

INDIAN POWER GENERATION MARKET

2017



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Krishnan & Associates
Innovative Solutions for the Energy Industry

2017

INDIAN POWER GENERATION MARKET

INDIAN POWER GENERATION MARKET - STRATEGIC REVIEW & FORECAST - 2017

Krishnan & Associates, Inc. announces the release of its latest study - ***Indian Power Generation Market - Strategic Review & Forecast, 2017***. The study takes an in-depth look at the past history, current status and future development of the Indian fossil-fuel fired power generation industry with an overview on emerging regulatory and market trends.

Prime Minister Modi's Government elected to power in 2014, has outlined an aggressive plan to increase power generation capacity from the current installed base of 303 GW. Key factors fueling India's power generation initiatives include GDP growth, growing need for reliable and affordable energy, rapid industrialization, increasing household incomes and electrification plans for the vast rural areas of the country.

Our report analyzes the current electricity generation profile, generation capacity additions, equipment capacity additions (boiler, turbine, generator, BOP), planned environmental regulations and the Air Quality Control Systems market from a short-term and long-term perspective. Our generation capacity forecast analyzes announced targets in conjunction with the projected fuel supply and other impediments to determine the slippage and what can be realistically achieved in terms of capacity additions. ***This edition of our report has a special section on the environmental equipment market given the new regulations announced by the Central Indian Government to lower emission standards for NO_x, SO₂, Hg and PM.***

With actual business experience in the Indian power sector and numerous ongoing interactions with power generation companies, OEMs, regulators and state agencies within India, Krishnan & Associates is uniquely qualified to present a clear and concise picture of the market opportunities and challenges.

The report is a "must read" providing critical insight for any equipment supplier, investor or organization contemplating business development, marketing or investment activities in the Indian power generation sector.



Key issues analyzed in the deliverable report include:

Market Overview

2017 Power Market Update

Generation Capacity Update

- Installed Capacity Growth
- Breakdown of Power Generation Capacity
- Generation Capacity Growth
- Key Fuel Alternatives – Opportunities & Challenges
 - Coal, Natural Gas, Wind, Hydro, Solar, Nuclear

Key Economic Indicators

Power Market Outlook

- Government Targets
- Challenges Impacting Power Projects

Power Market Forecast

- Projected Generation Capacity Forecast
- Proposed & Actual Capacity Additions (2002-2022E)
- Forecasted Capacity Additions
 - Breakdown by Coal & Other Key Fuel
- Key Issues Impacting Power Project Forecasts
- Forecast Assumptions
- Impact on Equipment - Boiler Turbine Generator Market

Environmental Emission Regulations

- Particulate Matter (PM), Nitrogen Oxide (NO_x), Sulfur Dioxide (SO₂) and Mercury (Hg) Regulations
- PM Emission Standards
- Ambient Air Quality Standards
- SO₂ Emission Control
- NO_x Emission Control
- Hg Emission Control
- India vs Regional Markets

Air Pollution Control Market

- PM Control Market
 - Market Overview for PM Control
 - Baghouse vs ESP in India
 - Competitive Assessment
 - Major Boiler & ESP Suppliers
 - Market Opportunity for New & Retrofit Applications (ESP & Baghouse)
- NO_x Control Market
 - Challenges for Selective Catalytic Reduction Technology in India
 - NO_x Emission Control Opportunity (All Technologies – 2016-2027)
 - SCR Market Opportunity
- SO₂ Control Market

Market Opportunities for Air Quality Control Systems (AQCS) Market**K&A Recommendations – Key Market Issues****Major Indian Power Companies****Appendix (Excel Spreadsheet)**

- Power Generation Capacity Additions – Project Pipeline by Year (2014-2025)
- Operating Coal Plants with AQCS Equipment
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- Major Indian Power Companies: Overview
- Major Indian Power Companies: Overview (Contd...) |

**Approximate number of pages: 50+ & Excel Spreadsheet containing Pipeline Report
Price: \$4,950**



Ravi Krishnan, Lead Consultant

Ravi Krishnan is Principal Consultant at Krishnan & Associates. Ravi brings over 17 years experience in marketing & business development services in the power and coal mining industries. Originally from India, Ravi's firm initiates business development programs for US and European OEMs seeking market expansion in India and vice-versa.

K&A is playing an active role in marketing, technology transfer and manpower solutions for new power projects in India and South America.

Ravi has initiated several relationships among US and Indian utilities & OEMs such as Babcock Power, Southern Company, Cormetech, Caterpillar, Edison Mission, Doosan, Babcock, Adani Power, Tata Power, etc.

Previously, Ravi served as Executive Vice President & COO of RJM Corporation, a global provider of environmental technologies for utility and industrial power plants. His expertise is in the management and marketing of air pollution control technologies, Selective Catalytic Reduction (SCRs), Catalysts, FGD Scrubbers, Particulate Collection Devices, and air-pollution control equipment for power applications.

Ravi began his consulting career at Mississippi Power Company, an operating company of Southern Company, a large fossil fuel fired power producer in their marketing & market research group. Ravi has a Bachelors degree in Accounting and Computer Science. He earned his MBA and Master of Science in Marketing from Georgia State University in Atlanta, GA. He is a member of numerous trade associations including Air and Waste Management Association and his work has featured in over 200 publications.



John Evans, Project Consultant

John's expertise stems from over 25 years of experience in technical sales, marketing and business development. His previous experience involved in the sales of solid fuel combustion equipment and associated ash handling ancillaries, flue gas conditioning systems, ammonia vaporization, metering, and injection systems for SCR applications, and abrasion-resistant linings for piping and vessels.

John has been leading some of K&A's consulting projects in the Indian power industry and has visited India numerous times during his professional career. John has a Master's Degree in Chemical Engineering from the Ohio State University and is a senior member of The American Institute of Chemical Engineers.

The lead consultants were supported by the K&A research staff in the United States and India for this project.



Kaival Shah, Business Analyst

Kaival Shah is a Business Analyst with Krishnan & Associates (K&A) based in Mumbai, India. Prior to joining K&A's India operations, he worked with K&A's USA office. Kaival is consistently involved with marketing, recruitment and business development projects within the Power, Mining, and Energy sectors in India. Kaival maintains regular contact with various regulatory authorities and the Indian power market at large and has played a vital role in updating and analyzing various aspects of this market report.

Kaival has a Masters Degree in Business Administration from University of Hartford, USA and a Masters in Commerce from Symbiosis College, Pune.



Guru Murthy, Market Analyst

H V Guru Murthy received a BSc (Bachelor of Science) degree from National College, Bangalore and a B.E (Bachelor of Engineering) degree from University Vishweswariah College of Engineering, Bangalore.

Guru has over 36 years experience in the power industry. Joined Bharat Heavy Electricals Limited as Engineer Trainee and retired as General Manager. He has worked at BHEL, Trichy and Ranipet in Air Quality Control Systems (ESP) Engineering department for 18 years in various fields of Proposals & Contract engineering, Product engineering, Field engineering services, Testing, Model studies and R&D. He has also submitted various technical papers / articles in number of seminars and technical booklets.

Later he was in-charge of Marketing of ESPs, Bag Filters, Steel Chimney, Ash & Coal handling Systems, Steel Structurals and associated Systems, before moving to Noida to Power Sector Technical Services. He also has experience in Spares & Services Business Group for 15 years.

He is also a Fellow of Institution of Engineers (India) in Environmental Division.

Additionally, K&A's staff in the USA and India were involved in the development of various parts of this report.

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A CONVERSATION WITH

A Conversation with Ravi Krishnan on Doing Business in India

Details Published on Monday, 05 December 2011 08:52 Written by Genlee Parente



Although this year's Market Outlook had its share of gloomy news regarding economic woes, a bright spot in many of the speakers' comments was India, which did not have nearly the magnitude of problems during the Great Recession. The rest of the world, has seen consistently large year-over-year gains in the last half as it has learned to deal with the major economic reforms that began in the 1990s.

The country now has one of the highest Gross Domestic Product (GDP) growth rates on the globe (8% at the time of the market outlook), with a strong demand for flow control and a current market of billion in valves, according to outlook speaker Ravi Krishnan, president of Krishnan and Associates.

POWER
BUSINESS AND TECHNOLOGY FOR THE GLOBAL GENERATION MARKET

July 1, 2012

Power in India: Opportunities and Challenges in a Fast-Growing Market

By Ravi Krishnan, Krishnan & Associates Inc.

Pages: 1 2 3 4

New Environmental Norms and Clearances

India's priority is first to generate low-cost power and then observe environmental initiatives. Late in 2009, the government issued new norms for ambient air quality for the first time in 15 years. The new norms are stricter and more inclusive than the previous requirements and include specific pollutants to be monitored for the first time. Prior to 2009, the only pollutants monitored were NO_x , SO_2 , PM_{10} , lead, CO, and ammonia. The new norms include $\text{PM}_{2.5}$, ozone, benzene, arsenic, nickel, and PAH (benzo(a)) pyrene. Areas throughout India are identified as attainment or nonattainment, much as in the U.S. Within the 12th five-year plan (2012-2017), emission limits for power plants likely will be formulated requiring the application of control technologies similar to those used in Western plants.

Although current emission limits for coal-fired power plants apply to PM_{10} only (150 mg/m^3 for existing plants and 50 mg/m^3 for new plants), the current environmental clearance provisions for new coal-fired power plants are fairly comprehensive. Flue gas desulfurization (FGD) scrubbers are required on plants that burn imported fuels that typically have higher sulfur content than Indian coal; no FGD equipment is currently required for plants burning Indian fuels. Electrostatic precipitators (ESPs) are widely utilized, and many plants are upgrading their existing ESPs to meet more stringent PM requirements. Most new coal-fired power plants come equipped with low- NO_x burners. However, a combination of combustion and

power report INDIA

India: Can she make the most of her opportunities?

With a growing economy and an appetite for energy to match, India will be attractive to power companies and providers of environmental services. But for some time, where do the opportunities lie?

India will remain a robust market for providers of power plant and environmental equipment. At least until 2020, demand for electricity in the country is high and India could experience further and regional growth. Rapid economic growth has created a growing need for disposable and related supplies of electricity, gas and petroleum products. India rapidly over the decades. India has a population of over a billion people and a market for consumer goods that is about one of the largest. Wholesale is expected to grow to \$500 billion

Prime Minister of India
Shri Narendra Modi




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Ravi Krishnan
to Digital India Technology Dinner
with
**Prime Minister of India
Shri Narendra Modi**
on
Saturday, 26 September 2015
at 5.00 pm
at Regency Ballroom, The Fairmont San Jose
170 S Market Street, San Jose, CA 95113