Emerging Structure of Generation Entities and Role of Captive Power

Workshop on

State-Level Electricity Reforms:
Impacts on Technologies, Institutions and Environment

April 7-8, 2003

Indian Institute of Management, Ahmedabad

IIMA-Stanford Team Presentation

Presentation Agenda

- Generation Entities
- Evolution of Recent Structures
- Captive Power Plants

Generating Structure

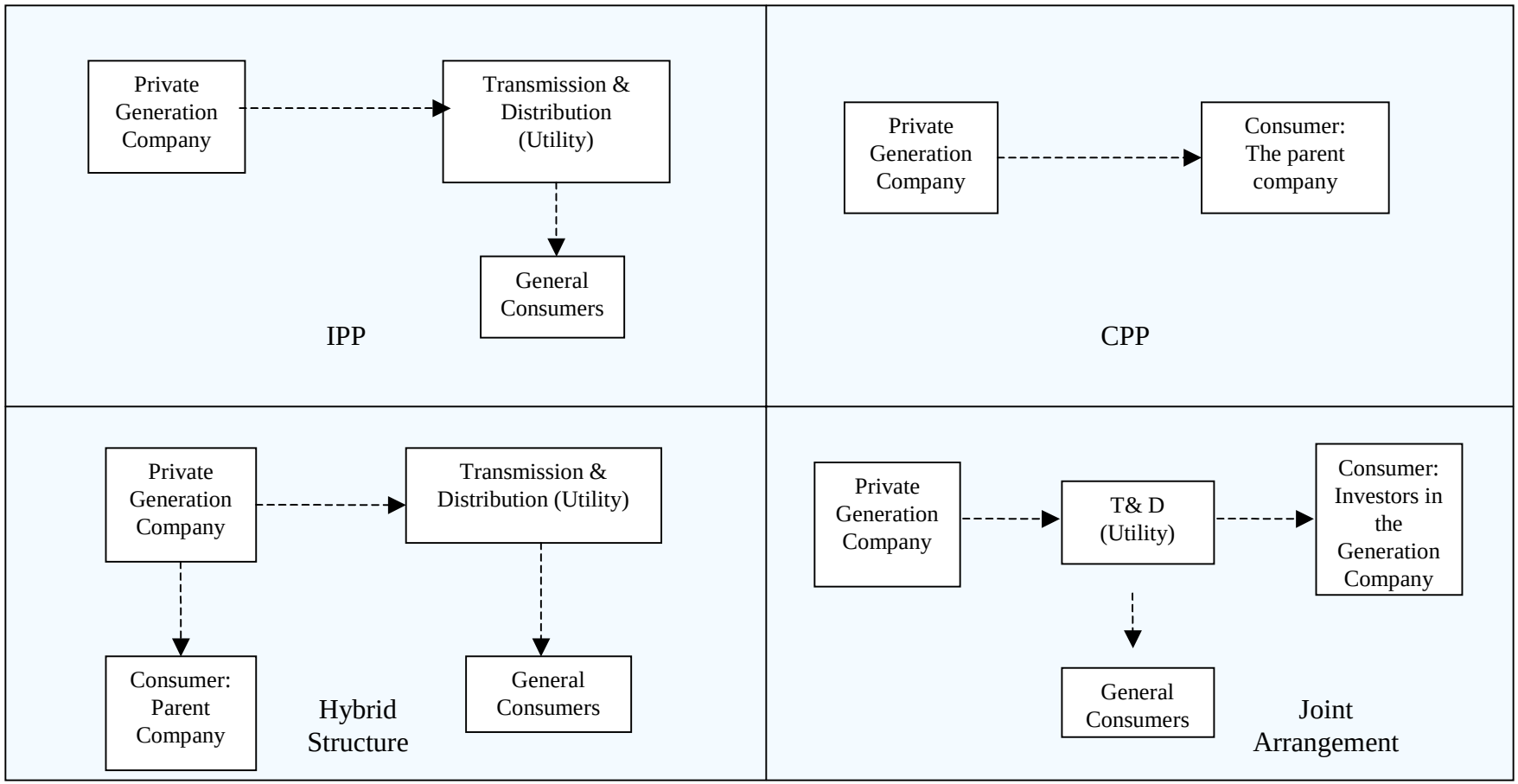
Conventional

- State
- Center
- Private Licensees

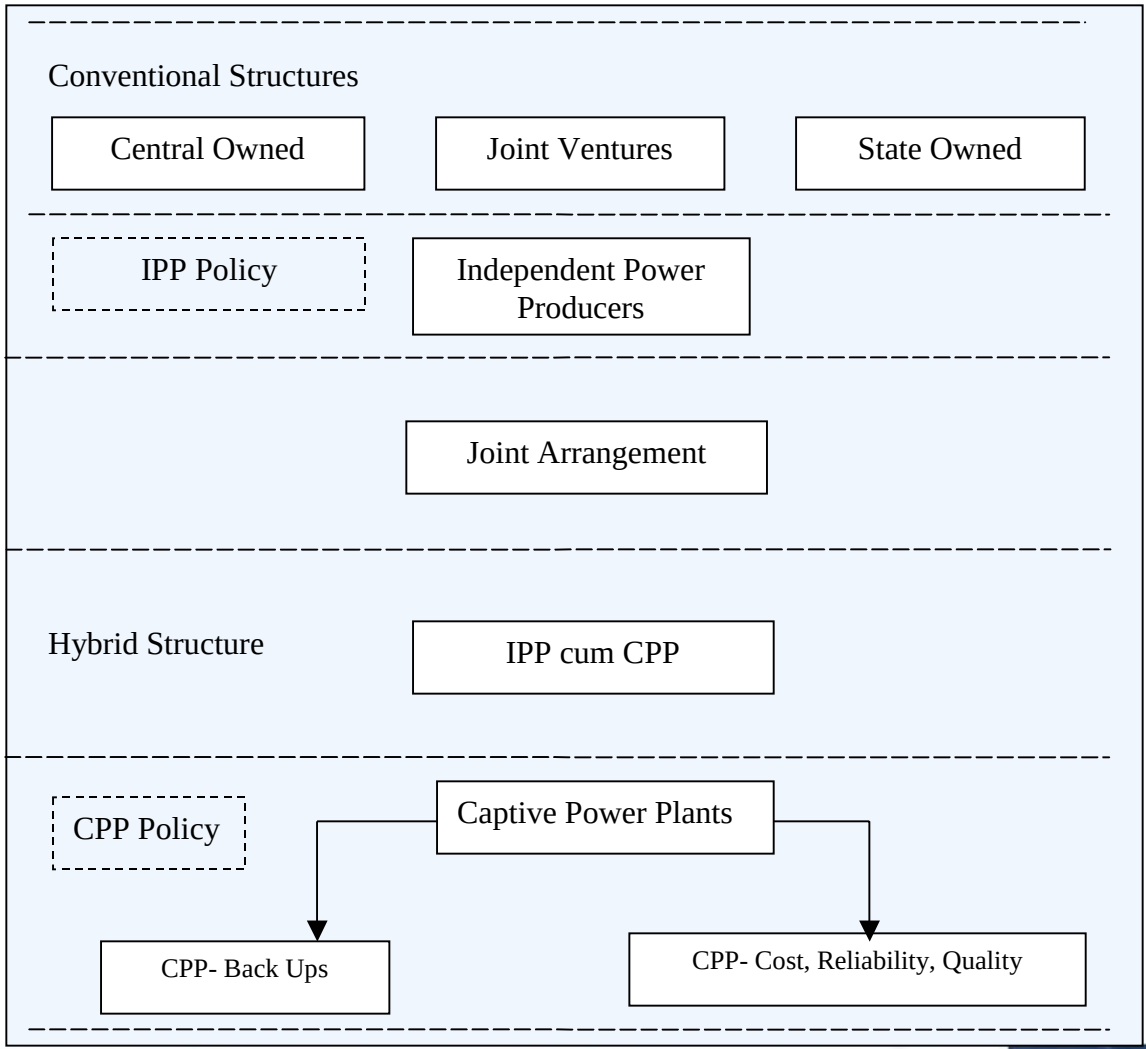
Recent

- IPPs
- Joint Arrangement
- Hybrid Structures

Generating Structure



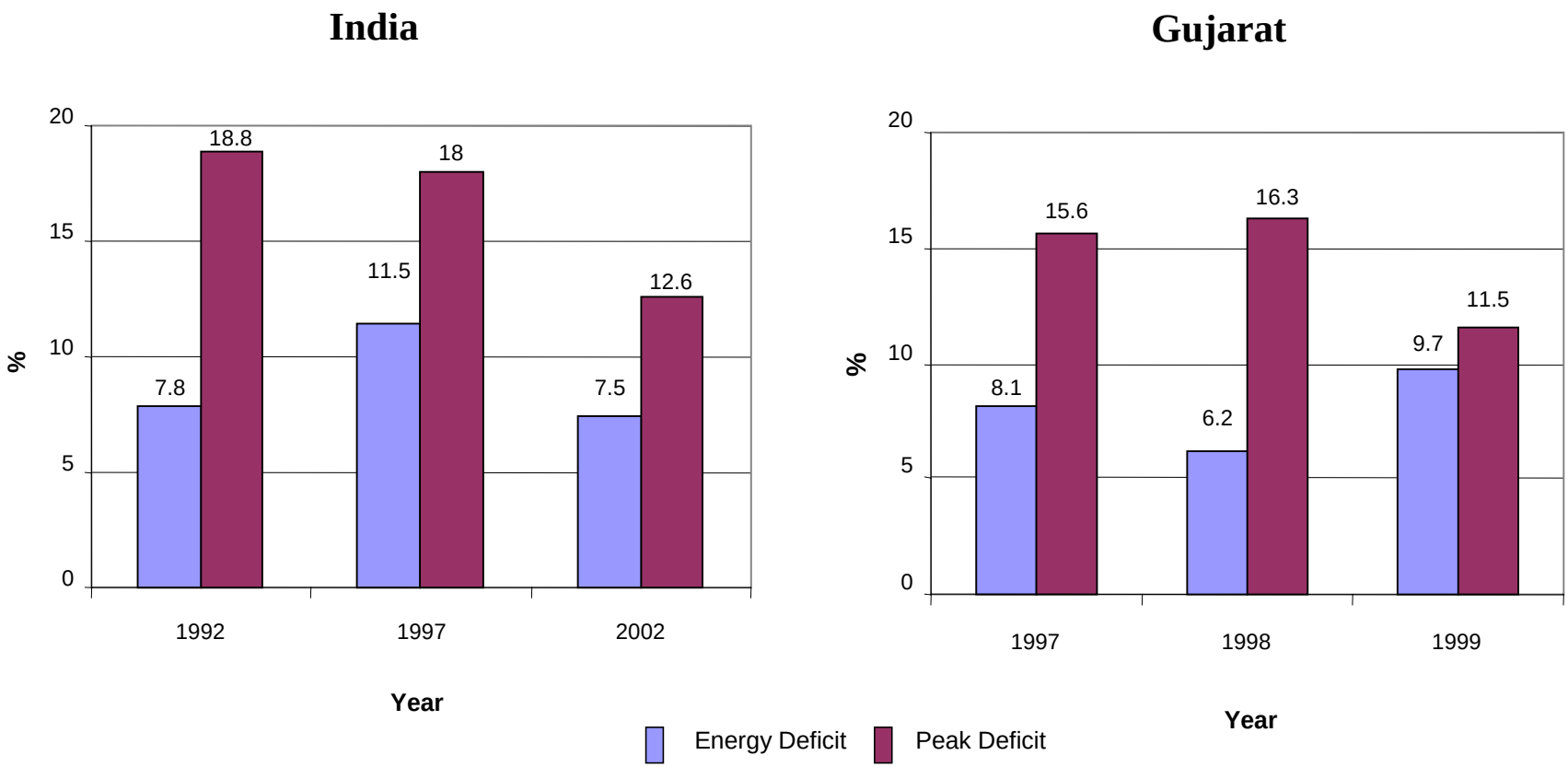
Segmentation of Generation Entities



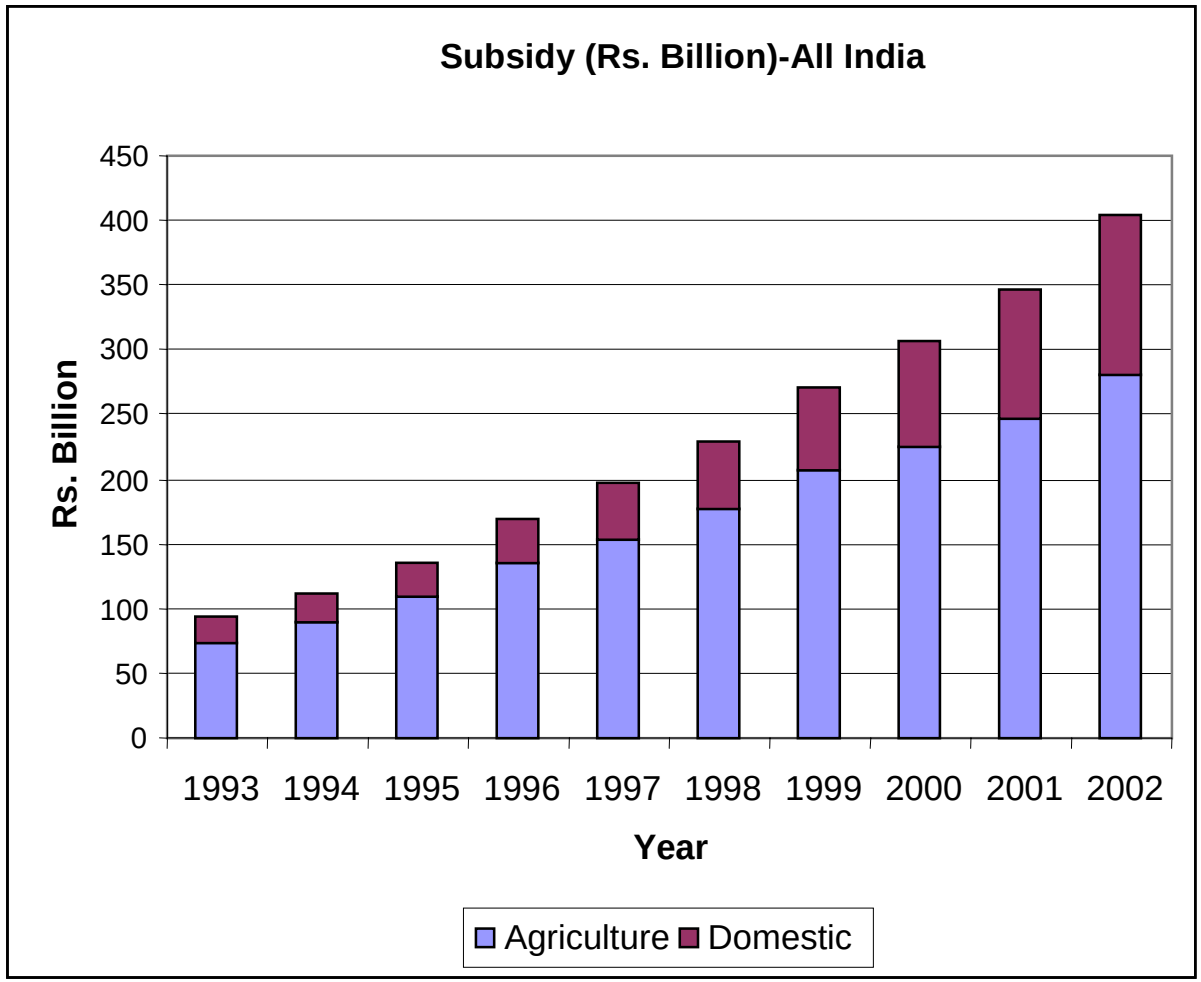
Reasons of New Structure

- New Policies
- Persistent Supply Deficit
- High Industrial Tariff
- Quality of Electricity
- Multiple Benefits

Supply Deficits



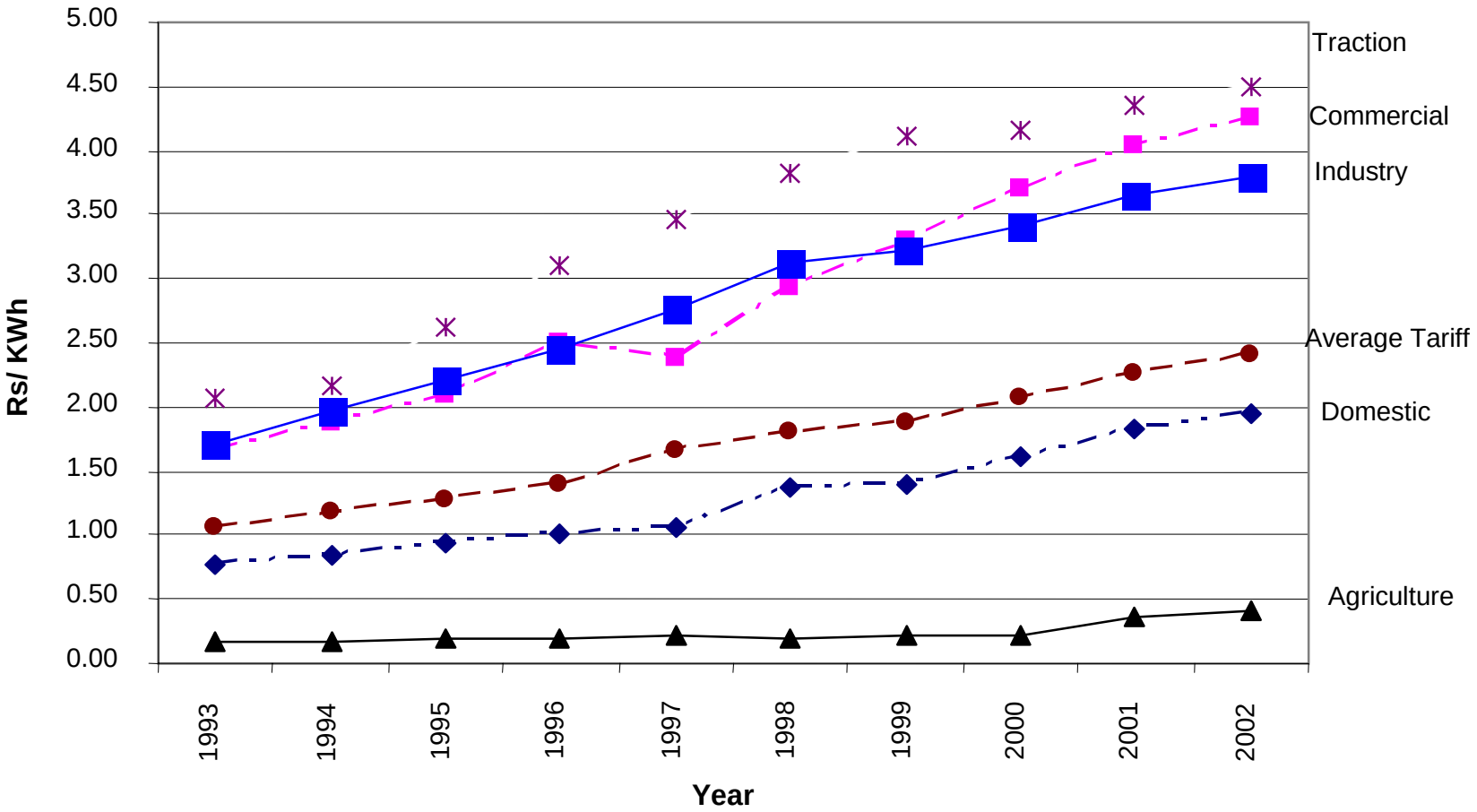
High Industrial Tariff



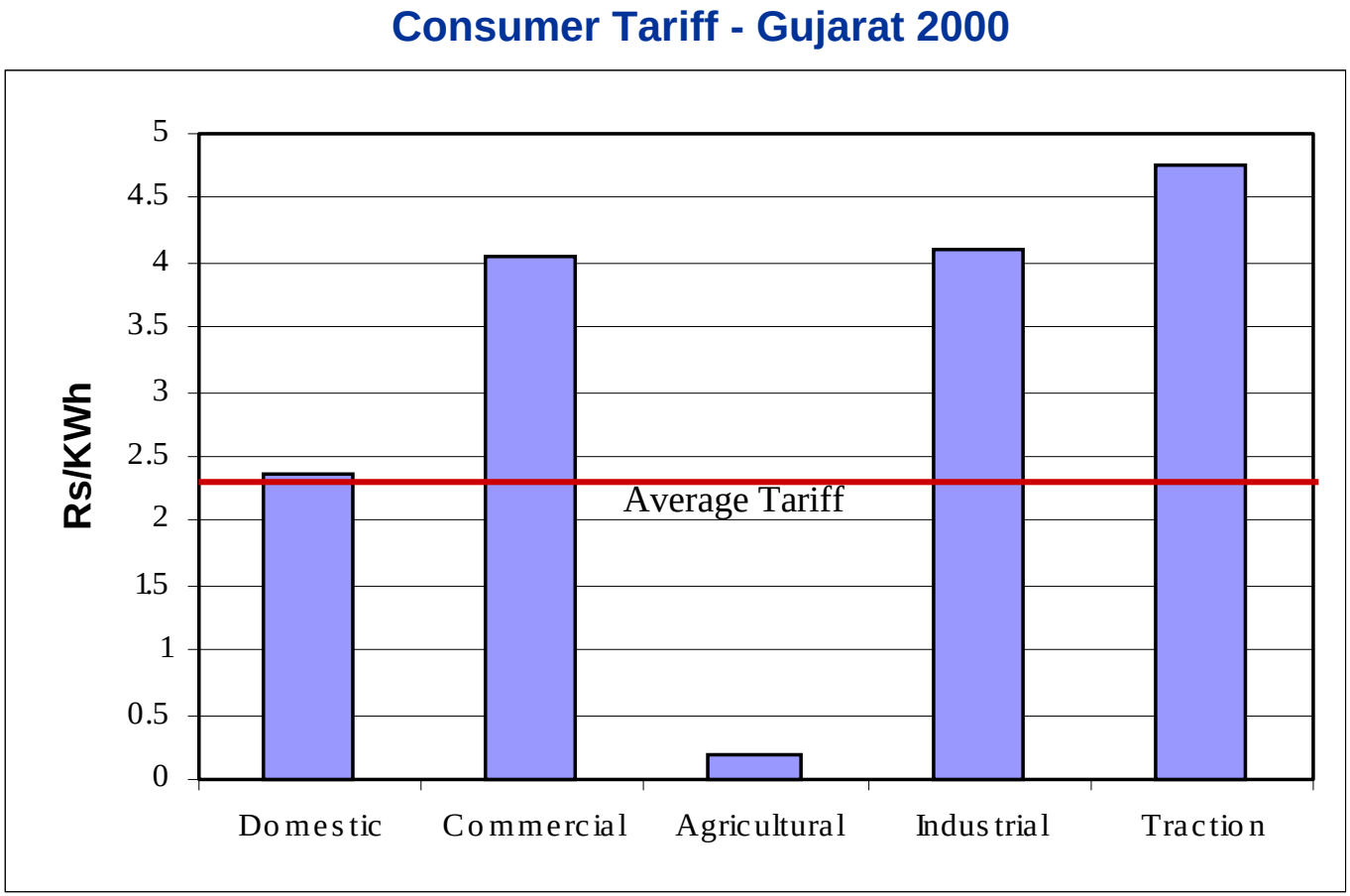
An IIMA - Stanford Study

High Industrial Tariff

Average Tariff - India



High Industrial Tariff



Quality of Power

- Performance of Sensitive Equipments
  - Maintenance Cost
  - Repair time
  - Down Time
- Production losses from Poor Power Quality
- CPP is chosen to improve power quality

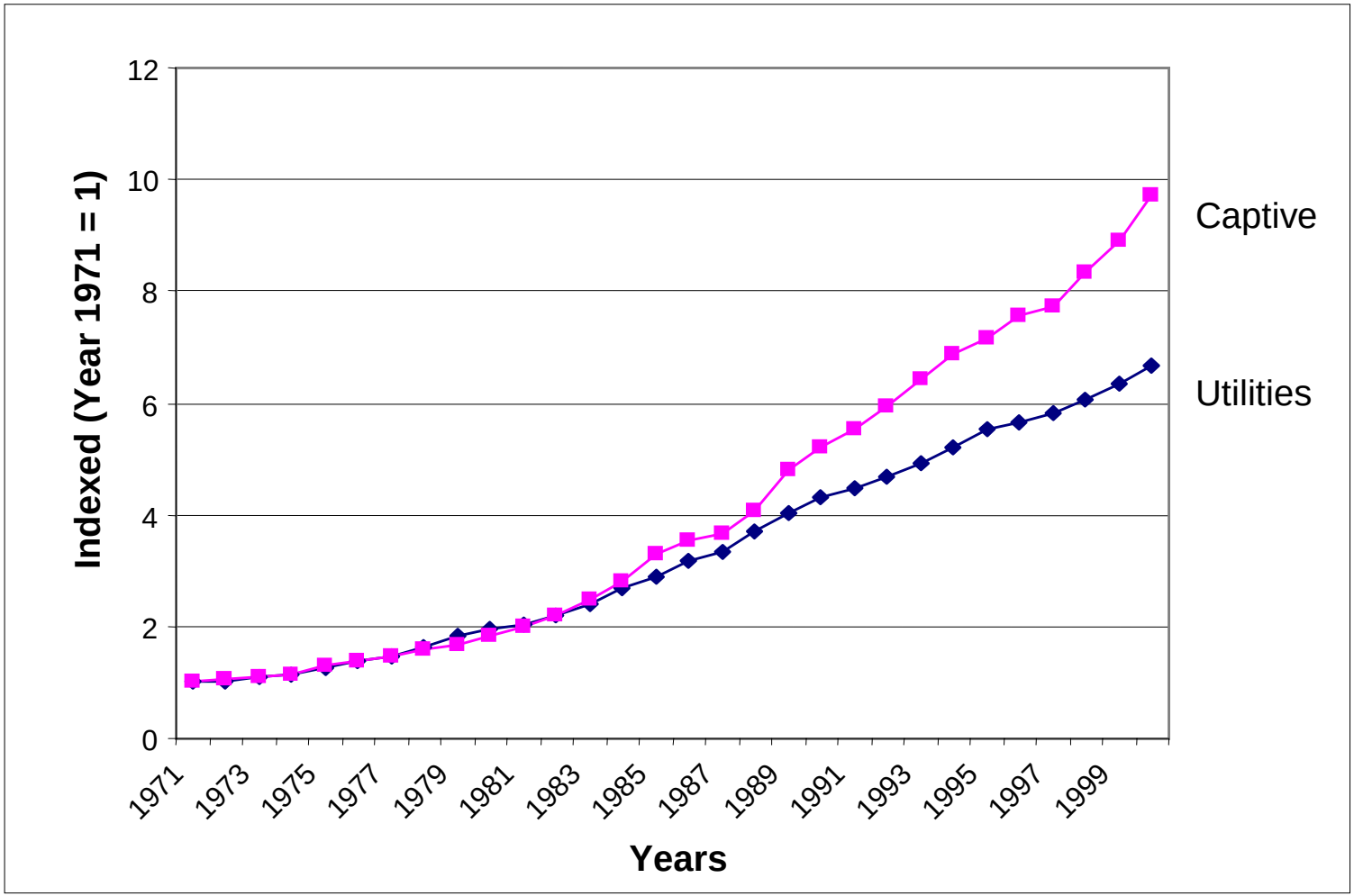
Multiple Benefits

Energy efficiency from joint electricity and steam production

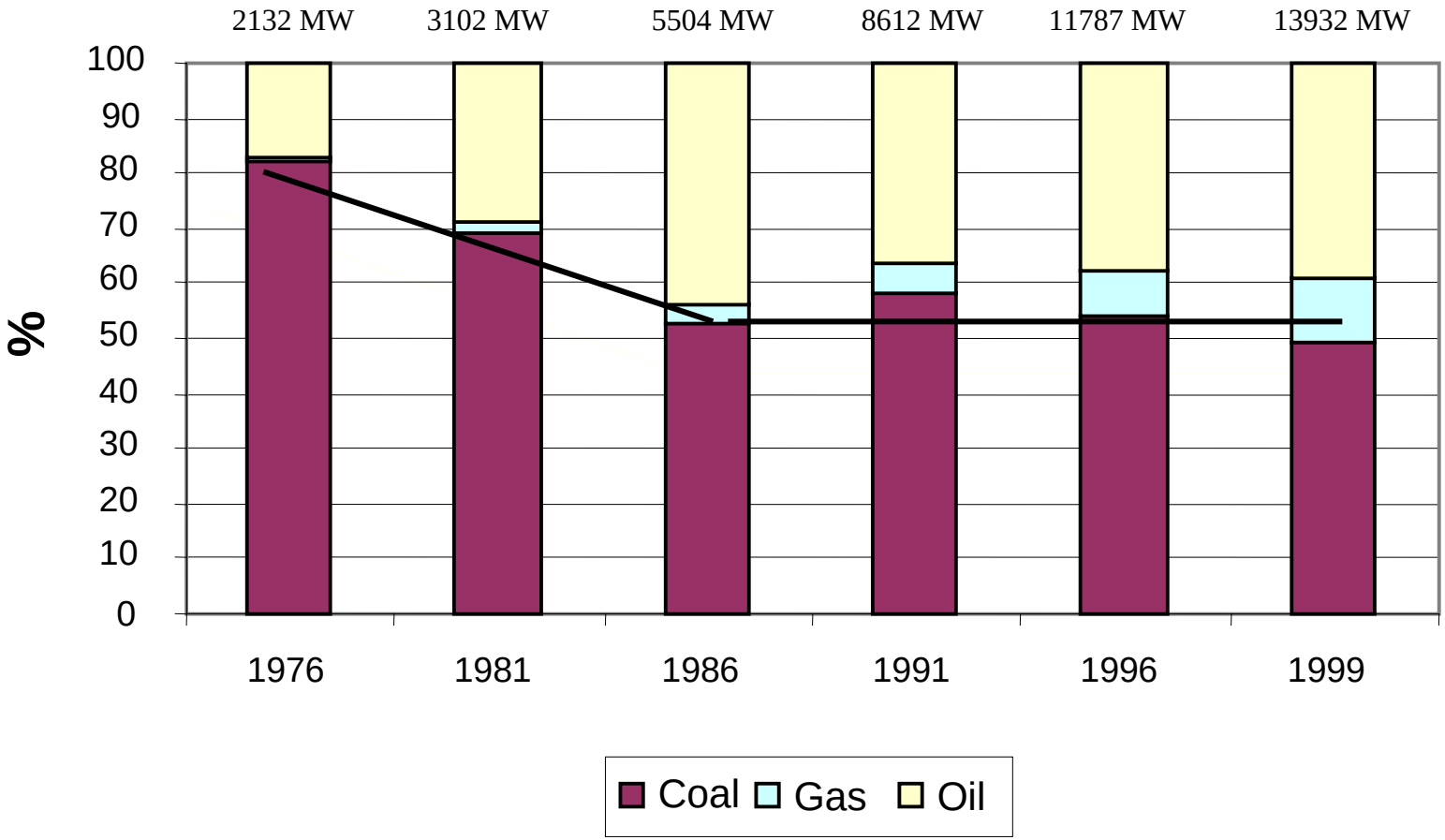
- Bagasse Cogeneration (Sugar Mills)
- Cotton Textile

Captive Power Plants

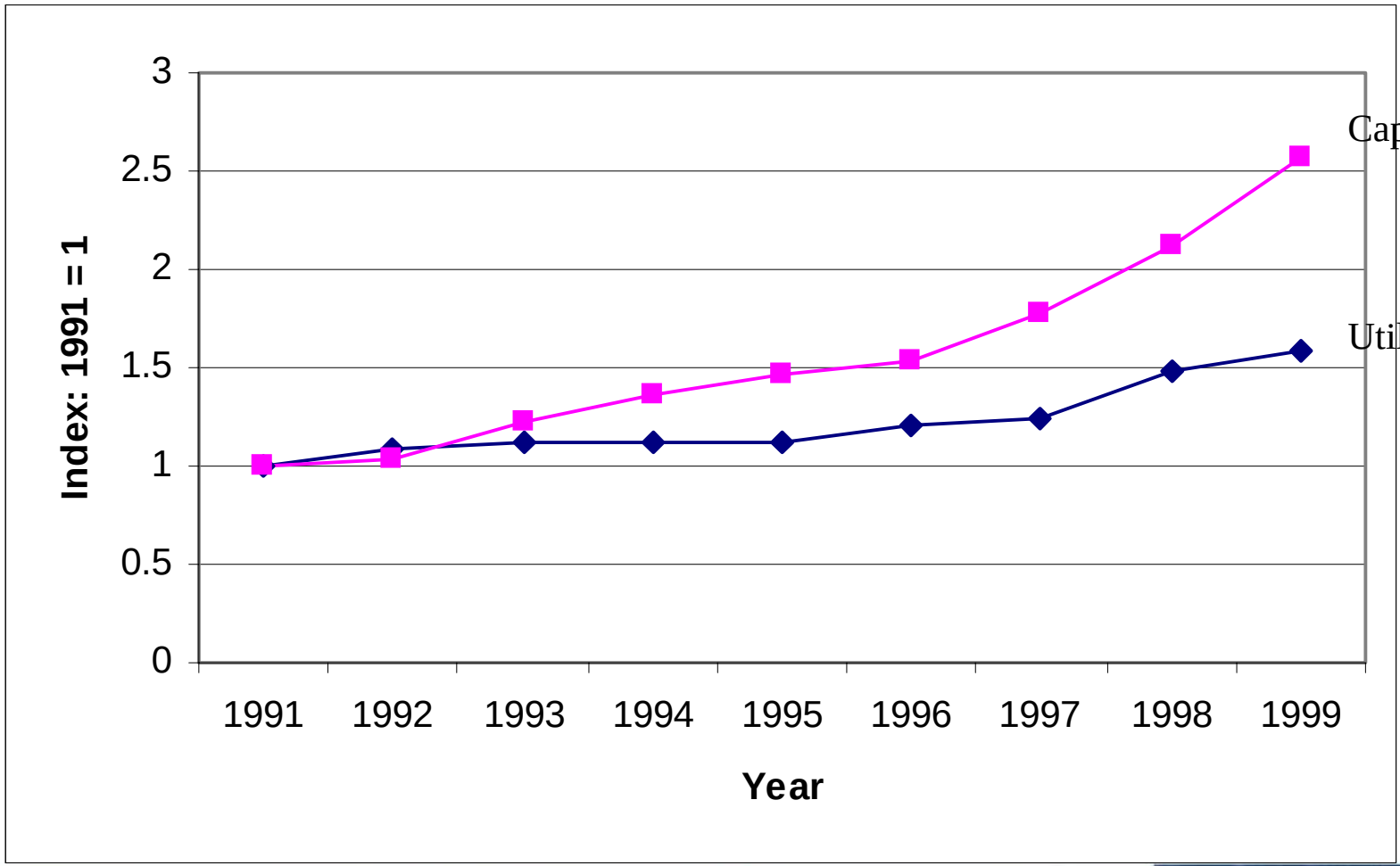
Installed Capacity- India



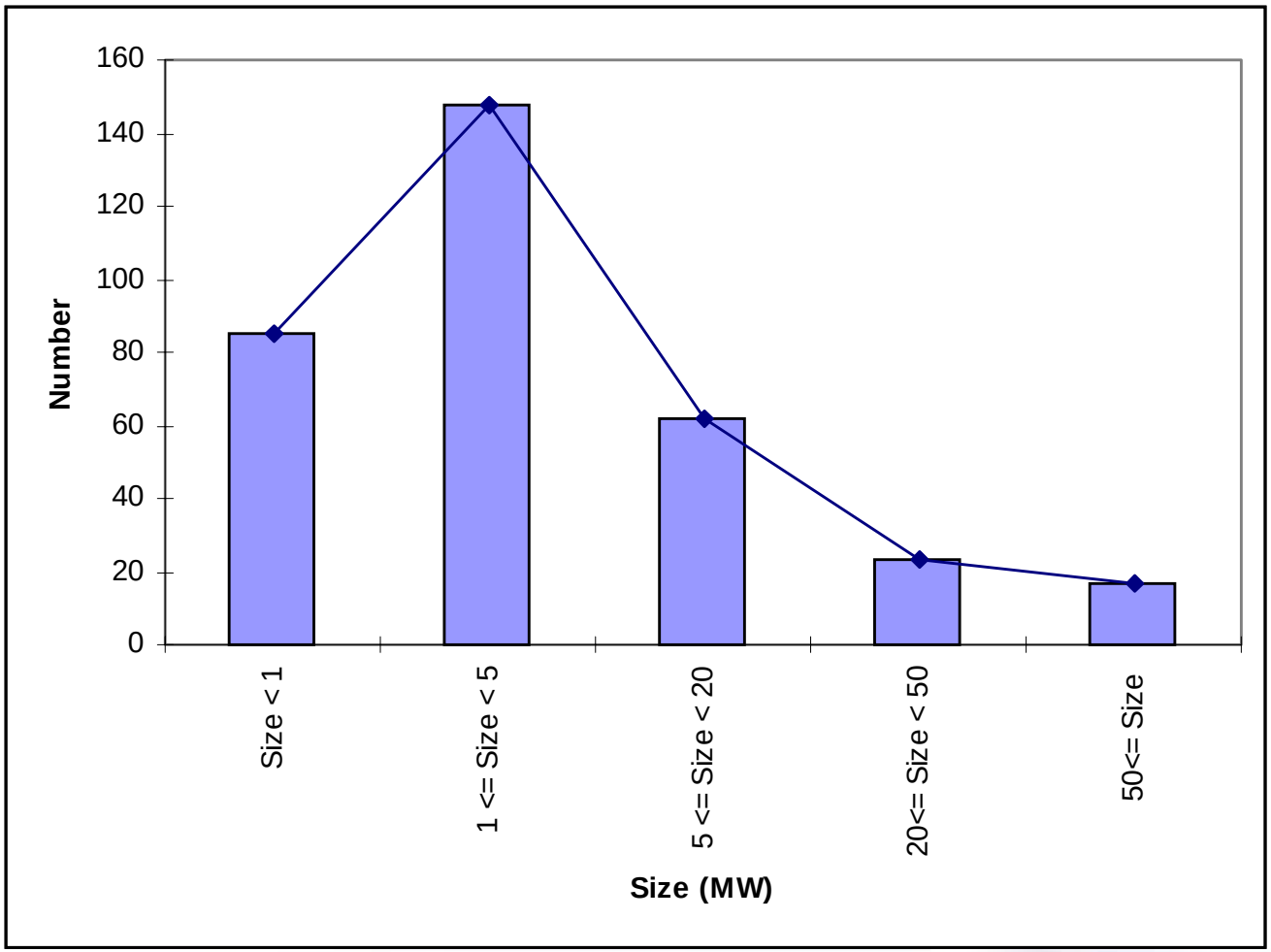
Fuel Mix of CPP - India



Growth of Installed Capacity - Gujarat



Captive Power Plant Size - Gujarat



CPP- Gujarat

Fuel	Installed Capacity MW (%)	Total Number (%)
Bagasse	3	8
Coal	17	12
Oil	23	55
Gas	17	18
Naptha	38	5
Naptha and Gas	1	0.3
Others	1	1.7

CPP Survey (21 Plants)

- Industry type
  - Cement
  - Chemicals
  - Fertilizers
  - Manufacturing
  - Paints
  - Paper
  - Petrochemicals
  - Steel
  - Textile
- Fuel (Number)
  - Coal (3)
  - Natural Gas (4)
  - Naptha (3)
  - Naptha/Natural Gas (1)
  - Oil
    - RCO (1)
    - FO (4)
    - HSD (2)
    - LDO (3)

Segmentation of the CPPs

Objective/ Segment	Size	Preferred Fuel	Typical Consumer
Hedging against interrupted power supply (Back Up)	Small	Oil (HSO, HO, LDO)	Small units (Textiles, Paints, Paper)
Better Control, Quality power	Small - Medium	Gas, Naptha	Facilities with sensitive equipments
Joint production of steam and Electricity (Cogeneration)	Small - Medium	Gas, Naptha, Bagasse	Sugar mills, Cotton Textile
Reduced cost of generation (below industrial tariff)	Medium - Large	Coal, Gas, Naptha	Petrochemicals, Cement

CPP Segments - Gujarat

From IIMA-Stanford Survey of 21 Captive Plants

CPP	Fuel Type	Installation cost (million rupees per MW)	Generation cost (rupees per unit)
Back Up	FO	10 - 12	3.5 - 3.75
	LDO	7.5 - 10	4.25 - 4.6
	HFO	10 - 15	4.5
Cogeneration	Naptha	35 - 41	3 - 3.25
Quality/ Cost of electricity	Natural Gas	42.5 - 50	2.3 - 3.3
Cost of electricity	Lignite	50 - 52.5	1.59 - 1.90
	Coal	42.5 – 45	1.78 - 1.92

CPP: Issues and Concerns

- Loss of Industrial customers for the State Electricity Boards
- Low overall efficiency
- Adverse environmental impacts
- Future tariff rationalization may make CPPs uneconomical
- High transaction costs

Thank you