Biogas Scenario in India

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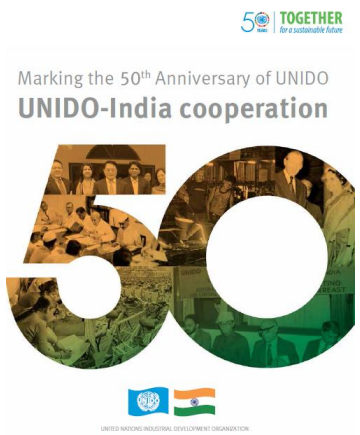
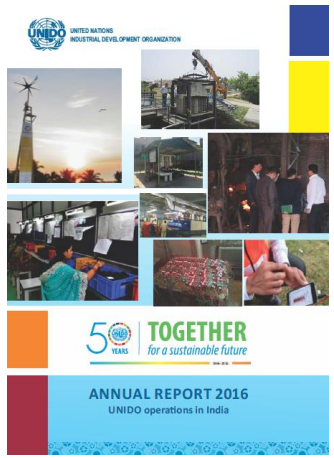
UNIDO in India



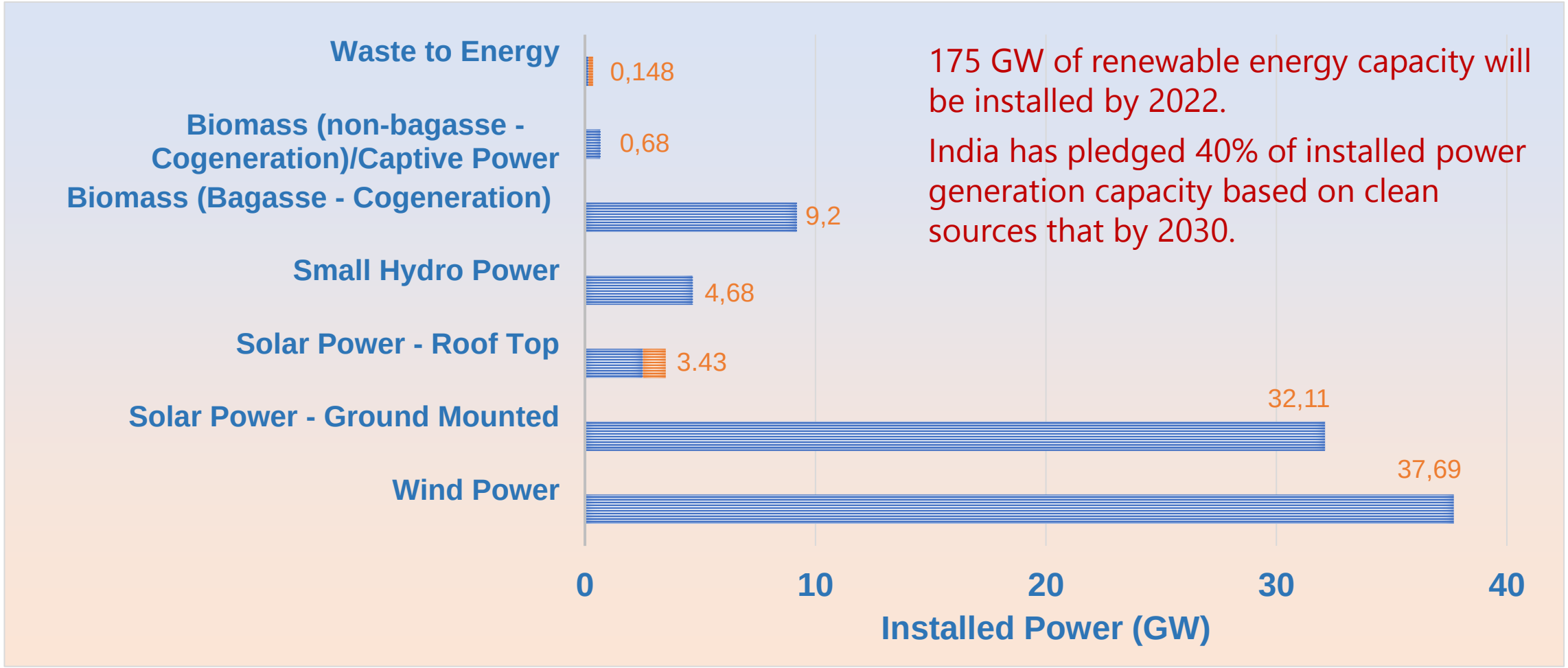


- **Technical cooperation services since 1966**
- **2013-2017 Country Programme**
  - Green industrial development
  - Inclusive economic development
  - South-South industrial cooperation
  - Operationalized 24 projects with total budget of USD 87 million
- **2018-2022 Country Programming Framework**
  - Productive and resilient MSMEs
  - Solutions for climate, resources and environment
  - Inclusive and responsible value chains and business
  - Strategic policy for industrial transformation

RENEWABLE ENERGY IN INDIA

Total: 88.02 GW (March 2020)

Off-grid



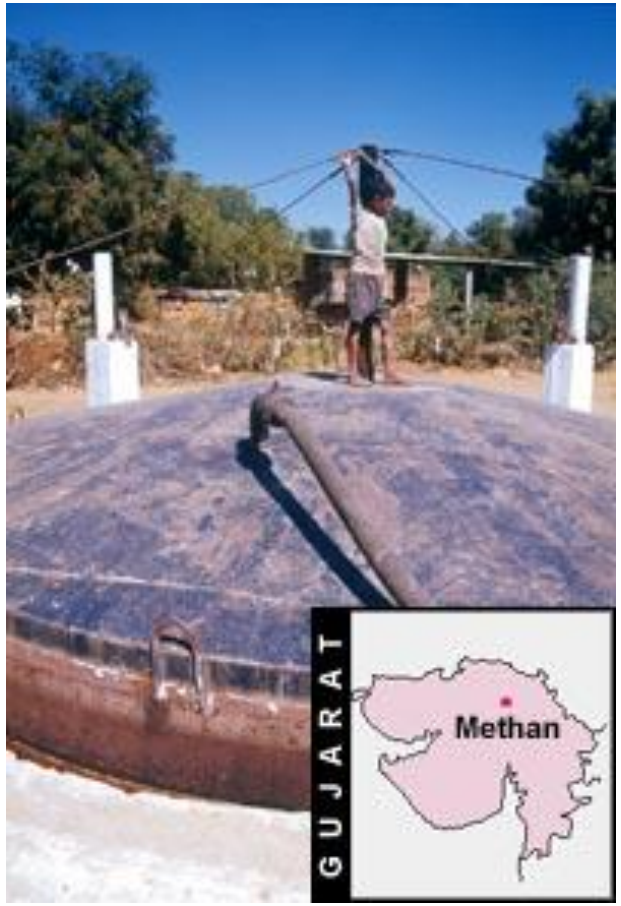
175 GW of renewable energy capacity will be installed by 2022.

India has pledged 40% of installed power generation capacity based on clean sources that by 2030.

History of Biogas in UNIDO in India

1897	Biogas used for lighting at Matunga leper Asylum, Bombay
1937	Commissioning of Dadar Sewage Purification Plant, Bombay
1946	NV Joshi designed the 1st Biogas plant at Indian Agriculture Univ., Delhi
1952	Floating Dome model of Biogas plant developed by Jabhai Patel
1961	Gobar Gas Research Station at Ajitmal (UP)
1962	KVIC started working on Biogas technologies
1977	Development of Janata Model of Biogas plant
1981	National Project of Biogas development launched
1982	Biogas included in PM's 20-point programme – transferred NP to DNES
1984	Low-cost Deenbandhu Model of Biogas plant developed by Action for Food
1985 - 92	Large National Biogas Program initiated with Subsidy – multi organization multi design approach
1992 - 02	Reduced subsidy – new structure of dissemination and extension

Example of old Biogas Plant for Household Supply



Methan village in Gujarat saves 500 metric tonnes of fuelwood annually since 1987 (good cattle population and agri-waste availability).

8 digesters with a total capacity of 630 cubic metres (cum). Six digesters have a capacity of 85 cum each, and two have a capacity of 60 cum each.

Biogas is supplied to households through underground pipes at fixed hours in the morning and evening.

All households that are connected are members of the cooperative society.

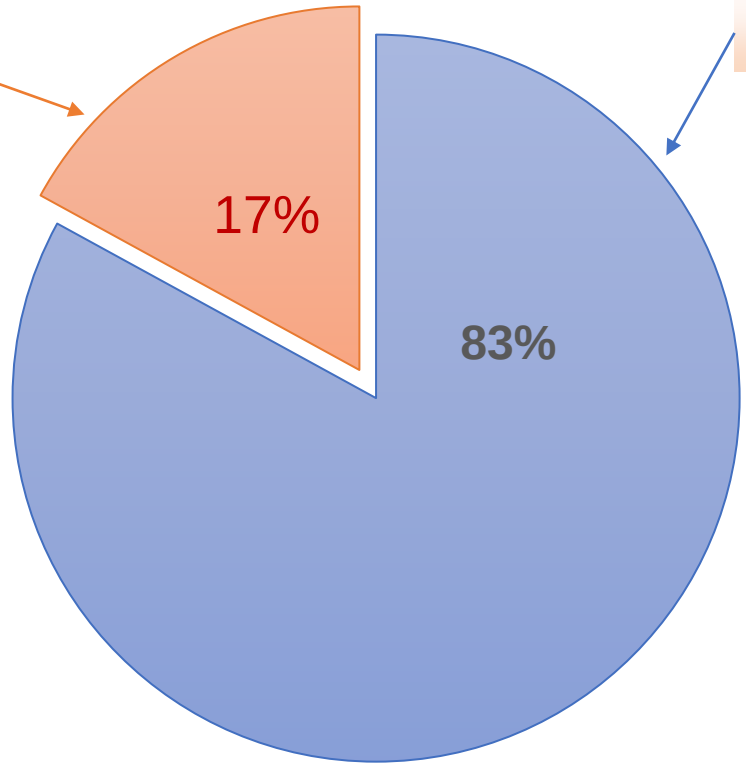
The management committee includes mandatory women representatives.

Biogas Plants in India

Industry scale biogas plant

Trend of usage of biogas

- 27% for thermal application
- 65% for power application
- 8% for BioCNG generation



Family/ community scale biogas plant

Trend of usage of biogas

- 99% for thermal application
- 1% for power application

15.28 Million m^3/day (Installed generation capacity)

Major Driving Factors for Biogas

- Growing energy demand, fossil-fuel consumption and rising pollution levels
- Demand for clean energy generation and reduction in oil import
- Abundant feedstock availability.
- Government focus and support to promote bio-energy
- Progressive R&D in the biogas technologies and its applications.
- Growing demand of and cost-effective employment

Feedstock Availability and Energy Generation Potential

- **Biodegradable organic waste from three sectors is the only feedstock available**

	Industry	Urban	Agriculture
Solid and liquid waste	Cattle farm, Poultry, Sugar, Fruit, food and vegetable processing, Tanneries, Paper, Tapioca processing, Slaughter house, Maize starch, Dairy	Segregated Municipal Solid Waste, Sewage Waste	Husk, bran, straw waste of rice, wheat, maize, millet produce
Estimated Potential Energy Generation	4,068 MW	1,622 MW	8, 000-10,000 MW

- **90 mil. m^3/day from cattle dung; 47 mil. m^3/day from urban & industrial waste.**
- **The concept on 'Energy Farming' is largely unacceptable in India due to socio-political issues such as food security, Minimum Selling Price (MSP) of agricultural produce, contract farming etc.**

Biogas Technologies – Current Status

- The mesophilic and 'wet type' Anaerobic Digestion (AD) is the most common biogas generation process in India as the average ambient temperature in most parts of the country is close to the optimum temperature of 37-39 °C. The low Total Solid concentration in the 'wet type' process makes entire design, engineering and operation simple.

- The Upward Anaerobic Sludge Blanket (UASB) and Continuously Stirred Tank Reactor (CSTR) are the two main biogas generation technologies widely used India for the large scale biogas production from the biodegradable organic liquid and solid wastes respectively.

- The water scrubbing and Pressure Swing Adsorption (PAS) are the most popular biogas upgradation systems used to convert biogas into bio-methane because of their simple design and easy operation.

Biogas Technologies – Under Development

- The different combinations of mesophilic and thermophilic, wet and dry type Anaerobic Digestion (AD) processes to improve overall plant efficiency and the throughput and reduce the cost.
- The different AD reactor construction materials and techniques such as glass fused steel CSTR reactors, the design and engineering of batch type digesters for dry digestion.
- The biogas upgradation technologies such as membrane filtration, amine scrubbing.

Key Biogas Programmes

01 Waste to Energy Programme

Ministry of New and Renewable Energy

02 Biogas Scheme

Ministry of New and Renewable Energy

03 National Policy of Biofuels

Ministry of Petroleum and Natural Gas

04 SATAT Initiative

Ministry of Petroleum and Natural Gas

Waste to Energy Programme

- Target - Industrial, Agricultural & Urban waste
- Biogas plants in the size range of >2500 m^3 per day and power generation capacity range of > 250 kW.
- MSW to Energy is covered under the programme.
- Mostly projects are set up in industrial sectors namely distillery, paper and pulp, Sugar, starch, pharmaceutical industries etc.
- To provide back-ended capital subsidy for setting up of Waste to Energy plants.

Waste to Energy Plants

POTENTIAL — **5690 MWeq**

Estimated potential of energy recovery from urban and industrial organic waste only.
Agricultural waste also provides huge opportunity.

ACHIEVEMENT — **330 MWeq**

Waste to Energy projects mainly installed in Industries to treat effluent/waste generated:

Industrial waste	:	65%
Urban waste including MSW	:	34%
Agricultural waste	:	<1%

Biogas Programme

- **Target: RURAL AREAS**
- **New National Biogas and Organic Manure Programme (NNBOMP) –**
- **Biogas Power Generation (Off-grid) and Thermal energy application Programme (BPGTP)-**
- **back-ended capital subsidy is provided for setting up of biogas plants.**
- **Ceiling of 35% of project cost. Enhanced subsidy for backward states and backward community.**

Biogas Plants

POTENTIAL **12 million**

Estimated potential of biogas plants of 1 to 25 m^3/day generation capacity is 12 mil. in the country

ACHIEVEMENT **5 million**

NNBOMP (1-25 m^3/day) – 5 mil. Biogas plants

BPGTP (30-2500 m^3/day):
Power generation capacity – 7.166 MW
Biogas generation capacity – 69585 m^3/day

Bio-fuels Programme

- **Target- Agricultural waste & surplus food-grain**

Strategy and approach

- **Ethanol Blended Petrol (EBP) Programme**
- **Biodiesel Blending Programme**
  - **Focus on advanced biofuels that includes–**
  - **Second Generation (2G) Ethanol,**
  - **algae based 3G biofuels,**
  - **drop-in fuels,**
  - **bio-CNG, bio-methanol,**
  - **DME, bio-hydrogen etc.**

Bio-fuels

POTENTIAL — **20% Ethanol 5% Biodiesel**

Indicative target of 20% blending of ethanol in petrol and 5% blending of bio-diesel in diesel by 2030.

ACHIEVEMENT — **6% Ethanol <1% Biodiesel**

6% blending of ethanol in petrol

<1% blending of biodiesel in diesel

SATAT Initiative

- ✓ **National Policy on Bio-Fuels 2018 emphasizes on promotion of advanced Bio-fuels including CBG.**
- ✓ **Launched in October 2018 to promote Compressed Bio-Gas (CBG).**
- ✓ **SATAT Initiative aims to**
  - **Guarantee Production offtake where Public Sector OMC to buy CBG at fixed rate**
  - **Set up CBG Plants mainly by independent entrepreneurs.**
  - **Provide an additional revenue source to farmers.**
  - **Reduce import of natural gas.**
- ✓ **CBG to be sold through cascades initially at OMC fuel stations and later it can be integrated with gas grid.**

SATAT

POTENTIAL — **62 MMT CBG**

The potential for Compressed Bio-Gas production from various sources in India is estimated at about 62 million tonnes per annum.

ACHIEVEMENT — **15 MMT CBG 5000 CBG Plants**

5000 CBG plants are expected to produce 15 million tonnes of CBG per annum by 2023, which is about 40% of current CNG consumption of 44 million tonnes per annum in the country.

ACHIEVEMENT — **Over 400 CBG Plants**

Letters of Intends issued by OMCs for over 400 CBG plants.

Actions Required for Rapid Growth of Biogas in India

- The waste management rules for proper disposal/ segregation of waste to enable standardisation of biogas plants in terms of their design, engineering, operation and maintenance.
- An appropriate tipping fee shall be levied to the industries for the collection and disposal of their organic wastes to produce biogas energy.
- Business models for collection and storage of agricultural waste (overall development and operation of biogas projects.
- Collaboration of the biogas project developers with European biogas developers to gain experience, knowledge about advanced technologies in biogas business.

Case Study

Asia's Largest Multiple Bio-degradable Waste Biogas Bottling & Fertilizer Plant in Nanded (Dist. Kheda) Gujarat

- Commissioned: 2018
- Fully Automated - PLC SCADA Controls
- Continuous Stirred Tank Reactor Technology
- PSA Based Purification unit

Feedstock (240 Tons/ day)

- Cow dung • Fruit-Vegetable Waste • Potato
- Waste Chicory • Press mud
- Poultry Farm Waste

Digester Volume: 21,000 m^3
Biogas Generation: 18,000 m^3/day
Bio-CNG or CBM: 7,200 kg/day
Bio-Manure: ~ 2 Tons/day

Project Cost: ~ 2.5 M USD

Biogas Institutions in India

- The Ministry of New and Renewable Energy, GOI
- State Nodal Agencies (SNA), (such as GEDA, MEDA, PEDA, UPNEDA)
- Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE)
- Biogas Development and Training Centre (BDTC), IIT Guwahati
- Biogas Development and Training Centre (BDTC), KIIT Bhubaneswar
- Centre for Rural Development and Technology, (CRDT) IIT Delhi
- Indian Biogas Association (IBA)

Biogas Technology and Equipment Companies

Biogas Power Solutions

ikos MAILHEM

SPECTRUM RENEWABLE ENERGY

ORGANIC RECYCLING SYSTEMS PVT. LTD

encare

BRIO Energy Efficient Energy Solutions

Verbio Biofuel and Technology

ClarkeEnergy

URJA BIO SYSTEM PVT. LTD WASTE TO ENERGY SOLUTIONS

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ATMOS POWER Committed to the Environment

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Thank you ……