## EXECUTIVE SUMMARY

**Third largest producer and fourth largest consumer globally**
- India is the third largest producer and fourth largest consumer of electricity in the world, with the installed power capacity reaching 329.226 GW by August 2017. The country also has the fifth largest installed capacity in the world.

**Large-scale government initiated expansion plans**
- The government targets capacity addition of 88.5 GW under the 12th Five-Year Plan (2012–17) and around 100 GW under the 13th Five-Year Plan (2017–22).
- Investments of around US$ 250 billion are planned for the power sector during the 12th Plan Five-Year Plan.
- In June 2017, the government announced intentions to set up an asset reconstruction company for handling the stressed assets in power sector. This would also help in the transfer of stressed power generation assets of stalled power projects, which would then be auctioned.

**Robust growth in renewables**
- Wind energy is estimated to contribute 60 GW, followed by solar power at 100 GW by 2022.
- The target for renewable energy has been increased to 175 GW by 2022.

**Favourable policy environment**
- 100 per cent FDI is allowed under the automatic route in the power segment and renewable energy.

*Notes: TWh - Terawatt Hours, GW – Gigawatt,
Source: Make in India website, Ministry of New and Renewable Energy, IEA, CEA (Central Electricity Authority), Aranca Research, Assorted articles*
ADVANTAGE INDIA
For updated information, please visit www.ibef.org

**ADVANTAGE INDIA**

- Expansion in industrial activity to boost demand for electricity
- Growing population and increasing penetration and per-capita usage to provide further impetus
- Power consumption is estimated to increase from 1160.1 TWh in 2016 to 1,894.7 TWh in 2022

- Ambitious projects and increasing investments across the value chain
- Diversification into renewable sources increasing growth avenues

- Total FDI inflows in the power sector reached US$ 11.8 billion during April 2000 to June 2017, accounting for 3.44 per cent of total FDI inflows in India
- Investment for 7 new transmission systems that includes strengthening of national grid have been sanctioned
- 100 per cent FDI allowed in the power sector has boosted FDI inflows in this sector
- Schemes like Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS) have already been implemented for rural and urban areas respectively

**Notes:**
- FY - Indian Financial Year (April – March), FDI - Foreign Direct Investment, E - Estimates, TWh - Terawatt-Hour, FY22 estimates as per IEA forecasts FY171 - Data for April 2016 – August 2016
- Source: CEA, DIPP (Department of Industrial Policy and Promotion), Aranca Research
MARKET OVERVIEW
EVOLUTION OF THE INDIAN POWER SECTOR

**Before 1956: Introductory Stage**
- Electricity (Supply) Act 1948
- Industrial Policy Resolution (1956)
- Generation and distribution of power under state ownership
- Power losses, subsidies, infrastructure bottlenecks and resource constraints

**1956–1991: Nationalisation Stage**
- Establishment of semi-autonomous State Electricity Boards (SEBs)
- Legislative and policy initiatives (1991)
- Private sector participation in generation
- Fast-track clearing mechanism of private investment proposals
- Electricity Regulatory Commissions Act (1998) for establishing Central and State Electricity Regulatory Commissions and rationalisation of tariffs

**1991–2003: Liberalisation Era**
- Legislative and policy initiatives (1991)
- Private sector participation in generation
- Fast-track clearing mechanism of private investment proposals
- Electricity Regulatory Commissions Act (1998) for establishing Central and State Electricity Regulatory Commissions and rationalisation of tariffs
- Industrial Policy Resolution (1956)
- Generation and distribution of power under state ownership
- Power losses, subsidies, infrastructure bottlenecks and resource constraints

**2003 onwards: Growth Era**
- Electricity Act (2003)
- National Tariff Policy (2006)
- New renewable energy policy have been announced
- Amendments made in Electricity Act so as to create competition
- Implementation of Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme for rural and urban areas respectively
- Implementation of Ujwal DISCOM Assurance Yojana (UDAY) which would enable electrification to all villages and tracking it using the Grameen Vidyutikaran App
- Amendment in National Tariff Policy (2016) has been made, wherein government is focusing more on sustainable utilisation of renewable energy resources

*Source: MNRE, Corporate Catalyst India, IFLR, Aranca Research*
With a production of 1,423 TWh, India is the third largest producer and the third largest consumer of electricity in the world.

Although power generation has grown more than 100-fold since independence, growth in demand has been even higher due to accelerating economic activity.

India to become the world’s first country to use LEDs for all lighting needs by 2019, thereby saving Rs 40,000 crore (US$ 6.23 billion) on an annual basis.

Note: TWh - Terawatt Hours Figures mentioned in the graph is as per latest data available
Source: Enerdata, Aranca Research,
Power Generation has grown rapidly over the years

- With electricity production of 1,160.1 BU in India in FY17, the country witnessed growth of around 4.72 per cent over the previous fiscal year.
- Over FY10–FY17, electricity production in India grew at a CAGR of 7.03 per cent.
- The 12th Five Year Plan projects that, total domestic energy production would reach 844 million tonnes of oil equivalent (MTOE) by 2021–22.
- A total of 13,872 villages out of 18,452 un-electrified villages in India have been electrified up to June 30, 2017 as part of the target to electrify all villages by May 1, 2018.

**Notes:** FY - Indian Financial Year (April-March), BU – Billion Unit, 1 - Data up to July 2017

**Source:** BP Statistical Review, Ministry of Power, Aranca Research;
SOURCES OF POWER WITH SHARES IN TOTAL INSTALLED CAPACITY … (1/2)

**Thermal**
- **Coal**: 66.4%
  - India has large reserves of coal. By the end of August 2017, total installed coal capacity in India stood at 193,466.50 MW.
- **Gas**:
  - India’s proven natural gas capacity measure about 25,185.38 as on 31st August 2017

**Hydro**
- 13.6%
  - With a large swathe of rivers and water bodies, India has enormous potential for hydropower; the 12th Five-Year Plan (2012–17) includes additional 30GW of hydroelectric power generation. As of August 2017, India has 44.65 GW of hydro power generating capacity

**Renewable**
- 17.7%
  - Wind energy is the largest renewable energy source in India; projects like the Jawaharlal Nehru National Solar Mission (aims to generate 20,000 MW of solar power by 2022) are creating a positive environment among investors keen to exploit India’s potential. There are plans to set up four solar power plants of 1GW each. As of August 31, 2017, India has 58.30 GW of renewable energy capacity.

**Nuclear**
- 2.1%
  - As of July 2017, India has 6.78 GW of net electricity generation capacity using nuclear fuels (across 20 reactors) and aims to increase it to 45 GW by 2020; with one of the world’s largest reserves of thorium, India has a huge potential in nuclear energy.

**Notes:**
- MW - Megawatt, GW - Gigawatt
- **Source:** Ministry of Coal, NHPC, CEA, BP Statistical Review 2015, Corporate Catalyst India, Indian Power Sector, Ministry of Power, Aranca Research
As of August 2017, total thermal installed capacity in the country stood at 219.46 GW, while hydro and renewable energy installed capacity totalled to 44.65 GW and 58.3 GW, respectively.

For the 12th Five-Year Plan, a total of 88.5 GW of power capacity addition was targeted; of which, 72.3 GW constitutes thermal power, 10.8 GW hydro power and 5.3 GW nuclear power. As of March 2017, 99.21 GW of installed power capacity was achieved, of which 91.73 GW is thermal, 5.48 GW is hydro and 2 GW is nuclear.

As a part of the green corridor project, the power lines would transmit 20 gigawatts of power capacity from 34 solar parks across 21 states.

In January 2017, the 2nd unit of Kundankulam Nuclear Power Project, attained a capacity of 1000 Mwe and this is anticipated to strengthen the overall power generation capacity in India.

In February 2017, a 40-kilowatt solar power plant was inaugurated at Don Bosco Higher Secondary School in Johrat City, Assam.

In May 2017, the government approved the raising of bonds worth US$351.03 million for renewable energy through the Indian Renewable Energy Development Agency (IREDA). The funds will be then used by the Ministry of New and Renewable Energy for the approved schemes for green corridor, CPSU, defence solar projects, solar parks, generation-based incentives for wind projects, etc.

**Notes:** MW - Megawatt, GW – Gigawatt; FY18* - Data up to August 2017
Source: Ministry of Coal, NHPC, Central Electricity Authority (CEA), Corporate Catalyst India, Aranca Research
GENERATION CAPACITY HAS INCREASED AT A HEALTHY PACE … (1/2)

- Installed capacity increased steadily over the years, posting a CAGR of 10.57 per cent in FY09–17
- As of July 2017, energy generation from conventional sources stood at 405.9 billion units (BU).

**Installed electricity generation capacity (GW)**

Note: GW - Gigawatt, CAGR - Compound Annual Growth Rate; FY18* - data upto August 2017
Source: CEA (Central Electricity Authority), Aranca Research
GENERATION CAPACITY HAS INCREASED AT A HEALTHY PACE … (2/2)

- Among the different sources of power in India, the CAGR in installed capacity over FY07–FY17 was:
  - 10.57 per cent for thermal power
  - 22.06 per cent for renewable energy, the fastest among all sources of power
  - 2.51 per cent for hydro power
  - 5.68 per cent for nuclear power

- India is expected to become the third biggest solar market across the globe in 2017, with 8.8 gigawatt (GW) of capacity addition projected for the year ahead.* Moreover, the country’s solar capacity is expected to reach 18.7GW by 2017, which is about 5 per cent of global solar capacity.

- In August 2017, Bridge to India (BTI) has increased its forecast for India’s solar power capacity addition to 9.4 gigawatts (GW) in 2017 from the previous 8.8 GW as solar power is becoming a more attractive new source of power with decreasing costs.

- The 2026 forecast for India’s non-hydro renewable energy capacity has been increased to 155 GW from 130 GW on the back of more than expected solar installation rates and successful wind energy auctions, according to a statement by BMI Research.

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*Note: CAGR - Compound Annual Growth Rate; * - According to the India Solar Handbook 2017 released by Bridge to India (BTI),
Source: CEA, Aranca Research, India Solar Handbook 2017, BMI Research, Bridge To India, Livemint
### MAJOR PLAYERS IN THE POWER SECTOR

<table>
<thead>
<tr>
<th>Company</th>
<th>Indian company</th>
</tr>
</thead>
</table>
| **NTPC**         | ▪ NTPC is the largest power producer in India and is also the sixth largest thermal power producer in the world, with installed capacity of 47.17 GW (including JVs). By 2032, NTPC plans to reach 128,000 MW of power capacity. Coal-based power accounts for more than 84.7 per cent of the total capacity  
▪ It has also diversified into hydro power, coal mining, power equipment manufacturing, oil and gas exploration, power trading and distribution |
| **TATA POWER**   | ▪ Tata Power is India’s largest integrated power company, with significant presence in solar, hydro, wind and geothermal energy space. The company accounts for 52 per cent of total generation capacity in the private sector. The company has an installed capacity of 10,463 MW in FY17. By 2022, the company plans to increase the generating capacity to 18 GW, distribution networks by 4 GW and energy resources by 25 million tonnes per annum. |
| **Reliance Power** | ▪ The company has more than 35,000 MW of power generation capacity, both operational and under development. Reliance Power has an operational power generation capacity of 6 GW. Reliance Power will double the capacity of its Rosa power plant in Uttar Pradesh to 2,400 MW and Butibori power plant in Maharashtra to 1,200 MW  
▪ In FY15, the company accounted for a generation performance of 1048 billion units. |
| **CESC LIMITED** | ▪ CESC Limited is a vertically integrated player engaged in coal mining and generation and distribution of power. It owns and operates 3 thermal power plants generating 1225 MW of power. These are Budge Budge Generating Station (750 MW), Southern Generating Station (135 MW) and Titagarh Generating Station (240 MW) |
| **NHPC**         | ▪ NHPC is the largest hydro power utility in India, with an installed capacity of 6.5 GW; it has drawn up a massive capacity expansion plan of adding 6.7 GW by 2017  
▪ NHPC is constructing 9 projects, aggregating an installed capacity of 4.2 GW. NHPC added 1.9 GW and 1.1 GW during the 10th and 11th Plan periods, respectively |

*Source: Company websites, News articles, Industry sources, Aranca Research*
### MAJOR PLAYERS IN THE POWER SECTOR … (2/2)

<table>
<thead>
<tr>
<th>Company</th>
<th>Indian company</th>
</tr>
</thead>
</table>
| ![PFC](image1) | ▪ Power Finance Corporation Limited (PFC) is an NBFC engaged in financing and development activities within the Indian power sector  
▪ Major products and services include project term loans, lease financing, direct discounting of bills, short-term loans and consultancy services |
| ![ADANI](image2) | ▪ Adani Power is one of India’s largest private thermal power producers, with total capacity at 10.5 GW in 2016; the company aims to generate 20 GW of power by 2020  
▪ The company is one of the world’s largest single-location thermal power plants in Mundra, Gujarat |
| ![PGCIL](image3) | ▪ Power Grid Corporation of India Limited (PGCIL) is the single largest transmission utility in India; it is responsible for planning, co-ordination, supervision and control over inter-state transmission systems  
▪ Target to enhance inter-regional capacity to about 72.25 GW at the end of XII Plan. In 2016, inter-regional capacity is 47.45 GW. |
| ![DVG](image4) | ▪ Damodar Valley Corporation is engaged in power generation, distribution and transmission of electric power, irrigation and flood control |
| ![SJVN](image5) | ▪ SJVN Limited is the second largest hydro power company in India  
▪ The company plans to diversify into wind power projects soon |

**Note:** NBFC - Non-Banking Financial Company  
**Source:** Company websites, News articles, Aranca Research
### Porter’s Five Forces Framework Analysis

<table>
<thead>
<tr>
<th>Port of Call</th>
<th>Positive Impact</th>
<th>Neutral Impact</th>
<th>Negative Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bargaining Power of Suppliers</strong></td>
<td><img src="#" alt="Red Bullet" /></td>
<td><img src="#" alt="Green Bullet" /></td>
<td><img src="#" alt="Red Bullet" /></td>
</tr>
<tr>
<td>▪ Bargaining power of suppliers is high as presence of bigger players block the new entrants</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Competitive Rivalry** | ![Neutral Bullet](#) |
| ▪ Rivalry is not intense due to oligopoly structure |
| ▪ In India, the projected demand is already above the supply levels |
| ▪ Competitive rivalry is expected to increase due to government encouraging private players to enter the sector |

| **Threat of Substitutes** | ![Green Bullet](#) |
| ▪ Does not have any substitutes |

| **Threat of New Entrants** | ![Red Bullet](#) |
| ▪ Capital intensive nature of the industry makes it difficult for new entrants |
| ▪ Regulatory approvals, land remain a major problem |

| **Bargaining Power of Buyers** | ![Neutral Bullet](#) |
| ▪ Medium, as for retail consumers, government sometimes interferes to regulate prices. However, prices are not regulated for industrial customers |

*Source: Aranca Research*
STRATEGIES ADOPTED
## STRATEGIES ADOPTED

### Control generation costs
- Companies are developing captive coal fields to reduce price volatility and ensure uninterrupted supply of fuel to control generation cost
- Most of the power companies are now located near energy source. This helps minimise costs of fuel transport

### Acquiring sources of fuel supply
- Power companies are now looking at securing adequate supplies of fuel by targeting not only domestic but also overseas resources
- Reliance Power already has coal reserves in Indonesia
- Essar Power have captive coal mines in Indonesia from which it extracts coal for power plants in India
- Government has enabled the power utilities for swapping their coal supplies with the nearest sources so as to save miscellaneous costs and decongest the rail network

### Diversifying generation technologies
- Companies are using multiple-generation technologies based on a project’s requirement
- Companies such as NTPC and Reliance Power already have coal-fired, gas-fired and hydroelectric capacity
- This helps them diversify, reduces dependence on a single source

### Additional revenue streams
- Most of the companies are now looking to sell their carbon credits to generate additional revenue by employing supercritical technology

### Digital India
- Launch of smart grid mission with 14 DISCOMS as a pilot
- Smart metering for high – end users of electricity
- Under Union Budget 2017, government approved the 'Pradhan Mantri Gramin Digital Saksharta Abhiyan' (PMGDISHA) for 6 crore rural households

**Source:** Aranca Research
GROWTH DRIVERS
Multiple drivers (industrial expansion, growing per-capita incomes) are leading to growth in power demand; this is set to continue in the coming years
- During FY16-17, GDP growth is likely to average 7.1 per cent
- India is set to become a global manufacturing hub with investments across the value chain
- India’s power demand is expected to rise up to 1,905 TWh by FY22

Note: TWh - Terawatt Hours, RGGVY - Rajiv Gandhi Grameen Vidyutikaran Yojana, CEA
Source: Aranca Research, Ministry of Statistics and Program Implementation
98 GW of generation capacity was added during FY11-16; future investments will benefit from strong demand fundamentals, policy support and increasing government focus on infrastructure. Around 21.67 GW of generation capacity was added during 2016-17.

The Government of India had targeted power capacity addition of 88,537 MW by FY17 during the 12th five year plan. India exceeded the target and achieved capacity addition of 99,209.47 MW by March 2017.

Per capita electricity consumption in the country grew at a CAGR of 9.63 per cent, during FY06-FY16, reaching 1075 KWh in FY16.

Note: RGGVY - Rajiv Gandhi Grameen Vidyutikaran Yojana P : Provisional
Source: CEA, Aranca Research
### POLICY SUPPORT AIDING GROWTH IN THE SECTOR

<table>
<thead>
<tr>
<th>Policy/Measure/Programme</th>
<th>Details</th>
</tr>
</thead>
</table>
| Electricity Act, 2003    | - Elimination of licensing for electricity generation projects  
                          - Increased competition through international competitive bidding  
                          - Demarcation of transmission as a separate activity |
| National Tariff Policy, 2006 | - Adequate return on investment to companies engaged in power generation, transmission and distribution  
                               - Uniform guidelines to SERCs for fixing tariffs  
                               - Assured electricity to consumers at reasonable and competitive rates |
| Ultra Mega Power Projects (UMPPs) | - Launch of the UMPP scheme through tariff-based competitive bidding  
                                    - Ease of land possession, provision of fuel, water and necessary clearances for enhancing investor confidence |
| R-APDRP                  | - R-APDRP was launched by Ministry of Power with the purpose of reducing AT&T losses up to 15 per cent by upgradation of transmission and distribution network  
                          - Linking disbursement of central government funds (to states), with actual reduction in transmission and distribution losses. Sanctioned projects of more than US$ 5.8 billion |
| No environment clearance required for solar projects | - The Ministry of Environment, Forest and Climate Change, Government of India has clarified that solar PV (photovoltaic) power, solar thermal power projects, and solar parks will not require the environment clearance which was mandatory under the provisions of Environment Impact Assessment (EIA) notification, 2006. |
| Fuel Supply Agreement   | - Fuel supply agreement with Coal India Ltd will ensure the availability of coal for power companies over the long term |

**Notes:**  
R-APDRP - Restructured Accelerated Power Development and Reform Programme  
SERC - State Electricity Regulatory Commission  
AT&T - American Telephone and Telegraph Systems  

**Source:** Ministry of Power, Aranca Research
### POLICY SUPPORT AIDING GROWTH IN THE SECTOR

| National Electricity Policy | ▪ Provide electricity to all areas  
▪ Prepared in consultation with state governments, CEA, and other stakeholders  
▪ Supply of reliable and quality power in an efficient manner and reasonable rates |
| Feed – in Tariff | ▪ This Scheme used for promoting generation of electricity from renewable energy sources  
▪ Allows Power Producers to sell renewable energy generated electricity to an off-taker at a pre-determined tariff for a given period of time |
▪ The policy aims to achieve the objectives of UDAY scheme  
▪ Special focus on renewable energy has been laid. In order to promote use of renewable energy, solar Renewable Purchase Obligation (RPO) is proposed to increase to 8 per cent by 2022 |
| BIMSTEC Trans-Power Exchange and Development Project | ▪ In April 2017, the Indian Government approved the proposal of the Ministry of Power for signing of an MoU for establishment of the BIMSTEC Grid Interconnection. The MoU will be signed at the upcoming 3rd BIMSTEC Energy Ministers’ Meeting.  
▪ The BIMSTEC is an international organisation involving a group of South Asia and South-East Asia countries, namely, Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal. |
| Sasti Bijli Har Ghar Yojana | ▪ The Government of India plans to implement a new scheme, named 'Sasti Bijli Har Ghar Yojana' with an outlay of Rs 17,000 crore (US$ 2.64 billion), to provide electricity to around 40 million un-electrified households in the country. |

**Notes:** R-APDRP - Restructured Accelerated Power Development and Reform Programme  
SERC - State Electricity Regulatory Commission  
AT&T - American Telephone and Telegraph Systems  
UDAY – Ujwai DISCOM Assurance Yojana  
**Source:** Ministry of Power, Aranca Research
### RECENT POLICIES ADOPTED

<table>
<thead>
<tr>
<th>Policy/Programme</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spinning Reserve</strong></td>
<td>In order to meet the peak load shortages and grid stability, spinning reserves have been created</td>
</tr>
</tbody>
</table>
| **Energy Conservation Campaign**                           | - Replacing nationwide street lights with LED lights  
- Plan to save 10 per cent energy that would light up 11 crore lives  
- Replacing 1 crore bulbs in Delhi within one year                                                                                     |
| **National Mission on Enhanced Energy Efficiency**         | - In August 2014, Government had launched the policy with an investment of US$ 128 million  
- Funds energy efficient electrical appliances                                                                                           |
| **Power to the people**                                   | - Implementation of 2 schemes – Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS) for rural and urban areas  
- Implementation of a new scheme – Ujwal DISCOM Assurance Yojana (UDAY) which would enable electrification for all villages by reducing losses through programmes that involve public participation |
| **Ujwal Discoms Assurance Yojana (UDAY)**                  | - In February 2017, India Ratings and Research (Ind-Ra) assigned UP Power Corporation (UPPCL)’s proposed US$ 1.48 billion bond a provisional ‘IND AA(SO)’ rating. This makes it India’s 1st state government revenue-supported bond |
| **National Tariff Policy (2016)**                          | - The National Tariff Policy for Electricity was amended by the Union Government on 20 January, 2016, and aims to achieve the objectives of UDAY scheme  
- Special focus on renewable energy has been laid. In order to promote use of renewable energy, solar Renewable Purchase Obligation (RPO) is proposed to increase to 8 per cent by 2022 |

*Source: Ministry of Power, Various News articles, Aranca Research*
INCREASING INVESTMENTS: FDI INFLOWS AND KEY DEALS … (1/3)

- Power is one of the key sectors attracting FDI inflows into India
- From April 2000 to June 2017, India recorded FDI of US$ 5.85 billion in non-conventional energy sector. New and renewable energy sector witnessed maximum power generation capacity addition, since 2000.
- Power sector accounted for 3.44 per cent of total inflows till March 2017
- Cumulative FDI inflows into the sector in April 2000–June 2017 were US$ 11.77 billion

Note: FY18* - data upto June 2017
Source: DIPP, Aranca Research
 increasing investments: FDI inflows and key deals … (2/3)

- EIG Global Energy Partners made an investment of US$ 125 million in Greenko Group, which is planning to develop its wind farms and hydropower assets in India by means of Greenfield projects and acquisitions.
- GE Energy Financial Services plans to invest US$ 24 million in a solar power project by Welspun Renewables Energy Pvt Ltd.
- The Ministry of New and Renewable Energy (MNRE) signed an agreement with Germany-based KfW Development Bank, to fund floating solar projects in Maharashtra and Kerala, at an estimated cost of US$ 44.47 million in June 2016. Both the plants are expected to generate over 310 GW of green energy.
- On 20 June, 2016, CLP India, which is among the largest foreign investors in India’s power sector, acquired 49 per cent stake in Suzlon’s 100 mw-solar power project in Telangana.
- SunEdison, world’s largest renewable energy company, plans to continue its focus on ‘Make in India’ initiative by further reducing the cost of renewable energy and developing over 15 gigawatts (GW) of wind and solar projects in the country by 2022.
- In April 2017, 12 agreements and MoUs worth US$9 billion of investments are to be signed between India and Bangladesh. An agreement worth US$2 billion investments in Bangladesh power sector by Adani Power, a subsidiary of Adani Group is to be signed as well.
- In April 2017, L&T’s construction division received an order from Qatar General Electricity and Water Corporation worth US$780.9 million, for network expansion and power transmission.
- In May 2017, PE Actis LLP announced plans to invest US$ 500 million in Solenergi Power Pvt. Ltd., its 2nd green energy platform in the country. The company was also awarded Rewa Solar Power Project in Madhya Pradesh.
- In July 2017, International Finance Corporation (IFC), the investment arm of the World Bank Group, is planning to invest about US$ 6 billion through 2022 in several sustainable and renewable energy programmes in India.

Note: FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker
Source: Thomson One Banker, Industry News, VC Circle, Aranca Research
## INCREASING INVESTMENTS: FDI INFLOWS AND KEY DEALS … (3/3)

### Private Equity deals

<table>
<thead>
<tr>
<th>Acquirer</th>
<th>Target</th>
<th>Deal date</th>
<th>Value (US$ mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenko Energy Holdings (GEH)</td>
<td>SunEdison</td>
<td>4 October 2016</td>
<td>392 million</td>
</tr>
<tr>
<td>Tata Power</td>
<td>Welspun Energy</td>
<td>14 June 2016</td>
<td>1,528</td>
</tr>
<tr>
<td>GIC</td>
<td>Greenko Group plc</td>
<td>August 2015</td>
<td>255</td>
</tr>
<tr>
<td>EIG Global Energy Partners</td>
<td>Greenko Group</td>
<td>October 2014</td>
<td>125</td>
</tr>
<tr>
<td>Standard Chartered Private Equity Ltd</td>
<td>Sterlite Power Grid Ventures Ltd</td>
<td>07 July 2014</td>
<td>83.4</td>
</tr>
<tr>
<td>ADB, Goldman Sachs, Global Environment Fund</td>
<td>ReNew Wind Power Pvt Ltd</td>
<td>03 July 2014</td>
<td>140</td>
</tr>
<tr>
<td>ADB, DEG</td>
<td>Welspun Renewables</td>
<td>June 2014</td>
<td>85</td>
</tr>
<tr>
<td>IDFC</td>
<td>GMR Energy</td>
<td>24 Feb 2014</td>
<td>-</td>
</tr>
<tr>
<td>Consortium led by Deutsche Investitations, FE Clean Energy Group and IFC</td>
<td>NSL Renewable Power Pvt Ltd</td>
<td>29 April 2013</td>
<td>60.0</td>
</tr>
<tr>
<td>Ascent Capital Advisors India Pvt Ltd, VenturEast, Draper Fisher Jurvetson Intl.</td>
<td>Bharat Light and Power Pvt Ltd</td>
<td>22 January 2013</td>
<td>18.6</td>
</tr>
<tr>
<td>GSFC Distribution Networks Ltd</td>
<td>Gujarat Gas Co Ltd</td>
<td>3 October 2012</td>
<td>674.2</td>
</tr>
<tr>
<td>Foundation Capital; Helion Venture Partners</td>
<td>Azure Power India Pvt Ltd</td>
<td>7 September 2012</td>
<td>8.0</td>
</tr>
</tbody>
</table>

**Note:** FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker

**Source:** Thomson One Banker, Industry News, VC Circle, Aranca Research

For updated information, please visit www.ibef.org
OPPORTUNITIES
Demand for electricity is expected to increase at a CAGR of 7 per cent to 1,894.7 TWh over FY07–22

Current production levels are not enough to meet demand; annual demand outstrips supply by about 7.5 per cent

All India per capita consumption of electricity is expected to reach 1348 TWh by FY17

Various reforms being undertaken by the government are positively impacting India’s power sector. In wake of the surging domestic coal production, the country’s power sector is becoming increasingly stable.

Notes: TWh - Terawatt Hour, CAGR - Compounded Annual Growth Rate E- Estimated
Source: International Energy Agency (IEA), CEA, Demand estimates based on IEA forecasts, Aranca Research
The government is targeting capacity addition of around 88.54 GW under the 12th (2012–17) and around 100 GW under the 13th (2017–22) Five-Year Plan.

The expected investments in the power sector during the 12th Plan (2012–17) is US$ 250 billion.

There is a tangible shift in policy focus on the sources of power. The government is keen on promotion of hydro, renewable and gas-based projects, as well as adoption of clean coal technology.

In March 2017, Bhoruka Power Corp. announced its plans to raise US$ 120 million, to increase their hydro and wind renewable energy capacity to 1 gigawatt by 2020.

**Note:** TWh - Terawatt-hour

**Source:** Business Standard, Capacity addition estimates by CEA, Aranca Research
The per-capita electricity consumption of India stood at 1075 KWh in FY16.

The peak power requirement by the country in FY17 stood at 159.54GW.

The peak power demand in the country stood at 159.816 GW between April-July 2017.

To meet the rising electricity demand, the Central Government plans to expedite market opportunity of US$ 14.94 billion for power transmission.

Note: KWh – Kilo Watt Hour, GW - Gigawatt Hour,
Source: NTPC presentation, CEA, Aranca Research
Wind energy is the largest source of renewable energy in India; it accounts for an estimated 64.77 per cent of total installed capacity (24.7 GW). There are plans to double wind power generation capacity to 20 GW by 2022.

Biomass is the 2nd largest source of renewable energy, accounting for ~12 per cent of total installed capacity in renewable energy. There is a strong upside potential in biomass in the coming years.

In May 2017, India’s solar power tariffs fell to a new low of US$ 0.038 per unit during the auction of a 250 megawatt capacity at Bhadla in Rajasthan. This bid was placed by South Africa’s Phelan Energy Group and Avaada Power to win contracts to build capacities of 50MW and 100MW, respectively, at Adani Renewable Energy Park Rajasthan Ltd.

In February 2017, low solar tariffs tendered in India at auction, is expected to catalyse green investments and help in reducing the dependency on fossils fuels.

On account of anticipated decline in solar panel prices, due to supply glut in international market, solar power prices in India are estimated to fall by 2018.

In March 2017, the Power Ministry has launched an application named - GARV-II, to provide real time data related to rural electrification regarding all un-electrified villages in India.

Declining solar power prices as compared to thermal power has prompted the government to switch to the renewable energy resources. Three coal power projects have been shelved in Odisha, Gujarat and Uttar Pradesh due to low rate of renewable solar energy at US$0.038 / kWh.

Notes: TWh - Tera Watt Hour; GW – Gigawatt
Figures mentioned in the graph is as per latest data available
Source: Renewables 2015 Global Status Report (REN21), Aranca Research, CEA
STRONG UPWARD MOMENTUM IN NUCLEAR ENERGY LIKELY IN MEDIUM TO LONG TERM

- Currently, the country has net installed capacity of 5.8 GW, using nuclear fuels, across 20 reactors. Of the 20 reactors, 18 are Pressurised Heavy Water Reactors (PHWR) and 2 are Boiling Water Reactors (BWR)

- The government aims to quadruple India’s nuclear power generation capacity to 20 GW by 2020;

- Nuclear Power Corporation of India Limited (NPCIL) plans to construct 5 nuclear energy parks with a capacity of 10,000 Mwe

- The Kudankulam Atomic power project, Tamil Nadu, by NPCIL is expected to start operating by 2016-17 with an installed capacity of 1000 MW.

- Unit II of Kudankulam plant has started functioning in May 2016 with an installed capacity of 1000 MW. The Kudankulam nuclear power plant’s 2nd unit attained criticality on 10th July, 2016

- As estimated by Nuclear Power Corporation of India, the plant would start generating 400 MW in 45 days, after attaining criticality.

Note: GW – Gigawatt, Mwe - Megawatt Electric, PHWR - Pressurised Heavy Water Reactors, BWR - Boiling Water Reactors, E – Estimates
TATA POWER: SURGING AHEAD IN THE PRIVATE SECTOR … (1/2)

- In FY17 Tata power’s revenue reached US$ 4.38 billion from US$ 3.81 billion in FY09.
- In FY16, the company has an installed generation capacity of 10.0GW in India and is present in all segments of power sector.
- The thermal power generation capacity stands at 7.6 GW, while clean energy generation such as hydro, solar and wind stands at 1.2 GW.
- The company is developing its 1st 4 GW Ultra Mega Power Project at Mundra (Gujarat) based on supercritical technology.
- Its international presence includes a 30 per cent stake in coal mines and a geothermal project in Indonesia and a hydro project in Bhutan in partnership with The Royal Government of Bhutan.
- The company is eyeing the clean energy segment; it acquired stakes in 2 Australian companies in the sector in October 2014.
- Tata Power’s defense engineering unit is planning to invest around US$ 83.3 million in Vemagal, Kolar district.

Note: MW - Megawatt
Source: Company website, Annual Reports, Economic Times, Aranka Research

For updated information, please visit www.ibef.org
The company estimates its installed capacity to expand fivefold in the next 5 years to 25 GW.

Recognising the enormous potential in renewable energy, the company intends to increase the share of renewable sources to 25 per cent of its total generating capacity in the near future.

In the year 2014, the company acquired a 39.2 MW wind farm at Jamnagar in Gujarat and commissioned a 25-MW solar power project at Palaswadi in Maharashtra.

As of FY17, the company has an installed capacity of 10,463 MW.

In comparison to FY16, the company’s generation capacity increased by 13.94 per cent in FY17.

The company being first independent power producer in India has been awarded with OHSAS 18001:2007 certification for its wind operations.

In March 2017, Tata Power entered into partnership with Nokia, to modernise electrical grids with advanced communication network. Tata Power Delhi Distribution Ltd. was allowed access to internet protocol/multiprotocol label switching network to support management of electrical grids in Delhi, by Nokia.

Note: MW - Megawatt, CAGR - Compounded Annual Growth Rate
Source: Company website, Company Presentation
RELIANCE POWER: ON A GROWTH TRAJECTORY ... (1/2)

- Reliance Power has 6 GW of operational capacity and approximately 15 GW under implementation
- It won 3 of the 4 Ultra Mega Power Projects (UMPPs) awarded by Government of India so far. These 3 projects are located in Sasan (MP), Krishnapatnam (Andhra Pradesh) and Tilaiya (Jharkhand)
- Additional three units of 660 MW each at the 3,960 MW Sasan project were commissioned in FY14
- Sasan UMPP is the largest integrated power plant and coal mining project globally
- The company’s coal production capacity has reached ~100 MTPA. It is the largest private sector coal producer in India
- The company’s ongoing projects would increase its production capacity to 20,000 MW of coal-fired capacity, 2400 MW of gas-fired capacity and 5,292 MW of hydroelectric capacity
- The company had ~12,000 MW capacity under implementation in FY16

Notes: Decline due to negative translation effect, MW – Megawatt, MTPA - Million Tonnes Per Annum
Source: Reliance Power website, Annual Reports, Aranca Research
Both units of the 600-MW Butibori coal project in Maharashtra are ready for production.

At the 2.4 GW gas project in Samalkot, Andhra Pradesh, four gas turbines are ready for generation.

Hydro power projects with capacity of 5.3 GW are currently under development in Arunachal Pradesh (4.2 GW), Himachal Pradesh (672 MW) and Uttarakhand (400 MW).

As on September 2015, three Coal based projects with capacity 5,760 MW, two Solar projects with capacity 140 MW, one Wind and Coal blocks projects each with capacities 45 MW and 20 MTPA respectively have started production.

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**Generating capacity (billion units)**

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<thead>
<tr>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
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<tr>
<td>772</td>
<td>811</td>
<td>876</td>
<td>912</td>
<td>966</td>
<td>1,048</td>
<td>1,107</td>
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**Note:** MW - Megawatt

**Source:** Reliance Power website, Corporate Presentation, Annual Reports, Aranca Research
KEY INDUSTRY ASSOCIATIONS
## INDUSTRY ASSOCIATIONS

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<thead>
<tr>
<th>Council of Power Utilities</th>
<th>Bureau of Energy Efficiency (BEE)</th>
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<tbody>
<tr>
<td><strong>Address:</strong> A-2/158, Janakpuri, New Delhi-110058, India</td>
<td><strong>Address:</strong> Ministry of Power, 4th Floor, SEWA Bhawan, R. K. Puram, New Delhi – 110066, India</td>
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<tr>
<td>Tel: 91 11 25618472, 45652708</td>
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<th>Hydro Power Association (India)</th>
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<td><strong>Address:</strong> Flat no 6, Green Park Apartment, Shriram Society, Warje, Pune - 411058, Maharashtra, India</td>
<td><strong>Address:</strong> PHD House, 3rd Floor, Opp. Asian Games Village, August Kranti Marg, New Delhi-110016, India</td>
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USEFUL INFORMATION
GLOSSARY

- CAGR: Compound Annual Growth Rate
- FDI: Foreign Direct Investment
- FY: Indian Financial Year (April to March)
  - So FY10 implies April 2009 to March 2010
- GW: Gigawatt
- MandA: Merger and Acquisition
- MW: Megawatt
- NBFC: Non-Banking Financial Company
- PE: Private Equity
- PLF: Plant Load Factor
- RandD: Research and Development
- R-APDRP: Restructured Accelerated Power Development and Reform Programme
- TandD: Transmission and Distribution
- TWh: Terawatt-Hour
- RGGVY: Rajiv Gandhi Grameen Vidyutikaran Yojana
- US$: US Dollar
- Wherever applicable, numbers have been rounded off to the nearest whole number
## Exchange Rates

### Exchange Rates (Fiscal Year)

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### Exchange Rates (Calendar Year)

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*Source: Reserve Bank of India, Average for the year*
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