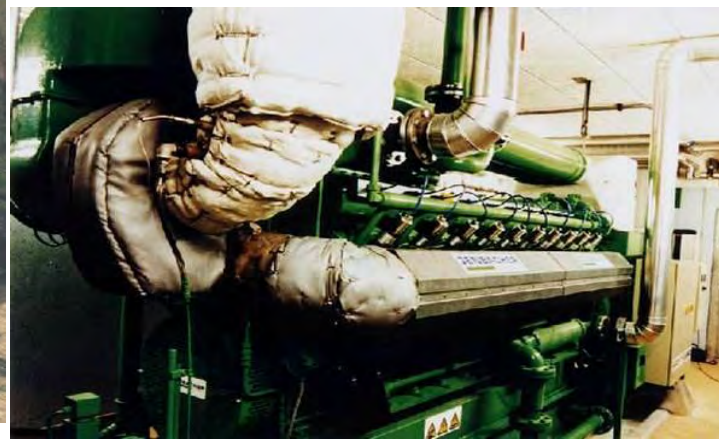




# BIOGAS STATUS & TRENDS IN INDIA

K.KRISHAN

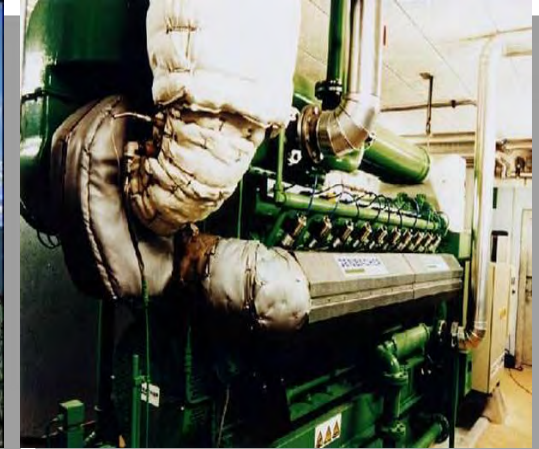


Organic Fertilizer





Figure 2: - Solar collector element of a Parabolic Trough system



# THE CASE FOR RENEWABLE ENERGY – IN INDIA



Organic Fertilizer

# **NEED for GENERATION CAPACITY INCREASE - BARRIERS TO FOSSIL ENERGY GROWTH**

**With 8 to 10% GDP growth, India will need significant capacity addition in Electricity Generation capacity, which is currently Coal centric.**

**However, apart from the environmental as well as ecological considerations, following factors could impede growth of fossil fuel power generation in India :**

- Availability of Coal**
- Cost of imported fossil fuels**
- Social & Climate Change factors**



# Coal availability is an issue → Power shortages

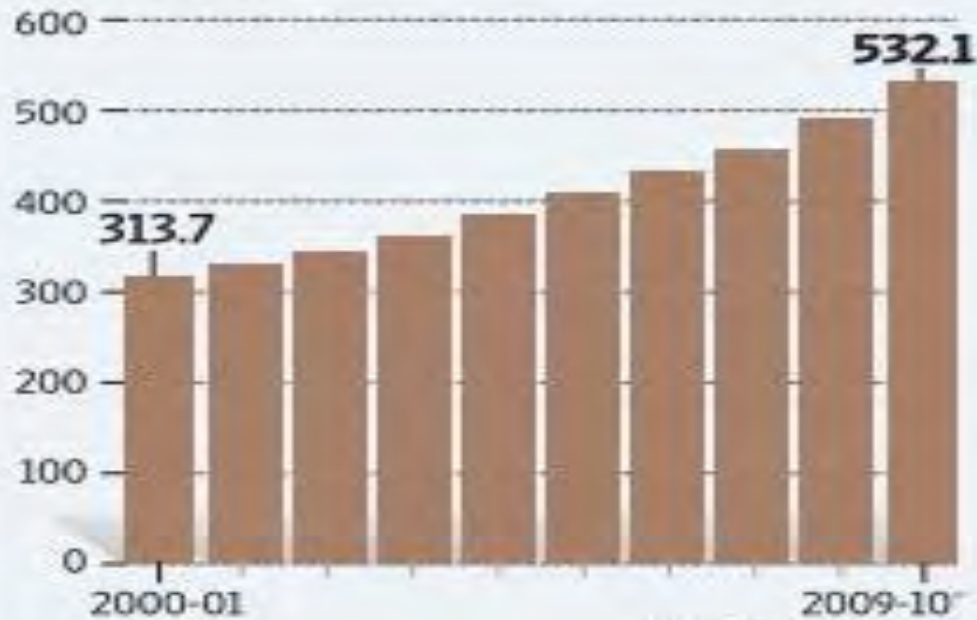


## GAP WIDENS

Coal production has been unable to keep pace with rising demand, leading to higher imports.

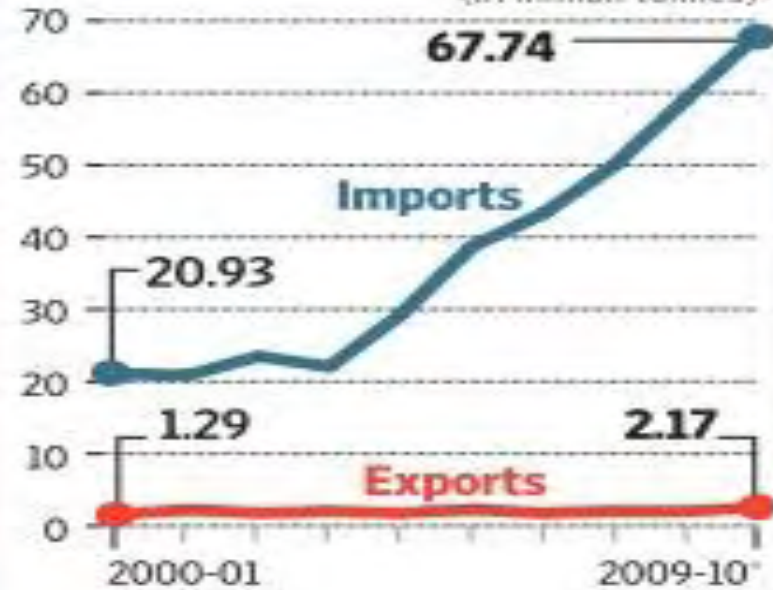
### Production

(in million tonnes)



### Imports vs exports

(in million tonnes)



Source: Coal ministry

< 5% annual growth in Coal production as unexploited coal mines are in forest areas with large tribal population – consequent environmental & social issues

# International Coal Price Spikes likely with increased purchases by China & India

## Top Coal Exporters (2009e)

	Total of which MT	Steam (MT)	Coking (MT)
Australia	259	134	125
Indonesia	230	200	30
Russia	116	105	11
Colombia	69	69	-
South Africa	67	66	1
USA	53	20	33
Canada	28	7	21

## Top Coal Importers (2009e)

	Total of which MT	Steam (MT)	Coking (MT)
Japan	165	113	52
PR China	137	102	35
South Korea	103	82	21
India	67	44	23
Chinese Tapei	60	57	3
Germany	38	32	6
UK	38	33	5

Source : IEA 2010

# Rising trends in Australian Coal Prices



Source : [www.mongabay.com](http://www.mongabay.com)



# International Coal Price rise also impacting domestic Coal prices in India

## Sell Coal at Global, Local Price Average: Plan Panel

**DEVIKA BANERJI**  
NEW DELHI

The planning commission has mooted the need for pooling imported coal with domestic supply to average out costs and supply it to all users at uniform prices.

This will help lower cost for companies that rely on import to meet their coal needs.

Imported coal is about 50% costlier than Indian coal despite the recent price increase by Coal India Ltd, the state-run coal miner.

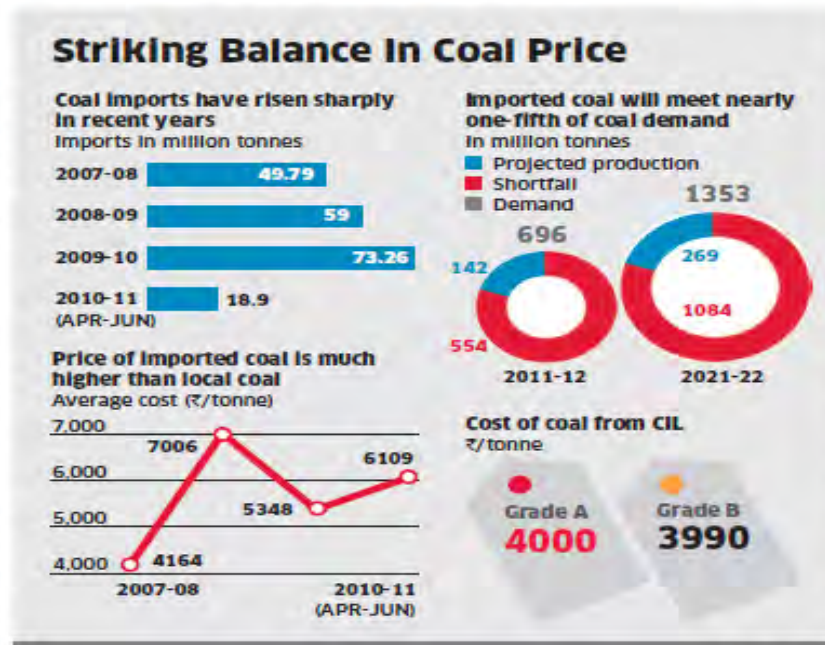
"We have to develop a system of pool pricing of coal so that imported coal plants don't become uneconomic," Planning Commission member BK Chaturvedi told ET.

The commission has forecast coal shortage in India will soar to 200 million tonnes by the end of the 12th Plan (2012-17), with a demand of 1,000 million tonnes against a production of 800 million tonnes.

Next year, the shortage is expected to be around 142 million tonnes, with availability of 554 million tonnes against a requirement of 696 million tonnes.

At a meeting with the prime minister last week, the commission had stressed on pooling and the need to expand the role of Coal India to that of a supplier.

The panel's proposal on Coal India was in line with the Central Elec-



tricity Authority's suggestion earlier that the state-run miner should act as a nodal agency for importing, pooling and supplying coal.

"If we have to meet energy requirements, we need to have large amount of power from coal and gas. Large amount of imports have to done," Chaturvedi said.

The Plan panel member said the idea of pool pricing of coal came from a gas pooling policy that helped revive power projects like the Dabhol plant, owned by Ratnagiri Gas and Power.

"We had a system of pool pricing for LNG, and plants like Ratnagiri became viable along with oth-

ers. This is the intention of pool pricing. And we are looking into the possibilities of formulating the policy," Chaturvedi said.

If implemented, the pricing policy will benefit companies such as Adani Power that invest heavily in imported coal. "In my view, pooling prices of coal will rationalise the transportation of coal, reduce congestion and increase efficiency," said Adani Power vice-president Kandarp Patel.

But it could impact other players differently, he added.

For other stakeholders, such as National Thermal Power Corporation, the largest consumer of coal in the country, coal prices will rise because the company meets most of its needs through domestic output.

"It will depend on how the government formulates the pricing policy. We rely heavily on domestic coal, so for us prices will increase," an NTPC official said.

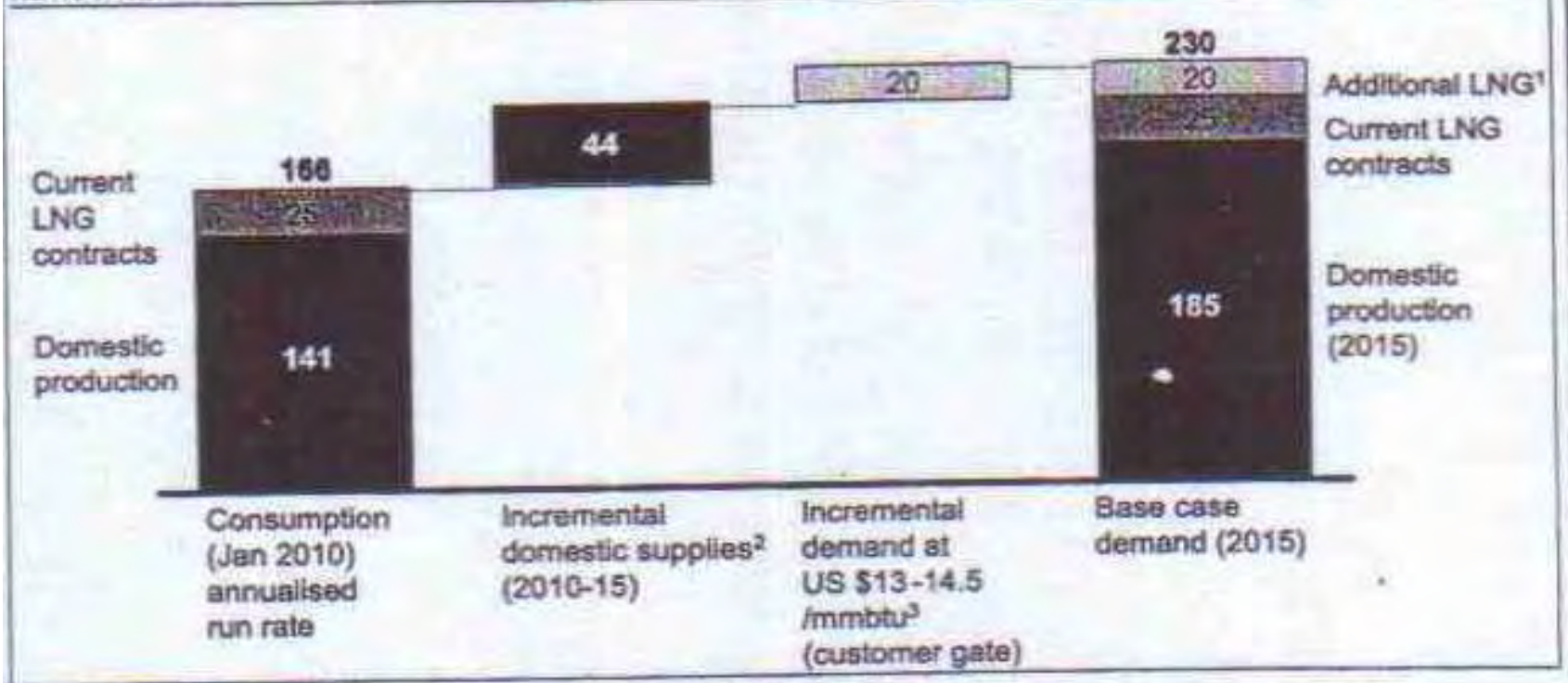
The electricity authority had also suggested a coal pooling pricing formula based on average price of imported coal after transportation and insurance charges, and taking into consideration coal produced by Coal India and Singareni Collieries Company.

However, the proposal has received few takers and will be worked on by the coal ministry after it gets feedback from all users.

# Indian Natural Gas – Growing Demand & Price

## Gas demand in 2015

mmscmd



1 Used in power sector (5 mmscmd), CGD (10 mmscmd) and industrial applications (5 mmscmd)

2 Includes additional output from RIL KG D6, as current production of ~55 mmscmd ramps up to 80 mmscmd and output from other fields

3 Based on LNG contract prices of 12.65 – 14.5% of JCC. Crude prices assumed at US \$70 / bbl

Source - McKinsey Report

Current, producer tariff of Rs 7.5/cu m ( based of \$ 4.2/MMBTU + Royalty).  
Current bulk consumer price of Rs 10/cu m (including transport + taxes)

Current GSPL retail price of Rs 18 to 20/ cu m – CNG @ Rs 35/kg

Projected, 2015, consumer gate price (from regasified LNG) of Rs 20-22 / cu m



## **Piped Natural Gas (from TAPI) is not cheap**

# India Offers \$12.67/Unit for Turkmenistan Gas

**RAJEEV JAYASWAL**  
NEW DELHI

India is willing to pay about \$12.67 per unit for natural gas supplied from Turkmenistan through a transnational pipeline while the central Asian nation wants the gas price to be linked with market rate of liquefied natural gas (LNG).

"We can't pay market rates which could be \$14-15 per mBtu (million British thermal unit). We want the rate at par with Petronet LNG's long-term contract with Ras Gas," an Indian government official with direct knowledge of the matter said. India is hosting a meeting of oil ministers of Turkmenistan, Afghanistan and Pakistan in New Delhi to negotiate construction of \$7.6 billion transnational gas pipeline.

India will not invest money in constructing 1,680 kilometre pipeline to bring gas from central Asia, provided it is cheaper than LNG, the official said requesting anonymity. "Why to invest in infrastructure, if we can import relatively cheaper LNG," the official said. The price negotiation is being done keeping gas supply in the next 4-5 years.

"India's participation in the TAPI pipeline will depend on the price at which Turkmenistan gives us gas," a senior official in the oil ministry said. The name TAPI pipeline is based on initials of the four partners; Turkmenistan, Afghan-

istan, Pakistan and India.

Officials said Turkmenistan currently supplies gas to China at \$7.5 per unit exclusive of transportation charges and the rate seems reasonable for consumers in the northern India, suffering from acute power shortage. This rate would also go up in the next five year, the expected

time to commission the transnational pipeline.

While signing agreements for construction of \$7.6 billion transnational natural gas pipeline in December last year, former oil minister Murli Deora had said that Turkmenistan

should provide gas at competitive rates and

that all the countries involved in the project should share the risks involved in the transit of gas through volatile regions.

Other gas-consuming countries along the 1,680 km pipeline — Afghanistan and Pakistan will also negotiate the gas price with Turkmenistan separately as Turkmenistan wants to sign separate commercial terms with the three gas consuming nations, officials involved in negotiation, said.

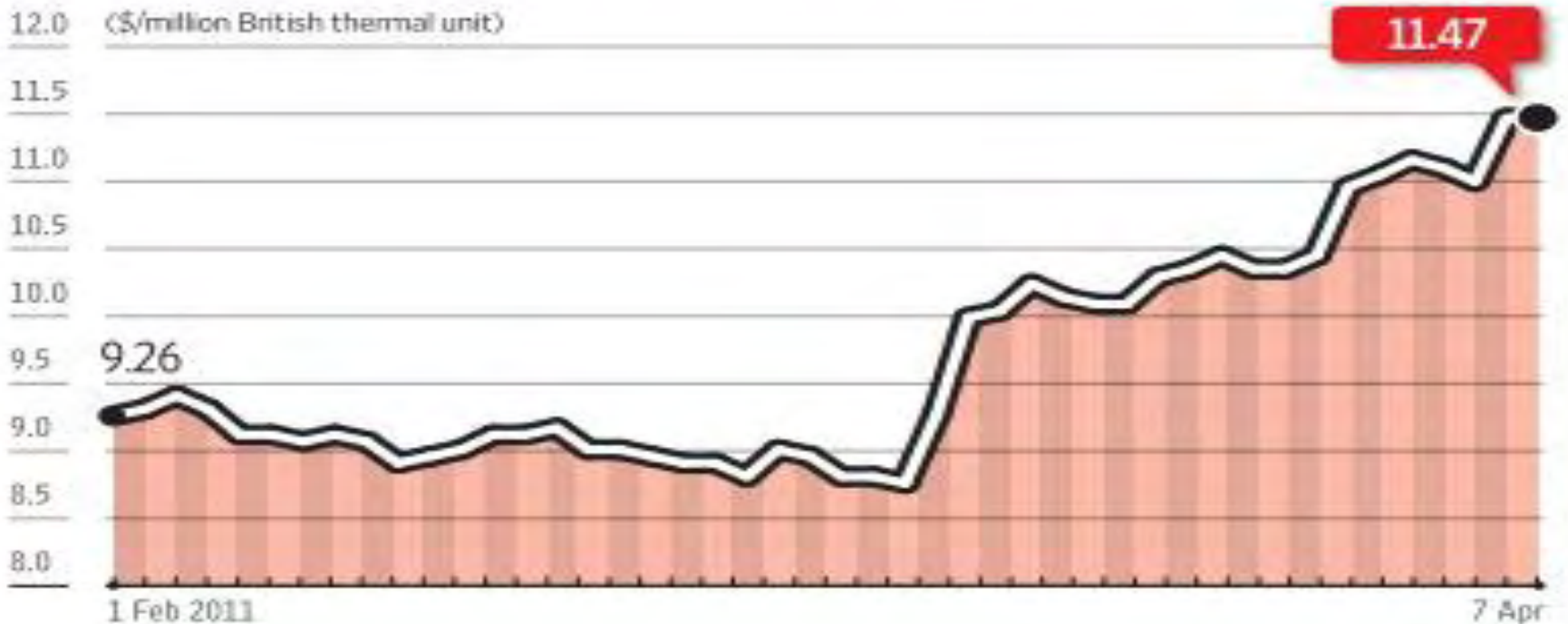
The entire process of finalising gas prices with different consumers and signing of separate GSPAs would expected to take 6-7 months time, they said.

**Turkmenistan to supply 90 mmscmd gas – India and Pak get 38 mmscmd each and the rest goes to Afghanistan**

# International Price of LNG is rising.

## COSTLIER FUEL

LNG prices in India have risen by more than \$2 per mBtu since the beginning of February.



Source: Platts

SANJEEV BHATNAGAR/MINT

Projected, Indian demand of LNG is 80 mscmd (out of total 350 mscmd for Gas)



## High delivered cost of Power from imported LNG.

# Plan for uninterrupted power to industries

But only if they are ready to shell out Rs. 7 per unit

Staff Reporter

**BANGALORE:** Industries in Bangalore can hope to get uninterrupted power supply in the next two years after the completion of the proposed Bidadi Gas Project. However, they should be ready to buy it at Rs. 7 per unit as against Rs 3.60 they are paying now.

Revealing this at an interaction with members of Bangalore Chamber of Industry and Commerce (BCIC) on Tuesday, Bangalore Electricity Supply Company (Bescom) Managing Director P. Manivannan said the Bidadi project (the first gas-based power project in the State) would be able to produce 700 megawatts of power.

“The Government has made it clear that if we are

## So far, so good

Staff Reporter

**BANGALORE:** Bescom officials are happy they have been able to tide over the summer power crisis so far. Managing Director P. Manivannan said on Tuesday the company had spent an additional Rs.

able to sell the power at Rs. 7 per unit, the gas-based plant would be expedited as that would be the cost of production,” he said.

Power would be supplied to industrial estates through separate feeder lines and in case of interruptions in the

600 core on buying power to meet the increasing demand this summer.

“This year, the demand was up by 15 per cent. We have been able to manage without many power cuts. We hope the situation will improve soon after the rains start,” he added.

supply, the supply company would be penalised.

## Domestic consumers too

Domestic consumers too can hope of uninterrupted power supply in the next two years when Bescom’s projects

on Smart Grid and Distribution Automation would be ready. Mr. Manivannan said he was personally interested in introducing franchise system in Bescom, where a portion of work would be given to private companies. “However, there should be proper checks and balances in this system.”

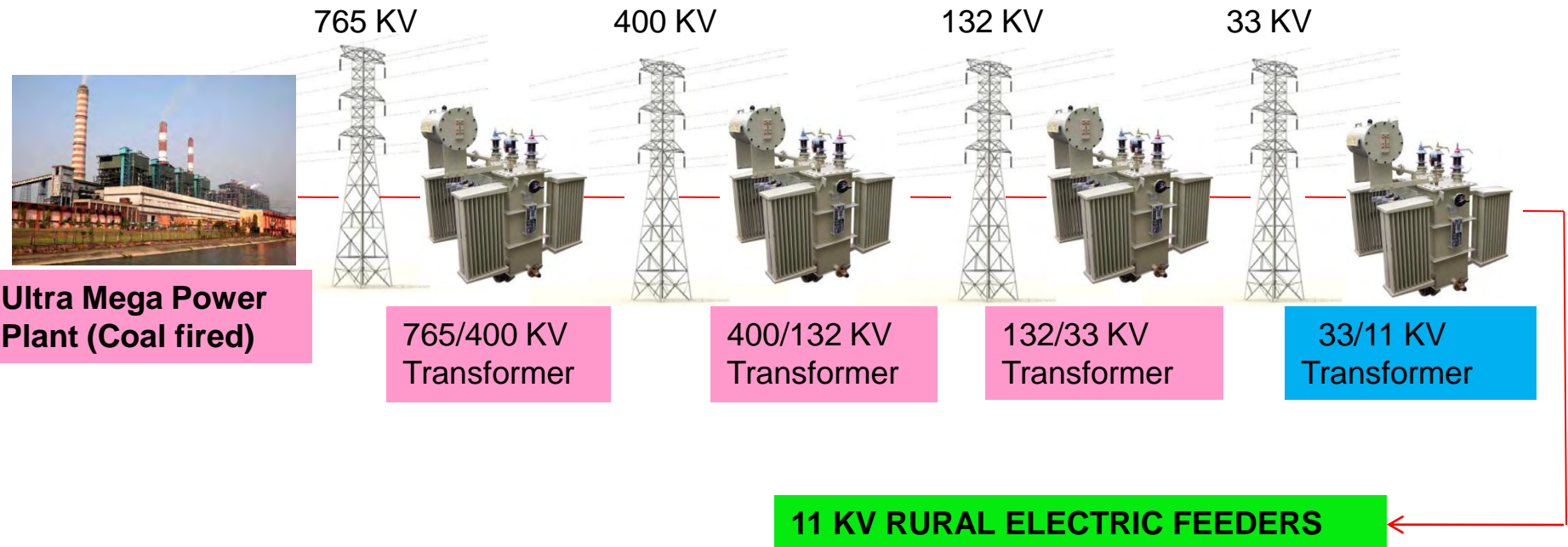
## Smart grid

The pilot smart grid project to be introduced in Electronics City will be completed in another two years. Bescom has roped in Infosys to provide an automated system that would help inform the public about power outages. Apart from this, Infosys and Reliance have also been roped in to introduce automated billing system.

Source : The Hindu, 13<sup>th</sup> April ,2011

# THE SOCIAL FACTOR - CENTRALISED POWER GENERATION and CLASSICAL T&D SYSTEMS - UNABLE TO SERVICE RURAL INDIA

**55 % of Rural Households lack electricity access & poor availability/ quality of grid power inhibits non agricultural economic activity**



**INVESTMENTS + T&D LOSSES, UPTO 11 KV FEEDERS, ARE HIGH & RETURNS TOO LOW TO SERVICE ASSOCIATED INVESTMENTS**



# Come 2030, Karnataka will be hotter by 2°C

TIMES NEWS NETWORK

**Bangalore:** Karnataka's temperature is likely to soar by 2 degrees Celsius by 2030. It's not all. The climate change will have disastrous impact on the state's



water resources, rainfall and forest cover, besides enhancing the occurrence of drought. The worst affected will be Uttara Kannada, Shimoga, Chikmagalur and north Karnataka districts.

These are some of the predictions by the Bangalore Climate Change Initiative - Karnataka (BCCI-K). BCCI-K chairman B K Chandrashekar submitted the interim report on the climate change in Karnataka to chief secretary S V Ranganath and chairman of legislative council D H Shankaramurthy.

Explaining the report, Chandashekar said: "The annual average rainfall in the state has decreased by 6% between 1951 and 2004. The decrease is higher in the coastal and northern parts. The state is projected to experience a warming of 1.8 to 2.2 degrees Celsius by 2030 and the impact is more in the north-eastern parts of the state."

# RENEWABLE ENERGY for ENERGY SECURITY

By 2021 India's Electricity Demand will be over 2025 TWh, even at a low per capita consumption of 1500 KWh/year.

**For Energy Security, as well as GHG mitigation, the share of Renewable Energy could be targeted as 20% i.e. 405 TWh.**

Wind & Small Hydro + grid interactive Solar PV/CSP will add to the grid pool ... albeit with "infirm" power.

***Solar PV/CSP "off grid" solutions with batteries can meet "life line" needs.***

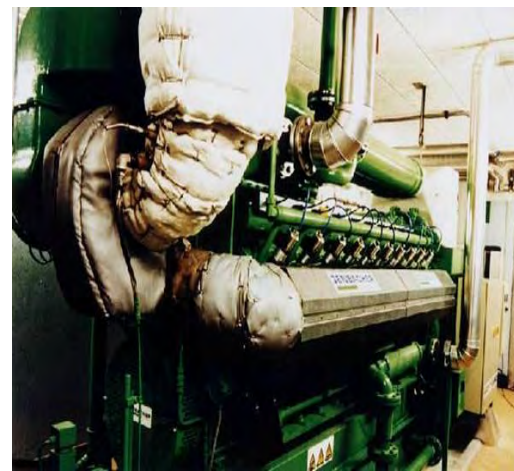
Peak loads (6 to 10 pm) could be met by CSP + Biomass "hybrids"

**Bio Energy will be a source of "firm" power at tail end of the grid through Distributed Power Generation facilities.**





# **Distributed Generation (DG) – at “Tail End” of Rural Electric Grids**



Organic Fertilizer

## E & Y findings on Small sized Plants (tail end of grid) over large size Biomass Power Plants – Power quality

- Small plants, whose power is evacuated at 33/11 KV Substation help in improving the voltage of the 11 KV Grid. For instance, Karnataka Power Transmission Corporation Limited (KPTCL) gets a voltage boost of over 100 volts i.e. 1%.
- They improve power factor. This is crucial as usually when irrigation pumps are connected the power factor deteriorates.
- Grid frequency stabilises
- They limit T&D losses to a large extent. For instance, if a 10 MW biomass based plant is connected to a 132 KV grid and the next 33 KV sub-station is about 30 km then losses would be about 4.7 %.

**This justifies specific support for “Tail end” Generation.**

# Distributed Generation (DG) at Tail End of Grid

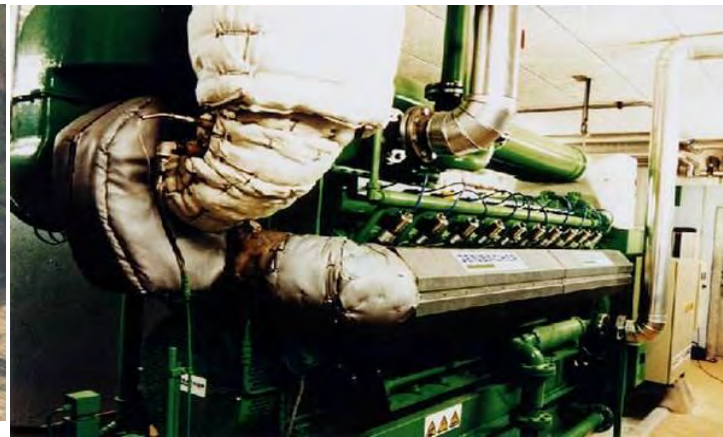
Distributed Generation (DG) Projects, based on biomass, at “tail end” of rural electric grids, provide following benefits :

- **Energy security**, through optimal utilization of locally available bio resources
- **Grid stability & assured Voltage** reduces need for enhancing the capacity of T&D networks to service low loads.
- **Useful bye products**, residues from Biogas Plants (compost) & Biomass Gasifiers (charcoal) , which meet key needs of rural communities.
- **Socio-economic development of rural India.** The symbiotic relationship between electricity availability & economic activity is a well recognized fact. Rural India suffers from lack of “non farm” economic activity due to inadequate power supplies





# BIOGAS POTENTIAL IN INDIA



Organic Fertilizer

# **MNRE - BIOGAS WORKING GROUP FINDINGS**

## **POTENTIAL (excluding specific plans linked to cow manure)**

- **Rural Electrification: 4000 projects of 8000 MW Capacity**

- Modular 2 MW unit based on locally generated and sustainably surplus agricultural residues/short cycle cellulosic biomass.

- 2 MW Plant would require 30,000 tons of such cellulosic biomass, which could be sustainably sourced in around 4000 out of 6000 Blocks in India.

- **Organic Fraction of MSW: 2000 projects of 1000 MW capacity**

- Based on 30 million MT segregated Organic MSW generation by 2021 (20 % of total MSW)

- Modular projects of 400/500 kW capacity could be set in all the 423 Class I cities with a number of projects set up in large cities.



# Case Study - Biogas of Namakkal and Salem districts

Salem & Namakkal Districts , generate significant amount of Bio waste  
 Sago Mills Effluent (> 13 mill KL/year) & Poultry liter (> 500,000 tons/year)



*(in lakhs)*  
**Average strength of layer birds in Namakkal zone in the last 10 financial years**

2000 - 01	171.18
2001 - 02	212.71
2002 - 03	225.42
2003 - 04	219.19
2004 - 05	234.49
2005 - 06	307.34
2006 - 07	339.79
2007 - 08	367.35
2008 - 09	398.62
2009 - 10	407.34
2010 - 11	447.19
2011 - 12	500*

*\*average strength after expansion*



# **ENVIRONMENT PROBLEMS from POULTRY LITTER PILES**

- **Ammonia Emission**
- **Nitrate Pollution**
- **Surface Water Contamination**
- **Ground Water Contamination.**
- **Breeding ground for flies ... health hazard**
- **Public Nuisance.**

# ENVIRONMENT PROBLEMS from STARCH MILL EFFLUENT

- **Ground Water Contamination** : The effluent water, stored in lagoon, leaches in significant quantity & thereby contaminating ground water & decrease in pH
- **Nitrogen Robbing**: The starch mill effluent is rich in carbohydrates but is deficient in Nitrogen. When this carbon rich effluent is used for irrigation, the soil microbes begin to starve for Nitrogen for growth and starts competing with the plant species for Nitrogen. This scenario is called as 'Nitrogen Robbing
- **Making Soil Acidic** : Starch effluent is typically in the range of 3.5 to 4, which increases the soil acidity.
- **Loss of Soil Porosity**: The suspended particle in effluent blocks the pores in the soil there by reducing the porosity in soil.
- **Loss of Water Holding capacity** : Adhesion of carbonaceous compounds on the soil surface disrupts the nascent structure of soil and hence reduces the water holding capacity of it.

# Project portfolio developed by PWPL

	Capacity	Location
PWPL Bio Energy Pvt Ltd	2 Nos. 2 x 2 MW	Salem District
Namakkal Bio Energy Pvt Ltd	1 No 4.9 MW	Namakkal District
ABC Company	1 No 2x2 MW + 1 No 4.9 MW	Salem District Namakkal District

Total capacity of projects available to Portfolio company Investors is 21.8 MW ( 8 MW + 4.9 MW + 8.9 MW)

*Note : Above capacity excludes 3 Nos 2x400 KW Biogas plants in Salem District, which is anticipated to be retained in PWPL balance sheet*



# Programme endorsed by Indian government

Mar 12 2010 4:48AM

HP LASERJET FAX

P. 1



सत्यमेव जयते

दीपक गुप्ता  
Deepak Gupta

सचिव  
भारत सरकार  
नवीन और नवीकरणीय ऊर्जा मंत्रालय  
SECRETARY  
GOVERNMENT OF INDIA  
MINISTRY OF NEW AND RENEWABLE ENERGY

D.O.No.14/1/2009-U&I

8<sup>th</sup> March, 2010

*Dear Shri Sripathi*

I was quite enthused by the response to the seminar in Salem on 30<sup>th</sup> January, 2010 organised by TEDA and also by the presence of Chairman, TNEB regarding setting up of Bio Waste to Biogas + Organic Fertiliser Projects in Salem.

I am told that, as a rough estimate, the Biogas Power Plants potential in Salem and Namakkal Districts is over 100 MW from the Bio Waste generated by Sago & Starch Mills and Poultry farms. Equally, such Biogas Plants will also address the significant environment pollution being caused by Sago & Starch Mills/Poultry farms waste.

There are also collateral benefits of the by-products from the Biogas Plants such as superior quality Organic Fertilizer and waste heat utilization of biogas engines, either to meet thermal energy needs of Sago Mills or to establish cold storages.

We feel that a focused effort should be made to implement such Biogas Power Plants in Salem and Namakkal Districts. Government of Tamil Nadu's involvement is necessary in the context of Power Purchase/Open Access facilities to be provided by TNEB. There is also need to involve the Collectors and Taluka/Block level officials of RDPR to ensure that local community is sensitized on the benefits of these projects. MNRE support is available in form of subsidies.

*With warm regards*

Yours sincerely,

(Deepak Gupta)

Shri K.S. Sripathi,  
Chief Secretary,  
Govt of Tamil Nadu,  
Secretariat,  
Chennai - 600 009.



ब्लॉक नं. 14, केन्द्रीय कार्यालय परिसर, लोदी रोड, नई दिल्ली-110003  
Block No. 14, CGO Complex, Lodi Road, New Delhi - 110 003  
Tel. : 011-24361481, 24362772 • Fax : 011-24367329 • E-mail : secymnres@nic.in  
website : www.mnre.gov.in

# **MNRE - BIOGAS WORKING GROUP FINDINGS POTENTIAL – LINKED TO COW MANURE**

- **5000 Plants of 1500 MW cumulative capacity**
  - ❑ **Linked to feedstock of**
    - (a)60 million MT of cow manure generated at Dairy farms/large Gaushalas (< 5% of total cow dung generated in India) +**
    - (b)30 million MT of agricultural waste (< 5 % of annual waste generated in India).**
  - ❑ **Modular 100/250 KWe or 400/500 KWe or 1000/1200 KWe , to match bio waste availability – as Captive Power Plants at the lower end & IPP's at the higher end.**
  - ❑ **The waste heat of the biogas engines could be used to meet thermal energy needs of Pasteurizers & Milk Chillers**

# CASE STUDY – GAUSHALAS IN INDIA

- **Shree Krishna Captive Energy Pvt Ltd (SKCEL), which has developed 2 MW portfolio in Haryana (linked to 5 Gaushalas, each having > 2,000 cows)**

**Agreements, signed with Gaushalas at Bhiwani, Rohtak, Hisar, Jhajjar and Hansi, for land lease as well as supply of feedstock.**

- **Permits obtained for 2 Gaushalas and will be obtained, for further 2 Gaushalas, by June 2011. All permits will be in place by Sept 2011.**
- **HERC (Electricity Regulator) order for Biogas tariff is anticipated within June 2011**
- **Term sheet signed with DSM for their equity investment in pre construction phase & joint efforts, employing DSM knowhow of enzymes, to enhance biogas yield from substrates**

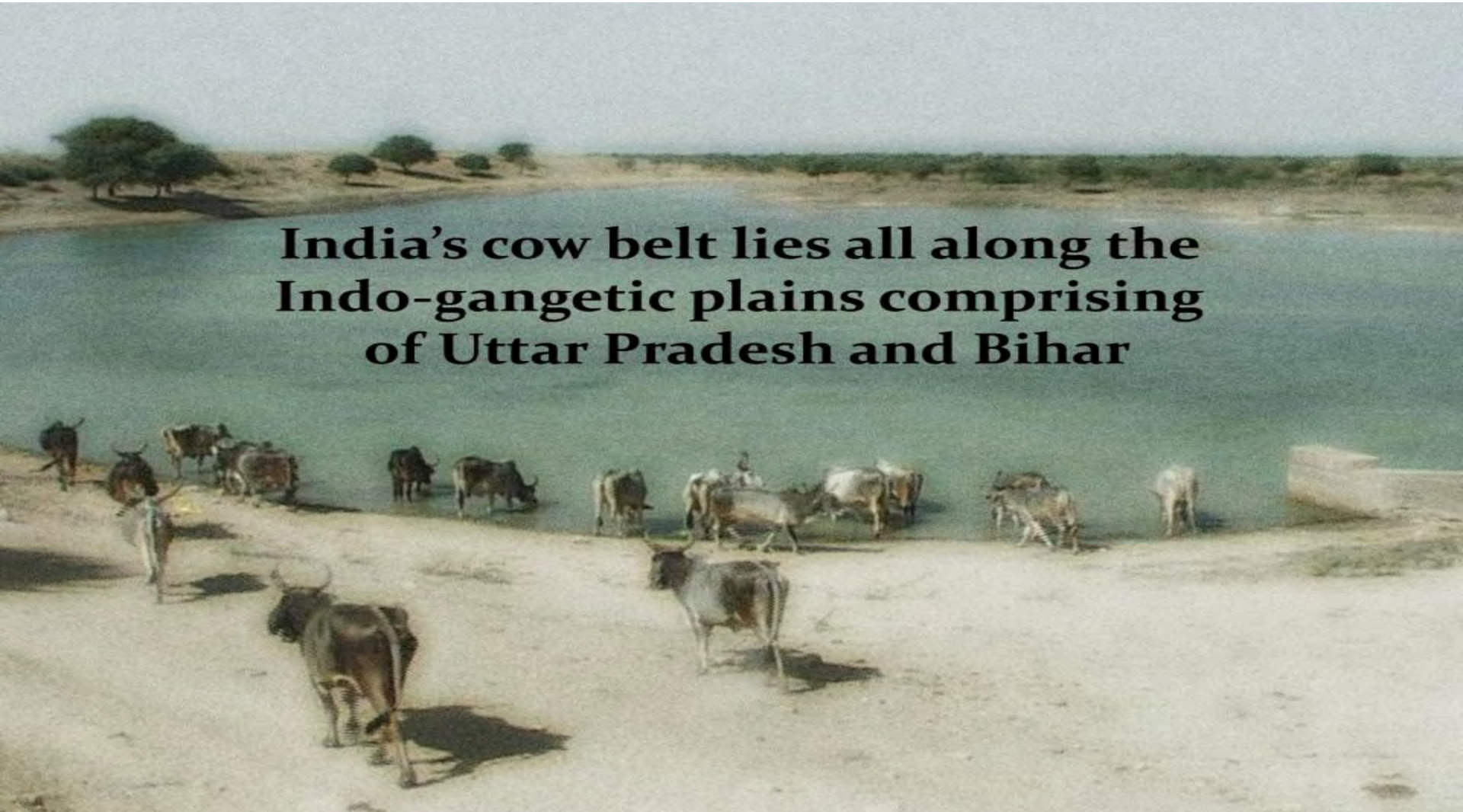


**There are 4,000 Gaushalas in India.  
They are supported by the State & community contributions**



**SKCEL's programme is fully supported by Government of India, as is evidenced by the fact that the agreements, with 5 Gaushalas, were signed in the presence of Minister & Secretary of Ministry of New & Renewable Energy, with Minister of Environment & Forest and Chairman of Animal Welfare Board of India (AWBI) also being present.**

**India has 283 million Cows & Buffaloes  
(18.5% of global population of bovine animals)**



**India's cow belt lies all along the  
Indo-gangetic plains comprising  
of Uttar Pradesh and Bihar**

**Green + Dry Fodder demand of 1.5 billion tons/year  
& manure (18% DS) production of 1.25 billion tons/year**





# BIOGAS FROM BIO WASTE & MANURE - TECHNOLOGY & PROJECT DELIVERABLES



Organic Fertilizer



# Modular Biogas Plant Solutions

## Advantages of standardisation

**Low cost deviation and high planning security**

**Efficient construction**

**High & assured product quality**

**Economies of scale via serial production**

## Modular Biogas Plants (of Envitec design)



**400/500 KWe, CHP solution**

**1000/1200 KWe CHP solution**

**2000 KWe CHP solution**

# Envitec technology deliverables – mitigating Construction/O&M risks

## Multifunctional

- > Generation of heat and electricity (food processing industry needs)
- > Organic Fertiliser
- > Silage (for animal feed)
- > Natural gas substitute (CNG)



## Storable and available

- > Base load capability
- > Peak load capability through the possibility of storage
- > Generation of energy from biogas not dependent on weather conditions which is an advantage over solar- and wind-power

## Highly efficient

- > Highest energy recovery amongst all biomass project types
- > The generation of biogas can be based on agriculture residues & short cycle cellulosic biomass (2<sup>nd</sup> crop when land is normally not utilised)
- > Variety of feed-stocks can be processed (e.g. Food industry waste, Manure)



## Output

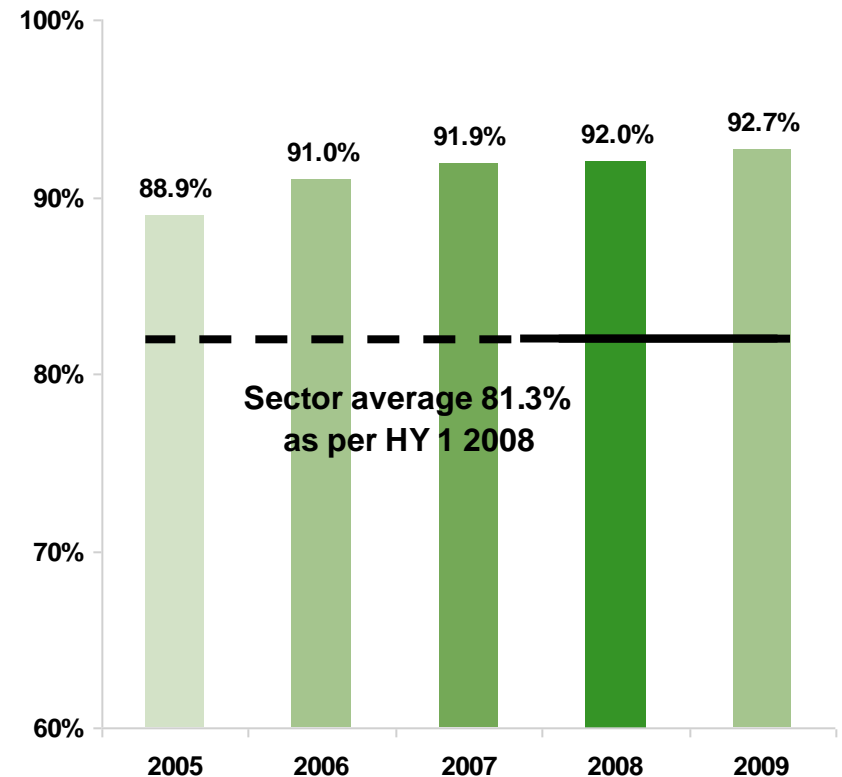
- > Biogas production gives a net positive carbon footprint
- > Suitable for the development of decentralised energy supply
- > Fermentation residues suitable for premium fertilizer

# Competitive advantages & technological superiority

## Reasons

- > **Single-stage, mesophile (35°-38°C), fully mixed process**
- > **Accurate weighing of feedstock**
- > **Daily variance analysis and calibration of gas production**
- > **High quality and standardised construction of components**
- > **Consistent implementation of process requirements**

## Plant efficiency



Source: EnviTec, Fachverband Biogas 2009

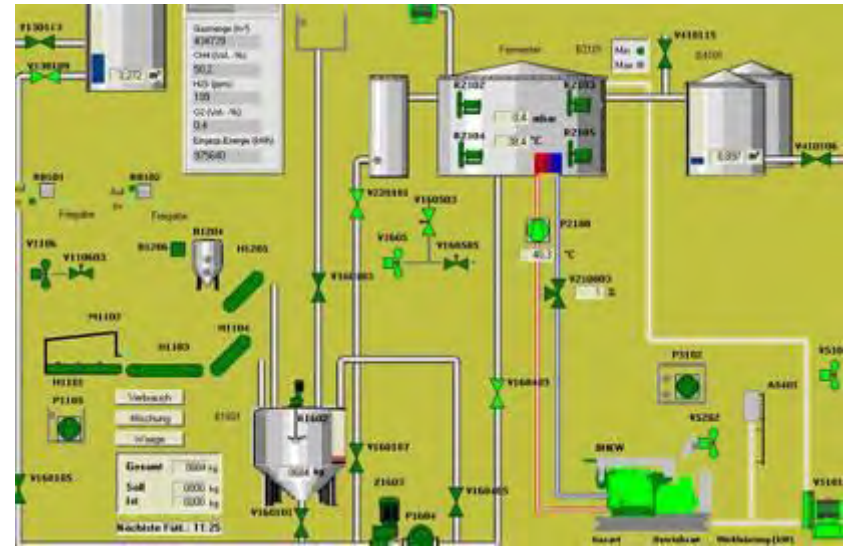


# Biological service – key to Biogas Plant performance

## Trouble-free operation

- > **Agro scientific specialists support before and during the commissioning of plant, and train O&M staff**
- > **During operation the biological processes are monitored online daily**
- > **Laboratory testing of substrates and residual effluents is carried out, as well as on-line gas production and the capacity utilization of biogas plant**
- > **Based on this data , feed stock mix is optimised along with suggestions for additives (enzymes) to ensure ongoing optimization of plant performance**

## Monitoring and control



Source: EnviTec

All-round service and security for trouble-free operation

# Technology & Construction Features of EnviTec Biogas plants

	Description	Advantages
Mixing	<ul style="list-style-type: none"> <li>&gt; Blending of feedstock before induction in fermenter</li> <li>&gt; Inputs are weighed &amp; controlled</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Easy stirring into fermenter through blending</li> <li>&gt; Permanent control of inputs</li> </ul>
Tank construction	<ul style="list-style-type: none"> <li>&gt; Fermenter construction including a system tank</li> <li>&gt; Pre-fabricated concrete elements</li> </ul>	<ul style="list-style-type: none"> <li>&gt; High quality</li> <li>&gt; Flexibility and scalability</li> </ul>
Roof	<ul style="list-style-type: none"> <li>&gt; FLEXO-roof</li> <li>&gt; Two-ply</li> <li>&gt; Self-supporting</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Film coating against corrosion</li> <li>&gt; Snow and wind pressure; static load certified</li> <li>&gt; Execution of a compression test</li> </ul>
Agitator	<ul style="list-style-type: none"> <li>&gt; Flexible agitators in the fermenter</li> <li>&gt; Not fixed within the fermenter</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Guarantees complete stirring</li> <li>&gt; Cleaning / maintenance through extraction of agitator during operation</li> </ul>
CHP	<ul style="list-style-type: none"> <li>&gt; Gas engine</li> <li>&gt; Integrative control system</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Engine specifically created for biogas plants</li> <li>&gt; Long-life cycle</li> <li>&gt; Higher capacity and efficiency</li> </ul>
Anaerobic technique	<ul style="list-style-type: none"> <li>&gt; Mesophilic fermentation (35-38°C)</li> <li>&gt; Wet fermentation</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Lower energy input / higher efficiency</li> <li>&gt; Non-sensitive process</li> </ul>

High quality and security standards allow CE labeling in combination with high plant efficiency confirmed by TUV certificate

# Plant construction – improved techniques – Envitec Feed Control



## Performance-controlled feeding

- > **Variable instead of the usual fixed feeding times**
- > **Adaptation to different substrate qualities**
- > **Software update and a redox probe in the fermenter for measurement and visualization of voltage differences**



## Advantages

- > **Better utilisation of the CHP**
  - > **Prevents overfeeding and therefore an excess production of gas**
  - > **Saving substrates**
  - > **Insensitive to variations in the quality of input**
  - > **Gas storage is used optimally**
- 2-5% more electricity



# Collateral benefit - Organic fertilizer (from Digestate)

- **Close nutrient cycle, using biogas plant effluent as fertilizer**
  - **Nutrients in feedstock of biogas plants can be reused after anaerobic digestion**
  - **Only very few losses of nutrients during storage, transport and biogas process itself**
  
- **Improvements on manure quality with anaerobic digestion**
  - **Degradation of cells, organic acids and long chain organic matter (which helps the young plant)**
  - **Increase of availability of nutrients (especially nitrogen)**
  - **Increase of humus on the fields (compared to combustion)**

Indian imports 17 mill MT Chemical Fertiliser , total demand of 53 million MT. Fertiliser subsidy amounted to Rs 966 billion in FY09 – not sustainable

10,000 MW Biogas Plants will result in 40 million MT stabilised (>75% dry solids) Organic manure – improving soil fertility of about 10 million hectares farm land

# Collateral benefit - Silage Preparation & Storage



**Silage Pile**



**Horizontal Silo's (Bunkers)**

**India's current fodder consumption (green + dry) is around 1 billion MT. Cultivating short cycle cellulosic biomass ,as 2<sup>nd</sup> crop in rain fed areas, can enhance availability to 2 billion MT ... meeting needs of Animal feed as well as generating surplus for Bio-energy .**

**Poor quality fodder is a key cause of low milk yields in India ... 70 million producers average only 6 to 8 liters/day of milk.**

**Annual milk production (117 mill tons) targeted as 200 mill tons by 2021 is a key element of farm households nutrition & income (from milk sales)**

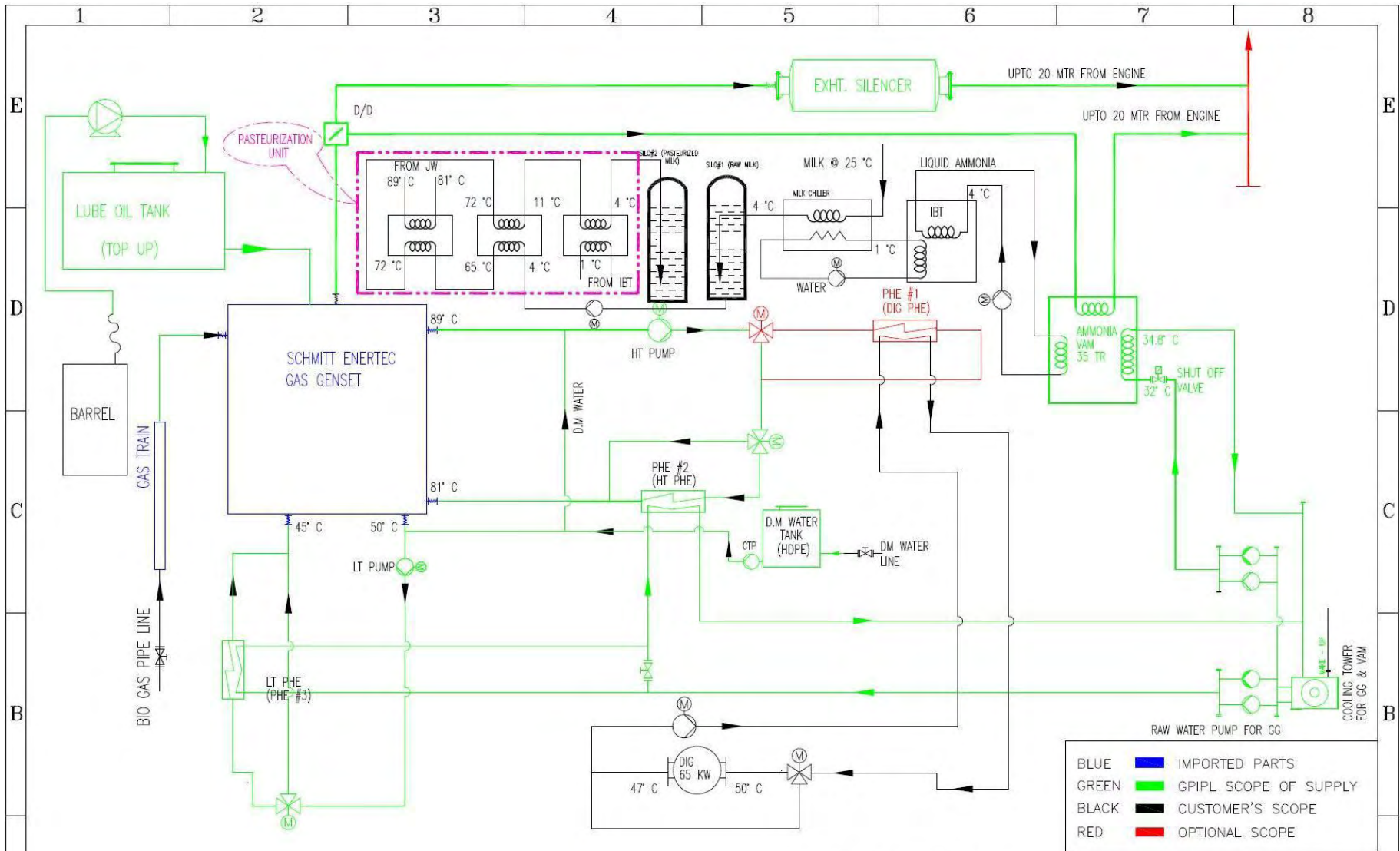
# WHR System - potential for Milk Chiller & Pasteurizer

- **Dairy farm Assumptions** : Gross production of 100,000 Litres per day.
- **Operations cycle assumptions** : in the morning, milk chilling is done for two hours, after that pasteurization process is run for 6-8 hours.  
In the evening, milk chilling is again done for two hours and pasteurization process is repeated again for 6-8 hours.
- **Process description** : the milk is collected at 25 °C and cooled through a Milk chiller and stored in Raw milk Silo at 4 °C.  
The milk is then pasteurized, where it is first heated to 65 °C and then from 65 °C to 72 °C .  
The milk is then cooled to 11 °C by passing through a Heat exchanger and then again cooled to 4 °C. The Pasteurized milk is then stored in Processed milk Silo.
- **Waste Heat Recovery Sysytem** : from Engine exhaust Ammonia Absorption Chiller which will replace the Ammonia Compressors thereby saving 70 KW of power.

The jacket water heat of the engine will be used as a heating media for the pasteurizer



# CHP – Waste Heat for Milk Chiller & Pasteurizer



NOTE: VENTILATION SYSTEM IS IN CUSTOMER'S SCOPE (NOT SHOWN IN DRG.)

<b>CLIENT:-</b>	ENVITECH BIOGAS INDIA (P) LTD.
<b>PROJECT:-</b>	1 x 400 KWe CPP WITH MILK CHILLING OPTION
<b>CONSULTANT:-</b>	

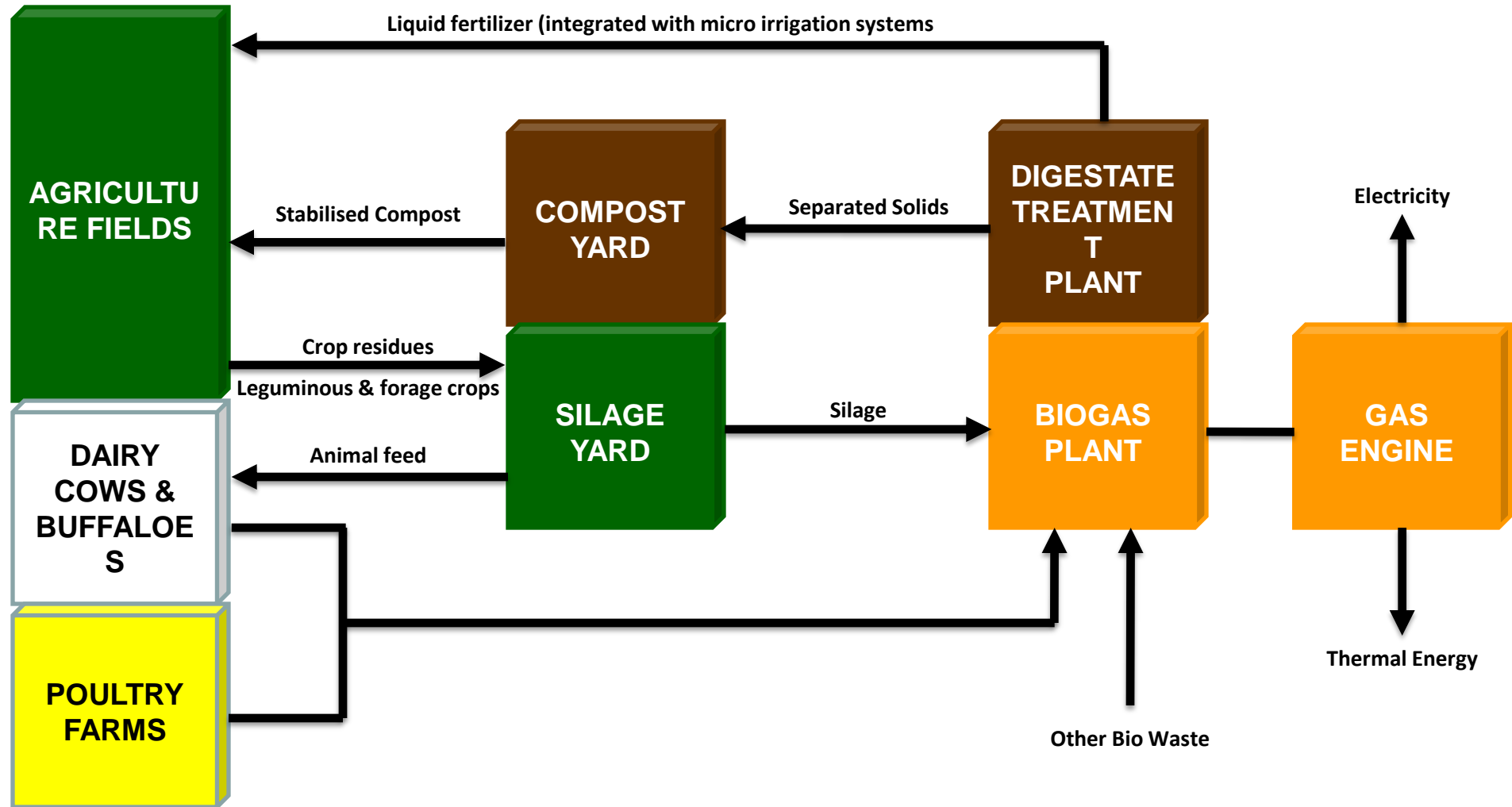
<b>Drawn</b>	
<b>Chkd.</b>	
<b>Appd.</b>	
<b>Date</b>	
<b>Scale</b>	

**SCHMITT  
ENERTEC**

Green Power International Pvt. Ltd.  
E-12/A, Sector - 63, Noida - 201301 (UP)  
Phone : (0120) 4655400, 4655444.

<b>TITLE :-</b> SCOPE & FLOW DIAGRAM FOR 1 x SE-MB-2312-KTA 45 @ 415V SE BIO GAS GENSETS FOR MILK INDUSTRIES		
<b>DRG. No.</b>	<b>REV.</b>	<b>0</b>
GPIPL/SALES/FD/010/A4	<b>DATED</b>	25/06/2010
	<b>SHEET</b>	

# SCHEMATIC OF AGRI COMPANY (linked to Biogas Plant)



# AGRI BUSINESS COMPANY – SILAGE cum COMPOST YARD

Regional Office

Admn & Accounts

PR & Community Relations

Commercial

Extension Officers  
(Silage + Organic Fertilizer)

< 5 MW Biogas  
Cluster

< 5 MW Biogas  
Cluster

< 5 MW Biogas  
Cluster

< 5 MW Biogas  
Cluster

< 5 MW Biogas  
Cluster

SILAGE cum  
COMPOST YARD

Knowhow  
Dissemination

ICT Kiosk

Collection & Transport of  
Agri residues +  
leguminous/ forage crops

SHG's

Retailing of Compost &  
Animal feed

SHG's

Ensilaging –  
Production  
&Marketing

Composting -  
Production  
&Marketing

M.S. Swaminathan  
Research Foundation

Development Alternatives

PPP between GTZ & Envitec/MPPL  
(for Salem/Namakkal + Bantayan)



Many thanks for your attention !

