

CONTENTS

| | |
|--|------------|
| Preface | iii |
| Units | x |
| Chapter 1 The Green Rating Project | 1 |
| The environmental audit with a difference | 3 |
| Impact on industry | 3 |
| Rating the Indian coal- and lignite-based thermal power sector | 4 |
| Rating criteria at a glance | 7 |
| Chapter 2 Coal-based power generation | 9 |
| The Indian power sector | 12 |
| Historical development | 13 |
| India's power supply deficit | 14 |
| Environmental clearances exceed capacity increase | 16 |
| Coal-based generation – India's best bet | 17 |
| Consumption trends | 18 |
| Global relevance of coal | 18 |
| Current scenario | 18 |
| Growth of coal generation | 19 |
| Externalities of coal – India's energy dilemma | 22 |
| Chapter 3 Resources – land, coal and water | 23 |
| LAND: Capacity concentrated | 25 |
| Land use in coal-fired power | 26 |
| Coal plant configuration and norms | 26 |
| Sample analysis | 27 |
| COAL: Coal demand | 28 |
| Fuel use | 31 |
| Specific coal consumption | 31 |
| Coal quality | 32 |
| Coal quality: Norms | 33 |
| WATER: The GRP Study | 35 |
| Water sourcing in thermal power plants | 36 |
| Water use in various processes and best practices | 39 |
| Water use for cooling | 39 |
| Water consumption and energy efficiency | 41 |
| Power plants and water stress | 41 |
| Water tariffs and its impact on water use | 42 |
| Indian power industry's water requirement | 43 |

| | | |
|------------------|--|-----------|
| Chapter 4 | Energy and greenhouse gases | 47 |
| | ENERGY: Energy efficiency of power plants | 49 |
| | Energy and the GRP study | 50 |
| | Efficiency of plants | 51 |
| | Ownership | 52 |
| | Factors influencing efficiency | 52 |
| | Impact of age | 52 |
| | Deviation from design versus age in GRP study | 53 |
| | Efficiency versus age | 54 |
| | Impact of load factor | 54 |
| | Auxiliary power consumption | 55 |
| | Perform, achieve and trade (PAT) targets in study | 56 |
| | Efficiency improvement for existing units | 58 |
| | New and upcoming technologies | 59 |
| | Conclusion | 60 |
| | GREENHOUSE GASES: CO ₂ and energy efficiency | 61 |
| | The challenge ahead: efficiency versus CO ₂ reduction | 63 |
| | | |
| Chapter 5 | Pollution – Wastewater, solid waste and air pollution | 65 |
| | WASTEWATER: Wastewater generation in Indian plants | 67 |
| | Ash handling and water pollution | 67 |
| | Surface water pollution | 67 |
| | Analysis of wastewater samples | 68 |
| | Groundwater pollution | 70 |
| | Mercury pollution | 70 |
| | Thermal pollution | 70 |
| | Coastal plant: growing capacity and emerging risk | 71 |
| | Water pollution from coal run-off management | 72 |
| | Weak regulations and little supervision | 72 |
| | SOLID WASTE: Pollution implications | 73 |
| | Ash pond maintenance | 75 |
| | Impact on community | 75 |
| | Ash-handling technologies adopted by companies | 75 |
| | Ash generation and utilisation | 75 |
| | Ash generation by companies | 77 |
| | Modes of ash utilisation | 78 |
| | Prospects of achieving targets | 79 |
| | Utilisation versus ownership | 80 |
| | Ash management: A rising problem | 81 |
| | AIR POLLUTION: PM emission: high and uncontrolled | 83 |
| | PM emission regulation and control | 85 |
| | Sulphur oxide: high emissions | 86 |
| | No SO ₂ emission norms in India | 86 |
| | Oxides of nitrogen: poor monitoring and control | 88 |
| | No NO _x emission norms in India | 89 |
| | Mercury – a growing concern | 89 |
| | No norms for mercury monitoring and control | 91 |
| | Fugitive emission | 94 |
| | Ambient air quality | 94 |

| | |
|--|------------|
| Chapter 6 Policy, compliance and community | 97 |
| Environment management | 99 |
| Elements of environment management | 99 |
| Health and safety | 101 |
| Compliance | 101 |
| Compliance monitoring: Inefficient and compromised. | 101 |
| Show cause notices | 102 |
| Show cause for water pollution under the Water Act | 102 |
| Show cause for air pollution under the Air Act | 102 |
| Stakeholder survey | 103 |
| Pollution is the primary threat | 104 |
| Toothless PCBs | 104 |
| Water for electricity versus water for life | 104 |
| Rehabilitation and resettlement and CSR | 105 |
| | |
| Chapter 7 Rating and recommendations | 107 |
| The final count | 109 |
| The top three | 110 |
| CESC-Budge Budge Generating Station (BBGS) | 110 |
| JSWEL-Toranagallu Power Station | 110 |
| Tata-Trombay Thermal Power Station | 111 |
| Resource efficiency | 111 |
| Land. | 111 |
| Coal | 112 |
| Water | 112 |
| Energy efficiency and greenhouse gases | 113 |
| Greenhouse gases | 114 |
| Pollution | 114 |
| Air | 114 |
| Feeble norms, toothless regulators. | 115 |
| Ash | 115 |
| Wastewater | 116 |
| The way forward | 116 |
| Recommendations | 116 |
| | |
| Annexures: | 00 |
| The rating methodology. | 119 |
| Indicators and weightages | 122 |
| | |
| Notes and references | 133 |