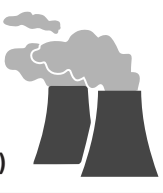

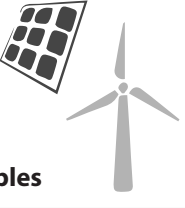
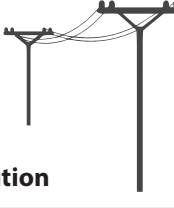




Parameters	Thermal (coal & gas) 	Large hydropower 	Renewables 	Distribution 	Coal 	Natural gas 
<b>Ownership and Industry structure</b>	<ul style="list-style-type: none"> <li>Upto 1990: Mostly Government owned</li> <li>1992: opened for private sector and 100% foreign investment, but share of private sector continued to be very small till 2000</li> <li>2003: setting up thermal capacity de-licensed under Electricity Act 2003</li> <li>2016: 38% of thermal capacity is privately owned</li> <li>More than half of the capacity added in the last decade is by private sector</li> </ul>	<ul style="list-style-type: none"> <li>Up to 1990: Mostly Government owned</li> <li>1992: opened for private sector and 100% foreign investment, but share of private sector continues to be small</li> <li>Apparent increase in pace of creation of privately owned capacity in late 2000s, but faltering once again</li> <li>March 2016: 7.3% capacity is privately owned</li> <li>Several private projects taken over by public sector</li> </ul>	<ul style="list-style-type: none"> <li>Early 90's to 2012: Virtually entirely based on private sector investments, with exception of older small hydropower projects, most of which are state owned</li> <li>2012-2016: Small but steadily rising investments and ownership from some PSUs like NTPC, SECI, Railways, OMCs etc.</li> <li>Solar sector has structurally ingrained competition with high number of players, while wind sector is still large vertically integrated with lesser competition. IPPs growing in wind sector</li> </ul>	<ul style="list-style-type: none"> <li>Up to 1996: Integrated SEBs in all States. Private distribution in Mumbai, Kolkata, Ahmedabad and Surat</li> <li>Distribution privatisation in Odisha (1999) and Delhi (2002)</li> <li>2016: Most SEBs unbundled into state owned companies, private franchisees in few urban areas, Odisha distribution back with state government</li> <li>Transmission largely publicly owned, but slow growth of joint ventures and private companies</li> </ul>	<ul style="list-style-type: none"> <li>Up to 1973: Mostly private sector</li> <li>From 1973: Government owned after Coal Mines (Nationalisation) Act passed in 1973</li> <li>Coal India Ltd. (7 mining subsidiaries, 1 subsidiary focused on exploration) now produces ~80% of India's domestic coal</li> </ul>	<ul style="list-style-type: none"> <li>Pre-independence: Mostly private sector</li> <li>1950s up to 1999: Predominantly public sector</li> <li>Since 1999: Increasing role for private sector in exploration, production and refining</li> <li>Since 2007: Increasing role for private sector in transportation and distribution of gas</li> </ul>
<b>Institutional structure</b>	<ul style="list-style-type: none"> <li>Tariff: can either be discovered through bidding or determined on cost-plus basis by the regulatory commission</li> <li>Performance regulated by Central or State Electricity Regulatory Commission (SERC)</li> <li>Any disputes between a generator and buyer to be resolved by the respective regulatory commission, appeals can be filed before the Appellate Tribunal for Electricity (ATE)</li> </ul>	<ul style="list-style-type: none"> <li>Tariff: regulated on cost-plus basis by the regulatory commission, subject to certain conditions like international competitive bidding for equipment and construction</li> <li>Little competition or market based operation in the sector</li> <li>Project developer fully protected from hydrological risk for ten years, beyond which there is still significant protection from hydrological risk</li> <li>CEA concurrence needed for projects with more than the notified outlay</li> <li>CDM benefits for several hydropower projects provided significant revenue bonus</li> </ul>	<ul style="list-style-type: none"> <li>Policy making by MNRE and state govts, with increasing role of MoP in last few years</li> <li>Mandatory minimum Renewable Purchase Obligations (RPOs) for obligated entities set by SERCs</li> <li>Preferential tariffs/feed-in-tariffs set by SERCs separately for each RE technology for each year (cost plus tariff). However solar has moved on to competitively discovered tariffs while wind continues with FITs. MNRE initiating competitive bidding for wind power projects starting with 1 GW in 2016-17</li> <li>Any disputes between a generator and buyer to be resolved by the respective regulatory commission, appeals can be filed before the Appellate Tribunal for Electricity</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Power and Central Electricity Authority prepares national policies and plans</li> <li>Many large scale central sector programmes for loss reduction, access and financial support, monitored by the Gol and implemented by DISCOMs</li> <li>National, regional and state load dispatch centres to coordinate grid operation</li> <li>Multi-state generation, transmission and markets regulated by Central Electricity Regulatory Commission</li> <li>DISCOM tariff and performance regulated by SERC, appeals can be filed before the ATE</li> <li>Three tier institutional mechanism to address consumer grievances – DISCOM grievance forum, Consumer Grievance Redressal Forum and Ombudsman</li> <li>State DISCOMs managed by the energy ministry</li> </ul>	<ul style="list-style-type: none"> <li>Governed by Ministry of Coal, assisted by Coal Controllers' Organization (part of MoC)</li> <li>Nothing equivalent to a quasi-judicial independent regulator in the sector</li> </ul>	<ul style="list-style-type: none"> <li>Governed by Ministry of Petroleum and Natural Gas</li> <li>Director General of Hydrocarbons (DGH) is the government regulator for the exploration and production (E&amp;P) activities</li> <li>Petroleum and Natural Gas Regulatory Board (PNGRB) is the independent regulator dealing with gas transportation and distribution</li> </ul>
<b>Reform milestones</b>	<ul style="list-style-type: none"> <li>1992: Independent Power Producers (IPP) policy. MoU based project selection</li> <li>1995: Mega power policy, which provided many incentives and tax holidays for large size plants (&gt;1000 MW). The policy is still in force, though terms have been modified from time to time</li> <li>2003: Electricity Act and introduction of competitive bidding for capacity addition based on transparent process</li> <li>2005-06: Ultra Mega Power projects (UMPP) policy, special case of competitive bidding for large size (4000 MW or more) projects for which central/state government would provide the site (land), fuel, water, environment and forests clearance and ensure substantial progress on land acquisition through a shell company</li> </ul>	<ul style="list-style-type: none"> <li>1992: Independent Power Producers (IPP) policy. Directly negotiated MoUs and PPAs</li> <li>1995: Tariff notification, enshrining several incentives, protection from risks</li> <li>1998: Notification removes limit on amount that private projects could raise from Indian public financial sources</li> <li>1998: New hydropower policy notes public sector would continue to play a dominant role for some time and reiterates the need to increase private investment. Measures to encourage both public and private developers. Recommendations include premium pricing for peaking power, expert committee to sanction cost escalation due to geological problems, insulate project from problems of R&amp;R and land acquisition</li> <li>2003: The 50,000 MW initiative to install as much capacity by 2017 launched by then PM Vajpayee</li> <li>2008: New hydropower policy brought out, with explicit focus to promote private investment in hydro</li> </ul>	<ul style="list-style-type: none"> <li>1992: Opening up to private sector with 100% FDI allowed</li> <li>1993: MNES advisory to states to price RE at min of ₹ 2.25/kWh with 5% annual esc. for 10 yrs. Incentives of accelerated depreciation and energy banking</li> <li>2003: Electricity Act, 2003 brought in RE targets (RPOs)</li> <li>2006: Tariff and Electricity policy institutionalised cost plus preferential/feed-in tariffs</li> <li>2008: Launch of National Solar Mission as part of NAPCC and subsequent move to competitive solar price discovery</li> <li>2010: Launch of Renewable Energy Certificate mechanism to overcome geographical mismatch of resources</li> <li>2010: Regulatory initiatives to mandate forecasting and scheduling of wind and solar power started, but only begun to be operationalized in 2016</li> <li>2009: Generation Based Incentive for wind power</li> <li>2012: National Clean Energy Fund through cess on coal</li> <li>2016: Tariff policy amended, recommends 8% solar RPO by 2022</li> </ul>	<ul style="list-style-type: none"> <li>1996: Unbundling starts in Odisha, with World Bank support</li> <li>1996-2016: Distribution privatisation and introduction of franchisees</li> <li>1998: Electricity Regulatory Commissions Act</li> <li>2001: Energy conservation Act and institutionalising Bureau of Energy Efficiency (2002)</li> <li>2003: Electricity Act and national policies, introduction of electricity traders and open access</li> <li>2005: National rural electrification program – RGGVY</li> <li>2008: Introduction of power exchanges</li> <li>2015: National programs on energy efficiency, proposals to amend Electricity Act 2003</li> </ul>	<ul style="list-style-type: none"> <li>1973: Nationalization of coal mining</li> <li>1993-2010: Captive blocks allocation round one</li> <li>2000: Price decontrol – coal mining PSUs free to set their own prices</li> <li>2007: New Coal Distribution Policy</li> <li>2015: New legislation enabling commercial mining by private sector</li> <li>2015-16: Captive block allocations round two</li> <li>2016: Mines allotted for commercial mining by state PSUs</li> </ul>	<ul style="list-style-type: none"> <li>1955: Formation of Oil and Natural Gas Directorate (later renamed ONGC)</li> <li>1981: Nationalisation of OIL</li> <li>1991-1995: Private sector participation in E&amp;P through pre-NELP production sharing contract (PSC) auctions</li> <li>1999-2012: Private players compete on equal terms with public sector companies in E&amp;P through NELP PSC auctions where profit is shared between contractors and government</li> <li>2007: Petroleum and Natural Gas Regulatory Board set up to regulate cross-country pipeline and city-wide distribution networks</li> <li>2014: New gas pricing policy announced</li> </ul>
<b>Major controversies</b>	<ul style="list-style-type: none"> <li>IPP policy: Ad-hoc and non-transparent selection process for signing MoUs, secrecy in negotiating tariffs. Most projects for which MoUs were signed never materialised</li> <li>Competitive bidding: Encouraging start, tariff discovered seemed economical. More than 40 GW of capacity added. Uncertainty due to post facto revision of discovered tariff, governance issues in various bidding rounds</li> <li>UMPP: Only 4 out of 10 identified sites awarded till 2016. 3 out of these 4 UMPP contracts won by a single company. 2 out of these 4, namely Tilaiya and Krishnapattanam have been abandoned. Only 2 UMPPs (Sasan &amp; Mundra) are generating power but seeking revision of quoted tariff</li> </ul>	<ul style="list-style-type: none"> <li>IPP policy: Ad-hoc and non-transparent selection process for signing MoUs, secrecy in negotiating tariffs</li> <li>Allocation of sites in Himalayan states through high upfront payments making projects fail and vitiating environmental &amp; forest clearances processes</li> <li>Maheshwar project, representing many of the ills of the reforms. Handed over to private developer in early 1990s, non-transparent process, capital cost shoots up on privatisation, PPA skewed to benefit developer, indicates very high tariffs, failed R&amp;R, opposition from affected communities. In 2016, project still incomplete, CEA puts cost at 6800 crores for this 400 MW project. Most of the 2300 crores spent till date is from public financial sources</li> </ul>	<ul style="list-style-type: none"> <li>Allegation in the early years, that wind projects came up mainly for fiscal benefits with little focus on siting and generation performance</li> <li>Adverse impacts on the local natural environment and irregularities in land transactions and compensation in some projects</li> <li>Failure of SERCs to penalise obligated entities for RPO non-compliance in line with their own regulations</li> </ul>	<ul style="list-style-type: none"> <li>Repeated financial bail-outs for state owned DISCOMs</li> <li>Failed Odisha privatisation: Exit of AES (2001), revoking license of other 3 companies (2015)</li> <li>Bidding and implementation issues, leading to termination of some urban franchisee agreements</li> <li>States preparing over ambitious capacity addition plans, power surplus reported in many states in 2016 and DISCOMs paying for stranded generation capacity – all due to faulty power purchase planning</li> <li>Agriculture consumption is largely not metered, leading to high consumption estimate, large subsidy demand and low T&amp;D loss claim by the DISCOMs</li> </ul>	<ul style="list-style-type: none"> <li>Captive blocks allocation I: Ad-hoc, discretionary, and some illegalities</li> <li>Linkage allocation: Ad-hoc, unrealistic, ambiguous</li> <li>Captive blocks allocation II: Legal and regulatory complexity, potential unviability of bids</li> </ul>	<ul style="list-style-type: none"> <li>NELP: Contract related issues in administration of the PSC regime, e.g., cost recovery, contract area relinquishment, gas pricing and reservoir management. Governance issues and weak regulatory capacity</li> <li>PNGRB: Bad legislation leading to weakened regulator, legal controversies and uncertainty</li> </ul>
<b>Areas neglected</b>	<ul style="list-style-type: none"> <li>Demand estimation: No scientific demand forecast. Capacity addition based on gross estimates</li> <li>Social and environmental issues concerning thermal projects</li> <li>Proper recording and monitoring of plant performance</li> <li>Fuel allocation policy: Ad-hoc and ambiguous leading to disputes, price escalation and legal issues</li> <li>Regulatory governance issues concerning bidding process, sanctity of contracts and capacity addition</li> </ul>	<ul style="list-style-type: none"> <li>Social and environmental issues of hydropower projects, particularly land acquisition, resettlement and rehabilitation</li> <li>Cumulative impact assessments and river conservation</li> <li>Impacts of climate change</li> <li>Assessing extent to which projects will actually deliver peaking power, creating appropriate framework to incentivise peaking power</li> </ul>	<ul style="list-style-type: none"> <li>Strict RPO compliance</li> <li>Bringing in competition in the wind sector</li> <li>Integrating variable renewables like wind and solar in grid operation protocols (forecasting, scheduling, and commercial settlement of deviation)</li> <li>Fully operationalizing and facilitating net metering for rooftop solar</li> <li>Local environmental and land procurement aspects</li> <li>Integration of RE within overall electricity sector planning, operation</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring supply quality</li> <li>Household electrification</li> <li>Agriculture supply</li> <li>Regular tariff determination and performance evaluation</li> <li>Electrical safety</li> <li>Reliable affordable power supply to small consumers</li> <li>Energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Resource estimation</li> <li>Coal market structure and efficiency</li> <li>Law and order issues</li> <li>Comprehensive approach factoring in consuming sectors</li> </ul>	<ul style="list-style-type: none"> <li>Gas pricing: Inadequate attention to policies guiding arm's length pricing of gas in the absence of a national gas market</li> <li>Transparency in E&amp;P operations: contractual milestones vis-à-vis achievements, development plans etc. not available in public domain</li> </ul>
<b>Key challenges</b>	<ul style="list-style-type: none"> <li>Proper demand estimation in the face of dwindling consumer base of distribution companies</li> <li>Financial viability of distribution companies, which continue to be the key buyers</li> <li>Shaky future in light of reducing costs of renewables and storage (in the long run)</li> <li>Fuel sector policy and governance – availability, affordability and quality continues to be a concern</li> <li>Controlling and mitigating social and environmental impacts</li> <li>Non base load (cycling) operation due to increase in renewables and excess capacity</li> <li>Implementation of new stricter environmental norms for coal plants</li> </ul>	<ul style="list-style-type: none"> <li>Handling social and environmental issues</li> <li>Uncertain financial viability and future of hydropower projects uncertain without significant support and incentives</li> <li>Balancing hydropower development, particularly in cascades of multiple projects in a basin, with the stated objectives of river conservation and rejuvenation, defined as including <i>aviral dhara</i> and protection of ecological integrity of rivers</li> <li>Lack of basin wide carrying capacity studies and cumulative EIA studies</li> </ul>	<ul style="list-style-type: none"> <li>Weak data management</li> <li>Evolving national and state transmission planning practices which are sensitive to renewables and having uniform inter-connection practices across states</li> <li>Reliable grid integration with minimal additional costs</li> <li>High interest rates affecting cost of RE power</li> <li>Incentivising growth of RE (enforcing RPOs, net metering, concessional RE based open access) without severe strain on DISCOM finances</li> <li>Continuation of separate solar and non-solar RPO and REC categories when solar prices going below wind</li> <li>Differing priorities and capabilities of the Centre and state on some issues</li> </ul>	<ul style="list-style-type: none"> <li>Universal access to households and small consumers</li> <li>Financial health of DISCOMs</li> <li>Professional management of DISCOMs</li> <li>Weak capacity of Regulatory Commissions</li> <li>Managing growth of markets and renewables</li> <li>Appropriate power purchase planning</li> <li>Designing equitable and viable tariff structures</li> <li>Metering, energy audits and loss estimation</li> <li>Public oversight of transmission sector</li> </ul>	<ul style="list-style-type: none"> <li>Lack of open, transparent and participative governance structure</li> <li>Market concentration</li> <li>Lack of independent regulation</li> <li>Socio-environmental impacts handled poorly</li> <li>Weak demand and dwindling interest</li> </ul>	<ul style="list-style-type: none"> <li>Weak regulatory capacity, independence and effectiveness</li> <li>Poor and difficult to access domestic gas reserves</li> <li>Need for a licensing and pricing regime that strikes a balance between investor interest, government revenue and availability and affordability of natural gas</li> </ul>
<b>Upcoming initiatives</b>	<ul style="list-style-type: none"> <li>New bidding guidelines to make fuel costs completely pass through</li> <li>Subsidy schemes to generate power from stranded gas based capacity</li> </ul>	<ul style="list-style-type: none"> <li>New hydropower policy and incentives framework in the offing, appears to be “more of the same”</li> </ul>	<ul style="list-style-type: none"> <li>Dedicated Renewable Energy Law, significant amendments in Electricity Act, 2003 to boost growth of RE</li> <li>Offshore wind, wind and solar hybrids, repowering of old wind sites</li> <li>State level forecasting and scheduling and deviation settlement regulations for RE</li> <li>Competitive bidding for wind</li> </ul>	<ul style="list-style-type: none"> <li>Increasing role of market and renewables and consequent sales migration</li> <li>Scheme to bring about financial turnaround of DISCOMs – UDAY</li> <li>Possible entry of multiple suppliers in DISCOM area</li> <li>24 x 7 power for all</li> <li>Feeder separation in all states</li> <li>Large investments in transmission – by govt and private companies</li> <li>National level programmes for appliance efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Ambitious plans to ramp up production</li> <li>Auctioning linkages</li> <li>Potentially more players involved in commercial mining</li> </ul>	<ul style="list-style-type: none"> <li>Revenue sharing contracts and open acreage licensing announced for E&amp;P</li> <li>Marketing and pricing freedom for gas produced from difficult to access areas and marginal fields</li> </ul>