

“The definitive handbook of clean technology innovations from Indian SMEs”



CLEANOVATORS!

Outstanding projects from the Global Cleantech Innovation Programme - India



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Innovation Programme - India*





सत्यमेव जयते

भारत सरकार

GOVERNMENT OF INDIA



मंत्री

सूक्ष्म लघु एवं मध्यम उद्यम

MINISTER

MICRO, SMALL AND MEDIUM ENTERPRISES

MESSAGE

It is our common mandate to promote sustainable industrial development of job creation and employment generation and the Indian SME sector should realize the need for clean technology adoption in industries so as to ensure fulfilment of committed goal of moving towards green growth.

The ministry of Micro, Small and Medium Enterprises (MSME) has taken such initiatives to promote energy efficiency in the SME sector. One such initiative is the GEF-funded programme of UNIDO called, the Global Cleantech Innovation Programme (GCIP) for SMEs, which aims at identification and promotion of clean technology innovations in the SMEs. The project tries to promote energy efficiency, renewable energy, waste to energy and water efficiency innovations that are sustainable and reduce carbon footprint in the SMEs.

This book is the compilation of the many such innovation in the field of Cleantech, which have been identified and mentored under the programme. It is an important resource to assess the depth, breadth and quality of Cleantech innovations occurring in the Indian SME sector.

I hope, it will catalyze our development sector professionals, policy makers, and researchers to understand, create and support many more valuable innovations with clean technologies which happen in the Indian landscape.

कलराज मिश्रा

(KALRAJ MISHRA)

PREFACE

India is currently faced with a range of climate, energy and economic challenges. Climate change is not the only reason to invest in the transition to a clean energy future; India is also entering an era of resource scarcity of land, water and energy, given its burgeoning population, which needs to be addressed given the aspiration and dreams of the billion people in the sub continent. In India we feel that this challenge can be met by a combination of good public policy and the right business innovation and investment environment. Therefore you see the new government in India promoting this new ecosystem. We believe that solutions do exist and can be enacted with the right combination of political, social and financial will.

Agencies, governments, investors and business need to proactively collaborate as forces facilitating this transition towards a sustainable energy future on a global level. Technology start-ups provide one of the most important vehicles for developing and commercializing innovation to meet these challenges, while generating value for investors. From research to commercialization, the life cycle of high-impact technologies include many players, from governments and universities to investors and multi-national corporations. In the center of this matrix is the entrepreneurial start-up, the vehicle for taking an idea from the lab to the market. Innovation companies come in many different forms. Most common are companies introducing incremental innovations; those transferring technological applications from one industry or geography to another; and those presenting business model innovations. Completely new breakthrough companies are rare, though they do exist.

Political debate sometime focuses on sustainability versus economic value creation on a global, national, and company level. Yet the reality is that individuals, multinationals, and governments are waking up to the need for renewable energy, energy efficiency and sustainable solutions in all sectors of the economy. India has also understood this paradigm and therefore has set one of the most ambitious targets in new and renewable energy sector in the world. This hopefully will drive a growing market for new and innovative technologies and services. Similarly the tough economic climate, which is likely to overhang much of the twenty first century where jobs and capital are in short supply, it is imperative for countries to think about fostering economic growth and try and give rise to a new set of companies in proportion to their size.

The cleantech revolution is happening because it is economically a must, and now the countries of the world want to be part of the ecosystem that facilitates this revolution both in the interest of the world and its own economic interest. Therefore understanding these innovation processes and the cleantech market is a must and should complement the establishment of national climate targets and international carbon thresholds.

In order to accelerate progress in the area of Cleanspace, India also needs to look at conditions surrounding our solution providers. And in this very context, the Government of India saw the virtue of the GCIP of UNIDO for SMEs, that was trying to leverage the power of entrepreneurship to address the most important challenges of energy and environment. As the Cleantech Open USA was the knowledge partner of UNIDO for the programme, we saw lot of merit in the GCIP programme bringing exposure to the SMEs. It also provided a platform where the countries could share their best practices and challenges. Partnering the Ministry of MSME, the Programme in India has incentivized clean technology adopters among MSMEs by providing a platform for recognition, reward, and replication. The annual competition run by the CGIP to find clean innovations, examples of which you will find in this e-book, has been a great success. The programme leverages the US-based Cleantech Open's model to find, fund and foster entrepreneurs with innovations that can address today's energy and environment challenges.

This book is a handy resource for those looking for a bird's eye view of the breadth and range of clean technology innovations currently being fostered by the GCIP in four crucial areas: energy efficiency, waste-to-energy, renewable energy and water efficiency. Going through the summaries, one can see the glimpses of the Indian innovative streak being manifested time and again, and also an acutely aware and informed ecosystem of grassroots innovators and entrepreneurs that are working on solving some of the most urgent and complex problems revolving around energy use in various industry verticals. I hope the Programme will be able to contribute to the ecosystem by sensitizing the stakeholders about the vibrancy in the innovation environment not only in the R&D institutes, engineering colleges but also in the existing SMEs from where many of these innovations have been picked up.

Surendra Nath Tripathi

*(Additional Secretary & Development Commissioner, MSME
Government of India)*

INTRODUCTION

The Global Cleantech Innovation Programme (GCIP) for SMEs is a global multi-stakeholder partnership that leverages the power of innovation and entrepreneurship to address the world's most urgent energy, environment and economic challenges. The United Nations Industrial Development Organization (UNIDO) with support provided by the Global Environment Facility (GEF) is currently implementing the GCIP in seven countries namely Armenia, India, Malaysia, Pakistan, South Africa, Thailand and Turkey. GCIP India was launched in May 2013 as a partnership between the Ministry of Micro, Small & Medium Enterprises (MSME), GEF and UNIDO, with the Federation of Indian Chambers of Commerce & Industry (FICCI) as main executing partners. The Programme aims at creating an ecosystem of clean technology innovations in the MSME sector to catalyze low carbon industrial growth in the country.

The Ministry of MSME has announced an ambitious and commendable vision for all twenty-six million micro, small and medium enterprises in India to adopt energy efficiency and clean technology measures by 2025. In achieving this goal, technology, business, and policy innovations will be crucial. To support the Indian government as well as other countries in achieving this vision, UNIDO has developed the GCIP – a platform to encourage the emergence of a formalized, structured, enabling ecosystem for promoting clean technology innovations in the SME sector.

While SMEs in India are leading market players in clean technology innovations, much of their efforts do not receive recognition nor translate into business opportunities. Therefore, a key contribution of the GCIP platform is in its ability to link other ongoing initiatives and bring innovators, entrepreneurs and investors on a common platform to provide opportunities for collaboration and synergies.

As in other GCIP countries, GCIP India employs a competition-based approach to identify the most promising innovators across the country, while its business acceleration programme supports, promotes and “de-risks” the participating innovators and connects them to potential investors, customers, and partners.

This e-book demonstrates how Indian MSMEs are buzzing with cleantech ideas and innovations, and showcases that the GCIP has had considerable impact in creating a sustainable innovation ecosystem to nurture ideas and prototypes. In doing so, the GCIP has highlighted and enhanced green aspects of Indian MSMEs, and has also prepared Indian entrepreneurs to leverage investment and outreach from the emerging global cleantech market.

As GCIP India heads into its third year, results have been extremely positive and encouraging with a cadre of clean tech entrepreneurs and innovations being brought to fruition.

Pradeep Monga, Ph.D

(Director of the Department of Energy, UNIDO)



SUMMARIES 2014



The Idea

Replace conventional sources of energy in small-scale industrial units with gasification technology.



The Innovation

Biomass gasifier-based micro power projects of capacity from 20 KW to 2 MW, using technology licensed from the Indian Institute of Science (IISc).

The gasifier design is open top, down draft, staged air entry system with cleaning and cooling systems.

The gasifier also has a thermal application in the food, aluminium melting, powder coating and mineral drying industries.



The Impact

- > Reduces CO₂ and SO₂ emissions
- > Cuts down operating costs
- > Creates a local biomass economy



The Company

Manufacturers of Biomass Gasifiers, AHE provides sustainable energy options for grid supply, captive consumption, and thermal applications.



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The Idea

Eliminate energy shortages hampering delivery of computer-based education in developing economies like India.



The Innovation

A hybrid Energy Solution (HES) for computer labs in energy deficient areas for IT education and training, using renewable sources of energy and shared computing technology.

The company conducts practical demonstrations of this combination of shared computing with hybrid energy at educational institutions and computer labs. Six large scale deployments of Astric's HES has been made in Bihar so far. The company has also assisted the State Government of Bihar to adopt the technology in about 2000 government schools.



The Impact

- > Over 50% savings in energy costs
- > Efficient use of computing power
- > 'Zero Carbon Footprint' computer labs



The Company

Astric Solutions is a partnership company seeking to create a network of IT/ICT/ITeS training solution centres across Bihar.



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The Idea

India produces in excess of 500 million tons per year of agricultural residue, which goes waste. This can be harnessed to meet energy needs sustainably.



The Innovation

An integrated technology process model to efficiently convert the agro residue into clean solid and gaseous energy sources and organic biochar farm fertilizer.

The gas is used for power generation and the char is further converted into solid charcoal fuel briquettes and Biochar soil amendment.

The proposed business model is a distributed honeycomb model where micro units are built at a village cluster level.



The Impact

- > Reduction in CO₂ emissions
- > More efficient utilization of feedstock
- > Generates rural jobs



The Company

ArSta Eco is an eco company with the mission to build and integrate modern technology with traditional techniques in a sustainable model.



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The Idea

Convert biowaste to energy using micro biomass gasifier technology.



The Innovation

A small biomass gasifier with dry filtrations and minimum tar content, which is being used to convert biowaste to useful energy. The product has minimum maintenance needs and its operation is quite simple. The gasifier is surrounded by a water jacket and has the capacity to handle multiple fuel sources.

The gasifier is an ideal solution to deliver off grid power to small and medium scale agro-based industries and villages.



The Impact

- > Smallest in size, mobile unit that replaces fossil fuels
- > Sound proof system
- > Generates rural employment



The Company

Enersol Biopower is one of the leading manufacturers of biomass gasifiers for both thermal and electrical purposes. It also deals in biogas plants and solar energy products.



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The Idea

Combat challenges of water collection, storage and utilization in developing economies through sustainable technologies.



The Innovation

Bioengineering of purification technology to design a solar-enabled, atmospheric water collection system. It consists of a potable solar dehumidifier for collection of water from a humid atmosphere, along with a storage tank (capacity 200l/day) and purifier. The dehumidifier can be used in diverse urban and rural settings, and comes with a battery backup powered by solar energy.

The dehumidifier allows for low human intervention as maintenance. The filtration system is through natural fibers and can withstand conditions up to 12 months.



The Impact

- > Ideal for water scarce regions
- > A 'Zero Maintenance' product that can last up to 10 years
- > Removes the drudgery associated with water collection



The Company

Enoveo is an environmental bioengineering solutions provider firm, catering to the treatment of water and soil pollution.



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The Idea

Create a more sustainable temperature control technology to replace energy-guzzling conventional ACs.



The Innovation

A solar-wind hybrid coupled air conditioner that produces a refrigerating effect inside a house or office from both solar and wind energy resources available at the roof top.

Using a power cycle (Rankine cycle) solar energy, the technology powers a compressor directly coupled to a gas turbine and the wind turbine through a variable coupler (CVT) with the same shaft. As there is no conversion of mechanical work into electricity, storing of electricity in batteries and again converting it through a motor to mechanical energy to run a compressor is eliminated.



The Impact

- > Zero intermittent energy loss
- > Low installation and maintenance costs
- > Eliminates air pollution from ACs



The Company

Fabonix is a tech start up that blends technology, creativity, engineering and innovations to solve problems from industries to households.



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The Idea

A sustainable solution to concerns regarding environmental, ecological and health impacts of untreated wastewater.



The Innovation

Wide area Ultraviolet-C based water purification systems for groundwater, grey, sewage, polluted water and industrial effluents for communities and industries. A working prototype has been engineered, developed and tested for disinfection and demineralization of industrial effluents and technologically polluted water to achieve clean and safe water of potable standards.

The prototype is powered by off-the-grid single photo-voltaic panel (~ 120 watt) and includes commercial off-the-shelf components.



The Impact

- > Cost effective and efficient water purification systems
- > Has long term implications for decentralization of water infrastructure



The Company

Greenfield Eco Solutions creates decentralized water systems for purifying industrial effluents and technologically polluted water to safe, clean and cost effective standards.



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The Idea

Reduce fossil fuel dependency among engine manufacturing OEMs by solving the non-viability of attaining variable compression rates in internal combustion engines.



The Innovation

A patented RVCR (Rotary Variable Compression Ratio) engine technology for automotive, tractor, marine, stand-alone applications.

Today's engines are single fuel machines and are saturated at current fuel-efficiency levels, being unable to switch between different fuels in engines. The RVCR technology enables 'VCR' feature in engines, allowing multi-fuel usage in same engine (either fossil or green fuel), hence enabling a level playing field for green fuels (biofuel, hydrogen, algae -based fuels) to compete with fossil fuels.



The Impact

- > Unhooks economy from fossil fuel dependency
- > Helps meet stringent of emission regulations
- > Higher efficiency, power-density and downsizing in engines



The Company

'GYATK was founded by inventor Mr. Ajee Kamath to commercialize his globally patented Disruptive RVCR Technology.



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The Idea

Harness the energy dissipated by collapsing cavitation bubbles to accelerate chemical reactions in water and effluent treatment processes.



The Innovation

The HyCator® Reactor System -makes an overall efficiency improvement in a cost effective and environmentally friendly way for applications ranging from effluent treatment, cooling tower water treatment, biogas generation enhancement to chemical processes.

These are standalone, custom designed, skid-mounted units which can be retrofitted into existing setups with minimum pipeline modification and with no plant stoppage. The company is already deploying prototypes with very encouraging results.



The Impact

- > Overall efficiency improvement of a minimum of 15%
- > Reduction in processing time, chemicals & energy usage
- > Saves large quantities of water



The Company

HyCa Technologies is a research led emerging company whose products use in-house patent-pending clean technology to provide equipment-based solutions to customers.



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The Idea

Effect energy efficiency and water savings in plastics processing through process improvement.



The Innovation

A national award winning technology for plastic processing, where cold water is required for the cooling mould and machine. However, the water temperature in the system is generally high at about 60 degrees celsius, causing higher production cycle time as the water is cooled to the required temperature. This system has been modified to achieve reduction in temperature by 5 degrees celcius.

With this modification, higher productivity, zero waste of water and saving of energy in running a chilling plant have all been achieved.



The Impact

- > Eliminates water wastage
- > Direct energy savings by removing chilling plant
- > Makes big savings in GHG emissions



The Company

Jagdamba Polymers is a manufacturer of plastic furniture, plastic household products, toys, PET performs, catering to general and industrial consumers.



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The Idea

Implement process improvements to make the scouring and bleaching process energy efficient and pollution-free.



The Innovation

The common practice of scouring and bleaching of hosiery cloth is on closed winches by hot processing, wherein water as medium and coal for heating up to boiling point is used in large quantities.

By modifying the process of controlling parameters like ph concentration of most compatible chemicals and time at different stages we could perform the scouring and bleaching process at room temperature with no input of coal. The solution is actively deployed internally and has achieved significant savings.



The Impact

- > Fully eliminates coal consumption
- > Reduces water usage by 60%
- > No associated air or water pollution



The Company

Jet Knitwears is a manufacturer of hosiery undergarments since 1969. Its products are marketed by a well developed sales network nurtured by the company.



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The Idea

Reduce energy wastage and boost energy efficiency of coal-based furnaces.



The Innovation

A solid flow meter designed for the measurement of coal powder and fly ash flow rate and totalizing for coal furnace. By measuring these parameters one can assure that coal is burned properly and fly ash doesn't contain coal residues.

Specially designed for Indian conditions, the meter is easy to install and cost-effective. It is applicable in thermal power plants, coal-fired furnaces, biofuel power plants, etc.



The Impact

- > 20-30% cheaper than similar imported meters
- > Improves the efficiency of coal fired furnaces
- > More accurate than traditional impact-type solid flow meters



The Company

ResponSave is multiple-innovations led business start-up with a portfolio of patented and patent-pending innovations ready for commercialisation, licensing and further R&D.



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The Idea

Convert waste plastics (PS-polystyrene, PPpolypropylene, HDPE/LDPE - polyethylene) into fuel oil without polluting the environment.



The Innovation

Neogi waste plastic fuel oil technology - an integrated system of creating energy from waste which produces fuel oil at par with IS 1593 - 1982 specification (BIS) for fuel oil.

NTR has been successful in demonstrating the process to extract 1 litre of plastic fuel oil from 1 kg. of waste plastic in various exhibitions in many occasions. A commercial prototype for loading 5 kg of raw material is available. Further R&D has been planned to economize the input energy.



The Impact

- > Rids the environment from plastic pollution
- > A new and viable addition to the alternative energy mix
- > Lower SO₂ content than in conventional fuel oils



The Company

Neogi Technologies & Research has 43 years of engineering excellence, which helps it design cleantech solutions for sustainable development.



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The Idea

Eliminate spillage, misuse and fraudulent practices in the sale of kerosene, petrol, diesel and other fuels.



The Innovation

A solar-powered KDM (Kerosene Dispensing Machine). The machine has a biometric/Smart Card-based access control system, is tamper-proof, and environment-friendly. Designed to work with India's vast PDS (Public Distribution System) and network of FPS (Fair Price Shops), the KDM makes kerosene distribution more convenient and uniform.

Supported by the Ministry of Science and Technology, the KDM is growing popular with each day, and a tanker-mounted mobile version is being developed for use in other industries.



The Impact

- > ensures proper and uniform volumetric distribution of fuel
- > Saves large quantities of fuel which otherwise is wasted
- > Generates rural employment, especially for women



The Company

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The Idea

Make industrial drying processes cost-effective and environment-friendly.



The Innovation

The Omasil air sanitizer and solar dryer to dry powders or liquid, which consists of SS Jacketed floor, glass slides, roof with an air circulating fan, and hot water in the bottom jacket. Typically, solar drying in an open area is the classical technique, but Omasil has the added value of drying in a closed aseptic system to minimise bioburden.

The technology has been validated by third party validators and has achieved market acceptance.



The Impact

- > Minimises the carbon footprint of the drying process
- > Cost effective and simple to operate
- > No decomposition of product being dried



The Company

Omatek Laboratories Pvt Ltd is a R&D-based chemical, food, and pharma company. It is also engaged in innovation for energy conservation.



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The Idea

Design an outdoor mobility solution powered by renewable energy for the self-employment and mobility of physically challenged persons.



The Innovation

Ricky - a mobility equipment that is designed to be a shop on a wheelchair, powered by battery and solar power. The equipment covers most of the outdoor mobility needs of physically challenged people, which includes but is not limited to, travel from home to the sales location, travel to get supplies etc.

The shop is mobile and one can move from place to place to increase the sales and hence the earning potential of differently abled people. The equipment is customizable to individual needs and is easy to operate.



The Impact

- > Low operating expenses of less than 11 paisa per km
- > Capable of handling Indian road conditions
- > Operates on renewable energy and is non polluting



The Company

Ostrich Mobility Instruments Pvt Ltd builds affordable mobility solutions for people with physical challenges and designs solutions for their sustainability and freedom.



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The Idea

Create an electricity generator powered by biomass producer gas and biogas from cow dung to electrify rural and remote areas.



The Innovation

An ignition system to start producer gas generation set and biogas-generation set, equipped with a control valve to supply gas in the engine as per required quantity. The generator sets are run purely on waste such as rice husk, wood waste, sewage, etc.

Currently being used for irrigation in farms and for household lighting, the generators are easy to operate, low on maintenance costs, and highly mobile.



The Impact

- > Clean source of energy
- > Makes biowaste valuable for rural communities
- > Offsets fossil fuel consumption



The Company

Prakash Diesels are manufacturers of power generating sets running on biowaste like rice husk, solidwaste, and cow dung to generate electricity and biogas.



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The Idea

Eliminate wastage of water in power plant boilers, where 2-3% of the boiler hot water is thrown away every hour.



The Innovation

A unique Boiler Blow Down Heat Recovery Unit (BBHRU), which heats the incoming boiler feed water to the deaerator on this waste heat.

The BBHRU exchanges heat indirectly, due to which carry over of high ppm water back to the deaerator is avoided. Further, the Unit throws the condensed water back to RO land, and there is visible steaming inside the plant.



The Impact

- > Conserves water
- > Converts waste heat into usable energy
- > Creates a healthier work environment



The Company

Ravi Industries is into design and manufacturing of process equipment like pressure vessels and Heat Exchangers.



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The Idea

Using energy storage technology to reduce power consumption by air conditioners.



The Innovation

An energy storing air conditioner that stores thermal energy in the form of ice within an insulated cabinet attached to the air conditioner. The cooling mechanism is calibrated to make ice, which in turn is used to cool the air in the room. In this manner, the air conditioner stores power in the form of thermal energy, which can be used during power failures or for load shifting from peak to off-peak hours.

The innovation is based on patented technology that can be applied in smaller air conditioners, in which energy storage has so far not been applied.



The Impact

- > Energy efficient air conditioners
- > Air cooling even during black outs
- > Cost effective in comparison to conventional technology



The Company

ResponSave is multiple-innovations led business start-up with a portfolio of patented and patent-pending innovations ready for commercialisation, licensing and further R&D.



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The Idea

Transforming waste from agricultural residue into clean energy, while retaining soil fertility by eliminating burning of agri waste.



The Innovation

Second generation bio diesel from rice straw - a waste byproduct of rice cultivation. It is estimated that one kg of rice straw has about 370 gms of cellulose, which can produce 280 ml of bio ethanol.

The technology has been tested in the Orissa Institute of Agriculture & Technology, and in its first phase will have the capacity to produce 15 mega liters (15 million l)/year by processing about 7% of the total rice straw available. As the Government of India has mandated a 5% ethanol mix in fuel products, the technology is poised to take off.



The Impact

- > Cheaper ethanol than compared to molasses
- > Eliminates large quantities of agricultural waste
- > Gives farmers value for their crop residue



The Company

Rohit Singhal & Co is a rice milling company with a capacity of 150 tpd, and a rice bran-based solvent extraction unit with a capacity of 150 tpd in Bargarh district of Orissa.



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The Idea

Remove the energy barrier to the availability and accessibility of high load industrial sewing machines in electricity scarce areas.



The Innovation

Custom-made machines that can be operated at the rate of 75 watts per hour, as against the standard machines that utilize 400-500 watts of electricity per hour.

This patent-pending technology seeks to help generate livelihood options in under developed areas and save on electricity consumption in cities. The company's vision is to augment installation of these machines with training centres and project sites in garment factories in rural areas of the country.



The Impact

- > Energy efficient garment manufacturing
- > Sustainable livelihood generation in rural areas
- > Portable and cost effective technology



The Company

Satnam Sewing Machine Company is a New Delhi-based company that deals in sales and spares of industrial sewing machines used in the garment industry.



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The Idea

Replace fossil fuels with solar energy for thermal applications in industrial processes and the hybrid power market.



The Innovation

SharperSun - a concentrating solar thermal industrial boiler that concentrates solar heat on multi-pan plate throughout the day using a cradle-like energy efficient sun tracking system.

The innovation has one of the largest aperture troughs for process heat application, and a modular structure that can easily fit industrial spaces.

Since the product is modular, it is easier to scale up for larger size projects from the existing 150 KWth model.



The Impact

- > Quick payback to customers for displacing fossil fuels
- > Offsets sizeable quantities of air pollution
- > Drastic reduction in operating costs



The Company

Founded in 2009, Energy Guru produces SharperSun - a Concentrating Solar Thermal system empanelled with the Ministry of New & Renewable Energy, Government of India.



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The Idea

Address the challenges of storing life saving drugs and vaccines in electricity parched areas.



The Innovation

Domestic type Solar thermal refrigeration - a system of refrigeration using solar heat directly or with the help of agro wastes.

The equipment comprises of a Solar Concentrator with electro-polished aluminum reflector and Heat Receiving Element (HRE) made of SS/Copper tube or chamber at its foci, coated with absorptive coating, with the whole solar system to be integrated with absorption type refrigerator. The reflector concentrates and focus the solar radiation on HRE. Thermic fluid in HRE, heated by the solar radiation, supply heat to the absorption type cooler. Hot thermic fluid is stored in an insulated storage tank for using when the solar radiation is absent or not sufficient.



The Impact

- > A standalone system not dependent on grid power
- > Environment friendly technology not producing any GHG
- > Cost effective and simple to use



The Company

Surya Engineering Pvt. Ltd. develops and manufactures Solar thermal devices and is developing Solar thermal Powered refrigeration systems particularly for use in the remote and rural areas.



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The Idea

Improve the efficiency of ceiling fans to drastically reduce power consumption by the estimated 350 million ceiling fans in use in India.



The Innovation

Superfan - India's first super efficient ceiling fan that consumes a mere of 35W of electricity compared to 75W by regular fans, while delivering the same amount of air.

The product does not use troublesome regulators and comes with a sleek and durable remote to control its speed. Constructed with highly efficient, durable and cost-effective BLDC motor technology, the speeds are precise and stable even when the supply voltage varies, even at as low as 140V or as high as 300V.



The Impact

- > Slashes energy consumption by more than half
- > Air flow efficiency greater than the energy star requirements
- > Cost effective and environment friendly cooling



The Company

Versa Drives Private Limited (VDPL) specialises in design and manufacture of motor controls, BLDC motors and super efficient ceiling fans.



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SUMMARIES 2015



The Idea

Create an energy efficient alternative to conventional gas cooking technology.



The Innovation

Energy efficient burners - a patented technology developed for use in kitchens that utilize LPG and other fuels. The equipment is noiseless, flameless and smokeless and provides uniform radiant heat. This enables tastier and healthier food due to uniform heat across the vessel and preservation of moisture in the food.

The technology has not only been validated but also been certified for highest thermal efficiency at 69%. These burners are eco-friendly as they do not emit carbon soot and significantly bring down the ambient heat in kitchens.



The Impact

- > Saves more than 30% LPG compared to normal burners
- > Conserves water and detergent in industrial kitchens
- > Enables a cleaner, greener cooking environment



The Company

Agnisumukh is a start up led by a team which has developed indigenously developed technology for domestic and industrial food preparation.



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The Idea

Design a solution to the challenges of security, energy theft and poor housekeeping of ATM sites.



The Innovation

WR600 (Web Remote 6 series) is a platform that automates and monitors unmanned sites that consume significant electricity such as Bank ATMs.

Using simple low-cost sensors and business rules, WR600 enables detection of theft and wastage of electricity and alerts relevant authorities to take corrective action. One caretaker can operate & monitor 200+ ATMs from a remote network operation centre using sensor based smart e-surveillance and rule based energy management system.



The Impact

- > Reduces costs of operating ATMs without losing control of the sites.
- > Energy vigilance at low costs for banks, restaurants, retail shops, fuel stations, vending machines, and dairy farms.



The Company

Ahoy Systems Pvt Ltd develops scalable internet of things (IoT) solutions to save money and drive efficiency in operations for customers cutting across sectors and businesses.



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The Idea

Address the paucity of low-cost clean energy for household use by using biomass resources.



The Innovation

Pine needle-based biomass power generation systems for heating, cooking, and lighting.

Electricity is generated through gasification of pine needles and the residual ash from the process is briquetted into charcoal. While these briquettes meet cooking energy needs in the villages, reliable supply of electricity will create facilities for an entrepreneurial ecosystem in rural areas, creating a positive impact at every stage of the value chain.



The Impact

- > Reduces carbon emissions
- > Regenerating biodiversity
- > Generates rural employment



The Company

Avani Bio Energy is a clean energy company, which employs local people to generate clean electricity and cooking charcoal from ecologically harmful and abundantly available biomass.



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The Idea

Create a low-cost clean energy solution for households by deploying small wind turbines.



The Innovation

A low-cost Small Wind Turbine (SWT) with minimum viable features to provide reliable power to residential & commercial customers in coastal and windy regions. The product uses a patent-pending indigenous technology in partnership with the world's largest DC group – Emerge Alliance.

The SWT generates a minimum of 120 kwh/month/KW (scalable upwards as required) and has the potential to reach and benefit approximately 7.4 million domestic consumers using less than 150 kwh/month in Kerala state alone.



The Impact

- > Low-cost, easy to use, and low maintenance
- > Reliable and clean energy
- > Enables income generation via grid paybacks



The Company

Avant Garde Innovations is a start up aiming to introduce innovative, affordable and sustainable solutions that take renewable energy self sufficiency to the next level.



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The Idea

Address the challenge of safe disposal of rice husk ash - a waste product of rice husk-based fuel used in biomass gasifiers and industry boilers.



The Innovation

A technology to extract an advanced grade of silica from rice husk ash. This silica - Highly Dispersible Silica (HDS) - is used in tyres and can reduce rolling resistance of tyres and improve fuel consumption of vehicles by 5-7%.

Every year more than 12-15 million tons of ash is generated globally, which is either dumped in open grounds or land-filled. The company's technology uses this waste and produces an advanced grade of silica from it.



The Impact

- > Helps rice husk fuel producers monetize their waste
- > HDS reduces fuel consumption of vehicles
- > Mitigates GHG emissions



The Company

Bridgedots Tech Services Pvt Ltd is a leading technology solutions provider for the chemical and allied industries in India and around the world.



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The Idea

Capture industrial emissions at the point of release and convert them into usable nano material.



The Innovation

A ground-breaking, patented technology that transforms waste carbon emissions from industries into a form of Nano-material called Carbon Nanotubes (CNTs). CNTs produced from the process are used to make composite materials like rubber or aluminum stronger and more lightweight.

The technology consists of a reactor that affixes to factory smokestacks and produces CNTs from carbon emissions on site. The reactors successfully capture 70% of the total emissions from the factories.



The Impact

- > Creates value from emissions without harming the environment
- > Carbon-neutral production of CNTs
- > 70% reduction in carbon emissions



The Company

Carbon Continuum is a Bangalore-based nanotechnology company that holds the patent to manufacture CNTs from carbon emissions.



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The Idea

Design end-to-end energy efficient solutions for the steel and allied industries using customizable hardware.



The Innovation

A furnace developed for forging operations in the hand tool industry, which consumes 26 kg LPG per ton of production against the national average of 90 kg per ton of production.

The processor in the furnace adjusts LPG and air quantity so that consumption of gas remains nearer to the lower end. This furnace is equipped with very good thermal insulation so that skin temperature do not exceed 55 degrees celcius. The furnace is also equipped with an automatic APQP system for selection of optimum fuel consumption.



The Impact

- > Reduces fuel consumption,
- > Enhances profitability and reduces GHG emissions
- > Reduces the temperature on the work floor by 6-10 °C



The Company

Delta Energy Nature manufactures cleantech hardware and provides services to customers for energy conservation and cost effective production.



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The Idea

Design and develop a monitoring and evaluation system to optimize energy usage.



The Innovation

SmartSense- an assembled product that is used to monitor live energy consumption at any given point in time by any power/energy consuming device. In development is a further enhancement that offers energy intelligence through a proprietary analytics engine.

The user is charged a nominal fee for accessing the data on his or her internet-enabled devices, with subsequent annual charges for maintaining the same.



The Impact

- > Reduces fuel consumption,
- > Enhances profitability and reduces GHG emissions
- > Reduces the temperature on the work floor by 6-10 °C



The Company

Ecolibrium Energy is a technology Company based out of Ahmedabad, Gujarat, and working in the domain of Energy Intelligence.



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GREEN COOLING & ENERGY REGENERATION

LUCKNOW, UTTAR PRADESH



The Idea

Use available energy to provide air conditioning in LPG and CNG vehicles.



The Innovation

Captive Energy Recovery - a system that uses readily available cooling energy from the expansion of Liquefied Petroleum Gas (LPG) to a gaseous state, to cool the cabin of LPG vehicles. This cooling of 92 Watts/ Kg of LPG occurs without the need of any compressor or condenser assembly.

The technology takes up the 'Latent Heat of Evaporation,' generating a very high amount of high quality cooling without the need for additional fuel consumption. In scientific parlance this cooling is termed as the Joule Thompson Effect.



The Impact

- > Eliminates the need for additional fuel to run vehicle ACs
- > Reduction in vehicular emissions
- > Makes LPG vehicles comfortable at no additional running cost



The Company

Green Cooling and Energy Regeneration is based out of Lucknow, and focuses on delivering sustainable cooling solutions for automobiles.



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The Idea

Using clean technology to enable sustainable food preservation and reduce wastage of food.



The Innovation

Hot N Cool is a product which achieves maximum efficiency to dry and preserve any perishable product by utilizing waste heat from cold storage units.

In one thermodynamic cycle one can utilize condensation heat for a hot room by using fresh air fans, exhaust fans, water pumps and by modifications in the condenser fan coil unit.

In addition, one can easily convert old air conditioning/refrigeration plants for hot storage using the product.



The Impact

- > Saves upto 95% of electricity by utilizing cold storage waste heat to run a hot storage
- > Eliminates wastage of food



The Company

Hot N Cool Store is a Pune-based company that is a pioneer in hot and cold storage technology, and serves customers in the hospitality and food processing sectors.



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The Idea

Make a series of process improvements to cut down energy use in hosiery manufacturing.



The Innovation

Jet has eliminated the process of boiling the cloth in Kiers with harmful chemicals, which has removed the need for coal and water.

It has successfully introduced bleaching through a unique “Cold Bleaching Process” at room temperature for the first time, and eliminated the use of caustic soda from the bleaching process.

It has also developed modified pole dryers for drying wet processed cloth. This has resulted in thermal energy saving.



The Impact

- > Reduction in power consumption in the knitting process by 32%
- > Ending coal and chemical consumption in Kiers
- > Garments with a small carbon footprint



The Company

Jet Knitwears is a manufacturer of hosiery undergarments since 1969. Its products are marketed by a well developed sales network nurtured by the company.



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The Idea

Create a more energy efficient and cost effective solution to improve conveyor belt processes in industrial plants.



The Innovation

The Hybrid Idler - used in conveyors from mines to factories in the steel, cement, mining and power sectors. The Idler developed by the company has a high abrasion resistance which has extended equipment life 10-fold.

The unique combination of polymer and ceramic powder is coated on the idler by a casting method, and hence is an integral part of the unit. Hybrid Idler is a joint patent with Tata Steel, which has deployed the product with great success.



The Impact

- > Long lasting - about 8-10 times higher life than normal idlers
- > Low coefficient of friction and 10-12% energy efficient compared to conventional idlers



The Company

Jyoti Cero Rubber is a Jamshedpur-based start up that develops energy efficient products for heavy industries.



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The Idea

Design a technological intervention to reduce chromium pollution from traditional rollers in the cotton ginning industry.



The Innovation

A self-grooving rubber roller to be used as a substitute for chrome-leather rollers in Double Roller Ginning Machines used for ginning cotton, patented jointly with Central Institute for Research on Cotton Technology (CIRCOT).

Grooving of the roller in the machines is not required since the roller automatically generates workable grooves while running. The modified machines give very good ginning performance and the one time investment on the modification is paid back within a short period of six months.



The Impact

- > Eliminates chromium pollution caused by leather rollers
- > Improves ginning efficiency by 25% and lint output by 30%
- > Reduces power consumption by 15%



The Company

Millennium Rubber Tech was formed in 2000 with a business plan to manufacture rubber and other polymer based products, including specialty products for high technology applications.



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The Idea

Develop an off-grid and renewable energy-powered cold storage solution for the “first mile of our food chain.”



The Innovation

GreenCHILL - an off-grid, compressor-less & renewable energy-powered refrigeration system that uses farm waste (biogas, cow-dung cakes, biomass pellets, dead wood, husk, hay, bamboo waste, etc.), biomass gasifiers (producer gas) or waste heat of generators for cooling to refrigerate food products.

The innovation can chill 500 – 1,000 litres of milk or 5 – 10 MT of fruits, vegetables, flowers, fish and other horticultural produce without using grid power or diesel generators.



The Impact

- > Sustainable solution to wastage of food
- > Converts agricultural waste into energy
- > Zero-emission cooling



The Company

New Leaf Dynamic Technologies is a New Delhi-based company committed to the development of sustainable cooling solutions for industrial and household use.



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The Idea

Recover waste heat from chiller and compressor units, and reuse it as heat energy.



The Innovation

ChillerMate - an innovative waste heat recovery system that is sustainable and cost effective.

Over 50% of input energy to industrial applications is typically wasted as heat to the environment. ChillerMate recovers this heat and puts it to use as heat energy. Technology for this product has been developed at IIT Bombay. The product has wide applicability across a lot of industries including chemicals, food and beverages, textiles, hospitality and automotive sectors.



The Impact

- > Reduces the fuel required by an industrial plant by upto 70%
- > Reduces heating costs by upto 75%
- > Rapid payback period of a few months



The Company

Promethean Energy builds unique waste heat recovery solutions for industrial and commercial applications, deploying cutting edge technologies to tap into sources of waste heat and recover them.



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The Idea

Design sustainable and clean technologies for the niche foundry business.



The Innovation

Ecoflex – an acronym for 'Economical & Flexible Plant' - sand plant systems.

Ecoflex was designed by Rhino based on its experience of making sand plants over the last 2 decades. It is a single configuration product with different capacities and has been introduced in the small foundries.

Twelve systems are operational, and the company is now looking to take the product to medium and large foundries.



The Impact

- > 50% reduction in power use in production equipment
- > 70% reduction in energy use in dust collection systems
- > Clean, efficient and sustainable foundries



The Company

Rhino Machines Pvt Ltd is a fully fledged manufacturing firm that produces machines & projects for foundries for Sand Casting in all processes of updated technologies.



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The Idea

Reduction in Specific Energy Consumption (SEC) in steel plant induction furnaces through preheating of raw materials with cheaper alternate fuels.



The Innovation

Electrical Energy Switching to cheaper biofuel, a first of its kind innovation in India where alternate fuels are used to preheat raw materials outside the induction furnace.

This patented technology has the potential to save secondary steel manufacturers 7,200,000 KWH/ year or 7.2 GWH/ year, which is equivalent to 6.48 Tonnes of Carbon Equivalent per year per 10 ton induction furnace. The technology is also cost effective, with payback of investment in only four months.



The Impact

- > 40% savings in electrical energy
- > 35% increase in production
- > 40% reduction in CO2 emissions



The Company

SEVAT is promoted by technocrats, and is engaged in implementing energy saving projects in Steel Plants.



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The Idea

Using anaerobic digestion to cleanly convert organic waste into biogas and organic fertilizer.



The Innovation

The world's first of its kind sugar cane waste to bio gas plant by Spectrum handles 100 tonnes of sugar cane waste per day, converting it to biogas, and then blending this biogas with 12,000 cubic metres of biogas obtained from spent wash digestion, which is cleaned and scrubbed for the removal of H₂S and CO₂.

This produces about 8,000 kg of compressed biogas with high methane content and 30 tonnes of organic manure on a daily basis. The company contends that it is the first instance of converting agro-industry waste into fuel energy on such a large scale.



The Impact

- > Substitutes fossil fuel use
- > Generates rural employment
- > Sustainable off-grid power for villages



The Company

Spectrum Renewable Energy is a global biogas company dedicated to providing innovative RE solutions for the organic waste management and agriculture sectors.



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The Idea

Improve agricultural productivity through sustainable technologies to empower the Indian farmer.



The Innovation

SmartAgri - Wireless Sensor Network-based monitor/control for farm irrigation. SmartAgri proposes to eventually achieve a real-time feedback system which monitors and controls all the activities of the agricultural irrigation process.

SmartAgri's successful implementation can achieve effective water management, improve homogeneity in resource usage (water, fertilizer, etc) of agricultural land, visualize and map temperature, humidity, and moisture parameters.



The Impact

- > Effective usage and minimal wastage of water resources
- > Enhances profit from harvests
- > Reduces the carbon footprint



The Company

An agritech company based in Tamil Nadu, TTPL focuses on bringing clean technology to benefit the Indian agricultural industry.



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The Idea

Develop solutions and technologies for the printing industry that conforms to global environmental standards.



The Innovation

A UV LED-based technology which is very heavily used in printing and packaging sector for coating and associated purposes.

The product consumes very little energy compared to other products working with conventional technology. It works in a single phase, enables immediate lightning up, has a narrow range spectrum of 395 nm constant, and can be easily powered by renewable sources of energy.

The product is designed by Ventech's own technical teams.



The Impact

- > Substitutes fossil fuel use
- > Generates rural employment
- > Sustainable off-grid power for villages



The Company

Ventech, based in Mumbai, is India's solitary manufacturer of high-performance UV LED for the printing industry.



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Aryaman holds a degree of Bachelors in Law from the prestigious NALSAR University of Law, Hyderabad. He is currently employed with a Public Sector undertaking involved in several Infrastructure and Intellectual Property-related initiatives under implementation by the Union Government. He has been on the Board of Editors for the Journal for Corporate Affairs and Corporate Crimes and Journal for IP issues. He also a founding member for the bi-annual Consumer Law Reporter.

Ashok Toshniwal



Ashok Toshniwal is Executive Director & CEO of Universal Instruments Manufacturing Company Pvt. Ltd. His core areas of operation are power & energy, EPC contracting, and engineering consultancy. Renewable energy is a love affair and a passion for Ashok, beginning in 1986 when he developed a solar power controller for unmanned offshore oil platforms. He is an Executive Committee member of the Consortium of Electronic Industries of Karanataka, and a member of several national industry associations. He was voted as the Mentor of the Year in GCIP 2015 by participants.

Deepak Gadhia



Deepak Gadhia has done his Process and Environmental Engineering in Berlin. He started Gadhia Solar Energy System Pvt. Ltd. which brought Parabolic Solar Concentrator technology to India in co-operation with the developers and successfully commercialized the technology in India. The company has undertaken prestigious projects like the world's largest Solar Steam Cooking System at Shirdi Temple, which cooks 50,000 meals per day with steam generated from Solar Concentrators.

Gyanesh Pandey



Gyanesh is a serial entrepreneur engaged in the fields of energy, electrification, distributed manufacturing, and sustainability. He has innovated solutions in waste-to-energy systems, metering and monitoring systems, production technologies, solar systems, and skill development. He has been a consultant to different government organizations as well as leading multi-national corporations. Gyanesh has a master's degree in Electric Power and Power Electronics from the Rensselaer Polytechnic Institute, New York, and a Bachelor's in Electrical Engineering from Banaras Hindu University.

Dr. Koshy Cherail



Dr. Koshy Cherail is the President and one of the founders of the Alliance for an Energy Efficient Economy (AEEE) in India, an industry association of the Energy Efficiency companies. Koshy has over 25 years of experience in policy research and consulting with various bilateral and multi-lateral agencies, including World Bank, USAID and GIZ. He has a PhD in Economics from University of Madras, and has several publications on energy efficiency, environment and climate change to his credit.

Karthik Chandrasekar



Karthik Chandrasekar is CEO of Sangam Ventures, a seed and early stage venture fund that invests to improve access to sustainable energy and resource productivity solutions. Earlier, he led cleantech investments in India for Acumen Fund. He has also worked with TVS Capital Funds, developing investment theses for providing basic services in water, energy and agriculture. Karthik has also worked in the banking and financial services sector with Goldman Sachs and Merrill Lynch. He holds an MBA from Chicago Booth, MS in Public Policy from Carnegie Mellon and a B. Tech from IIT Bombay.

Nagaraja Rao



Nagaraja Rao is Asia Regional Coordinator for Climate Technology Initiative - Private Financing Advisory Network (CTI PFAN), hosted by UNIDO and REEEP. He is also the Coordinator for the Asia Forum for Clean Energy Finance. He has actively mentored clean energy and renewable energy projects across Asia, Africa and Eastern Europe. He has over three decades of experience in corporate finance and retail finance; working capital management, leasing, hire purchase, factoring, trade finance etc.

Ramesh Gupta



Ramesh is an entrepreneur with twenty years of technology experience and has built products scaling to large number of devices and supporting millions of users in real-time. He is CEO of LoudCell, which helps organizations and industrial units save diesel and eliminate energy wastage. He has led development of hardware and software systems in various verticals with several startups in Silicon Valley that have had successful IPOs and acquisitions. Ramesh holds an MS from Supercomputing Education and Research Centre, Indian Institute of Science, Bangalore.

Shuvendu Bose



Shuvendu Bose is an Executive Director at Ernst & Young, having extensive experience in the managerial, technical and operational issues associated with energy systems design, energy economics, energy conservation and emission trading. He also has extensive experience in climate change policy development and CDM projects. His skill sets include - energy efficient system design assessment, market and sector development analysis for alternative energy technologies, and entry strategy for renewable investments.

Sudhir Kumar Singh



Sudhir Kumar Singh is the Lead Scientist in charge of the Solar Thermal Programme in the National Institute of Solar Energy. He has 25 years of experience in renewable energy and has published and presented several papers in the area of solar thermal technology mapping, solar resources, hybridization of solar thermal technology with biomass in national and international journals. Presently he is involved with R&D in areas such as paraboloid solar dish technology, solar thermal cooling systems, and desalination systems.

Sudhir Singh



Sudhir Singh is an Energy & Environment professional working with UNIDO with more than 13 years of experience in both thermal and renewable energy. He has worked in various areas like Procurement, Supply Chain Management, Project Planning, etc. He did his ME (Power) and MFM (Finance) and is also pursuing his Master in Business Law from National Law School of India University, Bangalore.

Umesh Bhutoria



Umesh Bhutoria is the founder and CEO of E-Cube Energy. Passionate about making energy efficiency simple, scaleable and sustainable, he has over six years of experience in the Energy Efficiency and Carbon Markets sectors. He is also an emerging thought leader in the use of Energy Data Analytics to foster energy efficiency in SMEs and MSMEs. His publications on Energy Analytics have a combined viewership of more than 12,500 on SlideShare.

Vivek Adhia



Vivek Adhia is currently Head of Business Engagement at World Resources Institute (WRI) India, working with the private sector to promote stewardship, innovation and an alternate response to climate change. He has extensively worked with the corporate sector on areas such as climate strategy, carbon footprinting and abatement, water footprinting, and environmental mapping. He also led a workstream on Collaborative Innovation with the World Economic Forum covering the areas of biorefineries, energy harnessing and alternative materials.

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