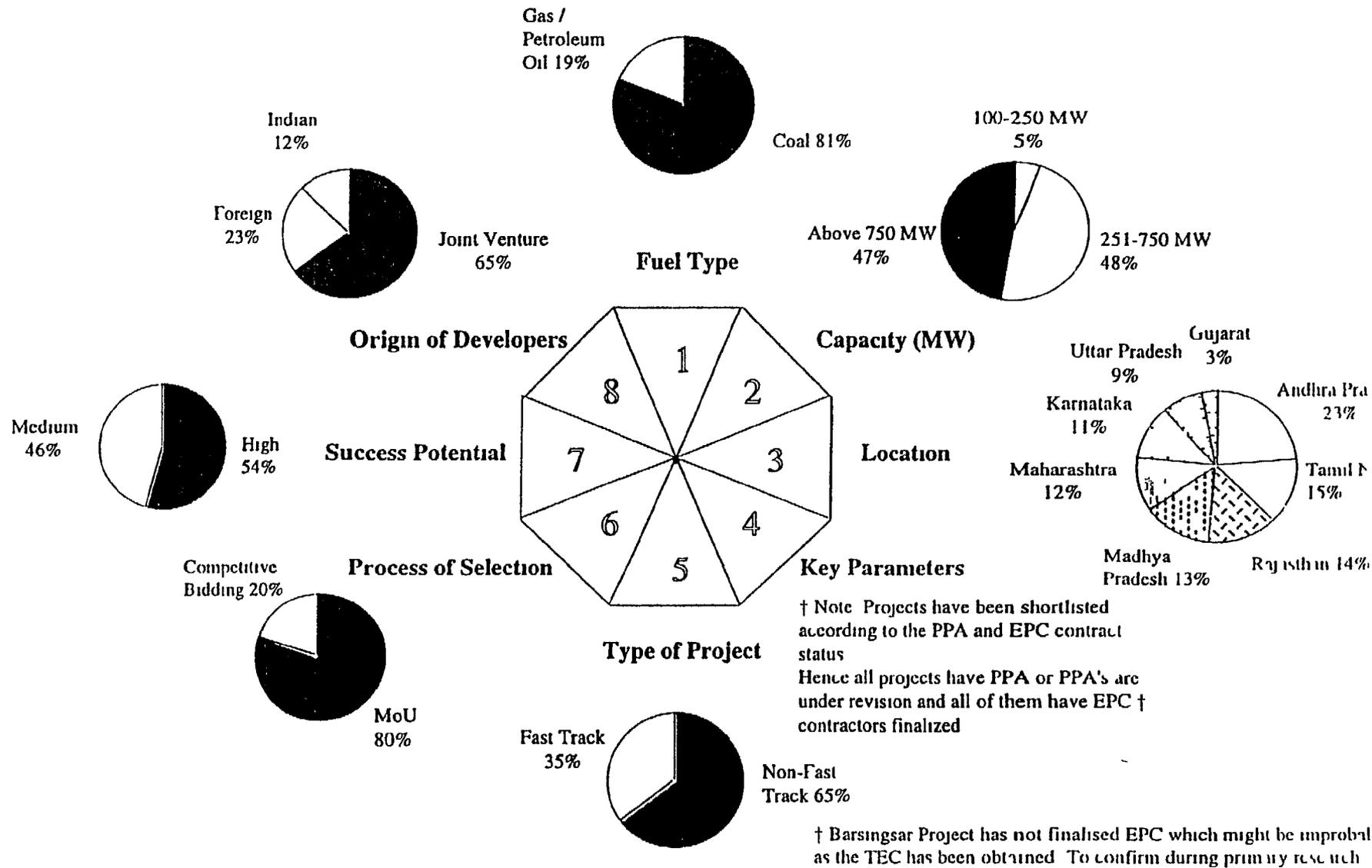
1 Project Profile 1 30

Asia Consulting

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Approximately 15 projects amounting to 8,800 MW have been selected according to the ACG selection criteria

## SUMMARY OF SELECTED PROJECTS



Source: National Project Track™ ACG Methodology ACG Models & Databases, ACG Analysis

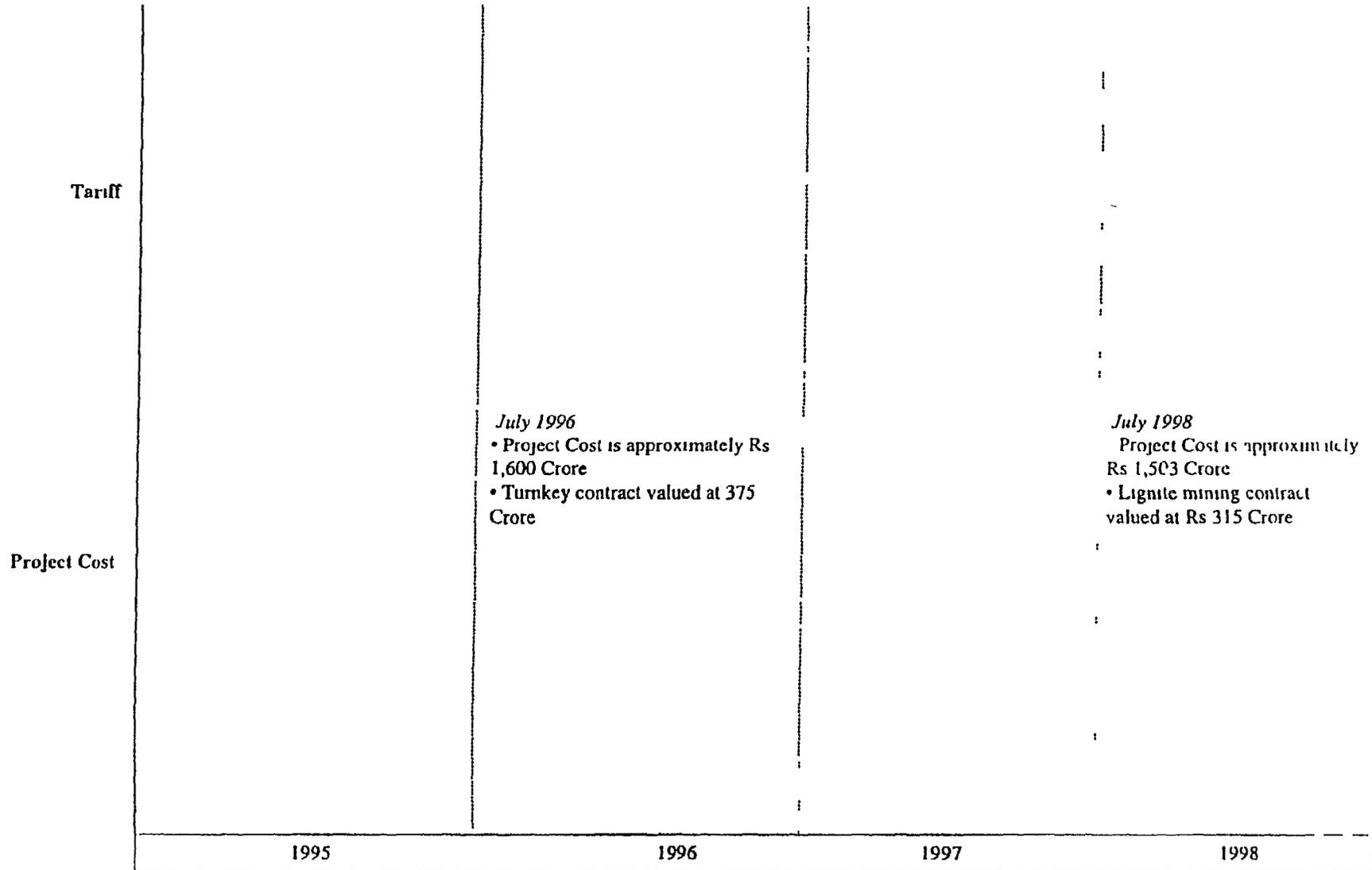
Summary of Selected Projects/10001/1/s

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Asia Consult

Capital cost of Mangrol project is pegged at Rs 1 503 Crore

## MANGROL COST AND TARIFF TIMELINES



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Source: Industry & Government Reports, National Project Track™, ACG Models & Databases, ACG Analysis

Mangrol Cost & Tariff Timeline /10001/gv

1 Project Profile 1 30

Asia Consulting