RENEWABLE ENERGY
A KEY INGREDIENT FOR SUSTAINABLE DEVELOPMENT: SHARING EXPERIENCES OF INDIA

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This earth provides enough to satisfy every man's need not every man's greed

- Mahatma Gandhi

Definition: The process of growing; the gradual increase of an animal or a vegetable body; the development from a seed, germ or root to full size or maturity; increase in size, number, frequency, strength, etc.; augmentation, advancement, production, prevalence or influence, as the growth of trade, the growth of intemperance.

CONSEQUENCES OF GROWTH

strain on natural resources (top soil, fuel, water, mineral, timber land and air)
Pollution
Increased urbanization (stress on carrying capacity)
Inequality and poverty
Inflation

CONSEQUENCES OF GROWTH

Over three billion people live on less than $2.50 per day (50% of global population)
434 million people face severe water crisis
600 million people do not have crop land
1.8 billion people (36 Nations) have less than 0.1 hectare of forest land per capita
India and China's combined population is 36.83% of the world's total population
Worlds total population is 6.922 billion (approx.) – expected to reach 10.9 billion (2050)

GREEN GROWTH

Paradigm shift from just growth to green growth

Green Growth emphasizes environmentally sustainable economic progress to foster low-carbon, socially inclusive development.

To achieve long term environmental sustainability, it is important to transform business practices to restore the natural resources.

Previous focus on cost reduction in order to improve profitability and cost effectiveness.

With the introduction of quality driven productivity, the strategy now is to achieve growth while ensuring no deterioration of natural resources.

Green Growth can be achieved by adoption of environmentally sound technologies and delinking of growth and development from environment degradation.

Thereby help in achieving a sustainable growth or precisely SUSTAINABLE DEVELOPMENT.

RENEWABLE ENERGY

- In simple words, energy from a source that is not depleted when used, such as wind or solar power.
- Renewable energy is from an energy resource that is replaced by a natural process at a rate that is equal to or faster than the rate at which that resource is being consumed
- Renewable energy is a subset of sustainable energy.
- Capturing renewable energy by plants, animals and humans does not permanently deplete the resource.

TYPES OF RENEWABLE ENERGY

Solar energy
Wind energy
Hydroelectric power
Bioenergy
Hydrogen
Geothermal Energy
Ocean Energy

WHY RENEWABLE ENERGY?

- *Renewable energy* technologies are clean sources of energy that have a much lower environmental impact than conventional energy technologies.
- *Renewable energy* will not run out. Other sources of energy are finite and will some day be depleted.
- Energy imports are costly. While renewable energy are usually spent within a Nation, the energy money can be used in creating jobs and local economies, rather than going overseas.
- Increased dependence on foreign supplies is reduced

SUSTAINABLE DEVELOPMENT (SD)

Sustainable Development means to fulfill the needs of the present without compromising the needs of the poor as well as the future generation, even with the limitations of the environment.

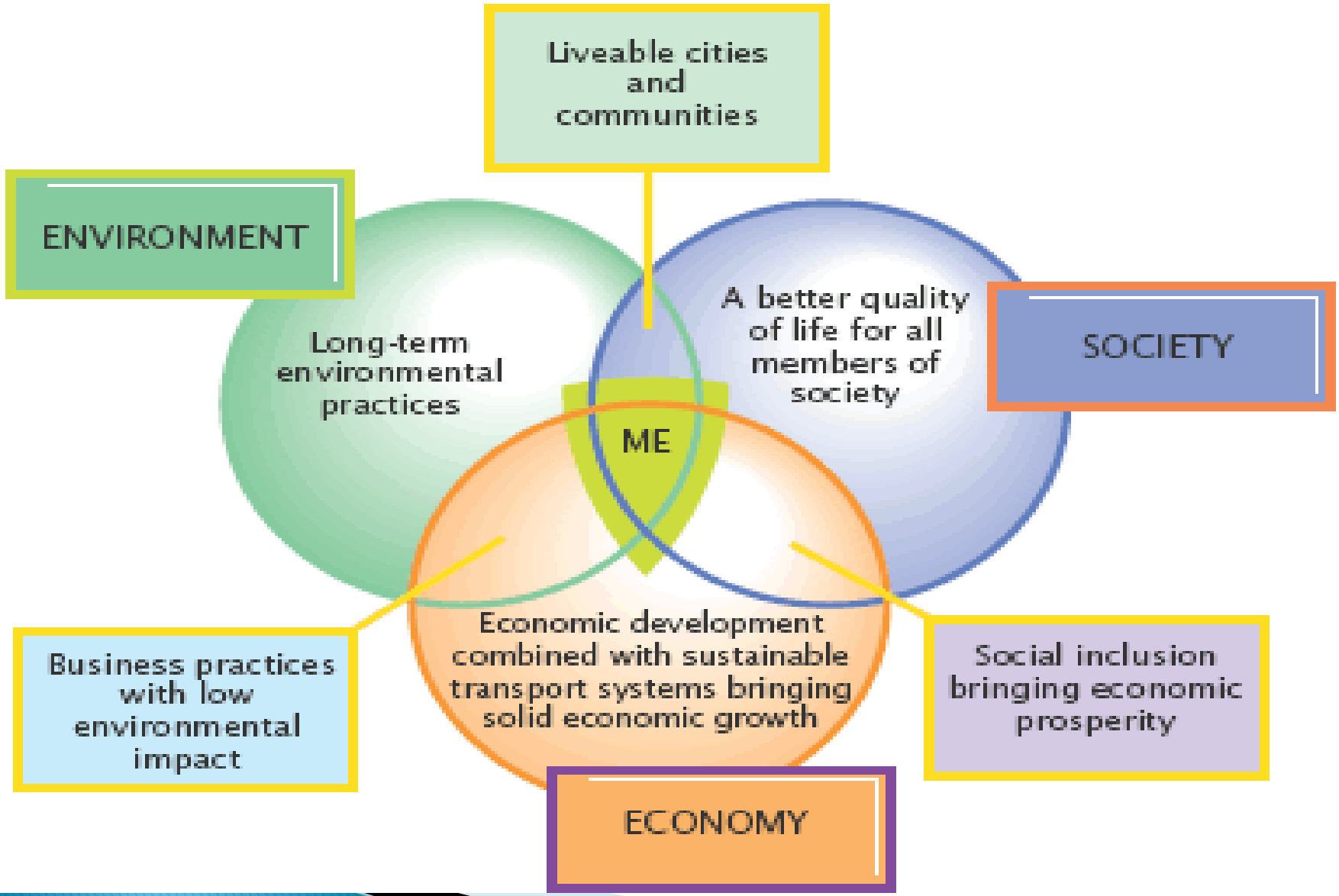
The three dimensions of Sustainable Development i.e. environmental sustainability, economic sustainability and sociopolitical sustainability is required to achieve a sustainable future for the present and future generations.

Sustainable Development can be achieved only if there are policies which direct and initiate methods to greener business practices.

Sustainable Development concentrates on the much needed economic growth but without compromising the nature's sustainability.

It covers Eco efficiency, Eco Sustainability, Eco Design, Product life cycle and Green Productivity.

SUSTAINABLE DEVELOPMENT (SD)



RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT

- ***Renewable Energy can help decouple that correlation, contributing to sustainable development (SD)***
- RE can accelerate access to energy, particularly for the 1.4 billion people without access to electricity and the additional 1.3 billion people using traditional biomass.
- RE increases energy access.
- RE deployment can reduce vulnerability to supply disruptions and market volatility.
- Low risk of severe accidents
- Environmental and health benefits

Source: Intergovernmental Panel on Climate Change

INDIA AND RENEWABLE ENERGY

- Emerging and developing countries have 80% of the world's population but consume only 30% of global commercial energy.
- India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems.
- Indeed, it is the only country in the world to have an exclusive ministry for renewable energy development, the Ministry of Non-Conventional Energy Sources (MNES).

INDIA AND RENEWABLE ENERGY

The key drivers for renewable energy are the following:

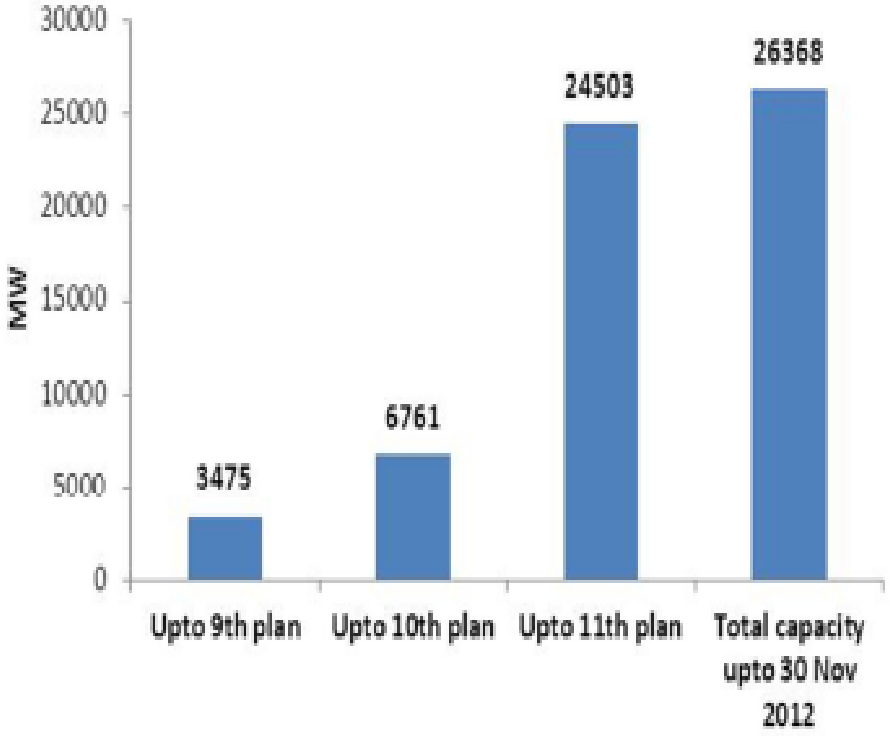
- The demand-supply gap, especially as population increases
- A large untapped potential
- Concern for the environment
- The need to strengthen India's energy security
- Pressure on high-emission industry sectors from their shareholders
- A viable solution for rural electrification

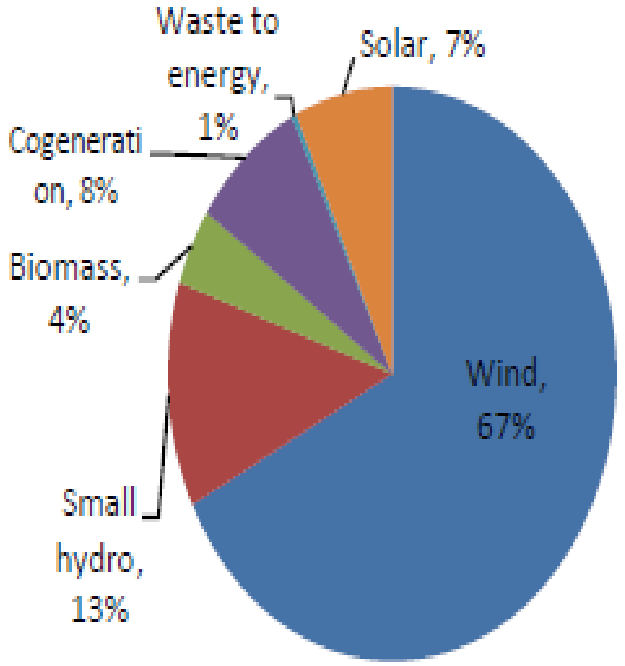
INDIA AND RENEWABLE ENERGY

- Renewables contribute about 12.3% of the total installed capacity in the country (CEA, 2013).
- Around 97% of the installed capacity is grid-connected and off-grid power constitutes a small share (MNRE, 2013).
- Wind continues to be the mainstay of grid connected renewable power in India (Figure 1).
- Globally, India ranks sixth in terms of renewable electric power global capacity (REN21, 2013).
- The historical growth of renewables has been tremendous with a compounded annual growth rate of 22% over the last decade (2002–2012).
- The rate of growth has been particularly significant for solar over the last three years (2009–2012), which grew from less than 10 MW to more than 0.7 GWMW in 2005–2006 to about 30 GW in 2013 (as on 31 October, 2013) (MNRE, 2013).

INDIA AND RENEWABLE ENERGY

- Further, the Government of India has projected capacity addition of 72,400 MW by end of the Thirteenth Plan (2022), of which solar is expected to contribute 28%. The policy thrust to renewables has been significant and specific targets have been announced to accelerate the deployment of renewable energy.
- The National Action Plan on Climate Change (NAPCC, 2008) envisages a dynamic RPO target of 10% at the national level for 2015 with an annual increase of 1% so as to reach around 15% by 2020.


30000
25000
20000
15000
10000
5000
0
MW
3475
6761
24503
26368
Upto 9th plan
Upto 10th plan
Upto 11th plan
Total capacity upto 30 Nov 2012


Waste to energy, 1%
Solar, 7%
Cogeneration, 8%
Biomass, 4%
Wind, 67%
Small hydro, 13%

INSTITUTIONAL ROLE OF CENTRAL AND STATE GOVT AGENCIES IN INDIA

LEVEL	Central government (Ministry of Power/ Ministry of Finance)	MNRE (Ministry of New and Renewable Energy)	CERC (Central Electricity Regulatory Commission)
Central	•· Develops national electricity tariff policies, which also cover renewable energy •· Provides fiscal incentives for promoting renewable Energy	•· Develops national renewable energy laws •· Sets technical standards for renewable energy •· Conducts resource assessments for renewable energy; supports R&D in renewable energy technologies •· Promotes effective use of information technology for renewable energy, manages database	•· Sets guidelines for feed in tariff design for different renewable energy technologies •· Regulates the regional electricity corporation mechanism •· Regulates interstate open access, and third party Sales

INSTITUTIONAL ROLE OF CENTRAL AND STATE GOVT AGENCIES IN INDIA

State	State Government	State Nodal Agency	SERCs
	•· Develops state-level renewable energy policy •· Provides fiscal incentives for promoting renewable energy sources	•· Conducts resource assessments for various renewable energy sources •· Allocates renewable energy projects and progress monitors •· Provides facilitation services to project developers Facilitates clearances and land acquisition •· Creates awareness and educates the masses about adoption of renewable energy Maintains database on renewable energy	•· Develops feed-in tariff methodologies for different renewable energy technologies •· Determines RPOs and enforcement mechanism •· Sets regulations on intrastate wheeling, open access, and third party Sale

JAWAHARLAL NEHRU NATIONAL SOLAR MISSION

- The flagship policy initiative for solar energy in India is the Jawaharlal Nehru National Solar Mission (JNSSM) launched in 2010, which has set ambitious goals on generation capacity additions from solar technology — solar thermal and solar photovoltaic — in terms of both grid-connected and offgrid applications.

- The Mission has adopted a three-phase approach, spanning the period of the Eleventh Plan and the first year of the Twelfth Plan (up to 2012–13) as Phase I. The remaining four years of the Twelfth Plan (2013–17) has been marked as Phase II and the Thirteenth Plan (2017–22) will be Phase III of the project.

JAWAHARLAL NEHRU NATIONAL SOLAR MISSION

- The first phase of the mission has seen significant progress in the deployment of utility-scale solar projects enabled by the reverse bidding mechanism introduced by the Government of India.

- Phase I of the mission has been concluded, though not all projects have been commissioned. Post the launch of JNNSM, several significant regulatory and policy developments have taken place.

- The Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) have issued various regulations including solar RPOs, Renewable Energy Certificates (REC) framework, tariff, grid connectivity, forecasting, etc., for promoting solar energy.

Encouraged by the success of JNNSM in 2010, several states have announced their own state solar policies and programmes with the exception of Gujarat which took a lead in announcing its solar policy a year before JNNSM

Table 1: States with solar policies in India (As on 31 Nov 2013)

State	Month of release	Target addition (MW)
Andhra Pradesh	September 2012	Has not set a target
Chhattisgarh	October 2012	500–1,000 MW by 2017
Gujarat	2009	500 MW
Karnataka	2011	350 MW by 2016
Kerala	November 2013	500 MW by 2017 and 2,500 MW by 2030
Madhya Pradesh	January 2012	
Punjab*	December 2012	1,000 MW by 2022
Rajasthan	2011	12,000 MW by 2022
Tamil Nadu	October 2012	3,000 MW by 2015
Uttarakhand	September 2013	500 MW by 2017
Uttar Pradesh	1st Quarter of 2013	500 MW by 2017

Note: *Solar targets are part of the Renewable Energy Policy

- There are a multitude of policy instruments and financing schemes for promoting renewables, despite which implementation has been slightly lagging or is happening at a slow pace because the sector is beset with certain inefficiencies.
- Having said that, growth of renewables in India over the last five years has been impressive and to continue on this growth path there are certain issues which can be dealt with good governance.

LESSONS TO BE LEARNED

- ENFORCEMENT OF RPO (RENEWABLE PURCHASE OBLIGATIONS)
- BIDDING & AUCTION IS COUNTER PRODUCTIVE
- LIMITS THE CAPACITY CREATION
- FIXED TARIFFS INSTEAD OF AUCTION/BIDDING
- CLEAN ENERGY CESS TO BE GEARED
- CURRENT RATE COAL INR 5.5 KILLOWATT
- SOLAR RATE INR 6.5 KILLOWATT

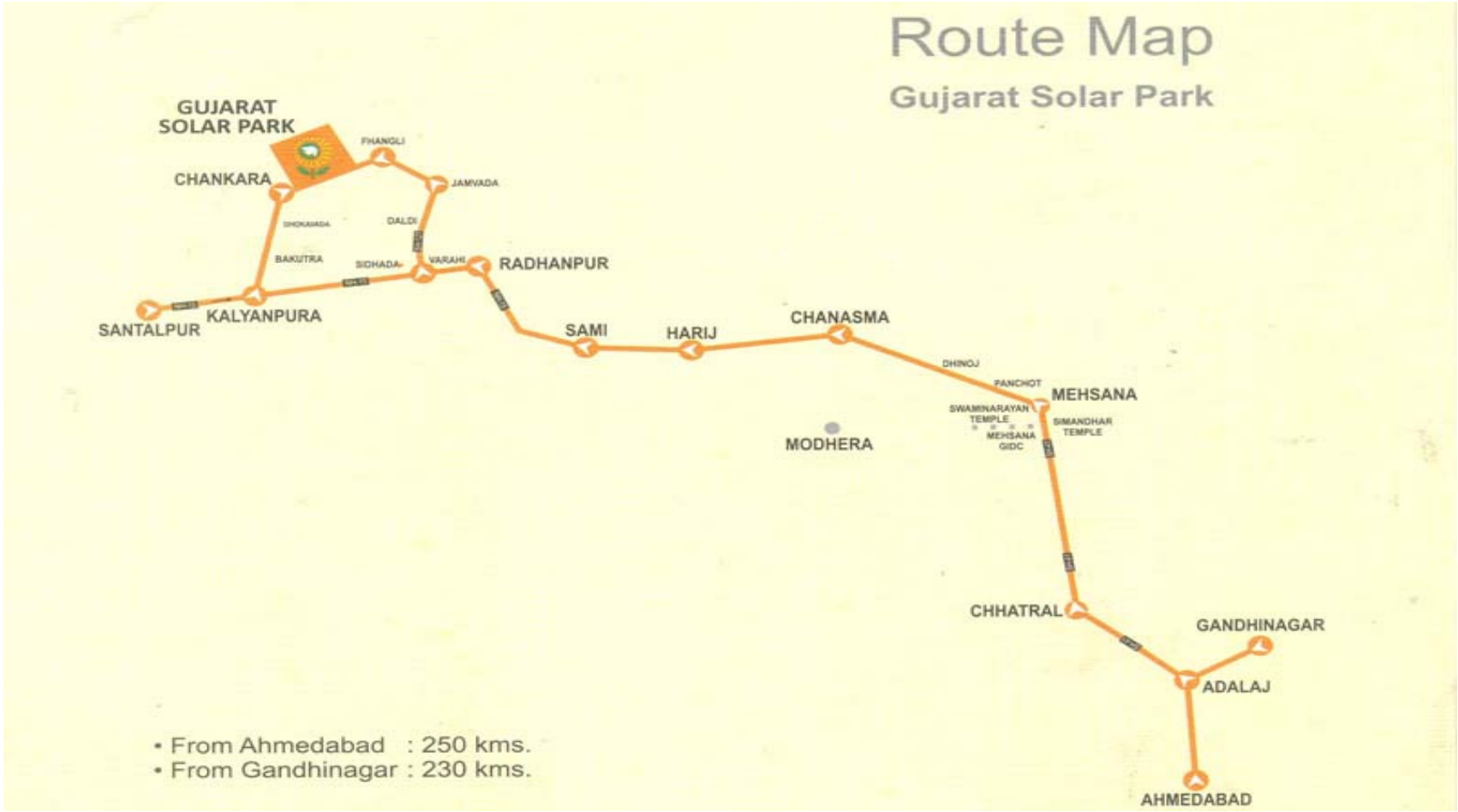
NEW GOVERNMENT'S INITIATIVE

- DESERT POWER INDIA – 2050
- 270 GW SOLAR ACROSS 10% DESERTS
- 29 GW WIND POWER
- TO REACH SHARE OF RE TO 35% AGAINST COAL OF 32%
- TO ATTRACT INVESTMENT IN CLEAN ENERGY OF US$100 BILLION
- OFFSHORE WIND POLICY ON COASTLINE (7600KMS)

NEW GOVERNMENT'S INITIATIVE

- INVESTMENT IN UPGRADATION OF GRID
- COLLABORATION WITH FINLAND , USA AND OTHER ADVANCED COUNTRIES
- FISCAL INCENTIVES TO PROMOTE INVESTMENT
- PROVISION OF LAND AND TRANSMISSION INFRASTRUCTURE
- CAPACITY BUILDING IN MANUFACTURING EQUIPMENTS

ROUTE OF SOLAR PARK



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MEGA SOLAR PROJECT

- 4 GW OF SOLAR POWER
- OFF GRID
- 100 000 SOLAR PUMPS
- PROVIDE WATER IN AGRICULTURE FIELDS
- CANALS TO BE COVERED WITH SOLAR PANELS
- GENERATE ELECTRICITY
- PROTECT WATER FROM EVAPORATION

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