Create a World where every watt counts

Ecolibrium Energy

Energy Analytics for the Developing World
What we do?

We enable Utilities and industries **optimize their input cost and maximize their revenue through use of the Internet**

Some may call it “*Internet of Things*” or “*Big data Analytics*”

we call it our Business.
Our journey so far

We started as an energy-management company but are now pivoting into being a resource intelligence for the industry.

Mar’12
Headcount: 3
Customers: 2

Mar’13
Headcount: 19
Customers: 60

Mar’14
Headcount: 47
Customers: 174

Mar’15
Headcount: 65
Customers: 600+

On the way, our scope has evolved and our solutions have been appreciated by many.

Seeded by IIMA & MNRE

May’13
Investment from IFC & Infuse

UNFCCC Lighthouse Activity
Climate Change

India Power Award

Global Entrepreneurship Award, Barcelona

Climate Solver 2013
About

We provide **Energy Intelligence** to our customers helping them **create a world where every watt counts.**

**Key Projects Include:**
- First Automated Demand Response with MSEDCL
- Full Scale Smart Grid Project with more than 22,000 consumers (Mysore)
- First Smart Micro Grid at SEC – MNRE Campus
The Developing World Situation

- **1 in 5** units lost in T&D losses in a lot of parts of the Developing World (*IEA data)

- **60%** of energy use in the Developing World is from Industrial and Commercial Consumers (*IEA data)

- **2X** the projected growth rate of I&C Energy consumption in the next 2 decades as compared to the Developed World (*UNIDO Data)

- **50%** higher proportion of Energy in total costs of production as compared to the Developed World

Yet, The developing World has the least access to Automation and Energy Efficient Technology!
Indian manufacturing industry needs to overcome significant challenges to produce in a globally-competitive manner. As per [India Manufacturing Barometer 2014 by PwC](#) for April-Sept 2014:

<table>
<thead>
<tr>
<th>Rising Costs</th>
<th>Dropping Margins</th>
<th>Capacity Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material prices and Energy prices are the 2 biggest challenge perceived by the industry</td>
<td>Competition from foreign markets (because of pricing / quality perception) seen as 3rd major challenge</td>
<td>Less than 55% of industry operating at a near-full capacity utilization.</td>
</tr>
<tr>
<td>61% of industry feels their costs have gone up</td>
<td>63% of industry feel their margins have been stagnant or declining.</td>
<td>49% of industry is planning a major capacity addition.</td>
</tr>
</tbody>
</table>

Need of the hour is for the industry to maximize capacity utilization, minimize costs and maintain good quality. This is what Ecolibrium enables.
The Roadmap

**Rising Costs**

Starting in 2012, we are now in over 500 factories collecting and presenting over 100 million data points on a daily basis across different industries and Utilities.

**Dropping Margins**

We are building simple and complex algorithms around the data collected by us to provide critical insights and savings to our customers.

**Capacity Utilization**

We want to enable our customers to source their input (equipment, energy and raw-material) optimally using our data and marketplace.
The Basic Architecture
Resource Monitoring: The start

- View multiple locations in single dashboard
- Generate customized reports
- Set up sms/e-mail alerts for critical conditions
- Live billing platform showing total consumption and current load
Dashboards

Real-time Web based Dashboard

TOU Analytics

Main Meter - 66 KV

Total Consumption: 101.39 kWh
Cost: ₹ 3.95

TOU Analytics

- Slot: Load (%) Set Load
- Peak Hour: 25% 100%
- Off Peak Hour: 50% 100%
- Night Time: 25% 100%
- Total Benefit: 20000 Rs

List of Alerts

- CETP Main: kW More than 60.0 for 1 min All 00:00 02:00 Yes No
- CETP Main: kW More than 55.0 for 5 min All 00:00 05:00 No Yes
- CETP Main: kW More than 40.0 for 1 min All 00:00 22:00 No Yes

- CETP Current: kW More than 60.0 for 1 min All 00:00 02:00 Yes No
- CETP Current: kW More than 55.0 for 5 min All 00:00 03:00 No Yes
- CETP Current: kW More than 40.0 for 1 min All 00:00 22:00 No Yes

Options: Save Changes, New Alert
The Insight engine performs real time analysis of various inputs parameters from Sensors and other database sources to provide actionable insights!

Sensor Data (Electricity, Water, Gas)

External Data

Industry benchmarks

Insight Engine

Insight Package

Insight Marketplace

Status SMS/Email Alerts || Analytical Reports || Insight Dashboard

Automated control on site
## Condition Monitoring Reports

### SmartSense Insights - Transformer Monitoring

**Date:** 07-05-2015  
**Type:** Monthly

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Location</th>
<th>Performance</th>
<th>Savings Potential</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Area 1</td>
<td>75%</td>
<td>72,000</td>
<td>Rewinding / Maintainence</td>
</tr>
<tr>
<td>2</td>
<td>Area 2</td>
<td>82%</td>
<td>5,000</td>
<td>Check Status</td>
</tr>
</tbody>
</table>

***Aggregate potential savings as an average of potential savings from all saving measures.***

### SMARTSENSE HEALTH INSIGHTS

#### LOADING

<table>
<thead>
<tr>
<th>Weightage</th>
<th>17%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently</td>
<td>0.7</td>
</tr>
<tr>
<td>Previously</td>
<td>0.76</td>
</tr>
<tr>
<td>Industry Standard</td>
<td>0.8</td>
</tr>
<tr>
<td>Performance</td>
<td>57%</td>
</tr>
</tbody>
</table>

**Insight for PF Test:** Conclusion  
**Potential of Savings:** 40000

#### EFFICIENCY

<table>
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<th>Weightage</th>
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</tr>
</tbody>
</table>

**Insight for PF Test:** Conclusion  
**Potential of Savings:** 30000

#### NEUTRAL CURRENT

<table>
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<th>Weightage</th>
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</thead>
<tbody>
<tr>
<td>Currently</td>
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</tr>
<tr>
<td>Performance</td>
<td>57%</td>
</tr>
</tbody>
</table>

**Insight for PF Test:** Conclusion  
**Potential of Savings:** 2000

### Health Index

- **PLANT USE FACTOR**
  - Weightage: 17%
  - Industry Standard: 0.8
  - Previously: 0.76
  - Currently: 0.7

- **PHASE BALANCING**
  - Weightage: 17%
  - Industry Standard: 0.8
  - Previously: 0.76
  - Currently: 0.7

- **HARMONICS**
  - Weightage: 17%
  - Industry Standard: 0.8
  - Previously: 0.76
  - Currently: 0.7

### Tracking Problem Areas

### Industry Benchmarking

### Identification of Savings Potential
Predictive Maintenance: Transformer

Efficiency Benchmarking

Tracking Probability of failure
Our Focus

Smart Sense
Industry Offering
- Power Monitoring
- Trading Analysis
- Energy analytics
- Predictive Maintenance

Grid Sense
Utility Offering
- Metering billing as a service
- Transformer Management System
- Demand Side Management
- Peak load Management Demand Response

Analytic Platform for Industry and Utilities
The Future: Insight Marketplace

The Insight Marketplace is a meeting ground for Potential vendors with the buyers

Benefit to Consumers:
• One stop shop for shortlisting and comparing of vendors for procuring solutions for energy efficiency, based on real time insight reports, in an unbiased manner.

Benefit to Vendors:
• Direct connection with Consumers who can benefit from solutions

Suppliers  The Insight Marketplace  Consumer
## Case Study

**Harsha Engineers**

Sector: Engineering

*Monitors Energy consumption of more than 3 facilities in multiple locations, SmartSense has lead to savings to **nearly 15%** in energy consumption overall, across all plants*

### The Project background

**Harsha Engineers** is a global solution provider of Bearing Cages as well as special purpose Stamped Components

Post survey, Ecolibrium team has advised Harsha Engineers team to install Seven devices (read: SmartSense) at different locations.

During monitoring, few things were identified:

1. All the Compressors were on load most of the time during operation
2. In 2 Compressors actual kW was more than rated kW

### Ecolibrium Impact

1. Arresting the leakages lead power consumption in Compressors **to go down by 15%**.

2. Line losses were almost 8%-9% inside the plant, post monitoring, the line losses came **down to 2%**.
### Some Notable Projects

<table>
<thead>
<tr>
<th>Type of Organization</th>
<th>Indian Railways – Delhi Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes</td>
<td>54</td>
</tr>
</tbody>
</table>

Ecolibrium Energy has created smart infrastructure for DMRC (Delhi Metro Rail Corporation) to enable them to monitor all the substations and view all the electrical data on a single platform through our SmartSense User Interface.

<table>
<thead>
<tr>
<th>Type of Organization</th>
<th>Automobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes</td>
<td>64</td>
</tr>
</tbody>
</table>

Ecolibrium Energy has installed completely wireless smart infrastructure to enable the client to monitor all their locations and sub-locations and view all the electrical data on a single platform through the SmartSense User Interface.
### Use Case: BSES Rajdhani

**BSES Rajdhani**  
Utility In Delhi Area

#### The Project background

- Launched an Event for its consumers where awareness of such Technology was showcased
- Provided an attractive financial package where consumers can benefit from the Data
- Real time consumption data at “NO – Cost”

#### Impact and way Ahead

1. **Start of Data Acquisition and dash board features to consumers – Quick take up!**
2. **Potential Revenue opportunities for BSES in future**
3. **Demand Response capabilities open up**
AIA Engineering Ltd.
Sector: Engineering

*Reduction of Gas consumption costs for its furnace by more than 14% using SmartSense furnace solution*

The Project background

AIA Engineering, a certified ISO 9001 company, is the global leader in the design and manufacture of high chromium wear, corrosion and abrasion resistant castings.

The process followed by the project involved:

- Deployed a continuous monitoring system for O2 level in the exhaust flue gas
- Controlled the blower speed automatically in accordance with the exhaust gas & specific process constraints such as heat treatment/melting, minimum air pressure required etc.

The Ecolibrium Impact:

- SmartSense furnace has **improved combustion efficiency by 8%-10% through O2 level optimization** by not only considering just O2 level in the flue gases but also various other process parameters
- Due to control over blower speed and in turn power consumption, SmartSense Furnace has generated additional savings of **62.5% in electricity consumption**
- AIA engineering receives its **payback period within 7 months, with total optimization of up to 14%**

*Customer Speak: “The SmartSense furnace solution is useful for not only energy saving, but also product quality improvement due to reduced oxidation”*
Some Opportunities ahead

1. **SAAS** Solutions for Utilities: Transformer Monitoring/Streetlight optimization

2. **Industry Benchmarking Dashboards**: Real time anonymous Industry level analytics

3. **Smart Sourcing**: Energy Efficient equipment sourcing Analytics

*Energy Analytics – A Tool, Not the Destination*
Ecolibrium Energy

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Corporate Presence:
Head Office: Ahmedabad, India
Branch Offices: Bangalore >> Chennai >> Delhi >> Hyderabad >> Pune >> Raipur >> Nagpur >> Chandigarh
Extra Slides
Industrial Losses

Currently annual Indian power consumption is about ₹3,000,000 Crore (600 TeraWatt hour ($10^{9}$ Kwh))

- 12.9% ~ Energy Deficit.
- 45% ~ 1,35,000 Crore - lost/stolen in transmission.
- 38% ~ 1,14,000 Crore - used by the industrial sector.
- 20% ~ 24,000 Crores - mismanaged/wasted.

Wastage is because of
1. Ineffective Asset maintenance
2. Little or no focus on energy cost reduction, focus on production and uptime

Power sourcing optimization is another component for energy cost optimization

These numbers are only for power. Fuel and Gas wastages are not considered.
Ecolibrium Brings in

Energy Savings

- Optimized energy consumption
- Centralized intelligent control mechanism
- Algorithms to dynamically adjust Equipment operations to changing site conditions and proactively optimize energy consumption.
- In-depth Energy Analytics, ability to zoom till the asset level, identifying trends and pinpointing savings opportunities within customer facilities

Operational Efficiency

- Enabling remote monitoring and automated Control for corrections needed.
- Proactive Maintenance
- Risk Mitigation based on Flexible and Smart Reporting and Alert management
- Reducing internal human and 3rd party capital needs to effectively service and maintain sites.

Capital Utilization

- Extended benefit of informed capital spend decisions.
- Project Analysis at asset level and measures progress v/s Planning
- Calculation of financial metrics like net present value, internal rate of return and payback to substantiate future capital decisions with empirical data.
- Helps facilities managers make informed repair and capital decisions by monitoring equipment performance data across all sites.
- Identifying and analyzing abnormalities and pinpointing poorly performing equipment.
- Delivers extended equipment life span, reduced capital expenditure costs and avoided expenses associated with what are otherwise previously undetectable operating inefficiencies.
The Energy Big Data Analytic Platform

Monitor

Maintain

Monitor

ecolibrium insights

Analyze

Control and optimize

Control and optimize
Insights

1. Entry based on need and pain point
2. Cross sell once credibility established

Customer
- Better Insight of Process performance and efficiency
- Industry benchmarking of asset and process productivity
- Cost optimization per SKU

OEM’s
- In field Product Performance indicators
- Analytic data for R&D for Product Enhancements & new Products
- Better Planning for after Sales Support
Increase the Span of Analytics

Process Analytics
- Enables monitoring the Process as whole for parameters like Efficiency, losses, leakages etc.
- Helps to analyze the production parameters at process level instead of silos of various equipment or locations
- Helps in streamlining the Energy Usage during a Process in line with TOU Pricing with variety of what if scenarios

External Data Sources
- Compare the Energy Usage and different Computed Parameters on SmartSense with your in-house data – Answers to questions like what is my cost of product per unit of inventory
- Helps to include Energy Costs as one of the important parameters while deciding Production Cycles
1. Energy management is a becoming key to industrial enterprise and commercial success
   - Effective energy utilization can result in tremendous cost savings and improved Productivity.
   - World is moving towards analytics/data based decision making
   - Complex availability and pricing issues

2. Large incumbent non-SCADA / PLC world.
Rapidly Evolving Technologies

Evolution of technology from SCADA to IOT

Today’s realities

- Software, sensors, and controls running today’s facilities and equipment are outdated and difficult to upgrade. Companies cannot readily incorporate new features and improvements.
- Limited integration between internal systems (managerial apps, plant data sources) and external partners creates data silos.
- Aging operating systems and vulnerable operational technologies pose security risks because they cannot be easily retired or replaced.
- Limited embedded computing or intelligence control at the device, product, or plant level.

Tomorrow’s vision

- Sensors, communications, and other operational technologies are working together with information technologies, most likely meshing in the cloud.
- Standard, fast software development techniques are used to create intelligent industrial products.
- A common data model and sensing and control architecture that supports the flow of insights and action throughout an organization and its ecosystem of partners.
- The IIoT infrastructure is trustworthy and resilient to inevitable compromise.

INDUSTRIAL INTERNET: THE POWER OF 1%

Efficiency gains as small as 1% could have sizable benefits over 15 years when scaled up across the economic system.

INDUSTRIAL INTERNET BENEFITS

SOURCE: GE ESTIMATES / POSTMEDIA
Losses due to lack of energy Management

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Power sourcing optimization is another component for energy cost optimization

These numbers are only for power. Fuel and Gas wastages are not considered.
20% Losses & its challenges

- Access to real-time accurate data
- Non-Standard Metering Hardware
- Lack of a comprehensive centralised monitoring system
- No data Analytics report
- Expensive & Complicated EMS systems
- Inefficient meter data Reading & Storage
- Losses & Penalties – No timely Alerts

Percentage breakdown:
- Textile: 33%
- Commercial Establishments / Hotels: 15%
- Fertilizers: 38%
- Cement: 41%
Ecolibrium Enables

Ecolibrium Energy’s Advanced Energy Management and Demand Side Management helps Commercial, Industrial consumers and Power distribution companies achieve

1. Achieve energy efficiency
2. Reduce cost of power and maintenance
3. Plug leakages & avoid penalties
4. Optimize power procurement & load shifting
5. Manage their demands to reduce the cost of energy
6. Optimize conventional and renewable energy sources
7. Increase Operational Efficiency
8. Improve Asset performance & Process Performance
9. Predictive Maintenance and Product Quality
For Industry

Example: Industrial

Factory Annual energy Spend = ₹ 1,15,00,000/site

Control
- Compressors

Metering
- Main Load
- Plant Sections

Monitoring
- Power
- Air Flow

- ₹ 2,00,000 Direct Energy Savings
- ₹ 2,50,000 Operational Savings
+ ₹ 2,00,000 Capital Expenditure Optimization

₹ 6,50,000/ site
Estimated Annual Savings
8% Savings
8 Month Payback

1. Track, migrate and predict peak demand charges
2. Protect and extend life of expensive equipment
3. Connect plant operations with energy price and tariff information
4. Monetize operational flexibility for significant demand response payments
5. Enhance efficiency of energy-intensive systems like compressed air, process heating and cooling systems with deep insights into industrial sub systems
6. Ensure insights into health of identified equipment resulting in preventive maintenance
7. Reduce Equipment and machinery downtime significantly
For Commercial/Institutional Facilities

Example: Institutional

Annual energy Spend = ₹ 16,80,000/site

Services industries struggle to manage costs, including energy spend, across a network of geographically distributed sites.

1. Ecolibrium helps facility managers gain insight into energy and site operations while maintaining customer comfort and maximizing capital expense savings opportunities.

2. From monitoring water and diesel consumption to the centralized control of HVAC and lighting systems for multiple sites, the Smart sense energy management system (AEMS) allows facility managers to:

   1. Adhere to corporate energy usage policies
   2. Monitor the performance of critical equipment, pinpoint and resolve costly issues
   3. Protect valuable, temperature-sensitive inventory
   4. Monitor and verify electricity and diesel usage
   5. Validate HVAC and lighting control system settings
Ecolibrium Brings in

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**Operational Efficiency**

- Enabling remote monitoring and automated Control for corrections needed.
- Proactive Maintenance
- Risk Mitigation based on Flexible and Smart Reporting and Alert management
- Reducing internal human and 3rd party capital needs to effectively service and maintain sites.
Ecolibriu**m** integrated energy management portfolio of asset-level sub metering and monitoring, intelligent control, energy management software and solutions can generate **up to 30% energy savings** as well as operations & maintenance savings and deliver a **8-20 month payback** or less.
<table>
<thead>
<tr>
<th>Client</th>
<th>Sector</th>
<th>Services</th>
<th>Payback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Hi-Rel</td>
<td>Commercial</td>
<td>Power leakages, Power Usage Optimization</td>
<td>63 Days</td>
</tr>
<tr>
<td>Esteemed Engineering Co.</td>
<td>Engineering</td>
<td>Power Sourcing optimization</td>
<td>6 Days</td>
</tr>
<tr>
<td>AiA Engineering Ltd</td>
<td>Engineering</td>
<td>Furnace Optimization</td>
<td>187 Days</td>
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<tr>
<td>Odhav Enviro Projects</td>
<td>ETP</td>
<td>Load Management, Power factor management, Power leakages</td>
<td>97 Days</td>
</tr>
<tr>
<td>Arvind Mills</td>
<td>Textile</td>
<td>Power Factor Management, MD Management</td>
<td>2 Days</td>
</tr>
</tbody>
</table>
Our Suite of Application – SmartSense

1. SmartSense Meter+
   Cost effective wireless power monitoring system for industrial and commercial consumers

2. SmartSense AEMS
   Comprehensive Wireless Energy Management System for Power, Flow, Temperature, Humidity etc.

3. SmartSense ET
   Energy Trading monitoring and power purchase optimization tool for customers with multiple sources of power.

4. SmartSense Furnace
   Wireless monitoring and control of furnace bringing in savings in fuel consumption of the furnace

Smart Sense is a complete wireless, cloud hosted Demand Side Management Platform for Commercial and Industrial Consumers

1. Monitor and Control their Energy Consumption
2. Reduce inefficiencies and prevent leakages
3. Optimize the cost of power purchase
4. Help in preventive maintenance of equipment’s
5. Optimize the performance of equipments
SmartSense – Meter+

Consists of

1. EMU : Connects with 8 Meters
2. Compatible with most existing panel meters in the market
3. Use Configurable Email Alerts
4. Daily automated shift wise report
5. SMS Alerts and Customized reports (Premium offer)

1. Automated Accurate Meter data
2. Real time data access
3. Wireless System
4. Alert Management System
5. Automated Reporting
6. Cross Platform Support
1. Hardware compatibility—sensors and meters with RS 485 port

2. Increased efficiency—monitor both electrical and physical parameters

3. Resource optimization—Central monitoring of multiple locations

4. Control

5. Informed decision making—data analytics, reports customized for SMS/Email
1. **BASE LINE MONITORING:** On a monthly basis to align bid more accurately.

2. **BID OPTIMIZATION STRATEGY:** By analysing bid vis-à-vis consumption data.

3. **Demand Side Management:** In case of digression from the bid.

4. **Analytics**
   1. Daily Net Benefit Analysis: benefits of Sourcing from IEX vis-à-vis State Electricity Board
   2. Monthly Analysis & Bid Optimization Analysis

Power sourcing optimization Analytics and Bid optimization Strategies
SmartSense – Furnace

Online Dashboard
Automated Efficiency Improvement
Customized Reports
Advanced Analytics by Energy Auditors
Alerts System
Real-time Energy data

Smartsense Furnace is a comprehensive solution with a variable frequency drive, oxygen sensor & an EMU

Flue Gas Monitoring
Waste Heat and Product Rejections
Inefficient Analysis and reporting
Losses and Penalties
Our Market

POWER DISTRIBUTION

- Agri: 32%
- Residential: 23%
- I&C [PERCENTAGE]:
  - Process: 16%
  - Utility: 29%

Distribution:
- Compressors: 16%
- Biolers & Furnace: 15%
- Fans & Pumps: 31%
- HVAC: 15%
- Lighting: 15%
- Misc: 8%

Available Market:
- 1 Million Customers
- Rs. 8000 Cr
The Energy Big Data Analytic Platform

1. Improve Product Quality
2. Reduce opex
3. Optimize Assets

Reduce cost of Energy
- Billing Meter Insights
- Energy Trading plus bilateral optimization Insight

Increase Operational Efficiency
- Asset Improvement Insights
- Process Improvement Insights

Increase Lifespan of Assets
- Regular and Ad-hoc Asset Maintenance scheduling

Monitor

Control and optimize

Analyse

Maintenance
1. Entry based on need and pain point
2. Cross sell once credibility established

**Customer**
- Better Insight of Process performance and efficiency
- Industry benchmarking of asset and process productivity
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