INDIA – Power Sector: Emerging Developments & Critical issues

1. Introduction

Large number of power projects (XI and XII five year plans) is under construction to overcome the power shortages and meet the growing energy requirements in the country. However, the sector has been encountering problems on account of inadequate / depleting conventional fuel resources, slippages in capacity addition, transmission / open access constraints and high Aggregate Technical & Commercial (AT & C) losses in the country.

Since the formulation of Electricity Act 2003, Government of India (GoI) has been taking several initiatives and announced various regulations to strengthen the sector. Significant GoI / regulatory initiatives in recent times have been those pertaining to Mega / Ultra Mega Power Generation projects revised tariff regulations for existing central government projects, competitive bidding for all future power generation projects, tariff norms for renewable energy / introduction of Renewable Energy Certificates, new transmission pricing grid code, power market regulations, Re – structured Accelerated Power Development Reform Programme (APDRP2), National Electricity Fund, etc.

2. Projected demand, XII plan capacity additions and projected investment

- According to 17th Electric Power Survey (2007), the energy requirement in the country is projected to grow at a CAGR of 7.5% during 12th plan period reaching from 9,68,658 Giga Watt hour (Gwh) in FY 2012 to 13,92,065 Gwh by FY2017, while peak load requirement is projected to grow from 1,57,324 MW in FY2012 to 2,23,660 MW in FY 2017 at a CAGR of 7.4%. The region-wise projection in energy and peak load requirement during the period FY2012 to FY2022 is shown in Annexure II.
- Ministry of Power and Central Electricity Authority (CEA) have projected a total investment requirement of Rs. 11,35,142 crore for the power sector during the 12th Plan period, which also includes investment for generation capacity addition of about 1,00,000 MW. (Existing capacity is 1,64,508 MW)
- According to Crisil report (June 2010), about 82,000 MW of generation capacity at an investment of Rs. 5,10,000 crore is likely to be added in the next five years i.e. during FY2011 to FY2015. The Central (with NTPC having the major share), State and Private sectors are estimated to add about 21,500 MW, 15,000 MW and 45,500 MW respectively during the next five years. Further, about 12,900 MW of captive generation capacity at an investment of Rs. 75,000 crore is expected to be implemented by several players. The investments in transmission and distribution segment are projected at Rs. 3,44,000 crore during the above period.
- According to Crisil report (June 2010), out of the 82,000 MW capacity (scheduled for commissioning over the next five years), more than 90% of the projects have received environmental /forest clearances, acquired land, achieved financial closures and placed equipment orders. About 80% of the above projects have either signed PPAs or earmarked a portion of their total power for merchant sales.

3. Emerging Developments

The emerging developments in the power sector are highlighted below:

3.1 Competitive procurement of power

As per the National Tariff Policy, the procurement of power by distribution licensees have to be made through competitive bidding. From January 2011, Central / State public sector companies also are expected to compete with private sector to supply power to the distribution companies through competitive bidding. Thus, volume of power contracted through competitive base bidding {Case 1

(location, technology or fuel not specified) & Case 2 (location specific where the GoI assists developer in securing land, clearances, etc)} is likely to increase in the medium term.

3.2 Thermal projects & Supercritical technology

In the medium term, thermal power is likely to remain the major source of generation as the coal based (particularly pit head plants) /gas based projects presently have a competitive tariff advantage over renewable energy projects. Thermal based capacity of about 29,000 MW is under construction (under Eleventh Plan) and about 75,000 MW coal – based capacity and 10,000 MW gas based capacities are being planned for twelfth plan period. There is continued emphasis on technology in proximity to the coal mines (pit head plants) or at coastal regions (for imported coal) in the country to leverage on economies of scale / fuel efficiency.

About 60% of the thermal capacity planned in the twelfth plan is on Supercritical technology, which is considered to be fuel – efficient and environment friendly technology. The overall share of Thermal power in total installed generation capacity is likely to increase from 64% (FY2010) to about 74% by the end of twelfth plan. Developments in Thermal power projects are mentioned in Annexure III.

3.3 Hydro / Nuclear / Renewable energy

Amidst the growing global concerns over the green house gas emissions (world wide power sector is the largest emitter (41%) of carbon dioxide) various policy / regulatory initiatives are being taken to explore hydro – power potential as also the renewable and nuclear energy addition in the country. The developments in Hydropower, Renewable energy (wind & solar) and Nuclear power are mentioned in Annexure IV. Under Jawaharlal Nehru National Solar Mission (JNNSM), GoI has planned an addition of 20,000 MW solar power by FY2022 (1100MW of Solar power has been planned under the phase I of the JNNSM.

3.4 Transmission grid & New pricing framework

Keeping in view the evolving load flows / externalities and evolution of open access and power markets, GoI has planned for development of national grid and augmentation of interregional transfer capacity. The new transmission pricing framework for transmission network is likely to attract private sector investment in transmission segment. However, Powergrid with its massive investment plans is expected to continue its major role as a Central Transmission Utility.

3.5 Power trading / power exchange

Several players participating in competitive bid projects are planning to set aside 15 – 20% of their capacities to sell through the merchant route to profit from the spread between merchant power prices and power purchase agreement (PPA) tariffs. According to Crisil report (June 2010), by FY2015, merchant power capacities are expected to account for 5.0 – 6.0% (13,000MW) of the country's generation capacity vis – a – vis 1.0 – 1.5% (2000 – 3000 MW) in FY 2010.

Going forward, the generation of power from future capacity addition is likely to be increasingly routed through the power traders / power exchanges gradually increasing the liquidity in the bilateral / OTC / power exchange market. The share of volume of power sold in short – term market (bilateral / OTC / power exchanges) which is currently at 4.1% of the total electricity generated is likely to increase in the medium term.

3.6 Reforms in distribution

Although several States have unbundled, privatization of distribution has not happened on a larger scale, although few circles in certain States are being given to private franchisees. Distribution

segment will continue to be dominated by State distribution companies (Discoms), which however may witness increase in number of private franchisees in the country. In the medium term, few States are likely to make progress in reforms by moving towards Multi – Year Tariff (MYT), Time of Day (ToD) metering and intra – state Availability Based Tariff (ABT).

4. Critical Issues / Risk factors

In view of the emerging developments, the critical issues / risk factors pertaining to the sector are mentioned below:

4.1 Issues pertaining to thermal projects

4.1.1 Availability of power equipment / EPC players

There are constraints pertaining to availability of power equipment as also the availability of quality EPC players to cater to the requirements of increasing number of thermal power generation projects. There has been increasing dependence on Chinese equipment and manpower by private players who have witnessed problems on account of restrictions of Chinese manpower by GoI as also concerns pertaining to the quality of equipment during operations. Developments pertaining to procurement of power equipment / EPC contracts are mentioned in Annexure VI. Despite the ongoing thrust on domestic capacity addition be the domestic power equipment industry, the reliance on equipment imports is likely to continue in he medium term. Thus the development in domestic power equipment industry and availability of quality EPC players will remain crucial for the timely implementation of power projects while meeting he quality and servicing / spare part requirements.

4.1.2 Coal shortages and environmental issues

Power generation companies have been procuring coal under coal linkages / Fuel Supply Agreements with Coal India Ltd, captive mine blocks and through imports. However, domestic coal based generation plants (which account for about 72% of the total coal requirement in the country) have been experiencing coal supply constraints and have lost generation due to coal shortages on account of factors such as constrained supplies by Coal India Limited (which accounts for 85% of domestic coal supplies) and lack of progress in captive coal mining. Thus the country's dependence on coal imports has been rising in the recent past. In FY2010, the domestic coal production was 533 million tonnes(MT) and imports 70MT.

Ministry of Environment and Forest (MoEF) have recently prohibited mining in no go areas where the coal blocks have been already allotted to private power companies. According of Ministry of Power, about 55 projects amounting to 50,000 MW including two ultra mega projects (Sarguja UMPP in Chhattisgarh and Bedabahal UMPP in Orissa) have been impacted due to the above norms. The details of 'coal outlook for power sector' are mentioned in Annexure VII. Despite the domestic capacity additions planned by Coal India Ltd, the sector is expected to remain increasingly dependent on coal imports forcing several domestic players to scout for overseas fuel linkages / coal assets for assured supplies.

4.1.3 Gas supply constraints

Plant Load factor of gas based plants has improved recently on account of enhanced gas supplies from KG basin to power sector. Based on demand supply analysis, while the domestic gas supplies are projected to increase, the country is expected to remain dependent on LNG imports to meet the growing demand by end user industries. Gas prices in the future are expected to witness an upward trend due to increase in exploration costs from difficult fields in the country as also increase in the proportion of costly LNG imports. The details of 'Gas supply outlook' are mentioned in Annexure VIII. The Ministry of power has stipulated that for the 12^{th} plan period, in view of the substantial

supply constraints expected, domestic gas would be allocated to meet only 60% of the total gas requirements of all power projects. The gas for the balance capacity would have to be tied through imports or retail contracts.

4.1.4 Risk factors pertaining to competitively bid generation projects

The inherent risk profile of competitive bid projects exceed those of cost plus tariff structure. The levellised cost of competitive bid projects is essentially a function of the risks pertaining to market, technology, construction, fuel and regulatory factors faced by each option (technology / fuel) for generating electricity.

The ability of the generating companies to pass through the fluctuation in fuel prices depends on whether such fuel price fluctuations are captured by the relevant index in levellised tariff formulae as quoted during bidding vis –a – vis the escalation rates as notified by CERC from time to time.

Competitively bid IPPs using imported coal remain exposed to any adverse fluctuations in international prices of coal as back – to – back pricing terms {which IPPs have with overseas coal suppliers in line with bid assumptions} is typically not achievable during the projects long tenure. Further, there could be take or pay related risks for IPPs in case of lesser fuel offtake than the contracted commitments. Currently there is no arrangement for domestic coal linkage to import coal in case Coal India Ltd is not able to supply coal in accordance with linkages commitment and importing coal for blending becomes unavoidable. Thus risks are higher in case of Case I coal based projects.

In case fuel costs are not pass through (where the bidder quoted firm tariff for every year during the contract), the returns from the project may fluctuate considerably depending on the portion of the power being sold in the short – term market. Thus the returns would depend on the bidding strategy adopted by the IPP and the ability to keep the costs (both operating and capital) within the bid levels.

4.2 Challenges in hydro power projects

Hydro power projects are expected to face risks on account of factors such as political and environmental protests, delay / cancellation of environmental clearances, delays in land acquisition, poor infrastructure, tunneling delays, geological surprises, contractual and procurement issues, shortage of skilled man power, difficulties in evacuation of power, etc.

Hydro power projects are also increasingly becoming prone to hydrology risks. Based on recent studies, Himalayan glacier is becoming increasingly susceptible to non linear climate changes and have been melting at a faster rate in the past two decades. Reliance on past Hydrology data may not reflect the future projections, thus the hydro projects based on glacier fed rivers will be increasingly exposed to Hydrology risks. Hydro power projects also face risks on account of developments in intercontinental rivers. There have been reports about the construction of major hydro power project in the upstream Brahmaputra river in China which may impact its hydropower potential (estimated at 40% in India) and potential projects in the country.

4.3 Evacuation Issues

In recent times, there have been problems pertaining to evacuation of power in case of generation projects who are unable to identify beneficiaries / tie up transmission through Bulk Power Transmission Agreements (BPTAs) leading to uncertainty in planning / investment in transmission line augmentation (associated transmission system) by transmission utilities / licensees. Also, there have been difficulties for evacuating power in case of small – hydro / renewable energy projects which are often located in remote / difficult State Regulatory Commissions on the issue of interconnection of renewable / non firm power to the grid). There have been also issues pertaining

to transmission pricing (under earlier postage stamp method), which did not reflect network utilization and also led to pancaking of charges.
However under the new transmission pricing framework, generating companies are not required to identify beneficiaries in advance and tie up BPTAs. Further, according to the recent regulations pertaining to connectivity CERC will consider thermal generating station of 500MW and above and a hydro generating station using renewable sources of energy of capacity of 250 MW and above (except captive generative plant) for coordinated transmission planning and also will not be required to construct a dedicated transmission line to the point of connection.
Under the amended Connectivity regulations, CERC hence forth will allow interstate interconnection to hydro power generation plants above 50MW (earlier it was 250MW). The new transmission pricing framework also encourages solar power projects by allowing Zero transmission charges and losses.
Going forward, interstate transmission planning and evacuation is expected to happened in a planned / coordinated and scientific manner which, however, may witness difficulties at intra – state level due to lack of upgradation of transmission / distribution network / infrastructure in the respective states. While larges inter State projects may comfortably connect to the nearest interstate interconnection point, small and renewable energy projects who rely on respective state transmission utilities for evacuation may face difficulties due to different policies in respective States.

4.4 Intra State open access issues

Open access transaction have been primarily used by SEBs / distribution licensees to sell surpluses or to meet the short – term power requirements in their respective regions. The industrial customers still face problems pertaining to accessing their choice of suppliers due to the restrictions (such as invoking Section 11/108 of Electricity Act 2003) imposed by several state governments / SLDCs citing shortages or non – availability of transmission infrastructure. According to Central Electricity Regulatory Commission (CERC), upto May 2010, applications seeking open for over 18000 MW have been submitted, but implementation has been quite low at about 2,000 MW (mainly for captive power).
While the inter State open access market has progressed due to regulatory initiatives taken by CERC, (on going development of national grid by Power Grid (although congestion is currently taking place during peak times) and support from NLDC / RLDCs), the intra state open access is facing constraints on account of delays in implementation of Intra – State ABT by several states. The sources of concern for implementation of Intra State ABT are assessment / augmentation of intra – state transfer capability, advanced infrastructure at State Load Despatch Centre (SLDC), real time communication and special metering at consumer level. The progress of reforms at state level, with less intervention by respective State government, will continue to remain crucial for penetration of such transactions across the States, to facilitate the development of full – fledged short term market.

4.5 Issues pertaining to trading based merchant sales

While the developments in inter state open access, inter state transmission corridors and connectivity / medium term open access is likely to facilitate the growth of merchant power sales, the constraints pertaining to intra state open access and transmission / distribution network at state level are expected to remain critical. While the major portion of merchant sales will continue to be routed through bilateral / OTC trading, the portion, sold in the power exchanges may be vulnerable to regulatory intervention in terms of putting cap on the prices.

Short term transaction through power exchanges have faced problems on account of congestion. During FY2009, while the unconstrained cleared volume on the two power exchanges was of the order of 6.78 billion Kwh, the actual volume transacted was about 5.79 billion Kwh indicating that the actual transacted volume could have been 17% higher, had there been on congestion in the system. Merchant power transacted through medium / short open access are vulnerable to the availability of transmission corridors by relying on the margins available, after accounting for long term open access transactions (which are given priority) during the transmission corridor allocation. However, the new transmission pricing framework (Planning as per network utilization and avoiding pancaking of charges0, may facilitate efficient planning of transmission corridors leading to larges infusion of merchant capacity into the grid, promote integration of electricity markets and enhance open access.

On account of projected increase in merchant capacity and narrowing peak deficit, the premium (which the merchant power currently commands over the long – term PPA power) may be limited in the future. According to Crisil the merchant power prices are projected to decline from Rs. 5.9 per unit in FY 2010 to Rs. 3.5 – 3.8 per unit by FY 2015. However, the rising cost of supply (on account of projected escalation in fuel prices) is expected to act as a floor for merchant power prices.

4.6 Concerns pertaining to distribution

AT & C losses are likely to remain a source of concern for the State sector distribution companies, thus leading to continued dependence on subsidies / grant from the respective state governments, as also resulting in frequent hikes in retail tariffs. Financial health of State DISCOMs will continue to remain fragile with continued reliance on growing subsidies and likely shift of lucrative consumers through open access.

Thirteenth Finance Commission (TFC) has in its recommendation to the GoI, Pointed out that even better performing states need a minimum of 7% increase in tariff on an annual basis (at 2007-08 subsidy levels), to bridge the gap between actual receipts and government subsidy. TFC has pointed out that requirement to hike the tariff in poorly performing state could be as high as 19% per annum which could be difficult to achieve. TFC, in its projection has pointed out that net losses of state transmission and distribution utilities are expected to rise from Rs. 68, 643 crore in FY 2011 to Rs. 1,16,089 crore in 2014-15 if immediate steps are not taken to reform the utilities.

Private discoms are likely to face risks pertaining to regulatory uncertainties and intervention by State Governments, autonomy of SLDCs, competition on account of provision of multiple licences and open access, etc.

5. Assessment

5.1 Despite the efforts being made to ramp up the generation capacity, the country may witness slippages in capacity addition on account of various emerging challenges leading to continued deficit scenario in the medium term (according to estimates by CEA / ICRA, the peak and energy deficit are projected to the 12% and 6% respectively by the end of Twelfth Plan period, while Crisil has projected a reduction in peak deficit to a level of 4% by FY2015.

5.2 While the importance of renewable energy projects is expected to increase, minimization of AT & C losses and effective demand management will remain critical for sustainable growth of the sector. While the externalities and constraints in transmission / distribution components particularly at State level would continue to persist, the ongoing regulatory developments would create an hybrid power market (comprising of long term contracted power and short term market) in the medium term.

India – Power Sector Present status and recent government / regulatory announcements

A) Present status:

Installed capacity

As on August 31, 2010 the installed generation capacity in the country constituted 1,64,508 MW, of which thermal capacity (coal, gas & diesel) is 1,06,432 MW followed by hydel capacity at 37,086 MW, renewable energy (wind, small hydro, solar, bio mass, etc) at 16,429 MW and nuclear energy at 4,560 MW. In addition to the total installed capacity as mentioned above, the captive generating capacity to the grid is 19,509 MW. The share of Central, State and private sector in the total installed capacity is 31%, 49% and 20% respectively.

Demand – supply gap

The domestic energy requirement for the financial year 2010 was 8,30,594 million units (mkwh) while the energy generated was only 7,46,644 million units (mkwh) creating a gap of 83950 million units (mkwh). During FY 2010 overall energy deficit in the country was 10.1% while peak deficit stood at 12.7% with shortage of 15,157 MW. During the period April – July 2010, the domestic energy requirement and availability were 2,91,214 MU and 2,58,972 MU respectively leading to energy deficit of 11.1% while the peak deficit stood at – 13.8%.

Slippages under XI plan

According to CEA, the capacity slippages in the 11^{th} Plan projects have been attributed to various physical and financial factors such as delays in land acquisition and creation of infrastructure facilities, delays in placement of orders mainly civil works and balance of plants (Bop), delay and non sequential supply of material for the main plant and Bop, Shortage of skilled manpower for crestion and commissioning, contractual disputes, inadequate deployment of construction machinery, shortage of fuel (gas & nuclear) and difficulties in financial closure.

According to Ministry of Power and CEA, finance to the power sector has been constrained due to several factors such as bank credit being subject to sectoral and group exposure limits and prudential norms of the term lending institutions, insistence on PPAs by lenders, poor financial health of state sector utilities etc.

As per planning commission, the actual generation capacity at the end of 11^{th} Plan is expected to be about 55,000 MW as against the capacity target of 78,700 MW.

Transmission grid / constraints

As on June 30, 2009, the transmission network in the country was comprised of 3187 circuit kilometer in 750 KV segment, 91359 ckm in 400 KV segment, and 124201 ckm in 220 kv segment. The capacity of substation / transformers installed as on June 30. 2009 in 420 kv segment is 111517 mega volt amper (MVA) and 1,80,450 MVA in 220 kv segment. The ownership of the grid is predominantly with Power Grid Corporation Ltd. (PGCIL) and State Transcos / SEBs. PGCIL operates around 74000 circuit km of High Tension transmission lines and 124 substations. Currently, the interregional transmission capacity is about 21000 MW, which connects northern, western, eastern and north – eastern regions in a synchronous mode operating at the same frequency and the southern region asynchronously.

The transmission grid is presently experiencing problems on account of insufficient interregional transfer capacity which is hampering the increasing volume of traded power as also encountering problems pertaining to increasing short circuits levels, operational voltage excursions due to fluctuating reactive balance and grid stability.

System operations / Grid Management

Power Grid Corporation of India, the country's large electricity transmission utility, has formed a wholly owned subsidiary company, Power system Operation Corporation Ltd for carrying out independent power system operations. National Load Dispatch Centre is linked with the 5 Regional Load Dispatch Centers (RLDCs), which in turn and connected to 31 State Load Dispatch Centers to facilitate optimum scheduling and dispatch of electricity across Regional boundaries, thus ensuring equitable utilization of surplus power countrywide while ensuring economy, efficiency, stability and security of the National Grid.

Distribution reforms / performance

The Ministry of Power had signed the MoUs with the states in the past to undertake timebound distribution reforms. As on FY 2009, 16SEBs / Electricity Departments have been unbundled and corporatized, and 23 SERCs have issued open access non discriminatory provision for use of transmission lines and distribution system by companies engaged in generation or users of power regulations. Consumer Grievances Redressal Forums and Ombudsmen have been constituted / appointed in 22 states. All the have securitized their outstanding dues towards Central Public Utilities. Electricity Distribution has been privatized in Delhi and Orissa. At national level 98% feeders and 88% of the consumer have been metered so far. 100% feeder metering have been achieved in 20 state. Separation of agriculture feeders constituted independent regulatory commissions and 23 SERCs have issued tariff orders for rationalizing tariffs.

The overall distribution loss levels, while remaining high in absolute terms, have shown improvement on account of improvement in the areas of energy audit, system strengthening, rural load management, and prevention of theft. Few States have witnessed improved financial performance and cash flows on account of gains accruing from trading in power and UI charges.

However, there has been a sharp rise in the subsidy dependence of distribution utilities and SEBs in many of the States.

Power trading / exchanges

The power market is dominated by long term contracted power. However, there has been gradual built up in the volume of short term transactions (bilateral contracts and deals through traders spanning less than one year as well as transaction taking place on the power exchanges).

The volume of electricity transacted during 2009 was 30.60 Billion Units which constitute 3.08% of total electricity generation in the country. Of which, power traded through inter state licensees was 24.8 Bus and volume of electricity transacted through power exchange was 5.07 Bus and 0.72 Bus in Indian Energy Exchange and Power Exchanges of India respectively. The weighted average price of electricity transacted through trading licensees during the above period and PXs was Rs. 6.41/kwh and Rs. 5.73/kwh respectively.

B) Recent Government initiatives

R – APDRP

GOI has approved the "Re – structured Accelerated Power Development Reform Programme" for XI plan as a Central Sector Scheme Projects under the scheme shall be taken up in Two Parts. Part A shall include the projects for establishment of baseline data of IT applications for energy accounting auditing & IT based consumer service centers. Part B shall include regular distribution strengthening projects. The focus of the programme is on actual, demonstrable performance in terms of AT & C loss reduction.

National Electricity Fund

The Planning commission has proposed setting up a National Electricity Fund with a corpus of Rs. 100000 – 150000 crore with State run power Finance Corporation and Rural Electrification Corporation would be the nodal agencies to finance development of power transmission and distribution network by state utilities so as to reduce T & D losses. The proposed fund aims lines and using new technology to reduce transmission and distribution losses to 15% by FY 2012

Clean Energy Fund

GoI has announce setting up of clean energy fund by imposing tax to Rs. 50 per tone of coal and using it for funding renewable energy projects.

C) Policy framework and recent regulatory announcements.

The broad regulatory / policy framework of the power sector is contained in Electricity Act 2003 (and also in National Electricity Policy 2005 and the National Tariff Policy 2006 as required by the Act), which inert alia comprises regulations / policies such as provision / planning of electricity and network, shift from the single buyer model to the multi – buyer model; delicensing of thermal generation; harnessing captive generation / renewable energy resources, grant of open access in transmission and distribution; identification of trading as a distinct activity; reorganization of the SEBs; supply of subsidized electricity only on timely payment by the State Government concerned; performance based cost of service regulation, competitive procurement of power, Merit order dispatch / Availability based Tariff, Multi Year Tariff framework, transmission pricing framework, tariff rationalization through the phased reduction and elimination of cross – subsidies, trading margin, etc. Electricity Act 2003 was later amended in the year 2007, which primarily omitted the clause ; 'elimination of cross subsidies' while retaining the provision for reduction of cross subsidies.

Recent regulatory development are highlighted below:

a) Changes in Mega Power Policy

GoI has amended the Mega Power Policy (as applicable to power projects more than 1000 MW (thermal) & 500MW (hydel)). Main features includes, extension of customs duty / tax benefits to expansion projects/ relaxation in terms of power supply to more than one State, relaxation on procurement of power equipment through international competitive bidding, extension of benefits to supercritical technology, etc.

B) New tariff regulations for generation & transmission projects for next five years (2009-14)

The Central Electricity Regulatory Commission (CERC) issued new tariff regulation for existing cost plus tariff central sector generation & transmission projects (and the projects which will be commissioned by Jan, 2011) which will be applicable for next five years. These regulations, inter alia, include raising of base rate of return on equity for central sector projects, revision / rationalization of various financial and operational norms / factors / parameters pertaining to tariff computation,

incentivize peaking load generation & protection of hydrological risk in case of hydro power projects, etc. The new regulation will also be the guiding principles for the State Electricity Regulatory commissions in arriving at tariffs for their respective state generation / transmission companies / projects.

C) Competitive procurement of power for all new power projects

The existing public & state generating companies & Hydropower projects have been exempted to supply power to the distribution utilities through competitive route till January 2011. Thereafter, all the generating companies need to compete through competitive tariff bidding route to supply power to the distribution licensees. Central Public Sector Undertakings which will be impacted are NHPC, Sutlej Jal Vidyut Nigam Ltd., NTPC Ltd., Tehri Hydro Development Corporation, and North East Power Corporation. However, the existing Independent Power Producers, planning one time capacity addition upto 50% will be governed by the prevalent Power Purchase Agreements and terms and conditions of respective regulatory commissions (CERCs/SERCs).

D) Amendments to competitive bidding tariff guidelines

Ministry of power has recently amended the guidelines for tariff determination for procurement of power by distribution licensees through competitive bidding. The amended guidelines aim to attract serious players, to bring about greater efficiency and transparency in the tariff determination process and also promote development of power market.

E) Tariff regulations for renewable energy

CERC has notified the tariff regulations for electricity generated from renewable energy sources Wind, Small Hydro, Biomass, Co generation, Solar PV and Solar Thermal. These regulations include specifying capital cost norms and fixing tariff upfront for the whole tariff period for the above renewable sources.

F) Introduction of Renewable Energy Certificate (REC)

Central Electricity Regulatory Commission (CERC) has notified Regulation on Renewable Energy Certificate (REC) to promote renewable energy generation and overcome geographical constraints. As per the REC mechanism, there will be a central level agency to be designated by the Central Commission for registration of Re Generators participating in the scheme. The RE generators will have two options – either a) to sell the renewable energy at preferential tariff fixed by the concerned Electricity Regulatory Commission or b) to sell the electricity generation at average cost of power supply and environmental attributes associated with RE generation separately. On choosing the second option, the environmental attributes can be exchanged in the form of REC. Price of electricity component would be equivalent to weighted average power purchase cost of the distribution company including short term power purchase but excluding renewable power purchase cost. The Central Agency will issue the REC to RE generators. The value of REC will equivalent to 1 MWh of electricity injected into the grid from renewable energy sources. The REC will be exchanged only in the power exchanges approved by CERC within the band of a floor price and a forbearance price to be determined by CERC from time to time. The distribution companies, Open Access Consumer, Captive Power Plants will have option of purchase Obligations. Pertinently, renewable purchase obligation is the obligation mandated by the State Electricity Regulatory Commission under the Act, to purchase minimum level of renewable energy out of the total consumption in the area of a distribution licensee.

G) GBIs for wind projects

GOI has extended the Generation based incentive scheme for grid connected wind energy projects to maximum capacity limit of 4000 MW, wherein an incentive of Rs. 0.5 per unit above the fee in tariff is provided.

H) Grant of Connectivity long term and Medium term open access in inter state transmission, 2009 (amendment Sep 2010)

The above regulations provide for procedures and requirements for obtaining connectivity to interstate transmission system, availing medium term open access and availing long term access. Any generating plant having installed capacity of atleast 250 MW (50MW is case of Hydro) and any bulk consumer can seek connectivity to interstate transmission system. Medium term open access would be available for any period between three months to three years and it shall be provided on the basis of availability of transmission capacity in the existing transmission system. No augmentation of transmission system is envisaged for granting medium term open access. Long term access can be availed for any period between 12 years to 25 years and might require construction of new transmission capacities.

I) New transmission tariff mechanism

In accordance with the Electricity Act 2003, National Electricity Policy 2005 and National Tariff Policy 2006, CERC recently notified regulation pertaining to sharing of interstate charges and losses that is sensitive to distance, direction and quantum of flow. These regulations would implement point of connection method of sharing the cost of inter state transmission services as well losses among the users in India, replacing the present system of regional postage stamps.

J) Amendment to Inter State open access regulations

CERC has amended the inter state open access regulations in a bid to streamline and rationalize the processes involved in obtaining open access which is likely to benefit power deficit states, consumers as well as trading companies.

K) Medium term open access norms

CERC has notified medium term (between 3 months and 3 years) open access regulations' and norms to provide a "non discriminatory arrangement of transmission", irrespective of ownership of the power plant. Power producers with capacity of at least 250 MW are now allowed to transfer power beyond their state limits through contract for three to 25 years as well as bulk consumers with at least 100 MW load can choose to connect to interstate transmission system under the new norms.

L) Restructuring of Unscheduled Interchange Mechanism

CERC has come out with new regulations restructuring the UI mechanism to avoid UI as a trading route and promulgate discipline among distribution utilities to go for planned procurement of electricity and thereby creating environment for investors to set up new power plants. Presently, may utilities postpone setting up of power projects and rely on overdrawal from the grid for meeting the consumers demand.

M) Congestion Charge regulations

CERC has notified the 'Application of Congestion Charges Regulations 2009" which will be imposed on the regional entities in addition to UI charges.

N) Grid code regulations 2010

CERC has revised grid code which inter alia include the following revisions / additions; a) the financial burden of all the fluctuations from schedule in case of new solar energy plants and the fluctuations within 30% of schedule in case of new wind energy plants will be borne by allthe users of inter state grid. B) The new grid code will also put in place a scheduling mechanism for renewable energy like solar and wind. It will enable the power plants to operate on “must run” principles, instead of “merit scheduling”, and also sell power to inter state regions c) maintain grid frequency within a range of 49.2 – 50.2 Hz and send out warning signal at 49.7 Hz and in case of violations to impose penalty and curb overdrawals by distribution companies. C) new concepts such as controlled area and increase of reactive charges to deter distribution companies from overdrawing from grid.

O) Ring fencing of SLDCs

CERC has advised the Centre to take up with the states, the separation of management and controlling interests between entities operating SLDCs and the entities engaged in distribution / trading activities to have a non discriminatory open access. CERC is also planning towards structuring a reporting channel of the SLDCs for implementation and monitoring of open access in respective states.

P) New Interstate Trading regulations

CERC has issued new Inter State Trading Regulations 2009. The new Trading regulations aim to tighten the term & conditions for grant of trading licence keeping in view current price of the trading power, liquidity requirements of the power trading business and to encourage the only serious players intending to undertake trading business. Power, having been imported from other countries fro resale in the domestic market is also covered under these regulations. As on FY 2009, CERC had issued trading licences to 42 companies such as Tata Power, Reliance Energy, RPG Power, GMR Energy and DLF Power, etc.

Q) CERC allows term ahead contracts

CERC has allowed the power exchange to launch term ahead contracts, which are likely to permit sale of energy over a longer period and thus facilitate better planning procurement and laod management of power by distribution utilities / consumers.

R) Power Market regulations

CERC has initiated power market regulations covering interstate electricity transactions in various contracts, including bilateral and transacted through traders and exchanges with the objective of transforming the role of power exchange from acting as price signal for investments to the dual role of providing price signal as well as acting as risk transfer platform. The regulations inter alia comprise introducing concept of derivatives contracts, financial settled exchange traded derivatives and other innovative contracts like capacity and ancillary services contracts. However, derivatives would be introduced from a date to be notified when the supply deficit scenario improves and sufficient liquidity gathers in day ahead market.

S) Price cap on traded power & fixing of trading margins

CERC has imposed a cap a Rs 8 / unit on the price of power traded bilaterally and at the two power exchanges to control the escalating price of power traded in the domestic market. However the price cap is for 45 days (which was to end mid October 2009). CERC has issued regulations for fixing of trading margins for interstate trading of power.

T) Third power exchange in the country

Central Electricity Regulatory Commission has given its approval to set up third power exchange in the country which will be owned by National Thermal Power Corporation, National Hydro Power Corporation, Power Finance Corporation, and Tata Consultancy Services.

Developments in Hydropower, renewable energy and nuclear projects

Hydro power projects

As on FY 2009, there were 40 hydro power projects with an aggregate capacity of 13,085 MW under construction. Hydro Power projects have been facing difficulties on account of factors such as difficult and inaccessible potential sites, difficulties in land acquisition, rehabilitation issues, environmental and forest – related issues, inter – state issues, geological surprises and long gestation period. 84 schemes with an installed capacity of 22,383 MW have been allotted to private developers by states.

There were 11 schemes with an installed capacity of 4,111 MW under construction in private sector. As on FY 2009, out of the 162 projects for which preliminary feasibility reports were prepared under the 50,000 MW Hydro Electric initiative, 77 schemes 33,951MW have been taken up for detailed survey & investigation and preparation of detailed project reports implementation of which DPRs for 18 schemes have been completed.

Central Electricity Authority has identified about 31,000 MW capacity under Twelfth Plan. Of this about 25,316MW is considered feasible.

Renewable Energy

GoI has envisaged National Action Plan on Climate Change, which envisages increase in usage of green energy with an aim to minimize the carbon footprint in the country as also provide electrification through distributed generation to remote areas. NAPCC has stipulated that minimum renewable purchase standards may be set at 5% of the local power purchase in 2010 an dtherafter should increase by 1% each year for 10 years. Regulatory commissions in the country are also emphasizing the procurement of renewable energy by Distribution companies as stipulated by the Renewable Purchase Obligations.

GoI has set target of 14,000 MW for renewable energy during Eleventh Plan period, of which only 60% capacity addition is likely to be achieved.

Potential for wind power is estimated in the range of 50,000 MW to 1,00,000 MW in the country. Wind energy has been the main contributing force which has witnessed increase in level of indigenization in the manufacturing of wind generators and increasing trend towards state of the art technologies such as use of lighter and large blades in turbines, more aerodynamic design, higher towers and direct drive and variable speed gearless operation using advance power electronics.

GoI is also encouraging the addition of solar power under Jawaharlal Nehru National Solar Mission, where in 20,000 MW of solar power have been planned in three phases upto the 13th Five Year Plan (i.e. FY 2022). Under the first phase (up to March 2013) of the mission, upto 1,100 MW grid – connected solar power plants have been targeted. Under the Mission, NTPC, Vidyut Vyapar Nigam Ltd. is designated as the nodal agency to procure solar power from PV the thermal project developers at a tariff by the Central Electricity Regulatory Commission.

Nuclear Power

India has signed 123 agreement (Concerning peaceful uses of Nuclear Energy) with the United States in October 2008, paving the way for development of civilian nuclear energy in the country. The ban on nuclear fuel imports into the country has also been lifted by the Nuclear suppliers group thus enabling the country to procure nuclear reactors / equipment as well as nuclear fuel. The integrated

energy policy has envisaged a possibility of reaching a nuclear power capacity of 21000 – 29000 MW by 2020, and 48000 – 63000 MW by 2030, through a mix of indigenous Pressurized Heavy Water Reactors, Fast Breeder Reactors, and Light Water Reactors which however is continent on availability / import of fuel / reactors through international cooperation as also on the evolving nuclear policy / regulatory framework and issues pertaining to nuclear liability / legal and institutional framework.

Developments in Transmission

Power evacuation has been a critical issue on account of factors such as a) development / augmentation of transmission system to cater to the long term requirements of large number of upcoming inter – state private sector generation projects as also need to harness renewable energy / non – firm power into the grid, b) requirements of maintaining the redundancies and reliability of interconnected network (as per the grid code) with increasing complexity and c) requirements to cater to the increasing volume of short – term / open access transactions.

GoI is planning to develop National Inter State transmission Grid with interregional transfer capacity of 37,700MW at an investment of Rs. 55,000 crore by FY 2012. The power grid of the future is expected to be more intelligent, effective and environmentally sensitive comprising of several elements such as Ultra High Voltage / HVDC (765KV ac, 800KV HVDC and 1200 KV AC) lines, flexible alternating current transmission system (FACTS), dynamic control systems, wide area monitoring system and distribution network management.

Power Grid Corporation of India Ltd is planning an additional investment of Rs. 80,000 crore over the next eight years to build transmission corridors and strengthen the grid in the country. PGCIL is planning to complete nine transmission corridors over next five years to evacuate 50,000 MW of upcoming projects by IPPs in various States. PGCIL is also exploring to set up transmission project to evacuate power from neighboring countries such as Myanmer, Banglahesh, Nepal, Bhutan and Sri Lanka. Seven transmission projects with investment of Rs. 5000 crore have been planned during Eleventh Plan period, while 14 other (Ultra Mega Transmission Projects) at an investment of Rs. 20,000 crore have been identified by the empowered committee on transmission that are to be awarded through tariff based competitive bidding to the private sector.

CERC has recently notified regulations on sharing of inter – state transmission charges and losses which have replaced the 'Regional Postage Stamp' method by 'Point of Connection(PoC)' system. Under the regional transmission on a pooled basis in the ratio of quantum of power drawn through the inter – state transmission system. A state in the southern region buying power from a state in the eastern region have to pay for the pooled transmission charges and losses of both eastern and southern regions leading to pancaking of charges.

Under PoC, transmission charges will be locationally differentiated the generators will have to take a view both on transmission costs of electricity and transportation costs of fuel. With many new independent power producers (IPPs) expected to come up in the near future and bulk consumers being allowed to buy power through open access from anywhere in India, even across regions, the change seems relevant.

Under the new transmission – pricing framework, all the power users will be default signatories to the transmission service agreement, requiring these users to pay the point of connection charge, which covers the revenue of transmission licensees. This commercial arrangement is expected to help financial closure of various transmission investment, as the transmission licensees will no longer be faced with the uncertainty in power generation project and the difficulties in getting the bulk power transmission agreements (BPTA) signed by all the expected beneficiaries of the transmission system.

Under the new system, the entire network is divided into various nodes based on geographical continuity, electrical contiguity and major consumption areas and major generation areas (load centers). Under the new mechanism, both the generator (who till now has been exempted) and load serving entity need to pay transmission charges and losses based on their location / connection level in the network (defined by node / zone comprising network of nodes) and the corresponding network usage chares as per the load flow studies conducted for each node one at a time. Thus the location of generating company will impact its share during the allocation of transmission charges and losses as computed in the respective network node / zone. The new pricing system is also likely to facilitate the development of competitive market by enabling interregional Case I bids to overcome distortions pertaining to pancaking of transmission charges, rationalize long – term, medium term and short term open access charges and encourage solar power projects (by allowing Zero transmission charges and losses) and merchant power plants.

Development in procurement of Power equipment / EPC contracts

There has been increasing reliance on the imports of Chinese equipment for the ongoing power projects. About 30,000 MW of capacity (of which 10,000 MW are planned for twelfth plan projects) has been ordered with Chinese equipment companies. Several companies have also been awarding Engineering, procurement and construction (EPC) contracts to Chinese companies. While there have been issues pertaining to design and technical parameters (such as improper design, ability to run on domestic / low calorific value and high ash content coal, boiler tube failures, water leakage, etc) with Chinese equipment, several domestic companies have had a satisfactory experience with Chinese equipment. Thus as the lifetime costs of main plant equipment are influenced by operation and maintenance costs, availability of spare parts and technical support, the long run cost – to performance will remain critical for the companies relying on Chinese equipment.

GoI has recently imposed restrictions on Chinese workface which however has been recently relaxed. GoI has also directed the Central and State sector generation players to source supercritical equipment from domestic companies. GoI is also contemplating to impose duty on power equipment imports. While the domestic companies (BHEL, L&T, etc) who are currently running full order books are augmenting their capacities, several joint ventures (L&T and Mitsubishi Heavy Industries, JSW Group and Toshiba Corporation, Bharat Forge Ltd. and Alstom, etc) have come in to power equipment market to cater to the increasing demand for BTG and other equipment.

It is estimated the to fulfill the demand for power by different sectors, domestic power equipment manufacturing capacity of about 40,000 MW needs to be created every year till FY2017.

Restrictions on Chinese workforce may compel the domestic players to restrict the contracts to boiler turbine and generator (BTG) only rather than the manpower intensive EPC contracts. Thus, the availability of quality EPC players assumes significance for the increasing requirements of power projects in the country.

Coal supply outlook

India has Coal resources of about 267 billion tonnes of which proven reserves are about 106 billion tonnes. Recent initiatives / plans in domestic coal sector such as competitive bidding of coal, improvised / underground mining efforts, New Coal Distribution (NCDP), revision in coal prices, fuel supply agreements with power utilities, pricing of coal based on Gross calorific Value rather than Useful Heat Value, creation of coal regulator, etc might give a fillip to the domestic coal production (by Coal India Ltd.).

As on March 31, 2009, 201 coal blocks with geographical reserves of coal of 45.89 billion tonnes have been allocated to eligible companies. Of the 201 blocks, 3 blocks have been de – allocated and mining lease of one block has been declared void. Out of remaining 197 blocks with reserves of

27.59 Billion tonnes have been allocated to PSUs. Out of the 100 blocks allocated to private companies with geographical reserves of 17.93 Billion tonnes production has commenced in 23 blocks.

According in industry sources, in FY2011, domestic production of coal is projected at 572 million tonnes(mt) (6.8 % increase compared to previous fiscal) and imports are projected to reach 84 million tonnes (21% increase from previous fiscal).

While Coal India Ltd, the major producer of domestic coal is aggressively planning to increase its production and also acquire overseas coal assets, the overall demand is unlikely to be met from the domestic supplies alone in the medium to long term. Power sector consumes about 72% of the total consumption of coal in the country. Domestic consumption of coal by power sector is projected at 442 million tonnes in FY2011, while the domestic availability is projected at 389 million tonnes. Thus, the domestic demand supply gap of coal for the power sector is projected to be about 53 million tonnes FY2011. After factoring Gross Calorific value, the projected imports are estimated at 35 million tonnes in FY2011. The domestic coal demand supply gap for power sector is projected to increase to about 120 million tonnes by FY2013.

According to industry sources, Coal requirements for the power sector is projected to reach to about 800 mt by FY 2017 and increase to 1070MT by FY2022. However, domestic coal supply is projected to increase to 554 Mt by FY 2017 and 756MT by FY2022. Total Coal imports are projected to reach about 200 million tonnes by FY2017.

NTPC the largest power company in the country plans to raise its existing 32,000 MW capacity to 51,000 MW by 2012 and 75,000 MW by 2017. It is estimated that NTPC (currently 80% of capacity is coal based) which has consumed 150 Mt during Fy2010 would be requiring about 280 MT of coal annually by the end of the 12^{th} plan period (2017). Around 70% NTPC coal requirement by the end of 12^{th} plan period is expected to be met from domestic sources, while another 20% through its mines and the remaining 10% through imports.

There have been also issues pertaining to the coal imports such as steep escalation in international coal prices and proposal by Indonesia to impose a cap on their exports. With the sudden emergence of China as a major buyer of thermal coal, global coal prices had also witnessed sharp escalation till FY 2008, which moderated subsequently. However the international sport prices have been witnessing upturn and is projected to be firm in the long term.

In Jan 2010, GoI has made allocations for IPPs (which are feasible for commissioning in Eleventh plan period). GOI have recently issued notice to cancel the coal blocks allocations where the respective players have failed to develop the same considering the shortage scenario of coal. GoI has prioritized coal linkages during Twelfth plan period based on Sector and technology. GoI is also planning to stop allocating domestic coal linkages to UMPPs which henceforth have to fully rely on imported coal and directed the domestic players to have the technical capability to process blended coal by importing upto 20% of their coal requirements.

Several players are also scouting for acquisition of overseas coal assets. Recently companies such as Reliance Power, JSW Energy, Essar, NTPC and Tata Power have bought overseas coal mines.

Gas Supply outlook

In Fy 2010, the overall demand for natural gas (from sectors viz., Power, Fertilisers, Petrochemicals, Spongeiron / Steel, City Gas Distribution, CNG, etc.) in the country is 190 mmscmd against overall suppliers (from Administered Price Mechanism (APM) gas, Joint Venture (JV) gas, natural gas supplies by private under National Exploration and Licensing Policy (NELP) and Regasified Liquefied Natural Gas (RLNG) of 175 mmscmd witnessing a shortage scenario to the extent of 15 mmscmd.

At present, the total allocation of domestic gas to the power sector stands at 79 mmscmd. Gas based power plants have operated at 67.3% Plant Load Factor (PLF) in FY 2010, which is an

improvement over 57.6% in FY09, on account of increase in allocation of gas supplies from KG basin to power sector. Potentially, gas power plants can operate at 90% PLF and thus have a potential shortfall of about 19 mmscmd. At the end of eleventh Plan period, projected shortfall in gas supplies are 35 mmscmd @90% PLF) /14 mmscmd @70%PLF). About 90 mmscmd of additional supplies are projected to need the requirements (at 70% PLF) of planned capacity during 12th plan period. The development in national grid is likely to facilities the continuity in supplies to the power plants and facilitate setting up of power plants closer to the load centers.

While the Reliance has begun gas production from KG basin, the gas supplies from recent discoveries of ONGC and GSPC is likely to partially materialize by FY2017. Overall gas supplies by Reliance, ONGC and GSPC are likely to be in the range of 50 to 70 mmscmd by FY2017. By FY2017, overall demand is projected to increase at CAGR of 9% to 350 mmscmd (including LNG imports of about 100 mmscmd). Thus the projected gas shortage is about 50 mmscmd by the end to twelfth plan period (i.e. by FY2017).

The country's dependence on LNG imports is likely to increase in the medium term. The proposed gas pooling pricing framework may facilitate introduction of substantial quantities of new LNG supplies while managing price volatility (e.g. by introducing 5MTPA of LNG at $6 per mmBtu, the pooled price along with the existing 185mmscmd of gas (54.3 mmscmd of ONGC&OIL at $1.79 per mmBtu, 18.6 mmscmd gas of PMT / Ravva gas at $5.35 per mmbtu, 90 mmscmd from KGD 6 gas at $4.4 per mmbtu and 22mmscmd term LNG gas at $5.42 per mmbtu) workds out to b $4.02 per mmbtu).

In view for the gas shortages expected, Ministry of power has recently (Sep. 2010) recommended following criteria for allocation of gas fro gas based power projects planned during 12th Plan period.

- Break up of gas allocation:
  - i) CPSUs / SPSUs / Case II bidding projects / Government of India initiative (SEZ and DMICDC to get 50% of the available domestic gas with the following breakup:-
    40% for CPSUs/SPSUs/ Case II bidding projects.
    4% for SEZ
    4% for DMICDC
  - Ii) remaining 505 of available domestic gas with the following break up:-
    40% for IPPs
    5% for peaking / CCHP stations
    5% for CPPs
- Priority for projects in state which does not have coal resources and is facing acute power shortage. Projects at coastal locations using Sea Water instead of fresh Water or air cooled condenser
- In addition, the power ministry has asserted that supplies can begin only after the developer has executed power purchase agreements (PPA) corresponding to at least 85% of the 60% of the total project capacity.
- The duration of such PPAs will need to be fro at least 5 years corresponding to the periodicity of the relevant Gas Sale and Purchase Agreements (GSPA), which are also normally executed for 5 year period. PPAs would be co – terminus with the GSPAs, if reviewed and renewed in the future.