Bio-Energy in India: A Policy Perspective
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Outline

Power Scenario in India

Challenges-Energy Security and Climate Change

Renewable Energy in India

Bioenergy

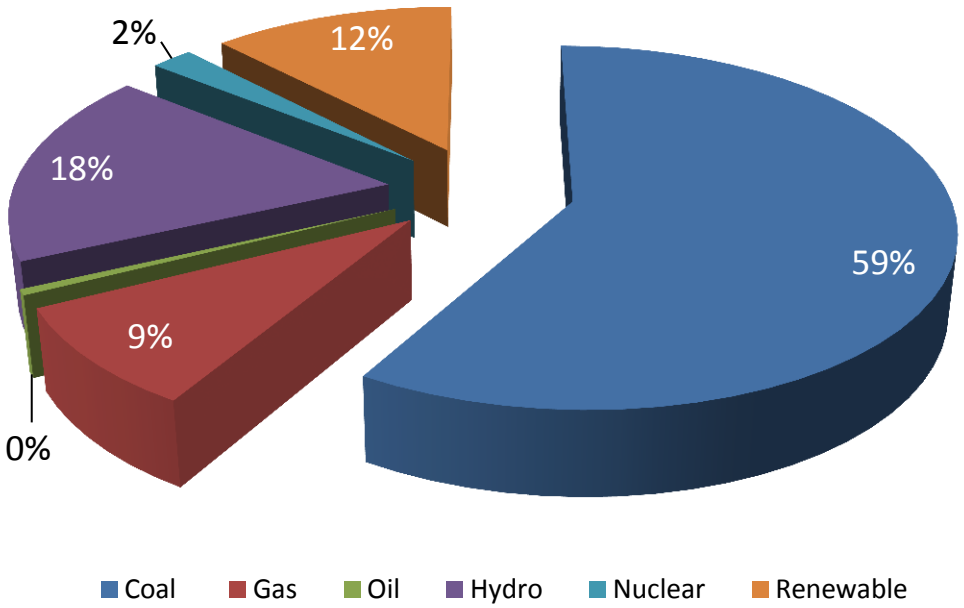
Strategic Agenda for Mainstreaming segments of the Bioenergy value chain-

- Feedstock,
- Biofuels,
- Power and DDG and
- Biogas

Key Takeaways

Power Scenario in India

The Indian power market is coal based with hydro and gas etc., playing an important role while renewable power has grown sharply

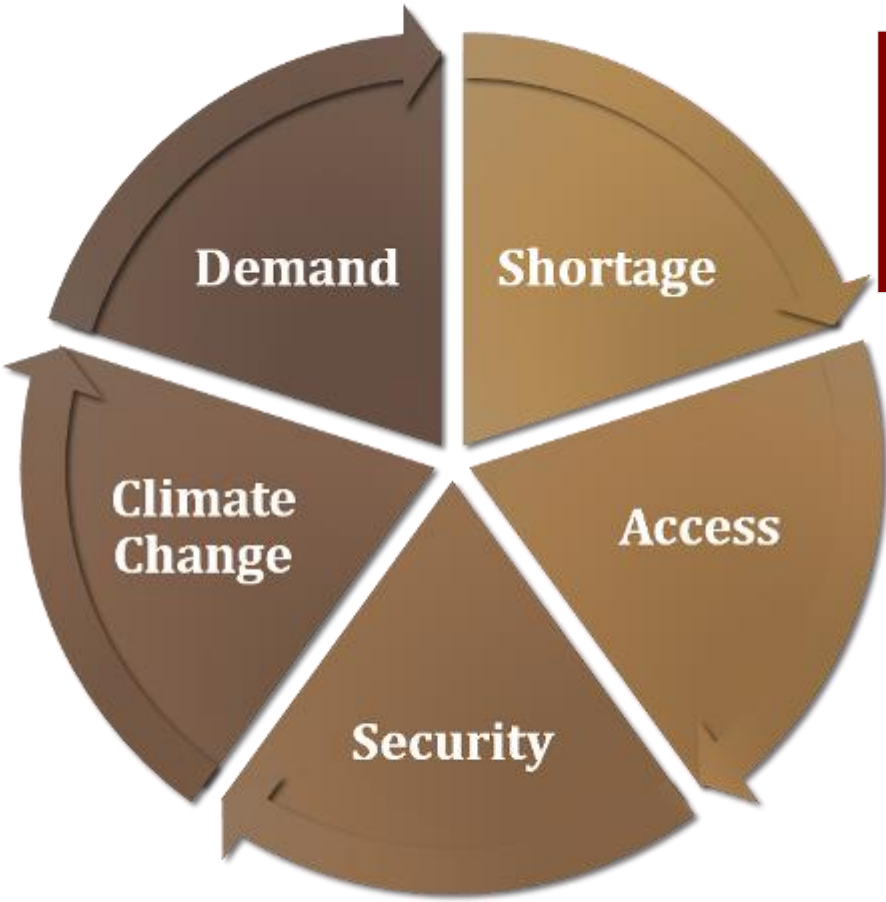


With an 8-9% GDP growth target as part of the 12th Five Year Plan (2012-17), energy supply will need to grow by a significant 6.5% annually. India will need to support economic growth by providing a secure and environmentally sustainable supply of energy

- Installed generation capacity at 227 GW
- Rapid pace of capacity additions in Eleventh plan (2007-12) (over 50 GW)
- Rising proportion of private sector participation which rose from 12.93% in 2007 to about 30% currently.
- Ambitious capacity additions of 90-100 GW in twelfth plan (2012-17)
- Per capita consumption of electricity at only 777 units
- Demand continues to outstrip supply with peak power shortages vary between 8-12%, which amounts to a huge 15,000—20,000 MW of power.
- 400 million people do not have access to electricity!
- Generation from Renewable Energy has grown sharply since 2007 with wind dominating the portfolio.
- Solar energy is now gaining traction driven by Government policies

Energy Challenge - India

In next 12 years India's electricity requirement to grow 2.5 times



Average shortage:
Electricity: 8.6%
Peak demand:11%

Climate Change taking centre stage

400 Million people still without access to electricity

India is dependent on oil imports for 80% of its demand

Energy Security has emerged as a matter of priority and concern for India

Multiple factors are plaguing the Energy Sector

1. Domestic output of the primary energy resources, coal, oil and natural gas is seen declining over the medium-to-long term
2. The country's oil import dependence has crossed 80 per cent.
3. In 2012-13, Oil and energy import bill was the highest at $120 billion of which $98 was for crude oil and petroleum products and about $9-10 billion was for coal and gas
4. Current levels of import accounts for 8 per cent of the total GDP-almost among the highest energy import bills globally and have an adverse impact on the current account deficit. (CAD)

…In recent months, the situation has worsened further

1. **Rupee's fast depreciation, making oil imports in rupee terms more expensive**
2. **Rapidly rising share of oil to CAD owing to rising oil imports**
3. **Increase in oil prices, due to ongoing geopolitical tensions**

The PM has asked the Oil Ministry to reduce the oil import bill by US$ 25Bn in 2013-14

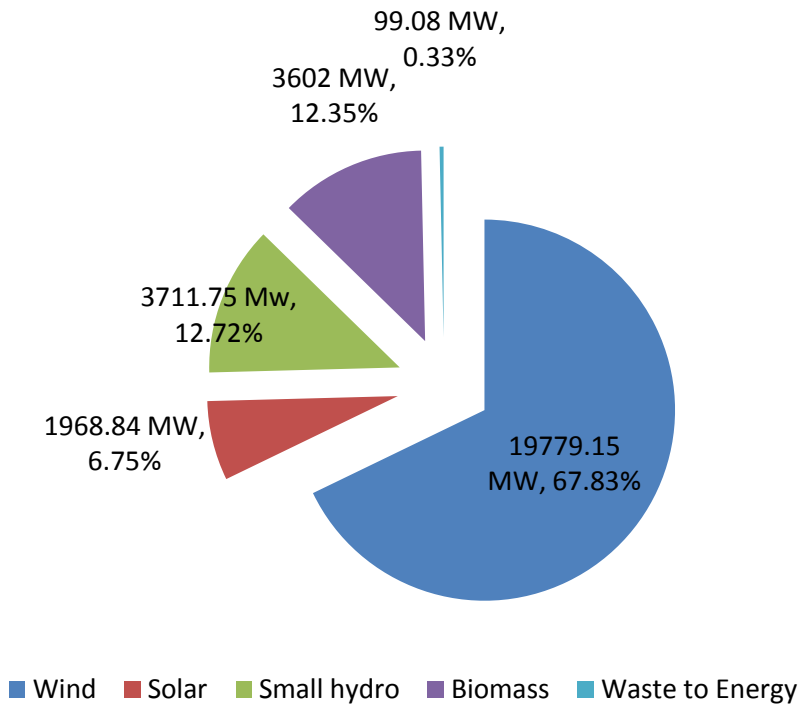
- **Requires significant uptake in domestic production – equivalent to 0.6M[1] bopd**

✗ Any significant reduction in oil consumption is not a viable option as it directly impacts GDP growth

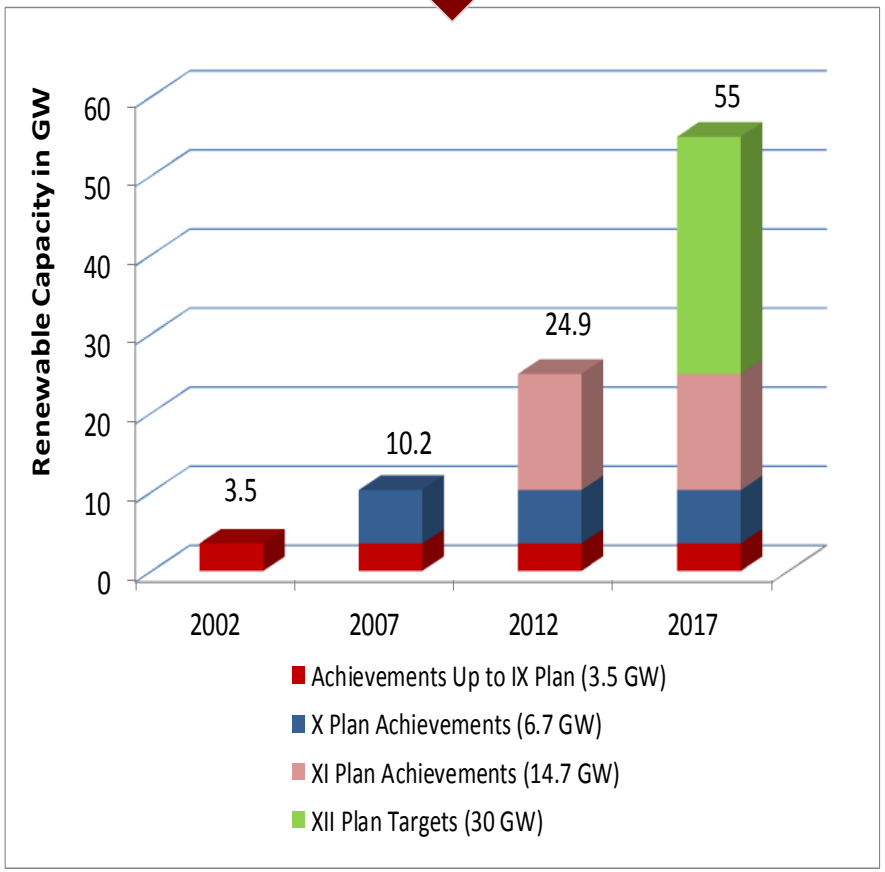
- ***Hence, option is to increase domestic production and meet our energy needs with safe & clean forms of energy..***

Renewable Energy in India

Wind Power dominates RE Portfolio
With National Solar Mission, India is poised to emerge as a key solar power country



Plan –wise Renewable Capacity Addition



Key Growth Trends and Drivers for RE in India

1 Growth Trends

Renewable Energy Capacity in India has grown rapidly at a CAGR of over 20 per cent since 2007 from 7,700 MW to 29, 160 MW currently

India is among the fastest growing renewable energy countries in the world after China, Brazil and United States

Largely driven by the private sector (accounts for over 80 per cent of renewable energy capacity) and an enabling policy framework

Solar and Wind Power are key thrust areas.

2 Policy Framework

Growth in renewable energy mainly due to a conducive, strong and clear policy framework and investor friendly environment.

Government promoting private investment for setting up RE projects through an attractive mix of fiscal and financial incentives include capital/ interest subsidies, accelerated depreciation and nil/ concessional excise and customs duties.

Preferential tariffs

3 Potential and Issues

- India has 150 GW of renewable energy potential, about half in the form of small hydropower, biomass, and wind and half in solar, cogeneration, and waste-to-energy.
- However, limited availability of evacuation infrastructure and grid interconnections is a key obstacle to harnessing renewable energy potential.
- Other challenge is access to low cost financing

Bioenergy constitutes a suitable alternative source of energy for India, as large amounts of raw material are available to be harnessed

- Avoids the food versus fuel debate as available agri-residues, forest waste and municipal waste can be used for biomass generation
- Biomass to bio energy model can become a significant contributor to the rural economy, if collection of these sources is addressed effectively.
- A Bio-based economy will help in reducing dependency on the rising fuel imports
- The strategic shift in energy sourcing will enhance energy security by developing an alternative technology security
- Biomass based power production extremely relevant primarily because of its potential to provide distributed power at the rural level
- On the cooking front, over 70% of India's rural population depends upon biomass for cooking.
- The Government has put in place policies (tariff support) and financial incentives (capital and interest subsidies) for bioenergy development
- There are challenges related to commercial sustainability, availability of appropriate technologies and market linkages

Features of Sustainable Bio-Energy Business

- All products and by-products must be sold
- Explore maximum possible value-added products
- Enter into long-term arrangements for feedstock supply
- Feedstock (even if it is waste for someone) procured at fair price
- Produce fuels that could be used with minimal changes in appliances
- Replace possible most expensive fuel
- Directly produce energy in the desired form
- Control capital expenditure by adopting ‘optimum’ capacity of the plant and machinery
- Limit region from which feedstock needs to be collected

Building a Sustainable Energy Future for Rural India: Case for Bioenergy

India – mostly rural

- >600,000 villages in India
- 75% of population in villages
- 60 to 70% directly/ indirectly dependent on agriculture
- Almost all of rural population dependent on different forms of Biomass for energy
- 188 million tons/ year of surplus biomass potential of 24,000 MW of power
  - 144 mn tons/ year Agro waste (18,000 MW)
  - 44 mn tons/ year Forest waste & wastelands (6,000 MW)

Source: National Biomass Resource Atlas – MNRE, IISc

Huge potential of harnessing biomass for energy

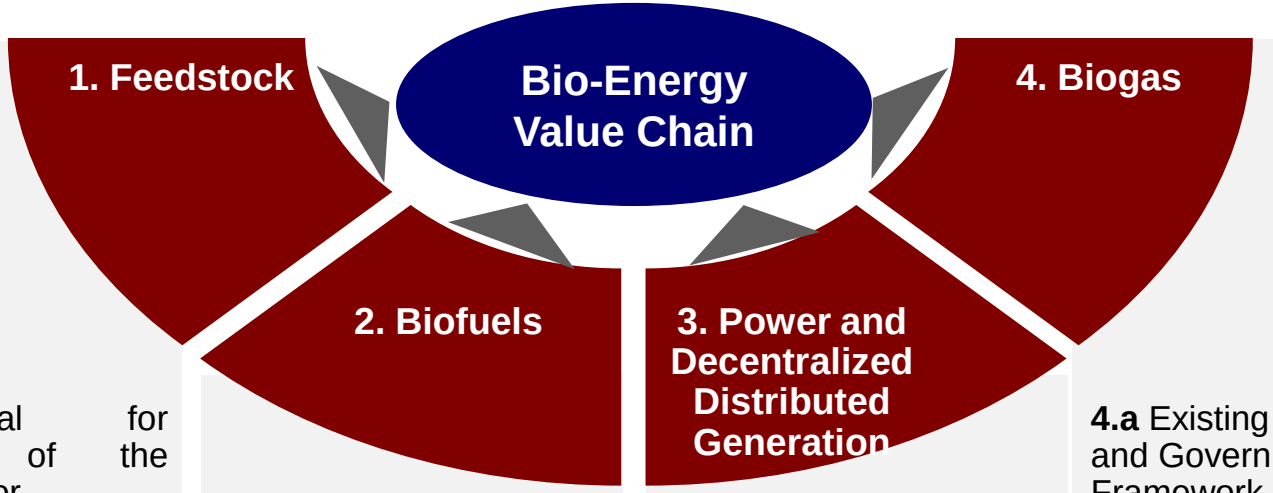
Energy requirement in rural areas

- Current rural energy requirements met by :
  - Cooking/ Heating
  - Lighting
  - Micro-industries
  - Open Chullas/ fires
  - Kerosene lamps
  - Diesel gensets
- Inefficient Polluting Health hazards

Conventional energy – LPG, Grid power (fossil fuels) and Renewable sources – Biomass, Solar, Hydro, etc

Strategic agenda for mainstreaming Bioenergy and integrating it with energy infrastructure

Measures need to be taken across the bioenergy value chain to achieve sustainable, low-carbon Bioenergy deployment in India



Key Thrust Areas

1.a Critical for development of the bioenergy sector

1.b Lack of proper supply chain for making biomass feedstock available, especially collection and logistics infrastructure

1.c Need to provide an enabling framework and promote rural micro entrepreneurship in biomass collection

2.a National Biofuels Policy

2.b Ethanol availability and biodiesel pricing and issue to achieve blending targets

2.c Key Policy Measures to expedite blending programme

3.a An important energy source but issues due to biomass supply chain.

3.b Sustainable Business Models

4.a Existing Biogas Plants and Government Framework

4.b Policy Framework

1. Feedstock: Biomass Availability

Current Situation

Feedstock Availability

- Availability of biomass in India estimated to be in excess of 500-600 million metric tons (MMT) annually as per Ministry of New and Renewable Energy (MNRE).
- Surplus biomass availability estimated at about 120 – 170 MMT per annum covering agricultural and forestry residues corresponding to a potential of about 20,000 MW.
- Additional power of about 5,000 MW or an equivalent of 65 million barrels of oil could be produced from bagasse based cogeneration in the country's 550 sugar mills.
- However, availability of feedstock at the right price is a key challenge in biomass projects

Key Issues

- Proper supply chain for making biomass feedstock available, especially collection and logistics infrastructure, is lacking as this sector is unorganized.
- Since biomass is collected in an unorganized manner and the farmer community is diverse, collection is an issue
- Biomass is bundled in a crude way with only some biomass balers put in place enabling villagers to access these at a cost.
- Need to procure equipment which provides overall value addition to the mechanization of the collection of biomass.

Policy Levers, Key Measures and stable fiscal incentives will be key in ensuring adequate feedstock availability

Action Agenda

Biomass Collection: Key Measures and Policy Levers

- Provide incentives to trigger entrepreneurship in biomass aggregation.
- Promote rural micro entrepreneurship through cooperatives for biomass collection. Cooperative Collection Points can be created in the sugar factory areas and Village Level Entrepreneurs (VLE) encouraged to manage these cooperatives.
- Procure equipment which provides value addition to mechanization of biomass collection.
- Banning/building awareness on the burning of biomass through a strong legislation
- Optimize potential of biomass collection in forests which has the potential to generate 300 million tons of biomass.
- MNRE/ Ministry of Environment and Forests to fund model depots to come up near the Bioenergy plants.

Fiscal Interventions Required

- Extension of Tax Holidays from 5 to 10 years for business in biomass collection.
- Incentivization of projects in the areas of biomass based power/ethanol/gas by providing Accelerated Depreciation and Generation Based Incentives. The Ministry of Finance to consider making mandatory budgetary allocation for these projects.
- Special lending schemes from Rural Regional Banks (RRBs) can be implemented. for bailing and processing equipment.
- Entire Biomass Supply Chain (collection, transportation, storage, processing and transportation) should be considered as renewable energy and all benefits should accrue to all elements of the supply chain.

2. Biofuels: Strong contender as fossil fuel substitute, especially for petrol and diesel in India; Production of biofuels primarily entails ethanol production in India

Current Situation

National Biofuels Policy 2009: Salient Features

- National Biofuels Policy aimed at mainstreaming the use of biofuels – bioethanol and biodiesel, for Indian transport sector.
- Major thrust on R&D with focus on plantations, processing and production of biofuels
- Purchase Price for bio-ethanol and bio-diesel
- Fiscal and financial incentives particularly for second generation biofuels.
- An indicative target of 20% blending both for bio- ethanol and bio-diesel by 2017: currently and 5-10% being attempted to achieve 5% ethanol blending
- 1.5-2 per cent Ethanol blending implemented while biodiesel usage is a non starter

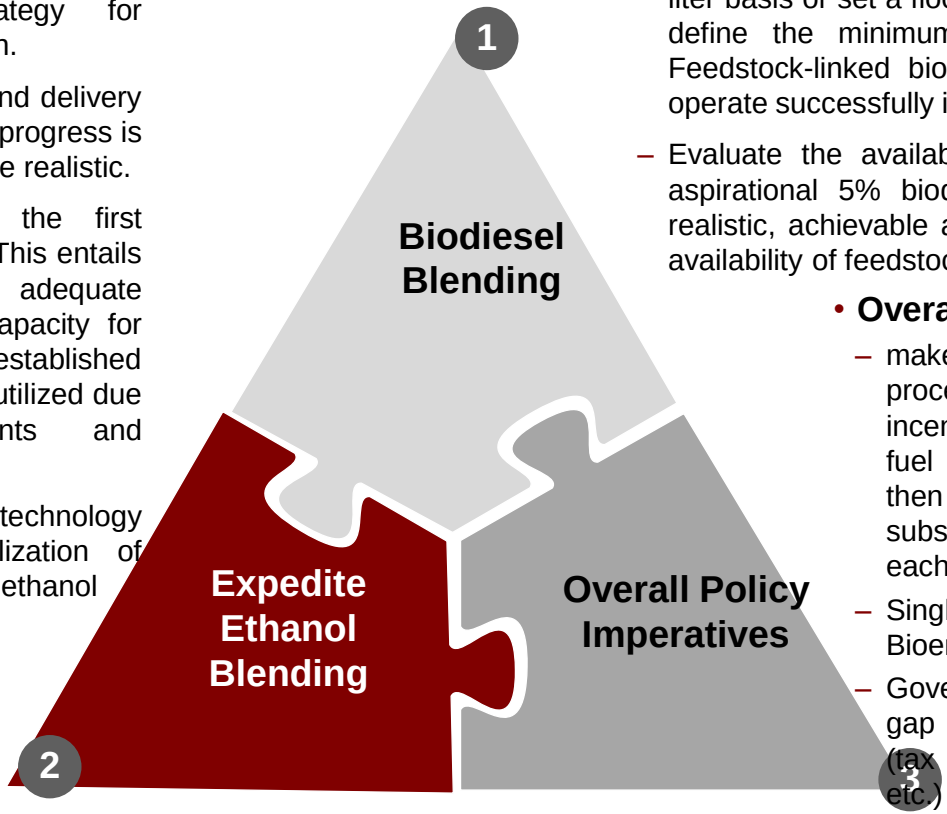
Key Issues

- Ethanol: Ethanol availability is an issue. But as ethanol prices in India are now market determined, ethanol availability expected to improve
- Distilleries perceive an unacceptable risk in case Oil marketing Companies (which order the ethanol) provide indication for off take and do not lift the indicated quantity.
- Biodiesel: Biodiesel procurement price not considered remunerative by bio-diesel producers.
- Despite having undertaken plantations on a large scale, the production capacity based on tree borne oil seeds is not being utilised.
- Indian Government working on a mechanism to make prices of biodiesel remunerative

Key policy measures to expedite blending programme: Critical for reducing import dependence on fossil fuels thereby reducing current account deficit

Action Agenda

- **Expedite Ethanol Blending**
- Forecast ethanol availability accurately and at least one season ahead to develop a realistic strategy for sustainable ethanol production.
- Monitor the implementation and delivery of the program to ensure that progress is on track and the targets set are realistic.
- Enhance effectiveness of the first generation ethanol program. This entails ensuring availability of adequate feedstock since adequate capacity for ethanol production has been established in the country but remains unutilized due to supply-side constraints and fluctuations
- Accord high priority to technology development & commercialization of second-generation(cellulosic) ethanol



- **Bio-diesel Blending**
  - Government to consider providing support on a per liter basis or set a floor pricing formula for biodiesel to define the minimum price the OMC must pay. Feedstock-linked biodiesel pricing models currently operate successfully in Thailand and Indonesia
  - Evaluate the availability of feedstock to meet the aspirational 5% biodiesel blending target and set realistic, achievable annual milestones based on the availability of feedstock resources.
- **Overall Policy Recommendations**
  - make the biofuels policy approach product, process and technology-neutral will incentivize efficient, advanced generation fuel production technologies which do not then have to go through fresh subsidy/incentive application processes each time.
  - Single window clearance for new biofuels / Bioenergy projects
  - Government support in the form of a viability gap funding, significant accounting policies (tax exemption, accelerated depreciation etc.) or limited period subsidies essential in the initial stages to help the sector attain economies of scale and technology maturity.

3. *Biomass Based Power: Capable of providing firm energy, is widely available, carbon-neutral and has potential to provide employment in the rural areas.*

Current Situation and Challenges

- Biomass energy constitutes < 13% of renewable energy in India with installed capacity of biomass power and cogeneration projects at only around 3698 MW
- Leading States for biomass power projects are Andhra Pradesh, Chattisgarh, Maharashtra, Madhya Pradesh, Gujarat and Tamil Nadu.
- Still not the preferred renewable energy source due to to several challenges including bottlenecks in the biomass supply chain.
- Due to feedstock availability issues, dedicated biomass plants for combined heat and power (CHP), are typically of smaller size and lower electrical efficiency compared to coal plants.

Action Agenda

- Most biomass based plants in operation are either gas engine/Rankine Cycle based. Combined heat and power is a mature, commercially available technology that also needs to be considered.
- Hybridization may also address some of the availability issue. Hybrid plants (50% biomass and 50% conventional/nonconventional energy) may be deployed. The combination of biomass gasification and fuel cells is another potential solution that needs to be pushed.
- Special incentivized packages for manufacturing components from combustion, gasification, gas clean-up turbines for building advanced manufacturing processes.
- Projects can be supported by Viability gap funding, generation based incentives (GBI) and a combination of both which can be tapered off when grid parity is achieved
- Categorization of biomass feedstock from the power generation perspective is important to determine the incentivisation framework and arrive at the levelised cost of electricity. Higher incentivisation needs to be given for difficult biomass. Incentivisation also needs to be linked with the efficient use of biomass.

3. Power and DDG: *One small plant is improving the lives of >1500 people: Thousands of such plants across can change the life in rural India*

Sustainable Business Models: possible to set up large scale biomass plants at Suitable Locations

Saran Renewable Energy has set up an independent power plant of 120 kW in Garkha village with the following innovations:

- Water-resistant and fast growing “Dhaincha” plant grown in waterlogged fallow land used as raw materials
- Medium voltage distribution to cover greater distances
- Used existing diesel genset owners as franchisees to distribute electricity

Challenges

- High capital and transportation costs and long gestation period
- Building raw material linkages
- Users to switch to electricity from diesel engines
- Price of biomass increasing disproportionately in project vicinity
- High transportation costs

Benefits

- Replaced 25 diesel gensets used by micro enterprises and 10 diesel water pumping stations
- Increased income of farmers: Benefit of over Rs 5.5 million per year for farmers and micro-industries
- Dhaincha plantations : 50 acres of waterlogged fallow land utilised (one third cost is raw material)
- Employment in collection & transportation of biomass and in power plant

4. *Biogas: An important renewable energy source that uses feedstock that are otherwise wasted and left to decompose*

Current Situation

- **Household Biogas Plants**: National Programme on household biogas plants operational since 1982.
  - Over 4 million small plants (1 Cum. onwards) for cattle manure installed against a potential of 12 Million
  - Cost from Rs.6000 (US$100) onwards
  - Two broad categories of plants in use -floating dome type and fixed dome type
- **Agricultural Biogas Plants**
  - 1 MW Cattle manure based biogas project at a dairy colony in Ludhiana, Punjab
  - About 2000 small and medium size biogas plants based on cattle manure for heat, electricity or motive power (5-25 kW)
  - 1.5 and 2.5 MW biogas projects based on poultry droppings in Tamil Nadu

Government Support and Action Agenda

Government Support for Biogas Programme in India

- Subsidy for installation – 20-40% of cost
- Preferential tariff for sale of power
- Fee for supervision and warrantee for small plants
- Capacity building through training, information dissemination
- Monitoring and Evaluation

Action Agenda

- Segmentation from a user perspective (urban/rural/industrial)
- Training of experts / planners
- whole aspect of rural community development also to be taken into consideration as the development of the biogas industry will lead to job creation.

Key Takeaways

Conclusions

1 Dependence on Biomass	• Dependence on biomass is expected to continue in India, due to the projected increase in rural population in absolute terms and continued lack of access to commercial fuels in rural areas particularly for cooking
2 Need for Enabling Policy Frameworks	• Despite the enormous potential for bio energy in India, actual on ground execution of Bio energy technologies is falling short. • Overall, the policies and programmes instituted have led to only sporadic success and have not succeeded in achieving their optimum technical potential.
3 Feedstock Availability	• Need too evaluate and ascertain the availability of feedstock in the country and ensure that bottlenecks across the feedstock supply chain are eliminated
4 Potential of Biofuels	• Bioenergy holds a huge potential in the country given the current prices of liquid fuels • Replacing 5 per cent of liquid fuels by biofuels could lead to savings of $5-6 billion annually.
5 Task Force on Bio-Energy	• Need for a focused approach on bio-energy • Growth of the bioenergy sector in India will greatly benefit from the formation of a Task Force in this area which can develop the policy levers across all segments of the biomass

Thank you