RAJAGIRI CENTRE FOR BUSINESS STUDIES (RCBS)

AN OVERVIEW OF RENEWABLE ENERGY POLICY OF INDIA:

SPECIAL FOCUS ON NITI AAYOG, KARNATAKA, KERALA, TAMILNADU & TELANGANA

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RBS RAJAGIRI BUSINESS SCHOOL

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Grand Four Objectives!!

The existing national programmes and appropriate interventions.

“The initiatives such as Smart Cities, solar pumps mandate, using only the most efficient appliances”

100 Smart Cities

Housing for All by 2022

Power for All by 2022

175 GW of renewable energy by 2022

National Energy Policy (NEP)

Universal electrification is to be achieved, with 24x7 electricity by 2022

Share of non-fossil fuel based capacity in the electricity mix is aimed at above 40% by 2030.

Reduction of oil imports by 10% by 2022

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By 2040, energy demand to be brought down over the default scenario by 17%

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NDCs target at reduction of emissions intensity by 33%-35% by 2030

Achieving a 175 GW renewable energy capacity by 2022

Energy Policy Highlights

Four key objectives of NITI Aayog energy policy

The energy demand of India is likely to go up by 2.7-3.2 times between 2012 and 2040.

1. Access at affordable prices
2. Improved security and Independence
3. Greater Sustainability
4. Economic Growth

Actual energy consumption in 2012 and projected consumption under alternative scenarios in major sectors in 2022 and 2040

Sectors	2012	2022		2040	
TWh		BAU	Ambitious	BAU	Ambitious
Buildings	238	568	525	1769	1460
Industry	2367	4010	3600	8764	7266
Transport	929	1736	1628	3828	3243
Pumps& Tractors	237	423	388	728	592
Telecom	83	131	124	207	164
Cooking	1072	829	684	524	467
Total	4926	7697	6949	15820	13192
% reduction in energy demand in 2040	17%				

National Energy Policy (NEP) I

Planned Interventions

(i) Classify Consumption by businesses, households, transportation and agriculture

(ii) Energy Efficiency/de-carbonisation measures on the demand side

(iii) Production and distribution of coal

(iv) Electricity generation, transmission and distribution

(v) Augmenting supply of oil and gas, both by domestic E&P, and through acquisition of overseas acreages

(vi) Refining and distribution of oil and gas.

(vii) Installation, generation and distribution of renewable energy

Financing will continue to pose a challenge to the Indian electricity sector. As per IEA, the Indian energy sector will require an investment upwards of $3.6 trillion between 2015 and 2040.

A near $150 billion capital investment is needed in energy sector on an annual basis until 2040 (IEA).

The role of external commercial borrowing (ECB) is well recognized

The Government will encourage adoption of imaginative tools such as e xtended debt tenure, VGF, tolling, and dollar denominated returns to attr act private capital to the energy infrastructure sector.

Estimated electricity generation from renewables in years 2021-22 and 2026-27

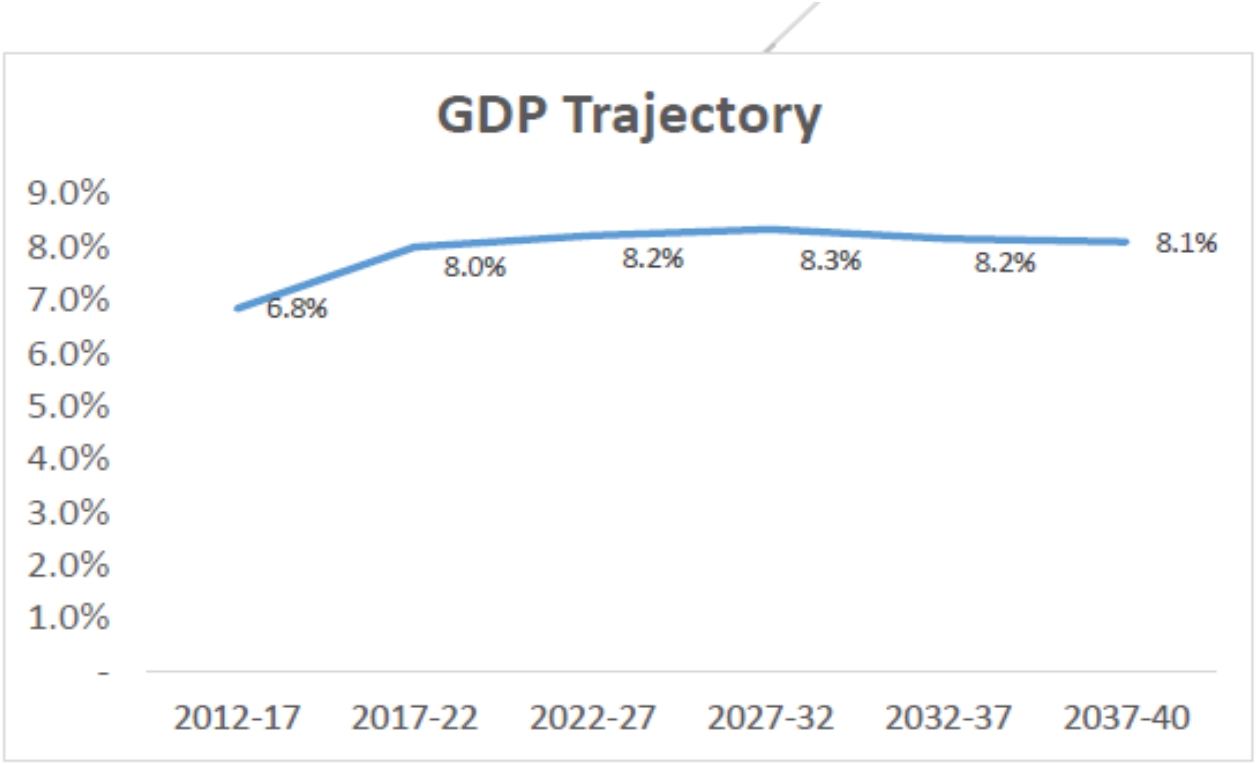
Year	Installed capacity of renewables	Expected generation (billion kWh)					Total energy requirement (billion kWh)	Contribution of renewables to total energy demand %
		Solar	Wind	Biomass	SHP	Total		
2021-22	175 GW	162	112	38	15	327	1611	20.3
2026-27	275 GW	243	188	64	21	516	2132	24.2

	Indian States	Estimated Solar Potential (GW)	Installed Solar Capacity As on December 2018 (GW)	Percentage of Total Potential	2022 Target (GW)
1	Rajasthan	142.31	3.081	2.16 %	7
2	Jammu & Kashmir	111.05	0.001	0.00009 %	23
3	Maharashtra	64.32	1.311	2.03 %	11.92
4	Madhya Pradesh	61.66	1.526	2.47 %	5.68
5	Andhra Pradesh	38.44	2.829	7.36 %	9.83
6	Gujarat	35.77	1.607	4.45 %	8
7	Himachal Pradesh	33.84	0.00148	0.004 %	0.77
8	Orissa	25.78	0.07951	0.005 %	2.38
9	Karnataka	24.70	5.328 (Rank 1)	21.57 %	6
10	Uttar Pradesh	22.83	0.875	3.83 %	10.7
11	Telangana	20.41	3.501 (Rank 2)	17.15 %	6
14	Tamil Nadu	17.67	2.055 (Rank 4)	11.63 %	8.89
23	Kerala	6.11	0.12	1.96 %	1.87
31	**Total**	**748.98**	**24.33**	**3.2 %**	**100**

The key Objectives of the EV Policy

1. Reduce primary oil consumption in transportation.
2. Facilitate customer adoption of electric and clean energy vehicles.
3. Encourage cutting edge technology in India through adoption, adaptation, and research and development.
4. Improve transportation used by the common man for personal and goods transportation.
5. Reduce pollution in cities.
6. Create EV manufacturing capacity that is of global scale and competitiveness.
7. Facilitate employment growth in a sun-rise sector.

Indian Projected GDP Growth



National Mission for Electric Mobility Targets:

- Sales of 6-7million units of new xEV vehicles by 2020
- Savings of 2.2- 2.5 mn tonnes of fuel
- investment upwards of $3.6 trillion between 2015 and 2040 (IEA)
- 46-52% of the power capacity being solar and wind dominated
- A near $150 billion capital investment/year
- 100 GW of installed solar energy by 2022, and 1 million full-time equivalent jobs

Overseas Energy Strategy

- Accessing latest technology
- Overland energy supplies through pipelines and transmission lines
- Leveraging our large buying position to influence energy markets
- Playing a lead position in international energy organisations
- Climate policy diplomacy to protect our energy strategy
- Collaborating in large international consortia based research.

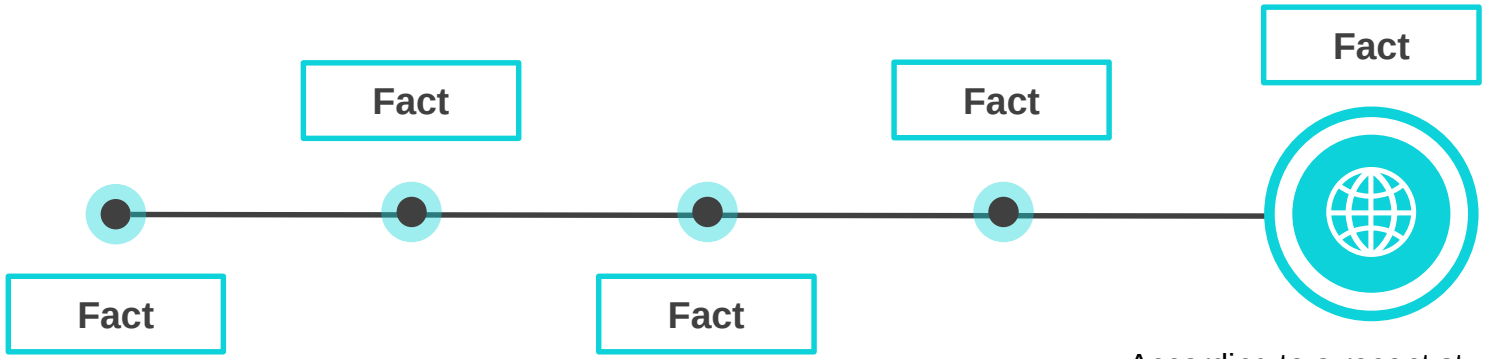
Based on the last six years of sales data, the vehicles on Indian roads are estimated to consist of

1. Two-wheelers: 79% of the total number of vehicles.
2. Three-wheelers (passenger and goods), including tempos: 4% of the total number of vehicles.
3. Buses and large goods vehicles like trucks: 3% of the total number of vehicles.
4. Economy four-wheelers (cars costing less than ₹1 million): 12% of the total number of vehicles.
5. Premium four-wheelers (cars costing higher than ₹1 million): 2% of the total number of vehicles.

MAKING EVS ECONOMICALLY VIABLE

India needs a minimum of 10 GWh of cells by 2022, which would need to be expanded to about 50 GWh by 2025.

Perhaps the most important task would be setting up of Lithium-ion battery recycling industry.



33 percent of all EV sales take place in only 14 cities where charging infrastructure is widespread and convenient to use.

prevalence in India of small vehicles such as two-wheelers, three-wheelers, economy four-wheelers and small good s vehicles is unique among large countries.

According to a recent study by WHO, India is home to 14 out of 20 most polluted cities in the world. Electric vehicles (EVs) can improve that scenario by reducing local concentrations of pollutants in cities

Ease of Doing Business

An Overview of India and Selected States

Place	Per Capita Income	GSDP (2018-19) (Billion)	GDP Ranking	Comparable country	Ease of doing business Rank (32)	HDI (2018) Rank	Population (2019) (Million)	Export share (17-18)
Andhra	$ 2,000	$130	7	Kuwait	1	20	54.164	2.8 %
Karnataka	$2,400	$200	3	Portugal	8	12	68.45	12.7 % (3^{rd})
Kerala	$2,300	$110	9	Qatar	21	1	37.66	1.7 % (13^{th})
Tamilnadu	$2,750	$260	2	Finland	15	6	82.08	11.5 % (4^{th})
Telangana	$2,500	$120	8	Kuwait	2	16	40.26	6.4 % (5th)
India	$1,626.98	$2.65 trillion	7th		77	130	1.37 billion	

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	States	Estimated Solar Potential
1	Rajasthan	142.31
2	Jammu & Kashmir	111.05
3	Maharashtra	64.32
4	Madhya Pradesh	61.66
5	Andhra Pradesh	38.44
6	Gujarat	35.77
7	Himachal Pradesh	33.84
8	Orissa	25.78
9	Karnataka	24.70
10	Uttar Pradesh	22.83
11	Telangana	20.41
12	Chhattisgarh	18.27
13	Jharkhand	18.18
14	Tamil Nadu	17.67
15	Uttarakhand	16.80

	States	Estimated Solar Potential
16	Assam	13.76
17	Bihar	11.20
18	Manipur	10.63
19	Mizoram	9.09
20	Arunachal Pradesh	8.65
21	Nagaland	7.29
22	West Bengal	6.26
23	Kerala	6.11
24	Meghalaya	5.86
25	Sikkim	4.94
26	Haryana	4.56
27	Punjab	2.81
28	Tripura	2.08
29	Delhi	2.05
30	Goa	0.88
31	Union Territories	0.79

Status on Potential, Current and Targeted Solar energy: Top States

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31	Total	748.98	24.33	3.2 %	100

Government Vision for the state

Infrastructure

Build infrastructure to boost productive potential of the economy.

Energy

Karnataka Solar Policy 2014-2021 plans to add solar generation of minimum 2,000 MW by 2021

Education

Develop the state as a vibrant knowledge society. Focus on job oriented growth through skill development of the workforce.

Industry

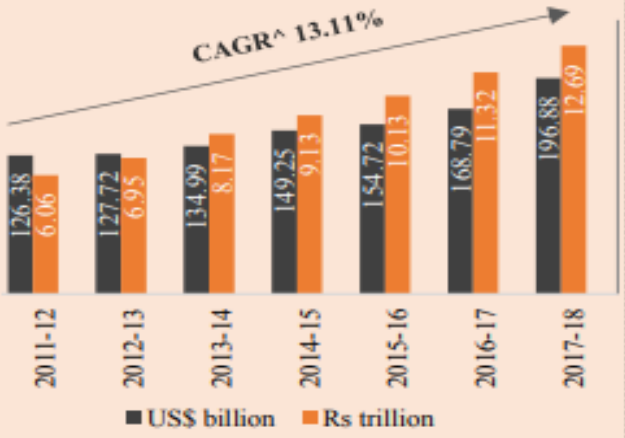
Build and sustain Bangalore's leadership in science, technology and knowledge based industries.
Achieve a sustainable and orderly process of industrialisation and urbanisation.

KARNATAKA

THE SILICON VALLEY OF INDIA

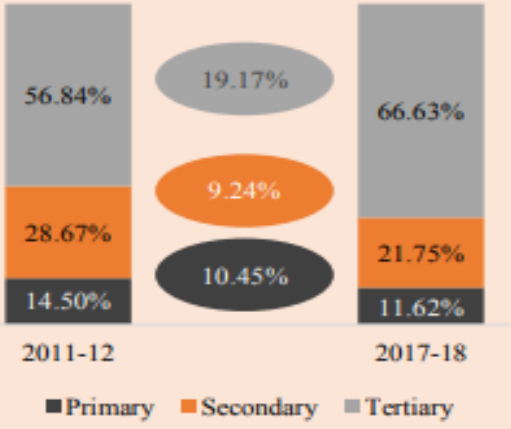
Economic Snapshot

GSDP of Karnataka at current prices

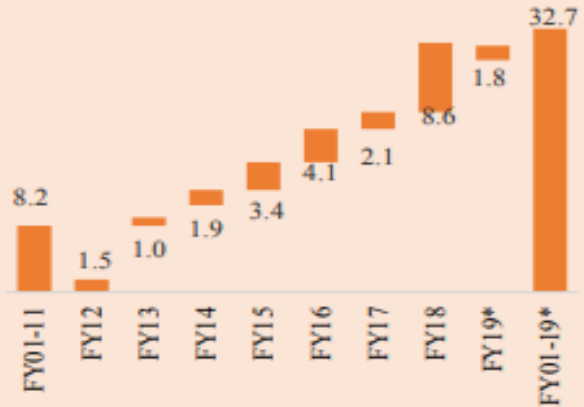


GSVA composition by sector

*CAGR^*



FDI inflows in Karnataka
April 2000 – June 2018 (US$ billion)



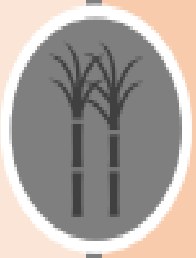
*Note: ^CAGR is in Rs terms, * - Upto June 2018*

Source: Directorate of Economics & Statistics of Karnataka, Central Statistics Office, Department of Industrial Policy & Promotion, Socio Economic Survey 2017-18, Aranca Research Sector-wise %share of GSDPμ -Karnataka Socio Economic Survey 2017-18, Directorate of Economics and Statistics, Government of Karnataka.

Advantages

Rich Talent Pool

- Termed as the Knowledge Capital of India.
- IT hub of India & home to the 4th largest technology cluster in the world.

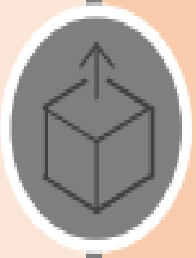


Significant agriculture base

- Sugarcane is the major crop of the state with production of about 31.5 million tonnes in 2017-18, as per the Advance Estimates.
- Third largest producer of plantation crops in the country.

Tourism

- Karnataka boasts of a diverse flora & fauna and a 320 km natural coast line.
- World heritage sites at Hampi & Pattadakal



Growing Exports

- Recorded exports of US$ 39.38 billion during 2017-18, up to September 2017.
- Sectors such as biotechnology, computer software and electronics are major contributors.

Karnataka Renewable Energy SCOPE

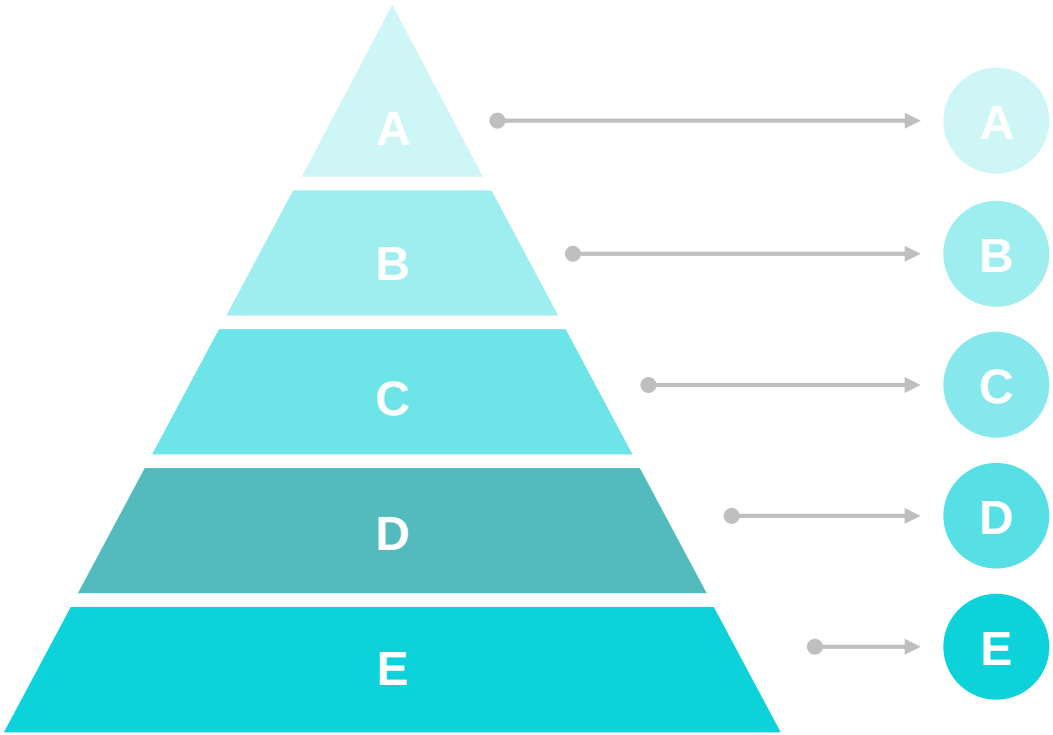
Solar Energy Policy: Technical Overview

Place	Installed Renewable Energy (GW)	Nodal Agency for Implementation	Regulatory Agency	Feed-in-Tarrif /kWh (INR)	Operative Period	Solar E Target 2022 (GW)
Karnataka	7.10	KREDL	KERC	3.74	2016-22	6
Kerala	2.89	ANERT	KSERC	3.90	2019-24	2.5
Tamilnadu	15.89	TEDA	TNERC	3.04		9
Telangana	5.03	Solar Policy Cell	TSERC	N/A	5 years	6
India	77.64	IREDA	MNRE	≈ 6.75		100

Solar Energy Policy: Technical Overview

Place	Ownership model 1	Ownership model 2	Ownership model 3	Eligibility	Net worth	Policy Initiatives
Karnataka	Feed in Tariff/ competitive bid based	Captive/ Group captive/ independent	REC Mechanism	Based in Karnataka	30 % of total project cost	Akshaya Shakti Nidhi
Kerala		CAPEX Model	RESCO Model			
Tamilnadu		Upfront ownership	Differed Ownership			SERF
Telangana						

Incentives offered in Solar Policy of Tamilnadu



Tax Exemption

Consumer category solar energy exempted from electricity tax for two years

Farming Support

Incentive schemes in the agricultural sector

Support Manufacturing

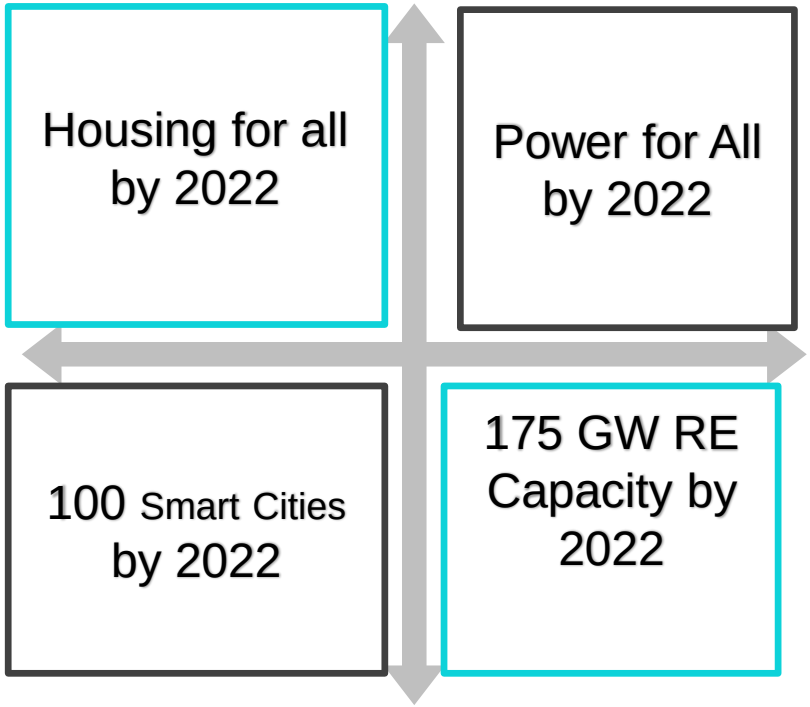
Promotes solar manufacturing solar cells, inverters, mounting structures and batteries. .

Land will be provided

Farming + Solar

Incentives for co-utilization of agricultural land for electricity generation

Scopes & Challenges



The population of India is assumed to grow from 1.2 billion in 2014 to 1.6 Billion in 2040

The urbanization rate, is assumed to increas e to 47% in 2040

Challenges

SCOPES

Investment upwards of $3.6 trillion between 2015 and 2040 (IEA)

A near $150 billion capital investment/year

.

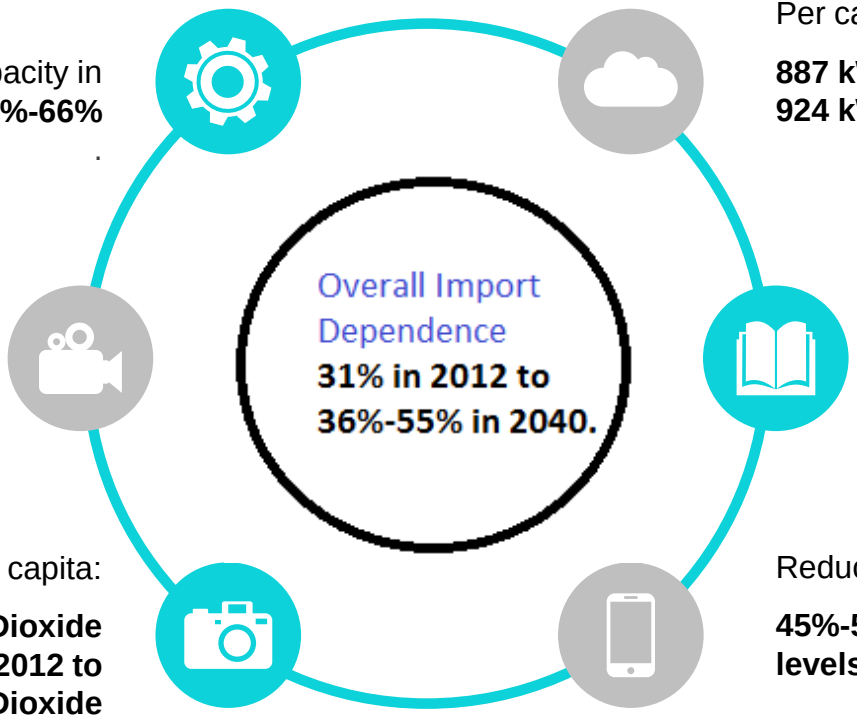
Key Takeaways & Implications

Share of non-fossil fuel based capacity in electricity: **57%-66%**
.

Per capita energy demand1: **503 kgoe/capita in 2012 to 1055-11 84 kgoe/capita in 2040**.

Energy related Emissions per capita:

1.2 tons of Carbon Dioxide Equivalent/capita in 2012 to 2.7-3.5 tons of Carbon Dioxide Equivalent/capita in 2040



Per capita electricity consumption

887 kWh in 2012 to 2911-2 924 kWh in 2040 .

CAGR of electricity supply

5.5% between 2012-2040

Reduction in emissions intensity

45%-53% by 2030 from 2005 levels.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THANK YOU
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