ECO-H
TECHNOLOGIES INC.

TAKE CONTROL OF YOUR POWER

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ECO-H is a power management system that uses energy storage solutions to improve power reliability and efficiency.

ECO-H Technologies Inc. works with clients to create custom energy solutions that best suit their power quality & peak demand management needs.

TABLE OF CONTENT

ABOUT ECO-H 03

WHAT ECO-H DOES 05

BENEFITS OF ECO-H 09

GLOBAL ADJUSTMENT 11

CONNECTION OPTIONS 13

HYBRID GENERATION 14

SUPPLY VS. DEMAND 15

OUR PROJECTS 17

ABOUT ECO-H

CUSTOMIZED ENERGY STORAGE & POWER MANAGEMENT SOLUTIONS

Established in 2012, ECO-H addressed an ongoing issue of transient loads on oil & gas drilling rigs. By analysing rig site data, ECO-H designed a customized energy storage solution to hybridize the generators utilized on a rig site.

After a period of prototyping, ECO-H was able to determine an average fuel savings of approximately 20% across the rigs along with fuel emission savings of 30%.

This gave ECO-H the distinguished title as the first system in the world to hybridize a drilling rig. Since then, ECO-H has been diversifying its Hybrid Power Management product lines.

UNDERSTANDING THE ECO-H SYSTEM

The ECO-H energy storage systems can operate connected to the grid or in island mode, providing features such as peak shaving, power transient management, frequency regulation, and energy arbitrage services.

The on-board reserve of energy delivers instant electrical power when required and absorbs excess power for later use. ECO-H will integrate with your electric utility, generator(s) and/or renewable energy sources to enhance the performance and reliability of your company's power supply.

This reliable and simple method is quickly becoming an ideal means to address peak demand and global adjustment charges which have become an increasingly high portion of business operating costs.

ON DEMAND POWER

The ECO-H power management system either provides power and/or stores energy, offering immediate on-demand power.

OPTIMAL STABILITY & QUALITY

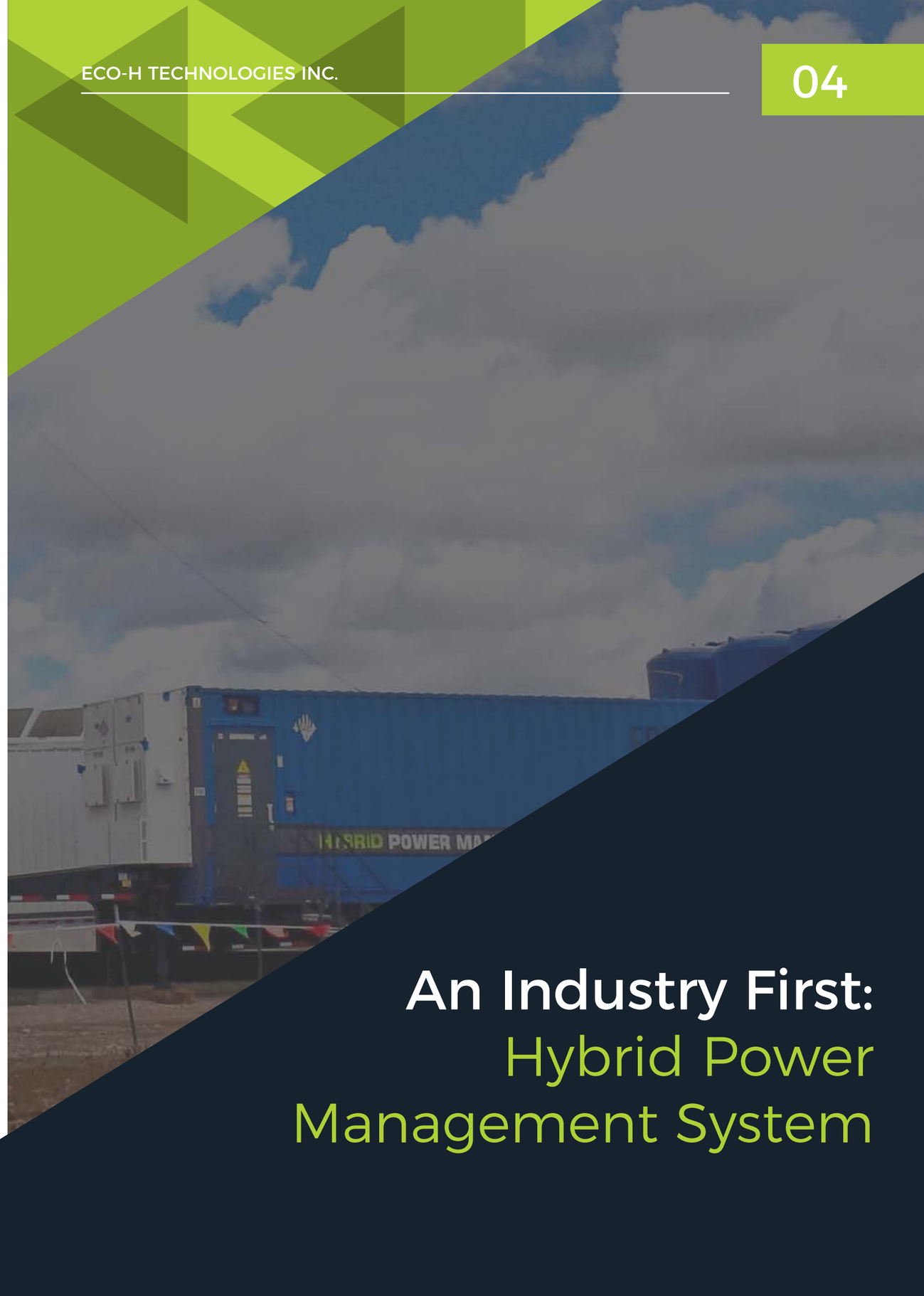
Connecting the ECO-H system allows for optimal grid stability and power quality. Complient with IEEE 1547 utility code.

POWER CONDITIONING SYSTEM

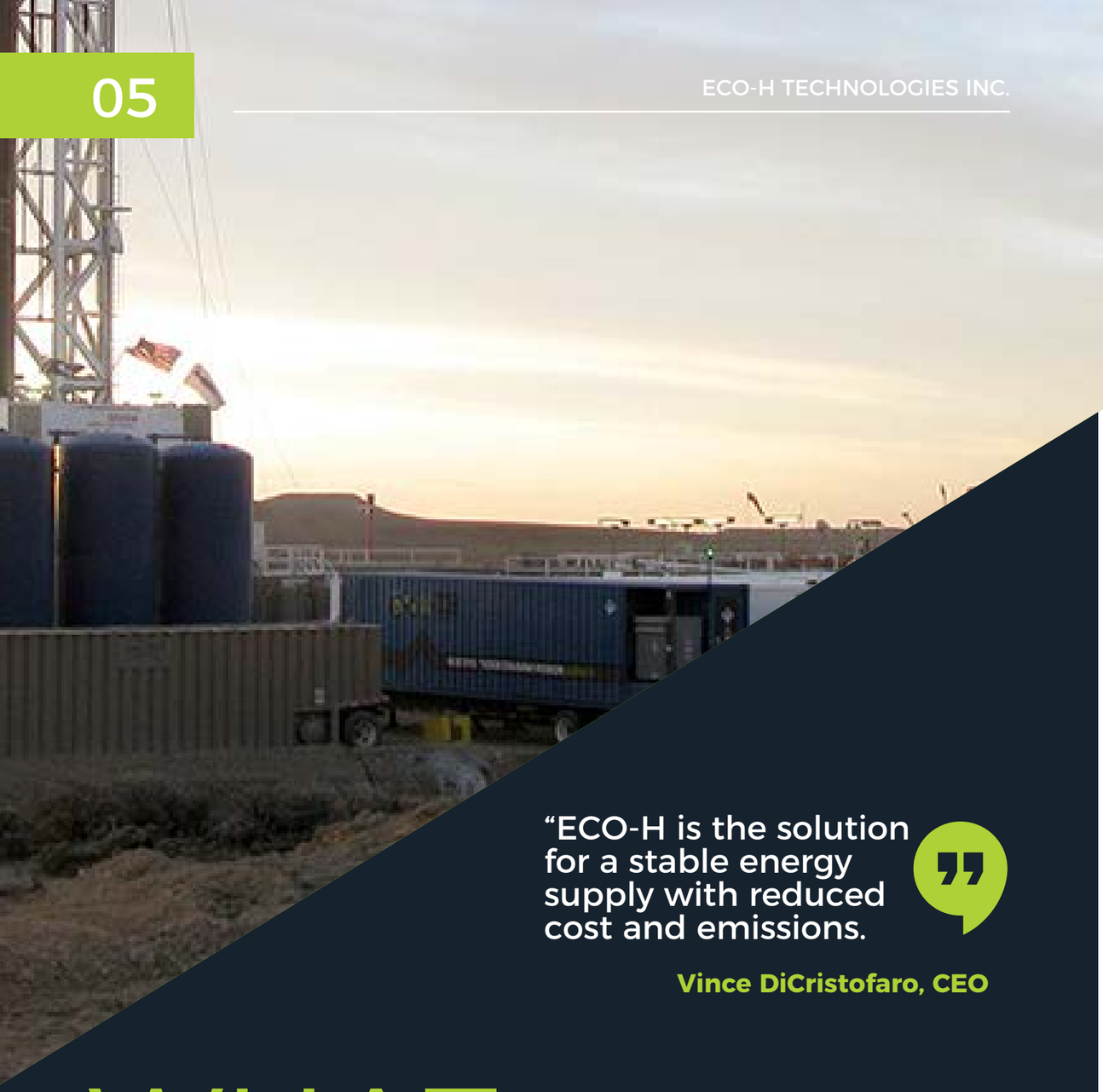
ECO-H's power conditioning system addresses voltage imbalances, inrush generated sags, power factor correction and harmonics.

UNPRECEDENTED MOBILITY

ECO-H can either be in a fixed position or have unprecedented mobility. Industry first and proven through rugged trials in remote off-grid areas.



An Industry First: Hybrid Power Management System



"ECO-H is the solution for a stable energy supply with reduced cost and emissions."

Vince DiCristofaro, CEO

WHAT ECO-H DOES

PEAK DEMAND MANAGEMENT

The ECO-H Power Management System addresses peak demand by providing additional electrical power during times when a facility's electrical consumption is excessively higher than its average consumption.

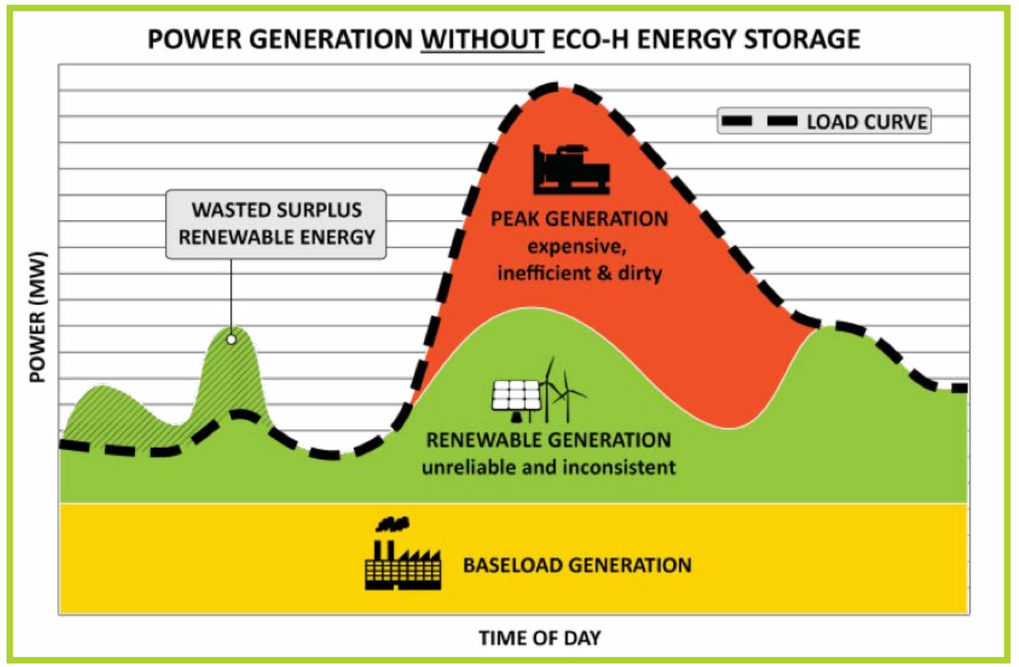
This power provision is replenished during below average facility consumption or at times of low rate hydro costs.

INTEGRATED ENERGY STORAGE WITH PATENTED POWER TRANSIENT MANAGEMENT SOFTWARE

The ECO-H system integrates energy storage with patented power transient management software that is capable of instantaneously discharging or absorbing excess power.

This process allows generators to run more efficiently and maximizes renewable energy penetration.

For grid connected systems, the power management software is an effective tool for Peak Demand Management.



GENERATOR OPTIMIZATION

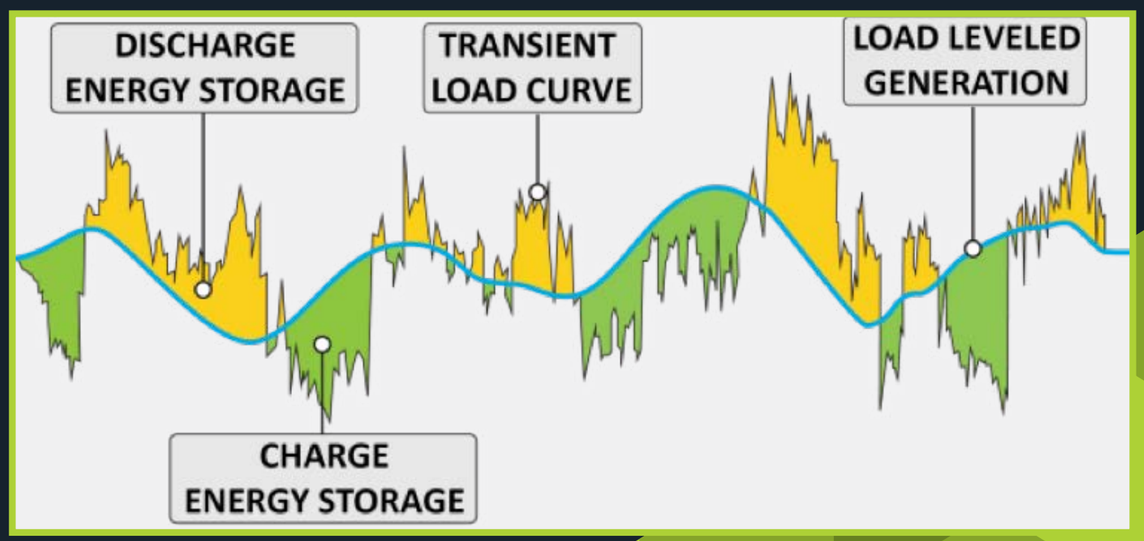
The ECO-H system load levels generator(s) by analyzing the facility's load. It then processes the information through proprietary algorithms and either discharges to the AC bus bar or absorbs the excess genset power.

This process happens instantaneously 24/7 and allows the gensets to run more efficiently. The sharp peaks and valley power spikes become smoother rolling hills.

As a result, natural gas gensets can now operate at higher load efficiency and reduced costs, without having to react to high and low transient loads.

The combination of ECO-H and natural gas gensets produces a high level of energy stability by providing energy security during peak demand periods.

"Harmful environmental emissions are minimized and fuel efficiency increased."



RENEWABLE PENETRATION

Renewable energy has the potential to provide energy by sustainable means to vast populations in both developed and developing countries.

These factors can vary in developing countries that have no access to clean energy or in developed countries to supplement the increase in demand of electricity.

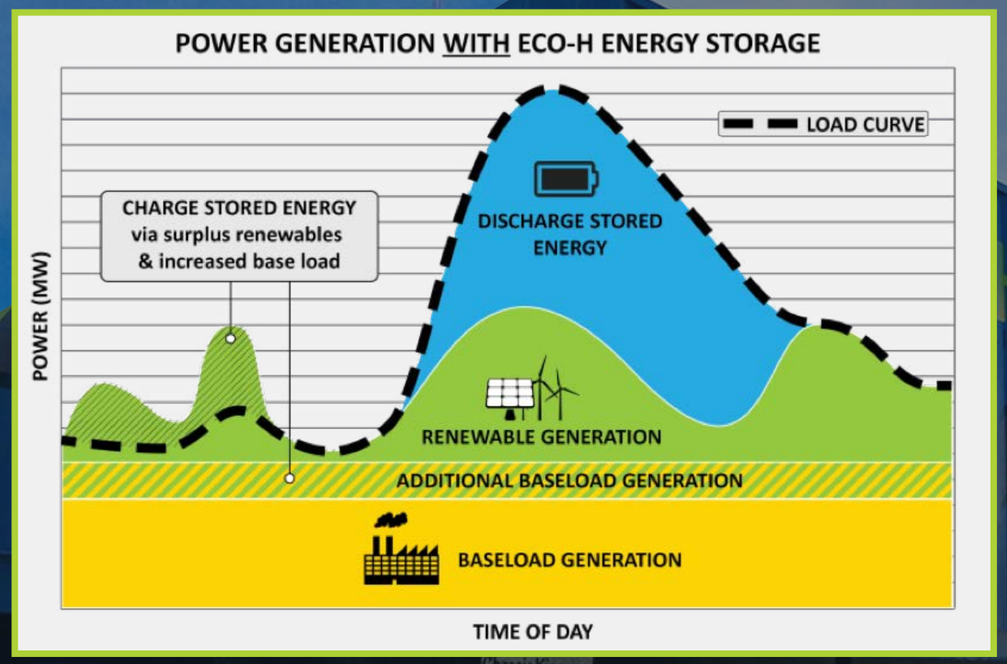
Although economically viable for several applications, renewable energy has not been able to be utilized to its full potential due to several barriers to its penetration.

Renewable penetration refers to the retaining of excess renewable energy generated for future use.

ECO-H is used to store this potential 'excess' renewable energy generated which would otherwise be wasted.

Typically, energy is wasted either by dissipating the excess energy or by reducing the efficiency of the respective renewable component.

ECO-H absorbs this potential excess power or 'wasted' energy and allows it to be used at a future period.



BENEFITS OF ECO-H

OPERATIONAL

- Peak Demand Management
- Generator Load Leveling
- Smooths Out Renewable Power
- Backup Power (UPS)
- Peak Shaving
- Portability
- Island Mode Capability
- Voltage & Frequency Stabilization
- Micro-grid Management
- Black Start

ENVIRONMENTAL

- Cleaner Generated Power
- Reduce Greenhouse Emissions
- Reduce Carbon Footprint
- Removal of Load Banks
- Silent Operation
- Capture Regenerative Energy

FINANCIAL

- Global Adjustment Reduction
- Time Shifting Cost Saving
- Reduction in Fuel Consumption
- Maintenance Cost Reduction
- Reducing the amount of fuel truck deliveries that are required to go on site

LEGISLATIVE

- Implementing a “Green Initiative” can assist in achieving environmental requirements of local governments
- Utilizing new “Green” technology can be translated into good PR for customers utilizing ECO-H

FIELD PROVEN

30%
EMISSIONS REDUCTION

20%
FUEL SAVINGS

KEY BENEFITS

- **PEAK LOAD MANAGEMENT** in milliseconds versus waiting for multiple generators to respond
- **MAXIMIZING FUEL EFFICIENCY AND ENGINE RESPONSIVENESS** by keeping engines in their sweet spot
- **STORES WASTED POWER** into energy grid, as opposed to burning it off as heat
- **REDUCES FUEL EXPENSE** by 20% and emissions by 30%
- **REDUCES MAINTENANCE** by load leveling engines and minimizing engine wear
- **FULLY AUTOMATED SOFTWARE** handles all of your power management decisions
- **IMPROVES POWER QUALITY** by stabilizing voltage and frequency

- FIVE PEAK DAYS PER YEAR
- ONE PEAK HOUR DURING THE FIVE PEAK DAYS
- BUSINESSES ARE CHARGED BASED UPON THEIR PERCENTAGE CONTRIBUTION TO THE LOAD
- BUSINESSES ARE CHARGED APPROXIMATELY $530,000 PER 1 MW OF CONTRIBUTION
- IMPACTS BUSINESSES USING >500kW PEAK DEMAND

GLOBAL ADJUSTMENT

ECO-H SOLUTION FOR GLOBAL ADJUSTMENT

ENERGY STORAGE

ECO-H is designed using Lithium Ion batteries to match the power and energy required for the site load.

The System is able to be cycled 365 days per year giving full advantage of energy arbitrage every day.

Cycling everyday virtually guarantees capturing every possible GA peak demand event.

Predicting the five GA peak demand days using third party software is no longer required.

System is pre-programmed to run longer periods of time to capture the historical GA peak times every day. This can be adjusted accordingly to optimize future GA deviations if required.

Consumers can also participate in a Demand Response program for all 25 events throughout the year as an additional benefit returning financial incentives from utility companies.

HYBRID - ENERGY STORAGE COMBINED WITH GENERATOR(S)

This method uses generators with ECO-H to provide an optimized solution for peak demand and grid stability.

Utility power is relatively inexpensive when not affected by the supplemental cost of GA.

This hybrid method with ECO-H removes the GA component by islanding your facility for +/- 12 hours (7 am to 7 pm).

ECO-H then seamlessly switches back from island to utility mode during the evening to take full advantage of lower electricity cost.

Decreased generator runtime results in less wear & tear which converts to reduced maintenance costs.

ECO-H method of operation eliminates the necessity to curtail production in order to mitigate the cost of GA.

ECO-H OPERATION MODES

DISCHARGE

The System discharges to reduce facilities contribution to Global Adjustment charges, peak demand response and any power quality interruption.

ECO-H Factor: Peak demand utility power is offset. This peak demand power is typically generated through dirty fossil fuel based power generation.

Benefits: Providing clean hospital grade power.

IDLE

ECO-H is always on. The System will remain idle and engaged, waiting for the next event.

ECO-H Factor: No moving parts, means no wear and tear. Utilizing minimal amount of power to keep ECO-H systems online. ECO-H is on 24/7 – 365 days per year and ready to go when you need it.

Benefits: Always online ready to instantly respond without emissions.

CHARGE

The batteries recharge during off-peak times.

ECO-H Factor: During these periods, grid or renewables provide batteries charge power.

Benefits: Taking advantage of off-peak lower utility costs.

CONNECTION OPTIONS WITH GENERATORS

1
PARTITIONED
No grid synchronization required

During peak demand periods, generators only provide the power to the dedicated facility partition.

2
GRID PARALLEL
Grid synchronization required

During peak demand periods, generators are parallel connected to the grid to reduce facility GA contribution.

3
ISLANDED
No grid synchronization required

During peak demand periods, generators provide the full facility power requirements.

1
GRID-TIE MODE

Peak demand reduction during GA and peak events.

ECO-H synchronizes with Utility power (Sine-wave / Frequency).

2
GRID-FORM MODE

Backup power during utility power interruption.

ECO-H becomes an uninterrupted power supply.

3
ISLAND MODE

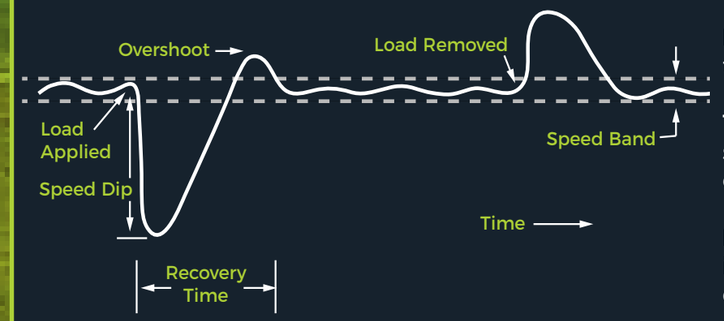
Power management combined with generators.

ECO-H synchronizes, load-levels, stabilizes and enhances generator power quality.

CONNECTION OPTIONS WITH ECO-H

HYBRID GENERATION

TRANSIENT LOAD RESPONSE & WHAT IT MEANS



Diesel and natural gas gensets require time to respond to changes in load.

This type of behaviour results in sudden changes in voltage & frequency causing power instability.

ECO-H responds to changes in load instantaneously, acting as your power quality guardian.

CONVENTIONAL GENERATION

Electricity

Generator Sized For Peak Load

≈33%

System Efficiency

VS

HYBRID GENERATION

Electricity

Generator Sized For Base Load
Increased Fuel Efficiency
Improved Transient Response
Reduction in Emissions

≈50%

System Efficiency

GENERATORS WITH ECO-H SYSTEM

- ECO-H is always on 24/7 - 365 days.
- GA & Demand Response program anytime.
- Facility power quality response all the time.
- Long term power outage supply.
- Generators are sized for base load.
- ECO-H is sized for peak loads.

CONVENTIONAL GENERATION WITH BOILERS

Electricity Heat

Efficiency ≈33%

Efficiency ≈80%

≈51%

System Efficiency

VS

COMBINED HEAT & POWER (CHP) GENERATION

Electricity & Heat

Increased Fuel Efficiency

≈75%

System Efficiency

VS

HYBRID GENERATION

Electricity & Heat

Increased Fuel Efficiency
Improved Transient Response
Reduction in Emissions

≈90%

System Efficiency

SUPPLY VS. DEMAND

Generator(s) provide continuous power SUPPLY for long term applications.

ECO-H was developed for instant DEMAND response, load leveling and improving the power quality.

Large generators are robust and ideal for long term supply of power. They were never designed for demand response and power quality conditioning.

With the use of stored energy, ECO-H is perfect for demand response.

These two systems compliment each other in every case. Where one falls short, the other responds.

THE DIFFERENCE

	ECO-H	Reciprocating Engines
Transient Response	Response time within milleseconds	Depending on load - multiple seconds
Power Quality	Complient with IEEE 1547 utility code	Prone to voltage & frequency fluctuation
Emissions	N/A	SCR & MOE certification
Startup Time	Always on	Startup times are between two to five minutes
Noise Pollution	N/A	High DB levels, sound attenuation required
Fuel Source	N/A	Fossil Fuels
Maintenance	Yearly visual system inspection	Fluid changes, wear & tear, overhauls
Redundancy	Modular system	N+1

OUR PROJECTS

We've worked with numerous clients to create custom solutions that suit their needs.

- **PROJECT TYPE: SOLAR ENERGY STORAGE**
  Description: 250kW system with a capacity of 1MWh energy storage
  Location: Rural Germany, 2015

- **PROJECT TYPE: DRILL RIG POWER MANAGEMENT**
  Description: ECO-H 1MW - 500kWH Energy - Portable Hybrid Power Management System
  Location: Grande Praire, Alberta, Canada, 2016

- **PROJECT TYPE: DRILL RIG POWER MANAGEMENT**
  Description: ECO-H 1MW Power - 500kWH Energy - Portable Hybrid Power Managment System
  Location: Jonah Field, Wyoming, USA, 2014

- **PROJECT TYPE: DRILL RIG POWER MANAGEMENT**
  Description: ECO-H 1MW Power - 500kWH Energy - Portable Hybrid Power Managment System
  Location: DJ Basin, Colorado, USA, 2014

- **PROJECT TYPE: SUBSTATION ENERGY STORAGE**
  Description: Battery container which houses 714 series connected Toshiba Li-Ion batteries in racks, fire suppression, DC disconnect, auxiliary power distribution, controls and cooling equipment.
  Location: Ohio, Michigan, USA, 2015

- **PROJECT TYPE: GRID TIE ENERGY STORAGE**
  Description: 2MW Battery container which houses series connected LG Li-Ion batteries in racks, fire suppression, DC disconnect, auxiliary power distribution, control and cooling equipment.
  Location: Ohio, Michigan, USA, 2014

- **PROJECT TYPE: TRANSPORTABLE ENERGY STORAGE**
  Description: ConEd - Transportable Grid Support Energy Storage
  Location: New York State, USA, 2016

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