

## CHAPTER 2

### Literature Review

#### 2.1 Introduction

India has a federal structure. Constitution of India places electricity as a concurrent subject<sup>9</sup>. By the scheme of current electricity law of 2003<sup>10</sup>, interstate issues are governed by the Central policies/ regulations while intra-state ones are controlled by State instrumentalities. Central Electricity Regulatory Commission regulates interstate transactions and intrastate issues like power distribution falls within the ambit of State Commissions.

This section focuses on appreciating published works and reports relating to Indian power and coal sectors, the international reform process together with related initiatives in India and various investment appraisal techniques. The section goes on to classify the outcomes in a thematic format and identify the gaps.

#### 2.2 Objective

Literature review has been done under four broad categories as follows:

- i) Indian Power sector business framework (Wholesale & Retail) & investments made by Independent Power Producers (IPPs)
- ii) Coal Supply framework and uncertainties
- iii) Reform in power sector in India vis-à-vis international power sector reform
- iv) Investment appraisal and investment decision under uncertainty

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<sup>9</sup> Seventh Schedule (Article 246) – List III – Concurrent List – item 38

<sup>10</sup> Part X – Regulatory Commissions – The Electricity Act, 2003

### 2.3 Selection of Key Words

IPP, Indian Power Sector, MPP, Power Sector Reform, Policies, Uncertainties, Generation capacity creation, coal supply to Indian power plants, Competitive Bidding, Retail Power Market, Wholesale Power Market, Investment appraisal criteria, Laws in Indian Power Sector, Unbundling.

### 2.4 Literature Search Process

Thorough search of available literature including online data bases. A total of over 300 documents comprising national / international journals, data-bases, media reports, rules, regulations, policies and judgements of Hon'ble Supreme Court, High Courts, Appellate Tribunals and Regulatory Commissions were studied to trace the background of Indian power sector since 1910 leading to the current scenarios. An illustrative list is appended.

<b>Journals</b>	<b>Indian Journals</b>	<b>Online Data Base</b>	<b>Websites</b>
Energy	Infraline	Sigma insights –	<a href="#">Ministry Of Power</a>
Energy Policy	Coal Insight	India Electron Exchange –	<a href="#">Central Electricity Authority</a>
Energy Economics	Manupatra	REConnect Energy - <a href="http://www.reconnec">http://www.reconnec</a>	<a href="#">Coal India Ltd.</a>
Journal of Regulatory Economics	Energy Law Reports	Infraline	Central Electricity Regulatory Commission
Utilities Policy			<a href="#">Forum Of Regulators</a>
Resources Policy			<a href="#">Appellate Tribunal For Electricity</a>
Academy of Management Journal			<b>Supreme Court of India</b>
Academy of Management Review			<a href="#">Andhra Pradesh ERC</a>
Strategic Management			<a href="#">Assam ERC</a>

<b>Journals</b>	<b>Indian Journals</b>	<b>Online Data Base</b>	<b>Websites</b>
Journal			
American Economic Review			<a href="#">Bihar ERC</a>
			<a href="#">Central ERC</a>
			<a href="#">Chhattisgarh State ERC</a>
			<a href="#">Delhi ERC</a>
			<a href="#">Gujarat ERC</a>
			<a href="#">Haryana ERC</a>
			<a href="#">Himachal Pradesh ERC</a>
			<a href="#">Jammu &amp; Kashmir ERC</a>
			<a href="#">Jharkhand ERC</a>
			<a href="#">Karnataka ERC</a>
			<a href="#">Kerala State ERC</a>
			<a href="#">Madhya Pradesh ERC</a>
			<a href="#">Maharashtra ERC</a>
			<a href="#">Orissa ERC</a>
			<a href="#">Punjab State ERC</a>
			<a href="#">Rajasthan ERC</a>
			<a href="#">Tamil Nadu ERC</a>
			<a href="#">Tripura ERC</a>
			<a href="#">Uttar Pradesh ERC</a>
			<a href="#">Uttarakhand ERC</a>
			<a href="#">West Bengal ERC</a>

## 2.5 Author-wise Details of Literature

Literature Review has been charted theme-wise in tabular format mentioning source, author, year, context and inference and placed herein below.

## 2.5.1 Literature Review : Summary of Literature Survey

**Table 2-1: Indian Power sector business framework (Wholesale & Retail) & IPP investment**

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
1.	The Indian Electricity Act, 1910	Government of India	1910	Oldest National Electricity Law	Concept of competition in power sector (through 'Open Access') not envisaged	Indian Power sector business framework (Wholesale & Retail) & IPP investment
2.	The Electricity (Supply) Act, 1948	Government of India	1948	Post-Independence special law for creating large state sector monoliths	Concept of competition in power sector (through 'Open Access') not envisaged	Indian Power sector business framework (Wholesale & Retail) & IPP investment
3.	The Electricity Regulatory Commissions Act, 1998	Government of India	1998	Law framed for introducing Independent Regulatory Commission	Recognition of need for competition	Indian Power sector business framework (Wholesale & Retail) & IPP investment
4.	The Electricity Act, 2003	Government of India	2003	New Law in Indian Power Sector, repeals all the earlier laws in one go – radical	<ul style="list-style-type: none"> <li>• Special thrust on Generation Capacity addition.</li> <li>• Introduction of competition is a principal objective</li> <li>• Specific plan for</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
5.	Commentary on The Electricity Laws of India –, Delhi Law House,	S.K. Chatterjee	2010	change in Industry structure Standing Committee Report on Electricity Bill 2001	<p>competition in retail segment (open access)</p> <ul style="list-style-type: none"> <li>• Creating framework so that Power Producers can access end consumer</li> </ul> <p>Need for introducing competition in retail sector in a time bound manner</p>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
6.	Gazette of India	MOP, GOI	22.10.1991	GOI formulation of a new policy to encourage greater participation by privately owned enterprises in electricity Generation, Supply & Distribution	<ul style="list-style-type: none"> <li>• Widened the scope for private investment.</li> <li>• Introduced modification in the financial, administrative and legal environment for making private sector investments attractive</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
7.	Letter from Union Power Secretary to all Chief Secretaries of States	GOI	10.11.1995	Policy for Setting up of power plants of capacity 1000 MW or more	<ul style="list-style-type: none"> <li>• Inter-state and inter-regional mega power projects proposed to be set up both by Public and Private sectors</li> <li>• Power Trading Company (PTC) would be established to purchase power from identified private projects and sell to identified SEBs</li> <li>• Fiscal benefits for these projects</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
8.	GOI Guidelines	MOP, GOI	31.1.2000	Private sector participation in Transmission	<ul style="list-style-type: none"> <li>• Promotion of Private Sector investment in Transmission sector</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
9.	National Electricity Policy, Government of India 2005	Govt. of India	2005	Framing policies for development of Indian Power Sector	<p>Strongly recommends introduction of competition</p> <ul style="list-style-type: none"> <li>• Availability of reliable and quality power at competitive rates is of critical importance to Indian economy (1.2)</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
					<ul style="list-style-type: none"> <li>• 1,00,000 MW of capacity addition is required to reach per capita electricity consumption of 1000 units by 2012 (5.2.1)</li> <li>• In Electricity Act 2003 Generation business has been delicensed and captive generation has been encouraged and freed from all control to enhance generation capacity in the country (5.2.2)</li> <li>• A spinning reserve of at least 5% at national level need to be created to ensure grid security and reliability of power. (5.2.3)</li> <li>• The Electricity Act 2003 promoted competition in distribution business through open access and multiple licensee in same area (5.4.2)</li> <li>• Direct selling to end-</li> </ul>	

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
					<p>consumers by generating companies and trading licensees has been allowed in Electricity Act, 2003. (5.4.5)</p> <ul style="list-style-type: none"> <li>• Provision of creating a short term market was envisaged. Market mechanism to encourage generating companies having generation capacity outside long term PPA (Merchant Power Plants) to sell such power to end-consumers either directly or through traders and /or power exchanges has been proposed.(5.7.1)</li> <li>• The concept of cross subsidy surcharge and additional surcharge has been implemented under Electricity Act 2003 to compensate local distribution licensee</li> </ul>	

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
10.	National Tariff Policy, Government of India, 2006 (read with Amendments from time to time)	Govt. of India	2006	Framing policies for development of Indian Power Sector	<p>against loss of cross subsidy resulting from consumers opting for open access. There is a necessity to ensure that such surcharges do not drive out competition in retail market. (5.8.3)</p> <p>Role of private participation in generation, transmission and distribution would become increasingly critical in view of the rapidly growing investment needs of the sector. (5.8.9)</p> <p>Strongly recommends introduction of competition</p> <ul style="list-style-type: none"> <li>investment in power sector with appropriate return is necessary as Government is incapable of providing requisite fund, to achieve rapid economic</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
					<p>development and improvement of living standards of people. (1.3)</p> <ul style="list-style-type: none"> <li>Introducing competition in different segments of the electricity industry is one of the key features of the Electricity Act, 2003. Competition will lead to significant benefits to consumers through reduction in capital costs and also efficiency of operations. It will also facilitate the price to be determined competitively. (5.1)</li> <li>National Electricity Policy lays down that the amount of cross-subsidy surcharge and the additional surcharge to be levied from consumers who are permitted open access should not be so onerous</li> </ul>	

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
11.	Merchant Power Plants : Another Opportunity to participate in the growth of India power sector: - Brochure	MOP, GOI / PFC/ CEA	2006	Promoting investment in the power sector	<p>that it eliminates competition which is intended to be fostered in generation and supply of power directly to the consumers through open access. (8.5.1)</p> <ul style="list-style-type: none"> <li>●</li> <li>● Market based power plants will be provided coal linkage for any capacity upto 1000 MW</li> <li>● Electricity Act 2003 created open access in Transmission and Distribution. Merchant Power Plants are required to cater to retail consumer market through open access</li> <li>● Merchant Power Plants are not bound by any long term PPA</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
12.	Conference materials on Merchant Power : Towards Developing Power Markets	KSK Energy Ventures Pvt Ltd.	19.12.06	Alternative business model for generation	<ul style="list-style-type: none"> <li>• Free market price determination</li> <li>• Capacity creation needed to bridge peak deficit, National peak deficit 13%</li> <li>• Electricity Act provides for reform and competition in the power sector</li> <li>• IPPs could reach end customers directly by paying requisite charges</li> <li>• Open access power generating company (Merchant) is one to supply power to end consumer</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
13.	Presentation : Merchant Power Plant	Power Finance Corporation	19.12.06	New market structure emerging after Electricity Act 2003	<ul style="list-style-type: none"> <li>• MPPs to play substantial role in the Indian scenario (power deficit)</li> <li>• Development of MPP would require market and coal supply among others</li> <li>• Coal linkage would be provided for power plants upto 1000 MW</li> <li>• Power exchange would be set up</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
14.	Press Release	GOI	15.1.07	Mission of power to all	<ul style="list-style-type: none"> <li>• Merchant power plants are identified as one of the routes for achieving targeted capacity addition and offer investment opportunity for potential investors</li> <li>• Electricity Act provisions including open access in distribution will facilitate emergence of merchant power plants</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
15.	Presentation at MPP Developers' Conference	CEA	16.1.07	Promotion of investment in power plants	<ul style="list-style-type: none"> <li>• With a view to developing electricity market it is essential to build capacities for inducing competition in the market.</li> <li>• Competitive advantage of electricity market would accrue to consumers</li> <li>• Unlike traditional utilities, MPPs compete for customers</li> <li>• MPPs would be given either coal linkage or coal block</li> <li>• Sale of power by MPP – short term, spot sale, seasonal, TOD etc.</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
16.	Conference Proceedings on MPP	MOP, GOI	16.1.07	Development of Merchant Power Plants	<ul style="list-style-type: none"> <li>• Minister of Power inaugurated.</li> <li>• He expressed the hope that innovative ideas would emerge towards the road map for development of competitive power</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
17.	Record of Proceedings of Meeting on MPPs	MOP, GOI (Participants Principal Secretaries / Secretaries from various states)	11.1.07	MOP's initiative for promoting Merchant Power Plant	<p>markets through Merchant Power projects</p> <ul style="list-style-type: none"> <li>Chairman, CEA made a detailed presentation on the Scheme of MPP under new law and policy which had provisions for open access and sale of power outside long term PPA.</li> <li>Electricity Act mandates open access and competition to determine price of power in market.</li> <li>MPPs would be without any arrangement of guaranteed power offtake through long term PPA</li> <li>Coal linkages / blocks to be given to such stations</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
18.	Report of Expert Group on Operationalisation of scheme of development of MPPs	Chairperson CEA, Member (PS) CEA, Director (Comm)		MOP formed an Expert Group to promote MPPs based on indigenous	<ul style="list-style-type: none"> <li>Introduction of competition is key feature of Electricity Act</li> <li>Non-discriminatory open access is mandated to</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
19.	Discussion Paper on Operationalising Parallel Distribution Licensees in the State of Maharashtra	NTPC, Director (Projects) Power Grid, Principal Advisor – CII, MD- NDPL, VP - Allian Duhangan Hydro CRISIL Advisory Paper	2010	coal MERC keep to promote competitive retail market	facilitate competition <ul style="list-style-type: none"> <li>Coal supply would be assured for MPP</li> <li>Power Exchange would be set up</li> <li>MPP also to supply directly to consumers</li> </ul> Analysis of various options	Indian Power sector business framework (Wholesale & Retail) & IPP investment
20.	Report of High Level Panel on Financial Position of Distribution Utilities	Committee appointed by Planning Commission headed by Shri V.K. Shunglu	2011	Examining financial position of Discoms and suggest remedial measures	Recommended plan of action to achieve financial viability in distribution of power by 2017.	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
21.	Case-1 Bidding Guidelines	MOP. GOI	2005 onwards	To enable Discom to invite Bids	Movement towards Wholesale Market Competition	Indian Power sector business framework (Wholesale & Retail) & IPP investment
22.	DBFOO Guidelines	MOP. GOI	2012 onwards	To enable Discom to invite Bids	Movement towards Wholesale Market Competition	Indian Power sector business framework (Wholesale & Retail) & IPP investment
23.	Report on Short Term Transactions	CERC	2011-16	Market Monitoring	Power Exchange Price falling	Indian Power sector business framework (Wholesale & Retail) & IPP investment
24.	Report on 18 <sup>th</sup> Electric Power Survey of India	CEA	2013	Demand Projection	Demand slowdown	Indian Power sector business framework (Wholesale & Retail) & IPP investment
25.	National Tariff Policy (Amended)	GOI	2016	Statutory Policy Amendment	Tries to step up competition. More focus on Renewable	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
26.	Electricity Act 2003 Amendment	GOI	2015	To amend Act to suit current needs	<ul style="list-style-type: none"> <li>• Large focus on Competition</li> <li>• Separation of Content &amp; Carriage</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
27.	Power Sector Performance	Central Electricity Authority, Govt. of India	Jan. 2013	Monthly Report on Power Sector	<ul style="list-style-type: none"> <li>• Peak Shortfall YTD Dec.' 12 - 9%</li> <li>• Energy Shortfall YTD Dec.' 12 – 8.7%</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
28.	Media Reports	Business line	1.11.10	Merchant Power price	<ul style="list-style-type: none"> <li>• Electricity spot prices coming down.</li> <li>• Wheeling constraints compounding troubles for generation</li> <li>• Serious adverse impact for private sector projects</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
29.	Media Reports	Business Standard	30.12.10	Merchant Power price	<ul style="list-style-type: none"> <li>• After a free fall in the first three quarters for 2010-11, Merchant Power price may stabilize in the next 2 /3 years</li> <li>• States are reducing dependence on Merchant Power</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
30.	Emkay Industry Report	Amit Golchha, Sr. Analyst	Jan 2011	Assessing viability of IPPs	<ul style="list-style-type: none"> <li>States will reduce buying power from market</li> <li>Power stocks showing under performance</li> <li>High Merchant price unlikely to sustain</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
31.	Media Reports	Business Line	24.4.12	Quoting CERC Chairman	<ul style="list-style-type: none"> <li>Merchant power rates may go up by 2012 summer</li> </ul>	Indian Power sector business framework (Wholesale & Retail) & IPP investment
32.	Report on Short Term Transaction in Electricity in India	CERC	Jan. 2013	Tracking Short term Market Behaviour	Low Traded volume at Power Exchange Wholesale price coming down	Indian Power sector business framework (Wholesale & Retail) & IPP investment
33.	Power Sector Performance	CEA	March 2016	Report on Indian Power Sector	Demand-Supply Gap reducing fast	Indian Power sector business framework (Wholesale & Retail) & IPP investment
34.	Regulations	Commission	2010-2016	Tariff setting	Barriers exist in Retail market	Indian Power sector business framework (Wholesale & Retail) & IPP investment

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
35.	APP Documents	APP	2012-2016	IPPs in India	Suffering due to policy uncertainty	Indian Power sector business framework (Wholesale & Retail) & IPP investment
36.	Committee Documents	FICCI	2014-2016	Present Status IPP investments	Large investments standing idle	Indian Power sector business framework (Wholesale & Retail) & IPP investment

*Table 2-2: Coal Supply Framework*

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
1.	New Coal Distribution Policy, Ministry of Coal, Government of India	Ministry of Coal, Govt. of India	2007	Allocation policy for coal, the chief fuel in India	<ul style="list-style-type: none"> <li>● Standing Linkage Committee's role curtailed</li> <li>● Agreement based allocation</li> <li>● Two-step process – first LOA then FSA – Independent Power Producers (IPPs) given Priority</li> <li>● 100% of quantity as per the normative requirement of the consumers would be considered for supply of coal, through Fuel Supply Agreement (FSA) by Coal India Limited (CIL) at fixed prices to be declared/notified by CIL. The units/power plants, which are yet to be commissioned but whose coal requirements have already been assessed and accepted</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
					<p>by Ministry of Coal and linkage/ Letter of Assurance (LOA) approved as well as future commitments would also be covered accordingly.</p> <ul style="list-style-type: none"> <li>In order to meet the domestic requirement of coal, CIL may have to import coal as may be required from time to time, if feasible. CIL may adjust its overall price accordingly. Thus, it will be the responsibility of CIL/Coal companies to meet full requirement of coal under FSAs even by resorting to imports, if necessary.</li> </ul>	

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
2.	Model Fuel Supply Agreements for eligible New Power Stations commissioned between 1st April 2009 and on or before 31st March 2015, Coal India Limited	Ministry of Coal (MOC), Govt. of India (GOI)	July 2008	Drafting Provisions for Fuel Supply Agreement	Coal to be supplied if the purchaser IPP has been issued a Letter of Assurance	Coal Supply Framework
3.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	07.10. 2008	Decision on coal supply to off-takers. Discussed by MOC, Planning Commission, Ministries of Power, Railways, Ports, Steel, Commerce & Industries, Central Electricity Authority, CMD – coal companies	<ul style="list-style-type: none"> <li>No demarcation between IPP and Merchant Power Plants. Both should be treated at par for supply of coal</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
4.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	12.11. 2008	Decision on coal supply to off-takers. Discussed by MOC, Planning Commission, Ministries of Power, Railways, Ports, Steel, Commerce & Industries, Central Electricity Authority, CMD – coal companies	<ul style="list-style-type: none"> <li>61,175 MW power projects having valid linkage/ LOA</li> <li>29,755 MW to come up during 11<sup>th</sup> Plan</li> <li>Balance 31,400 MW to come up during 12<sup>th</sup> Plan</li> <li>Coal supply will be governed by LOA</li> </ul>	Coal Supply Framework
5.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	29.01. 2010	Decision on coal supply to off-takers. Discussed by MOC, Planning Commission, Ministries of Power, Railways, Ports, Steel, Commerce & Industries, Central Electricity Authority, CMD – coal companies	<ul style="list-style-type: none"> <li>Provisions of NCDP are to be followed</li> <li>Issuance of LOA was cleared for a number of power projects including many private producers</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
6.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	08.04. 2010	Decision on coal supply to off-takers. Discussed by MOC, Planning Commission, Ministries of Power, Railways, Ports, Steel, Commerce & Industries, Central Electricity Authority, CMD – coal companies	Discussed and cleared issuance of LOA for a number of power projects including many private producers	Coal Supply Framework
7.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	18.04. 2011	Decision on coal supply to off-takers. Discussed by MOC, Planning Commission, Ministries of Power, Railways, Ports, Steel, Commerce & Industries, Central Electricity Authority, CMD – coal companies	<ul style="list-style-type: none"> <li>• CIL have not been able to achieve production targets</li> <li>• Draft Model FSA circulated</li> <li>• Making case by case review of progress of stations.</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
8.	Model Fuel Supply Agreements for eligible New Power Stations commissioned between 1st April 2009 and on or before 31st March 2015, Coal India Limited	MOC, GOI	May 2011	Drafting Provisions for Fuel Supply Agreement	MOC, GOI has notified New Coal Distribution Policy (NCDP) and purchaser IPP will be supplied coal by CIL if it has been issued a Letter of Assurance	Coal Supply Framework
9.	Presentation: Strategy for Pooling of price of Coal	CEA	2011 onwards	Generating options for price pooling	<ul style="list-style-type: none"> <li>• Serious shortfall in domestic coal supply</li> <li>• Incremental cost for coal import to be shared by all power stations</li> </ul>	Coal Supply Framework
10.	Coal price pooling – not a rational approach (Power Today, July 2011)	R.K. Sachdev	July 2011	Examining coal price pooling Concept	<ul style="list-style-type: none"> <li>• The government formulating a policy to balance international and domestic coal prices by “pooling”</li> <li>• But since generation plans are heavily dependent on coal, only way to get cheaper coal is to increase</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
11.	Correspondence of Association of Power Producers (APP)	APP to Secretary MOC	11.10. 2011	Inviting attention to Power Sector issues	<p>domestic production.</p> <ul style="list-style-type: none"> <li>• CIL, a monopoly is not following the mandates of New Coal Distribution Policy</li> <li>• Coal supply is critical for power stations</li> <li>• Investment undertaken on the basis of enforceable LOAs provisions of which are not being followed by CIL</li> </ul>	Coal Supply Framework
12.	Model Fuel Supply Agreements for eligible New Power Stations commissioned between 1st April 2009 and on or before 31st March 2015, Coal India Limited	MOC, GOI	Sept. 2012	Drafting Provisions for Fuel Supply Agreement	<ul style="list-style-type: none"> <li>• Reference to New Coal Distribution Policy deleted.</li> <li>• For signing Fuel Supply Agreement and for supply of coal, IPPs are required to have long term power purchase agreements with power distribution companies.</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
13.	Press Information Bureau Report	GOI	Feb. 2012	PM initiates action to address coal issue	<ul style="list-style-type: none"> <li>Coal India will sign FSA with power plants having long term PPA with Discoms</li> </ul>	Coal Supply Framework
14.	Agenda of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	14.02. 2012	Holding Standing Linkage Committee Meeting	<ul style="list-style-type: none"> <li>As of 25.1.2012, coal companies issued 172 LOAs covering 108877.99 MW. This capacity is for commissioning beyond 31.3.2009.</li> <li>Need for freezing the capacity to be supplied coal by CIL in 12<sup>th</sup> Plan.</li> <li>CIL had earlier estimated that they would be able to supply only 50% of normative requirement through indigenous sources and balance through imported, if feasible. Entire capacity for which LOA has been issued may not come up due to various reasons. Imperative that MOP finalise the list of 12<sup>th</sup> Plan</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
15.	Minutes of Meeting (MOM) of Standing Linkage Committee (SLC)	MOC, GOI	14.02. 2012	Holding Standing Linkage Committee Meeting	<p>projects and freeze so that CIL can plan accordingly.</p> <ul style="list-style-type: none"> <li>• “Competent Authority” has since taken decision that CIL will sign FSAs with upcoming power stations that have entered into long term PPA with discoms</li> <li>• Detailed direction would be issued by MOC</li> <li>• There is need for freezing the capacity so that CIL can plan supply</li> <li>• Certain LOAs were cancelled, based on MOP recommendation.</li> </ul>	Coal Supply Framework
16.	Memorandum to Prime Minister	From APP	January 2012	Key issues impacting Power Sector	<ul style="list-style-type: none"> <li>• Power generation sector facing key structural threat in the form of fuel unavailability and pricing</li> <li>• Fuel supply agreement floated by CIL not in compliance with NCDP</li> <li>• FSAs floated by CIL not</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
17.	Correspondence Association of Power Producers (APP)	APP to Minister of MOC	18.01. 2012	Key issues impacting the power sector	<p>bankable</p> <ul style="list-style-type: none"> <li>• Distribution reform not carried out</li> <li>• Private sector share in capacity addition going up fast</li> <li>• Despite capacity addition, generation is constrained because of domestic fuel shortage</li> <li>• Sub-optimal utilisation of capacity created feared</li> </ul>	Coal Supply Framework
18.	Correspondence from Association of Power Producers (APP)	APP to Minister of Power	18.01. 2012	Key issues impacting the power sector	<ul style="list-style-type: none"> <li>• Private sector share in capacity addition going up fast</li> <li>• Despite capacity addition, generation is constrained because of domestic fuel shortage</li> <li>• Sub-optimal utilisation of capacity created feared</li> <li>• Distribution sector reform not carried out</li> <li>• Failure to address would</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
19.	GOI Report	CEA	May 2012	A Group was constituted to examine the Fuel Supply Agreement issue – IPP's eligibility	About 27788 MW capacity now under construction has not been recommended for fuel supply pact	Coal Supply Framework
20.	Correspondence from Association of Power Producers (APP)	APP to Minister of Power	2.8.12	Issues faced by Power Sector	<ul style="list-style-type: none"> <li>Private sector, a key contributor to capacity addition in 12<sup>th</sup> 5 year Plan</li> <li>Prime Minister assured APP that no power plant would be shut down for want of fuel. But no clarity of fuel availability.</li> <li>Distribution utility bail out package needs to be accompanied by concrete measures</li> </ul>	Coal Supply Framework
21.	Media Reports	Economic Times Rachita	06.07. 2012	Merchant Power sales under coal ministry scanner	<ul style="list-style-type: none"> <li>MOC threatened to cancel coal block allocation for power companies selling</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
		Prasad			power in short term market at high rates and has asked them to enter into PPAs (long term)	
22.	Media Reports: Coal Price Pooling	Business Line	02.08. 2012	CIL Board expressing reservation against price pooling	<ul style="list-style-type: none"> <li>Independent Directors were critical on this cross-subsidising policy</li> </ul>	Coal Supply Framework
23.	Report on Price Pooling	Infraline	September 2012	Different view points on price pooling	<ul style="list-style-type: none"> <li>In view of the concerns on price pooling, exercise should be reviewed after one year</li> </ul>	Coal Supply Framework
24.	Media Reports: Coal Price Pooling	Economic Times	21.09. 2012	Price pooling facing resistance from certain State Governments	<ul style="list-style-type: none"> <li>Scheme may not materialise</li> </ul>	Coal Supply Framework
25.	Media Reports: Coal Price Pooling	Financial Express	08.10. 2012	States say it would raise cost & tariff	<ul style="list-style-type: none"> <li>Coal price pooling may be postponed</li> </ul>	Coal Supply Framework
26.	Correspondence from Association of Power	APP to Competent Commission of India	10.10. 2012	Notice u/s 36(2) of Competition Act 2002	<ul style="list-style-type: none"> <li>Several observations / instances to prove Coal India has abused its</li> </ul>	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
	Producers (APP)				dominant position.	
27.	Model Fuel Supply Agreements for eligible New Power Stations commissioned between 1st April 2009 and on or before 31st March 2015, Coal India Limited	MOC, GOI	November 2012	Drafting Provisions for Fuel Supply Agreement	<ul style="list-style-type: none"> <li>Reference to New Coal Distribution Policy deleted.</li> <li>For signing Fuel Supply Agreement and for supply of coal, IPPs are required to have long term power purchase agreements with power distribution companies.</li> </ul>	Coal Supply Framework
28.	Media Reports: Coal Price Pooling	Economic Times	04.12. 2012	Government fine-tuning coal pricing policy	<ul style="list-style-type: none"> <li>Government plans to roll out from April 2013</li> </ul>	Coal Supply Framework
29.	Report on Price Pooling (source: Infraline)	Inter-ministerial Committee, GOI	March 2013	Examining Pooling of Coal Prices by CCEA	<ul style="list-style-type: none"> <li>Schemes placed for consideration –CEA &amp; CIL may modify or update, if necessary</li> </ul>	Coal Supply Framework
30.	Infraline Newsletter	Infraline Energy	28.03. 2013	Prospect of Indian Power Sector	India faces acute fuel shortage particularly for private sector generators	Coal Supply Framework

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
31.	Supreme Court Order	Supreme Court	2014, August	PIL on legitimacy of coal block allocation	Major effect on Power Producer	Coal Supply Framework
32.	Supreme Court Order	Supreme Court	2014, September	PIL on legitimacy of coal block allocation	Fuel Uncertainty deepens	Coal Supply Framework
33.	New coal laws	GOI	2014-2015	1. Framework of new allocation through Auction 2. Future coal market	Does not resolve satisfactorily Fuel Uncertainty	Coal Supply Framework
34.	Auction document	Nominated Authority	2014-2015	Competitive Bidding	IPPS not in position to pass on fuel cost	Coal Supply Framework

*Table 2-3: Reform in power sector in India vis-à-vis international power sector reform*

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
1.	Expert Group on Settlement of SEB Dues, May, 2001	Montek Singh Ahluwalia	2001	Large dues owed by SEBs to the CPSUs was found to be major impediment for reform and was to be resolved.	For sectoral reform SEBs should accept reform based milestone.	Reform in power sector in India vis-à-vis international power sector reform
2.	Privatization of Electricity Distribution – the Orissa Experience – TERI,	K. Ramanathan & Shahid Hasan	2003	Analysing context for Privatisation of Orissa, the first state in India where comprehensive reform was initiated in Power Distribution	Brings out the need for different models and approaches for distribution privatization keeping in view state-specific requirement.	Reform in power sector in India vis-à-vis international power sector reform
3.	India's Economic Transition: The Politics of Reforms – Oxford University	Rahul Mukherji,	2007	Managing competition policies and the building of Independent	<ul style="list-style-type: none"> <li>● Telecom regulatory more successful in competition</li> <li>● Reforming power tariff</li> </ul>	Reform in power sector in India vis-à-vis international

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
	Press			Regulatory Institutions	<p>had more political obstacles</p> <ul style="list-style-type: none"> <li>• Need to increase competition and thereby efficiency</li> </ul>	power sector reform
4.	Electricity Sector in India – Policy And Regulation, Oxford University Press,	Alok Kumar & Sushanta K. Chatterjee	2012	Analysing the gap between vision and reform in Indian Electricity sector	<ul style="list-style-type: none"> <li>• The anxiety of the Parliament to introduce open access to consumers expeditiously and in a time bound manner was reflected in the first set of amendment to the Act in 2004</li> <li>• But open access is not progressing</li> </ul>	Reform in power sector in India vis-à-vis international power sector reform
5.	Economic Times Magazine		25.11.2012 to 01.12.2012	Examining why SEBs are incurring loss	<ul style="list-style-type: none"> <li>• Very large power project cost</li> <li>• Expensive choice</li> </ul>	Reform in power sector in India vis-à-vis international power sector reform

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
6.	Discoms Resisting Open Access, Infraline Plus	Sushanta K. Chatterjee	January 2013	Need for early implementation of competition in retail market	International experience is available and to be studied	Reform in power sector in India vis-à-vis international power sector reform
7.	PWC/ CERC Study on New Act Amendment	PWC/ CERC	2015	Amendment to Electricity Act	Separation of Content & Carriage	Reform in power sector in India vis-à-vis international power sector reform
8.	UDAY Scheme	MOP	2015	Improvement of Discom Financial	Need to improve Discom's financial health	Reform in power sector in India vis-à-vis international power sector reform

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
9.	Sustainable Power Sector Reform in Emerging Markets- Financial Issues and Options, Joint World Bank/USAID Policy Paper	Deloitte Touche Tomatsu	2004	Analysis models of Power Sector Reform across countries	Certain elements are common but sequencing may be different	International Reform
10.	Experience of Privatisation, Regulation and Competition: Lessons for Governments. <i>CCP Working Paper 05-5.</i>	Davies, L., Wright, K., & Price, C. W.	2005	Analysis models of Power Sector Reform across countries	Discusses various alternatives there is no fit for all model	International Reform
11.	Market Restructuring, Competition and the Efficiency of Electricity Generation: Plant level Evidence from the United States 1996-2006.	Crain, J., & Savage, S. J.	2013	Analysis models of Power Sector Reform across countries	Even in deregulated scenario, strong governance is necessary	International Reform

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
12.	The political economy of Indian power sector reforms	Rahul Tongia	December 2003	Discusses Indian power sector reform in the backdrop of international reform in certain key countries	Indian reform since 1991 was driven by two forces – worldwide trend towards reform and need to increase capacity.	International Reform
13.	Major conclusions: the political economy of power sector reform in five developing countries	David G Victor and Thomas C Heller	2006	Electricity sector reform in five critical developing countries—Brazil, China, India, Mexico and South Africa.	<ul style="list-style-type: none"> <li>● Reform in initiated under duress</li> <li>● Belief that weaknesses of power sector can lead to economic failure</li> </ul>	International Reform

*Table 2-4: Investment appraisal and investment decision under uncertainty*

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
1.	Exploratory Analysis to Support Real Options Analysis	Buyung Agusdinata	2005	Investigating impact of various uncertainties on NPV of investments	Calculation of Regret value of an infrastructure investment	Investment appraisal and investment decision under uncertainty
2.	Investment under Uncertainty in Power Generation: Integrated Electricity Prices Modeling and Real Options Approach	C. Barria and H. Rudnick	2011	Investment under uncertainty in power generation using real option	Flexibility in decision adds value to the investment	Investment appraisal and investment decision under uncertainty
3.	How much should we pay for interconnecting electricity markets? A real options approach	Alvaro Cartea, Carlos Gonzalez-Pedraz	2011	Real option application in Transmission	Identifies markets where interconnector would be most valuable	Investment appraisal and investment decision under uncertainty
4.	Modeling technology adoption as an irreversible investment under uncertainty: the case of the Turkish electricity supply industry	Reinhard Madlener, Gurkan Kubaroglu, Volkan S. Eidger	2004	Energy conversion technology adoption on the perspective of investment under uncertainty	Increased adoption of gas based technology in Turkey has doubtful merits from investors' perspective	Investment appraisal and investment decision under uncertainty

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
5.	A real option analysis of investments in hydropower- the case of Norway	Frode Kjaerland	2007	Valuation study of Hydropower in Norway	Shows consistency between ROT and investment behaviour	Investment appraisal and investment decision under uncertainty
6.	Managing the financial risks of electricity producers using options	S. Pineda, A.J. Conego	2012	Multi-stage model to determine optimal selling strategy of a risk-averse producer	An option is advantageous w.r.t a forward contract	Investment appraisal and investment decision under uncertainty
7.	A real options based model and its application to China's overseas oil investment decisions	Ying Fan, Lei Zhu	2009	Application of ROT to overseas oil investment	Can provide useful advice for China's overseas investment programme	Investment appraisal and investment decision under uncertainty
8.	Integrating financial theory and methods in electricity resource planning	Frank A Felder	1996	Option theory and Risk adjusted Discount Rates	By correctly using RADR and OT decision makers can improve their ability to value risks in power plants	Investment appraisal and investment decision under uncertainty
9.	Projects, Planning Analysis & Review, 4 <sup>th</sup> Edition - Tata McGraw-Hill Publishing Company Limited	Prasanna Chandra	1995	Appraisal criteria	Discusses application under different scenarios	Investment appraisal and investment decision under uncertainty

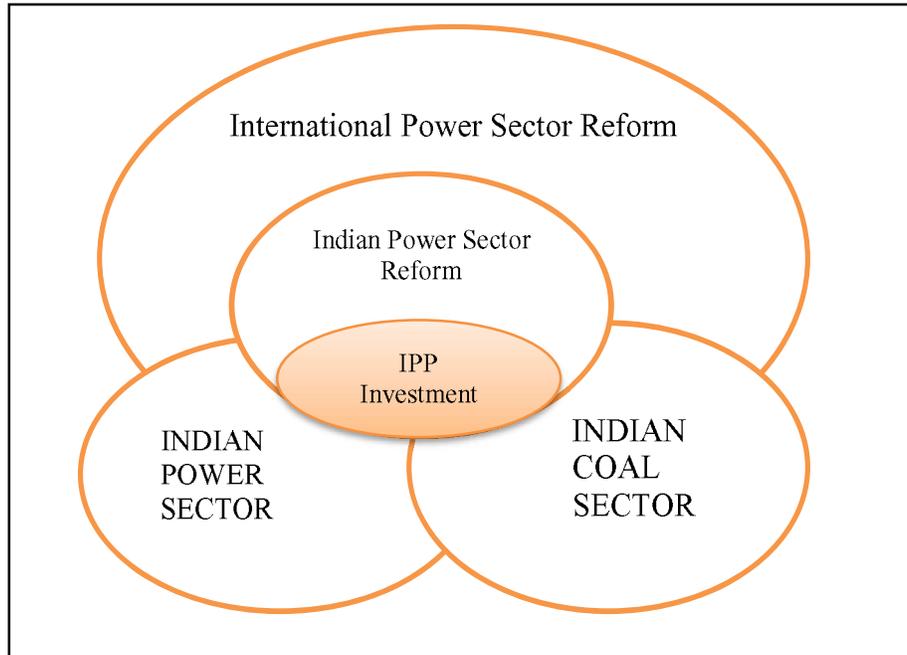
Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
10.	Principles of Corporate Finance	Brealey, Myers & Others, 8 <sup>th</sup> Edition	2013	Investment Appraisal criteria	ROT helpful in uncertain scenario	Investment appraisal and investment decision under uncertainty
11.	Project Financing, Asset-based Financial Engineering, John Wiley & Sons, Inc.,	John D. Finnerty,	1996	Project financing plans	Project financing is distinct from conventional direct financing	Investment appraisal and investment decision under uncertainty
12.	Financial Management, Tata McGraw-Hill,	P. Periasamy 2 <sup>nd</sup> Edition	2009	Investment appraisal	Discusses financial ratios	Investment appraisal and investment decision under uncertainty
13.	Flexibility in Investment Decisions under Uncertainty: Do Managers Behave According to Real Options Theory? Australian Graduate School of Management	Michael Alan Collins	March 2009	Real Option Valuation applies option valuation techniques to capital budgeting decisions.	<ul style="list-style-type: none"> <li>A real option itself is the right — but not the obligation — to undertake certain business initiatives, such as deferring, abandoning, expanding, staging, or contracting a capital investment project.</li> </ul>	Investment appraisal and investment decision under uncertainty

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
					<ul style="list-style-type: none"> <li>Real Option Valuation model can be used for valuation of an investment decision under uncertainty.</li> <li>In Classical models like Discounted Cash Flow/ Net Present Value methods, decision making capability of management under various possible future events are ignored.</li> <li>This difficulty can be addressed through Real Option Valuation technique.</li> </ul>	
14.	Modeling Investment under Uncertainty in Indian Electricity Sector with Real Option Approach: A Review , IJBIT/ Volume 5/ Issue 1	Neeta Nagar	October 2011-March 2012	Trade-off between need for increasing power generation and burden on environment	Use of Real Option for Indian Electricity can bring value. Challenge lies in identifying and designing uncertainty of a particular investment.	Investment appraisal and investment decision under uncertainty

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
15.	Irreversible investment in alternative projects	Jean-Paul Decamps, Thomas Mariotti and Stephane Villeneuve	2005	Comparison of alternative investment decision	The dichotomy of investment persists even when output price volatility becomes large	Investment appraisal and investment decision under uncertainty
16.	The validity of Company valuation using Discounted Cash Flow Methods	Florian Steiger	2008	Examines widely used discounted cash flows valuation method	DCF method in conjunction with other ones, is effective. But it is very sensitive to underlying assumptions.	Investment appraisal and investment decision under uncertainty
17.	Net present value approach: method of economic assessment of innovation projects	Ondrej Zizlavsky	2014	Performance measurements for innovation projects utilizing NPV	Problem lies with average probability assumption	Investment appraisal and investment decision under uncertainty
18.	Simulation discounted cash flow valuation for internet companies	M. Ali,	2008	Examining efficacy of DCF approach valuation of internet companies	High uncertainty in such business calls for a “modified DCF” approach	Investment appraisal and investment decision under uncertainty
19.	Discounted cash flow valuation methods: examples of perpetuities, constant growth and general case	Pablo Fernandez	July 2005	Examining DCF approach for valuation of Perpetual Companies	Wherever applicable Tax shield due to interest payment may not be discounted	Investment appraisal and investment decision under uncertainty

Sl. No.	Papers / Article / Document	Author	Year	Context	Inference	Theme
20.	A Net-Present value analysis for a Wind Turbine Purchase at a small US College	Nicholas H Johnson & Barry D Solomon	May 2010	Cost Benefit Analysis of small wind plant for a college	NPV analysis may be considered for projects	Investment appraisal and investment decision under uncertainty
21.	Using Probabilistic Analysis to value power generation investments under Uncertainty	Fabien A Roques, William J Nuttall and David M Newbery	July 2006	Discuss Levelised Cost approach	Introduces probabilistic approach with case studies.	Investment appraisal and investment decision under uncertainty

## 2.6 Thematic Review of Literature



### 2.6.1 Outcome: Salient Points

#### 2.6.1.1 *Indian Power sector business framework (Wholesale & Retail) & IPP investment*

- Indian laws and policies for power sector have radically changed in the last 20 years. From traditional mould of public sector development the focus has shifted to the need for capacity creation by private sector also.
- GOI has been trying for the last 20 years to bring in private capital for development of Indian power sector. One of the chief reasons for doing so is to address large demand-supply gap.
- Electricity Act, 2003 brought in an important dimension to Indian

power sector, i.e., competition in the power industry. Paradigm of open access has been introduced by the said Act both for wholesale and retail markets.

- Generation business has been de-licensed and freed from all controls in order to enhance generation capacity in the country. The Act lays special thrust on generation capacity addition and on creation of conducive framework so that power producers can access end consumers in a time bound manner.
- National Electricity Policy, 2005 also strongly recommends introduction of competition and recommends substantial capacity addition.
- Coal is the principal fuel for India and GOI formulated New Coal Distribution Policy in 2007 which accorded priority for coal supply to power sector including private power producers.
- GOI from time to time held conference with private sector investors for bring in investment in power sector assuring them of fuel supply and access to market.

#### ***2.6.1.2 Indian Fuel Context***

- Coal sector is marked by presence of a large monopoly in Coal India Ltd.
- GOI encouraged market based generation and assured coal supply to IPPs will supply power outside long term agreements to Discoms..
- However in 2012, in a sudden departure from earlier assurance, it decided not to allow any coal supply for projects which did not have any long term agreements with distribution licensees.
- New Coal Distribution Policy and Letters of Assurance issued by the coal authorities to independent power producers did not prescribe any such restriction.

- Draft FSAs floated by GOI since 2008 showed that till 2011 this restricting provision was not there.
- MOMs of Linkage Committee would show that both long term PPA holders and market based IPPs were to be treated on par regarding coal supply.
- Coal India for new power stations wants to restrict supply to 50% of LOA quantity. Association of Power Producers (APP) raises alarm and invites attention of Ministry of Coal that
  - i) CIL, monopoly not following the mandates of NCDP
  - ii) Coal supply is critical for power stations
  - iii) Investment undertaken on the basis of enforceable LOAs ... not being followed by CIL.
- Jan. 2012 - APP escalates the issue to Prime Minister and other concerned Ministries.
- Feb. 2012 – Presidential Directive is issued to CIL on FSA indicating that generating companies, whose units are/ would be commissioned between 1.4.09 and 31.3.15 and who have long term power purchase agreements with distribution companies, to be given an assured coal supply upto 80% of LOA level.
- GOI constitutes Group to examine the Fuel Supply Agreement issue and IPPs’ eligibility – the Group comes up with a concept of price pooling which means additional cost for imported coal incurred by CIL should be shared by all power stations in the country.
- Different view points emerge on this report. Some States vehemently reject it.
- This uncertainty continues.

### 2.6.2 Indian Reform Experience, Demand Supply & Power Market Behaviour

- From early 1990's GOI wanted to have Reform in Indian power sector. Indian power sector needed reform because of precarious financial condition of the Government utilities. Investments were needed desperately, but could not take place with "business-as-usual" conditions.
- Government attains this structural Reform by introducing Regulators through a new law in 1998 both at Central and State levels.
- Large volume of dues accumulated to the Central sector power producers and Government constituted an Expert Group for settlement of Dues.
- Large dues owed by SEBs to the CPSUs was found to be a major impediment to Reform and was to be resolved.
- Certain reform based milestones were prescribed.
- Major initiatives for power sector reform came through the new law of 2003 which was aimed at primarily 3 objectives:
  1. To address large demand supply gap through capacity creation
  2. Freeing up control of generation sector
  3. Enabling provision and clear mandate for time bound introduction of competition both in wholesale and retail market.
- While a number of private developers make forward and invested in the generation scheme, the clear mandate of law for letting these private generators to access the end retail consumers did not happen.
- Interestingly, despite shortfall, distribution companies did not prefer to buy from the market newly created and electricity spot prices started coming down even as fuel prices going up in the

Indian market.

- The power developers claimed that that at existing spot price, their plants would become unviable particularly if GOI denies them the benefit of earlier assurance for providing coal from the Indian market.
- Very large capacity would therefore become stranded.
- Retail tariff in the Indian market went up varying across the States, but barriers did not allow for this stranded capacity to be utilised for the end-consumers.

#### ***2.6.2.1 International Power Sector Reform***

- International power sector had many experiences of reform starting from 1990s.
- Electricity industry in UK particularly saw series of initiatives in the form of privatization and introduction of competition.
- Major reform initiatives were also seen in New Zealand, Australia and some parts of Europe.
- Almost everywhere introduction of competition was the primary objective of a reform programme.
- Programmes however are influenced by local specificities like socio-economic circumstances, political culture.
- Major experimenting of separating product from services were attempted and soon met with success.
- Some of the countries introduced the policy of forced ownership unbundling in electricity distribution.

#### ***2.6.2.2 Investment appraisal criteria***

- Two types – Discounting and Non-Discounting
- Urgency, Payback period and Accounting Rate of return fall in Non-Discounting criteria
- NPV, Cost-Benefit ratio, IRR are in Discounting criteria

- Conceptual definitions around risk and uncertainty are varied
- Major uncertainties are around Technological Resource, Competitive, Supplier, Political, Consumer Or Market

***Table 2-5: Important Events - Indian Electricity & Coal Sector***

<b>Year</b>	<b>Development</b>	<b>Remark</b>
1910	<i>Indian Electricity Act</i>	First consolidated Act on electricity business in India. Interestingly, it enabled competition among suppliers
1948	<i>Electricity (Supply) Act</i>	Post-Independence framework to suit new role of electricity as a developmental tool. Concept of vertical monoliths in SEBs brought in
1956	<i>Industrial Policy Resolution</i>	Reserving power generation industry for Government sector
1971 - 1973	<i>Nationalisation of Coal Mines</i>	<i>Coal sector nationalised</i>
1975	<i>Formation of Coal India Ltd. with 5 Subsidiaries</i>	<i>and brought under</i>
1976	<i>Amendment to 1948 Act</i>	Concept of large scale Central Govt. generating stations for inter-state power sale
1986 – 1992	<i>Formation of 3 more Subsidiaries NCL, SECL &amp; MCL</i>	<i>Establishing Government control</i>
1991	<i>GOI policy for inviting large scale private sector participation<sup>11</sup></i>	Major shift in the backdrop of power shortage and weak financials of SEBs
1995 – 2000	<i>Promulgation of various State Reform Acts</i>	Electricity being concurrent subject, certain States moved on their own to re-organise electricity industry viz.

<sup>11</sup> Widening the scope of private sector participation, Ministry of Power, 1991 – MOP publication lays down the policies.

Also “The scheme formulated under the policy throws the electricity generation, supply and distribution field wide open to private entrepreneurs, opening up profitable investment opportunities. That offers a package of incentives which investors, both from India and overseas, will find really attractive.”- MOP Annual Report 2991-92.

“The only opposition to the amendment came from Communist members, and even they ignored broader issues about who gets electricity and at what price, focusing instead on how best to protect workers in the public sector. – Electrifying India: Regional political economies of development by Sunila S. Kale

<b>Year</b>	<b>Development</b>	<b>Remark</b>
<b>1998</b>	<i>Electricity Regulatory Commissions Act</i>	Brought in important provision for independent Regulatory Commissions (State and Central)
<b>2003</b>	<i>Electricity Act 2003</i>	New Act repealing all earlier Acts to modernise & consolidate electricity law
<b>2006</b>	<i>CERC Draft Regulation on market development</i>	To promote market development in line with Electricity Act.
<b>2007</b>	<i>New Coal Distribution Policy, Ministry of Coal, GOI</i>	Concept of “letter of Assurance” introduced
<b>2008</b>	<i>Power Exchanges becomes operational - platform for short term power trading</i>	Two Power Exchanges became functional – IEX and PXIL <i>Wholesale market starts</i>
<b>2008 - 2009</b>	<i>Letters of Assurance issued to large number of developers on fuel (coal) supply</i>	GOI assures prospective power project developers regarding supply of domestic fuel
<b>2008</b>	<i>Open access for large consumers</i>	1 MW and above consumers have right to seek open access subject to payment of charges
<b>2012</b>	<i>Government Fuel Policy shift – Merchant generators not to get access to concessional fuel (Bhattacharyya, Dhingra, &amp; Sengupta, 2016)</i>	Fuel will not be supplied by Government to generators without long term power sale agreement with Discoms
<b>Sept 2014</b>	<i>Allocation of 204 blocks cancelled by Supreme Court</i>	Power Sector crisis deepens
<b>Oct. to Dec.2014</b>	<i>New laws framed for Coal Sector</i>	<ul style="list-style-type: none"> <li>• First CMSP Ordinance promulgated</li> <li>• CMSP Bill, 2014 introduced in Parliament</li> <li>• Second CMSP Ordinance promulgated after Parliament fails to pass the 2014 Bill</li> <li>• New allocation methodology and rules finalised to initiate process of auctions and allotments</li> </ul>
<b>2015</b>	<i>Coal Block Auction takes place<sup>12</sup></i>	First two tranches of auction and first round of allotment concluded

<sup>12</sup> Auctions of a few blocks have since landed up in Courts on issues like procedure employed and restrictions imposed

Year	Development	Remark
	<i>Coal Blocks allocated to PSUs</i>	<ul style="list-style-type: none"> <li>• CMSP Bill, 2015 introduced in Parliament</li> <li>• 2015 Bill passed by Parliament as CMSPA</li> </ul>
		Third tranche of coal auctions under CMSPA concluded with the stipulation that block holders will not get pass through of fuel cost.
2016	<i>Huge private investment in power generation capacity becomes uncertain</i>	<ul style="list-style-type: none"> <li>• Over 20,000 MW capacity created has potential to get stranded for either fuel uncertainties or market uncertainties</li> </ul>

## 2.7 Reform in power sector in India vis-à-vis international power sector reform

### 2.7.1 International Reform Experience

International power sector reform covered a large geographical spread across continents and a time period of about 25 years starting from early 1980s (Joskow 2008). Initiatives were built around three cornerstones:

1. Separation of natural monopoly from potentially competitive segment. Network business (Carriage) was considered as natural monopoly while the supply side (Content) was a candidate for competition.
2. Bringing in private capital – private ownership – for management efficiency.
3. Creation of independent regulatory bodies for balancing the need of consumers and developers.

Many reforming countries, however, did not pursue all the three objectives together. But at least two were common in all.

Chile was the pioneer in reform (1982) driving the following: (Nepal & Jamasb, 2013)

- i) establishment of the electricity market regulator at the start,
- ii) corporatization of state-owned agencies,
- iii) law for liberalisation of electricity sector,
- iv) unbundling (or vertical separation) of the main segments,
- v) incentive regulation of networks,
- vi) establishment of a wholesale electricity market,
- vii) introduction of privatization and
- viii) introduction of private independent power producers (IPPs).

Electricity Reform models across countries targeted progressive transition to retail competition in the long run (Deloitte Touche Tomatsu Emerging Markets Ltd., 2004), with various countries sequencing intermediate steps according to their own model.

### 2.7.2 Reform outcomes – Key Metrics

World Bank studies (Manibog, Dominguez, & Wegner, 2003) suggest that wherever developmental work was backed by country commitments such initiatives delivered results.

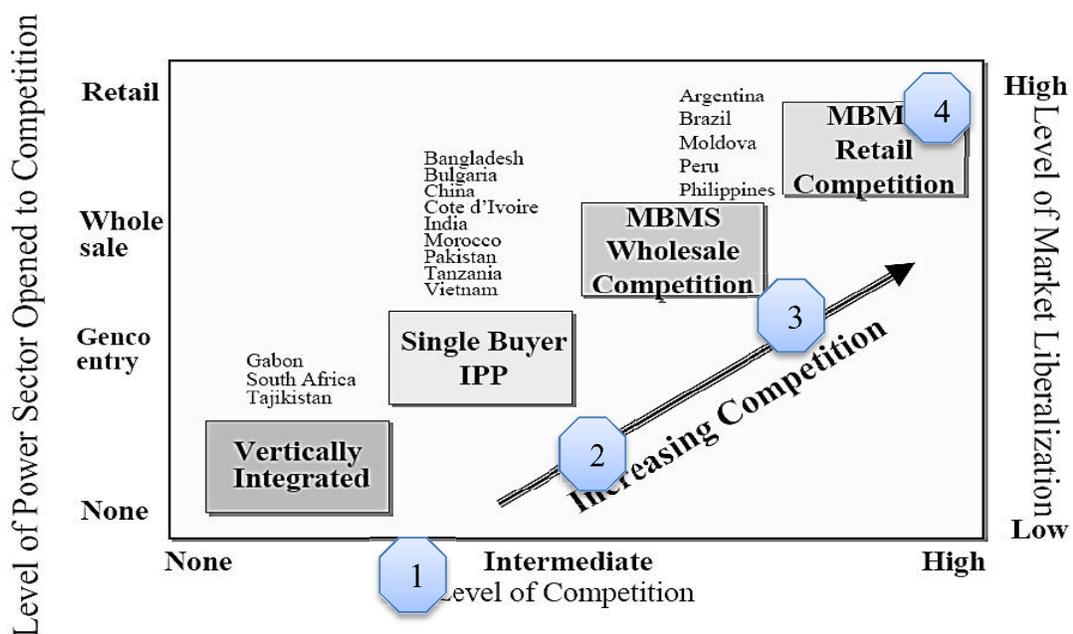
<b>Metrics</b>	
<b>Access to</b>	Extension of grids to economically weak communities
<b>Quality of Service</b>	Reduced interruptions
	Lower Voltage fluctuations
	Better responsiveness

<b>Fiscal issue</b>	Earnings for Govt. – one time Additional investments Dividends to government - Recurring Reduced subsidies Scope for accommodating more Developmental Expenses
<b>Labor and Employment Impacts</b>	Possible retrenchment and scheme on safety nets Number of employees in the sector
<b>Price Impacts and Affordability of Service</b>	Reduced Wholesale electricity prices Affordable Retail electricity prices

<b>Outcome vis-à-vis Return</b>	<b>Power Sector</b>	<b>All Sectors</b>
High Development Outcome with Low Return	21%	19%
Low Development Outcome with Low Return	7%	26%
High Development Outcome with High Return	65%	45%
Low Development Outcome with High Return	7%	10%

Reform Models

*Figure 2-1: Electricity Reform models across countries*

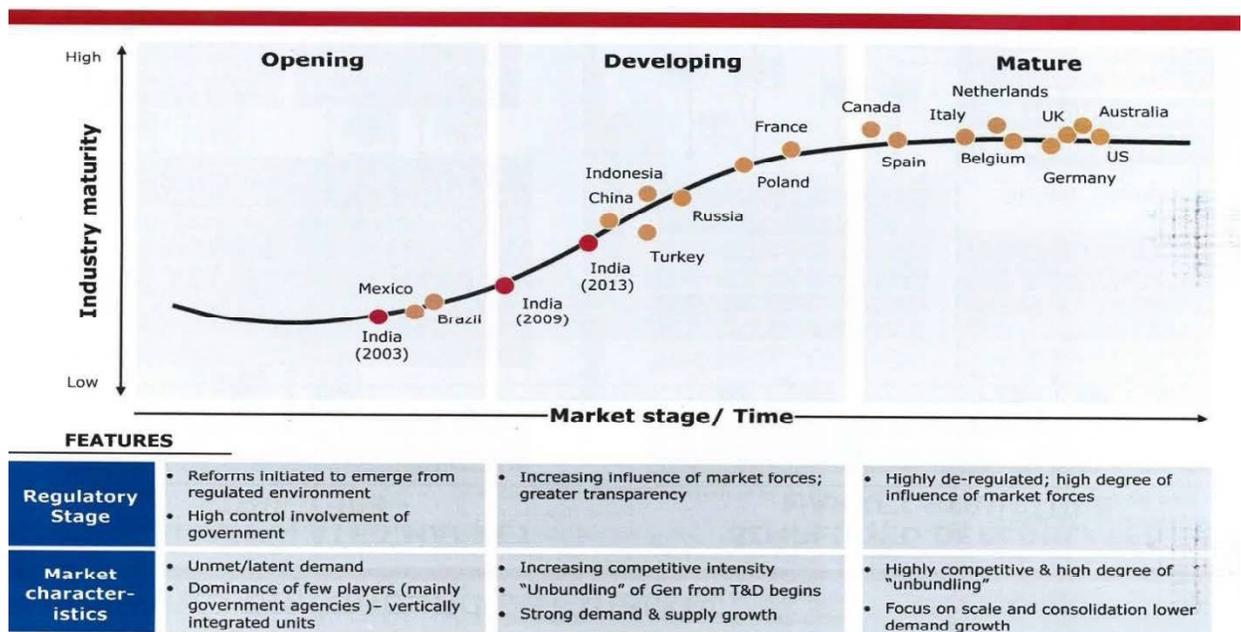


Source: *Caught Between Theory and Practice: Government, Market, and Regulatory Failure in Electricity Sector Reforms* by Rabindra Nepal; Tooraj Jamasb; January 2013

Model 4 implies that choice for all customers is available, with complete separation of generation and retailing (supply) from the network business. There is no monopoly over retailing, competing retailers can perform the same role as they do in other markets. The distribution wires provide open access or common carriage. With this structure there would also be free entry to generation market and free exit (Sally Hunt, 1996).

Regulation / control are at different stages for countries undertaking reform. Industry maturity is based on per capita consumption, consumption growth rate, competitive and stage of regulatory reforms in market. Select countries amongst the top twenty nations by GDP have been represented in the chart.

*Figure 2-2: Reform at different stages*



Source: Business Monitor International, EIA, Bain analysis

### 2.7.3 Indian Experience

Literature Survey suggests India has seen the following initiatives on reform so far:

- i) Comprehensive Law for electricity sector liberalisation being in place
- ii) Functional Regulatory Commissions at the Central and State levels
- iii) Unbundling of the main segments – Genco, Transco and Discom and Corporatization of State-owned enterprises
- iv) Generation Delicensed - Introduction of private independent power producers (IPPs)
- v) Establishment of wholesale spot electricity market (2 power exchanges) and introduction of Traders
- vi) Actions to improve Discoms' financials
- vii) Large investments made by the IPPs

While wholesale market has been functional for last 8 years, retail market is practically non-existent.

## 2.8 Investment appraisal and investment decision under uncertainty

Once the stream of costs and benefits for a project is defined in the form of cash flows accounting figures, analysis shifts to project worthiness. Important parameters can be classified as follows:

*Table 2-6: Investment Appraisal criteria*

Non-discounting Criteria	Discounting Criteria
Urgency	Net present value
Payback period	Benefit-cost ratio
Accounting rate of return	Internal rate of return

### 2.8.1 Net present value (NPV)

The net present value of a project is equal to the sum of the present value of all the cash flows associated with it.

#### *Rationale for the NPV Method*

The NPV method has a straight-forward rationale. Zero NPV signifies that the benefits of the project (project cash inflows over time) are just enough to (a) recoup the capital invested and (b) earn the required return on the capital invested. A positive NPV implies that the project earns an excess return.

#### *Modified Net Present Value*

The standard net present value method assumes the intermediate cash flows to be re-invested at a rate of return equal to the cost of capital. When this assumption is not valid, the re-investment rates applicable to the intermediate cash flows need to be defined for calculating the modified net present value.

### 2.8.2 Benefit Cost Ratio

There are two ways of defining the benefit-cost ratio. The first definition relates the present value of benefits to the initial investment.

$$BCR = \frac{PVB}{I}$$

Where I = initial investment

BCR = benefit-cost ratio

PVB = present value of benefits

The second measure, a net measure, relates net present value to initial investment.

$$NBCR = \frac{NPV}{I} = \frac{PVB - I}{I} = \frac{PVB}{I} - 1$$

Where, NBCR = net benefit-cost ratio

NPV = net present value

PVB=present value of benefits

I=initial investment

### **2.8.2.1 *Internal Rate of Return (IRR)***

This analysis finds out the discount rate which makes its net present value equal to zero. This becomes the Internal rate of return.

### **2.8.2.2 *Significance of IRR***

There are two possible economic interpretations of internal rate of return: (1) The internal rate of return represents the rate of return on the unrecovered investment balance in the project. (ii) The internal rate of return is the rate of return earned on the initial investment made in the project.

### **2.8.2.3 *Modified Internal Rate of Return***

IRR interpretation is based on the assumption that the intermediate cash inflows can be re-invested at a rate of return equal to the internal rate of return of the project. When this is not valid the re-investment rates applicable to the intermediate cash flows need to be defined for calculating the modified internal rate of return.

### **2.8.2.4 *Accounting Rate of Return***

It is also called the average rate of return or the return on investment indicating profitability measured in accounting terms. Since income and investment can be measured variously, there can be a very large number of measures for accounting rate of return.

### **2.8.2.5 *Payback period***

It's a measure of the time period in which the initial investment is recouped. This does not consider time value of money, hence no discounting is done.

**Table 2-7: Assessment of Basic Evaluation Techniques<sup>13</sup>**

	Net present value	Benefit cost ratio	Internal rate of return	Payback period	Accounting return of investment
<i>Theoretical consideration</i>					
1. <b>Does the method consider all cash flows?</b>	Yes	Yes	Yes	No	?
2. <b>Does the method discount cash flows at the opportunity cost of funds?</b>	Yes	Yes	No	No	No
3. <b>Does the method satisfy the principle of value additivity?</b>	Yes	No	No	?	?
4. <b>Does the method identify the project which maximises shareholder wealth?</b>	Yes	No	No	?	?
<i>Practical considerations</i>					
1. <b>Is the method simple?</b>	Yes	Yes	Yes	Yes	Yes
2. <b>Can the method be used with limited information?</b>	No	No	No	Perhaps	Yes
3. <b>Does the method give a relative measure?</b>	No	Yes	Yes	No	Yes

### 2.8.3 Sensitivity Analysis

Sensitivity analysis, sometimes called ‘what if’ analysis, draws out results out of variations in critical assumption like, capital Cost, production/ sales volume, interest rate / forex rate, commissioning date, efficiency etc.

### 2.8.4 Scenario Analysis

In sensitivity analysis, typically one variable is varied at a time. If variables are inter-related, set of interrelated assumptions need to be looked at. For example, a project may be evaluated under three different scenarios:

<sup>13</sup> Projects, Planning Analysis Selection Implementation & Review, 4<sup>th</sup> Edition - Prasanna Chandra, Tata McGraw-Hill Publishing Company Limited, 1995

- (a) Where the demand and price are expected to be normal
- (b) Where the demand is high, but the price low
- (c) Where the demand is low, but the price high.

### 2.8.5 Monte Carlo Simulation

Sensitivity analysis indicates the sensitivity of the criterion of merit (NPV, IRR, or any other) to variations. The likelihood of occurrences can be generated by Monte Carlo Simulation.

### 2.8.6 Project selection under risk

#### 2.8.6.1 *Judgmental Evaluation*

Managers look at the risk and return characteristics of a project and decide intuitively on acceptance/ rejection without using any formal method for incorporating risk in the decision making process. The decision may be based on the collective view of some group.

#### 2.8.6.2 *Payback Period Requirement*

Often NPV or IRR are used with an eye on a payback period requirement. For a risky investment a shorter payback period is looked for even if the NPV or IRR are favourable.

#### 2.8.6.3 *Risk Adjusted Discount Rate Method*

It is used for adjustment of the discount rate to reflect project risk. The risk adjusted discount rate is :

$$r_k = i + n + d_k$$

Where  $r_k$  is the risk-adjusted discount rate for project  $k$ ,  $i$  is the risk-free rate of interest,  $n$  is the adjustment for the firm's normal risk, and  $d_k$  is the adjustment for the differential risk of project  $k$ .

#### 2.8.6.4 *Certainty Equivalent Method*

Under the certainty equivalent method, the net present value is calculated as follows:

$$NPV = \sum_{t=1}^n \frac{\alpha_t \bar{A}_t}{(1+i)^t} - I$$

Where NPV is the net present value,  $\bar{A}_t$  is the expected cash flow for year t,  $\alpha_t$  is the certainty equivalent coefficient for the cash flow of year t, i is the risk free interest rate, and I is the initial investment.

#### **2.8.6.5 *The Hurdle Rate***

It is a measure of rate of return that the investor will look for compensation for a particular degree of risk. The weighted average cost of capital normally serves as the hurdle rate for a project. Typically, a project is financed by Debt and Equity. Debt carries a contractual figure of interest, equity does not. Capital Asset Pricing Model is used for estimating cost of equity for the project.

#### **2.8.6.6 *Discounted cash flow (DCF) valuation model***

To generate a value of the investment before making the initial investment, the DCF model assumes that the expected value of the future benefits does not change over the time to expiry.

#### **2.8.6.7 *Real Options theory***

Real options theory is a way of analysing decision making problems that involve uncertainty, irreversibility and future discretionary action. Even though no uniform definition of real options has emerged (as demonstrated by the debate in the Academy of Management Review in 2004), all variations in the literature contain three essential elements: uncertainty, irreversibility and future discretionary action.

Real options are defined as investment decisions that may be made in the future and that cannot be costlessly reversed, and where there is uncertainty about the future value of the investment.

Example of definitions of real options:

- 1) Real options investments are characterised by sequential, irreversible investments made under conditions of uncertainty.
- 2) A real option is the investment in physical and human assets that provides the opportunity to respond to future contingent events.
- 3) Real options theory concerns classes of investments in real assets that are similar to financial options in structure.

### **2.8.7 Theories on Investment decisions by firms (Nagar, IJBIT, October 2011- March 2012)**

#### ***2.8.7.1 Research in Corporate Investment Decisions***

Research in corporate investment decisions has taken multidisciplinary perspectives primarily in three areas - finance, management accounting and strategic management (Dempsey 2003). The management accounting area has focused on qualitative research around capital budgeting process with the usage of financial techniques as part of the process. The financial perspective has relied on building sophisticated models for valuing investments based on traditional discounting flow methods, while strategic perspective has focused on market opportunities and firm's competitive advantages (Myers 1987). While the common thread appears to be financial analysis of the investments, there is distinct gap found in practice because of inability of traditional financial theory to capture the real value of the investment (Myer 1987). Traditional valuation methods have shown limitations in estimating the discount rate, project's future cash-flows, the cross-sectional links between projects and most importantly, the linkage between today's investments and firm's future investment opportunities (Myers 1987). This has led to lack of reconciliation across different streams in arriving at investment decision analysis with strategic side relying more on qualitative assessments instead of financial

valuation techniques, while financial side not able to arrive at the real investment value through their traditional quantitative models. The studies recognized the need to extend financial theory that could evaluate that additional value, closer to strategic value of any investment, for better synchronization across different levels of investment decision making.

### **2.8.7.2 *Investment under Uncertainty***

Most of the large investment decisions have three important characteristics – irreversibility with initial investment as sunk cost, uncertainty over the future returns, and timing of investments with postponement in expectation of more information; and interaction of these characteristics determine the optimal investment for the future (Dixit and Pindyck 1994). The extent and nature of the analysis of this interaction to arrive at a real value in the form an extended NPV can influence the decision making for optimal investment. The option based framework provides an expanded and unifying approach for real investment decisions by integrating capital budgeting and strategic planning under the single roof of value maximization (Trigeorgis, 1988)

While there is general agreement in the literature on calculating this additional value of the project to fill the gap between financial and strategic value of any investment based on real option theory, there is not enough practical application of this theory for valuing complex investments. Difficulties arise in analysing uncertainties and being able to accurately predict outcome, to take at an optimal investment decision in present time.

### **2.8.7.3 *Defining Uncertainty***

The conceptual definitions around risk and uncertainty in investment decisions literature are varied although they are considered inherent in capital investment decisions (Lipshitz and

Strauss, 1997). In simplistic form, risk is defined as randomness with knowledgeable probabilities and uncertainty is defined as randomness with unknowable probabilities (Meijer, 2008) and consequently, risk is inherent part of uncertainty. Moreover, the way risk and uncertainty are conceptualized does not affect the models and methods adopted by the decision makers to handle the same (Lipshitz and Strauss, 1997).

Uncertainty is defined as any departure from the unachievable ideal of complete determinism (Walker et. al., 2003) or a system of inadequate information due to inexactness, unreliability and border with ignorance (Funtowicz and Ravetz 1990). However, uncertainty prevails even with lot of information (Van Asselt 2000) and it can increase or decrease with new information. The uncertainty also needs to be distinguished based on perspective of a modeller or a decision maker where the latter's focus is to value the outcomes based on goals and objectives (Walker et. al. 2003). Literature categories uncertainty under two major headings - Knowledge Uncertainty (weak, internal, secondary, substantive or epistemic) due to lack of information about future (Van Asselt 2000), complexity (Boyd and Fulk 1996) and Variability Uncertainty (stochastic, random, primary, external or procedural) due to inherent variability in the system which cannot be reduced (Walker et.al 2003) leading to decreasing confidence in the predictions (Boyd and Fulk 1996). It is important for decision makers to know the nature of variability uncertainty to decide their course of action, while knowledge uncertainty can be reduced with more information.

Policy related literature categorises different uncertainties based on their sources that are domains of an organization environment which the decision maker is uncertain about (Milliken 1987) and are categorised as in the following Table :

*Table 2-8: Policy related literature on Different Sources of Uncertainty*

<b>Sources of Uncertainty</b>	<b>Description</b>	<b>Sources</b>
<b>Technological Uncertainty</b>	Uncertainty about technology itself, Uncertainties about the relation between technology and the technological infrastructure. The possibility of choosing alternative technological option	Meijer, 2008; Foxon, Gross et. Al, 2005, Chesbrough, 2004; Carlsson and Jacobsson, 2004; Buyukozkan and Feyzioglu, 2004; St. John, Pouder et. Al, 2003, Jennings and Jones, 1999)
<b>Resource Uncertainty</b>	Availability of raw materials, human and financial resources	St. John, Pouder et. Al, 2003, Jennings and Jones, 1999; Mullins and Sutherland, 1998; Farzin, Huisman et. Al, 1998
<b>Competitive Uncertainty</b>	Perceived uncertainty about the actions of competitors either innocent or strategic. Major factors are ‘first mover advantage’, Economies of scale, number of competitors	St. John, Pouder et. al, 2003, Jennings and Jones, 1999; Farzin, Huisman et.al, 1998; Mullins and Sutherland, 1998; Miller, 1993; Milliken, 1987
<b>Supplier Uncertainty</b>	Uncertainties about the action of supplies i.e. timing, quality and price of delivery, uncertainties about partners in a JV. With more dependence, uncertainty becomes important	Buyukozkan and Feyzioglu, 2004; St. John, Pouder et. al, 2003, Jennings and Jones, 1999, Miller, 1993; Milliken, 1987
<b>Political Uncertainty</b>	Regulatory or policy uncertainty about current policy, unclear or inconsistent regulation, lack of regulation, future changes, government behaviour	Foxon, Gross et.al, 2005, Chesbrough, 2004; Carlsson and Jacobsson, Miller, 1993; Milliken, 1987
<b>Consumer or market uncertainty</b>	Uncertainty about consumer preferences, characteristics, development of demand	Foxon, Gross et.al, 2005, Chesbrough, 2004; Carlsson and Jacobsson, 2004; Buyukozkan and Feyzioglu, 2004; St. John, Pouder et. al, 2003, Jennings and Jones, 1999

The sources of uncertainties depend upon the context (Meijer, 2008) and each of the uncertainty can further be given a level ranging from complete deterministic level to total ignorance (Van Asselt, 2000; Walker et. al, 2003) based on which decision maker can opt for appropriate strategies.

The effect of uncertainty on investment has brought mixed results in the studies so far, favouring towards postponement of decisions due to negative relationship between uncertainty and investment, while a few recent studies suggesting a positive relationship (Abey and Eberly 1999; Sarkar 2000; Fuss 2008). These studies have indicated that the effect depends the way option frameworks are applied based upon the context, type of uncertainty and the underlying process for uncertainty in question leading to varied results.

## 2.9 Overall Research Gap

An analysis on the literature review conducted identifies following gaps in the existing research works and published material :

- 1) Implication of change of fuel policy on project viability of IPPs is not known
- 2) Implication of barriers in retail market on project viability of IPPs is not known
- 3) Overall viability of IPPs in the present scenario of likely stranding is not known
- 4) How policy uncertainty during ongoing project stage be part of investment appraisal to evaluate various options?

## 2.10 Concluding Remarks

This section began with the need for reviewing existing published material on Indian power and coal sectors together with the themes both in international scenario and the Indian context thereof. Accordingly thorough review was made as indicated above referring to all relevant published materials. Theme-wise analysis was thereafter made on Indian Law and Policy for the Power Sector, Indian Fuel Context, Indian Reform Experience and International Power Sector Reform.