Can India’s Power Sector Keep the Lights On?

The long-term prospects of the Indian power sector, despite uncertainty over the past few years, remain strong. The next 10 years will likely redefine the industry.
After nearly a decade of rapid growth marked by reform and investment, India’s power sector has reached a new period of skepticism. Long-standing concerns about fuel availability, the financial health of state-owned distribution companies (discoms), and land and environmental issues have bubbled back up to the surface. Meanwhile, rising costs could threaten the viability of new projects (see sidebar: India’s Power Industry Phases).

Regulatory controls over prices, production, and allocation of fuel are leaving a mark on the energy sector.

However, the Indian power sector still holds much promise for its stakeholders. Despite a gloomy short-term picture, the medium to long-term outlook appears to be much more optimistic.

This paper examines four trends that will shape the evolution of the Indian power sector over the next decade. We discuss how they will fundamentally change the industry structure and redefine the balance of power.

Trend 1: Reforms in the Fuel Sector

**Conventional wisdom:** India will continue to operate in a subsidized energy regime with government controls on the supply side.

**Challenging thought:** Substantial fuel-side reforms will be undertaken, resulting in market forces determining the industry dynamics.

India’s energy portfolio is dominated by fossil fuels (coal, gas, and oil), which have long had availability problems. Rapid economic growth only exacerbated this. Supply continues to struggle to keep pace with demand because of productivity problems, logistics, a lack of accessible reserves, and environmental concerns.
Regulatory controls over prices, production, and allocation of fuel are also leaving a mark on the energy sector, distorting market mechanisms and dissuading significant progress. Almost half of India’s energy consumption is subsidized—including power, transportation, and process heat requirements (see figure 1). This includes subsidies for liquefied petroleum gas (LPG) and diesel, piped natural gas and compressed natural gas that are subsidized by the administered price mechanism (APM), and the cross subsidization of agricultural and domestic power segments by industrial and commercial segments.

However, as fuel shortfalls and subsidies become untenable, policy makers will have to launch reforms. These include market-driven pricing, fuel supplies based on market dynamics rather than government mandate (although broad guidelines would likely continue to exist), accelerating coal and gas development, and separating the roles of producer, regulator, and policy maker to bring better governance.

These reforms, properly executed, will have a significant impact on economics, business models, and technologies in the following ways.

**Fuel costs will increase.** Fuel deregulation would raise costs closer to global prices—possibly between 50 and 75 percent higher, especially in coal. This in turn would put pressure on generators to pass the cost increase on to distribution companies and customers. Fuel cost increases could put significant pressures on margins.

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**Figure 1**

**Much of India’s energy consumption is subsidized**

**Total energy consumption in India, 2010**

(million tons of oil equivalent)  

<table>
<thead>
<tr>
<th>Source</th>
<th>Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other liquid fuels</td>
<td>Process heat</td>
<td>20%</td>
</tr>
<tr>
<td>Piped natural gas</td>
<td>Process heat</td>
<td>15%</td>
</tr>
<tr>
<td>Kerosene</td>
<td>Process heat</td>
<td>10%</td>
</tr>
<tr>
<td>Household liquefied petroleum gas</td>
<td>Process heat</td>
<td>6%</td>
</tr>
<tr>
<td>Domestic coal</td>
<td>Process heat</td>
<td>40%</td>
</tr>
<tr>
<td>Diesel</td>
<td>Transport</td>
<td>25%</td>
</tr>
<tr>
<td>Aircraft turbine fuel</td>
<td>Transport</td>
<td>60%</td>
</tr>
<tr>
<td>Petrol</td>
<td>Transport</td>
<td>10%</td>
</tr>
<tr>
<td>Compressed natural gas</td>
<td>Power</td>
<td>30%</td>
</tr>
<tr>
<td>Natural gas</td>
<td>Power</td>
<td>40%</td>
</tr>
</tbody>
</table>

Areas that receive subsidies in bold

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Note: Energy consumption includes processed and secondary energy consumed by end users.  
Sources: Ministry of Petroleum and Natural Gas, Ministry of Coal, Ministry of Petroleum, Consumer Energy Alliance, Petroleum Planning and Analysis Cell, A.T. Kearney analysis
**New business models and capabilities will evolve.** Regulatory reforms will draw new players, such as fuel retailers and traders. Many will enter the fuel production segment, especially coal. Generators would have more options for sourcing fuel, which in turn would require evolved sourcing capabilities. Business models oriented around power tolls, as it exists in developed markets, may also gain prominence.

**Conversion efficiencies will become more important.** Energy efficiency will become a key theme as fuel costs rise and put pressure on margins. Companies are already seeking technology-aided efficiency improvements. For example, many efficient super-critical technology-based coal plants and advanced combined-cycle gas plants are under construction or in planning. Fuel reforms are expected to accelerate the adoption of new technologies, while companies will minimize costs with several advanced maintenance and operations techniques.

**Once-expensive fuels will become more viable.** As basic fuel costs increase, especially in thermal coal, more expensive fuels such as liquefied natural gas (LNG) and petroleum coke (or petcoke) will become more viable alternatives. Increased costs for conventional fuel will also significantly reduce the gap in relation to renewable energy, including solar and wind (covered in detail in the next section).

So what are the implications for India’s power industry? One is that thermal power plants, which rely on access to cheap fuel (especially coal), may see margins erode quickly if they cannot secure fuel from captive or long-term arrangements or cannot pass on costs to customers. New projects should include scenarios for significantly higher fuel prices than before. Power purchase agreements (PPAs) are a good step for protecting plants from significant price increases.

Players in power generation may also seek strong positions on the fuel value chain with integrated fuel generation and standalone tolling. Leading suppliers, particularly those that supply expensive fuels (such as LNG), will seek to take advantage of the opportunities that these developments bring.

**Trend 2: The Rise of Renewable Energy**

**Conventional wisdom.** Renewable energy is futuristic and subsidy dependent and will remain a fringe segment in the Indian power sector.

**Challenging thought.** Renewable energy, especially solar, will become a mainstay segment in generation portfolio, without government support, sooner than expected.

In the eyes of many, renewable energy remains a futuristic, subsidy-dependent fringe segment of the power sector. However, this is changing. Renewable energy is fast becoming a mainstay in the generation segment.

Several central- and state-level incentives, including tax holidays, capital subsidies, and attractive feed-in tariffs, have driven the growth. Currently, renewable energy contributes to roughly 10 percent of installed generation capacity and 5 percent of total power production in India. However, the potential of renewable energy has not been fully tapped, even for the most advanced segments (including wind, small hydro, and biomass).

The government has set aggressive growth targets for renewable energy (particularly solar), even as many cynics consider these targets highly ambitious and unattainable in India. While project execution and policy implementation issues exist, three factors could potentially redefine the future landscape:
Renewable energy will achieve cost parity with conventional sources as fuel costs rise.

Driven by rapidly declining capital costs and the rising cost of conventional power, renewable energy sources such as solar could achieve grid parity much sooner than expected, especially compared with high-cost fuels such as LNG and imported coal (see figure 2).

Capital costs have declined over the past few years, driven by technology advancements, economies of scale, and the entry of fully integrated manufacturers. Since 2008, prices of solar modules have declined more than two-thirds, and polysilicon prices have dropped from a high $190 per kilogram in 2008 to $50 per kilogram in 2011. At the same time, conventional sources of power have become more expensive, due to higher domestic coal prices and greater dependence on imported coal. Domestic coal prices have increased 5 to 10 percent year over year and are expected to trend toward international coal prices as fuel reforms are implemented.¹

These rising fuel prices coupled with rapidly falling solar photovoltaic (PV) costs mean that solar power prices could equal prices for conventional sources (particularly high-cost fuels) as soon as 2016. This would significantly alter the market dynamics, shifting the focus toward renewable energy.

Customers are demanding cleaner energy. Customers across the spectrum have increased their focus on clean energy. State discoms must meet renewable purchase obligations (RPOs), while many corporations have internal sustainability targets that are likely to increase the demand for clean energy.

In developed markets, more retail customers are demanding green energy in their households, and Indian customers will likely follow suit as they become more attuned to environmental concerns. We believe that by 2015, Indian customers will demand the equivalent of 40 to 50 gigawatts of renewable energy. In other words, the growth of renewable energy will not just be driven by the government “push” model, but also by the “pull” of specific customer segments.

Figure 2

Solar power could achieve grid parity with conventional power by 2016 in the accelerated scenario

Energy costs (rupees per kilowatt hour)

Notes: PV base scenario is a 6 percent yearly cost decrease, and the accelerated scenario is 8 percent. Conventional price assumes 8 percent yearly increase. PV is photovoltaic.

Source: A.T. Kearney analysis

¹ Imported coal is currently 60 to 70 percent costlier than subsidized domestic coal on an energy equivalent basis.
A well-developed ecosystem is forming. Turnkey solutions from leading global and Indian players are allowing for the setup and operation of renewable projects. A strong ecosystem reduces risk, especially relevant for renewable energy due to the unpredictable nature of projects and their infrastructure and operational challenges.

Ecosystem improvements will bring fundamental change to renewable energy in India, which still lags other developed countries. In the future, renewable energy will operate not on the fringes, but become a leading contributor to the overall power supply. This is happening in many developed countries; for example, Germany’s dependence on renewable energy was 30 percent of total capacity in 2010.

What do these changes mean for India’s power market? For one, players with long-term aspirations must develop a renewable energy strategy with clearly developed long-range perspectives and definite positions on what to do in the short term. Early adopters at the utility scale may face uncertainties, but many of them will eventually emerge as the winners in the sector, as players without a renewable energy plan could get caught on the wrong end of the development cycle. At the global level, conventional companies understand this and have altered their business models accordingly. For example, AES has increased its share of renewable energy in the United States from 0 to 13 percent in the past 10 years.

Secondly, for associated segments such as equipment manufacturing and engineering, procurement, and construction, renewable energy will provide continued growth opportunities. It is critical for companies in these spaces to take bets on technologies and develop strong mechanisms to modify the market approach in line with the developments in the industry.

Trend 3: Smarter Grids

Conventional wisdom. Smart grids are a developed market concept that will have low implementation effectiveness in India.

Challenging thought. India can lead in smart grid application, as there is strong need and benefit potential, and resident technical expertise in the country.

Many see smart grids as developed market concepts with limited chances for effectiveness in India. However, we believe India can be a leader in smart grids, as there are vast potential benefits, strong need, and technical expertise already in the country.

Smart grids are advanced digital transmission and distribution networks based on the integration of information and communications technology. It delivers electricity to consumers using two-way digital technology, enabling the efficient management of both end use and grid use. Contrary to popular belief, smart grid technology impacts the entire power value chain from equipment manufacturing to sales and is not just restricted to transmission and distribution.

Overall, smart grids have three dimensions:

Demand response. Demand response allows generators and demand centers to interact in real time in an automated fashion.

Distributed energy generation. This includes next-generation small-scale power generation technologies and renewable sources such as wind and solar.
**Distributed energy storage.** Smart grids can manage the demand-supply mismatch by storing excess energy and making it available when required.

India today is in a strong position for an advanced smart grid infrastructure. A few factors are in the country’s favor:

- Growing pressure to improve transmission efficiencies
- Increased emphasis on power cost management and reliability
- Increasing adoption of renewable energy, including captive micro-installations in industrial and residential spaces, which require options for feeding electricity back into the grid
- Rapid IT infrastructure growth across the country, including broadband access

Broad-based smart grid adoption will impact the Indian power sector in the following ways:

**The focus will shift from power supply to power management.** End consumers will have better visibility of, more control over, and greater expectations about the sources and amount of power being used, which in turn will drive their own empowerment.

**Distributed electricity generation as a business model will emerge.** Distributed generation will provide new opportunities in the Indian power sector.

**The wire business will separate from suppliers.** The future customer will be able to choose suppliers based on quality and costs. For example, UK wires are owned by National Grid, but there are roughly 70 licensed electricity suppliers.

India currently lags global counterparts in terms of smart grid implementation—it is in the early stage, while other countries are in the growth and mature phases (see figure 3). Increased focus is required from all stakeholders, including government and the industry, to push smart grid implementation. For example, China has launched policy initiatives to set up a nationwide, interactive, integrated grid, which has started yielding results.

If this trend takes hold in India, power companies will have to realign their value propositions to take advantage of the changing landscape. Power management, cost efficiencies, and supply quality will become important selection criteria for customers. At the same time, new business opportunities will emerge, including small-scale renewable projects and distributed electricity

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**Figure 3**

**The stages of smart grid implementation**

- **Early**
  - There is no clear policy and little regulatory support
  - No full scale projects are underway, but pilot projects are planned
  - Operational inefficiency and push for new power sources drive demand

- **Growth**
  - There is a national mandate but little movement
  - A deployment policy roadmap is in place
  - Investments are driven by government and utility firms
  - Large scale deployment has started, and the pace is picking up

- **Mature**
  - There is a national mandate and early deployment, with set targets and investments
  - Investments are driven by utilities more than government
  - Rollout is well under way

Source: A.T. Kearney analysis
models (already operational in the United Kingdom, United States, Canada, and elsewhere). Lastly, power distributors will have to increase their customer focus, as smart grids and other advances give end-customers more choices.

Trend 4: A Vibrant Retail Market

Conventional wisdom. The power sector works on a “push model” to generate electricity and transmit to demand centers. End consumers have a limited role.

Challenging thought. The advent of a vibrant “retail” market is imminent. This will change the rules of the game to a “pull” model, where the customers will have increased bargaining power.

Indian power customers (particularly industrial and domestic retail) have, to this point, been passive entities in the power value chain. They cross-subsidize systemic inefficiencies and low affordability segments such as agriculture by paying high tariffs. Yet, they continue to face availability and price rise issues. These problems have forced many customers to use expensive and polluting diesel generator sets. Many large users (typically 20 megawatts or more), have set up rather inefficient captive plants, but now even these units face problems pertaining to fuel costs and availability.

In this context, downstream reforms are imminent. The first stage will involve increasing power tariffs to reduce the subsidy burden. Subsequent reforms will introduce competition at the distribution and retail level, allowing power retailers to operate alongside discoms, and allow dynamic pricing, giving rise to new products and services. Technology, including smart grids, will be crucial in bringing about this transformation. Bulk customers would feel an immediate impact, but the changes would eventually trickle down to residential customers.

While some think renewable energy is a fringe segment of the power sector, it is fast becoming a mainstay in power generation.

The advent of a vibrant retail market will bring three key changes to the industry:

The balance of power will shift to customers. The new era of power markets in India will belong to customers, particularly end-consumers. This has already occurred in both developed (such as the United Kingdom and Germany) and emerging markets (such as the Philippines). For example in the United Kingdom, prices dropped 8 to 17 percent for domestic customers and up to 30 percent for commercial customers between 1998 and 2005, as the markets were opened to competition. In Germany, increased competition and market-driven pricing opened up the power markets.

The first signs of this shift in India are already visible, although there is still a long way to go. Most states have implemented some type of open access, although this hasn’t yet occurred across

* For more information, see “Power Spend—New Options for Bulk Customers in India” at www.atkearney.com.
the board. Industries in several states are starting to take the opportunity to trade exchange-based power (see figure 4). Going forward, this trend will gain momentum as smaller customers are allowed into the open-access regime.

**New entities and business models will emerge:** As the retail power market evolves, a new set of entities and business models will emerge both on the buy and sell sides.

- **Electricity retailers.** Separating wire owners and power suppliers will create a new class of power retailers adept at buying and selling power without owning the infrastructure.

- **Generators’ industrial sales arms.** Today, generators focus on selling only to discoms. In coming years, a new class of generating companies with dedicated sales arms catering to bulk industrial customers will emerge. The solutions provided by these entities will vary from independent power producers (IPPs) catering to industrial customers only to distributed generation and group captive plants.

- **Power sourcing.** The power procurement role within industries today focuses mainly on managing the tactical relationship with a distribution company. However, an evolved electricity retail market will make power sourcing a key activity as firms take a strategic view of their power supply portfolio and optimize their power costs and quality.

- **Integrated energy utilities.** Attractive downstream opportunities will result in integrated power sector players with interests in both generation and power retailing. Significant M&A may arise as power retailers seek to acquire generation assets and generation companies aim to enter power retailing.

- **Convergence across sectors.** Cross-utility synergies will lead to the emergence of new infrastructure players—and to the entry of new players with little experience in the power value chain.

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**Figure 4**

**Power trading growth in India**

**India Energy Exchange**

*(number of industrial customers)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-open-access customers</th>
<th>Open-access customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>89</td>
<td>0%</td>
</tr>
<tr>
<td>2010</td>
<td>178</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>2011</td>
<td>825</td>
<td>34%</td>
</tr>
</tbody>
</table>

**Billion units sold**

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2.6</td>
<td>6.2</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Note: Data is for power trading from the India Energy Exchange, which accounts for roughly 85 percent of all power trading in India. Totals are for day-ahead transactions. Years are fiscal years.

Source: Central Electricity Authority; A.T. Kearney analysis
Downstream innovation will rise. To acquire and retain customers, distribution companies need innovative solutions that cater to the growing mass of open-access customers. Solutions include the following:

- **An emphasis on energy efficiency.** Demand-side management will emerge as a major business area as customers seek products such as energy-efficient appliances and micro-generation products (such as solar panels) and services such as energy consulting. Utilities and equipment manufacturers will compete in this lucrative market.

- **Customized products and pricing.** Tailor-made products (such as time-of-day services) will cater to customers with varying consumption patterns. At the same time, the breadth of products offered on power exchanges will rise significantly.

- **New value propositions.** Retail players will strive to stand out through well-crafted value propositions that attract customers. These include green power, improved quality of service, and better costs—advances already made in some developed markets.

Amid these changes, power industry players in India will need to become more customer focused. This starts by improving sales and delivery capabilities to cater to open-access customers (an immediate opportunity for industrial customers) and by developing value propositions to target emerging customer segments.

Utilities have a prime opportunity to diversify and expand their value chain presence. Upstream players can explore organic and inorganic opportunities to enter the power retail segment. For example, the opening up of the UK market created acquisition-led growth for several players, including RWE, GDF, EDF Energy, and E.ON. Non-power sector players will also find a lucrative opportunity in power retail in synergistic businesses (such as gas distribution)—in the United Kingdom, Centrica and GDF participate in both electricity and gas distribution. New areas such as energy-efficient equipment and energy consulting may also offer attractive opportunities.

**Imperatives for India’s Power Industry**

The four trends outlined above pose many strategic and operational imperatives for India’s power industry (see figure 5). Fuel availability is fast becoming an impediment to growth, so can government afford to wait to bring coal and gas reforms? Most states in India now offer viable

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**Figure 5**

Implications of the major power sector trends

<table>
<thead>
<tr>
<th>Fuel sector reforms</th>
<th>Industry imperatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>The rise of renewable energy</td>
<td>1. Track market developments and prepare specific response strategies</td>
</tr>
<tr>
<td>Smarter grids</td>
<td>2. Realign the business model and go-to-market approach</td>
</tr>
<tr>
<td>A vibrant retail market</td>
<td>3. Focus on project and operational excellence as margins come under pressure</td>
</tr>
</tbody>
</table>

Source: A.T. Kearney analysis
business propositions in renewable energy, so will it be long before it grows to its expected potential? Smart grid pilots have begun, so how long will it take before commercial-scale implementation begins? Industrial customers are already moving away from discoms and securing their own power, so how far off is a vibrant retail market?

Serious players in the sector have seen these trends begin to play out and are aligning their business approaches accordingly. To address these trends, industry players have three major moves:

**Track market developments and prepare response strategies.** Identify how the sector’s expected changes will affect current business. Assess the impact of disruptive changes (such as new renewable energy technological breakthroughs or major regulatory reforms) to identify opportunities and threats arising out of the same. Develop strategies on how to counter these changes and track markers on an ongoing basis.

**Realign the business model and go-to-market approach.** Develop a long-term business plan based on the market assessment and implications for the company. Incorporate mechanisms to adapt to changing trends. Create a more forward-looking value proposition.

**Focus on project and operational excellence, as margins come under pressure.** Focus aggressively on cost management especially during projects stage. Build and roll out organizational process changes to enable more efficient operations and management activities and to minimize conversion costs. Assess existing organizational capabilities in light of changing industry dynamics, and invest in building future skill sets.

### A Divided Approach

Thus far, power sector players have taken several different approaches in response to these trends. Some have begun acting, while others seem content with a wait-and-see approach. All power sector companies, however, must answer several questions as they assess their readiness to confront the challenges. Which changes will impact your business model and market approach? Do these changes offer new opportunities that didn’t previously exist? Could they potentially threaten your competitiveness? How prepared are you to respond to these changes? Have you defined a long-term strategic roadmap? Are you building the capabilities and skill sets to adapt?

Forward-looking companies will have the opportunity to emerge as the long-term winners in India’s power sector.

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