



Introduction and Overview of India's Biofuels Activities

Ravi P Gupta, General Manager (Bioenergy)

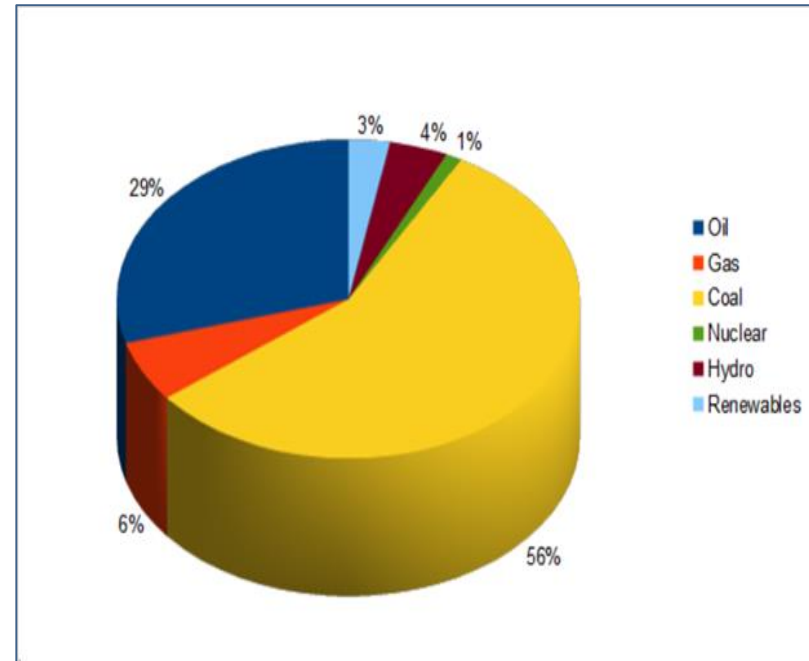
Indian Oil Corporation Limited, R&D Centre

23rd November 2020

The IEA Bioenergy Technology Collaboration Programme (TCP) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the IEA Bioenergy TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

India's Total Primary Energy Demand

- India's share of total global primary energy demand is set to roughly double to ~11% by 2040, underpinned by strong population growth and economic development
- India accounts for more than a quarter of net global primary energy demand growth between 2017-2040
- 42% of this new energy demand is met through coal, meaning CO2 emissions roughly double by 2040
- Gas production grows but fails to keep pace with demand, implying a significant growth in gas imports

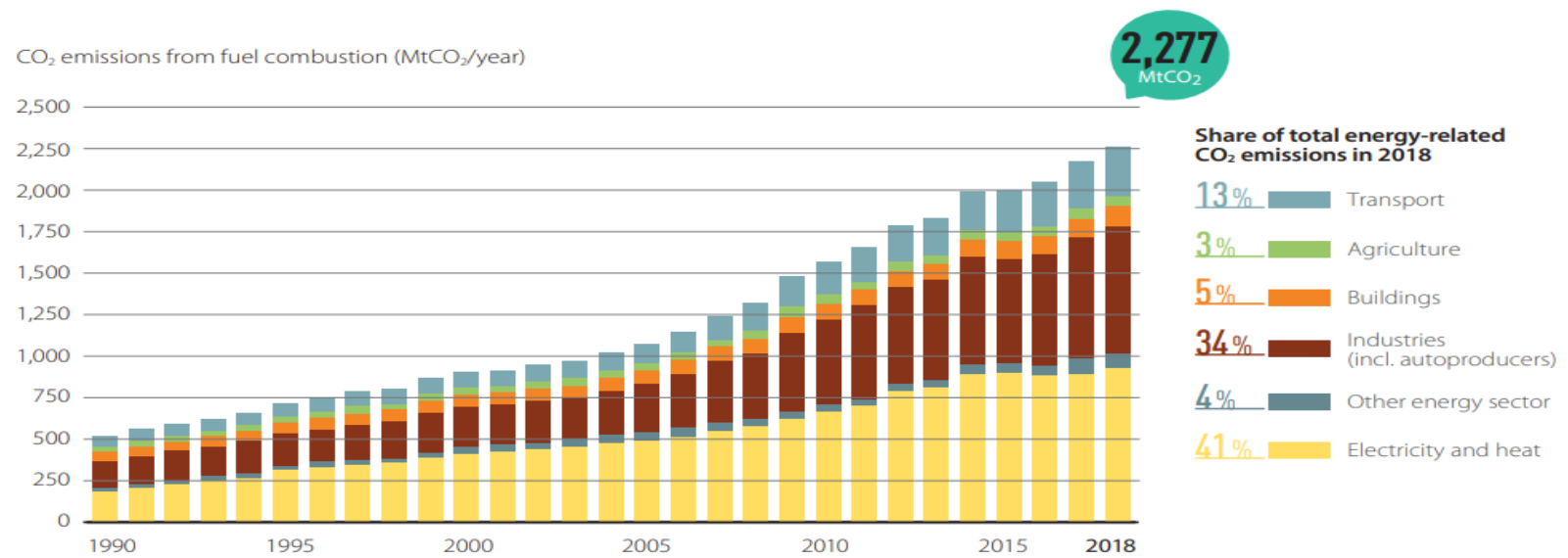


Primary consumption in India
(Source: BP energy Review)

India is one of the fastest growing economies and the 3rd largest consumer of primary energy in the world after US and China

India's Historical GHG emissions inventory data

- GHG emissions by India are the third largest in the world and the main source is coal
- India emits about 3 gigatonnes (Gt) CO₂eq of GHG each year ~ half the world average
- Both the energy and emission intensities of India's GDP have decreased by more than 20% over the past decade.
- Represents commendable progress even as total energy-related CO₂ emissions continue to rise.
- India's per capita emissions today are 1.6 tonnes of CO₂, well below the global average of 4.4 tonnes, while its share of global total CO₂ emissions is ~ 6.4%



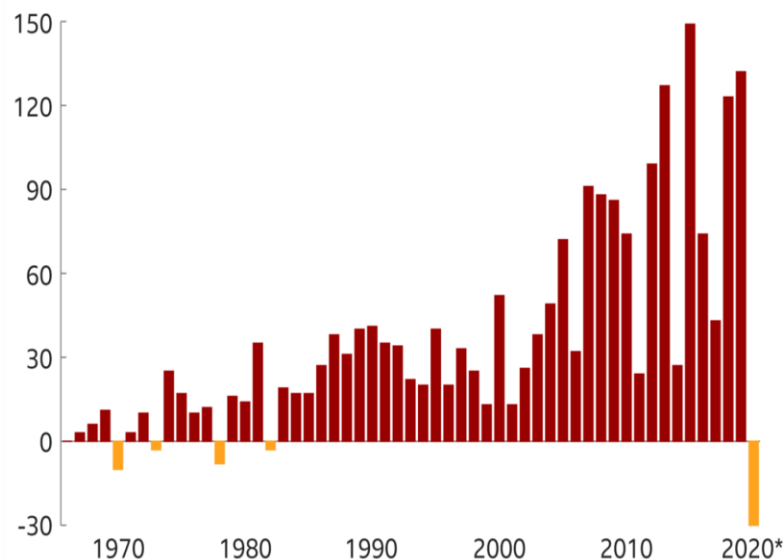
Sources: Enerdata 2019, Brown To Green: The G20 Transition Towards A Net-zero Emissions Economy 2019 Report

Steps taken by India for reducing GHG emissions

- Government of India has target of reducing import dependence i.e. usage of fossil fuels by 10% from current levels by the year 2022
- Target will be achieved by adopting a five pronged strategy which includes- Increasing Domestic Production, Adopting biofuels & Renewables, Energy Efficiency Norms, Improvement in Refinery Processes and Demand Substitution.
- Envisages a strategic role for biofuels in the Indian Energy basket.
- Taken significant steps to improve energy efficiency, which have avoided an additional 15% of annual energy demand and 300 MMT tonnes of CO₂ emissions over the period 2000-18

India's CO₂ emissions fall for the first time since 1982

Millions of tonnes of CO₂



Note: Figure is an estimate for financial year ending March 2020

Source: Centre for Research and energy for clean air

As of 2014, India's carbon intensity per GDP was twice the world average.

The Paris Agreement commitments included a reduction of this intensity by 33-35% by 2030

National Biofuel Policy 2018

National Biofuel Policy 2018



National Policy on Biofuels 2018

Salient features

An indicative target of 20% blending of ethanol in petrol and 5% blending of biodiesel in diesel is proposed by 2030.	With a thrust on Advanced Biofuels, the Policy indicates a viability gap funding scheme for 2G ethanol Bio refineries of Rs.5000 crore in 6 years in addition to additional tax incentives, higher purchase price as compared to 1G biofuels.	Categorization of Biofuels into Basic Biofuels - First generation(1G) Bioethanol & biodiesel and "Advanced Biofuels"- Second Generation(2G) ethanol, drop-in fuels, algae based Third Generation(3G) Biofuels.	Increase scope of raw material for ethanol procurement by encouraging Intermediate (B-Molasses), Sugarcane Juice, other Sugar containing materials and damaged as well as surplus food grains.
Develop National Biomass repository by conducting appraisal of biomass across the Country.	Bio diesel production to be encouraged from non edible oilseeds, used cooking oil, short gestation crops and development of supply chain mechanisms.	Thrust on research, development and demonstration in the field of Biofuel feedstock production, advanced conversion technologies from identified feedstock.	Setting up of National Biofuel coordination committee (NBCC) under Ministry of Petroleum & Natural Gas and Working Group on Biofuels.



- Government of India has a plan to increase ethanol blending in gasoline from 4.3% now to 8-10 % by 2020-21.
- For 10 % ethanol blending, India will require about 4.5 billion litres of it in a year, about ₹23,000 crore (**US\$ 3 billion**) in terms of value.
- In order to augment feedstock availability and promote Bio-Fuels, MoP&NG, notified the National Policy on Biofuels-2018 on 8th June 2018.
- **Indicative Target by 2030**
 - 20% ethanol blending in petrol
 - 5% biodiesel blending in diesel

Salinet Features of National Biofuels Policy 2018

- The Policy categorises biofuels as "Basic Biofuels" viz. First Generation (1G) bioethanol & biodiesel and "Advanced Biofuels" - Second Generation (2G) ethanol, Municipal Solid Waste (MSW) to drop-in fuels, Third Generation (3G) biofuels, Bio-CNG etc. to enable extension of appropriate financial and fiscal incentives under each category.
- The Policy expands the scope of raw material for ethanol production by allowing use of Sugarcane Juice, Sugar containing materials like Sugar Beet, Sweet Sorghum, Starch containing materials like Corn, Cassava, Damaged food grains like wheat, broken rice, Rotten Potatoes, unfit for human consumption for ethanol production.
- Policy allows use of surplus food grains for production of ethanol for blending with petrol with the approval of National Biofuel Coordination Committee.
- Policy indicates a viability gap funding scheme for 2G ethanol Bio refineries of Rs. 5000 crore (US \$ 675 million) in 6 years in addition to additional tax incentives, higher purchase price as compared to 1G biofuels.
- The Policy encourages setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, Used Cooking Oil, short gestation crops.

Major programs for implementation of Biofuels

List of Funding Agencies & Major Program :

- Department of Biotechnology (DBT) , Ministry of Science & Technology, Government of India
- Centre for High technology (CHT) , Ministry of Petroleum & Natural Gas, Government of India
- Ministry of New & Renewable Energy (MNRE) , Government of India

List of major programs supporting the development of biofuels production and use in India :

- Viable Gap funding (VGF) for Commercial scale 2G ethanol plants under Pradhan Mantri JI-VAN Yojana from CHT, MoP&NG
- Financial Assistance for Demonstration Scale 2G Integrated Bioethanol under Pradhan Mantri JI-VAN Yojana from CHT, MoP&NG
- Grant for Research & development from DBT to five Centre for Excellence in Bioenergy Area

MoP&NG has taken major initiative for setting up of 12 no. of 2G Ethanol commercial plants from agriculture waste across eleven states at an estimated cost of Rs 14,000 crore (US\$1.9 billion)

Dedicated DBT Bioenergy Centres for Biofuel Research

1. **DBT-ICT Centre** for Energy Bioscience-
Mumbai-2008
2. **DBT-IOC Centre** for Advanced Bioenergy
Research – Faridabad (in *Partnership*
Indian Oil Corporation Ltd)-2011
3. **DBT-ICGEB Centre** for Advanced
Bioenergy Research – New Delhi 2012
4. **DBT-Pan IIT Centre** for Bioenergy –
Virtual Center with 5 IITs - 2014
5. **DBT-TERI Centre** of Excellence on
Integrated Production of Advanced
Biofuels and Biocommodities - 2018

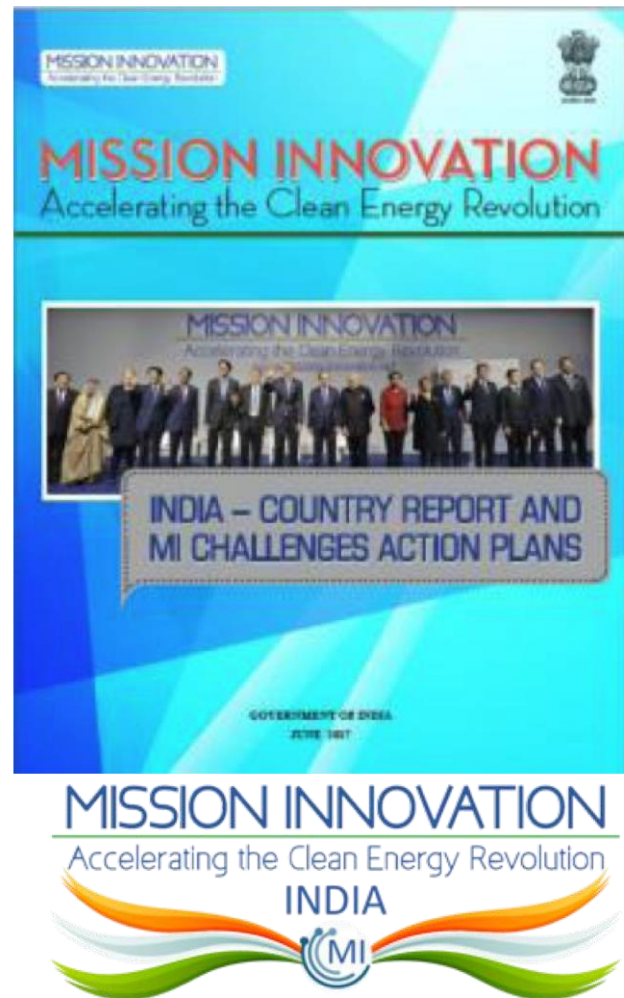


India's Contribution to Mission Innovation

- Member of Steering Committee
- Country Document and Action plan
- Participating in all 8 Innovation Challenges
- Co-Lead of Smart Grid, Off-Grid and Sustainable Biofuel (IC#4) Challenges.



Participants of MI-India Workshop on Sustainable Biofuels



Existing plants /Proposed Plants in India

Name of company	Status (planned; operational; closed)	Technology	Production capacity (ML/year)
Indian Glycols Kashipur/ 2016	Operational	Demo/ Cellulosic ethanol/ DBT ICT Technology	0.75
Praj Biofuels/2017	Operational	Demo/ Cellulosic ethanol/Praj	1.0
Shell Bangalore/2018	Operational	Demo/ Drop-in fuels/Shell	0.6
NRL Numaligarh/2018	Planned	Commercial /Cellulosic ethanol/Chempolis, Finland	60
IOCL Panipat	Planned	Commercial /Cellulosic ethanol/Praj	30
BPCL Bargarh	Planned	Commercial /Cellulosic ethanol/Praj	30
HPCL, Bhatinda	Planned	Commercial /Cellulosic ethanol/Praj	30
IOCL Panipat	Planned	Demo/Cellulosic ethanol/DBT-IOC, IOC R&D	0.75
CSIR-IIP, Dehradun	Operational	Pilot/ HEFA Biojet/CSIR IIP	0.01
IOCL Panipat	Planned	Commercial/3G ethanol/LanzaTech, USA	33

DBT IOC Centre for Advanced Bioenergy Research at IOCL R&D

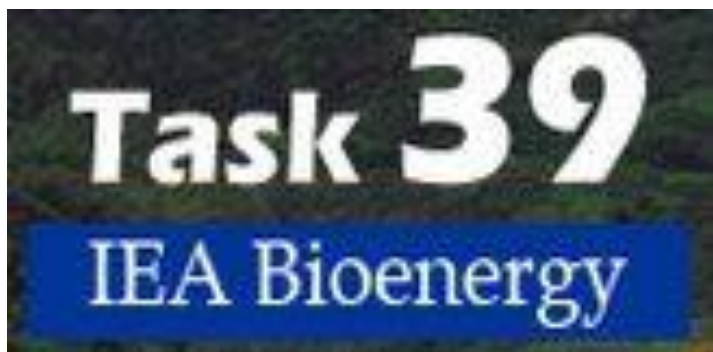
- **Development of economic and scalable cellulosic ethanol technology**
 - ✓ Low OPEX and low CAPEX, Multifeed
 - ✓ Technology meeting LCA criterion
 - ✓ 2G Ethanol technology developed at Pilot scale : 0.25 ton/day
- **In house enzyme development capability**
 - Scaled-up to 5KL & demonstrated at 2G ethanol demo plant
- **10 TPD Demo plant with integrated enzyme production planned at Panipat in 2021**



Pilot facility for pretreatment of Biomass at IOCL R&D Centre with assistance from NREL USA

THANKS

Ravi P Gupta, GM (Bio-Energy)
Indian Oil Corporation Limited, R&D Centre
guptarp1@indianoil.in



www.task39.ieabioenergy.com



IEA Bioenergy
Technology Collaboration Programme

www.ieabioenergy.com