

# **THE STATUS AND FUTURE OF COAL PREPARATION IN INDIA**

**Gary Staats**

U. S. Department of Energy  
Federal Energy Technology Center

**Nagaraja Rao and Sai Gollakota**

Burns and Roe Services Corporation

For Presentation at the  
1997 Coal Liquefaction & Solid Fuels  
Contractors' Review Conference  
Pittsburgh, Pennsylvania

September 3, 1997

## **OUTLINE OF THE PRESENTATION**

- **Background and Objectives**
- **FETC Implementation**
- **Drivers for Coal Preparation**
- **Status of Implementation**
- **Future Activities**
- **Conclusion**

## **BACKGROUND OF COAL PREPARATION ACTIVITIES IN INDIA**

- USAID/India and US-AEP initiatives to promote coal preparation projects for the Indian power sector and Coal India Limited
- Announced as part of the Presidential Mission to India in July 1994
- FETC is participating in the implementation of the program

# **OBJECTIVES AND IMPLEMENTATION OF COAL PREPARATION ACTIVITIES**

## **OBJECTIVES**

- To assist Ministry of Coal in expediting the development of captive coal mines and washeries
- To facilitate the development of private coal preparation plants

## **IMPLEMENTATION COMPONENTS**

- FETC Technical Support and Business Promotion
- Project Financing
- Energy Projects Advisor in India
- Business Plan Development

## **FETC IMPLEMENTATION AND TECHNICAL SUPPORT**

- Develop database on Indian coals
  - \* Resources, characteristics, and washability
- Obtain improved washability/combustion data
  - \* Pilot-scale preparation of clean coal at CFRI
  - \* Combustion tests with raw and clean coals at BHEL
  - \* Advanced Coal Preparation at CFRI and Bilaspur Washery
- Develop different coal preparation alternatives and analyze profitability for
  - \* Power plants
  - \* Coal preparation plant investors
- Support for Commercial Coal Washery Development
- Preinvestment Support for Coal Cleaning and Other Environmental Enhancement Projects

## **KEY DRIVERS FOR COAL PREPARATION**

- Increased coal-based power generation
- Increased surface mining and mechanization
- Depletion of better quality coal reserves
- Increased shipments of coal to distant power stations
- Greater need for maintaining the environmental quality
- Demand from independent power producers for cleaner coal
- Competition from abroad

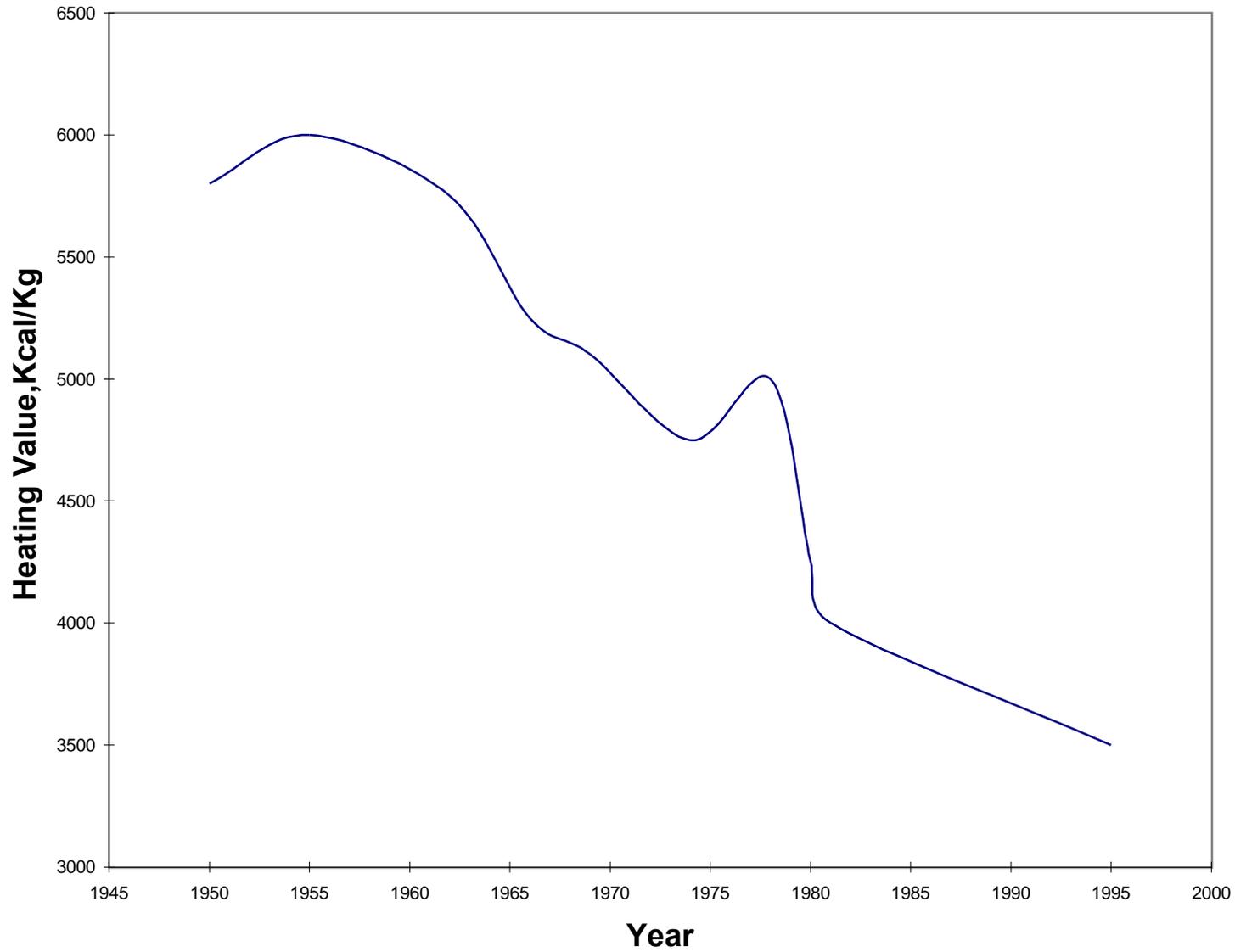
## **ELECTRIC POWER GENERATION IN INDIA**

- Present total installed capacity : 81,000 MWe
- Annual electricity production : 350 billion kWh
- Population : 930 million
- Per capita annual consumption : 376 kWh
- Thermal generation (mostly coal-based) : 76%
- Planned capacity addition : 140,000 MWe (next 15 years)
- Most of the additional capacity will be coal-based

## **GROWTH PROJECTION OF COAL UTILIZATION**

- Coal requirement for power generation is expected to increase from about 170 million tonnes/yr in 1994 to 500 million tonnes/yr by the year 2010.
- Non-coking coal resources are concentrated in the central and northeastern parts of India in the North Karanpura, Korba, Ib Valley, and Talcher coal fields.
- Long-distance transportation of coal to power plants located near the major urban areas is required.
- Non-coking coals, which contain high mineral-matter content (35-50 wt%), are being utilized for power generation mostly without any washing.

## Deterioration of Non-Coking Coal Quality in India



**ESTIMATED EMISSIONS AND ASH GENERATION  
FOR COAL-BASED POWER PLANTS WITHOUT COAL PREPARATION  
(2010)**

Distance km	Coal consumption Mt/yr	Ash Mt/yr	Parti- culates t/yr 1000s	SO <sub>2</sub> t/yr 1000s	Land ha  1000s	CO <sub>2</sub> , Mt/yr
Mine-mouth	155	65	182	775	52	239
<500	70	29	82	350	23	108
500 - 1000	60	25	70	300	20	92
>1000	215	90	253	1,075	72	331
Total	500	209	587	2,500	167	770

**STATUS OF  
FETC TECHNICAL SUPPORT AND IMPLEMENTATION**

## **HIGHLIGHTS OF INDO-US COAL BENEFICIATION WORKSHOP**

- This Indo-US Workshop was held last year in New Delhi.
- This workshop provided an excellent forum for U.S. companies to meet the key people in the Indian coal industry.
- Over 150 delegates participated including 12 from the U.S.
- U.S. utilities presented the cost effectiveness of coal washing and the multiple benefits to their plants.
- Key officials from the Government of India-Ministries of Power/Coal/Railways/Environment & Forest, Planning Commission, National Thermal Power Corporation, and State Electricity Boards promoted coal beneficiation and agreed to reduce potential barriers to acceptance.

## **ACTIONS OF GOVERNMENT OF INDIA (GOI)**

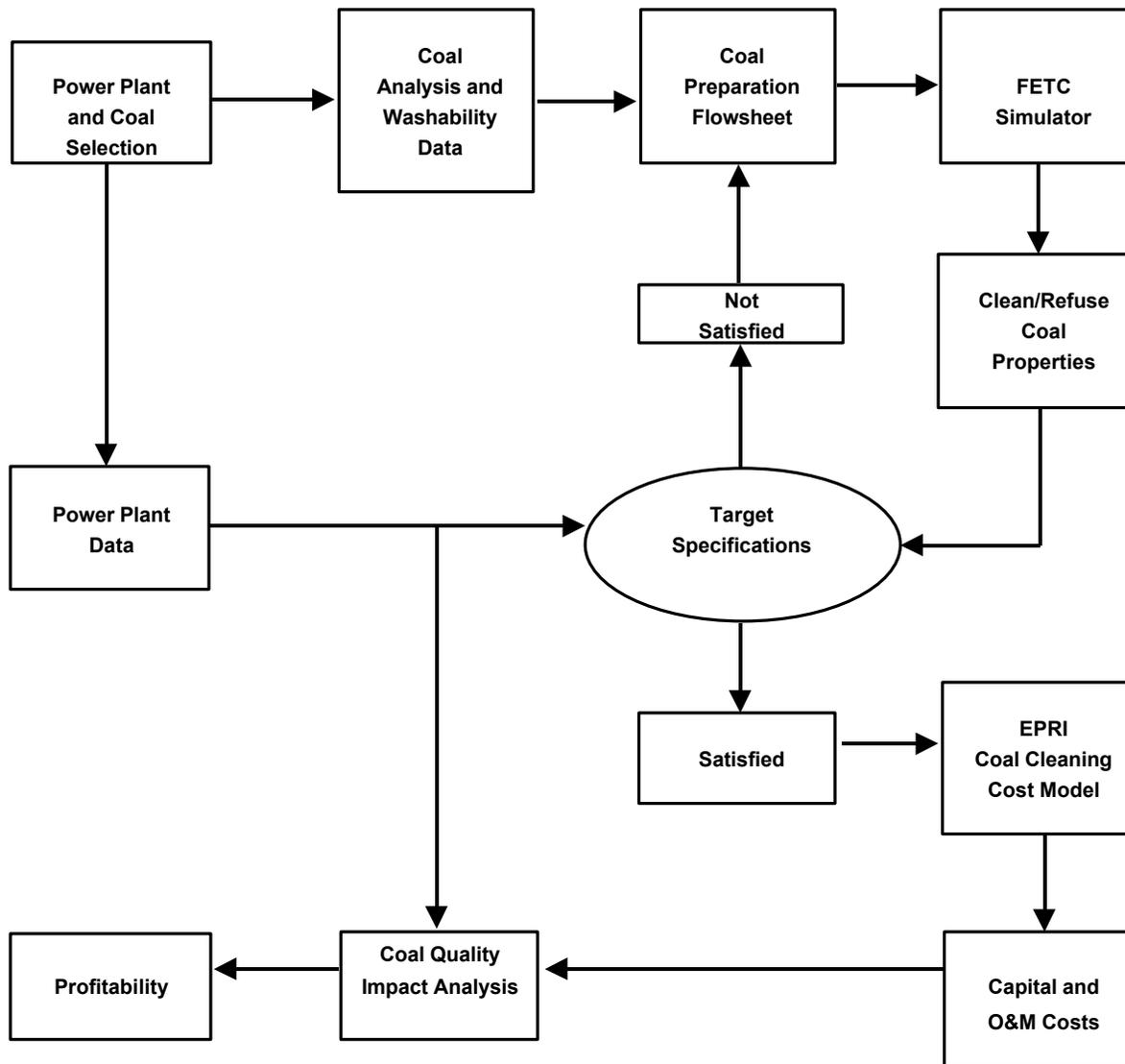
- Beneficiation of high-ash Indian coals has been recognized as one of the most important growth areas in the power sector by the GOI.
- To encourage private companies to build, own, and operate independent coal preparation plants, the GOI has liberalized its policies and introduced several incentive schemes, such as tax holidays and tax reductions.
- Privatization of coal mining, power generation and distribution has been initiated.

## **HIGHLIGHTS OF BILASPUR WASHERY**

- The first private non-coking coal washery.
- ST-BSES Washeries Limited is poised to build several more washeries in India.
- Participants: Spectrum Technologies, CLI Corporation, BSES Limited, USAID/India, and FETC/DOE.
- Annual raw coal processing capacity is 2.5 million tonnes.
- Provides cleaned Dipka coal to BSES's Dahanu power plant.
- USAID & DOE/FETC are supporting advanced coal cleaning at Bilaspur.
- Two more U.S. companies are working on other GOI washeries.

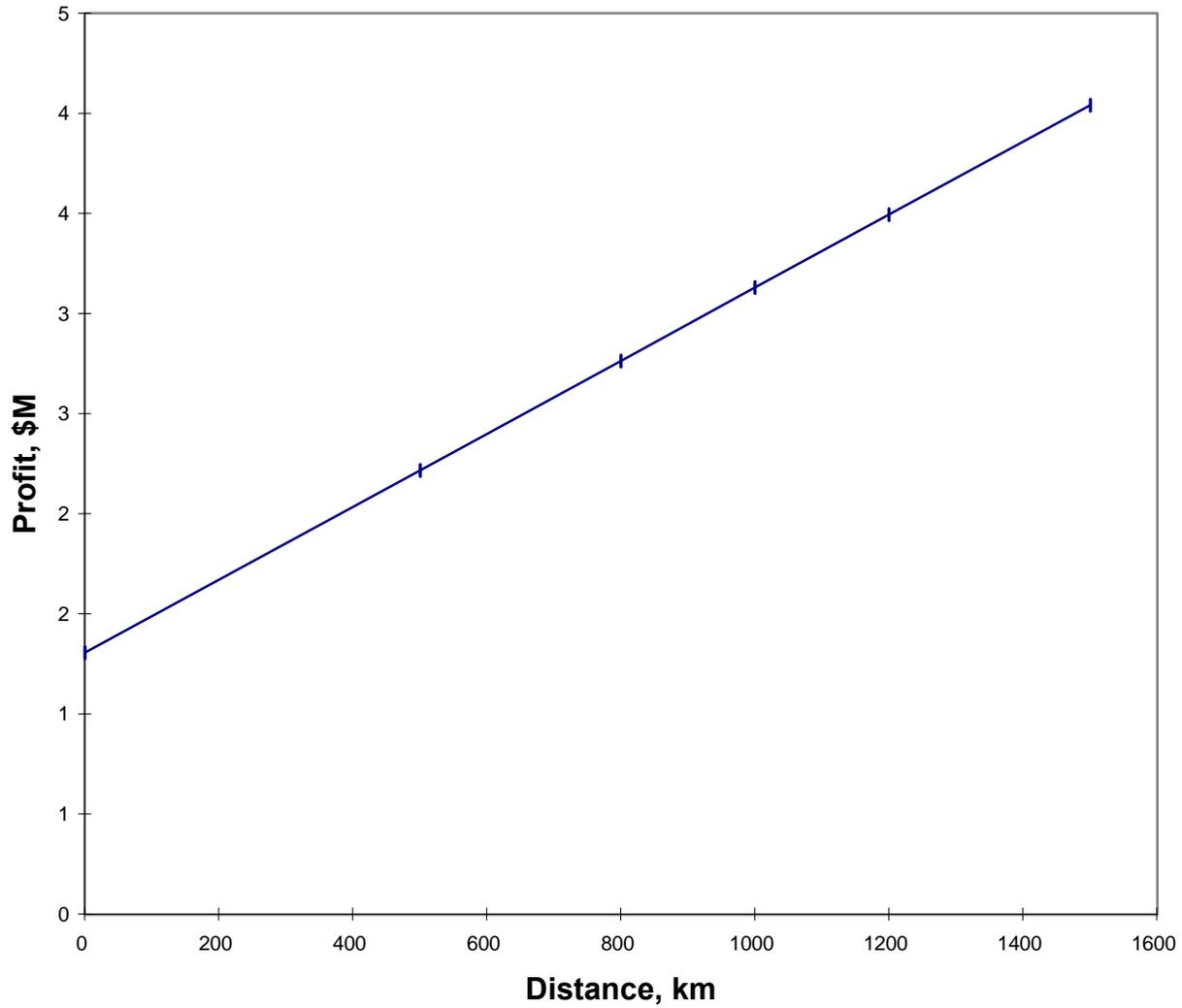
## **SITE-SPECIFIC STUDIES**

- Determined the benefits of coal preparation for Talcher and Dipka coals.
- Obtained washability data for Dipka coal to design fine coal cleaning circuits; scheduled pilot-scale tests at CFRI and BHEL.
- Presented the results at:
  - \* Indo-US Coal Preparation Workshop, New Delhi, India, February 1996.
  - \* World Coal Institute Conference, June 1996, New Delhi, India.
  - \* Thirteenth Annual International Pittsburgh Coal Conference, September 1996.
  - \* ASIA ENERGY VISION - 2020, International Conference on Energy, New Delhi, November 1996.
  - \* National Conference on Energy Policy - Towards the 21st Century, New Delhi, December, 1996.
  - \* Annual Air & Waste Management Association's Meeting & Exhibition, Toronto, June 1997.



**Block Diagram for Profitability Analysis**

## Effect of Distance on Profitability (Mine to Power Plant)



## **ENVIRONMENTAL IMPACTS**

(Projected for Year 2010)

Potential benefits of coal preparation include reduction of the following:

- Ash disposal at power plants (78 Mt/yr)
- Greenhouse gases (30 Mt/yr)
- Particulate emissions (220,000 tonnes/yr)
- SO<sub>2</sub> emissions (440,000 tonnes/yr)
- Land requirements for ash disposal (62,000 ha)

## **OTHER IMPACTS**

- Because of the use of higher heating value coal:
  - Power generation can be increased  
(2,500 MWe at 5% additional availability)
  - Transportation costs can be reduced (\$685 million/yr).
- The socio-economic benefits include:
  - Improved health  
(e.g., reduced incidences of bronchitis, asthma)
  - Reduced displacement of people  
(i.e., reduced land acquisition for ash disposal)
  - Availability of additional resources for other essentials  
(e.g., using rail wagons for more essential commodities)

## **FUTURE ACTIVITIES**

- Promotion of cleaned coal utilization by NTPC and State Electricity Boards.
- Four studies for lead SEBs and IPPs to identify the economic and environmental benefits.
- Demonstration of deep-coal cleaning benefits.
- Pilot-scale coal cleaning and combustion tests to determine economic and environmental benefits.
- Database development to assist US washery developers.
- Technology transfer/business promotion through workshops, site-visits, and cooperative meetings in the U.S. and India.
- Preinvestment support for commercial washery development.

## **CONCLUSIONS**

- DOE/FETC coal preparation implementation activities in India will promote development of at least six coal washeries in the next five years.
- The potential beneficial impacts of coal preparation on the economics of power generation, infrastructure, and environmental management have been quantified and have been found to be significant.
- The establishment of coal washeries in India provides an attractive business opportunity to U.S. washery developers.