Green India, Getting it Right

Pre-read for public webcast on May 19
Global installed power capacity (2017)

- **Americas**: 1,611 GW
- **APAC**: 3,043 GW
- **EMEA**: 1,862 GW

**Total Installed Capacity**: 6,516 GW

Source: BNEF capacity & generation; IEA – global energy & Co2 report
Global electricity demand increased by 4% in 2018

Change in electricity generation by source 2017-2018 (in Twh)

Renewables met half of the increased demand (993 Twh)

Renewables: 449 Twh
Coal: 258 Twh
Gas: 236 Twh
Nuclear: 87 Twh
Oil: -37 Twh

Source: IEA – global energy & Co2 report
Still ~860m people dream access to electricity (2018)

India achieved 100% village electrification in 2018

Source: IEA
Fossils dominated electricity generation (2018)

- Coal – 38%
- Gas – 23%
- Oil – 4%
- Nuclear – 10%
- Hydro – 16%
- Renewables (all) – 9%

26,700 TWh Electricity produced

Source: IEA – global energy & Co2 report
But burning fossils impacted adversely...
2019 global $\text{CO}_2$ emission 33.3 Gt

Power sector of advanced economies constitutes 36% of Energy related emissions

1.7% emission growth in 2018, highest since 2013

Source: IEA - emissions
This is leading to……

Polluted environment

Global warming
India has 6 of 10 most polluted cities (2019)

- Ghaziabad, India: 110.2
- Hotan, China: 110.1
- Gujranwala, Pakistan: 105.3
- Faisalabad, Pakistan: 104.6
- Delhi, India: 98.6
- Noida, India: 97.7
- Gurugram, India: 93.1
- Raiwind, Pakistan: 92.2
- Greater Noida, India: 91.3
- Bandhwari, India: 90.5

Source: IQAir
Global warming implications

19 of hottest 20 years occurred in last 2 decades

$320b global loss (2017)

140m climate migrants (2050)

Source: New climate economy 2018 report; NASA data
What is the solution?
Transformation to cleaner tomorrow
By implementing renewables........
Global installed RE (2019)

2,537 GW
Installed capacity

Americas 628 GW
APAC 1,159 GW
EMEA 750 GW

Source: IRENA – Renewable capacity highlights
RE tariff surpassed conventional energy globally

LCOE Global Average
US $/MWh

Source: Lazard LCOE Analysis
India’s Paris commitment - 2030

40% non fossil fuel share in electricity generation

35% reduction in emission intensity from 2005 level
"We must accept that if we have to overcome a serious challenge like climate change, then what we are doing at the moment is just not enough..... The time for talking is over. The world needs to act now....."

Source: various articles, reports, industry information; assumptions
International Solar Alliance

Collaborative platform of 122 Sun belt countries promoting solar energy for:
- enhanced energy security
- Achieve sustainable development

“"We have a dream One World, One Sun One Grid. We generate round the clock electricity from Sun as it sets in one part of the world but rises in another part. Sun never sets for entire earth,””

Sri Narendra Modi at first assembly of ISA
India’s has \(~87\)GW of installed RE capacity

RE accounts for 23.5% of installed capacity

Source: National power portal
$315\text{b}$ expected investment in RE sector by 2030

$290\text{b}$ + $25\text{b}$

Source: Estimate
<table>
<thead>
<tr>
<th>Bid</th>
<th>Transmission</th>
<th>Land</th>
<th>Financing</th>
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<tbody>
<tr>
<td>Non availability of quarterly bid plan</td>
<td>Transmission capacity &amp; RE project mismatch</td>
<td>Single Window clearance</td>
<td>Priority sector lending</td>
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<td>Tariff ceilings</td>
<td>Pending 66.5 GW of transmission bidding</td>
<td>Land ceiling in states</td>
<td>Access to foreign bonds</td>
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<td>Onerous financial charges on developer</td>
<td>New capacity plan for 450 GW RE connection</td>
<td>Policy for allocation of waste land</td>
<td>Timely DISCOM payments</td>
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</tbody>
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Source: Industry discussion
Essential technologies for 24x7 supply

Solar energy + Wind energy

Storage battery (ESS)
Exponential fall in storage battery price

Historic battery pack prices

Battery pack price (real 2018)
US $/kWh

1,160

Getting affordable

Forecast

Source: BNEF
2,850 GWh energy storage capacity (2040)

Investment in energy storage by 2040

$662 b

17 GWh

Source: BNEF
Power services to maximum utilize storage

2018

17 GWh

Power service: 96.5%
EV: 0.4%
Other: 3.1%

Source: BNEF

2040

2,850 GWh

Power service: 94.0%
EV: 6.0%

Source: BNEF
Second major transformation globally

- **Steam engine**
- **IC engine**
- **Diesel engine**
- **Hybrid car**

Timeline:
- 1769: Steam engine
- 1885: Diesel engine
- 1936: IC engine
- 1997: Hybrid car
- 2008: Modern EV’s
Top drivers of EV market (2030)

- China: 34%
- Europe: 25%
- USA: 20%
- India: 8%

Source: BNEF EV outlook 2019
EV benefits

- Environment friendly
- New job creation
- Low cost for drivers
Learnings from Indian RE sector

- Large RE vision
- Large scale projects
- Government backed PPAs
- Solar & Wind integration
- Solar park innovation
Thank You