Waste Generation in India from Different Sources

Waste	Quantity
Municipal solid waste	27.4 million tonnes/year
Municipal liquid waste	12145 million liters/day
Distillery	8057 kilo liters/day
Pressmud	9 million tonnes/year
Food and fruit processing waste	4.5 million tonnes/year
Dairy industry waste	50 – 60 million liters/day
Paper and pulp industry waste	1600 m3 wastewater/day
Tannery	52500 m3 wastewater/day
Sewage	5 billion liters/day

HIGH RATE BIOMETHANATION ANIMAL MANURE BASED POWER PROJECT -1.048 MW

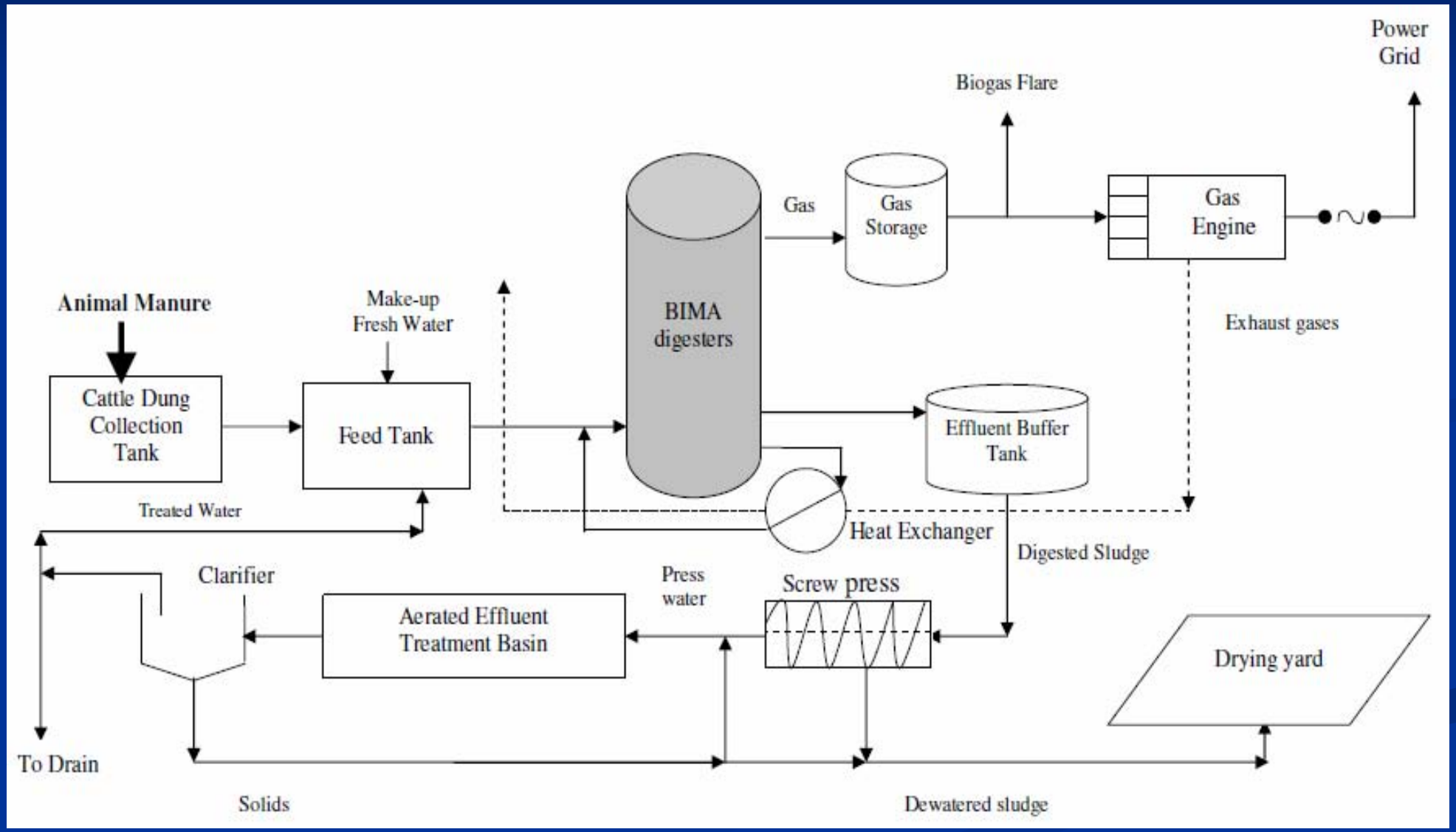
- MNRE / UNDP-GEF demonstration project for power generation from dairy waste setup at Haebowal, Ludhiana – Capacity 1MW
- Cost – Rs. 13.66 crore
- MNRE,GOI grant under UNDP-GEF PROGRAMME – 6.83cr
- State share – 3.42cr
- PEDA / PGL share – 3.41 crore
- Based on BIMA technology provided by M/s. Entec, Austria
- Project commissioned on 4th November'04
- Plant PLF = 75%
- Bio-manure generated being sold to farmers
- Green house gas emission abatement -802kg CO_2-C eqv./Hr

Salient Features of the Plant

Location	Haebowal Dairy Complex, Ludhiana
Capacity	1 MW
Animal Waste Requirement	235 ton/day
Biogas Production	9116 m^3/day
Emission reductions	32,900 tons/annum
Implementing Agency	PEDA, Chandigarh
Technology Provider	Entec, Austria
Technology Consultant	Enkem Engineers Pvt. Ltd.,
Technology Institution	Department of Chemical Engineering, IIT Roorkee

Process Flow Sheet

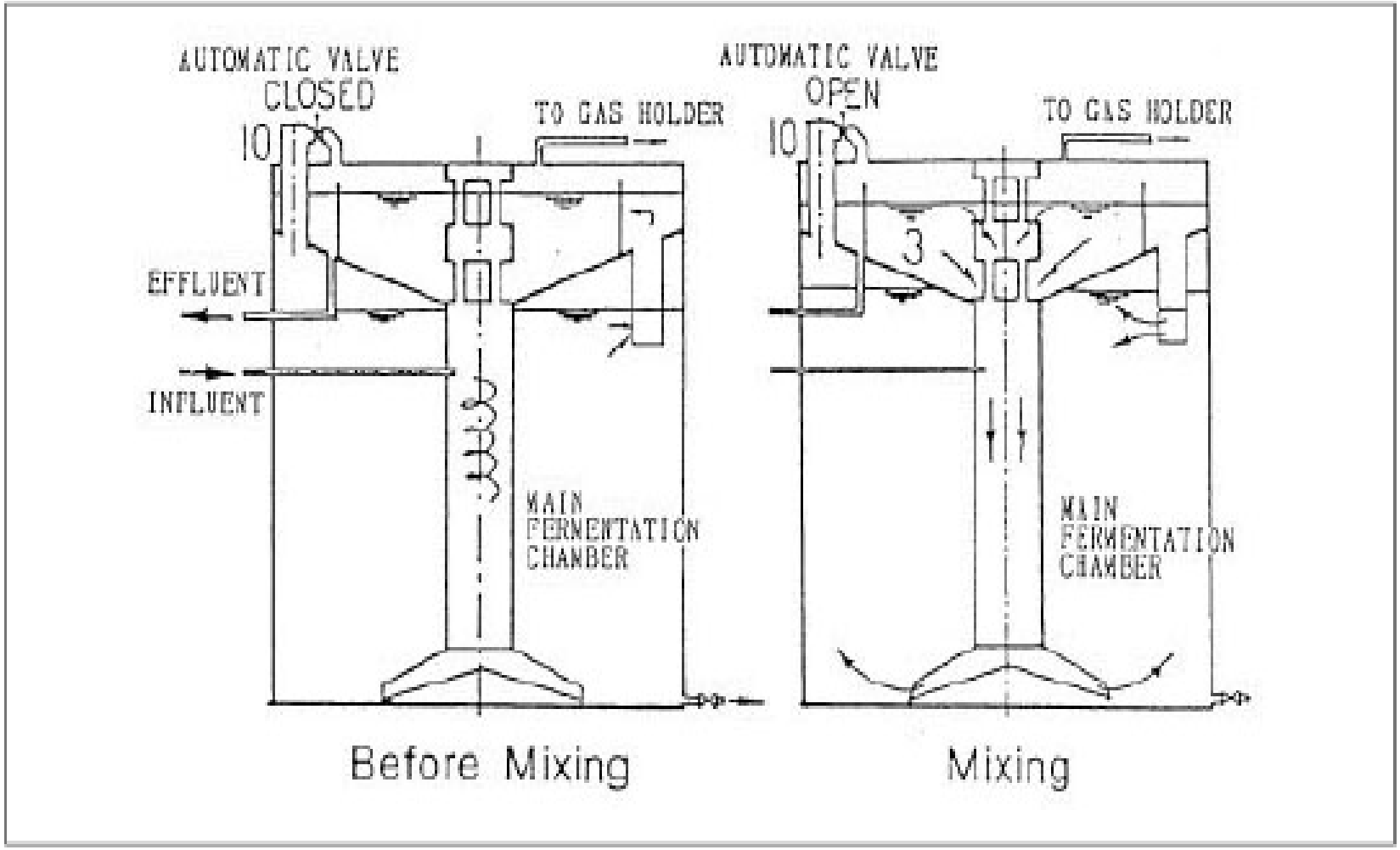
Haebowal WTE Plant



- **Major components of the plant :**
  - Collection tanks
  - Dry well
  - BIMA Digesters
  - Effluent buffer tank
  - De-watering station
  - Drying yard
  - Effluent treatment plant
  - Gas holder
  - Gas blowers
  - Gas Engine
  - Flare System
  - PLC Scada system
  - Electrical Control Room
  - Outdoor yard
  - Fire Fighting System

BIMA DIGESTERS AND GAS HOLDER

Working Principle of BIMA Digester



Highlights of BIMA Digester

- Ability to handle high solids concentration
- Absence of mechanical moving parts
- Effective control of scum, sediments etc.
- Minimum operating power requirements.

GAS ENGINE AND WHRU

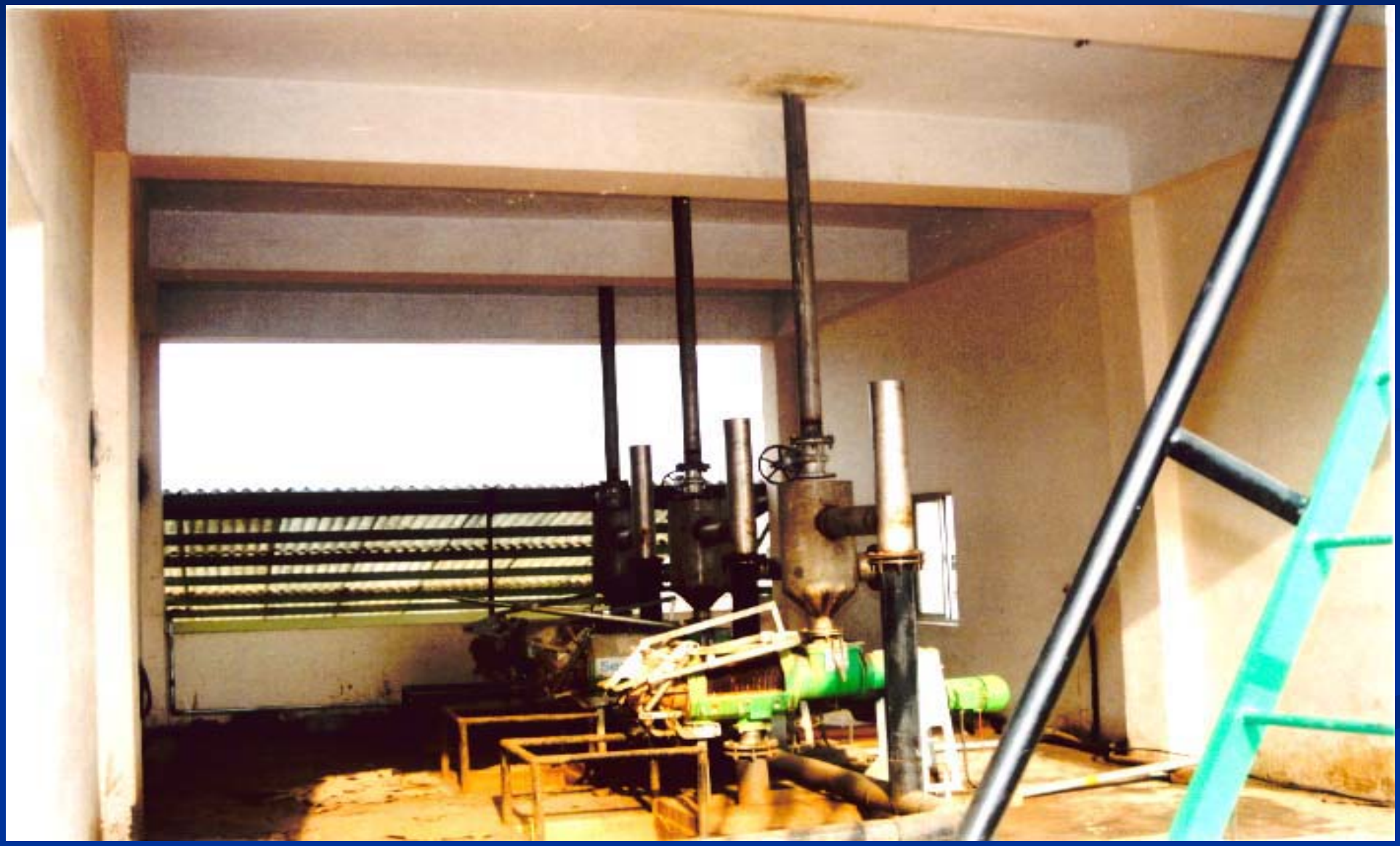
ELECTRICAL CONTROL ROOM-PCC,MCC

RELAY CONTROL AND PLC SYSTEM

Material Balance

Raw feed	235 ton/day
Dilution water	141 m^3/day
Volatile solids loading rate	3.0 ton/day
Hydraulic retention time	27 days
Digester efficiency	55 %
Biogas produced	9116 m^3/day
Biofertilizer production	37.5 ton/day

Dewatering Station



Energy Balance

Biogas generation	9116 m^3/day
Engine efficiency	39 %
Auxiliary power requirement	2400 kWh/day
Power generation from plant	20000 – 22000 kWh/day
Power exported to grid	17600 – 19600 kWh/day

BIOGAS ENGINE PERFORMANCE IN THE PLANT

- GE-JENBACHER GAS ENGINE CAP.1.048 MW
- ACHIEVED ENGINE EFFICIENCY OF 39.2%
- PLANT OPERATING PLF- 78%
- BIOGAS CONSUMPTION- 480-510 CUM/MWH
- CH4 CONTENT IN BIOGAS- 55-58%
- COOLING WATER CYCLE AND EXHAUST GAS HEAT EXTRACTED THRU HEAT EXCHANGERS FOR DIGESTOR HEATING /TEMP.CONTROL IN MESOPHILIC RANGE.

Effluent Treatment Plant

EFFLUENT TREATMENT PLANT

Plant operations-developments undertaken

- Screw Presses Sieves have been indigenously developed.
- Macerator shaft and seals have been developed.
- Other components/spares indigenized.
- Rotary sieves identified and shall be installed.
- Frequency Drives installed on gas blowers.

- **Imported Electro-mechanical equipments :**
  - Gas Engine
  - Macerator
  - Screw Presses
  - Gas Holder
  - Startup Blowers
  - Variable frequency drives

11 K V POWER EVACUATION YARD

Benefits offered by the Plant

- Environment friendly process.
- Reduction in GHG emissions
- Reduction in malodors formation.
- Complete destruction of pathogens.
- Biogas as well as biofertilizer production.
- Employment opportunities for local population.
- Significant revenue generation.
- Efficient waste management.

BEST GREEN POWER PLANT IN ASIA AWARD

- HIGH RATE BIOMETHANATION PLANT AT HEABOWAL , LUDHIANA WAS BESTOWED ***THE BEST GREEN POWER PLANT IN ASIA*** AWARD BY ASIAN POWER IN BANGKOK IN SEPTEMBER,2007

ASIAN POWER AWARDS 2007

Proudly Presents the Winner of

Best 'Green' Power Plant in Asia

PUNJAB ENERGY DEVELOPMENT AGENCY

Hosted by Publisher Timothy Charlton

Asian power

WASTE TO ENERGY SECTOR PROJECTS UNDER PLANNING

- 2MW High Rate Biomethanation , Dairy Waste Based Power Project at Amritsar by PEDA under Built Own Operate basis in private sector
- Expansion of existing 1 MW High Rate Biomethanation Dairy Waste based power project at Haebowal Ludhiana to 2MW cap.
- 2MW Waste to Energy project based on Dairy waste at Tajpur Dairy Complex, Ludhiana under Built Own Operate basis in private sector

SOLAR POWER GENERATION

- Estimated solar power generation potential – 20MWp / sq. Km.
  - 62 MW aggregate capacity has been installed in the country so far
- Projects based on solar photovoltaic power generation set up so far in the state (4 nos.) - Total cap. – 325 kwp
- Capital investment cost
  - SPV Technology - 25-26 crore / MW
  - Solar Thermal Technology – 10-12 crore / MW
- No recurring / fuel costs
- Major environmental benefits
- Project grant funding available from international agencies

GRID INTERACTIVE SOLAR PHOTOVLTAIC POWER PROJECTS SET UP BY PEDA

- 50 kwp at Punjab Mini Secretariat, Chandigarh, commissioned in Oct,99.
- 50kwp at village Bajak, Distt. Bathinda, commissioned in Oct,99.
- 200 kwp at village Khatkar Kalan, Distt. Nawanshahar, commissioned in Jan,03.
- 25 kwp at PEDA's Solar Passive Complex, commissioned in May,04.

50 KWp SPV GRID INTERACTIVE POWER SYSTEM FOR OFFICE BUILDING LIGHTING LOADS, Pb.MINI SECTT.-PEAK LOAD SHAVING CONCEPT

200 KWp SPV GRID INTERACTIVE POWER PLANT,NAWANSHAHER-VOLTAGE SUPPORT APPLICATION ON RURAL GRID

SOLAR PHOTOVOLTAIC POWER PROJECTS ON BUILD, OWN & OPERATE BASIS TOTAL CAP. 100 MW

- Bids / offers invited through International Competitive Bidding for setting up of solar photovoltaic power projects on BOO basis
- Maximum project capacity – 5MW
- Total capacity projects – 100mw offered under Phase-I bidding
- Tariff based bidding
- Tariff – Rs. 7/- per unit (base year 2006-07) with 5% annual escalation
- Maximum tariff Rs. 8.93 per unit (year 20011-12)
- Tariff under NRSE Policy-2006 approved by PSERC vide order dt. 13.12.07
- PROJECTS UNDER ALLOCATION.
- MOU signed with BPCL for development of a 1 MW SPV Power Plant at Lalru in Punjab.

SOLAR PHOTOVOLTAIC POWER GENERATION PROJECTS ON BOO BASIS

S. No.	Name of the Site	Cap.	Name of the Company	Levelised Tariff matched as per NRSE Policy-2006	Date of Allotment	Date of Commissioning
1.	Nalash, Rajpura	5	M/s India Bulls Electricity Co. Ltd.	8.79	4 April,2008	Nov,2009
2.	Fatehgarh Sahib	5	M/s Moser Baer India Pvt.Ltd.	8.79	4 April ,2008– MoU signed	Nov,2009
3.	SherkhanBudhlada	5	M/s Power Quality & Electrical systems Inc.	8.79	4 April ,2008– MoU signed	Nov,2009
4.	Amritsar, Majitha	2	M/s. Azure Power (I) Pvt. Ltd.	8.79	4 April ,2008– MoU signed	Nov,2009
TOTAL = 4 sites, capacity 17 MW.						

WIND POWER GENERATION

- MOU signed with M/s Enercon, Germany for wind resource assessment and setting up of wind turbines on Built Own Operate Basis.
- MOU signed with M/s Suzlon Energy for wind resource assessment and setting up of wind turbines on Built Own Operate Basis (Cap. 100MW)

ENERGY CONSERVATION SECTOR IN THE STATE

Energy Conservation Potential to be achieved by 2012 = 500 MW

- Industrial sector – 300 MW
- Agriculture sector – 100 MW
- Domestic sector – 25 MW
- Govt. building sector – 50 MW
- Commercial sector – 25MW

SALIENT FEATURES OF RENEWABLE ENERGY POLICY-06

- **Self identified sites in Micro hydro and Wind Power Sector eligible for investment by private developers.**
- **Same tariff of Rs. 3.49 per unit NRSE Policy'06 for NRSE Projects setup by private developers located in the Northern Regional Power System outside the state**
- **Govt. land if available, would be provided on nominal lease rent of rupees one rupee per square meter for a period of 33 years**
- **PSEB will purchase electricity in whole or part offered by the power producer without any restriction of time or quantum to ensure full utilization of NRSE.**
- **Time bound clearances with in a period of 60 days by an Empowered Committee headed by the Chief Secretary.**
- **PSEB shall provide wheeling of power through its network with in the state at a uniform wheeling rate of 2% of the energy fed to the grid.**
- **A differential tariff mechanism introduced under which the rate of sale of power to the PSEB from NRSE projects is Rs 3.49 per unit (Base year 2006-07) with an annual escalation varying from 3% to 5% on yearly basis upto 5 years and a tariff of Rs. 7/- per unit for solar power generation projects with an annual escalation of 5%.**

- Agriculture land shall be allowed to be use for setting up of Renewable Energy Power Projects in the state and no conversion charges for the same shall be charged by the Town & Country Planning Deptt.
- The banking facility for the power generated shall be allowed for a period of one year by the PSEB.
- Exemption from levy of Electricity Duty.
- All payments will be paid by the PSEB to the generating company involving sale of power on a monthly basis.
- PSEB will accept the injection of energy in full during sustained high frequency hours.
- Facility of irrevocable and revolving, Letter of credit issued by any nationalised bank will be provided by PSEB.
- In case of Mini/Micro hydro projects,Punjab Irrigation Deptt. will accord technical clearances of drawings/technical specifications within 30 days.
- In case of Waste to Energy projects, Municipal Corporation will provide garbage at the project site free of cost and also pay tipping fee @Rs. 250/- per ton of MSW processed by the project developer in the Municipal Solid Waste to Energy Plant.
- PEDA shall provide complete project facilitation services to the pvt. Developers desirous of setting up of NRSE projects with a reduced facilitation service charge @0.1% of the project cost.

PSERC TARIFF ORDER DT. 13.12.07 FOR NRSE PROJECTS

- PSERC approves NRSE Power Sale Tariff under Section 108 of the Electricity Act-2003
- Tariff rates for purchase of power from NRSE Power Projects for the year 2007-08 as under
  - Biomass, Urban/Municipal/Ind. Liquid/solid waste to energy & wind power projects - 366 P/Unit
  - Mini/Micro Hydel, Bagasse/Biomass based Co-generation - 359 P/Unit
  - Solar Energy - 735 P/Unit
- The above tariff rates will be considered the Minimum rates that a NRSE Developer can claim.
- Individual Developers will be free to approach the commission for determination of enhanced rates if so required.
- PSEB as the distribution licensee in Punjab will purchase minimum NRSE Power as indicated below :

Year	Min. %age
2007-08	1%
2008-09	1%
2009-10	2%
2010-11	3%
2011-12	4%

- Punjab Village Common Lands (Regulation) Rules, 1964 amended to provide Panchayat land for 33 years lease for setting up of Industrial / Commercial projects

THANK YOU