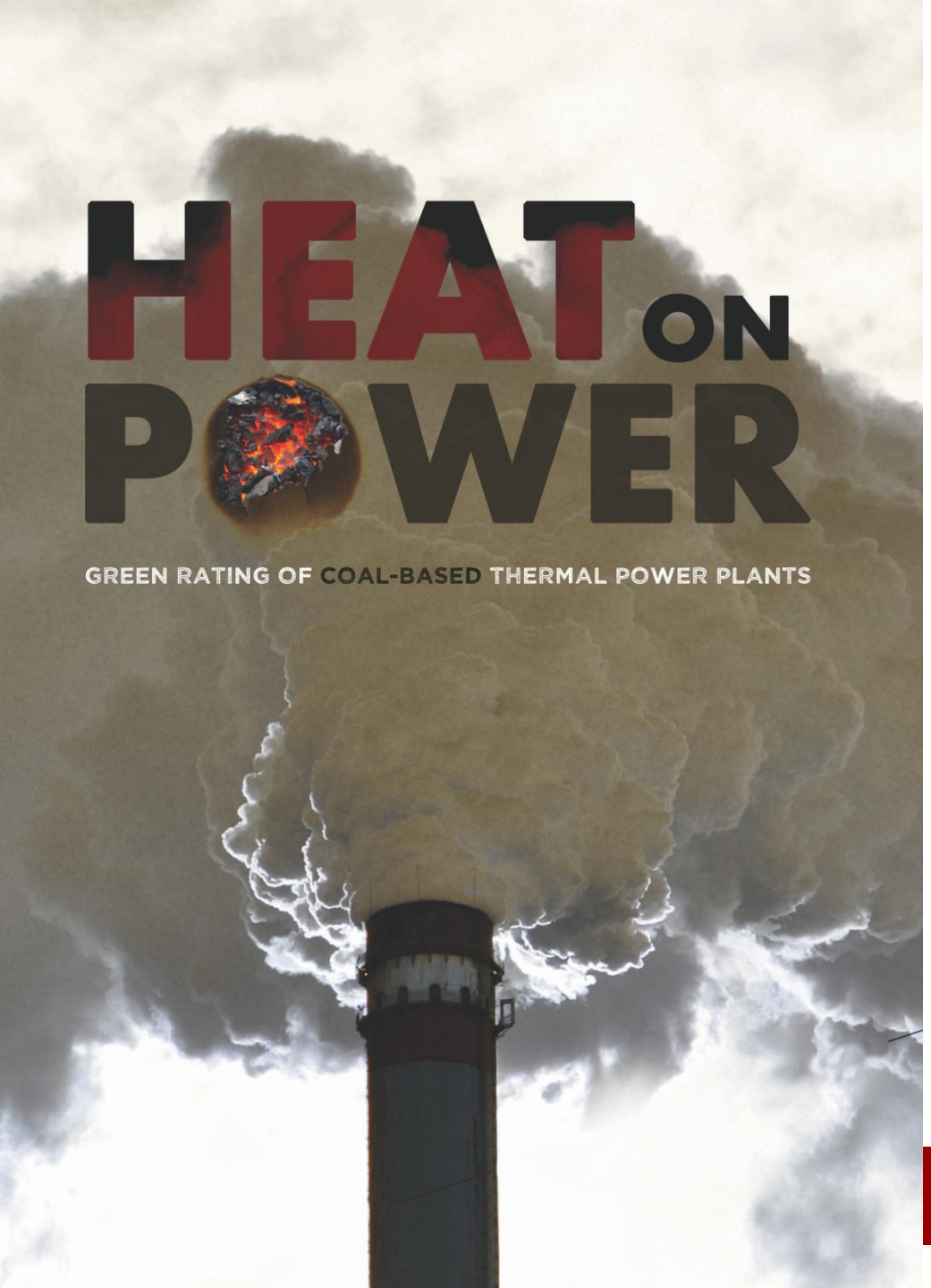
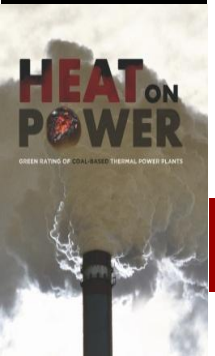


CSE THE FIVE LEAVES AWARD

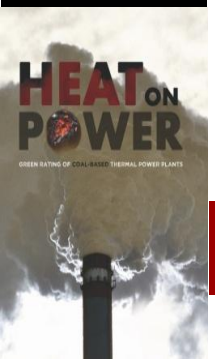
THE FINDINGS

Rating of coal-based power sector

- ✓ Research design – sample selection, key parameters, questionnaire – under guidance of panel of industry and academic experts



Technical Advice & Assurance



Technical advisory panel: To guide in rating methodology, data verification, analysis and provide independent assessment

Dr. B. Sengupta, Former Member Secretary, Central Pollution Control Board

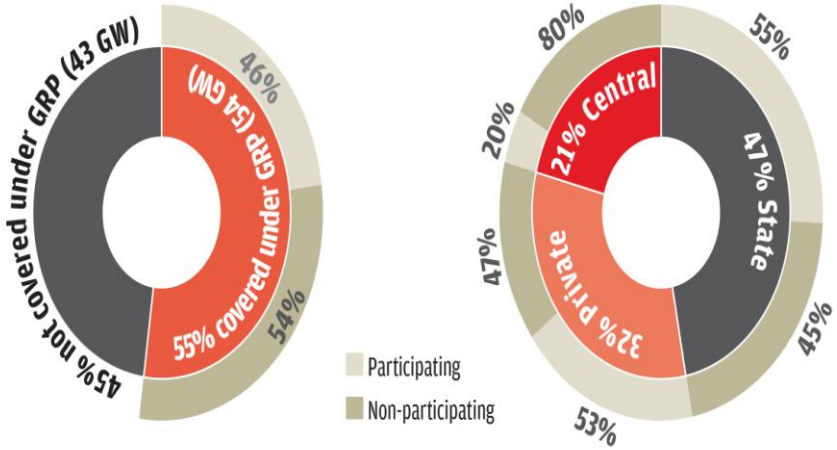
Er. Umesh S. Bapat, Ex-Vice president-Operations, Tata Power

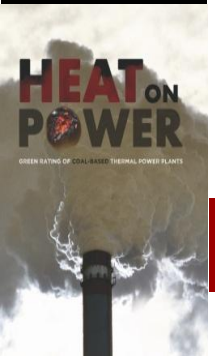
Dr. Y.P. Abbi, Ex. Director-Power Station Engineering,BHEL

Dr. Avinash Chandra, Former Professor and Head, Centre for Energy Studies, Indian Institute of Technology, Delhi

Study coverage

- ✓**Sample size:** 47 plants, 54 GW
- ✓**Over half the sector's capacity** when study began early 2012
- ✓**Just under half participated;** non-participating also rated based on survey of plant location and stakeholders, secondary information
- ✓Good participation by state-owned; Only 2 of 10 central ones agreed

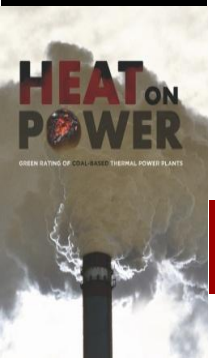




Sample Selection

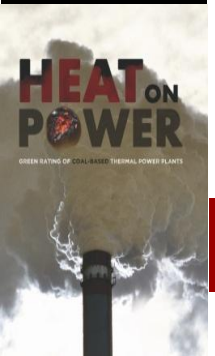
The study selected a wide range of plants to ensure they accurately represent the total sector

- ✓ **Geographically diversified**
- ✓ **State, centre and private ones – each company was represented in proportion to its size**
- ✓ **Wide range**
  - **Varying unit sizes – 30% were 210MW units; 25% were 500MW units**
  - **Varying age – quarter each exceeding mid life and full life**
- ✓ **Rating is site specific – Coal mining and sourcing not included**



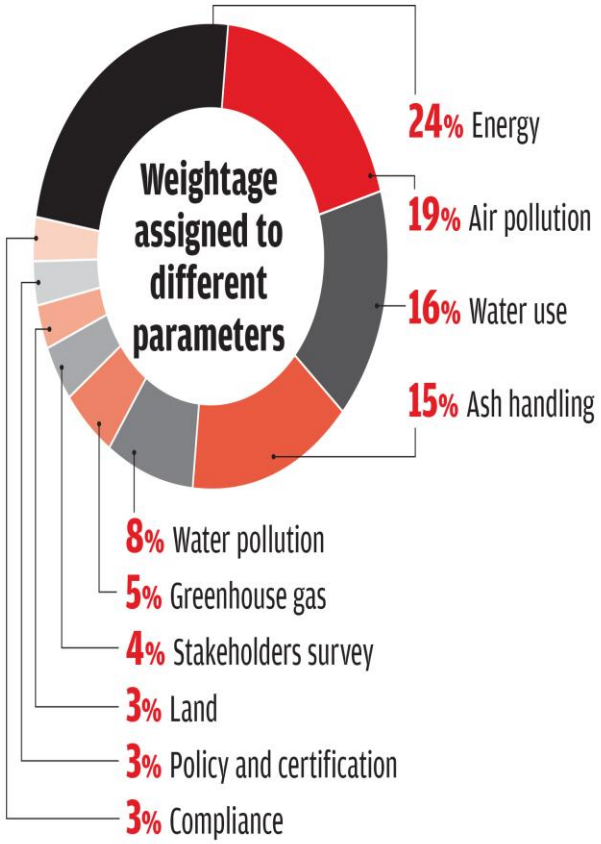
Rating methodology

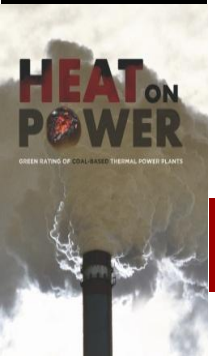
- ✓ **Collect data** from companies but also from other sources including pollution control boards, CEA/CERC, media, legal cases, RTI, industry publications etc.
- ✓ **Survey of the plant** to verify operation data and environment practices
- ✓ **Interaction with local community,** workers, NGOs, pollution control boards to judge on-the-ground environment impact
- ✓ **Final company profile** (report) after seeking clarifications/comments from plant
- ✓ **Indicators, weightage and rating:** finalized in consultation with external experts



Weightages

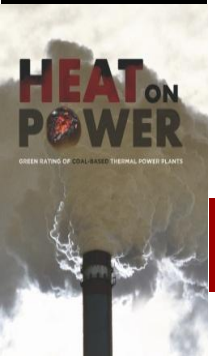
Segments	Weightage (%)
Resource Efficiency	19
Land	3
Water	16
Energy and GHG	29
Pollution	42
Water Pollution	8
Solid Waste	15
Air Pollution	19
Policy, compliance and stakeholder 's survey	10





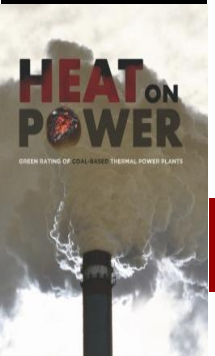
Key indicators

- ✓ **Technology & performance**
  - Gross efficiency
  - Deviation from design efficiency
  - Technology (Steam parameters, reheat)
  - Availability
  - GHG
- ✓ **Resource use**
  - ❑ Water
    - Water consumption index
    - Sourcing
    - Water stress index

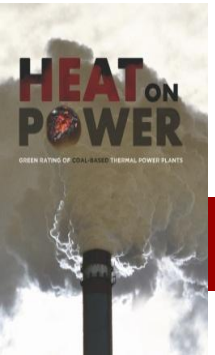


Key indicators

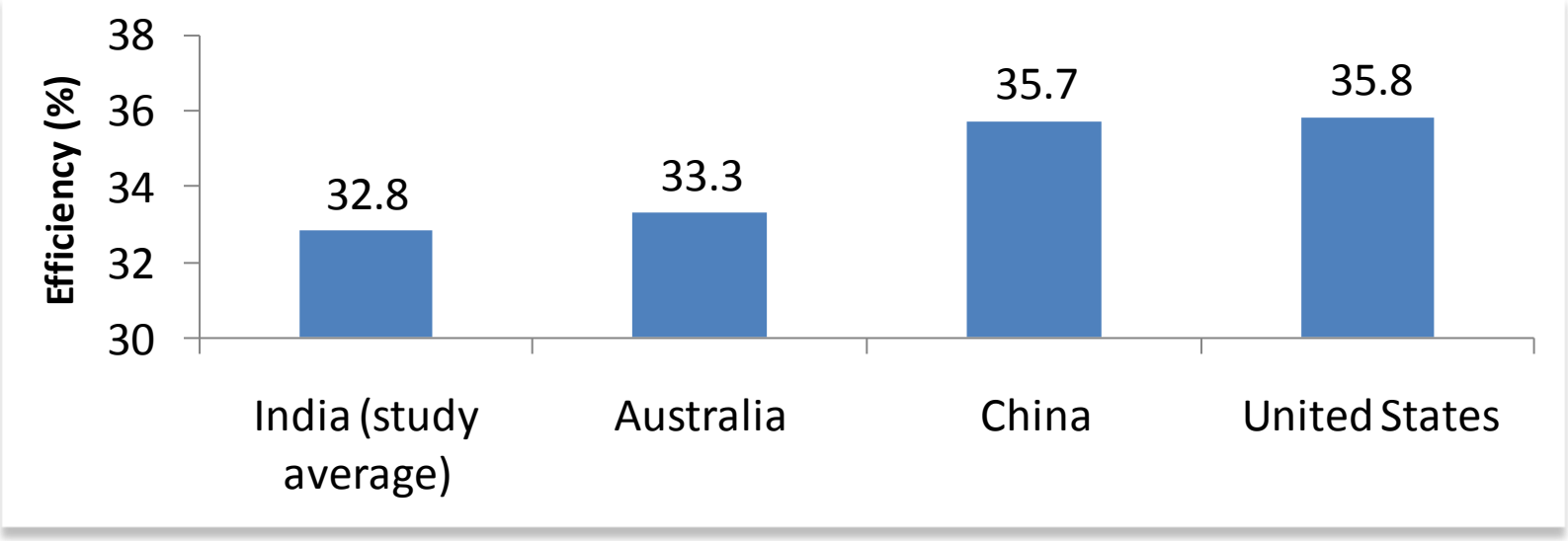
- ✓ **Pollution**
  - ❑ Solid waste
    - Gainful ash utilization
    - Ash pond maintenance
  - ❑ Air pollution
    - Coal storage and handling practices
    - PM index
    - SOx and NOx emission rates
  - ❑ Water pollution
    - Water pollution index
    - ETP, STP; Coal storage runoff; Lab results
- ✓ **Policy, Compliance, Stakeholder survey**



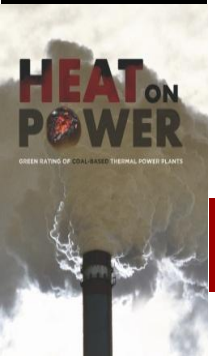
What we found?



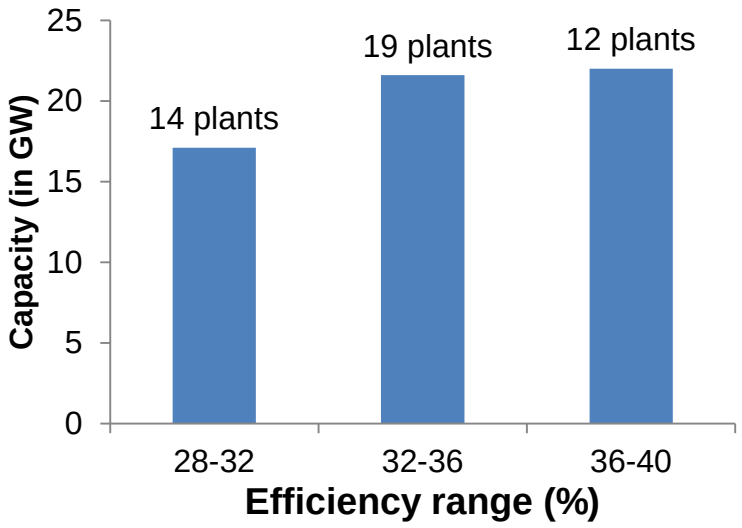
Energy (in)efficiency

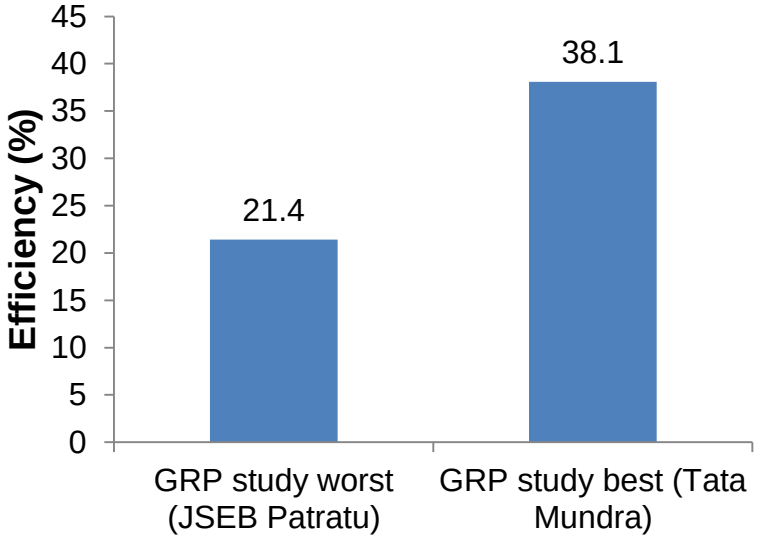


- ✓ Among the least efficient in the world. GRP study average was just 32.8%
- ✓ Impact on GHG – around 3% per %age point efficiency
- ✓ Dated technology - SC offer 3-4% higher efficiency
- ✓ subcritical 90%, SC 10% ; China subcritical 75%, SC/USC – 25%
- ✓ USC not even introduced
- ✓ Less than 10 years and >300MW – less than fifth; China – 60%+
- ✓ No policy push to close inefficient plants, to allow new only SC

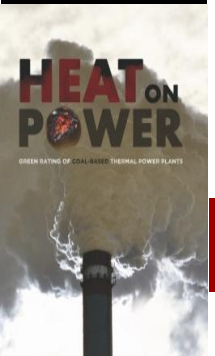


Efficiency

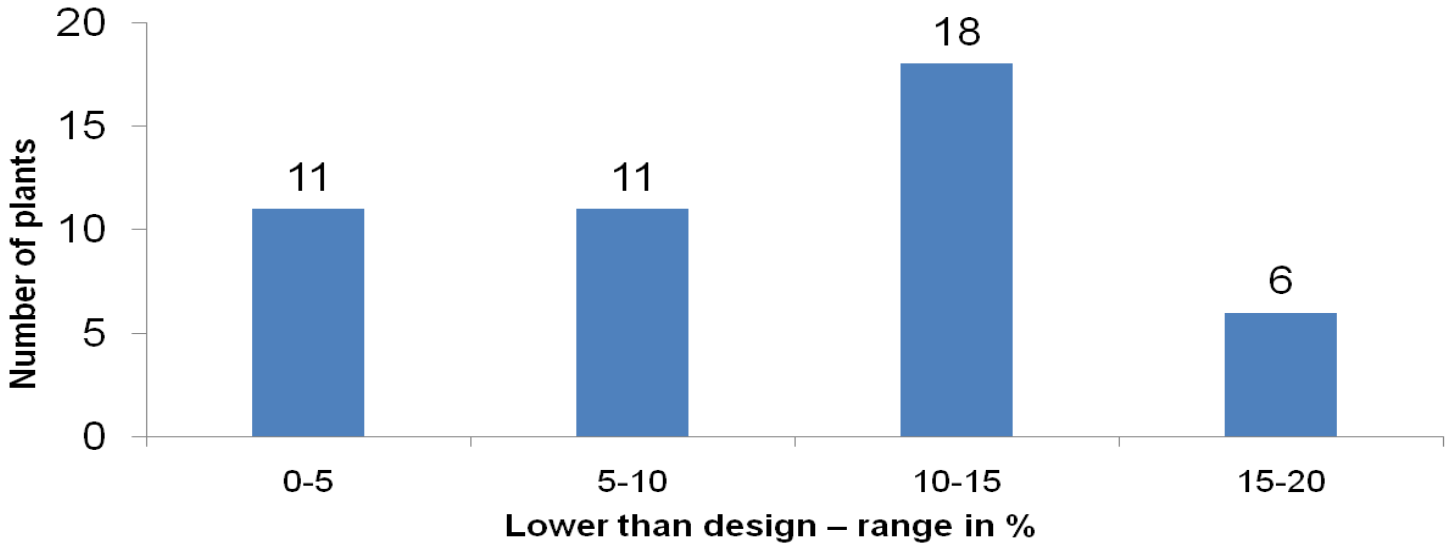




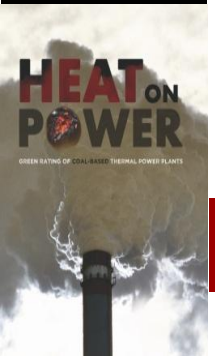
- ✓ 14 plants below 32%; Almost all state-owned
- ✓ Overall, merely 12 plants had efficiency in excess of 36%, around the Chinese average
- ✓ All except two in top category use domestic coal
- ✓ JSEB Patratu at the bottom at 21%



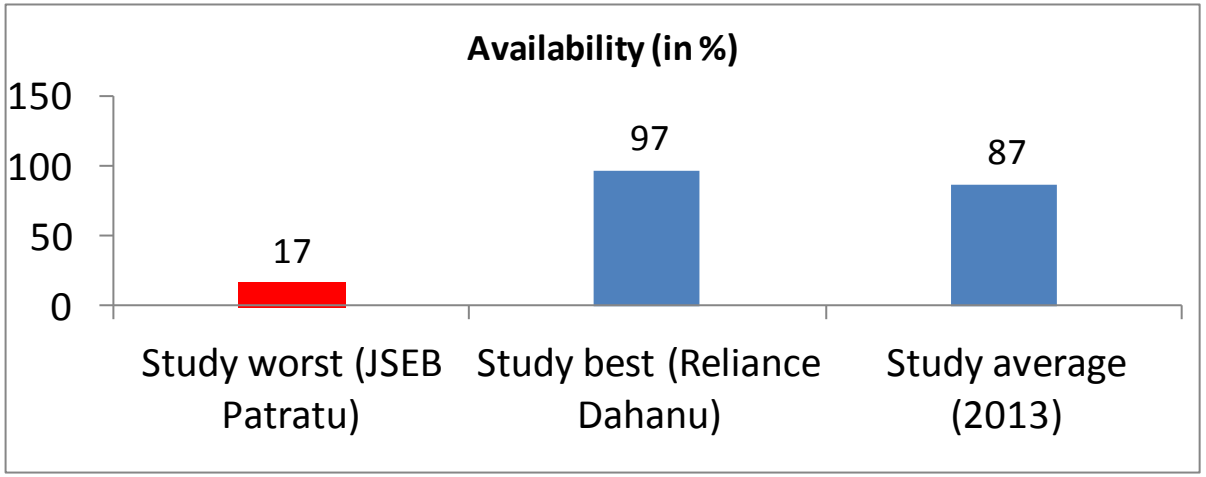
Efficiency: Actual vs. design



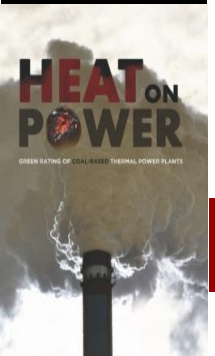
- ✓ Efficiency 10% lower than design poor O&M - more than half the plants in the study
- ✓ Age is factor, but huge variations in study; Newer plants such MPPGCL Birsinghpur – 20%+
- ✓ State-owned old plants were the worst performers
- ✓ Efficiency and deviation from design vs. PLF (Adani Mundra)



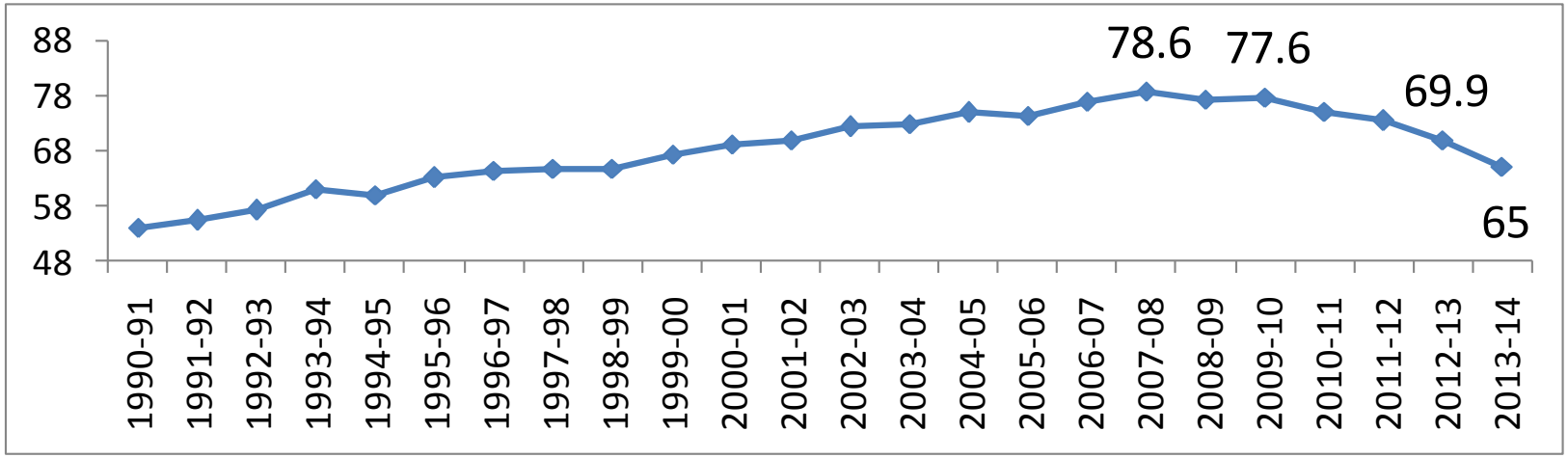
Availability



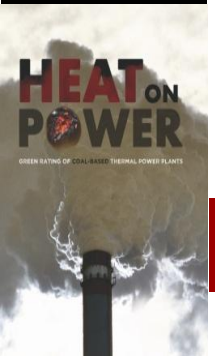
- ✓ Just one plant had less than 15 days average outage during study period
- ✓ 11 plants had average outages of more than 2.5 months
- ✓ Average outages were 47 days in 2012-13
- ✓ Irregular maintenance schedules and bad operational practices increase outages



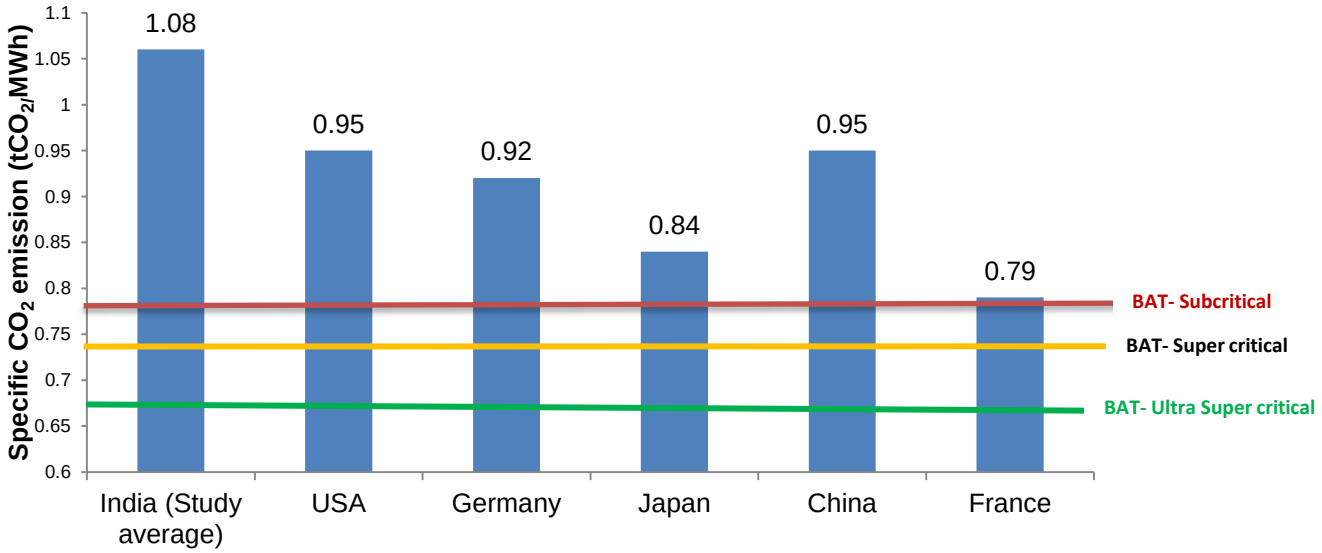
PLF (in %)



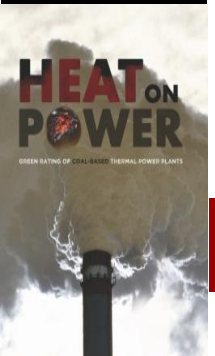
- ✓Overall demand slow down; excess capacity during night time decline in demand
- ✓Stagnant coal production, evacuation bottlenecks in railways have constrained supply
- ✓State discoms weak financial position limited their power purchasing capability



CO_2 emissions

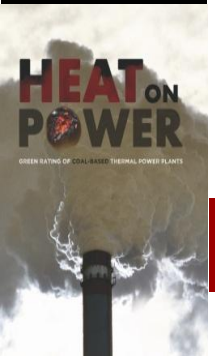


- Coal plants responsible for over half of GHG emissions
- Sample average was 1.08 tCO_2/MWh; 45% higher than the global best; 14% higher than Chinese average
- Improving efficiency key to cutting GHG

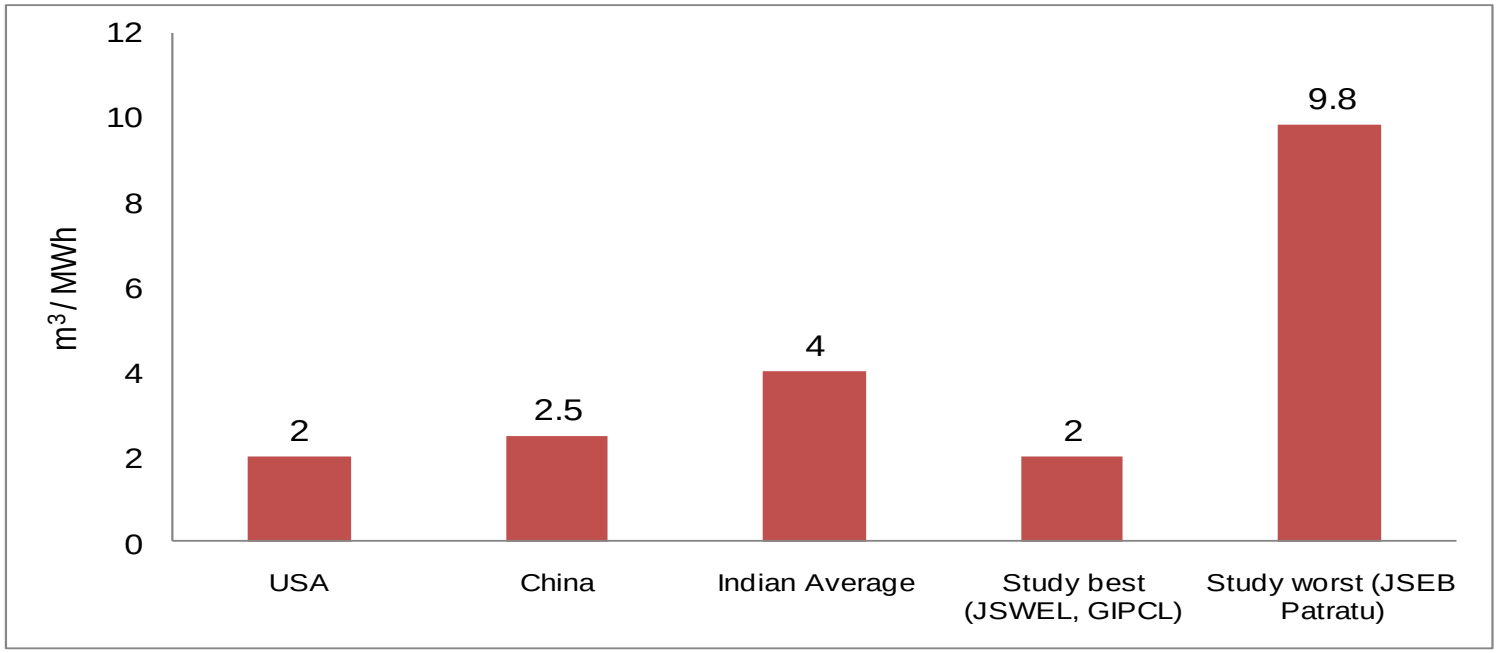


Resource use - land

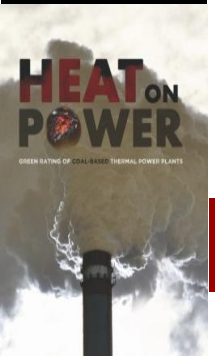
- Average around 2 acres/MW, CEA's latest guidelines suggest 1.09 acre/MW; Worst performer:- Mahagenco Chandrapur uses 10.8 acres/MW
- Over 40% was used for ash disposal
- Old state-owned plants posses nearly 4 times more land per MW than new private plants



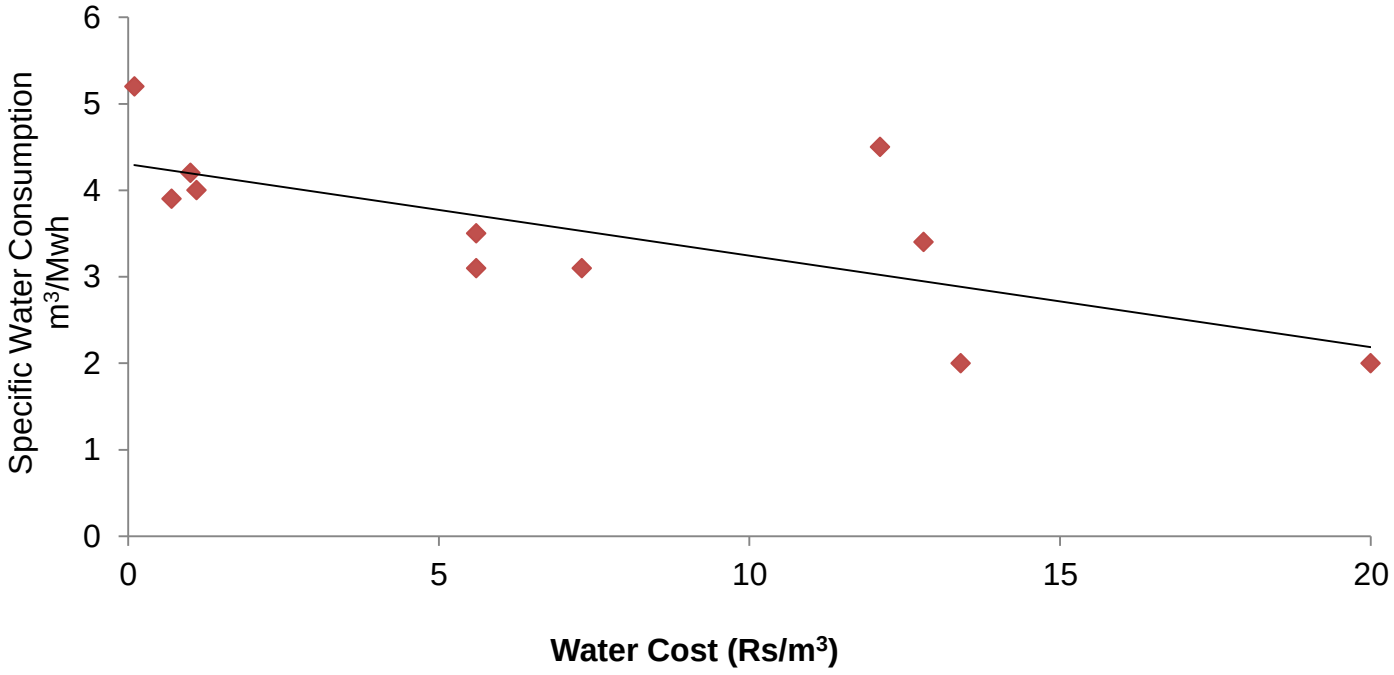
Resource use - water



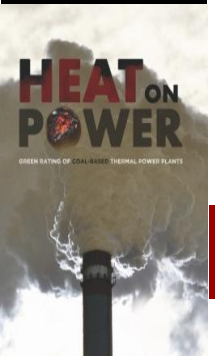
- Inefficient water users; global best 1.6 m^3/MWh
- Annual water draw (around 22 BCM), is over half of India's total domestic water needs
- Two thirds of the plants located in water stress areas



Not paying for water

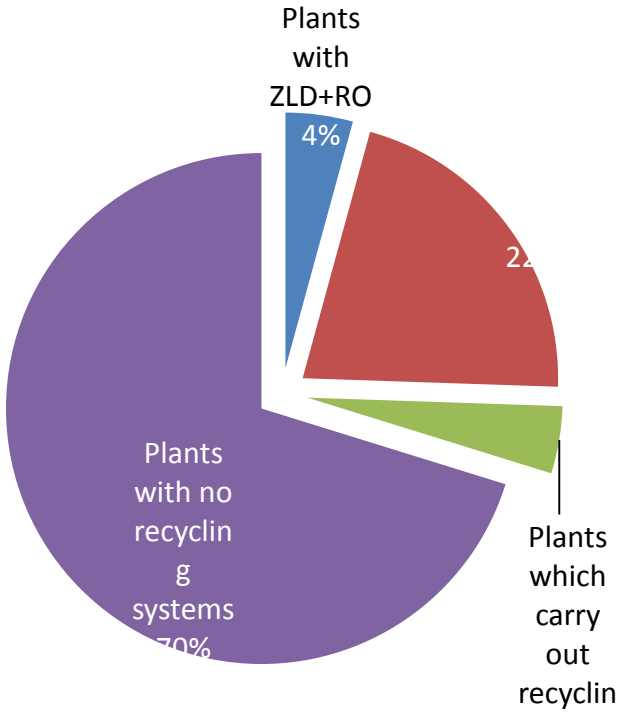


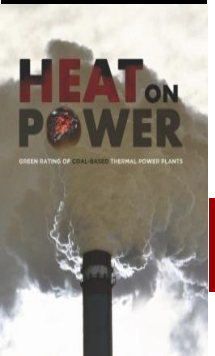
Range – 10 paisa/m^3 to Rs 20/m^3;
Rajasthan charges only 70 paisa/m^3
Tariff impacts use



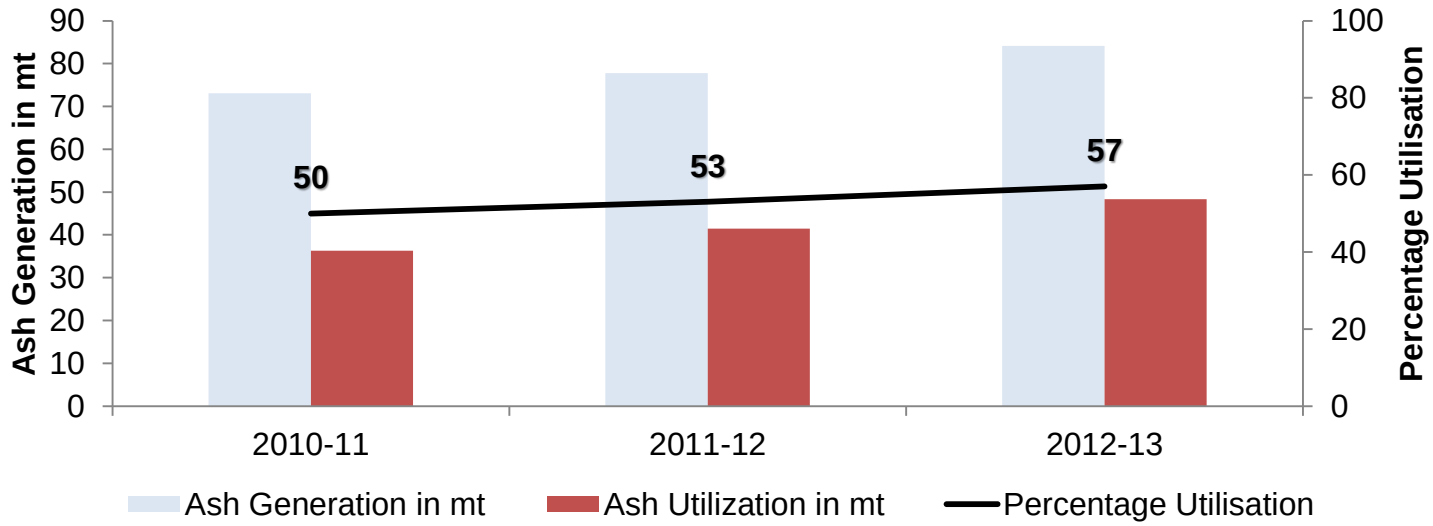
Waste water

- Power plants can easily be a zero-liquid-discharge; less than a third were even recycling.
- 20 plants were discharging ash slurry into water bodies, a serious violation
- Effluent samples taken by CSE show 39 percent violated total suspended solid norm





Solid waste - Ash

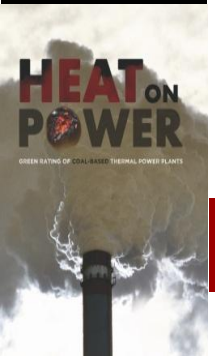


Second largest solid waste stream of the country.

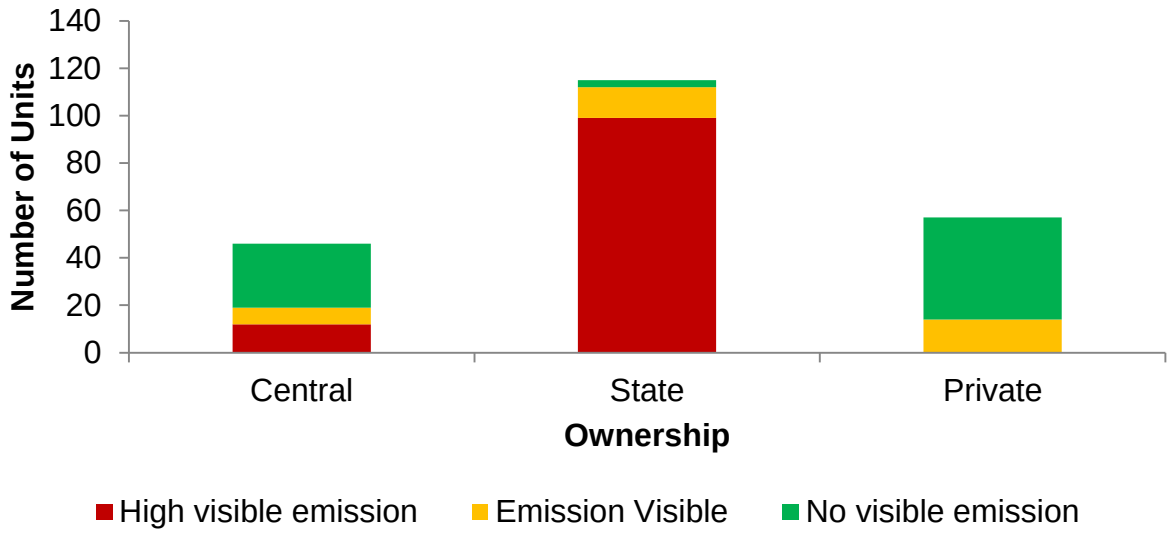
Average utilisation during 2010-13 was only 53 per cent for plants in study. However, one-third of this was not beneficial.

Three fourths not meeting 2013 target

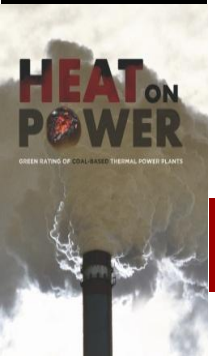
Unused ash dumped in poorly maintained ponds (around 80% non compliance – lining, leakage, piezometers)



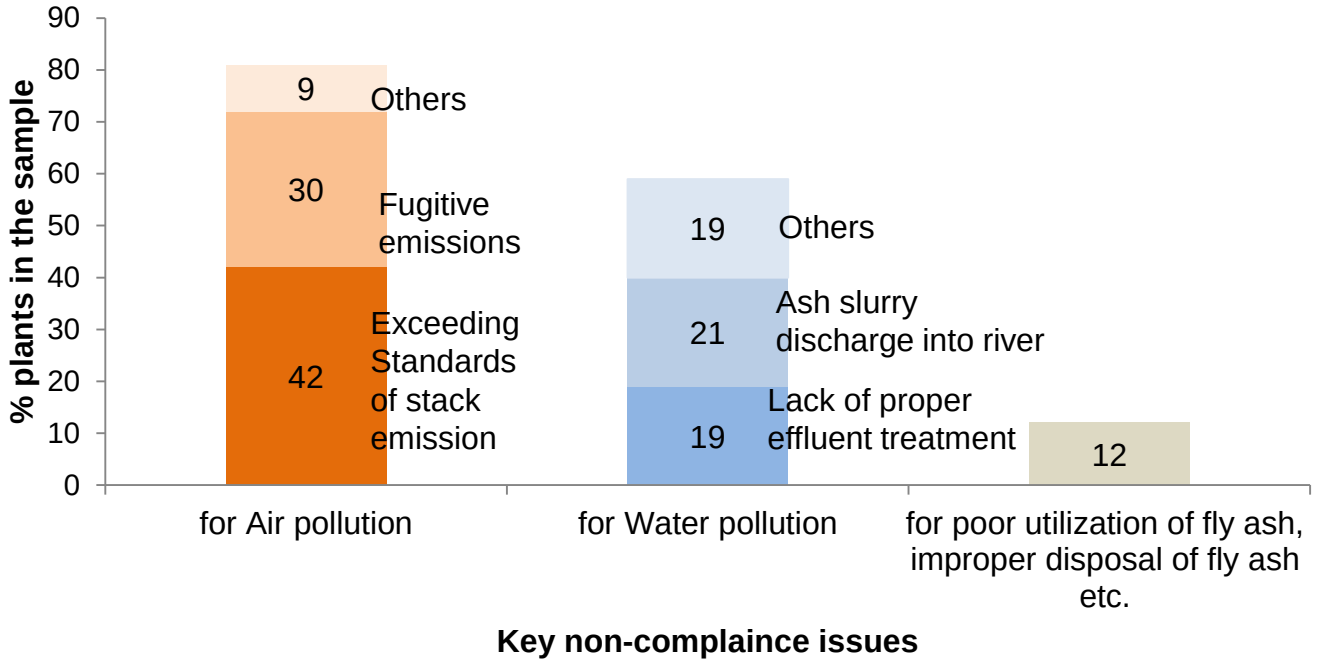
Air Pollution - PM



- National PM emission norms lax (150- 350 mg/Nm^3), China: 30 mg/Nm^3.
- More than half violating, of which 85 per cent were state plants
- No national NO_x ,SO_2, and Hg standards
- Ambient Air Quality – only 7 monitor continuously

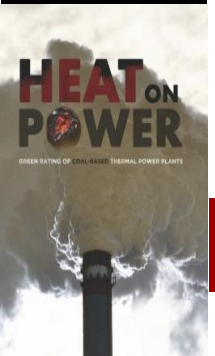


Enforcement



Show cause notices – but enforcement is poor

PCBs noted violations but unable to act – power needs



Summary

- ✓ 2 years of rigorous assessment
- ✓ 60 key parameters were selected - technology, process performance, efficiency, pollution, compliance, management systems etc.
- ✓ With hope that this will drive the power sector towards better social and environmental practices