Green Housing & Energy Limited

Annual Report

2013




Table of Contents: **Page #**

Foreword:

The second year of operations at GHEL has been a year of great development and growth. The company almost doubled in size with respect to the number of employees as well as the value of its assets. GHEL's field presence also got a boost as it is not operating through 80 branch offices nationwide. The past year has seen large investments in customizing and finalizing new renewable energy programs that complement GHEL's established programs and can provide clients with even more attainable solutions to various socio-economic problems of rural life. Through this approach and its cross-sectional products and services, we are confident we have created a new and comprehensive model for rural development.

At the end of the 2011-12 fiscal year GHEL was happy to celebrate the inception of one of its brainchild projects. The Green and Low Cost Housing Program was successfully launched after two years of research and development on housing construction, design and technology as well as the needs of low and medium income people. GHEL's housing project is the first of its kind to cater to the rural population and the soaring popularity of the houses has proven to us that all the hard work and careful preparations will bear fruit. The construction of GHEL's signature houses started in Muradpur Village in the Bogra District, where also the production facilities are located.

GHEL is continuously investing in the development and advancement of its employees and the empowerment of women and other underprivileged groups through organizing technical trainings on renewable energy. Throughout the year GHEL has participated in training of 3,965 partner employees and 8,750 female villagers through its partnerships with ASA, AUP and Citi Foundation. GHEL is also glad to announce that it has established new international partnership to promote its objective of technology and knowledge transfer for sustainable development of the industry in Bangladesh.

As concluding remarks for the year ending June 2012 I must express my gratitude and excitement over GHEL's current situation as it sets an excellent and well deserved starting point for further growth and for reaching the objectives for developing rural Bangladesh.

I would like to show special appreciation for everyone that has worked with us throughout the year as well as to those that have joined us more recently. The growth of GHEL is a testament to the hard work, skill and dedication of its people. In addition I wish to thank our business and funding partners for supporting us and contributing to our work and mission.

Best wishes,

Dr. Mostaq Ahmmed
Managing Director
Green Housing and Energy Limited (GHEL)

Company Information:

Company Name: Green Housing & Energy Limited (GHEL)

Web Address: www.ghel.org

Key Person: Founder and Managing Director: Dr. Mostaq Ahmmed, an expert in microfinance, SME and Social Business. He is also founder of the Paris based Social Business Think Tank ICMSE (International Center for Microfinance and Social Enterprise), which is creating and building linkage program with Corporate Businesses and Microfinance Institutions.

Date of Establishment: 2010

Registration Number: C 82133/10

Legal Status: Joint Stock Registered Company and Registered at BOI also

Registered Capital: 100 Million BDT

Business Scope: Alternative green and renewable energy answers the scarcity of clean energy and its availability, Low cost housing, SME and Agro-business Development.

Employees: GHEL is presently working in 62 districts around Bangladesh. The total number of employees currently stands at around 400 and over 60% of them are engineers.

Number of Head Office Staff: 35
Number of Field Staff: 325
Number of Rural Women Oriented: 9,950
Number of Branch Offices: 94

Company Overview

Green Housing & Energy Limited (GHEL), is a sister concern of International Center for Microfinance and Social Enterprises Ltd. (ICMSE), which is dedicated to Social Enterprises Development by linking corporate social capital venture funds with new technologies for sustainable development.

Green Housing and Energy Ltd. is getting technical assistance from INES (a French National Solar Institution) and technological support from Taiwan based institute “AFTA Technology”. GHEL addresses a range of socio-economic problems amongst low-income people through its renewable energy, housing and capacity building programs.

The Ultimate Goal

1. Overcome the dependency on fossil fuel by offering alternative green energy

2. Comes up with innovative solutions and offering the best and cleanest technology at an affordable price.

3. To contribute to make Bangladesh a role model in renewable energies and sustainable housing projects.

4. The initial and most meaningful goal of GHEL is to ultimately alleviate poverty by offering cross-sectional solutions that support income generation and empowerment of low-income people in Bangladesh:

    - *By reducing energy and electricity expenses*
    - *By supplying and promoting green energy*
    - *By providing low-cost sustainable houses equipped*
    - *SME and Business Development Services*
    - *Skill Training and Capacity Building*

5. Access to modern technology and customized solutions of e- and mobile banking services for isolated low-income people.

6. To invest in agro-business development to increase the productivity of the agricultural sector and secure the livelihoods of farmers as well as future food security.

7. Technology integrated in a smart Business Model combining social impact initiatives, gathered synergies from complementary partnerships and constant low-cost preoccupations lie at the core of GHEL's goal.

Mission: Creating Social Business Projects and Small & Medium Enterprises for fighting poverty.

Vision: Resource Mobilization and Technology Transformation for Creating Social Enterprises. GHEL has initiated to set up a Battery Production Plant, SME & Business Development Services, and Low Cost Housing Program with other activities.

- Major technologies transformation for producing Solar Module and providing low cost power solutions.
- Collective efforts for drastic carbon emission reduction and community people empowerment in Bangladesh through community plantation program.
- Provide skills training to 10,000 rural women entrepreneurs.
- Setting up a training center for Solar Technicians and Civil Engineers.

Objectives

- To promote, develop and extend renewable energy technologies such as solar power, biogas etc.
- To reduce poverty through creating social enterprises and carrying out campaign for the utilization of energy for productive purposes.
- To train rural women entrepreneurs and introducing affordable technologies for rural people.
- To set up assembling units for renewable energy products and technology
- To set up local production of sustainable construction material and solar batteries
- Offering SME funding and capacity building business development services

Management Structure and Human Ressources:

- **Human Resources:**

The Human Resources Department of GHEL provides its services to a large array of staff's including the Managing Director (MD), department heads, managers, suppliers and other executives. The focus of the HRD team is always to deliver quality service to the staff.

GHEL operates through 94 branches and 16 regional offices in 62 of the country's districts. The Dhaka Head Office employs 35 people while almost 325 people are employed in the field operations.

Employee Status:

Total Staff of GHEL are now 360 (Field staff 325 and Head Office Staff 35).

Month/Year	Number of Staff		
	Field	Head Office	Branch Number
2010	70	15	35
2011	175	25	55
2012	300	33	84
2013	325	35	94

Senior Management of GHEL:

Position	Name
Managing Director	Dr. Mostaq Ahmmed
Accounts & Finance Manager	Md. Zahirul Islam
Head of HR & Admn	Ayesha Nargih
Head of Logistic	Md. Alamgir Hossain
Program Managers (5 Nos)	Mohoshinuzzaman Hena
Head of Technology & Innovation	Md. Mizanur Rahman Protiva Rani Ghosh Md. Shariful Islam Md. Rabiul Islam Razib

GHEL is constantly developing its staff through training sessions and on the job training. Developing the skill of our human resources is and will remain a driving factor in GHEL's strategy both for internal program development but also to be able to assure the best technical training and orientation for our clients.

Training and Technical Support:

GHEL offers a variety of training programs designed to help management, officials and front line staffs learn more about Microfinance, SME, Agro-businesses and Solar Energy technical and operational issues. The Managing Director of GHEL Dr. Mostaq Ahmmed is highly reputed Training Expert who has taken initiative for strengthening Training and Technical Support Department of GHEL. For the smooth functioning and effective coordination of all the GHEL clients' service center, GHEL Management/Technical Team are providing leadership training courses for ensuring quality management at the field level operation since solar training is critical because solar energy is such a broad, deep and often misunderstood topics. To date GHEL has organized 800 training sessions. During these sessions GHEL has provided training to 3,965 ASA staff and 9,950 rural women.

Training Methodology:

The trainings are based on action based learning and under the action based there are two wings one is (i) Image-based presentation which training designed especially for those people who are not literate. The other one is (ii) Practical demonstration and it focuses on flip chart presentation along with learning by doing approaches.

Objectives of the Training:

- To ensure some technical skill training for rural female entrepreneurs on business development, income generating activities and solar system to develop their technical know-how for improving their business entities and the economical condition as well.
- To ensure sustainable rural SME and enterprises development and sound operation of the energy utilities.
- To encourage public and private sector participation in the development and management of the microfinance, SME and energy sector.
- To provide better and effective service to the customers.

Awareness & Campaigning Activities:

Through leaflet, brochure and poster GHEL is doing their campaigning activities in rural areas. The GHEL trainings are an integral part of the company's awareness and promotion activities. GHEL is aiming to increase the awareness of the social, economic and environmental impact of its different products and services as well as to educate the clients and the staff of partner organizations on renewable energy technology.

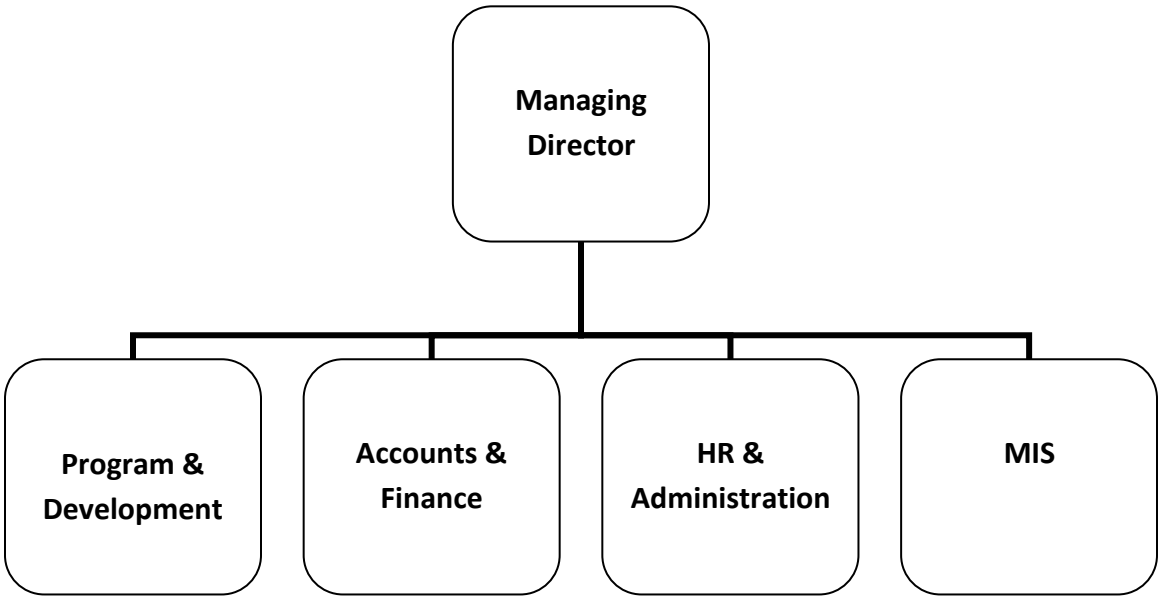
- **Management Structure:**

MIS Department is responsible for database maintain of all customers, suppliers, branches, stock & sales.

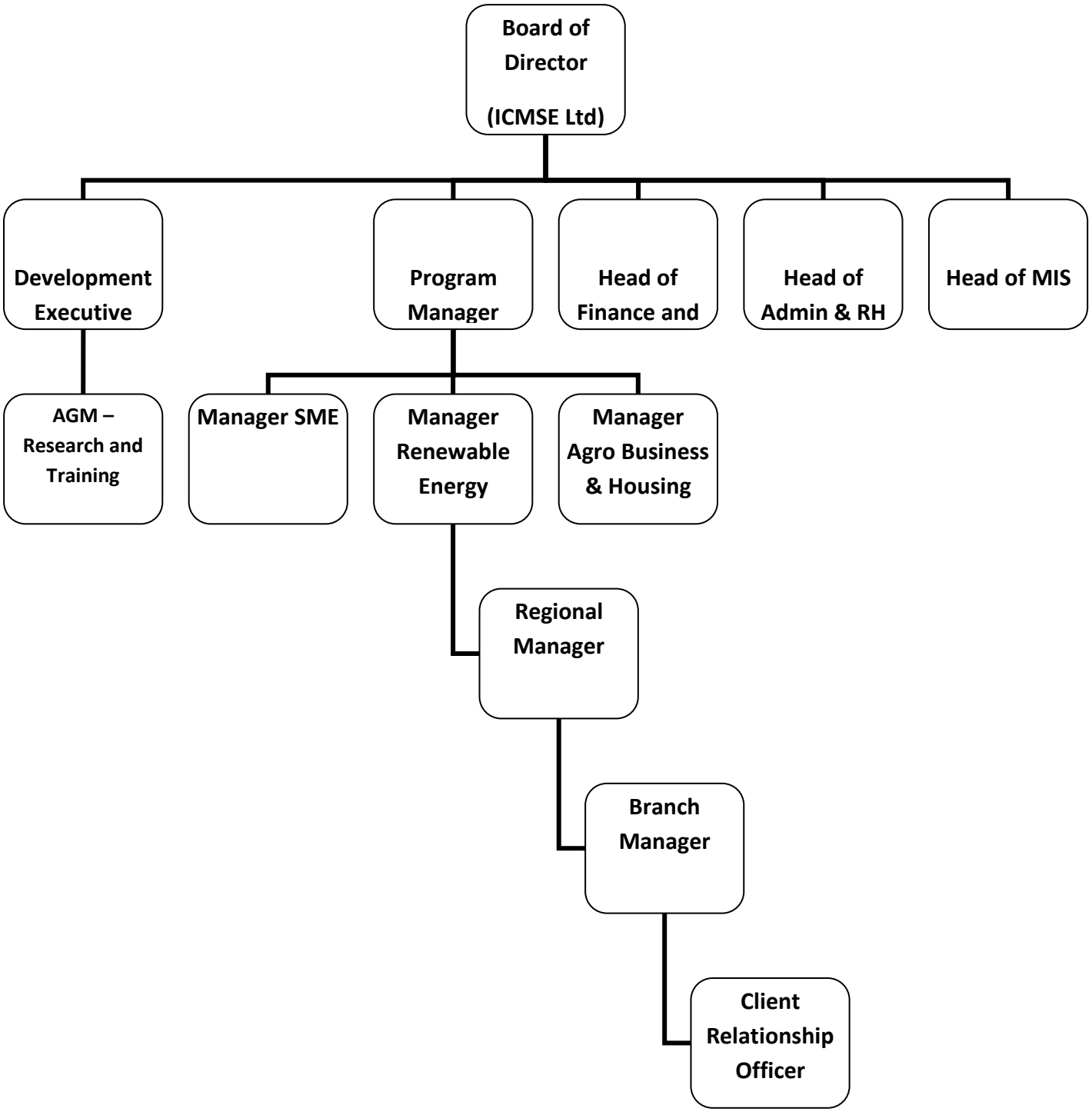
Program & Development is responsible for direct contact with the consumers, sells, distribution and production.

Companies Accounts and Finance is responsible for internal and external accounting of the organization, financial management & controlling.

Admin. & HR covers the administrative department, human resources, communications, governance and sustainability.

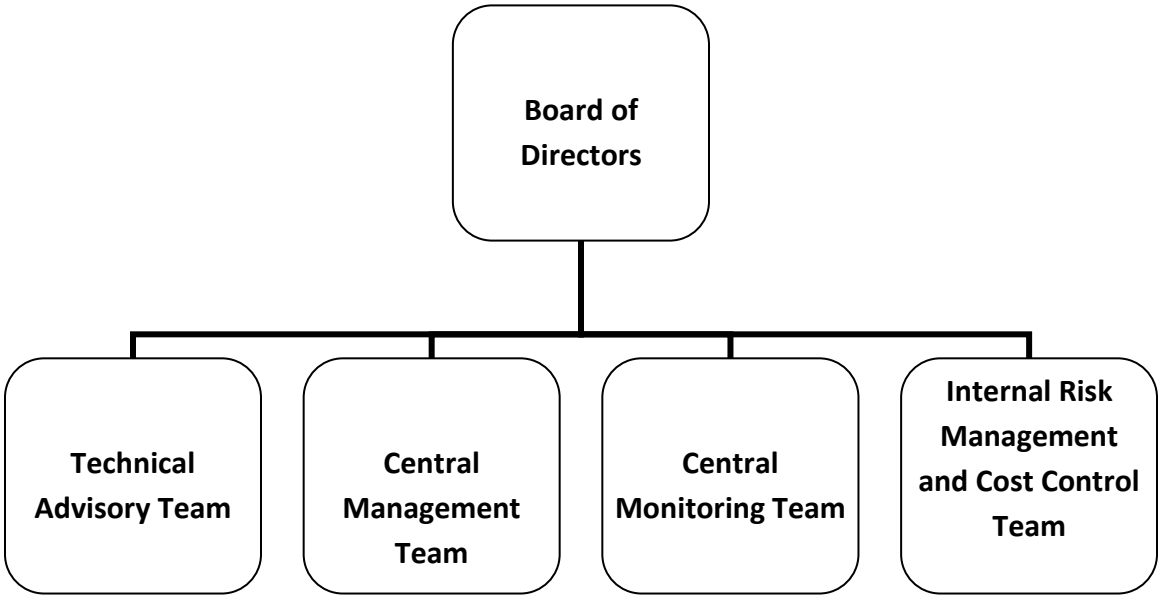


Organigram:


Board of Director
(ICMSE Ltd)
Development Executive
Program Manager
Head of Finance and
Head of Admin & RH
Head of MIS
AGM – Research and Training
Manager SME
Manager Renewable Energy
Manager Agro Business & Housing
Regional Manager
Branch Manager
Client Relationship Officer

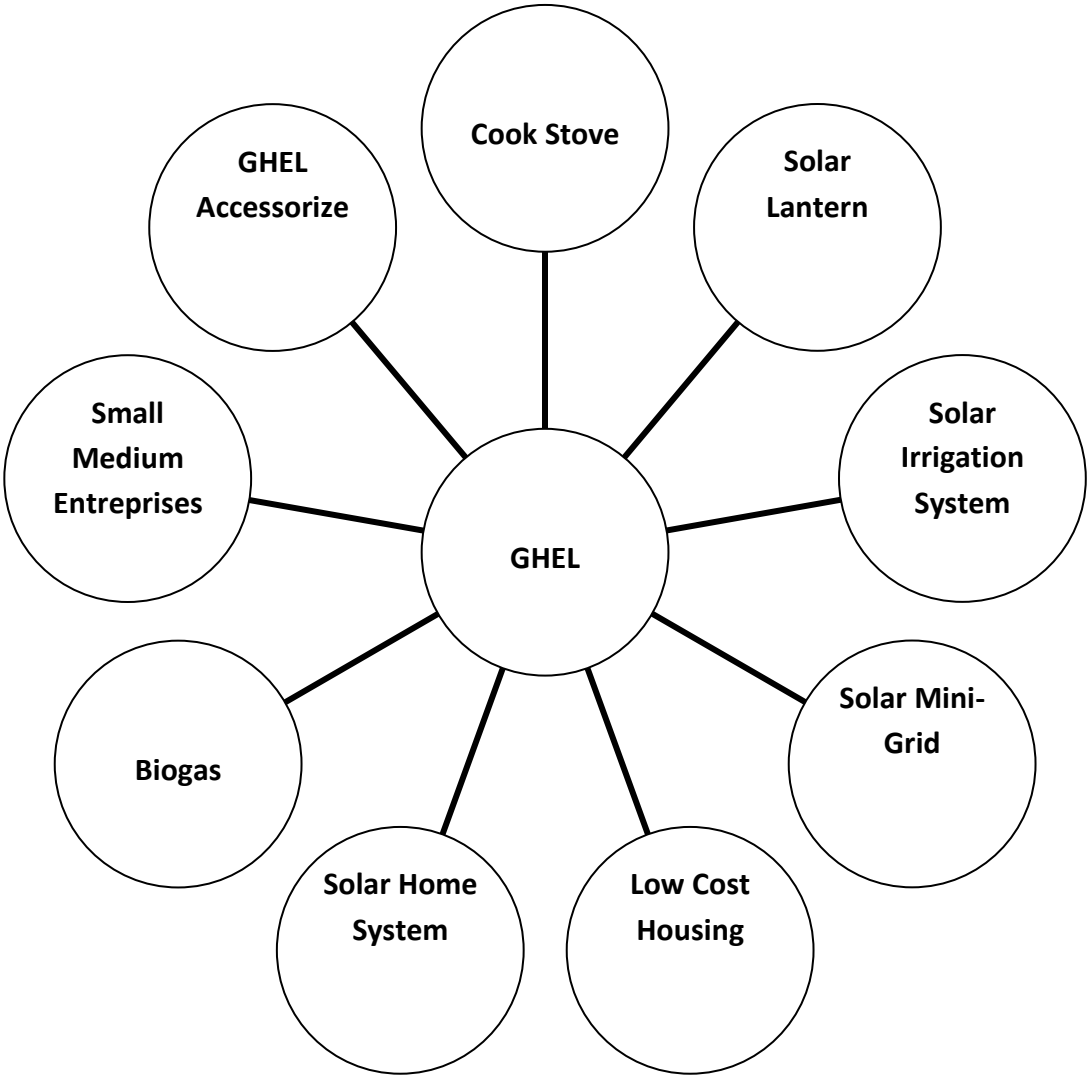
GHEL's Operation:

The operation of the GHEL is carried out by the Top Management. Top management is continuously developing the processes and mechanisms. They involved in monitoring and supervision to make sure all operations follow the corporate policy of conduct. GHEL's operation and governance process running effectively through its branches, clusters and Head office.



GHEL's Activities:

Through its 9 projects, GHEL promote a sustainable and social model of development for Bangladesh sustained in an holistic approach of the different villages and rural areas.



Our Working Areas in Bangladesh:

Clusters of GHEL:

GHEL offices are divided into four categories: Head Office, Cluster Head, Regional Office and Branch Office. Currently, GHEL is working in 5 Clusters throughout Bangladesh. Through 16 Regional Offices and 94 Branch Offices, we cover the entire region of Bangladesh and provide support to our customers.

Area	Number of Regions	Number of Branches
Dhaka	3	23
Chittagong	3	13
Barisal	3	21
Faridpur	3	14
Bogra	3	23

Development Partners:

- **Infrastructure Development Company Limited (IDCOL)**

Infrastructure Development Company Limited (IDCOL) was established on 14 May 1997 by the Government of Bangladesh (GOB). The Company was licensed by Bangladesh Bank as a non-bank financial institution (NBFI) on 5 January 1998. Since its inception, IDCOL is playing a major role in bridging the financinrg gap for developing medium and large-scale infrastructure and renewable energy projects in Bangladesh. The company now stands as the market leader in private sector energy and infrastructure financing in Bangladesh.

IDCOL is managed by a seven-member independent Board of Directors comprising four senior government officials, three prominent entrepreneurs from the private sector and a full time Executive Director and Chief Executive Officer. It has a small and multi-skilled work force comprising economists, financial and market analysts, engineers, lawyers, IT experts and accountants. IDCOL's stakeholders include the government, private sector, NGOs, multilateral institutions, academics and the people of Bangladesh at large.

GHEL has signed up a participation agreement with IDCOL for refinancing its Solar Home System Program and under this agreement GHEL will get the credit support for 10 years time period at the rate of 6% for as many as Solar System GHEL could installed. Along with that GHEL has honored to have a sectioned letter of 150 million BDT loan support for its battery production plant.

- **CITI**

Bangladesh is suffering from a severe energy crisis which has proven one of the key hurdles to economic and social development. Since the national grid is inaccessible to 70 % of the nation's rural regions increased use of alternative energies is perhaps the only realistic solution to the energy shortage. The Citi—GHEL Solar Project for Rural Microenterprises was introduced in 2011 in selected villages around the country to give these communities access to electricity. The program was initiated by AUP, financed by Citi Foundation and executed by GHEL. The objectives of the project were kept in line with the key focus areas of Citi Foundation – the development of micro entrepreneurs and microenterprises.

Objectives

- Direct support to microfinance clients by offering Solar Home Systems and Solar Lantern by which their families would have increased access to electricity.

- Enterprise development support to micro entrepreneurs by providing them training to enable the acquisition of new skills – making their businesses more productive and raising the income level of the entrepreneur.

Together with the Solar Home Systems and Solar Lantern, GHEL provided free training on their installation, functions and maintenance to women from remote rural locations. This approach allowed

for further female empowerment – both economic and social – through additional income generating activities.

Target population:

The beneficiaries of the program have been mainly micro entrepreneurs and their households. The initiative targeted the villages of Motlab and Changarchor in Chadpur District and Shajahanpur village of Bogra District. These villages did not have access to the national electricity grid which severely restricted the people and the local entrepreneurs in their daily activities and business development efforts. Households in selected villages were provided with 20W Solar Home Systems and micro enterprises with 40W Solar Home Systems in order for them to be able to extend their business hours. The solar home systems are distributed to 141 microenterprises and 369 rural households. Besides, 1200 Solar Lanterns are distributed among 1200 families.

- **Banglalink**

Green Housing & Energy Limited (GHEL) is a social impact business dedicated to combating poverty in Bangladesh by empowering low-income people and making a better living environment available to them. Therefore, GHEL has designed different programs such as: Solar home system, Bio-gas, Solar water pump, Solar mini grid, Modern cook stove, Solar smart micro grid project, Solar battery plant, Battery water project, Concrete hollow block project, Enterprise development project and Training center for renewable energy to tackle the socio-economic issues that hamper the expansion of rural communities.

Through this partnership program, it will be possible to grow up accustomed to this idea of a digital Bangladesh. Banglalink subscribers can now register their accounts and access mobile financial services through GHEL's branch office and people can buy different Banglalink product from GHEL's Branch offices through this program. Furthermore people can send and receive money to any Banglalink account through GHEL offices.

- **Sigmatns Co. Ltd**

Green Housing and Energy Limited (GHEL) and the Korean technology company Sigmatns Co. Ltd signed a Memorandum of Understanding on August 2, 2012. The partnership entails distribution of Sigmatns Co. Ltd.'s battery optimizers and LED lights through GHEL and collaboration on setting up assembly and production plants of the Korean technology in Bangladesh. With this MoU, Sigmatns Co. Ltd will also provide GHEL with support for technical training and new product development.

- **Private - Public Partnership in Nigeria with Bangladeshi Company- ICMSE Ltd.**

For the first time, Green Housing & Energy Limited (GHEL) and 'International Centre for Microfinance and Social Enterprises Ltd.' (ICMSE) launched together a vast development program in Nigeria with the collaboration of Nigerian Government. This public-private partnership program will foster Enterprise Development in the several villages in Nigeria to reduce the gap between urban and rural areas and to lift up the low-income people out of the poverty. Along with these activities, ICMSE will set up a SME and Microfinance Training Center, Social Venture Capital Funds, Renewable Energy Program and Model Agro Farming in a 100 hector land, provided by the Nigerian government. The Managing Director of GHEL, Dr. Mostaq Ahmmed, attended the launching of ICMSE Nigeria in Port Harcourt with the honorable presence of the state high officials and the CEO of the Rivers State Sustainable Development Agency.

- **International Business Partners:**

INES, ICD, EDHEC and HEC, Woord en Daad, Citi Foundation, Sigmatns Co. Ltd. and Rivers State Sustainable Agency-Nigeria.

- **National Business partners**

ASA, IDCOL, Banglalink, Dutch-Bangla Bank Limited.

- **Other Business Partners**

AFTA, UN Sustainable Energy for All

Featured Projects and Business Units:

- **GHEL Solar Home System:**

The GHEL Solar Home System is designed to provide the household with a complete set of solar energy products to cater to the energy need in rural and semi-urban areas. The GHEL Solar Home Systems are customized for low to medium income house- holds and can power lights, fans, phone chargers, radio and TV depending on the power capacity and the client's requirements. The GHEL Solar Home Systems have already proven a success in the market with 10 000 satisfied customers around the country. Additionally GHEL has distributed 6 000 Solar Lanterns of 5W for lighting rural households.

By using solar energy for electricity households get to enjoy the health and cost benefits of renewable green energies as opposed to fossil fuels. Home production of energy reduces the dependencies on the unreliable — or in remote areas unavailable — national electricity grid. This way, houses can stay lit after dark, allowing for more time spent on studying and an increase in productivity for home grown businesses. Thus, improved energy supplies have direct benefits on business productivity and education levels of rural households.

GHEL guarantees high quality of its Solar Home Systems with competitive warranties for all components. Maintenance for the GHEL Solar Home System is provided free of charge by trained local GHEL technicians for 3-5 years depending on the component.

Description of different components of Solar Home System:

Solar Panel:

Solar panels (arrays of photovolraic cells) make use of renewable energy from the sun and are a clean and environmentally sound means of collecting solar energy. Solar panel is a packaged interconnected assembly of photovoltaic cells, also known as solar cells. Solar panels must withstand heat, cold, rain and hail for many years. The usual warranty is 15 years at 90% of rated power output and 25years at 80% of rated power output. The average cost for soalr panel is from Tk. 5,500 to Tk. 85,000. An easy installation and portable technology which provides uninterrupted power supply unlike Fossil Fuel electricity.

Solar panels are easy installations and portable technologies which provide clean, uninterruptible power supply unlike fossil fuel electricity. Their impact is thus inherently economic (they are less expensive in the long term), social (the living standard of low and mid income people will improve with the touch of modern technology in their daily activities), and environmental.

General Information	***Whistands:*** ***• heat*** ***• cold*** ***• rain***
Power supply capacity	***•10 watt Solar Home System*** ***• 20 watt Solar Home System*** ***• 40 watt Solar Home System*** ***• 50 watt Solar Home System*** ***• 75 watt Solar Home System*** ***• 85 watt Solar Home System*** ***• 120 watt Solar Home System***
Use of solar electricity	***• Lightening of the house*** ***• Operating televisions, radios and cassettes*** ***• Charging batteries of mobile phones***
Installation	***Placed on GHEL's houses roofs by GHEL's technicians.***

Lifespan	***20 to 25 years.***
Warranty	***15 to 25 years.***
Maintenance	***•Free of charge*** ***•Ensured by GHEL's local trained technicians***

Mounting racks and Roof Attachments:

Solar panels must be mounted on structural members so that they will remain stable and at the correct angle to the sun. Some of these mounting systems are movable so that the panels can follow the path of the sun during the day to increase their efficiency. Mounting brackets are usually part of a package that comes with the panels. To get the best performance from the panels, and protect your roof, you should follow the installation instructions closely or consult a professional.

Sun Electronics sells a complete line of roof-mounting systems. The rail kits come complete with L-feet (L-brackets) to mount onto your roofing structure. Rails are available in a variety of widths to accommodate different panel sizes. There are also have different sized clamps (end-clamps and mid-clamps) to attach your panels to the rails, as well as grounding lugs and stand-offs to make the system complete.

Batteries:

Most homes need power even when the sun is not out, so batteries are an important component of a solar system. These should be deep-cycle golf-cart or marine batteries with a rating of at least 220 amp-hours. You will need to wire several of these together to form a bank if you plan on having enough available electricity for you home, and they should be stored in a dry, cool, well-ventilated location, preferably in a rack.

GHEL battery plant can produce all kinds of solar batteries that will be suited to our solar lanterns, home systems, tricycles and water pumps as well as other solar products that require battery.

The production capacity of the plant amounts 3300 pieces per month if run one shift (8 to 10 hours).

The GHEL could produce following categories of the batteries as per the Market Demands and it must have composed of three assembly lines:

- One small VRLA battery (55AH) assembly.
- One VRLA battery (80AH) assembly line.
- One 100AH battery assembly line.
- And one 130AH battery assembly line.

All the batteries are designed and destined to be used for solar panels.

Specifications:

Battery voltage: 12V
Maximum PV panel open circuit voltage: 26V
Continuous load / charge current: 30A
Maximum charge current (5 mins.): 35A
Maximum load current (5 mins.): 35A
Operation current (no load and PV): 15mA
Voltage across terminal (PV to battery): 1.2V
Voltage across terminal (battery to load): 0.6V
Electronic Blocking*: Yes
Battery reverse polarity protection: Yes
Overcharge & Over-discharge protection: Yes
Battery status LED indiction: 5-state LED Indications
Charging status indiction: 3-state LCD Display
Recommended wire size: #10AWG
Weight: 0.48kg
Dimension: 150(W) x 85(D) x 50(H) mm
Fuse: 40A
Operating ambient temperature: -10 to 50°C
Over temperature protection: Yes
Battery charging float voltage setting: Adjustable from 12.0-15.0V
Battery charging bulk voltage setting: Adjustable from 12.0-16.0V

DC load control mode (For DC load terminal)

Low Voltage Disconnect(LVD): 8-16V
Low Voltage Reconnect(LVR): 8-16V

Batteries are used in Off-Grid and Grid-Tie with Battery Backup systems. They are used to provide backup power during the night and during power outages.

Normally the batteries used in photovoltaic systems are lead acid type. The two main types are Starting and Deep Cycle. Choosing the right type depends on the application. The starting type is used for systems which need a quick and large amount of energy to start, for example starting an engine. Deep cycle batteries can be discharged and recharged continuously. They are compatible with systems which need long-term energy delivery, such as solar and marine applications.

There are various types of lead acid batteries: Gel, AGM (Absorbed Glass Mat) and Wet. Gel and AGM types are more resistant to degradation and can store more energy. If the system is not used constantly, AGM batteries are a good choice since they can keep their charge much longer than other types. The wet batteries are generally less expensive than the other two.

The other factor for choosing the batteries in a system is the Amp-hour (AH) rating. The AH rating represents the amount of current delivered from the battery over one hour. For example, a 100 AH battery can deliver 5 amps over a 20 hour period or 20 amps over a 5 hour period. The higher the AH rating, the longer it can deliver energy. Note that draining your batteries all the way down to 0% will

actually damage the batteries. It is recommended to not discharge your batteries to less than 50% (higher is recommended). If you would like to go back to the homepage please do so to go over our latest Solar Panels Deals, great deals on inverters and systems of all sizes to meet your system requirements.

Solar Charge Controller:

A charge controller placed between the solar array and the batteries will stabilize the fluctuating voltage of the panels and thus make it usable for charging the batteries. Charge controllers protect the batteries by preventing them from overcharging and they also protect the panels by preventing back-flow from the batteries.

The charge controller is used in off-grid and grid-tie with battery backup systems. The charge controller is an electronic voltage regulator that is used to limit the rate at which electric current is drawn in or out of the batteries. The simplest charge controllers turn off the charge when the battery reaches the optimum charging point and turns on when it goes below certain level. It fully charges the battery without permitting overcharge while preventing from reverse current flow. The overcharge or overvoltage may reduce the battery performance or lifespan and may pose a safety risk. Some charge controllers can show system operation parameters, battery status and protection from over discharging.

The capacity of charge controllers ranges from 4 amps to 80 amps. Most charge controllers use Pulse Width Modulation (PWM) and Maximum Power Point Tracking (MPPT) technology. PWM controllers are a time-tested technology that has been around for many years. Although efficient, there is no comparison with MPPT. MPPT controllers track the maximum point of power (constantly scanning the VI curve) thousands of times per minute. If you would like to go back to the homepage please do so to go over our latest Solar Panel Specials, great deals on inverters and systems of all sizes to meet your system requirements.

Inverter:

An inverter is an important part of a solar system because it converts the 12-volt DC power from the batteries into 110-volt AC house current. The inverter is often installed as part of a solar control center, complete with fuses and switches to guard against current surges and other mishaps. It can also be connected to the power grid and programmed to sell some of the electricity generated by the panels back to the power company.

Renewable energy systems generate DC power, household appliances operate on AC power. The inverter's task is to take the incoming DC power from the panels, batteries, or wind turbines, and convert it into alternating current (AC) energy used in homes and businesses.

There are many different types of inverters; choosing the right inverter for your system depends on your application. Our power inverters are all high-quality and designed to give you reliable AC power when you need it.

Wires and Cables:

Wires connecting the panel to the charge controller should be sized to minimize transmission power loss. The farther away the panels are, the larger the wire gauge should be. Batteries should be connected to each other and to the charge controller and inverter with battery cables. Cables used to connect batteries to each other should all be the same size and length.

LED Lights:

LED 12V DC Bulb Lamp

Description:

Classification	SHSB-LEDC 3.5W	SHSB-LEDC 5W	Remarks
Input Power	12V DC	12V DC	
Power consumption(W)	3.5W	5W	
LED(0.2W Chip LED)	Chip LED(16pcs)	Chip LED(20pcs)	Made in Korea
Life time (hr)	>30,000	>30,000	3 Years warranty
Luminous flux(lumen)	250~300 Can replace a 5W CFL Lamp	400~450 Can replace a 9W CFL Lamp	Depend on Globe(diffusion)
CRI(Ra)	>70	>70	
CCT(Kelvin)	5,000~65,000K	5,000~65,000K	Pure White
Luminous Efficiency(Im/W)	>70	>70	
Power Factor (%)	>90	>90	
View angle	120degree	120degree	
Dimension(length)	Ø65x107mm(h)	Ø65x107mm(h)	
Weight(kg)	100g	100g	
Socket Base	E26	E26	

- **GHEL Solar Lantern**

GHEL Solar Lantern is a lighting system composed of a lamp, a rechargeable battery and a solar panel. Easily of use: the battery is simply charged through the PV module, and then, used to power the LED lights inside the lantern. Our lanterns are portable and suitable for either indoor or outdoor lighting.

Our solar lanterns are a clean, cheap and reliable alternative to traditional lanterns (fuelled by kerosene or gas), candles and torch lights. Environmentally speaking, solar lanterns do not emit carbon dioxide, the main global warming pollutant. They are safe both for the user and the environment: no risk of burn or fire. Finally, solar lanterns are the cheapest source of energy on the long range. Indeed, people in rural Bangladesh spend an average of 12-15 BDT per day on kerosene while a solar lantern has a total cost of 2500 BDT. Considering an interest rate of 12% on the repayment plan offered in conjunction with the product, the solar lantern is amortized within only 200 days.

- **GHEL Solar Water Pump**

The solar powered pumping system consists of a solar panel that powers an electric motor, which in turn powers a bore or surface pump. The water is pumped from the ground or stream and stored into a raised tank.

GHEL Solar Water Pump can be used for two purposes, namely agriculture irrigation and pure drinking water supply. In fact, solar water pumps offer a cheap and clean alternative to diesel pumps for farmers located in remote areas. GHEL Solar Water Pump has a 21 capacity of 600,000 L/day, that is to say enough to supply a 120-bigha land.

On top of that, GHEL Solar Water Pump can be installed in a house to provide its household with purified drinking water. The water quality is tested by GHEL and the maintenance of the construction is provided by our experts. The household can access running drinking water up to six hours a day (based on a daily solar recharge of eight hours).

- **GHEL Biogas**

GHEL has launched a Biogas Plant Program in Bangladesh to address the pressing need to adopt wide-scale use of clean alternative sources of fuel for cooking. The ultimate goal of GHEL's Biogas Plant Program is to offer low cost green and alternative source of energy for everyday household needs.

Benefits of GHEL Biogas:

- Biogas is an **eco-friendly** source of energy,
- Beneficiaries experience long term **health benefits**
- More **affordable source of energy** (compared to e.g. kerosene and wood) in the medium to long term

In addition, the capacity of bigger GHEL Biogas Plants can produce both gas for cooking and electricity to power a generator. The Biogas Plants also support income generation since the excess production of gas can be distributed to other households. The byproduct—bio-fertilizer—can be collected and provide the household with a valuable additional income.

GHEL targets all those rural households currently using traditional health and environmentally hazardous fuels for cooking purposes. Women and children are disproportionately affected by diseased related to indoor air pollution due to their household responsibilities. Additionally GHEL is working to serve the low-income population and to increase the affordability of green energy technology to these people.

GHEL provides its clients with a customized financial solution with a 10 %-20% down payment and additional monthly installments for a period of 2-3 years.

Types of Biogas Plants:

GHEL offers two types of Biogas Plants according to the client's need:

1. The GHEL Biogas Plant for household cooking purposes
2. The GHEL Biogas Plant for industrial purposes

GHEL can design and provide Biogas Plants of any size depending on the client's needs and capacity.

- **GHEL Mini Grid:**

The GHEL Mini Grid is an off grid solar energy system managed by GHEL. The GHEL Mini Grid is installed in villages with a collective need of electricity of at least 100 kW. Through the GHEL Mini Grid, electricity is generated from solar energy and distributed to participating households. A power capacity of 100 kW can provide 500 households with six hours of electricity per day. The infrastructure of the GHEL Mini Grid gives participating households the option to sell excess electricity onwards to third party households. GHEL supports this kind of secondary distribution – by so called GHEL Power Ladies – as it can increase the efficiency and socio-economic benefits of the GHEL Mini Grid and provide the GHEL Power Ladies with an additional source of income.

The technology for the solar panels, charge controllers and inverters are imported from GHEL's trusted international partners. GHEL ensures the highest quality of sensitive technologies used for controlling and monitoring the generation and distribution of power. The GHEL Battery Plant produces the batteries locally under strict quality control to ensure first-class and long term quality of these components.

The GHEL Mini Grid is suitable for the landscape and weather conditions in most of Bangladesh since it relies on sunlight to produce electricity. GHEL nominates the suitability of the GHEL Mini Grid in a village based on the number of households in need of electricity. A GHEL Mini Grid of 100 kW will provide energy to 500 households within proximity of 2-4 km from the plant.

Benefits of GHEL Mini Grid:

- The benefits of GHEL Mini Grid are the same as GHEL Solar Home System.
- Long-term **health benefits** of clean energy
- A **cheaper** long-term source of electricity
- **Increased number of hours** for working and studying
- **Increased productivity, income and education levels** of the population in rural areas
- **Decrease national dependency** on fossil fuels and decrease the levels of carbon emissions

- **GHEL Smart Micro Grid:**

The GHEL Micro Grid is a hybrid construction of an off grid solar energy system and a biogas production plant. Compared to the GHEL Mini Grid the power capacity of the GHEL Smart Micro Grid is lower, ranging from 30 to 50 kW. The additional GHEL Biogas Plant for collective use also provides participating beneficiaries with clean and affordable fuel for cooking purposes. The 30 kW GHEL Micro Grid can provide energy for up to 250 households or 1250 beneficiaries.

Biogas is a bio fuel which originates from the biological breakdown of organic matter in the absence of oxygen. Biogas offers a clean alternative to traditional cooking methods. Input capacity for the GHEL Biogas Plant (measured by number of cows and amount of feces and waste) must be high enough in the village for its viable implementation. Generally, twelve cows producing 100 kg of cow dung can generate enough biogas for nine hours of cooking.

The GHEL Smart Micro Grid requires the land area to be suitable for the installment of the GHEL Biogas Plant. For a village to be nominated for the installment of the GHEL Smart Micro Grid, a demand for electricity and biogas for a minimum of 50 households is needed to meet the supply from the 30 kW plant.

- **GHEL Hollow Block Project:**

GHEL has its own Hollow Block factory at Shahjahanpur, Bogra. GHEL Blocks are made of cement, sand and small stones from Dinajpur. All our materials are selected with care to g uarantee the best end product. From its factory Bogra, GHEL manufactures 5 different models of hollow, cavity and solid blocks and supply to construction farms throughout Bangladesh. GHEL production plant has a capacity of 10,000 blocks per day to rapidly answer the demand and fulfill client's satisfaction.

- **Low Cost Housing:**

GHEL believes that housing solutions specifically designed for rural living conditions will have a significant impact on the economic situation and social status of families. The durability of GHEL Low Cost Housing as well as the affordable prices and customized mode of payment corresponds perfectly to the needs of low and middle-income people living in rural areas in Bangladesh.

In addition to providing comfortable living conditions, the houses are designed to be suitable to accommodate home grown businesses. The aim is to increase inhabitants' living standards as well as to foster their productivity by providing them facilities in which to set up their own SMEs.

Benefits of GHEL Low Cost Housing

GHEL Low Cost Housing benefits from a **higher durability and longevity** than traditional houses. All the parts are prefabricated and the structures are of extremely **good quality**.

The houses are **eco-friendly and resistant to changes in weather** since they are built with concrete blocks made from cement, sand and stones

Designed for low-income people, GHEL Low Cost Houses are **40% cheaper** than traditional houses.

The houses are seismic **shock-absorbing and solid** enough to endure earthquakes and cyclones.

Features of GHEL Low Cost Housing

All our houses are equipped with eco-friendly sanitation and water purification system. The GHEL Solar Home System and the GHEL Biogas Plant can be integrated in the houses to further decrease environmental impact and offer savings in living expense.

- **GHEL Modern Cook Stove:**

In most rural homes, where there is no electricity, food is cooked over an open fire using wood, agricultural residue, and animal dung, known together as "biomass." The result is 50,000 deaths in Bangladesh a year and over 2 million worldwide. The release of black carbon is also a significant source of greenhouse gases. In rural Bangladesh, the energy consumption for cooking outstrips the demand for all other uses of energy. Bangladesh has entered into new area of energy saving sector called improved cooking stove (ICS) to address the high demand for biomass fuels. Goal is to modify the stoves to make them fuel efficient and provide them with a mechanism (e.g. chimney) to remove pollutants from indoor environment.

GHEL are producing Modern Cook Stove in Shajahanpur, Bogra.

Advantage:

1. To reduce the in-door air pollution and no blackening.

   2. To improve the kitchen environment for supporting the mother and child health.

   3. To protect de-forestation through improving the fuel efficiency of cooking stove.

   4. To Reduce the Green house gas (GHG) effects.

Apart from no smoke in the kitchen, increased energy efficiency of 27% -29% and fuel saving of 50% -60% compared to traditional stoves. There was significant reduction of indoor air pollution in kitchens and reduction of cooking fuel by about 50 per cent, leading to saving of money, less time (50%) for collection of fuel as well as less time (30%-40%) for cooking. Apart from these, the stove resulted in clean kitchen and pots, reduced burden on forest resources, improvement of soil by increased use of bio-fertilizer and income generation for builders and trainers

Main Feature of Improved Cook Stove (ICS):

1. Minimum of 50% biomass fuel saving.

2. Reduce the smoke and thus protect the in-door environment of kitchen.

3. Thermally efficient so the temperature of the kitchen remains low.

4. Reduce Green house gas effects and sudden fire causes.

In rural areas about 95% uses traditional fuels like cow dung, agricultural wastage and wood totaling 60 million tones most inefficiently, worth 100 billion taka ($1.46 billion) per year.

- **Mongla Project:**

GHEL established solar panel in Government office by. To achieve optimum utilization of solar energy and generating power from renewable energy sources, GHEL has decided to establish solar energy plants on rooftops of different government buildings. The equipment was durable and solar power generating unit was cheaper than for other sources.

- **Enterprise Development:**

Taking a step beyond grass root poverty reduction, GHEL has introduced an Enterprise Development program as a response to the need of capacity building within the SME sector. The program mobilizes capital and consultancy expertise to be channeled to SMEs that currently do not have access to this kind of support. The GHEL enterprise development model has four key components:

1. Equity or debt financing by GHEL
2. Skill training by industry experts and consultants
3. Technological and operational support systems
4. Legal, administrative and market support

The GHEL Enterprise Development program targets SMEs in a broad range of industries. Through its 80 branch offices in rural and semi-urban areas, GHEL is well equipped to assess the market potential and valuation of ventures in an overarching range of sectors and regions. Each branch carefully reviews local entrepreneurs and SMEs and nominates the most viable ventures to the GHEL head office. A skilled team of SME development experts then evaluates the business opportunities and allocates equity of 300,000 to 7,000,000 BDT (corresponding to 20-50 % of total equity capital) or debt funding to the most promising prospects.

Prospective industries include:

ix) Agro-business Food processing and preservation
x) Pathology and Diagnostic Institutions Land development
xi) Housing and construction Mini garments
xii) Hospitality Retail and wholesale
xiii) Engineering and workshops etc.

- **GHEL Cable & Switch Plant:**

We specialize in manufacturing custom battery cable assemblies for many applications. We are manufacturing resource for power and high-current conductors intended for severe, rugged environments. We provide a complete range of cable sizes 8 awg to 4/0 for commercial and industrial applications.

Our automated cable processing equipment is capable of producing cables with a maximum outside diameter of 1¼ inches. From 6 inches to hundreds of feet long. GHEL established its production Unite at Shajahanpur, Bogra.

We use automated, high-speed cutting, stripping and crimping processes whenever possible. These automated processes improve process repeatability, increasing the overall quality of our products.

GHEL has also started manufacture of high quality sockets, plugs, switches and wiring accessories.

- **GHEL Solar Battery Water:**

We manufacture and supply high quality Deionized Battery Water under a brand name “Power Battery Water”. Our Deionized battery water is highly purified as a result it contains no dissolved solids or any kind of impurities, so it will not interact with any of the other functioning chemicals of a cell battery in Lead Acid Battery which help in increasing life of your battery.

- **GHEL Solar Battery Optimizer:**

The GHEL-Sigma Smart Battery Optimizer is a unique and patented battery accessory that revives old batteries and maintains the performance level at around 85% throughout the battery’s promised service life. The Smart Optimizer prevents premature battery failure through reversing the sulfation process inside the battery.

By simply addi8ng the GHEL-Sigma Smart Optimizer onto a new or old battery the service life of the battery can be more than doubled-allowing to cut battery expenses in half.

- **GHEL Battery Plant:**

The backbone of most power storage system is battery. An electric Battery is “any machine that storage energy into electricity for transmission and distribution.”

GHEL battery plant will produce all kinds of solar batteries that will be suited to our solar lanterns, home systems, tricycles and water pumps as well as other solar products that require battery. The production capacity of the plant amounts 3300 pieces per month if run one shift (8 to 10 hours).

***Plant Size**:*

Plant will be built on a 5 Bigha land which cost has estimated amounts 3.30 Crores BDT and which will be located in the surroundings of Dhaka (in Gazipur). The plant requires 102 employees for production and 18 for corporate office.

Battery Production:

The GHEL has made a clear technical plan to produce following categories of the batteries as per the Market Demands and it must have composed of three assembly lines:

xiv) One small VRLA battery (55AH) assembly.
xv) One VRLA battery (80AH) assembly line.
xvi) One 100AH battery assembly line.
xvii) And one 130AH battery assembly line.

All the batteries are designed and destined to be used for solar panels.

AT A GLANCE

Monthly Status as of October 20, 2013

Company Name:	**Green Housing & Energy Limited (GHEL)**
Web Address:	www.ghel.org
Key Person: Founder and Managing Director:	Dr. Mostaq Ahmmed
Date of Establishment:	2010
Registration Number:	C 82133/10
Legal Status:	Joint Stock Registered Company and Registered at BOI
Registered Capital:	100 Million BDT

S/N	Introduction	Present Status
1.	Number of Branch Offices	94 Nos.
2.	Number of Districts Served	62 Nos.
3.	Number of Regional Offices	15 Nos.
4.	No. of Overseas Offices with ICMSE Nigeria	5 (Nigeria)
5.	Number of Head Office Staff	31 Nos.
6.	Number of Field Staff	325 Nos.
7.	Number of Staff in Nigeria	2 Nos – Bangladesh 25 Nos. - Nigeria
8.	Number of Solar Lantern Sold Out	6,600 Pc

9.	Number of Solar Home System Sold Out	18,200 Pc
10.	Number of Bio-gas Sold Out	390 Nos.
11.	Number of Solar Irrigation Water Pump set up	3 Nos. under operation 4 Nos. under construction
12.	Number of Low Cost House Sold Out	5 Nos.
13.	Number of Cook Stove Production & Sold Out	Production: 549
14.	Number of Battery Water Sold Out	200 ton
15.	Total Production of Cables	**70/76:**250 Coils (950 ft) **40/76:**400 Coils (1200ft)
16.	Total Production of Structure	900 Set
17.	Total Production of Hollow Block	20,498 Pc
18.	Obtained Certificate from IDCOL	xviii) LED Bulb xix) LED Tube Light
19.	Number of Orientation Session Organized	480 Nos.
20.	Number of Rural Women Oriented	6,750 Nos.
21.	Number of Vehicles	xx) Covered Van – TATA:2010, Dhaka Metro, AU-14-2579 xxi) Pick-up – TATA 407, Narshingdi-NA-11-0055 xxii) Mini Pick-up, Dhaka Metro-NA-11-2989 xxiii) Auto Rickshaw (Solar) Three Wheeler
22.	Machineries of GHEL	xxiv) Cable Machine (Bogra) xxv) Block machine (Bogra) xxvi) Switch machine (Bogra) xxvii) Drilling Machine (Bogra): Structure Machine, Type: LT 19 G, Capacity 19mm xxviii) Hydro-Chemical Water Filter (Khilkhet)(02 Cylinders) xxix) Generator, Fuzi Power, Model K-4100D, HRS, 12HR/Rating (Bogra) xxx)Generator, Fuzi Power, Model K-4100D, HRS

		12HR/Rating (HO)
23.	GHEL running projects	xxxi) Solar Home System xxxii) Biogas xxxiii) Solar Irrigation xxxiv) Solar Lantern xxxv) Switch & Cables xxxvi) LED Lights xxxvii) Battery Water xxxviii) Hollow Block xxxix) Low Cost Housing xl) Modern Cook Stove xli) Co-operative
24.	GHEL up-coming projects	xlii) Solar Mini grid xliii) Solar Battery Plant xliv) Bio-fertilizer xlv) GHEL University Project.
25.	Total Land Assets of GHEL : 13 Bigha	xlvi) Mawna: 174.19 Decimal xlvii) Satkhamair: 136.75 Decimal xlviii) Sandip: 60 Decimal xlix) Kutubdia: 60 Decimal l) Bogra: 23 Decimal
Partners:		
26.	Number of Domestic Business/Banking Partners	IDCOL, Mercantile Bank Limited, Southeast Bank Limited. ASA, Banglalink, Dutch-Bangla Bank Limited.
27.	Number of International Business Partners	INES, ICD, EDHEC and HEC, Woord en Daad, Citi Foundation, Sigmatns Co. Ltd. and Rivers State Sustainable Agency-Nigeria.

For More Information:

Contact Address:

HEAD OFFICE:
House No: 16, 1st Floor, Road No: 07
DIT Project, Merul Badda, Dhaka-1212.

FACTORY:
Vill: Bashkuta, Jomadarpukur (Dairy Farm)
Post: Gohail, Upazilla: Shajahanpur, Dist: Bogra.

Phone: 02-8835688, 02-8835704
E-mail: contact@ghel.org

www.ghel.org