What are the chances of meeting 1.5°C?
Coal production/consumption by region
Million tonnes oil equivalent

Production by region

Consumption by region

Asia Pacific
Africa
Middle East
CIS
Europe
S. & Cent. America
North America
Gas production/consumption by region
Billion cubic metres
Oil production/consumption by region
Million barrels daily

Production by region

Consumption by region
Renewable energy consumption/share of power by region

Other renewables consumption by region
Million tonnes oil equivalent

Other renewables share of power generation by region
Percentage

- Asia Pacific
- Africa
- Middle East
- CIS
- Europe
- S. & Cent. America
- North America

Graph showing the consumption and share of power generation by region, with data points and lines for each region.
India does not need any more coal-based power units till 2027: Central Electricity Authority

The country's peak power demand at the end of the financial year 2021-22 will be 235 giga watt (GW), down 17% from the estimate made in 2012, the Central Electricity Authority (CEA) has said.

By: Sumit Jha | New Delhi | Published: January 16, 2017 6:15 AM

The toned down demand forecast will also make it easier for the country to meet the multilateral obligation to reduce its carbon footprint or emission intensity of the gross domestic product. (Reuters)

The country's peak power demand at the end of the financial year 2021-22 will be 235 giga watt (GW), down 17% from the estimate made in 2012, the Central Electricity Authority (CEA) has said. With this revision, taking into account the lower-than-estimated economic growth in the five years to March 31 2017, the CEA reckons that the country wouldn't need any more coal-based power stations, other than the 59-GW under-construction capacity, till 2027.
PLF of coal & lignite plants
TREND 1

Falling cost of renewable energy and energy storage
Solar PV CAPEX reduction (@20% annually)

<table>
<thead>
<tr>
<th>Year</th>
<th>CAPEX (US$ million/MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-11</td>
<td>2.6</td>
</tr>
<tr>
<td>2012-13</td>
<td>2.2</td>
</tr>
<tr>
<td>2013-14</td>
<td>1.2</td>
</tr>
<tr>
<td>2014-15</td>
<td>1.1</td>
</tr>
<tr>
<td>2015-16</td>
<td>0.9</td>
</tr>
<tr>
<td>2016-17</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Solar & wind power tariff reductions

- Onshore Wind tariff: 2014 = 6.5 (US Cents/kWh), 2018 = 3.7
Renewables installation (@18.7% annually)
In 2016 onsite solar PV became viable for commercial and industrial customers in most states.
Projected cost reduction in Lithium ion-based storage technology

India’s first grid-scale battery storage commissioned in 2017
TREND 2

The factor X
Energy efficient buildings, appliances & industries

- Improvement in efficiency of appliances
- Mandatory rating of appliances and minimum energy efficiency standards (BEE’s star rating programme)
- Mandatory energy efficiency building codes for commercial buildings; voluntary for residential
- Mandatory energy efficiency standards for industries and trade in efficiency certificates – PAT Scheme
Energy Efficiency - Lighting

60 Watt VS 7 Watt
1980s: Ceiling Fans consumed 150 Watt

2015: Most efficient Ceiling Fans Consume only 28 Watt

Energy Efficiency - Fans
Energy Efficiency - TV

1980: 24 inch CRT TV
150 watt

VS

Energy Efficient LED TV
24 watt
Energy Efficiency Ratio for AC have increased from less than 1 BTU/W in early 1990 to the most efficient AC today of ratio of 7.0 BTU/W and above.

Energy Efficiency – Room ACs
1980’s fridge with freezer on top
1200 units/year

An efficient fridge 200-300 litres
200 units/year

Energy Efficiency - Fridges
Growth in LED market: $75 million to $1.75 billion in 6 years
TREND 3

Electricity as the primemover
Replacing direct fossil fuel use with electricity

Today electricity can practically replace fossil fuels in all uses except in some industrial production like cement and transport like airplanes & cargo ships

(Draft) National Auto Policy, 2018 -- roadmap for reduction in CO2 emissions through CAFE regulations and taxation based on congestion and emissions – Big boost to electricity mobility

Autonomous move towards electricity for cooking
Mainstreaming of electric vehicles

Note: 2DS = 2°C Scenario; 4DS = 4°C Scenario.
Electricity for cooking

<table>
<thead>
<tr>
<th></th>
<th>LPG</th>
<th>Electric coil</th>
<th>Induction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency (%)</td>
<td>40</td>
<td>74</td>
<td>84</td>
</tr>
<tr>
<td>Cost of heating 10 lts water (US Cents)</td>
<td>17</td>
<td>9</td>
<td>8.5</td>
</tr>
</tbody>
</table>

Do we need to build pipe infrastructure to supply cooking gas when we already have grid to supply electricity?
TREND 4

SMART GRID
A co-benefit agenda: Reduce T&D losses; improve quality

- Bi-directional (23 states with net metering policy)
- Open access
- Smart meters (Feeder, distribution transformers and large consumers)
- Battery storage (grid stability)
TREND 5

Public demand to improve air quality
Air pollution cost India 8.5% of its GDP in 2013: study

A World Bank study shows that worker and sick labour income lost due to air pollution amounted to 8.5% of India’s GDP in 2013.

New Delhi: Measures to address air pollution are often considered to be economic spoilers as they entail putting restrictions on economic activity such as limiting a polluting factory or scrapping old vehicles. What is not taken into account while making these calculations is the...
65% Freshwater withdrawal
60% PM emissions
45-50% SO₂ Emissions
30% NOₓ Emissions
80% Hg Emissions

New pollution standards to be met by 2022
Joining the dots

Energy-mix in power sector
Installed capacity: March, 2018 (344 GW)
175 GW of renewable power by 2022

40% non-fossil fuels in electricity mix by 2030 – India’s INDC

- Solar: 100,000 MW (40,000 MW Solar Rooftop)
- Wind: 60,000 MW
- Biomass: 10,000 MW
- Small Hydro (≤25 MW capacity): 5,000 MW
Cumulative Renewable Energy Capacity (MW)

Target for 2022 – 175,000 MW

110,000

25,000

15,000

70,000

- Tendered
- Under process
- Installed

0

2018
Projected installed capacity: March 2027 (640 GW)

Source: CEA, 2016
Projected installed capacity: March 2032 (772 GW)

Source: CSE, 2017
Will India need new coal power plants post 2032?

Between 2018-32, India will add 428 GW of electricity generation capacity. This would comprise of 66 GW of fossil fuel capacity and 362 GW of non-fossil fuel capacity (including 280 GW from solar and wind).

2032 would be a renewable energy world. Between 2018 and 2032, for every 1 MW of coal capacity addition, 6 MW of RE would be added.
By 2025, renewables with storage will be viable for most high paying consumers.

Additional Rs. 5/kWh for storage

By 2030, solar and wind with energy storage would become viable for both utility scale and small scale systems.
Coal-based power capacity would peak at 248 GW by 2027
Peak coal consumption would reach 1.0 billion tonnes by 2032 (@80% PLF)
And, if we retire coal plants at the age of 30 years, coal based plants can be phased out between 2050-60.
Rapid and deep decarbonisation

• Weak mitigation actions in near-term will lead to higher impacts and greater long term mitigation and adaptation challenges.

• It is not recommended for countries to pursue an overshoot pathway and instead focus on pathways that are consistent with deeper GHG emissions reductions until 2030.

• There are huge co-benefits to the economy of limiting warming to 1.5°C, which includes keeping millions of people out of poverty.
Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)

Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.
Can the Paris Agreement and the UNFCCC process deliver on 1.5°C?
“There is high agreement that current NDC emission levels are not in line with pathways that limit warming to 1.5°C by the end of the century” (SR15 Chapter 4, Box 11)
What is plan B?
Plan B

• Keeping global warming within 1.5°C is very difficult. Still, the world must set its goal to limit warming to 1.5°C and not 2.0°C

• For Paris Agreement to remain relevant, countries must revise their NDC targets by 2020.

• Action on all fossil fuels is a must

• A UNFCCC-plus approach is needed: Climate efforts cannot be restrictive to the UNFCCC and the Paris Agreement. The world needs to think and devise more forums and venues to address climate change.