राष्ट्रीय ऊर्जा सुरक्षा परिदृश्य
INDIA ENERGY SECURITY SCENARIOS 2047

Taiwan
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DISCLAIMER

The presentation examines various energy demand and supply scenarios as developed through the IESS, 2047 tool, and in no way offers the Indian Government's energy strategy. This is merely meant to inform the range of options and implications thereof on several fronts. The numbers do not present the likely scenario or the Government's projections or choices regarding the energy pathway of the country.

Structure of the Presentation

India's Energy Status

India's Developmental Ambitions
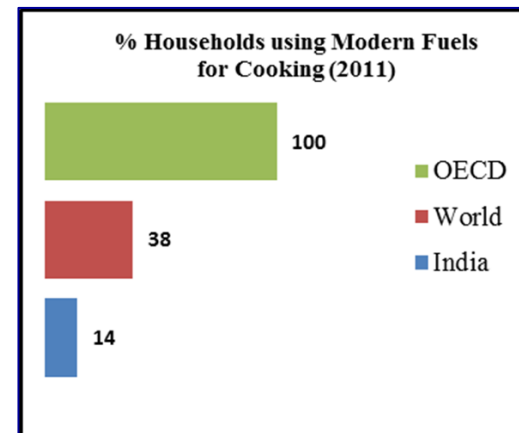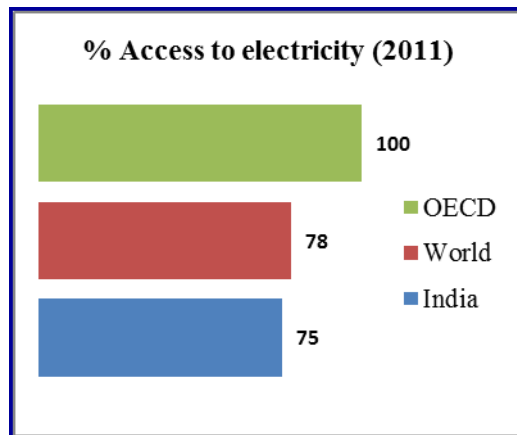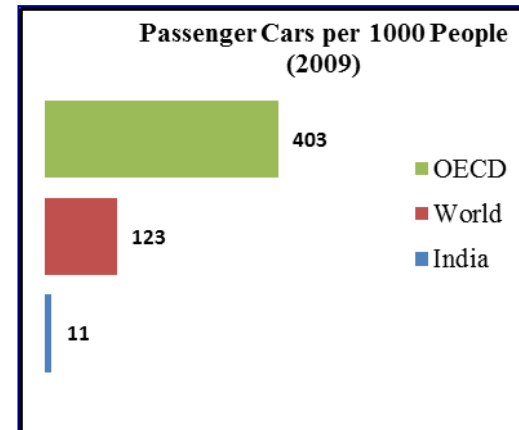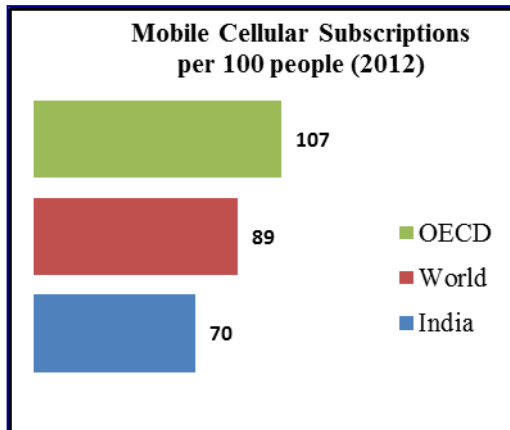
Energy Security Pathway(V-1).

Energy Security Pathway(V-2).

Grid Reliability and Climate Stress(V-2).

India's Development Indicators

Mobile Cellular Subscriptions per 100 people (2012)

- OECD: 107
- World: 89
- India: 70

Passenger Cars per 1000 People (2009)

- OECD: 403
- World: 123
- India: 11

% Access to electricity (2011)

- OECD: 100
- World: 78
- India: 75

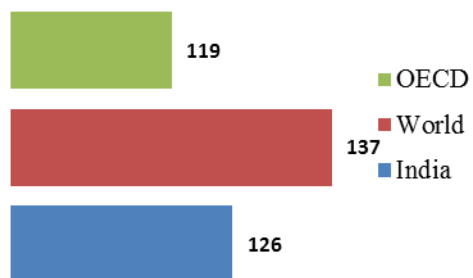**% Households using Modern Fuels for Cooking (2011)**

- OECD: 100
- World: 38
- India: 14

Source: World Bank

India's Energy Status

Energy Use(Kgoe) per 1000 $ GDP(PPP-constant 2011) (2011)
- OECD: 119
- World: 137
- India: 126

Electricity Consumption/Capita in Kwh (2010)
- OECD: 8173
- World: 3045
- India: 684
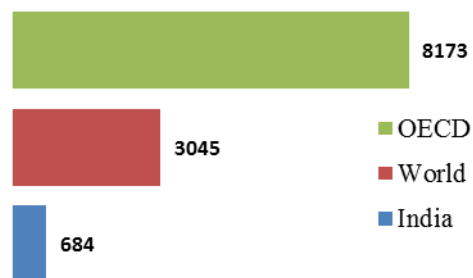
Energy Use per Capita Kgoe (2011)
- OECD: 4249
- World: 1890
- India: 614
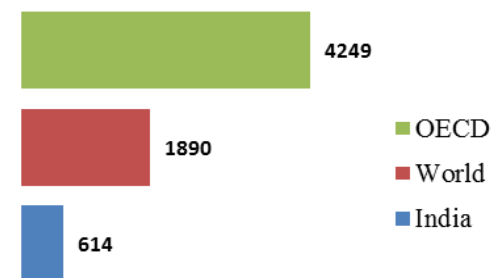
% Electricity from Fossils (2011)
- OECD: 61
- World: 67
- India: 79
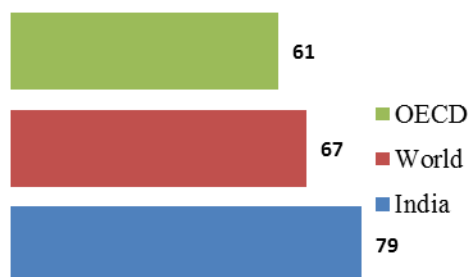
Energy Imports, net (% of energy use)(2011)
- OECD: 27
- World: 0
- India: 28
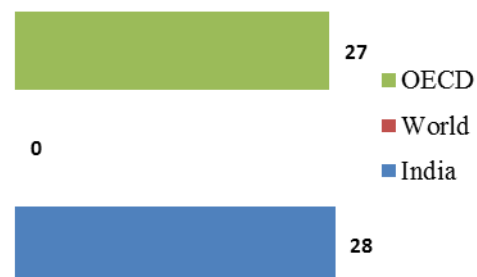
CO_2 Emissions per capita (2010)
- OECD: 10.2
- World: 4.9
- India: 1.7

Source: World Bank
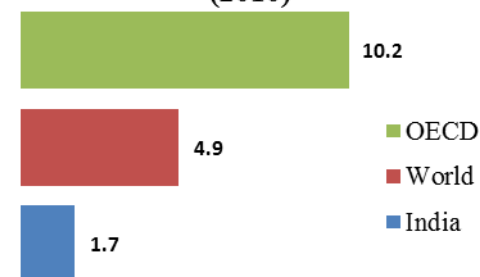
Energy and Low Carbon Strategy must support India's Developmental Goals

- Developmental Objectives can be met only at 7.4% CAGR in GDP from 2012-2047.

- Government committed to the following:
    - Affordable housing for all by 2022 (**Only 30% of the building stock in 2030, in existence in 2012**)
    - 24x7 power for all by 2019 (**Grid size to triple between 2012 and 2030**)
    - Modern Cooking Fuels for all by 2019 (**Nearly 800 million people use biomass for cooking**)
    - Share of manufacturing to rise from 16% to 25% of GDP by 2022.

India's Developmental Ambitions at 100 years of India's Independence (2047)

Population
- Well being of likely 1.7 billion people (2047)

Urbanization
- 30% in 2012
- 39% in 2047

GDP
- 7.4% CAGR from 2012-47

Manufacturing Share
- 16% in 2012
- 34% in 2047
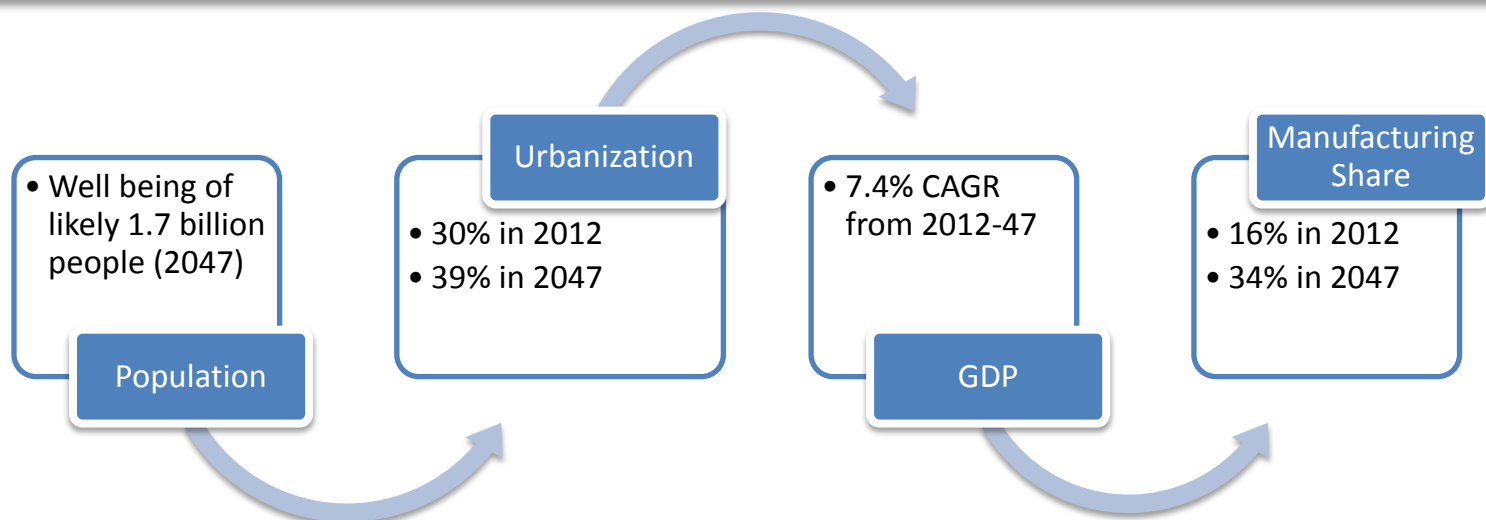
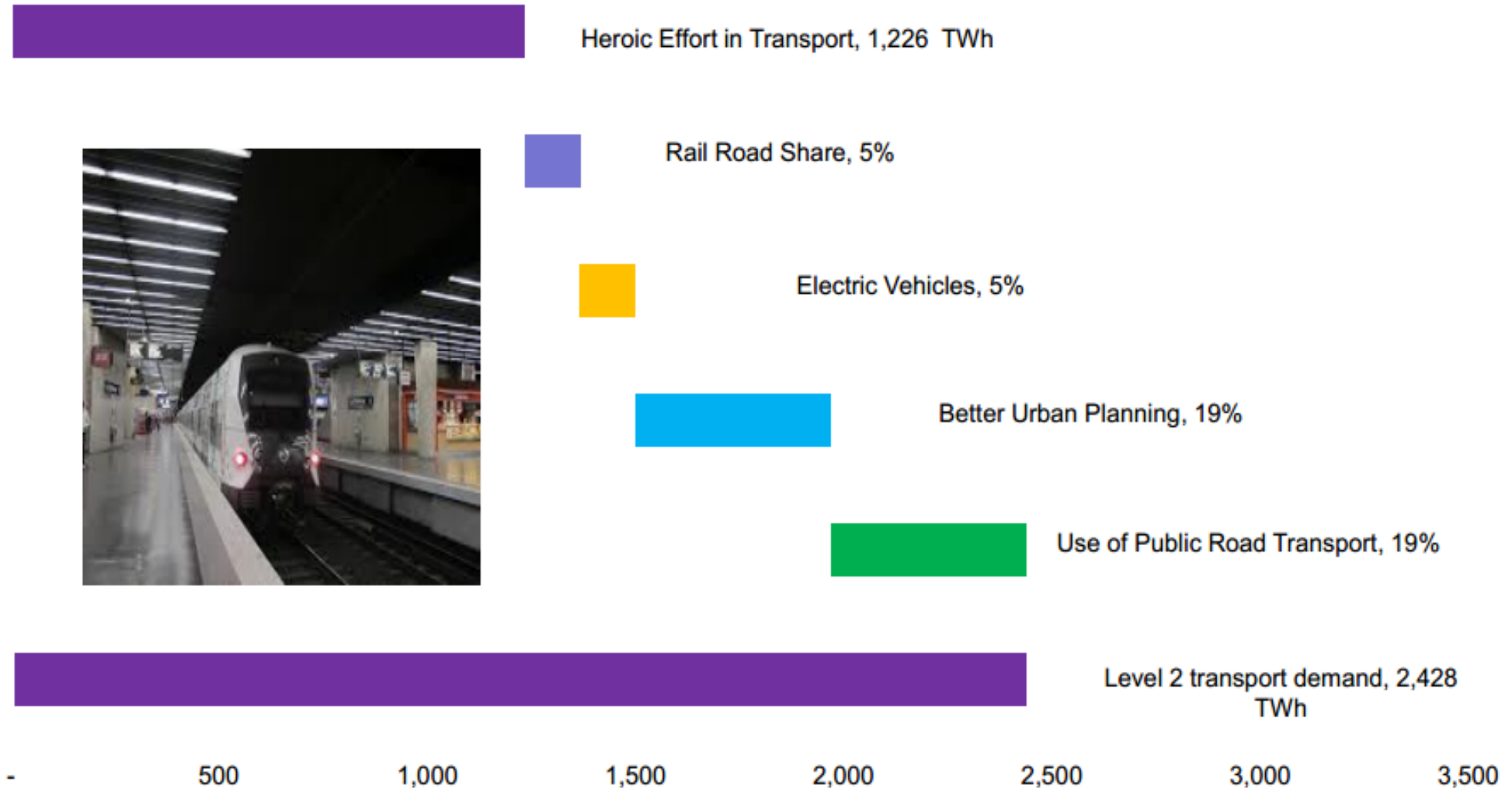| Indicator	2012	2047
Per Capita Passenger Transport Demand (km)	5,970	18,700
Per Capita Steel Use(kg)	66	372
Per Capita Residential Building Space (m²)	1.8	32
Per Capita Residential Building Space (m²)	0.7	9.5

Reducing Import Dependence (by Demand Side Interventions)
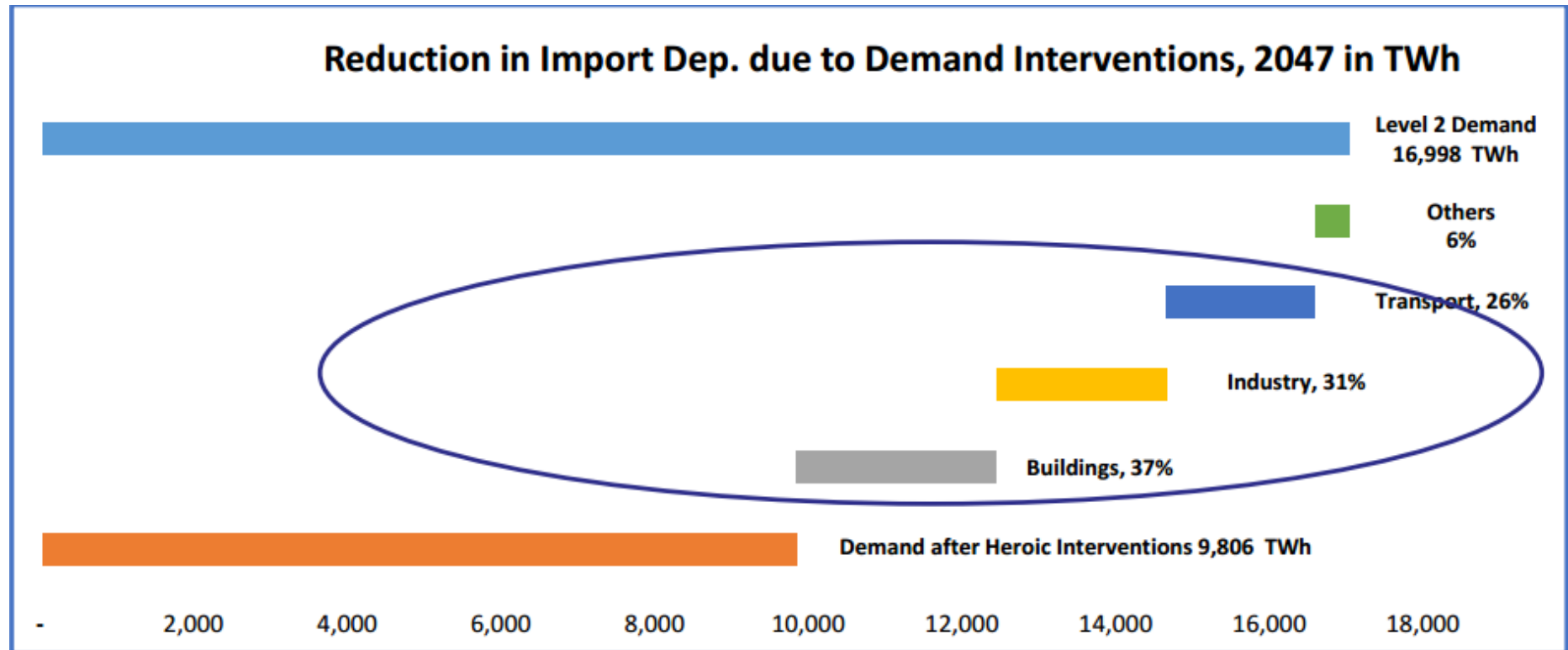
Reduction in Import Dep. due to Demand Interventions, 2047 in TWh

- Level 2 Demand 16,998 TWh
- Others 6%
- Transport, 26%
- Industry, 31%
- Buildings, 37%
- Demand after Heroic Interventions 9,806 TWh

(Axis values: 2,000 · 4,000 · 6,000 · 8,000 · 10,000 · 12,000 · 14,000 · 16,000 · 18,000)

	2012 Base Year	2047	
		BAU	Heroic
Import Dependence	31%	62.4%	49.5%
Emissions per Capita in (tons per capita)	1.4	5.1	4.2
Emission Intensity of GDP (tons CO2/INR Cr)	415	169	122

Efficiency Interventions in Passenger Transport

Heroic Effort in Transport, 1,226 TWh

Rail Road Share, 5%

Electric Vehicles, 5%

Better Urban Planning, 19%

Use of Public Road Transport, 19%

Level 2 transport demand, 2,428 TWh

| - | 500 | 1,000 | 1,500 | 2,000 | 2,500 | 3,000 | 3,500 |

Efficiency Interventions in Freight Transport

Heroic Effort in Freight, 1,809

DFCs & integrated logistic planning, 9%

freight Shift to rail to 45 % from 36%, 11%

Level 2 transport demand, 2,305 TWh

| - | 500 | 1,000 | 1,500 | 2,000 | 2,500 | 3,000 | 3,500 | 4,000 |

Efficiency Interventions in Residential Buildings

Heroic Effort in Buildings, 1,126 TWh

Envelop Optmization, 0.3%

Televisions, 1%

Lighting, 1%

Refrigerators, 2%

Fans, 2%

Others, 10%

Air Conditioners, 19%

Level 2 Residential Buildings demand, 1,764 TWh

| - | 500 | 1,000 | 1,500 | 2,000 | 2,500 |

Efficiency Interventions in Commercial Buildings

Heroic Effort in Buildings, 689 TWh

Others, 3%

HVAC, 4%

Envelope, 5%

Lighting, 6%

Level 2 Commercial Buildings demand, 846 TWh
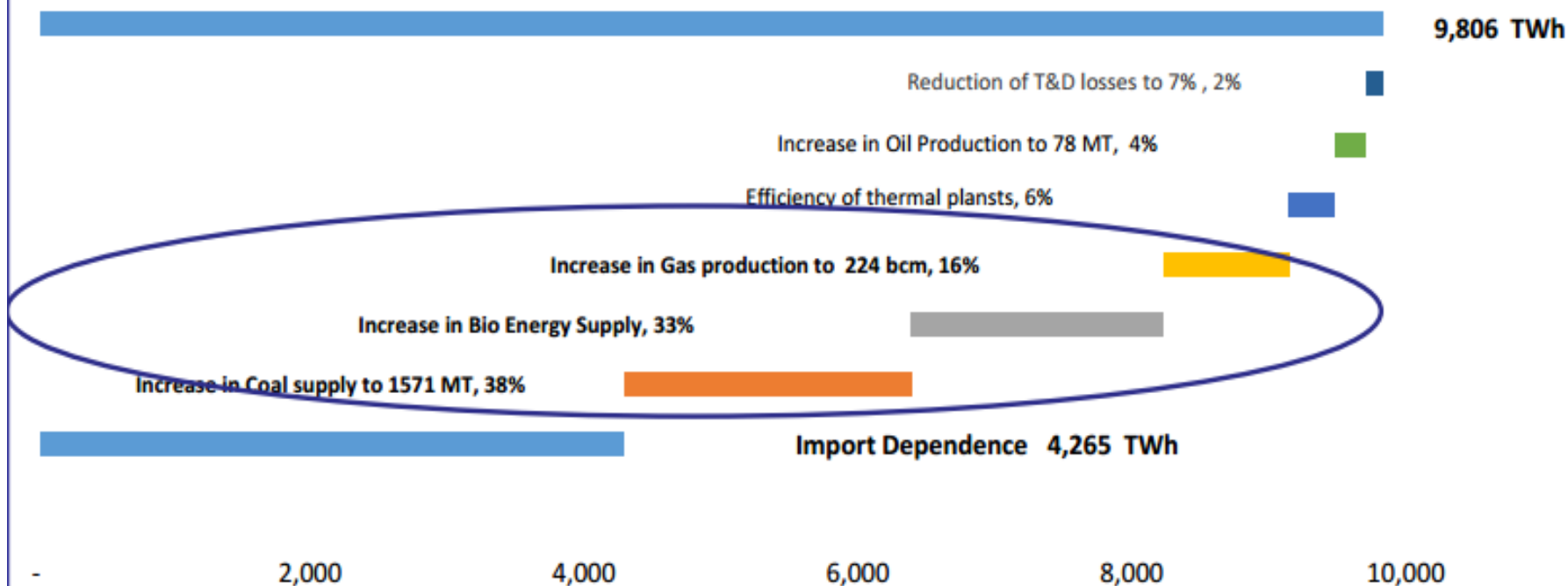
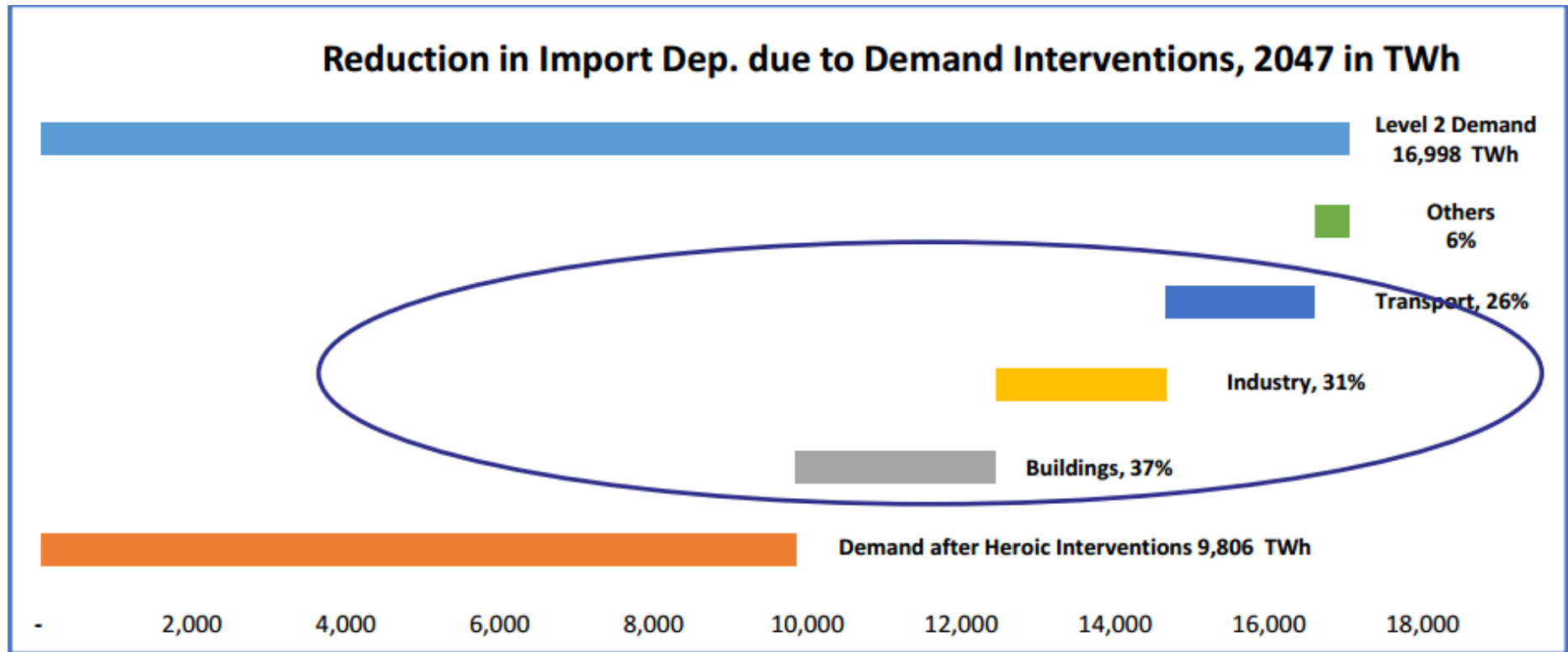| - | 200 | 400 | 600 | 800 | 1,000 | 1,200 |

Moderate Carbon Intensive Energy Security (Supply side interventions)

Decrease in Import Dependence due to Moderate Supply Side intervention in TWh & Demand at Level 4
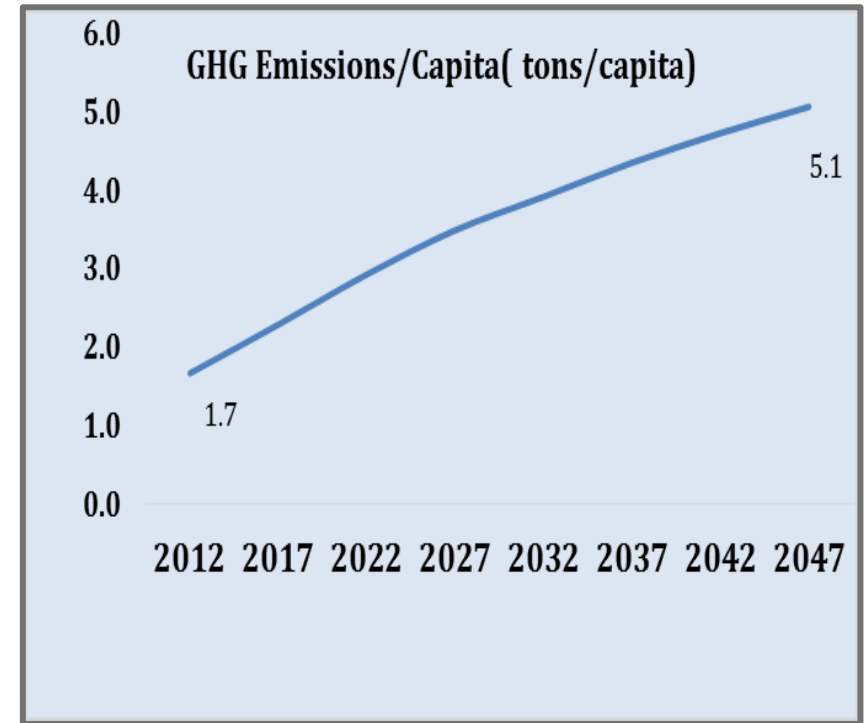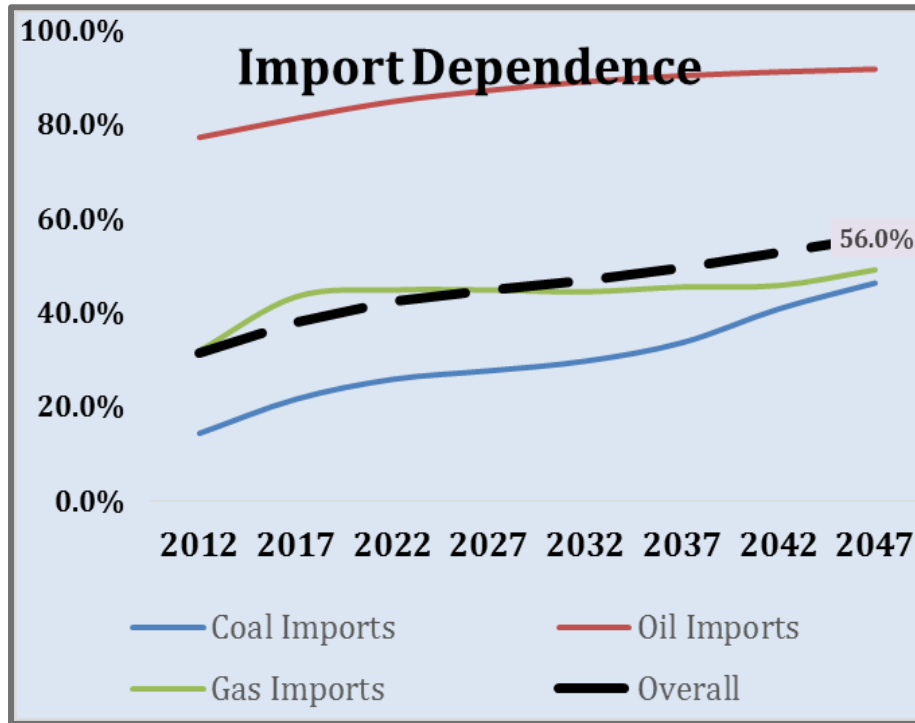
- 9,806 TWh
- Reduction of T&D losses to 7%, 2%
- Increase in Oil Production to 78 MT, 4%
- Efficiency of thermal plansts, 6%
- Increase in Gas production to 224 bcm, 16%
- Increase in Bio Energy Supply, 33%
- Increase in Coal supply to 1571 MT, 38%
- Import Dependence 4,265 TWh

	2012 Base Year	2047	
		After Demand Reduction	Moderate Carbon Energy Security
Import Dependence	31%	49.5%	21%
Emissions per Capita in (tons per capita)	1.4	4.2	3.3
Emission Intensity of GDP (tons CO2/INR Cr)	415	122	111

# Reducing Import Dependence _V2 (by Demand Side Interventions)

Reduction in Import Dep. due to Demand Interventions, 2047 in TWh

Level 2 Demand 16,998 TWh

Others 6%

Transport, 26%

Industry, 31%

Buildings, 37%

Demand after Heroic Interventions 9,806 TWh

	2012 Base Year	2047	
		BAU	**Heroic**
Import Dependence	31%	62.4%	49.5%
Emissions per Capita in (tons per capita)	1.4	5.1	4.2
Emission Intensity of GDP (tons CO2/INR Cr)	415	169	122

IESS-V2(Reference Scenario)

Import Dependence

Coal Imports — Oil Imports — Gas Imports — Overall

56.0%

GHG Emissions/Capita(tons/capita)

1.7

5.1

	2012 Base Year	2047 Terminal year
Import Dependence	31%	56%
Emissions per Capita in (tons per capita)	1.4	5.1

Reducing Import Dependence _V2
(Max Energy Security Scenario)
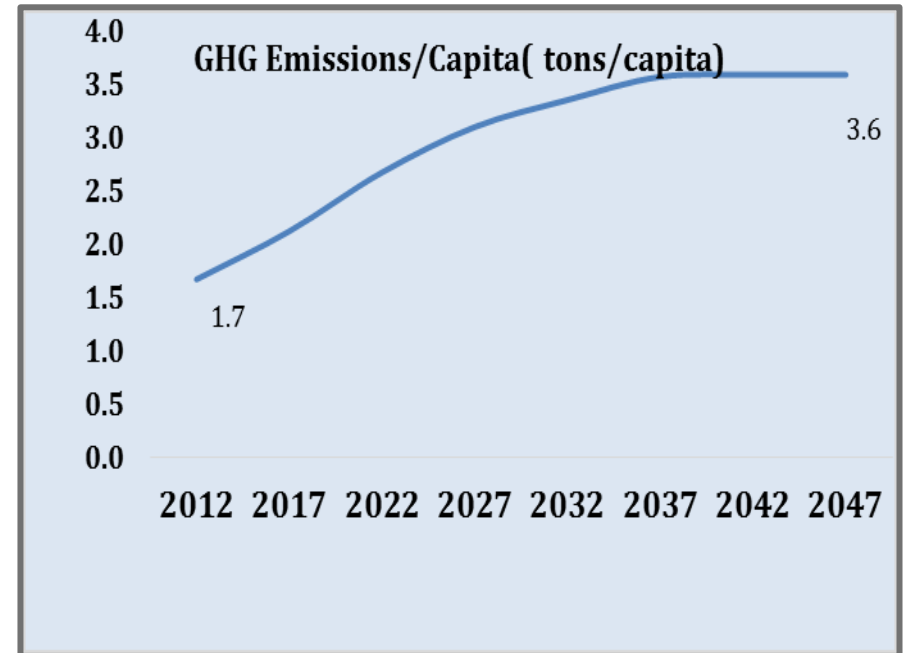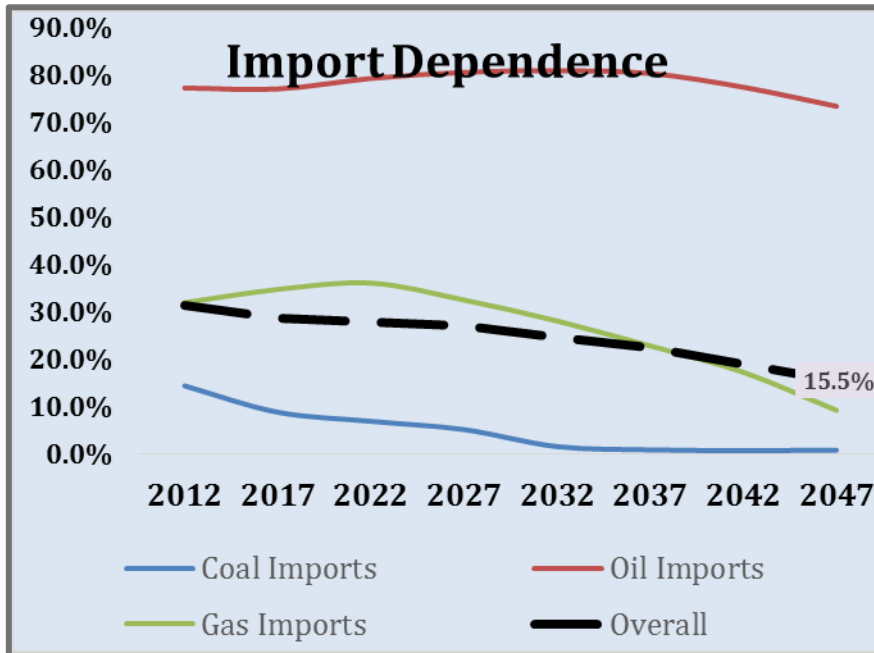
	2012 Base Year	2047	
		BAU	Heroic
Import Dependence	31%	62.4%	15.5%
Emissions per Capita in (tons per capita)	1.4	5.1	3.6

IESS-V2(Moderate Carbon Energy Security)

1. Demand reduces by almost 33% from the reference scenario.

2. Share of renewables in the grid increases to 30%.

3. Share of non-commercial energy in the primary energy supply reduces to 2% in 2047 from 13% in the year 2012.

4. This pathway will require $5.2 Trillion of capital investments,$ 991 Billion of opex, spread over 35 years and will lead to a savings of $3.8 trillion dollar of fuel related costs.

IESS-V2(Reliability)

1. The impact of increasing reliability of Indian grid is almost half the impact of green policies in Telecom sector in context of Energy Security.

2. It will save 24 Billion $ in the year 2047 alone apart from having health benefits, development and economic benefits for the nation as a whole.

3. The cumulative investment planned by State of Rajasthan in India to provide power is only $2.5 Billion over the next 5 years.

IESS-V2 (Cost of Climate Stress)

- For every 1 degree rise in temperature, building energy demand will increase by 1.8% in 2047.

- Emissions will increase at a rate of 37 million tons/year per degree temperature rise--erasing some of the gains of better urban planning.

- For every one degree rise in temperature, cost of a building pathway will go up by $1.6 Billion.

Utility of a Scenario Modelling Exercise

MORTON STREET, CORNER OF BEDFORD, LOOKING TOWARD BLEECKER STREET,
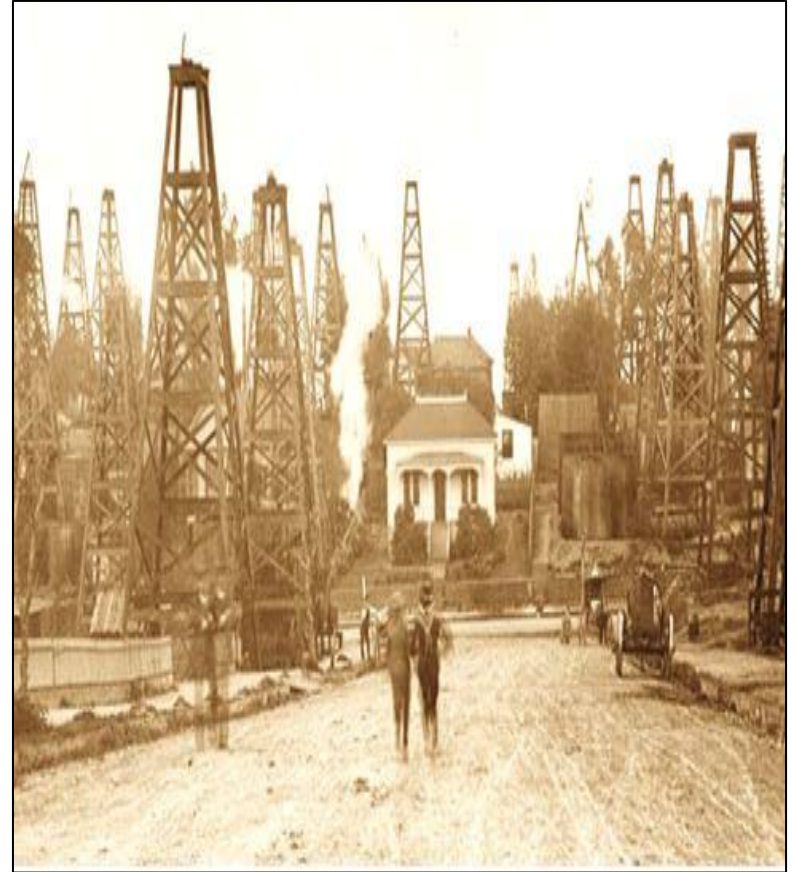MARCH 17, 1893.

By 1950 every street in the city would be buried nine feet deep in horse manure….
Times of London, 1894

By 1930, it was predicted that horse manure would reach the level of Manhattan's third-story windows…
Quoted by New Yorker
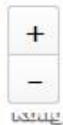
Source: NY Times

World would have been so much better..

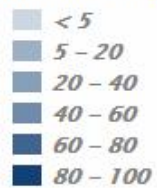Models are always wrong, but they help us think about the future

Visitor Summary

Questions ??