

POWER



DECEMBER 2016

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POWER



CONTENTS

- ❖ [Executive Summary..... 3](#)
- ❖ [Advantage India..... 4](#)
- ❖ [Market Overview and Trends.....6](#)
- ❖ [Porter Five Forces Model.....16](#)
- ❖ [Strategies Adopted.....18](#)
- ❖ [Growth Drivers.....20](#)
- ❖ [Opportunities.....31](#)
- ❖ [Success Stories.....38](#)
- ❖ [Useful Information..... 46](#)



EXECUTIVE SUMMARY

Third largest producer
and fourth largest
consumer globally

- With production of 1,278.91 TWh in 2015, India was the third largest producer and fourth largest consumer of electricity in the world, with the installed power capacity reaching 306.36 GW by September 2016. 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 USD250 billion are planned for the power sector during the 12th Plan Five-Year Plan.

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.

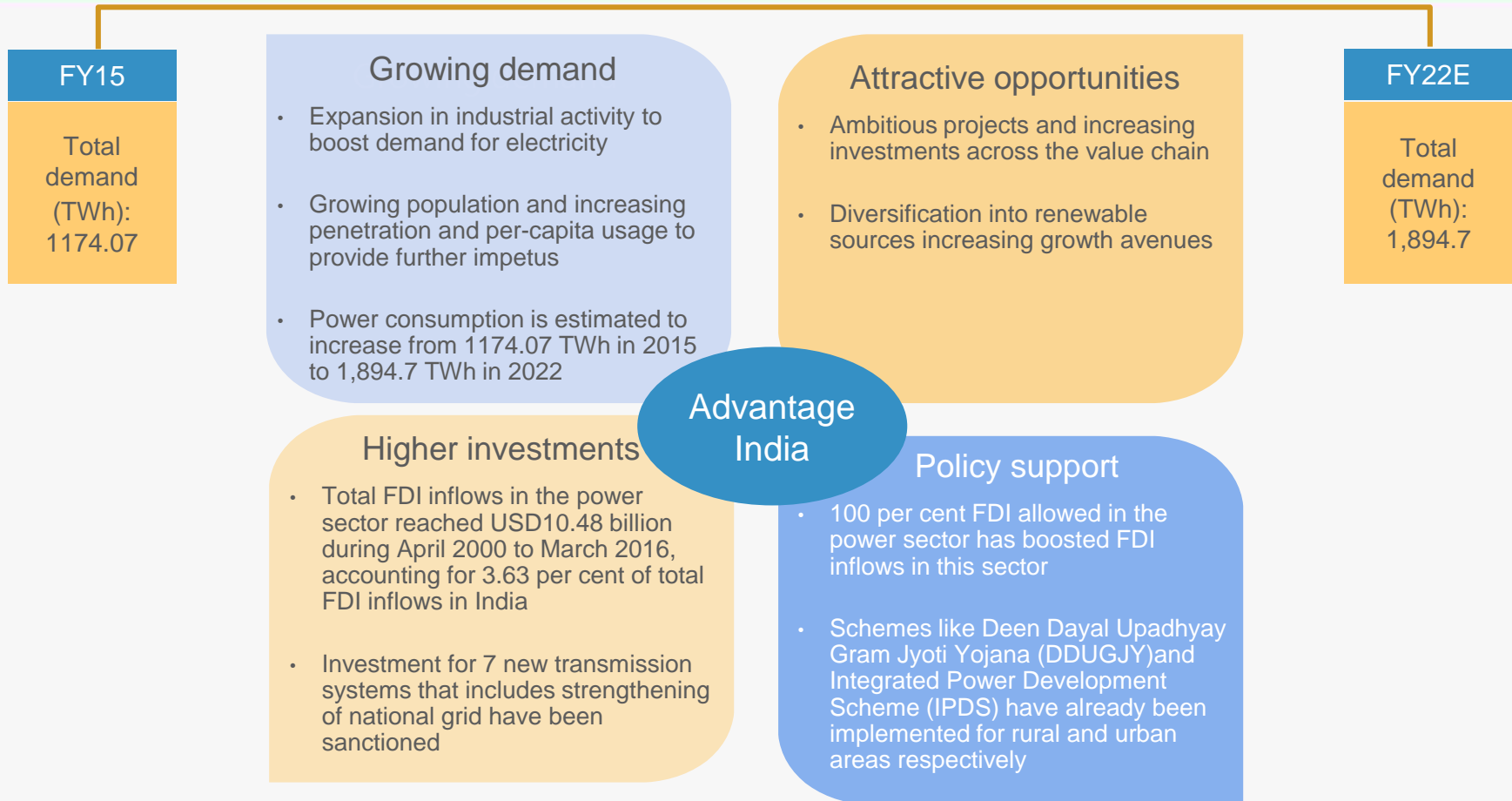
Favourable policy
environment

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

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ADVANTAGE INDIA

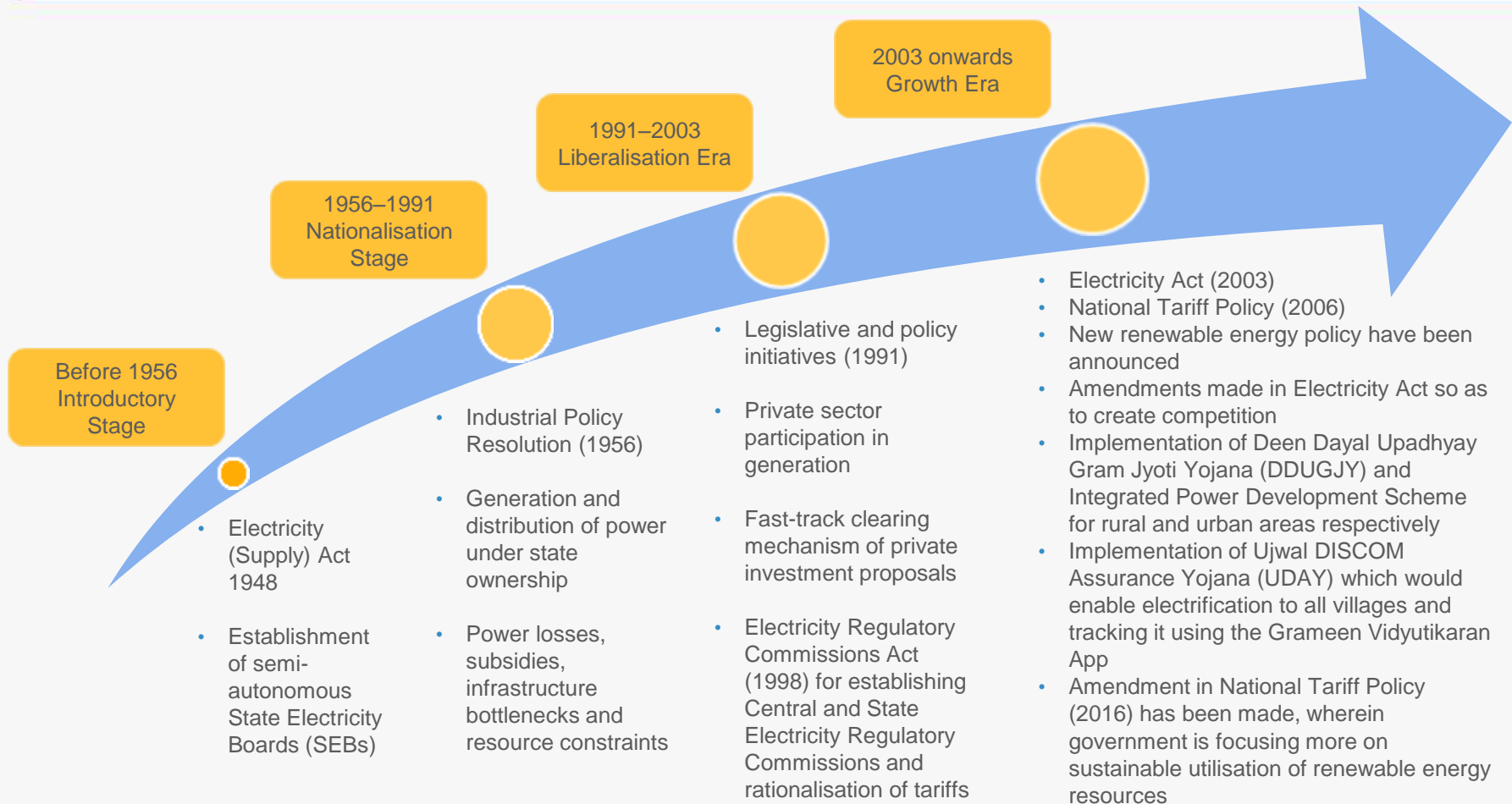


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MARKET OVERVIEW AND TRENDS

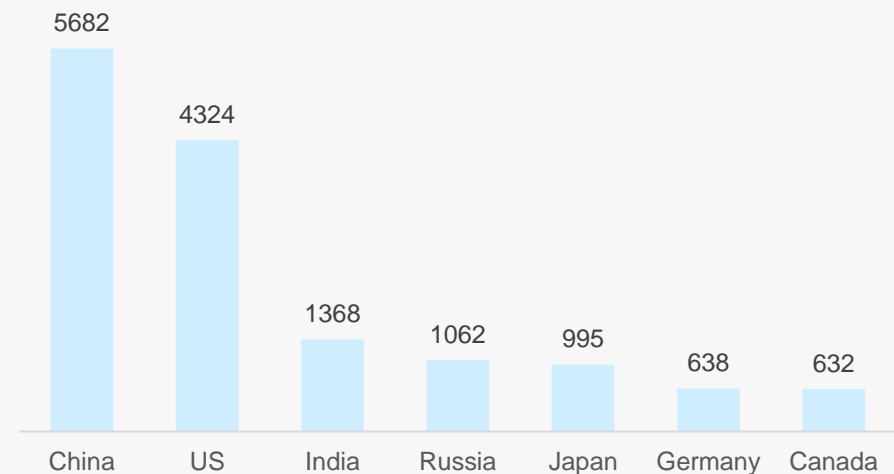
EVOLUTION OF THE INDIAN POWER SECTOR



INDIA AMONG TOP FOUR POWER PRODUCERS AND CONSUMERS

- * With a production of 1,278.91 TWh, India is the third largest producer and the fourth 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.

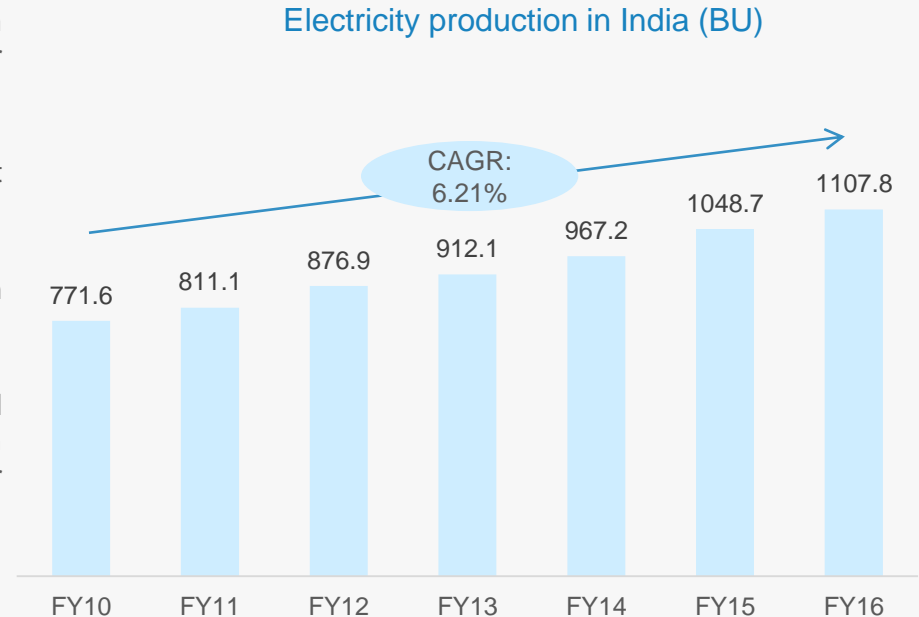
World's leading electricity producers in 2015 (TWh)



Source: Enerdata, TechSci Research,
Note: TWh - Terawatt Hours
Figures mentioned in the graph is as per latest data available

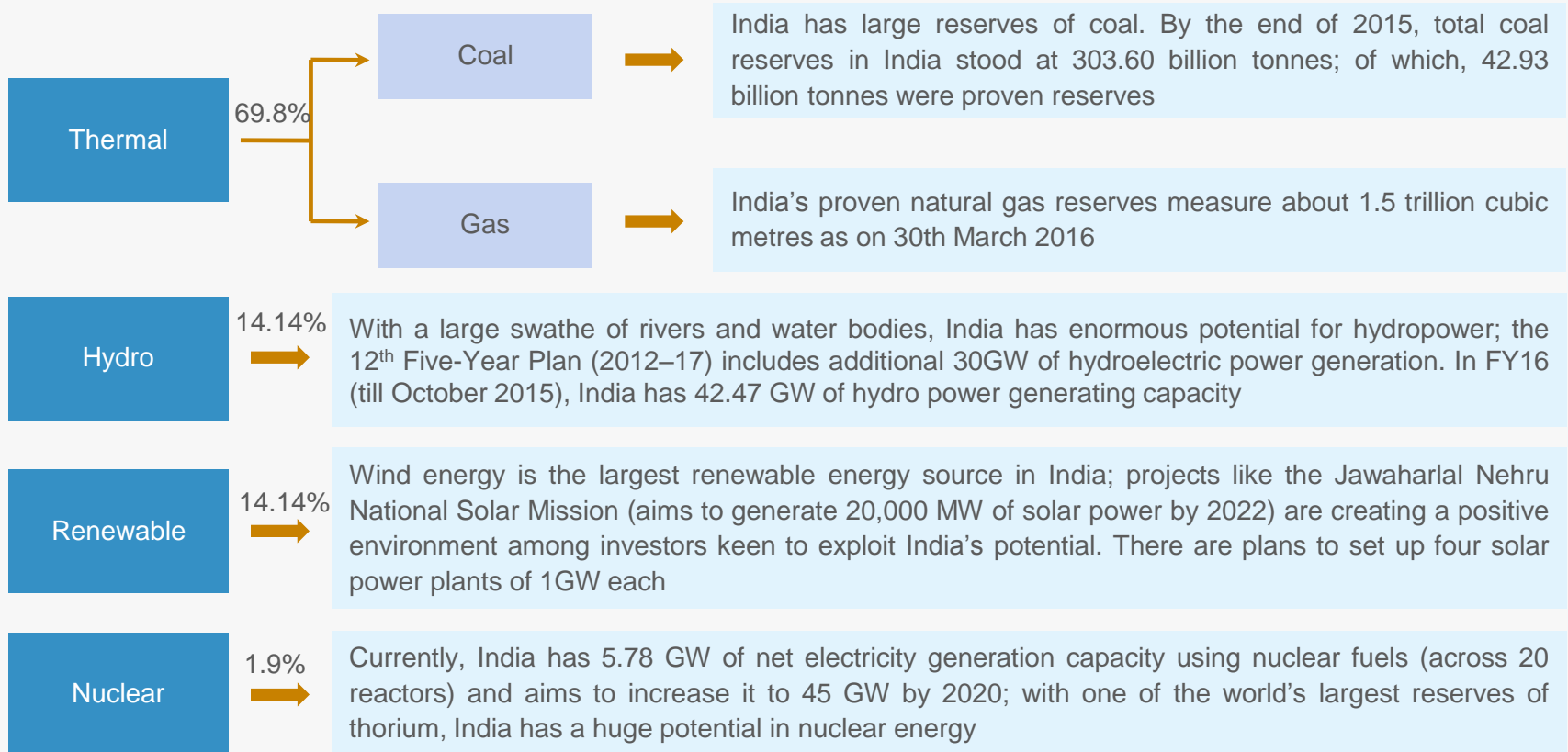
POWER GENERATION HAS GROWN RAPIDLY OVER THE YEARS

- * With electricity production of 1,107.8 BU in India in FY16, the country witnessed growth of around 5.64 per cent over the previous fiscal year.
- * Over FY10–FY16, electricity production in India grew at a CAGR of 6.21 per cent.
- * During April-September 2016, electricity production in India reached 584.22 BU.
- * The 12th Five Year Plan projects that, by 2016–17, total domestic energy production would reach 669.6 million tonnes of oil equivalent (MTOE) and would further increase to 844 MTOE by 2021–22.



Source: BP Statistical Review, Ministry of Power, TechSci Research;
Notes: FY - Indian Financial Year (April-March),
BU – Billion Unit

SOURCES OF POWER WITH SHARES IN TOTAL INSTALLED CAPACITY ... (1/2)

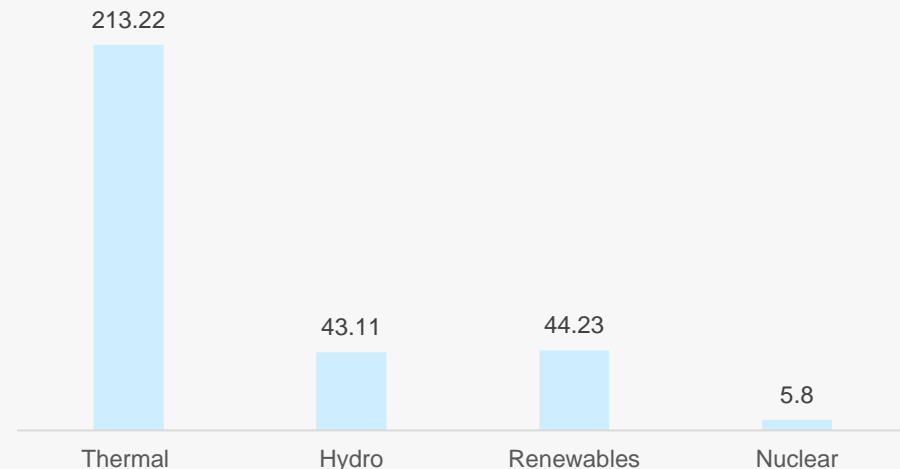


Source: Ministry of Coal, NHPC, CEA, BP Statistical Review 2015, Corporate Catalyst India, Indian Power Sector, Ministry of Power, TechSci Research
Notes: MW - Megawatt, GW - Gigawatt

SOURCES OF POWER WITH SHARES IN TOTAL INSTALLED CAPACITY ... (2/2)

- * As of September 2016, total thermal installed capacity in the country stood at 213.22 GW, while hydro and renewable energy installed capacity totalled to 43.11 GW and 44.23 GW, respectively
- * For the 12th Five-Year Plan, a total of 88.5 GW of power capacity addition is targeted; of which, 72.3 GW constitutes thermal power, 10.8GW hydro power and 5.3 GW nuclear power
- * As a part of the green corridor project the lines would transmit 20 gigawatts of power capacity from 34 solar parks across 21 states.

Installed capacity for different sources of power – 2016⁽¹⁾ (GW)

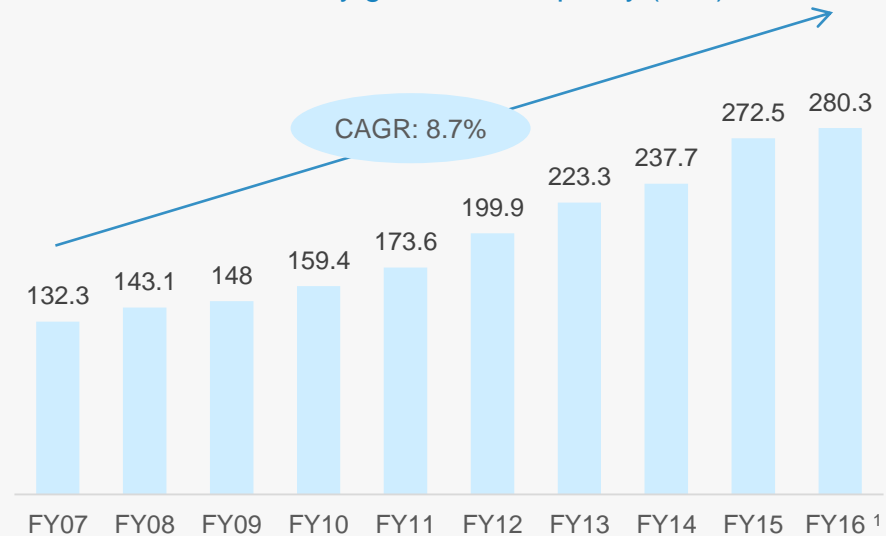


Source: Ministry of Coal, NHPC, Central Electricity Authority (CEA), Corporate Catalyst India, TechSci Research
Notes: MW - Megawatt, GW – Gigawatt
(¹) - Data as on 30th September 2016

GENERATION CAPACITY HAS INCREASED AT A HEALTHY PACE ... (1/2)

- * Installed capacity increased steadily over the years, posting a CAGR of 8.7 per cent in FY09–16⁽¹⁾
- * As of November 2016, energy generation from conventional sources stood at 777.506 billion units (BU), registering a Y-o-Y of 4.99%, over the previous year.

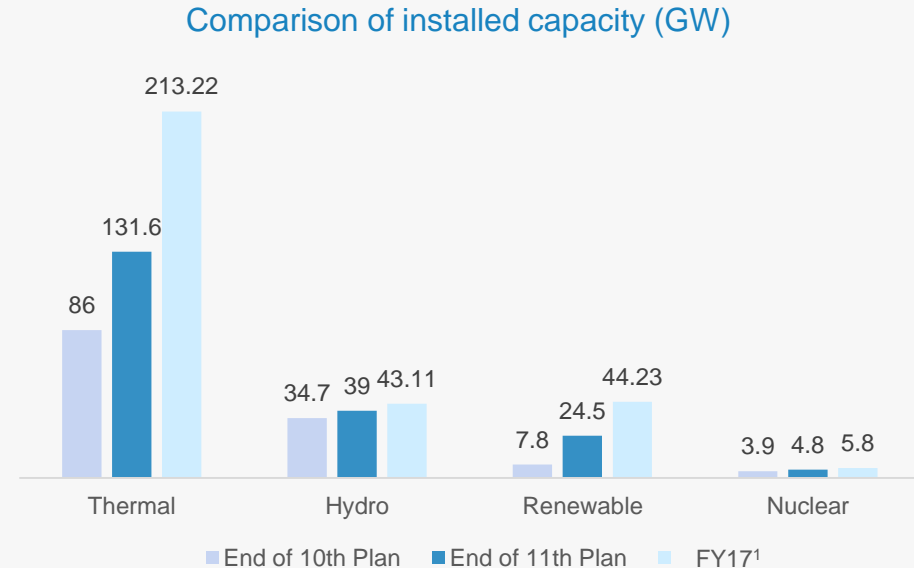
Installed electricity generation capacity (GW)



Source: CEA (Central Electricity Authority), TechSci Research
 Notes: GW – Gigawatt, CAGR - Compound Annual Growth Rate
⁽¹⁾ - Data is for April-October 2015






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⁽¹⁾ was
 - * 10.6% for thermal power
 - * 21.3% for renewable energy, the fastest among all sources of power
 - * 2.4% for hydro power
 - * 4.5% for nuclear power








Source: CEA, TechSci Research,
Note: CAGR - Compound Annual Growth Rate
⁽¹⁾ – Data as on September 2016

MAJOR PLAYERS IN THE POWER SECTOR ... (1/2)

Company	Business description
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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 10.0 GW in FY16. 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.
	<ul style="list-style-type: none"> 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. FY13 saw the development of 3,960-MW Sasan UMPP in Madhya Pradesh In FY15, the company accounted for a generation performance of 1048 billion units.
	<ul style="list-style-type: none"> CESC Limited is a vertically integrated player engaged in coal mining, and generation and distribution of power. It owns and operates three 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)
	<ul style="list-style-type: none"> 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 nine 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, TechSci Research

MAJOR PLAYERS IN THE POWER SECTOR ... (2/2)

Company	Business description
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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.
	<ul style="list-style-type: none"> • Damodar Valley Corporation is engaged in power generation, distribution and transmission of electric power, irrigation and flood control
	<ul style="list-style-type: none"> • SJVN Limited is the second largest hydro power company in India • The company plans to diversify into wind power projects soon

Source: Company websites, News articles, TechSci Research
Note: NBFC - Non-Banking Financial Company

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PORTER FIVE FORCES ANALYSIS

PORTERS FIVE FORCES ANALYSIS

Competitive Rivalry

- 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 New Entrants

- Capital intensive nature of the industry makes it difficult for new entrants
- Regulatory approvals, land remain a major problem

Substitute Products

- Does not have any substitutes

Bargaining Power of Suppliers

- Bargaining power of suppliers is high as presence of bigger players block the new entrants

Bargaining Power of Customers

- Medium, as for retail consumers, government sometimes interferes to regulate prices. However, prices are not regulated for industrial customers



Source: TechSci Research

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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

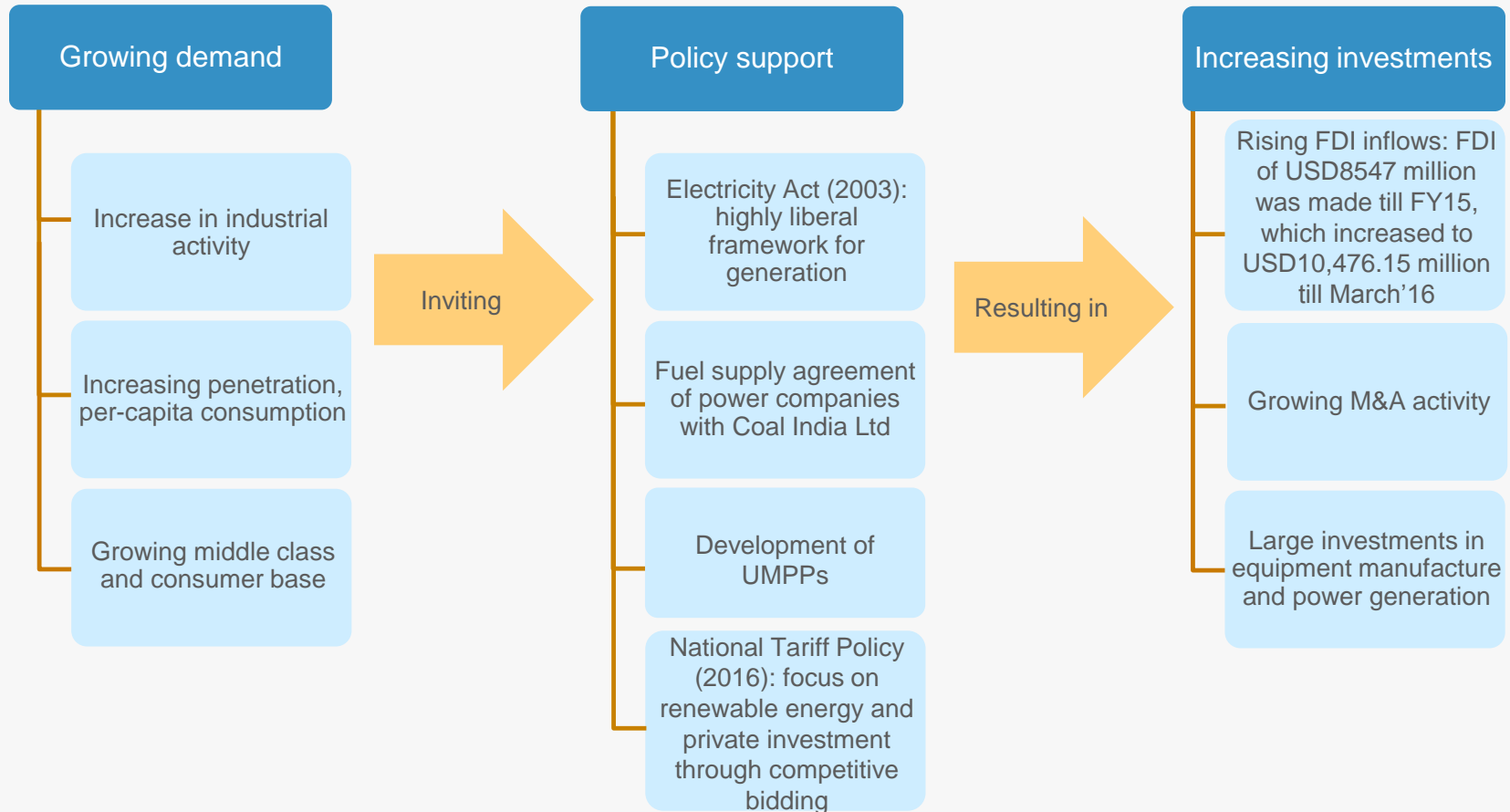
- Launch of smart grid mission with 14 DISCOMS as a pilot
- Smart metering for high – end users of electricity
- In 2015, Companies like Uttar Gujarat Vij Company, Tata Power and Essel have installed machine-to-machine (M2M) based smart metering systems in India

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GROWTH DRIVERS

STRONG DEMAND AND POLICY SUPPORT DRIVING INVESTMENTS

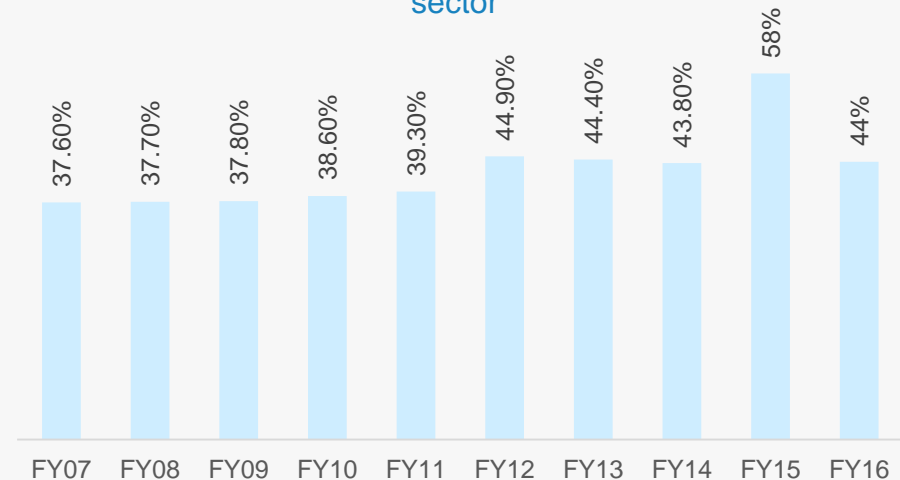


Notes: FDI - Foreign Direct Investment, M&A - Merger and Acquisition, R-APDRP - Restructured Accelerated Power Development and Reform Programme, T&D - Transmission and Distribution, UMPP - Ultra Mega Power Projects

INDUSTRIAL EXPANSION AND STRONG GDP GROWTH DRIVING POWER DEMAND ... (1/2)

- * 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 FY15-16, GDP growth is likely to average 7.6 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

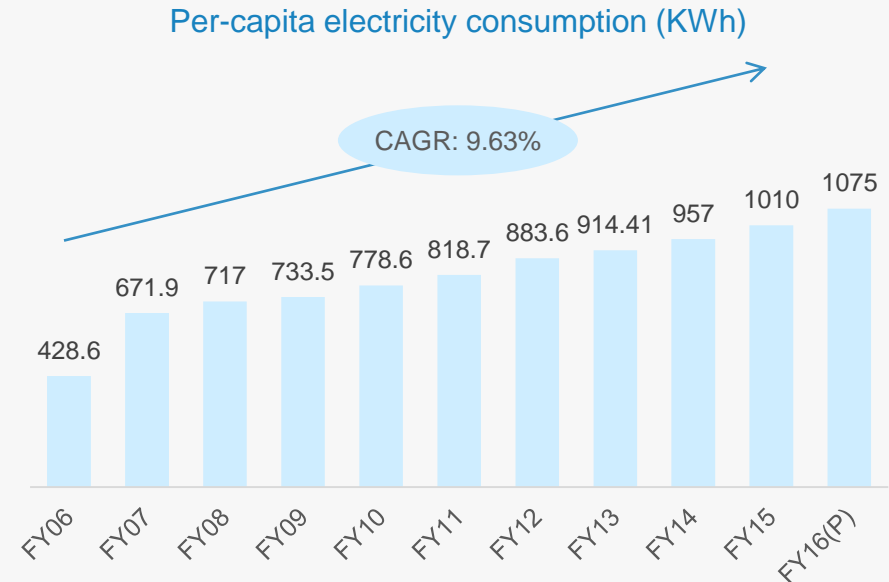
Share of electricity consumption in industrial sector



Source: TechSci Research,
Ministry of Statistics and Program Implementation
Notes: TWh - Terawatt Hours,
RGGVY - Rajiv Gandhi Grameen Vidyutikaran Yojana, CEA

INDUSTRIAL EXPANSION AND STRONG GDP GROWTH DRIVING POWER DEMAND ... (2/2)

- * 82 GW of generation capacity is set to be added during FY11–FY15; future investments will benefit from strong demand fundamentals, policy support and increasing government focus on infrastructure
- * Per capita consumption has grown at a CAGR of 10 per cent between FY06 and FY15
- * Per capita consumption grew 4.7 per cent in FY14 but tapered to 5.5 per cent in FY15, reaching 1010 KWh
- * During the 12th Plan, Government of India planned for capacity addition of 1,18,537 MW, which includes 88,537 MW through conventional sources and 30,000 MW through renewable sources, by 2016-17
- * Per capita electricity consumption in the country grew at a CAGR of 9.63 per cent, during FY06-FY16, reaching 1075 KWh by FY16



Source: CEA, TechSci Research
Notes: RGGVY - Rajiv Gandhi Grameen Vidyutikaran Yojana
P : Provisional

POLICY SUPPORT AIDING GROWTH IN THE SECTOR

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
- According to Union Budget 2015-16, five new UMPPs ,each of 4000MW, have been proposed to setup in the plug- and – play mode

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 USD5.8 billion

Fuel Supply Agreement

- Fuel supply agreement with Coal India Ltd will ensure the availability of coal for power companies over the long term

Source: Ministry of Power, TechSci Research

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

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

National Tariff Policy (2016)

- The National Tariff Policy for Electricity was amended by the Union Government on 20 January, 2016
- 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

POLICIES ADOPTED DURING BUDGET FY15 & FY16

Generation-based incentives

- Government to reintroduce 'generation-based incentives' for wind power projects to boost capacity addition in the sector; Cutting of excise duties by 2 per cent on capital goods import
- USD147.3 million would be allocated to the Ministry of New and Renewable Energy

Public Private Partnership (PPP)

- To reduce dependency on imported coal, a Public Private Partnership (PPP) policy framework would be devised with Coal India Limited to increase coal production

Liberalised FDI policy

- 100 per cent FDI is allowed under automatic route for power sector except atomic energy
- During FY13, the Government liberalised FDI policy for Power Trading Exchanges
- Foreign Investment in power exchanges registered under the CERC Regulations, 2010, allowed up to 49 per cent (FDI-26 per cent and FII-23 per cent)

Low-interest funds

- Low-interest-bearing funds to be provided from National Clean Energy Fund (NCEF) to Indian Renewable Energy Development Agency Ltd (IREDA) for on-lending to viable renewable energy projects
- Funding of USD746.82 million from (NCEF) and USD775.63 million from IEBR has been planned for year 2016-17 to develop and use renewable energy resources in an eco-friendly and sustainable manner

Growing investments

- As per Union Budget, the total planned outlay for power sector for FY17 is estimated at USD11.18 billion

Tax benefits

- Benefit under section 35 (2AA) of the Income Tax Act to industry/private sponsored research programmers
- Write – off can be availed for expenditure to be made on R&D to in-house R&D centres
- Further incentives are available for setting up of projects in notified areas

RECENT POLICIES ADOPTED

Spinning Reserve

- In order to meet the peak load shortages and grid stability, spinning reserves have been created

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 USD128 million
- Funds energy efficient electrical appliances

Power to the people

- Implementation of Two schemes – Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS) for rural and urban areas
- 24/7 power for rural homes
- Farmers will get power from a separate line
- 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

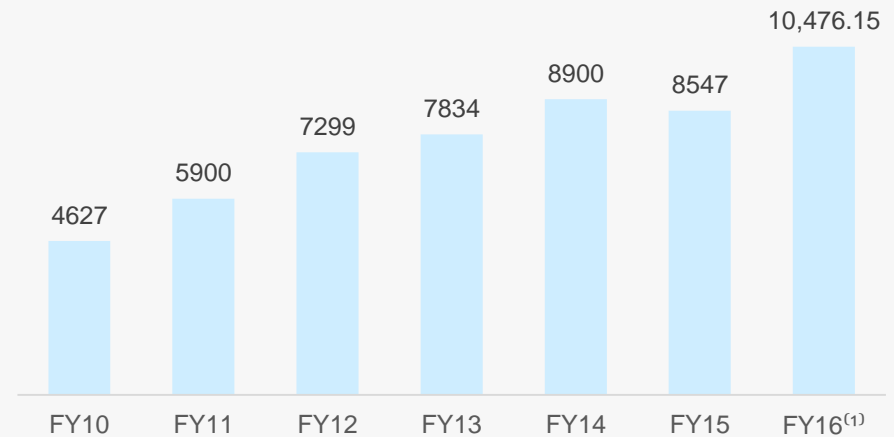
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INCREASING INVESTMENTS: FDI INFLOWS AND KEY DEALS ... (1/3)

- * Power is one of the key sectors attracting FDI inflows into India
- * FDI inflows into the sector increased from USD4627 million in FY07 to USD10,476.15 million in FY16
- * Power sector accounted for 3.63 per cent of total inflows till March 2016
- * Cumulative FDI inflows into the sector in April'00–March'16 were USD10.48 billion
- * 100 per cent FDI in power sector has boosted FDI inflows in this sector.

FDI inflows into the power sector (USD million)



Source: DIPP, TechSci Research
Note: FY16⁽¹⁾ – Data Till March 2016

INCREASING INVESTMENTS: FDI INFLOWS AND KEY DEALS ... (2/3)

- * Private equity investments in the sector have surged since 2010
- * Asian Development Bank (ADB), Goldman Sachs and Global Environmental Fund have together invested USD140 million in ReNew Wind Power Pvt Ltd on July 03, 2014
- * EIG Global Energy Partners made an investment of USD125 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 USD24 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 USD44.47 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

Source: Thomson One Banker, Industry News, VC Circle, TechSci Research
Notes: FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker

INCREASING INVESTMENTS: FDI INFLOWS AND KEY DEALS ... (3/3)

Private Equity deals			
Acquirer	Target	Deal date	Value (USD mn)
Tata Power	Welspun Energy	14 June 2016	1,528
Suzlon Energy	Gale Solarfarms Pvt. Ltd, Tornado Solarfarms Pvt. Ltd, Abha Solarfarms Pvt. Ltd, Aalok Solarfarms Pvt. Ltd and Shreyas Solarfarms Pvt. Ltd.	21 April 2016	-
GIC	Greenko Group plc	August 2015	255
EIG Global Energy Partners	Greenko Group	October 2014	125
Standard Chartered Private Equity Ltd	Sterlite Power Grid Ventures Ltd	07 July 2014	83.4
ADB, Goldman Sachs, Global Environment Fund	ReNew Wind Power Pvt Ltd	03 July 2014	140
ADB, DEG	Welspun Renewables	June 2014	85
IDFC	GMR Energy	24 Feb 2014	-
Consortium led by Deutsche Investitions, FE Clean Energy Group & IFC	NSL Renewable Power Pvt Ltd	29 April 2013	60.0
Ascent Capital Advisors India Pvt Ltd, VenturEast, Draper Fisher Jurvetson Intl.	Bharat Light and Power Pvt Ltd	22 January 2013	18.6
GSPC Distribution Networks Ltd	Gujarat Gas Co Ltd	3 October 2012	674.2
Foundation Capital; Helion Venture Partners	Azure Power India Pvt Ltd	7 September 2012	8.0

Source: Thomson One Banker, Industry News, VC Circle, TechSci Research
Notes: FDI - Foreign Direct Investment, PE - Private Equity, Thomson One Banker

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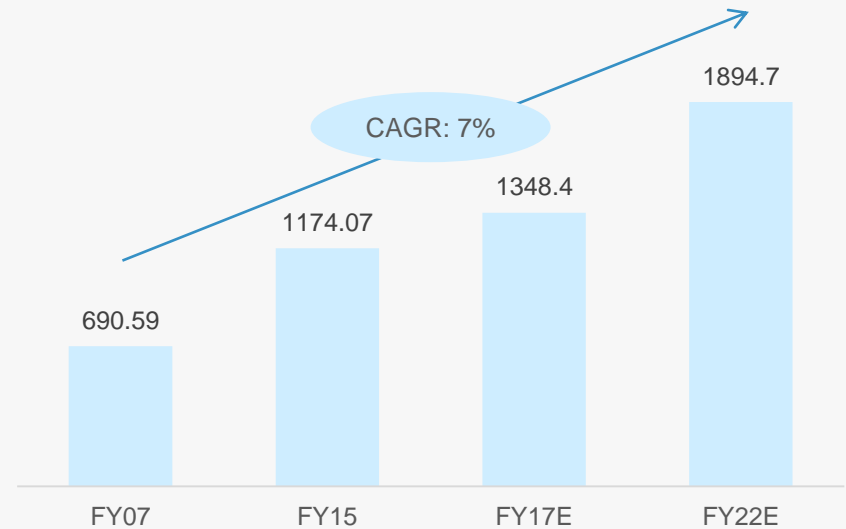


OPPORTUNITIES

POWER GENERATION: OVERALL FUNDAMENTALS WILL REMAIN STRONG ... (1/2)

- * 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

Electricity demand forecast (TWh)

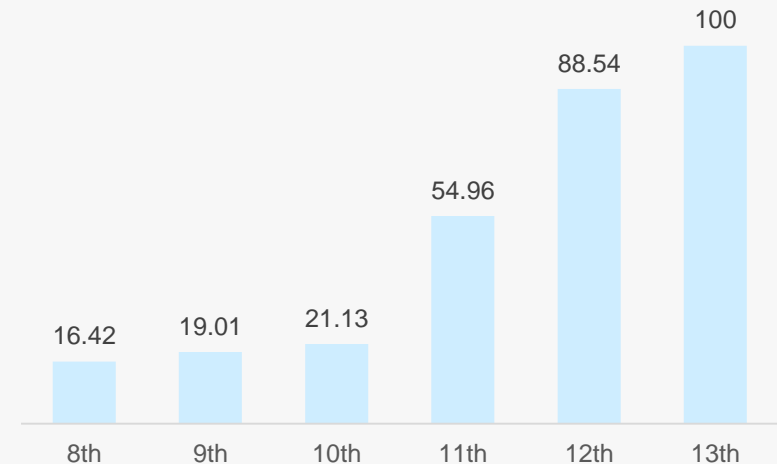


Source: International Energy Agency (IEA), CEA, Demand estimates based on IEA forecasts, TechSci Research
Notes: TWh - Terawatt Hour,
CAGR - Compounded Annual Growth Rate
E- Estimated

POWER GENERATION: OVERALL FUNDAMENTALS WILL REMAIN STRONG ... (2/2)

- * 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 USD250 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

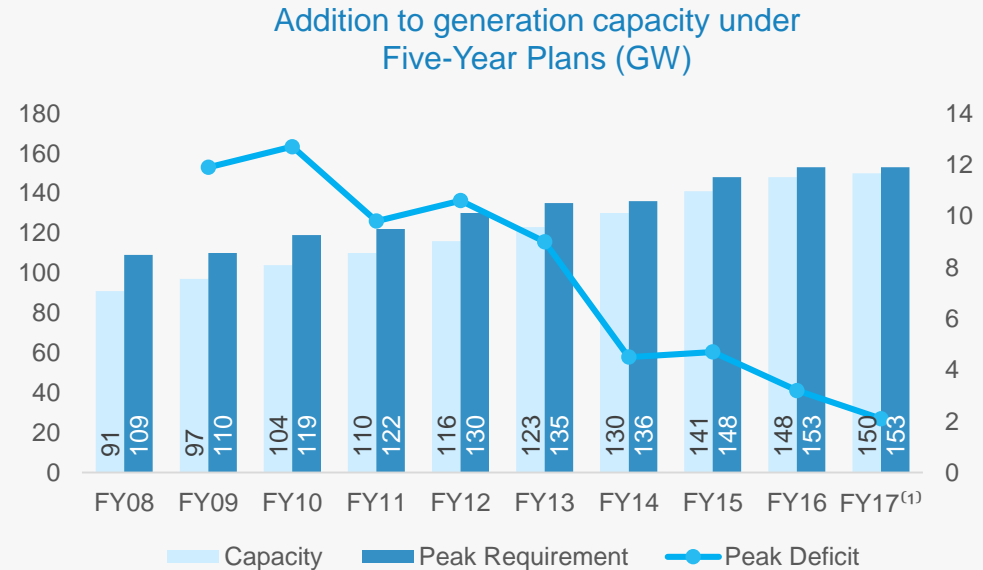
Addition to generation capacity under Five-Year Plans (GW)



Source: Business Standard,
Capacity addition estimates by CEA, TechSci Research
Notes: TWh - Terawatt-hour

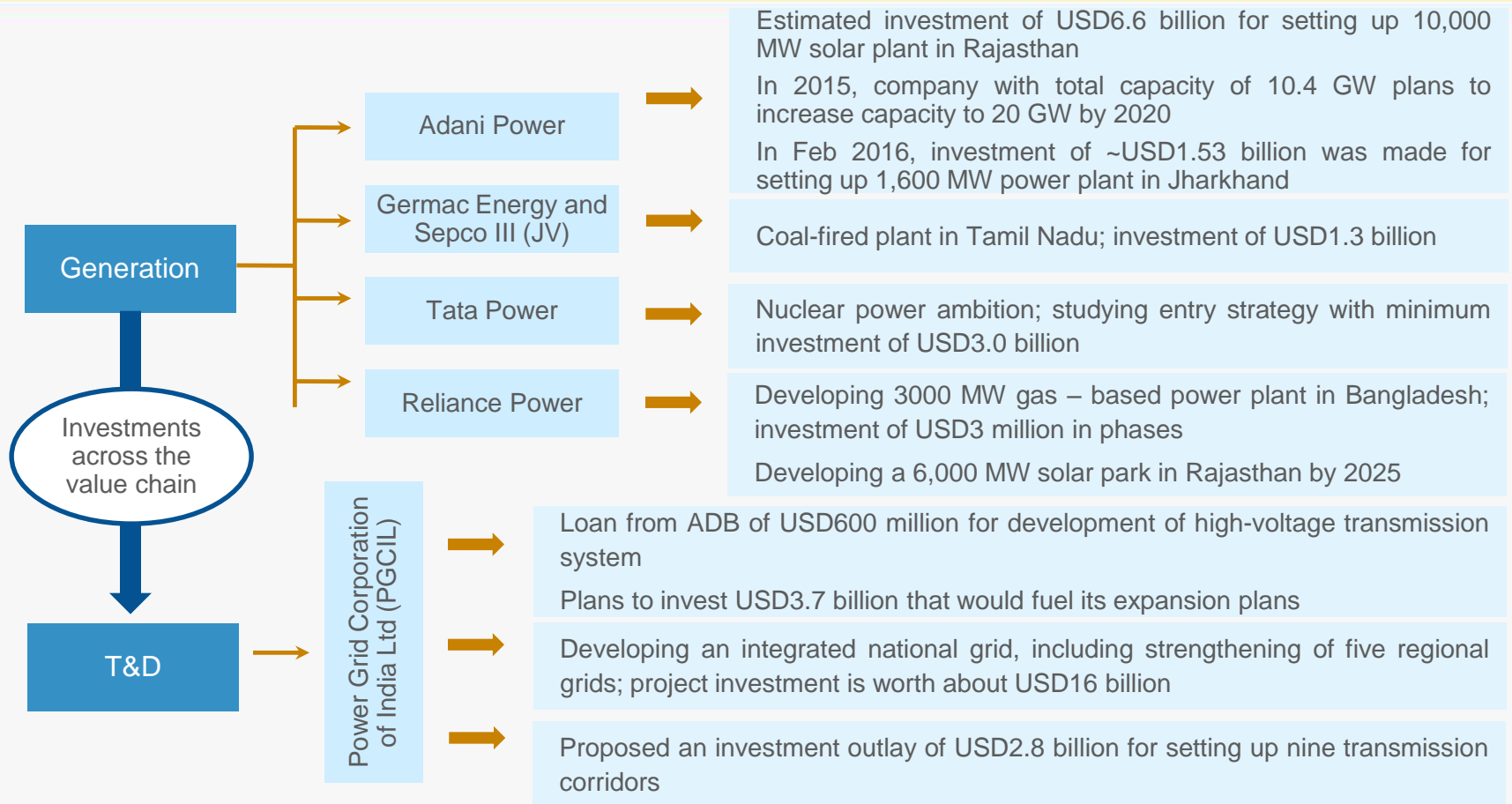
INDIAN POWER SECTOR: MARKET WITH ENORMOUS GROWTH POTENTIAL

- * The per-capita electricity consumption of India stood at 1000 KWh in FY15 lower than the global average of 2,803 KWh, representing huge potential for growth
- * The addition of approximately 106 GW to the existing capacity is expected to boost GDP growth to 8 per cent by FY17
- * The peak power requirement by the country in FY16 stood at 153 GW
- * To meet the rising electricity demand, the Central Government plans to expedite market opportunity of US\$ 14.94 billion for power transmission.



Source: NTPC presentation, CEA, TechSci Research
Notes: KWh – Kilo Watt Hour, GW - Gigawatt Hour, ⁽¹⁾ – Provisional - Data is upto May 2016

CURRENT TRENDS POINT TO OPPORTUNITIES ACROSS THE VALUE CHAIN



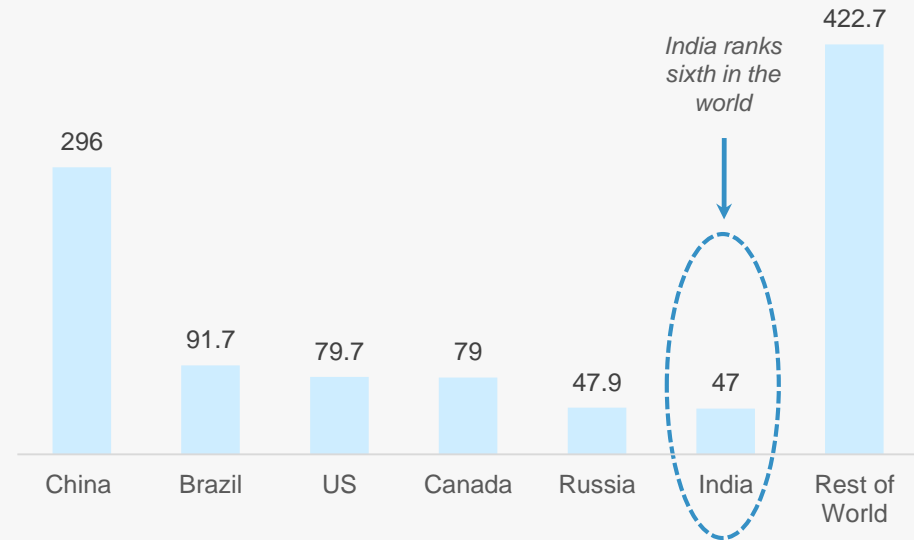
* To meet the rising electricity demand, the Central Government plans to expedite market opportunity of USD 14.94 billion for power transmission.

Source: BMI India Power Report, TechSci Research;
Notes: EHV: Extra High Voltage (Substation), JV - Joint Venture, T&D - Transmission and Distribution, GW - Gigawatt

RENEWABLE ENERGY IS FAST EMERGING AS A MAJOR SOURCE OF POWER

- * As of October 2015, total installed power capacity from renewable energy sources (excluding Hydro power) was 36.5 GW. This accounts for 13.0 per cent of the total installed power capacity and forms 6.5 per cent of the total electricity mix
- * 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
- * India installed wind power capacity of 2.6 GW, accounting for total wind power capacity of 25.1 GW by end of 2015
- * Biomass is the second 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
- * Solar energy accounts for 12 per cent of total renewable energy installed capacity. The country's true potential for solar power stands at an estimated 5,000 TWh per annum
- * Capacity addition of 30 GW is planned using various renewable energy technologies during the 12th Five-Year Plan. Wind Energy is estimated to contribute 15 GW, followed by solar power at 10 GW and the remaining by other sources

Hydro power generation capacity in 2015 (GW)

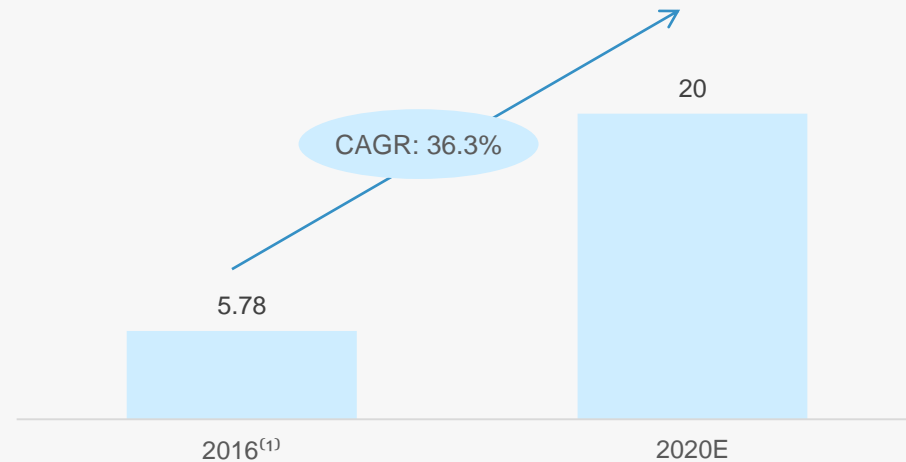


Source: Renewables 2015 Global Status Report (REN21), TechSci Research, CEA,
Notes: TWh - Tera Watt Hour; GW – Gigawatt
Figures mentioned in the graph is as per latest data available

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 two are Boiling Water Reactors (BWR)
- * The government aims to quadruple India's nuclear power generation capacity to 20 GW by 2020; currently, three nuclear power reactors of 5,780 MWe capacity are under construction
- * Nuclear Power Corporation of India Limited (NPCIL) plans to construct five 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. As on November 2015, 98.56 per cent of the project was already completed
- * Unit II of Kudankulam plant has started functioning in May 2016 with an installed capacity of 1000 MW. The Kudankulam nuclear power plant's second 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.

Nuclear energy installed capacity in India (GW)



Source: Ministry of New and Renewable Energy, Business Monitor International, CEA, TechSci Research

Notes: GW – Gigawatt, Mwe - Megawatt Electric,
PHWR - Pressurised Heavy Water Reactors,
BWR - Boiling Water Reactors,
E – Estimates

⁽¹⁾ - Data as on 30 June, 2016

POWER

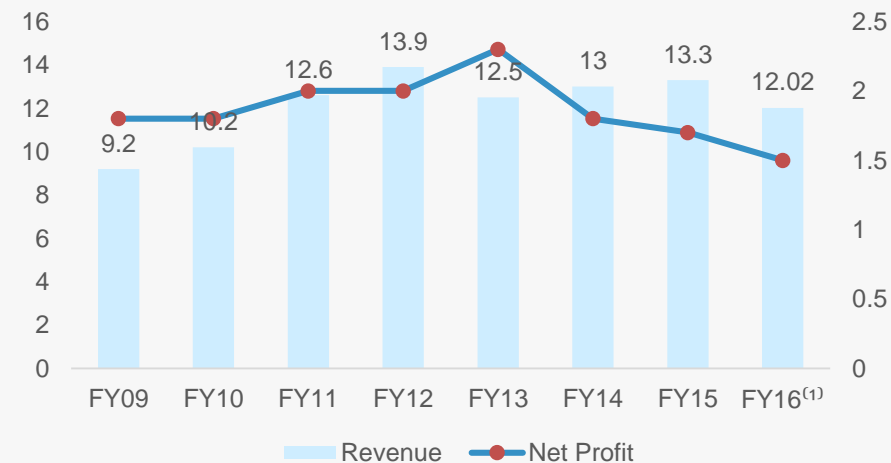


SUCCESS STORIES

NTPC: A PUBLIC SECTOR SUCCESS ... (1/3)

- * During FY09–15, NTPC’s sales increased at a CAGR of 6.3 per cent; CAGR in profits was 6.3 per cent during FY 09 - 13
- * As on 31. 03. 2015, NTPC accounted for 16 per cent of the country’s capacity, though it contributed 25 per cent of total power generation
- * As of June 6, 2016, the company had an installed capacity of 47.17 GW, and is aiming to attain a capacity of 128 GW by 2032
- * As of 2016, 24 GW of additional capacity is under construction
- * The company plans to set up an 800-MW advanced ultra supercritical plant, a first-of-its-kind in India
- * During FY15, 1290 MW of power generation capacity was commissioned, while 2255 MW of capacity was commissioned during FY16
- * In FY16, with an investment of USD2.37 billion, 2360 MW capacity has been approved for NP Kunta Ultra Mega Solar PV Project, Mandsaur Solar PV Project, Bhadla Solar PV Project and coal based project.

Revenues and net profit (USD billion)

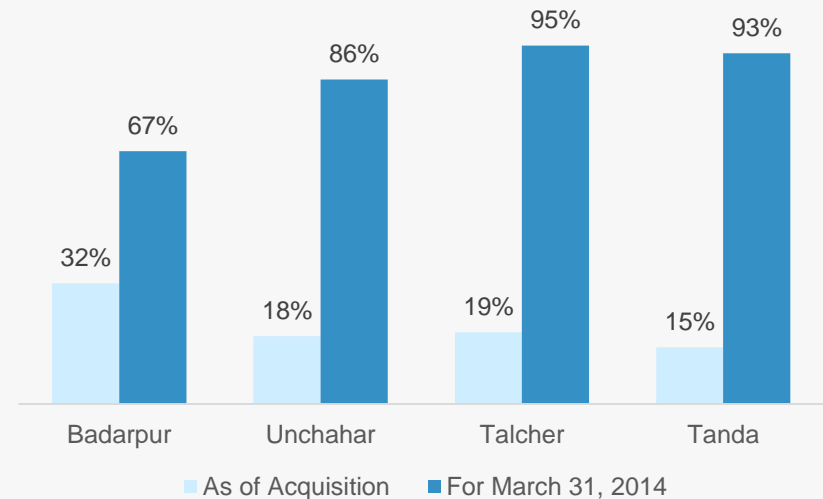


Source: NTPC website, Annual Reports, Economic Times, TechSci Research
 Notes: CAGR - Compound Annual Growth Rate, MW – Megawatt, ⁽¹⁾ Decline due to negative translation effect, Data upto 31st March 2016

NTPC: A PUBLIC SECTOR SUCCESS ... (2/3)

- * NTPC has taken over and successfully turned around numerous sub-optimally performing stations
- * High operational efficiency (indicated by plant load factor and availability factor) is NTPC's trademark
- * It is a pioneer in high-efficiency supercritical and ultra supercritical coal-bed power plants in India
- * NTPC has formulated a business plan for capacity addition of around 1,000 MW through renewable resources by 2017
- * As on 9 May 2016, NTPC commissioned 9 solar PV projects (Renewable energy projects) with an installed capacity of 310 MW.
- * As on August 2015, the company had commissioned its first hydro project at Koldam
- * In FY16, NTPC coal stations achieved highest PLF amongst Central, State and Private Sector, accounting for PLF value of 78.61 per cent
- * In terms of PLF, top 3 power stations in the country belong to NTPC which includes Talcher Thermal - PLF 93.15 per cent, Singrauli - PLF 92.61 per cent and Talcher-Kaniha - PLF 90.95 per cent

Impact of NTPC takeover of sub-optimal plants (PLF)

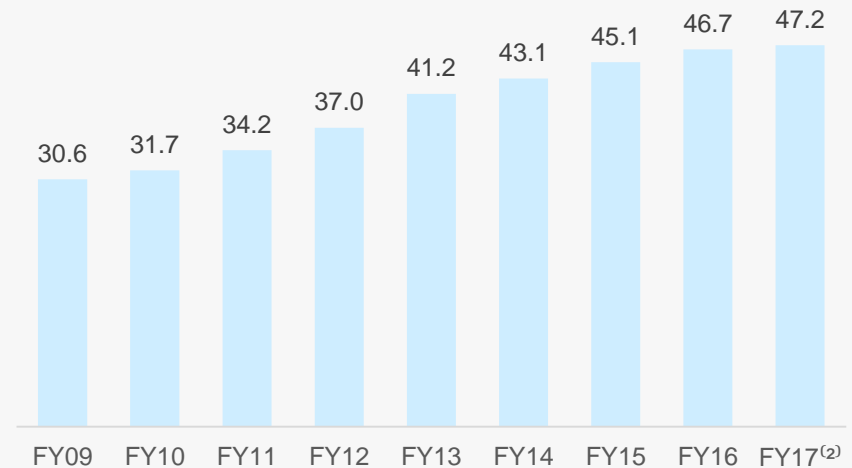


Source: NTPC website, Annual Reports, TechSci Research
Notes: PLF - Plant Load Factor, MW - Megawatt

NTPC: A PUBLIC SECTOR SUCCESS ... (3/3)

- * Capacity addition at a CAGR of 17.7 per cent during 1982–2015
- * Highest ever capacity addition of 43.05 GW during FY15. Average annual capacity addition of approximately 21 GW required till 2017
- * 26 per cent of the existing capacity needs to be added by FY17 to achieve 8 per cent GDP growth
- * As of 2015, the company's total installed power generation capacity stood at 45.05 GW
- * As of 2016, the total installed power generation capacity of the company stood at 47.17 GW
- * By March 2017, the state owned company is targeting to attain 50,000 MW installed power generation capacity

NTPC: Generation capacity over the years (GW)



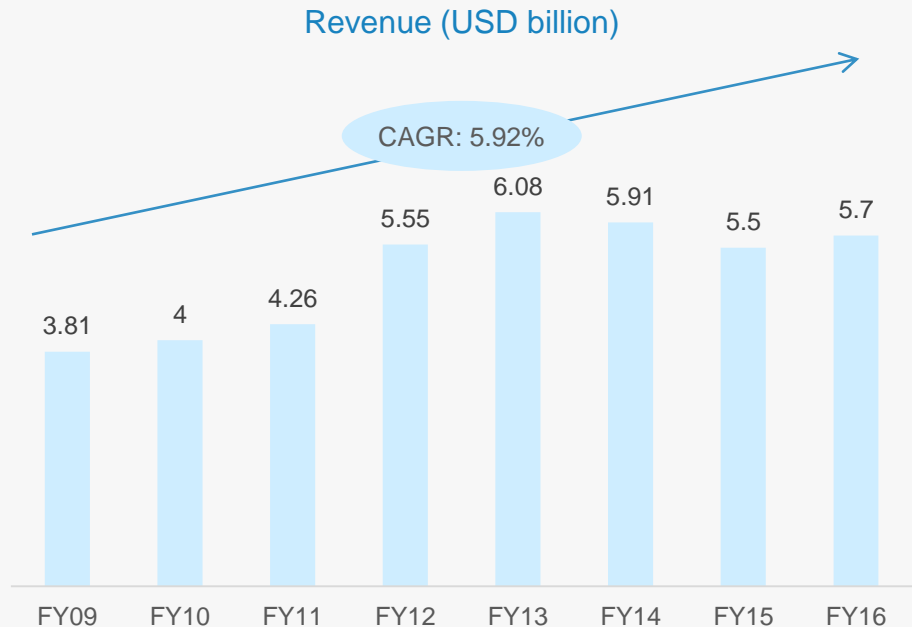
Source: NTPC website, Annual Reports, Economic Times, TechSci Research
Notes: PLF - Plant Load Factor, GW – Gigawatt

⁽¹⁾Data is for April-August 2015

⁽²⁾Data as on 4th May 2016

TATA POWER: SURGING AHEAD IN THE PRIVATE SECTOR ... (1/2)

- * During FY09–16, Tata Power’s revenues increased at a CAGR of 5.92 per cent, with the revenues for FY16 reaching to USD5.7 billion
- * 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 first 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 recently acquired stakes in two Australian companies in the sector
- * Tata Power’s defense engineering unit is planning to invest around USD83.3 million in Vemagal, Kolar district.

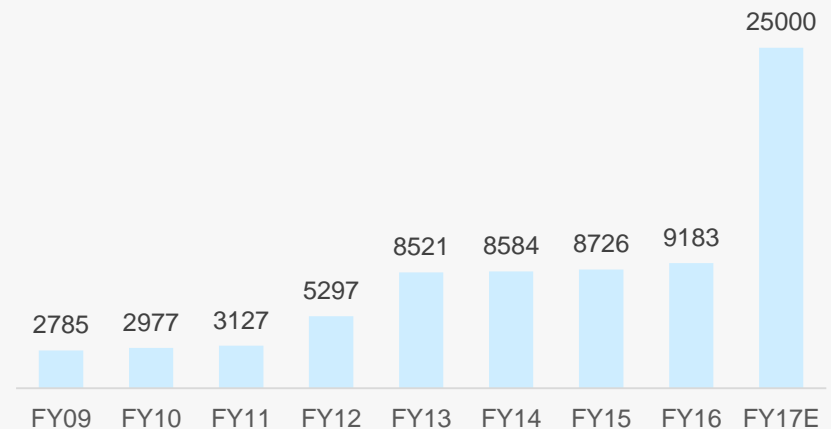


Source: Company website, Annual Reports, Economic Times, TechSci Research
Notes: MW - Megawatt

TATA POWER: SURGING AHEAD IN THE PRIVATE SECTOR ... (2/2)

- * The company estimates its installed capacity to expand fivefold in the next five 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 FY16, the company has an installed capacity of 9,183 MW
- * In comparison to FY15, the company's generation capacity increased by 5 per cent in FY16
- * The company being first independent power producer in India has been awarded with OHSAS 18001:2007 certification for its wind operations

Installed capacity in Mega Watts (MW)



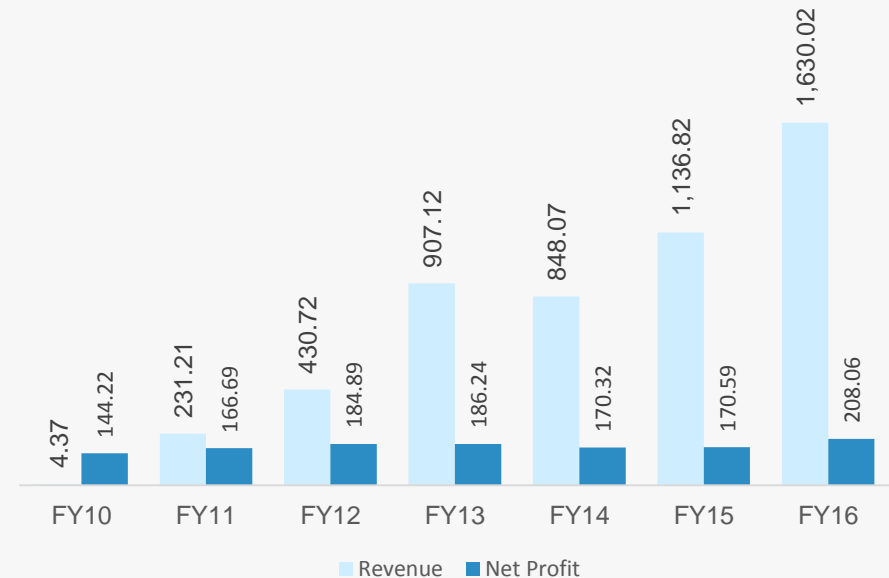
Source: Company website, Company Presentation, FY17 Estimates

Notes: MW - Megawatt, CAGR - Compounded Annual Growth Rate

RELIANCE POWER: ON A GROWTH TRAJECTORY ... (1/2)

- * Reliance Power has 6 GW of operational capacity and approximately 15 GW under implementation
- * It won three of the four Ultra Mega Power Projects (UMPPs) awarded by Government of India so far. These three projects are located in Sasan (Madhya Pradesh), Krishnapatnam (Andhra Pradesh), and Talaiya (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

Revenues and net profit (USD million)



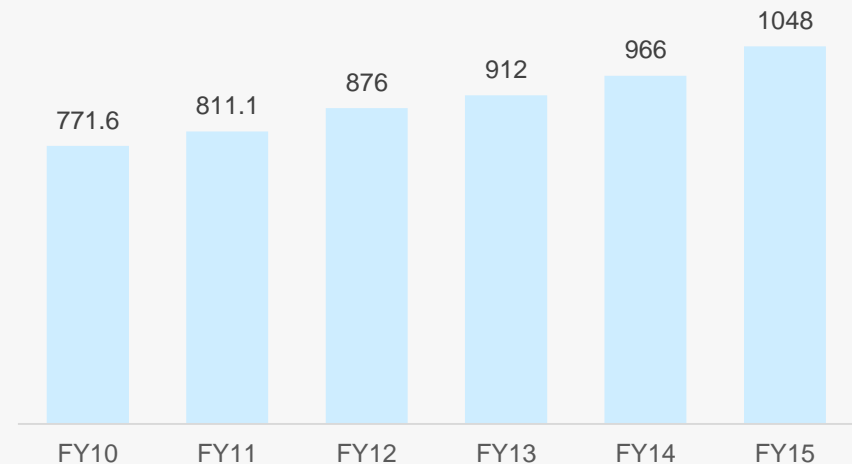
Source: Reliance Power website, Annual Reports, TechSci Research

Notes: -Decline due to negative translation effect, MW – Megawatt, MTPA - Million Tonnes Per Annum

RELIANCE POWER: ON A GROWTH TRAJECTORY ... (2/2)

- * 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, 3 Coal based projects with capacity 5,760 MW, 2 Solar projects with capacity 140 MW, 1 Wind and Coal blocks projects each with capacities 45 MW and 20 MTPA respectively have started production

Generating capacity (billion units)



Source: Reliance Power website, Corporate Presentation, Annual Reports, TechSci Research
Notes: MW - Megawatt, E - Estimate

POWER



USEFUL INFORMATION

INDUSTRY ASSOCIATIONS ... (1/2)

Council of Power Utilities

A-2/158, Janakpuri, New Delhi-110058, India

Tel: 91 11 25618472, 45652708

Fax: 25611622

E-mail: cvjvarma@gmail.com, cvjv1933@yahoo.com

Web site: www.indiapower.org

Hydro Power Association (India)

Flat no 6, Green Park Apartment, Shriram Society, Warje,
Pune - 411058, Maharashtra, India

Tel: 91 20 25233338

E-mail: hypaindia@gmail.com, president@hpaindia.org,
secretary@hpaindia.org

Website: <http://hpaindia.org/>

Bureau of Energy Efficiency (BEE)

Ministry of Power, 4th Floor, SEWA Bhawan, R. K. Puram,
New Delhi – 110066, India

Tel: 91 11 26179699

Fax: 91 11 26178352

E-mail: webmanager-bee@nic.in

Website: <http://www.beeindia.in/>

INDUSTRY ASSOCIATIONS ... (2/2)

Indian Wind Energy Association (INWEA)

PHD House, 3rd Floor, Opp. Asian Games Village, August

Kranti Marg, New Delhi-110016, India

Tel: 91 11 26523042

E-mail: manish@inwea.org

Web site: <http://www.inwea.org/>

- * **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
- * **M&A:** Merger and Acquisition
- * **MW:** Megawatt
- * **NBFC:** Non-Banking Financial Company
- * **PE:** Private Equity
- * **PLF:** Plant Load Factor
- * **R&D:** Research and Development

- * **R-APDRP:** Restructured Accelerated Power Development and Reform Programme
- * **T&D:** Transmission and Distribution
- * **TWh:** Terawatt-Hour
- * **RGVY:** Rajiv Gandhi Grameen Vidyutikaran Yojana
- * **USD:** US Dollar
- * Wherever applicable, numbers have been rounded off to the nearest whole number

EXCHANGE RATES

Exchange rates (Fiscal Year)

Year	INR equivalent of one USD
2004-05	44.81
2005-06	44.14
2006-07	45.14
2007-08	40.27
2008-09	46.14
2009-10	47.42
2010-11	45.62
2011-12	46.88
2012-13	54.31
2013-14	60.28
2014-15	61.06
2015-16	65.46
2016-2017E	66.95

Exchange rates (Calendar Year)

Year	INR equivalent of one USD
2005	43.98
2006	45.18
2007	41.34
2008	43.62
2009	48.42
2010	45.72
2011	46.85
2012	53.46
2013	58.44
2014	61.03
2015	64.15
2016 (Expected)	67.22

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