EnConTea

A Quarterly Newsletter of the Project -
Energy Conservation in Small Sector Tea Processing Units in South India

Issue - 11 December 2010

EDITORIAL

Mr. R. Ambalavanan, IA & AS,
Executive Director, Tea Board
National Project Director

PROJECT IN BRIEF

The project - Energy Conservation in Small Sector Tea Processing Units in south India, has been initiated by the Tea Board to remove barriers to energy conservation and energy efficiency that inhibit the realization of large energy saving potential in the tea sector. This 4-year project is supported by the United Nations Development Programme - Global Environment Facility. The project's objective is to remove barriers and to develop replicable strategies for energy efficiency and energy conservation interventions in the tea processing industry in south India. The objective would be achieved by:

a. Awareness creation among the target sector about energy efficiency/renewable energy technologies and their relation to profitability

b. Elimination of financial barriers that inhibit investment in energy conservation equipment

c. Adoption and procurement of energy efficiency/renewable energy equipment /practice

d. Learning, knowledge sharing and replication

As we begin 2011 with new resolutions, I believe that this is an opportune time to share the thought process of taking forward the project activities. The project has generated a vast amount of data which is now a vital component for future planning. The south Indian tea sector was consuming 2,80,360 tons of firewood, or its equivalent of briquettes or coal, and 235 million kWh of electrical power per year, before the project interventions. Energy efficient interventions can at best reduce energy consumption by about 15 - 20%. The sector is enthusiastically accepting several energy audit recommendations and investment in energy efficiency in the past two years is in the range of Rs. 10 crores.

The tea sector in south India would benefit immensely if it took the initiative to reduce its carbon footprint while simultaneously bringing down the cost of energy per kg of made tea. We must also think in terms of building a green brand for the south Indian tea sector and deriving strategic and commercial advantages through its environment friendly image. To this effect the project is working towards interacting with tea estates and completely exploiting the hydro power potential. I have recommended that the project support the cost of the Detailed Project Report (DPR) preparation for the same and estates are requested to contact the project office to avail this offer. We are also trying to understand the different options of wind energy for the sector and likely sources of investment for the same. The results of the project encouraged the Tamilnadu Energy Development Agency (TEDA) to show keen interest to also promote renewables in the tea sector.

Thermal energy continues to be a challenge and there have been several awareness meetings on energy plantations. Data shows that 4000 hectares of dedicated energy plantations and 1200 tons per year of briquette production infrastructure would ensure thermal energy security for the south Indian tea industry. The consumption of briquettes by the sector has increased in the past year but a lot more needs to be done. I am aware that the biomass gasification technology has evolved in the past decade and we are cautiously trying to understand the same and its application to the tea sector. So while a road map for low carbon tea manufacture has been drawn out, we must also clearly understand all issues and take correct decisions.

I look forward to taking these discussions forward in a set of meetings with stakeholders scheduled for mid February.

Wishing everyone a very happy and prosperous 2011.

INSIDE

2 Viewpoint
Mr. R. Muralikrishnan

3 Baseline Energy Consumption Data And Its Utility

4 Implementation Status of Encon Measures

6 Energy Plantation Projects India Ltd.
Mr. Avin Nanjappa

8 Announcement

(For Internal Circulation Only)

VIEWPOINT

LED – LIGHT OF THE FUTURE

R. Muralikrishnan, CMO, Concept 4e, Chennai

What are LEDs and why do you recommend LED solutions for lighting?

A Light-Emitting Diode (LED) is a semi-conductor light source. When a light-emitting diode is switched on, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. LEDs have many advantages over incandescent light sources like lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability. More importantly, they are powerful enough for room lighting. Currently, they are relatively expensive but they are highly recommended because they reduce recurring costs over their lifetime.

Originally, LEDs were used as indicators for electronic and decorative purposes only. But the technological changes over the past 5 years have enabled manufacturers to expand their product lines and LEDs are now used for industrial, corporate, factory, home, architectural and advertising lighting systems; in fact, to such an extent that it is now termed the "Light of the Future".

How do LEDs differ from incandescent lights and CFLs?

The difference lies in the way in which LEDs and CFLs produce light. Incandescent lamps produce light by heating the Filament of Tungsten to very high temperatures (> 2000°). Tube lights, CFLs and sodium vapour lamps have gases inside them, and when electricity is passed through, electrons change their energy state to produce light. LEDs do not have any fusible filaments or elements and do not contain any gases. When electricity runs through the LED, the passing electrons undergo an energy change and produce light. Since this is a "solid state" production, without heat generation or gaseous states involved, LEDs last for a very long time.

Discussing lighting energy, it is common to refer to power of 40 watts or higher. Is it true that LEDs offer similar light output at lower power consumption?

Yes. High efficacy is the buzz word for LED-based light sources. The light output, which is defined per unit power (lumens (lm) / W), is very high for LEDs. Recently, some LED manufacturers introduced LEDs which promised efficacies that hit the 150 lm / W mark. In contrast, the incandescent bulb comes at 15 lm / W and the fluorescent lamps provide 70 lm / W. LED lights are available with power consumption as low as 0.5W or even 0.25W, unlike incandescent lamps (15W), CFLs (5W) or slim tube lights (20W). This also allows them to be brought closer to the application / task area. Therefore, even a 1W LED providing light to a work table at a distance of ½ metre, can give more luminance than a 25W CFL (or a 150W incandescent lamp) located at a distance of 3 metres.

Would the lighting bills come down after shifting to LEDs?

The greatest barrier to migrating to LED technology is undoubtedly the initial cost. Nonetheless, it's surprising to know how much money can be saved by switching over. In a factory environment where say 100 bulbs of 60W rating are required, the power consumption would be 24,000 kWh / yr, amounting to Rs. 1.2 lakh of annual electricity costs. A matching lumen can be obtained by 100 LEDs of 5W rating each, consuming 2200 kWh annually at a cost of Rs. 11,000. This saves about 90% of the cost of electricity for lighting. The energy cost reduction would be 70% when compared to tube lights, 55% when compared to CFLs and 78% in case of sodium vapour lamps, for the same lighting load. I have assumed the cost of power to be Rs. 5 per kWh and considered 4000 working hours per year in a factory environment. I estimate that the ROI / payback period of migrating to LED lighting will range between 18 to 40 months, based on the usage pattern and application.

Can you tell us about what you have done for the tea industry in south India and what your future plans are?

We are supporting the project implementation team at TIDE that is currently conducting tests, with LED prototypes especially designed for the tea industry, to evaluate Lux / Wattage requirements in different factory areas, with special focus on the withering and CTC sections. Tests are being conducted on LEDs with inbuilt reflectors and the light output and losses are measured. We found that a 60° angled 1W LED gives more light within the cone of the 60° than a 40W (360°) incandescent lamp with much higher efficiency can. Initial results have been encouraging and we expect to freeze the technical feasibility as early as January 2011. As far as outdoor / open area lighting is concerned, we have successfully tested the same in factories like Highfield (Swamy & Swamy Plantation Ltd., Coonoor), BBTC in Valparai and Ripon Estate in Wayanad. We are conserving energy by having replaced the existing 250W sodium vapour lights with 36W LEDs.

Figure 1: *Breaking the darkness with an LED light*

It appears that for you LED is not a business but a passion?

I believe that LEDs address a primary environmental concern and we are leading a campaign against the use of mercury for lighting purposes. My home of 1100 sq. ft. is lit with just 71 watts of LED bulbs and I am committed to help save the planet through reduced energy consumption for lighting and the elimination of mercury in lighting solutions.

BASELINE ENERGY CONSUMPTION DATA AND ITS UTILITY

Baseline energy consumption data has been compiled for the first 61 tea factories at which energy audits have been carried out. This data captures the status of energy consumption in the audited factories as measured during energy audits before implementation of energy efficient interventions.

This depicts an improvement of baseline energy consumption levels reported in the past because:

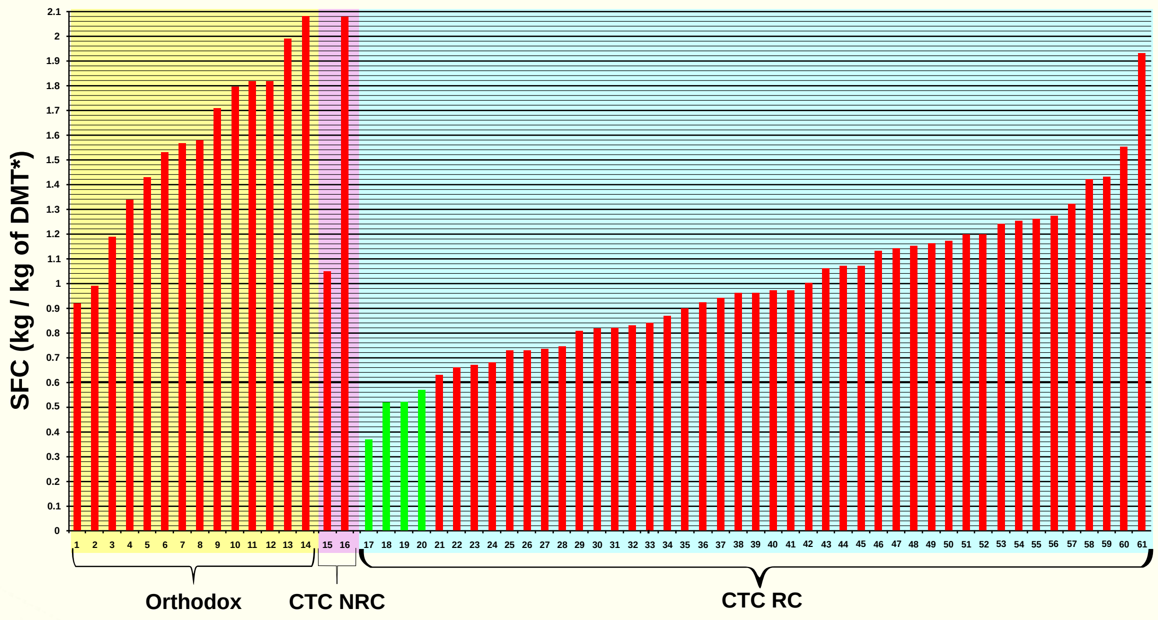
- Energy details being reported now are scientifically measured. Some of the data previously reported was collected from preliminary energy audits at tea factories and wasn't always thoroughly verified.
- In the past, data was being reported in terms of made tea. However, to eliminate inconsistencies arising due to variations in the quantity of reconditioned (RC) tea returned for processing (especially in CTC type of manufacture), data is now being reported in terms of dryer mouth tea (DMT).

A standard ratio of Specific Energy Consumption (SEC) has been used as the basis for reporting. Electrical SEC is the kWh of electricity consumed per kg of DMT. For thermal energy, the Specific Fuel Consumption (SFC) is the weight of fuel (whichever type is currently being used) in kg required to make 1 kg of DMT.

The graph in “Figure 1” captures the SFC of thermal energy as kg of fuel / kg of DMT as measured during energy audits. The red lines indicate the scope for further energy conservation and the green lines represent factories within the acceptable level of energy consumption. Achieving the SFC cut-off line of 0.6 kg of firewood / kg of DMT may seem unworkable at first sight. But data collected from factories after implementation of energy audit recommendations, suggests that such a target can definitely be worked towards through investments in the right equipment and good operation & maintenance practices.

Figure 1: Specific Fuel Consumption (SFC) before implementation of EnCon Schemes

(THERMAL ENERGY)



** DMT = Dryer Mouth Tea*

The SEC of electrical energy in terms of kWh / kg of DMT is depicted in “Figure 2”. The targeted cut-off line for SEC is 0.3 kWh / kg of DMT in CTC and 0.35 kWh / kg of DMT in orthodox type of tea manufacture.

A higher SEC in orthodox factories is mainly because of lower production capacities and can be brought down with an increase in production.

Continued on Page 6 ...

DATA

IMPLEMENTATION STATUS OF ENCON MEASURES IN ESTATE FACTORIES

EnCon Measure			
Electrical Energy			
1. Sectionwise Energy Meter	2. Maximum Demand Controller	3. Automatic Power Factor Controller	4. Star Connection of Lowly Loaded Motors
5. Flat Belt Drives in CTC / Pulverizer / Hot Air Fan	6. Energy Efficient Motors in CTC / Pulverizer	7. Energy Efficient Lamps	
Thermal Energy			
8. Firewood Shed / Splitter	9. VFD for Flue Gas Fan	10. Hot Water Generator	

= Audited Factory

TAMILNADU

#	Factory Name	1	2	3	4	5	6	7	8	9	10	Total
	TANTEA											
1	Pandiar											4/10
2	Tiger Hill											2/10
	INDCOSERVE											
1	Kaikatty											8/10
	COONOOR											
1	Chamraj											3/10
2	Coonoor Tea Estates											3/10
3	Glendale											6/10
4	Ibex Lodge											5/10
5	Katary											4/10
6	Korahkundah											2/10
7	Mailoor											2/10
8	Parkside											5/10
9	Singara											3/10
	GUDALUR											
1	Attikunna											8/10
2	Caroline											6/10
3	Devarshola											1/10
4	Silver Cloud											3/10
5	Wentworth											4/10
	KOTAGIRI											
1	Kairbetta											5/10
2	Kilkotagiri											2/10
3	Kotada											4/10
	OOTY											
1	Dunsandle											2/10
2	Glenmorgan											4/10
	TIRUNELVELI & THENI											
1	Manimuthar											4/10
2	Manjolai											3/10
3	Oothu											4/10

#	Factory Name	1	2	3	4	5	6	7	8	9	10	Total
	VALPARAI											
1	Anaimudi											5/10
2	Gajamudi											8/10
3	Kallayar											4/10
4	Malakiparai											8/10
5	Mayura											7/10
6	Mukkottumudi											6/10
7	Paralai											7/10
8	Sholayar											4/10
9	Thaimudi											9/10
10	Uralikal											8/10
11	Waterfall West											6/10
	Total	9	21	32	24	11	14	10	28	15	5	169/360

KARNATAKA

#	Factory Name	1	2	3	4	5	6	7	8	9	10	Total
1	Balanoor											4/10
2	Devon											5/10
3	Glenlorna											4/10
4	Joonktolle											3/10
5	Kadamane											7/10
6	Kelagur											6/10
7	Merthikhan											3/10
8	Quard Hitlow											4/10
	Total	1	5	5	7	3	2	2	6	5	0	36/80

KERALA

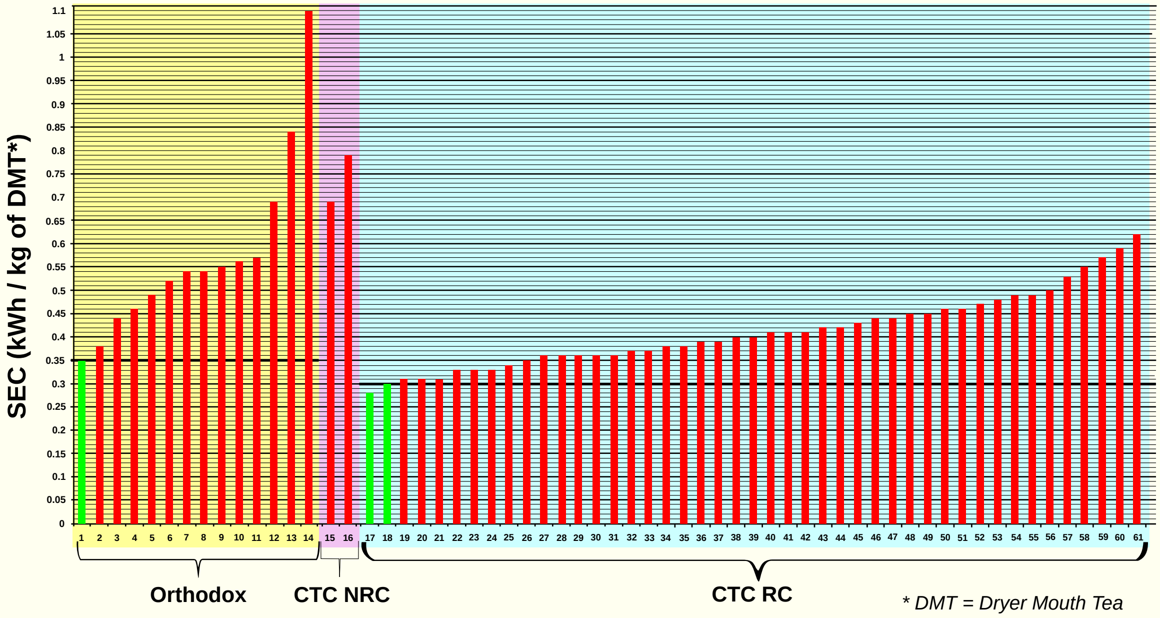
#	Factory Name	1	2	3	4	5	6	7	8	9	10	Total
	MUNNAR											
1	Chittavurrai											3/10
2	Chundavurrai											3/10
3	Kalaar											2/10
4	Yellapatty											6/10
	PALAKKAD											
1	Chandramalai											5/10
2	Manalaroo											4/10
	VANDIPERIYAR											
1	Aranakal											4/10
2	Caradygoody											4/10
3	Haileyburia											6/10
4	Karimtharuvy											7/10
5	Milgram											6/10
6	Pasuparai											7/10
7	Periyar Connemara											310
8	Poabs Enterprises											6/10
9	Pullikanam											1/10
10	Semnivalley											5/10
11	Tyford											7/10
	WAYANAD											
1	Arrapetta											8/10
2	Chulika											7/10
3	Chundale											4/10
4	Cherakara											7/10
5	Kurcheramala											3/10
6	Mayfield											4/10
7	Ripon											2/10
8	Talapoya											4/10
9	Wayanad Agro Movement											2/10
	Total	13	14	22	14	7	12	5	22	6	5	120/260

The previous issue carried an overview of the implementation status of EnCon measures in Bought Leaf Factories. In this issue we present to you the current status of EnCon measures implemented in 70 estate factories. We bring you this data not only as a confidence building measure, but also to present the project impact. The data confirms that EnCon measures are being accepted and implemented.

DATA

Continued from Page 3 ...

Figure 2:Specific Energy Consumption (SEC) before implementation of EnCon Schemes
(ELECTRICAL ENERGY)



The names of individual tea factories are irrelevant to the reporting and have not been included. However, tea factories would be able to identify themselves in the graph, based on the data presented. Once a specific factory has been found, you may use the indicated baseline as a self-assessment tool to measure the standing of your factory with respect to the accepted target SEC / SFC and to other factories.

ENERGY PLANTATION PROJECTS INDIA LTD.

Avin Nanjappa, Senior Manager – Operations / INDIA, EPPI

Energy Plantation Projects India Ltd. is a company established to produce low-cost electricity using biomass fuel. The feedstock (in our case, firewood as biomass) for the power stations is being supplied from home grown plantations. A combination of fast-growing, high-calorific wood yielding, easily reproducible species have been selected for this purpose. The pilot project on 500 acres is under implementation at Sivagangai, Tamilnadu. This will be a landmark within the Renewal Energy sector, as it will be producing the cheapest electricity in the world.

Though the primary focus was to develop energy plantations for their own power stations, it has been found that the same techniques and results can be extremely beneficial for tea factories requiring biomass for both electrical and thermal energy.

High Density Energy Plantations for Heat Energy within Tea Factories

The aim is to generate heat energy using home grown feedstock from fast growing trees on unused land for an all round advantage. For the production of firewood

***Figure 1:** He who plants a tree, plants hope.*

***Figure 2:** Respecting the fruit of nature*

needed in tea factories, energy plantations can be designed, implemented and maintained in a predictable manner, by factoring in suitability, repeatability and scalability.

Suitability: The species used in an energy plantation must be able to adapt to the local environment,

Figure 3: *Energy plantation for a better future*

produce biomass of the right density, have favourable thermal characteristics like calorific value and ash content, have good physical characteristics such as growth parameters of height and girth, and must exhibit required coppicing (regenerative) qualities.

Repeatability: The species must be amenable for reproduction in large quantities with all the characteristics of healthy growth inherent. Techniques for production (like seed farming, vegetable propagation, EMI techniques, etc.) may be man-made, but the species themselves should be able to adapt to regeneration techniques.

Scalability: One may expect large quantities of biomass to be acquired from the energy plantations every year.

Description of the Energy Plantation

Rate of Growth: Growth rate of the plants of different species must be a minimum of 5 meters in one year. These trees are expected to grow to a height of 15 meters over 5 years, with a trunk diameter of 1 meter at chest level.

Calorific Value: The calorific values of all the species are around 4500 kCal / kg (at 25% moisture while feeding to the boiler). This is the optimum range of calorific value that can be attained in combination with good growth characteristics.

Figure 4: *Fostering energy security*

Coppicing Quality: The regenerating nature of these species is an important aspect of commercial viability. All the species are very good coppices and re-grow very well on cutting.

Weight Density: The choices of species were finalized only after studying more than 60 different ones. The species selected all have a weight density ranging between 45 kg / ft^3 and 60 kg / ft^3.

Expected Growth and Yield: On a well maintained plantation, the expected growth yield per hectare is 2900 trees, the minimum yield per tree being 200 kgs. This results in 580,000 kgs / 580 MT per hectare, during the time of harvest (i.e. four years from the time of planting). 3 year old trees can stand upto 10 meters (35ft) high.

Salient Features: Any soil other than clayey soil, a drip irrigation system, a good water source, well-fenced with perennial and border roads. The saplings must be planted with sufficient space in between them.

Advantages of growing your own fuel:

Fuel Security: Most tea factories suffer from raw material supply / sourcing problem. Biomass plantations are an ideal solution for complete security of the raw material requirement and supply in a tea factory. The size of a plantation can be planned in line with the production needs. Other than the initial capital investment for the project establishment, there are no other major expenses required for a biomass plantation. You are also insured from the rise of the market prices of firewood.

Reduction in Cost of Raw Material: The cost of biomass / firewood which is harvested from a home grown plantation is more economical as compared to purchasing it from an open market.

Quality of Raw Material: The quality and specifications of the raw material have a direct impact on the maintenance of the boilers. However, in the case of captive biomass plantations, the raw material fed to the power station is predetermined, which reduces the intensity of boiler maintenance required. The harvesting, drying and cutting cycles can be precisely matched to the power production needs, since the raw material is available in your own plantations. This results in optimum utilization of the raw material available, without any scope for loss of weight due to early procurement and storing concerns.

Transportation: There will be a huge reduction of cost due to the availability of the biomass near to the power station. Since the biomass is permanently available, logistics involved in the biomass transportation can be well planned and managed.

Afforestation & Green Image: Since this is the age of global warming and green energy projects, the project shall surely earn laurels from all corners of society, the Governments and bankers. This is in reality a true contribution to earth.

Social Benefits: The biomass plantation will also provide employment opportunity to local habitats. The generation of employment opportunities in dry areas is a strong focal point of all Governments. Private companies can do it without much effort by just developing such biomass plantations.

ANNOUNCEMENT

RESULTS OF HIGHFIELD STUDY

The pattern of electrical energy usage in the Highfield tea factory was studied over a period of 30 days during which 110,355 kg of DMT were produced. This study was conducted before the implementation of EnCon schemes. The electrical SEC (Specific Energy Consumption) during the period was found to be 0.5kWh / kg of DMT. Certain EnCon schemes, like the installation of EE motors in the CTC and the withering sections, the replacement of aluminum blades with nylon blades in the withering section, the substitution of v-belts with flat belts in the drier section, and the installation of a delta connection instead of a star connection for motors in the sifting section, were implemented after the 30 day study. The electrical SEC after implementation of the EnCon schemes was 0.436 kWh / kg of DMT. The energy consumed post implementation was 12.8% less.

DPR for Hydro Sites proposed

It is possible to generate power from small streams flowing down the slopes in your estates. The project is supporting the development of a preliminary and / or a detailed project report (DPR) at nominal or no charge to estimate the hydro power potential and likely investment for the same.

Interested estate factories with a small or large perennial stream, willing to invest in hydro power generation, are requested to contact the project office in Coonoor for further details.

RENEWABLE ENERGY UPDATE

Below table illustrates different types of Renewable Energy interventions that have been implemented and are in use at mentioned tea factories as of 31st December 2010.

Bheema Bamboo

#	Factory Name	Location	No. of Plants
1	Devon Plantations & Industries Ltd.	Chikmagalur (KA)	2750
2	Penshrust Estate, Malankara Plantations Ltd.	Idukki (KL)	2000
3	Parry Agro Industries Ltd.	Valparai (TN)	1200
4	Kelagur Coffee & Tea Estates	Chikmagalur (KA)	1000
5	Tyford Estate	Idukki (KL)	25

Hydro Power

#	Factory Name	Location	Electrical Energy (kW)
1	The United Nilgiri Tea Estates Co.Ltd, Korakundah Estate	The Nilgiris (TN)	60
2	Waterfall Estates Pvt Ltd.	Valparai (TN)	5
3	Accord Estate, Gudalur	The Nilgiris (TN)	1
4	Swamy & Swamy Plantations Pvt. Ltd., Highfield Estate	The Nilgiris (TN)	1
5	The United Nilgiri Tea Estates Co. Ltd., Chamraj Estate	The Nilgiris (TN)	1

Solar Power

#	Factory Name	Location	Solar Collector Area (m^2)
1	Glenworth Estates Ltd., Glendale Estate	The Nilgiris (TN)	383
2	Erinkadu Tea Factory, Golden Hills Estate P. Ltd.	The Nilgiris (TN)	212

Wind Power

#	Factory Name	Location	Electrical Energy
1	Bombay Burmah Trading Corporation Ltd. (BBTC)	Valparai (TN)	250 kW x 12
2	Havukal Tea & Produce Co. Pvt. Ltd.	The Nilgiris (TN)	750 kW
3	Peria Karamalai Tea & Produce Co. Ltd.	Valparai (TN)	250 kW x 3; 400 kW; 225 kW x 5

LED

#	Factory Name	Location	Electrical Energy
1	Bombay Burmah Trading Corporation Ltd. (BBTC)	Mudis, Valparai (TN)	36 W x 3
2	Ripon Estates, Poddar Plantations	Wayanad (KL)	36 W
3	Swamy & Swamy Plantations Pvt. Ltd., Highfield Estate	The Nilgiris (TN)	9 W x 6; 5 W x 10; 36 W
4	Tea Board Campus	The Nilgiris (TN)	12 W; 36 W; 24 W x 2;
5	TIDE Project Office	The Nilgiris (TN)	12 W x 2; 7 W;

Editorial Team

Chief Editor — **Mr. R. Ambalavanan,** IA & AS
Executive Director**,** Tea Board
National Project Director

Assistant Editors — **Mrs. Svati Bhogle**, TIDE
Ms. Asha Ramaswami, TIDE

Design & Print — **Mrs. Poulomi Deb**
www.graphicshapes.com

Contact

TIDE Project Office
Tea Board Zonal Office
Shelwood
Coonoor Club Road
Post Box No. 6
Coonoor - 643101
Phone: 0423 2222090
e-mail: encontea@bsnl.in

TIDE
#19, 9th Cross Road
6th Main Road
Malleswaram
Bangalore 560003
Phone: 080 23315656
Fax: 080 23344555
e-mail: tide@vsnl.com