



Infrastructure Planning and Management

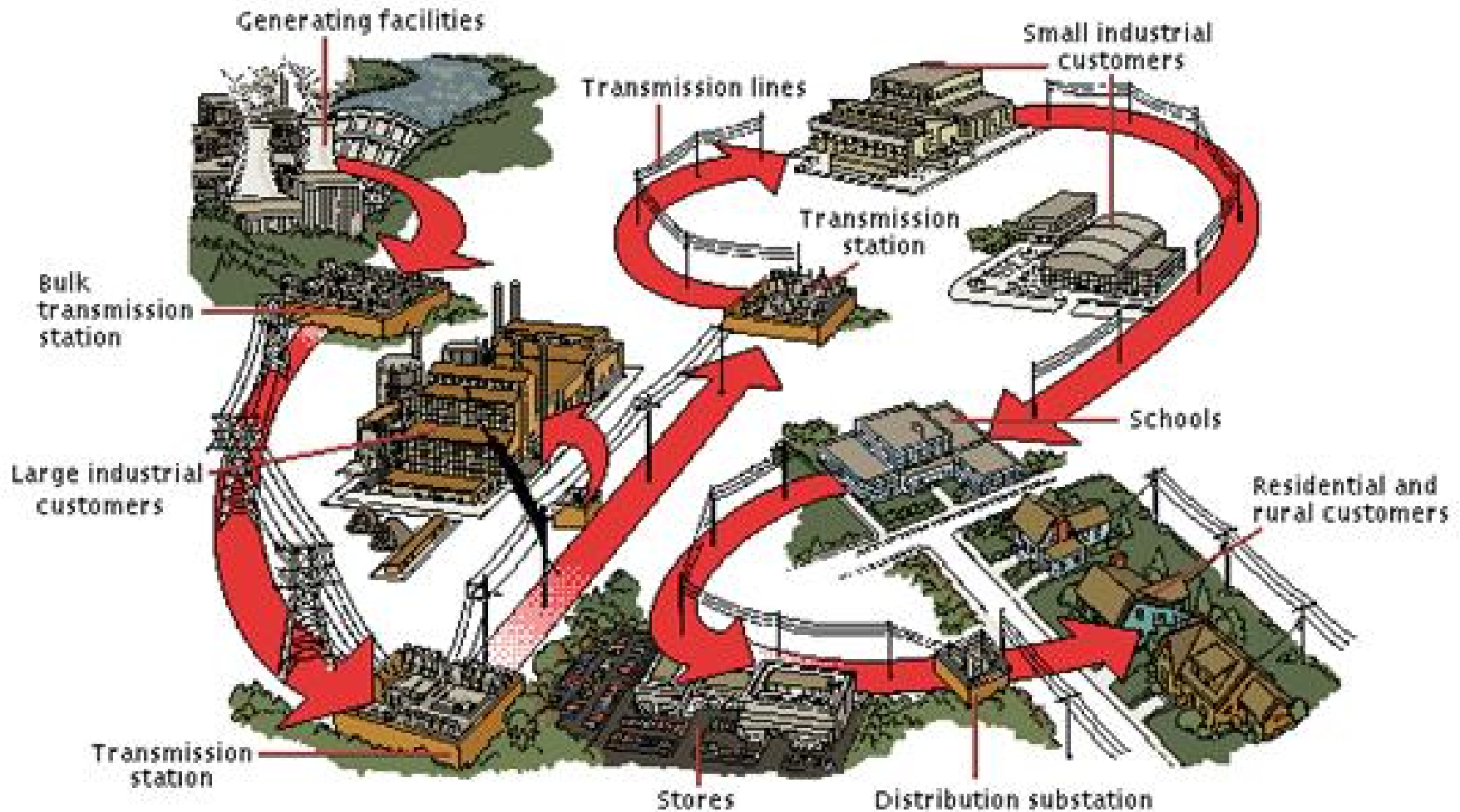
Class 3 – The Power Sector in India



Agenda

- Overview of the Power sector
- Power Sector Timeline in India
- Performance of the Indian power sector
- Reforms and Policies in the power sector

The Power Sector





Overview

- As the previous slide indicates, the power sector is normally divided into three sub-systems
 - Power Generation which is done at power plants or stations
 - Power Transmission which describes the process of transferring the generated power to a distribution system
 - Power distribution which involves conveying the transmitted power to individual homes, commercial areas etc
- However such a system need not always be followed
 - Generated power can directly be transmitted to Industries
 - Industries can themselves have power generation plants

Power generation modes



- **Thermal**
- **Hydro**
- **Nuclear**
- **Renewable**





Power Generation Modes

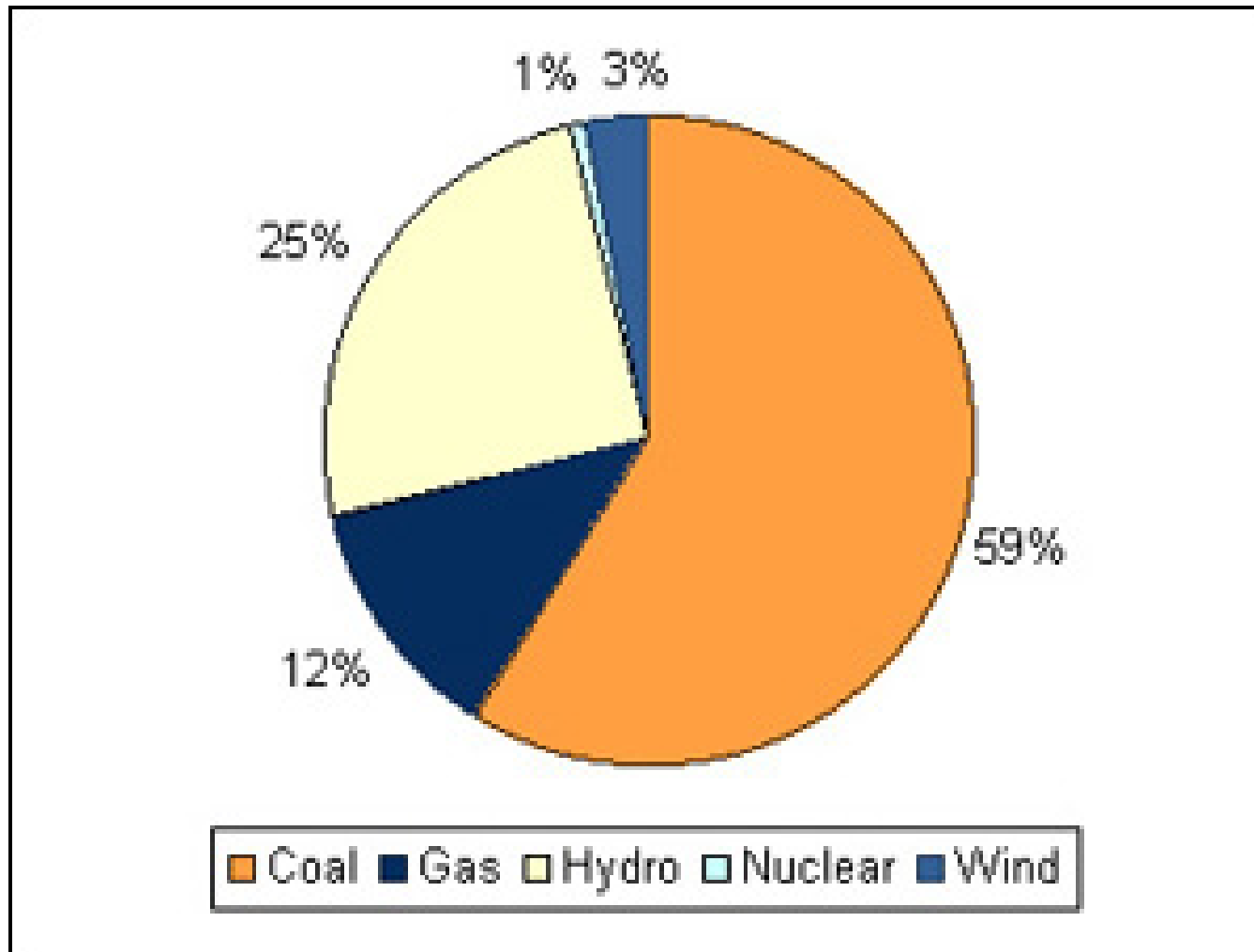
- Power generation falls into four broad categories
 - Thermal power, which is often produced through centralized thermal power plants using coal as a fuel
 - Hydropower that is often produced by trapping river flows via the construction of dams and hydroelectric power stations
 - Nuclear Power
 - Renewable sources of power such as Wind Energy, Solar Energy, Tidal Power etc
- Renewable sources of energy are the most environment-friendly, while thermal energy often causes the greatest amount of pollution



Power in India – a brief timeline

- We will start this discussion from a few years prior to Indian independence
- Pre-Independence: In this era, 65% of power generation was done by the private sector
- 1947-1975: After independence, the involvement of the public sector increased, and SEBs (State Electricity Boards) were set up in each state as Public Sector Entities to manage and distribute power within states
- 1975-1991: During this era, the trend of moving away from the private sector towards the public sector continued in the power industry. This phase was characterized by greater involvement from the Central government. Centralized organizations such as the National Thermal Power Corporation (NTPC), The National Hydro Power Corporation (NHPC), the National Power Trading Corporation (NPTC) etc were set up at the central level
- Post 1991: After the liberalization of the Indian Economy, there has once again been greater involvement of the private sector in the power industry, and a rapid growth of this industry as well

Power in India





Power Sources in India

- India currently generates 135,781 MW of power
- As Indicated in the previous slide, most of India's power is currently generated through thermal Power Plants that use coal as a fuel
- Hydropower sources also account for a non-trivial amount of power generated in India
- As per India's current policies, a lot of emphasis is being given to developing hydro, nuclear and renewable sources of power



Performance of the Power Sector

- The current performance of the power sector leaves much to be desired
- Average Return on Investment for State Electricity Boards (SEBs) is -26%, indicating that several SEBs are loss making agencies
- Aggregate Transmission and Distribution (AT&C) losses are close to 40% implying that almost half the generated power does not make its way to the intended consumers
- There is a peak power deficit of 12.6% and energy deficit of 7.5% at the All India Level in 2002.
- As per current 5 year plan estimates, we do not have the generating capacity to meet our current needs if we plan to grow at 8-9% p.a. This implies that there should be more investment in power generation



Power Targets

- 60,000 more MW of power generation capacity to be added by 2012
 - 23% of this should be from Private sources
- 50,000 MW of power to be generated through Renewable sources by 2017
- AT&C losses to be cut to 15% by 2012



Subsidies in the Power Sector

- Costs of power generation are typically higher than the costs at which power is sold
- This is partially due to subsidies – for instance, farmers get power at virtually no cost
- Although industry is expected to cross-subsidize the farmers, the costs to industry are so high that many firms prefer to set up their own captive plans that generate power. As a result, SEBs are deprived of potential revenues
- This in turn has led to several SEBs making losses
- As a result, they have insufficient funds to invest in capital renewal, upgradation and maintenance, leading to a negative cycle of poor performance, large losses and in turn, a greater loss of revenue



Reforms and Policies

- The Electricity Act of 2003 is one of the key policy acts in the Power Sector
- This act encourages private sector involvement in Generation, Transmission and Distribution
 - Open Access Provisions are provided in the Act wherein private generators can sell directly to consumers
- Privatization and Corporatization of SEB's is encouraged
 - State Governments pay off or write-off the debts of the SEB's
- Competition is promoted in Generation and Distribution
- Unbundling of Generation, Transmission and Distribution is proposed in order to increase the number of players in this sector and thereby promote efficiency, consumer choice and satisfaction
- Cross subsidies will be reduced and State governments will pay SEBs the subsidies they mandate. SEBs can also set appropriate tariffs so that they are financially viable



Reforms and Policies

- Multi-year Regulation through CERC (Central Electricity Regulatory Commission) and SERC (State Electricity Regulatory Commission) have been established to monitor activity in this sector
- Although these reforms have been well intended, the current taxation structure and government bureaucracy have not allowed these reforms to have their intended effect



More reforms and policies

- APDRP – Accelerated Power Development and Reform Program. Some highlights are
 - States unbundle Generation, Transmission and Distribution, and take over SEB debts
 - States agree to an audit, use of IT and Metering
 - Investment is provided to upgrade infrastructure
 - Preference is given to programs aimed at removing commercial losses
 - Funding is contingent on whether targets were met for previous projects
 - Incentives provided for improved reliability, loss reduction, billing and metering
 - Incentive amount is pegged to reduction in difference between cost of production and revenue
- Bottom Line – there were initial improvements in some SEBS like WB, AP. However, now enthusiasm to implement reforms has decreased

APDRP

(Fig. in Rs Crore)

| State | Project Cost | Contribution from APDRP | APDRP Disbursement in 2002-3 | | | | | | Counter part fund tied up by the state | Utilization of funds |
|-------------------|--------------|-------------------------|------------------------------|----------------------|----------------------|------------|-----------|---------|--|----------------------|
| | | | 1 (4/4/ 2002) | 2 (28/1/ 2003) | 3 (31/3/ 2003) | Investment | Incentive | Total | | |
| Andhra Pradesh | 1476.50 | 738.25 | 39.07 | 72.75 | 52.00 | 163.82 | | 163.82 | 738.25 | 69.48 |
| Bihar | 717.57 | 358.79 | 16.11 | | 50.00 | 66.11 | | 66.11 | 76.95 | 0.48 |
| Chattisgarh | 424.58 | 212.29 | 10.00 | | | 10.00 | | 10.00 | 10.00 | 23.90 |
| Delhi | 946.46 | 473.23 | | | 105.51 | 105.51 | | 105.51 | 473.23 | 25.20 |
| Goa | 176.34 | 88.17 | 9.00 | 6.52 | 6.52 | 22.04 | | 22.04 | 4.45 | 12.53 |
| Gujarat | 1035.80 | 517.90 | 21.35 | 54.07 | 30.00 | 105.42 | 236.37 | 341.79 | 291.96 | 27.44 |
| Haryana | 450.66 | 225.33 | 18.23 | 19.05 | 19.05 | 56.33 | 5.01 | 61.34 | 163.38 | 35.93 |
| Jharkhand | 444.85 | 222.43 | 12.00 | | | 12.00 | | 12.00 | 137.25 | 9.32 |
| Karnataka | 1161.19 | 580.60 | 29.77 | 57.69 | 57.69 | 145.15 | | 145.15 | 580.60 | 69.00 |
| Kerala | 350.35 | 175.18 | 17.07 | 13.36 | | 30.43 | | 30.43 | 173.18 | 17.19 |
| Madhya Pradesh | 598.98 | 299.49 | 27.83 | 23.52 | 23.52 | 74.87 | | 74.87 | 62.00 | 11.96 |
| Maharashtra | 1107.85 | 553.93 | 45.00 | 46.74 | 46.74 | 138.48 | 137.89 | 276.37 | 345.42 | 65.09 |
| Orissa | 592.22 | 296.11 | 14.72 | | 39.63 | 54.35 | | 54.35 | | |
| Punjab | 667.46 | 333.73 | | 41.72 | 12.26 | 53.98 | | 53.98 | 333.73 | |
| Rajasthan | 1255.05 | 627.53 | 28.40 | 62.24 | 35.00 | 125.64 | | 125.64 | 308.02 | 71.68 |
| Tamil Nadu | 968.17 | 484.09 | 32.12 | 44.45 | 35.00 | 111.57 | | 111.57 | 484.09 | 77.14 |
| Uttar Pradesh | 718.19 | 359.10 | 30.12 | | 50.00 | 80.12 | | 80.12 | 301.77 | |
| West Bengal | 132.71 | 66.36 | 19.02 | | | 19.02 | | 19.02 | 66.36 | |
| Assam | 365.98 | 365.98 | 10.95 | 86.02 | | 96.97 | | 96.97 | | 0.05 |
| Arunachal Pradesh | 67.29 | 67.29 | | | | 0.00 | | 0.00 | | |
| Himachal Pradesh | 105.51 | 105.51 | 13.33 | 19.71 | 10.00 | 43.04 | | 43.04 | | 4.69 |
| Jammu and Kashmir | 453.48 | 453.48 | | | 20.00 | 20.00 | | 20.00 | | |
| Manipur | 10.13 | 10.13 | 2.67 | | | 2.67 | | 2.67 | | |
| Meghalaya | 26.29 | 26.29 | | 6.57 | | 6.57 | | 6.57 | | |
| Mizoram | 9.77 | 9.77 | 2.67 | 1.11 | | 3.78 | | 3.78 | | 3.78 |
| Nagaland | 47.22 | 47.22 | 2.67 | 10.47 | | 13.14 | | 13.14 | | 2.67 |
| Sikkim | 63.48 | 63.48 | 2.67 | 14.53 | | 17.20 | | 17.20 | | 2.67 |
| Tripura | 13.27 | 13.27 | 2.67 | | | 2.67 | | 2.67 | | |
| Uttaranchal | 361.51 | 361.51 | 18.50 | 81.13 | 75.00 | 174.63 | | 174.63 | | 56.60 |
| Total | 14,748.86 | 8136.40 | 425.94 | 661.65 | 667.92 | 1755.51 | 379.27 | 2134.78 | 4550.64 | 586.80 |

Source: Ministry of Power (Conference of State Power Ministers, 12 June 2003).



APDRP

Table 1.1
Project Outlays and Incentive Payments under APDRP
as on 31 May 2005

| Year | Project outlays (Rs crore) | Incentive payment (Rs crore) |
|--------|-------------------------------|---------------------------------|
| 2002–3 | 14,710.74 | 379.28 |
| 2003–4 | 1899.43 | 503.30 |
| 2004–5 | 2878.66 | 73.00 |
| Total | 19,488.83 | 955.58 |

Source: MoP (2005a)



APDRP

- The previous tables are from the India Infrastructure Report and indicate the extent to which APDRP funds are being used
- Two trends are visible. First, disbursements through the APDRP programs are reducing
- Of the two components of this program – the Investment component has been utilized to a greater extent as compared to the incentive component



Still more reforms and policies

- Hydropower projects are being encouraged - particularly through the Private Public Partnership mode
- Indo-US Nuclear agreement is being explored in order to enhance our fuel security by obtaining power from nuclear fuel.
- Power Transfer Corporation (PTC) has been set up to increase power trading across states, so as to balance supply and demand mismatches
- Rajeev Gandhi Grameen Vidyukranti Yojana has been proposed to generate funds for rural electrification
- SEBs and Power departments are being computerized. This will lead to greater transparency and accountability and improved service to citizens.
- Large emphasis has been placed towards **privatization** of Generation, Distribution of power



Power Privatization - a short note

- IPP - Independent Power Producers, Private agencies that generate power
- PPA - Power purchase agreement, an agreement that an IPP or another private entity might have with a buyer such as the government to buy a certain quantity of power at certain rates.
- IPPs take on the capital costs of generating power, and recoup these costs by selling to the SEBs in accordance to the PPAs. The SEBs can themselves transmit and distribute the power, or they can privatize this function also.
- In general, transmission efficiency depends on economies of scale and as a result it is difficult to have more than one transmission agency for a given area. Transmission thus has monopolistic characteristics in contrast to power generation and distribution.
- A regulator is often necessary for this sector in order to control power prices from becoming too high, and to foster competition in this sector.



Ultra Mega Power Projects (UMPP)

- Power plants of capacity ≥ 4000 MW are considered as UMPPs. The government has come up with a separate policy for these plants in order to encourage power generation in the country.
- Power Finance Corporation (PFC) will do the groundwork, create a Special Purpose Vehicle (SPV), acquire land, permits etc. This SPV will then be sold to private vendors who will build and operate the power plant, and supply power.
- 5 plants of 4000 MW have been proposed initially at an outlay of INR 3,20,000 Cr for the Indian government. Details are given in the next slide.

Table 1.5
Status of UMPP Projects

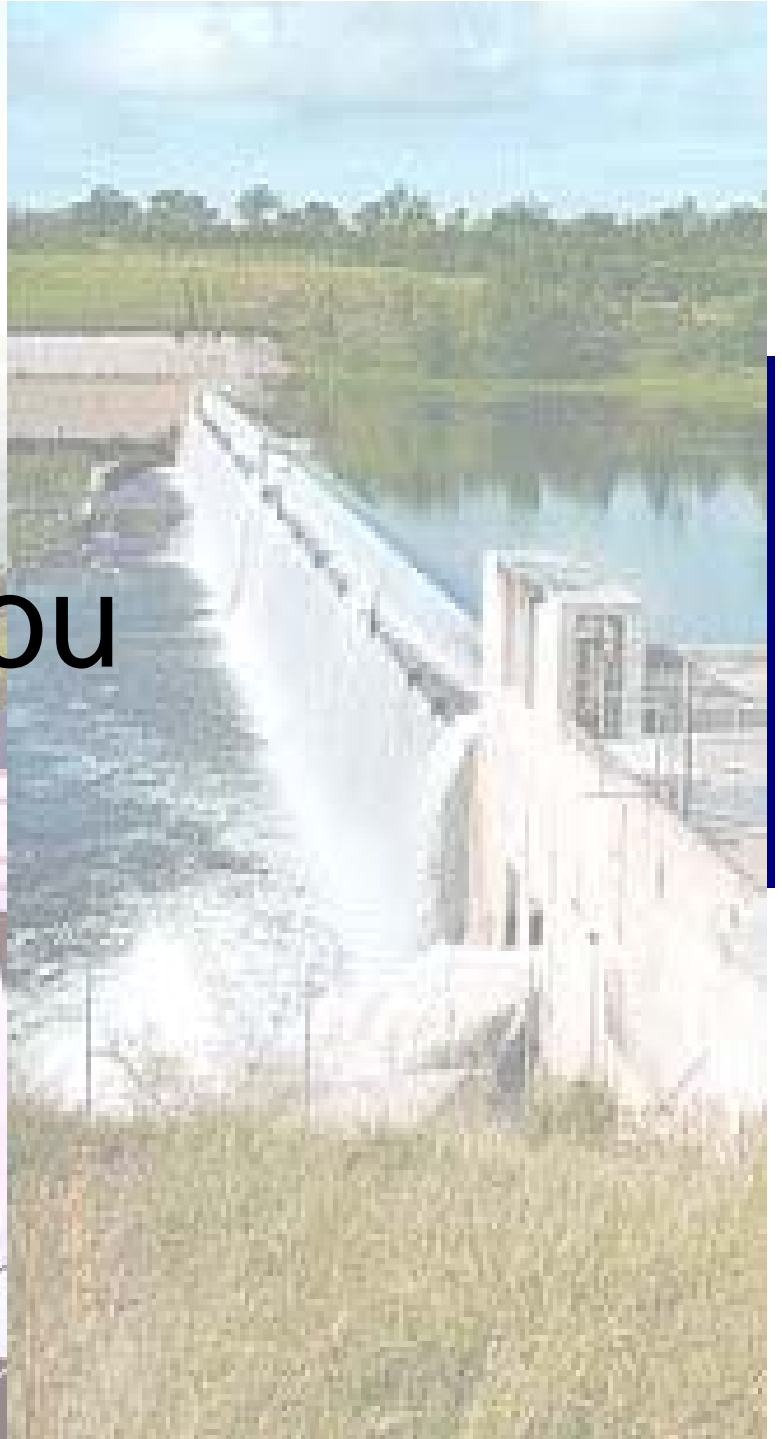
| | Sasan, MP | Mundra, Gujarat | Bhasma, Orissa | Krishnapatnam, AP |
|-------------------------|---|---|--|---|
| Status | SPV formed, detailed project report (DPR) ready. | SPV formed, DPR ready. | SPV yet to be formed, Consultant appointed. | SPV yet to be formed, Consultant appointed. |
| Land | Demarcation of 3,500 acres completed. MP to issue order for land acquisition. | Acquisition of 2,700 acres is expected to be completed soon. | Confirmation on alternative sites is awaited. | Details of 2,300 acres for power plant and 300 acres are filed with the District Collector. |
| Water | Permission to get 140–150 cusecs from Rihand Reservoir is granted. | Permission from Gujarat Maritime Board to draw sea water from Gulf of Kutch is awaited. | 140–150 cusecs from Ib river is given. A barrage is to be built. | Permission to draw sea water is filed with AP Maritime Board. |
| Fuel Linkages | Coal blocks of Moher-Amlori are allocated by Ministry of Coal. | Imported coal linkages to be established by the investor. | Coal blocks are yet to be allocated by Ministry of Coal. | Imported coal linkages to be established by the investor. |
| Environmental Clearance | EIA completed | EIA completed and CRZ clearance awaited | Site not yet confirmed | EIA not yet completed |

Girye, Maharashtra–SPV formed but site is not yet confirmed.

Tadri, Karnataka–SPV formed. Environmental clearance is a hitch. Project is on hold.

Akaltara, Chattisgarh–SPV formed. Project is on hold as state government wants free power from the project.

Source: Business Standard (August 25, 2006).



Thank You

