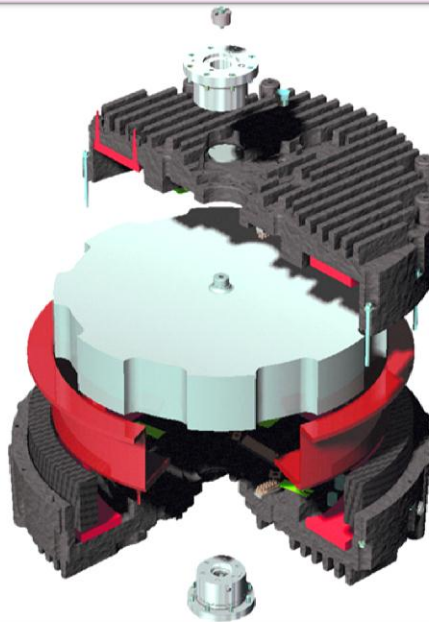


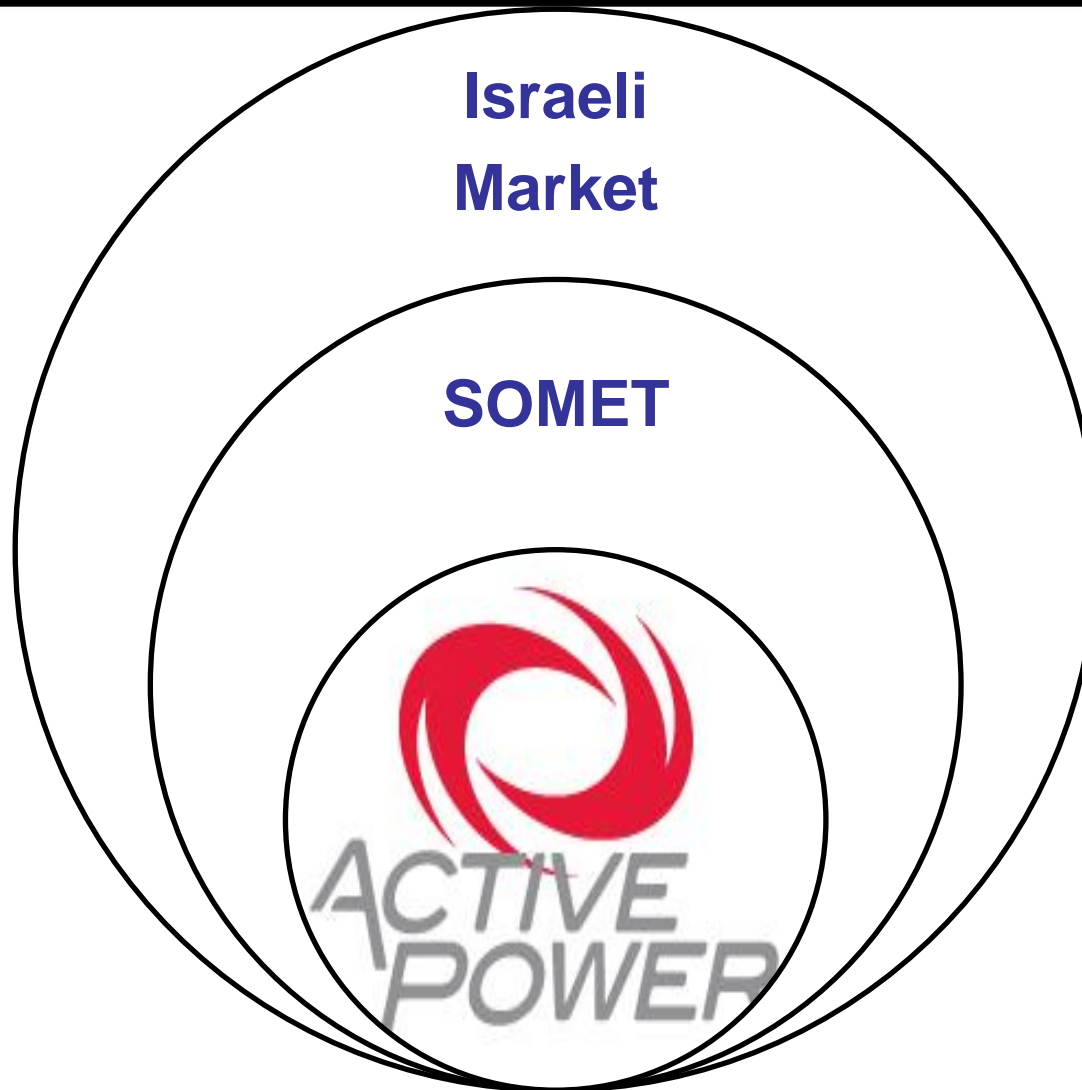


Somet
Integration

Presentation



Active Power – SOMET Integration



» Active Power

- Products / Solutions
- Engineering
- Technical support
- Service support / back-up

» Somet Intergration

- Administration / Order management
- Products
- Project Management
- Service activities
 - Installation assistance
 - Start-up / Commissioning
 - SIT Tests
 - Maintenance
 - Failure analyses
 - Repairs

Corporate Mission

Active Power consistently delivers efficient, reliable and green power and infrastructure solutions trusted worldwide. We accomplish this by developing ingenious people, products and services.



Unique Infrastructure Solutions



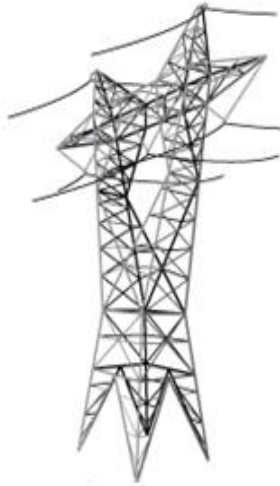
Continuous Power Solutions



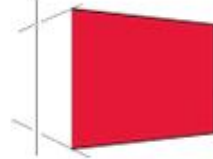
UPS Systems

How It All Works: Bridging the Gap

Utility Power Grid



Auto Transfer Switch



During Steady State:
UPS Provides Power Conditioning

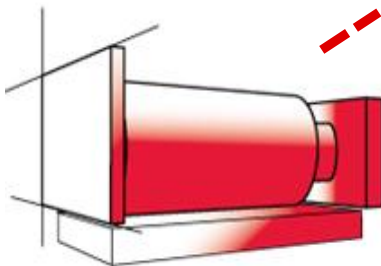
Critical Systems



UPS



Generator

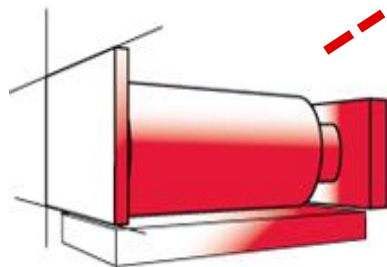


Upon Loss of Utility Power:

1. Battery immediately supports load
2. UPS signals Generator to start via Transfer Switch
3. Generator carries load until utility power is restored

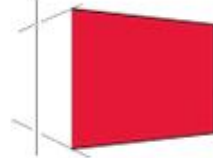
How It All Works: Bridging the Gap

Utility Power Grid



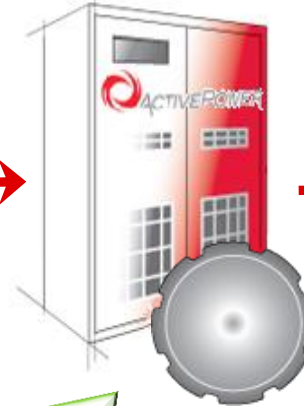
Generator

Auto Transfer Switch



During Steady State:
UPS Provides Power Conditioning

Active Power UPS



Critical Systems



Upon Loss of Utility Power:

1. Flywheel immediately supports load
2. UPS signals Generator to start via Transfer Switch
3. Generator carries load until utility power is restored

BATTERIES

» Batteries

- Unknown available capacity
- With every year of operation increasing risk of failure
- Temperature sensitive
- Air condition required
- Limited lifetime
- Very high weight
- Large footprint required
- Special disposal required
- High maintenance

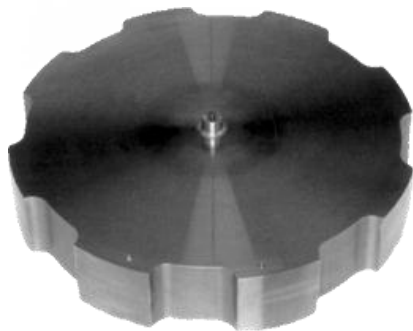


FLYWHEEL

» Flywheel

- Exact capacity known / predictable
- Unlimited discharge cycles
- No degradation in age
- Lifetime expectation +20 years
- Low weight
- Small footprint
- NO special disposal required
- Low maintenance requirements
- Temperature window from 0 to 40°C
- NO air condition required

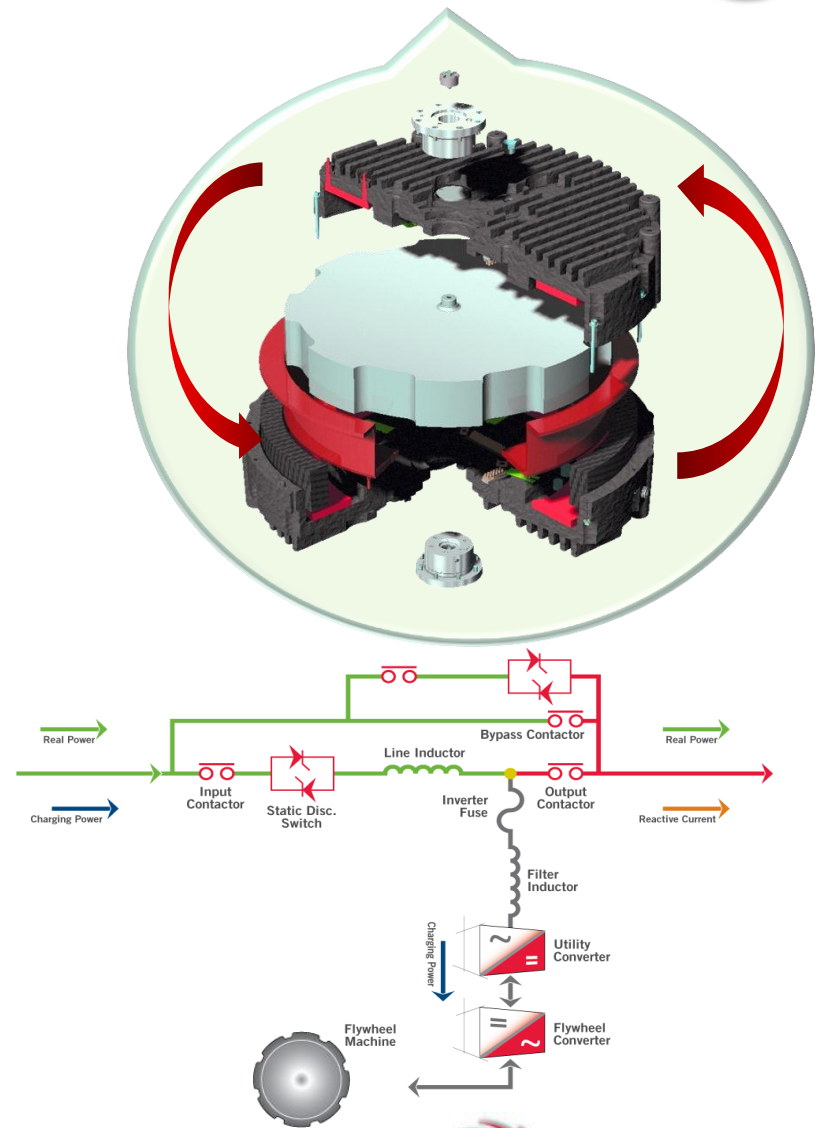




CleanSource® Flywheel Storage Technology

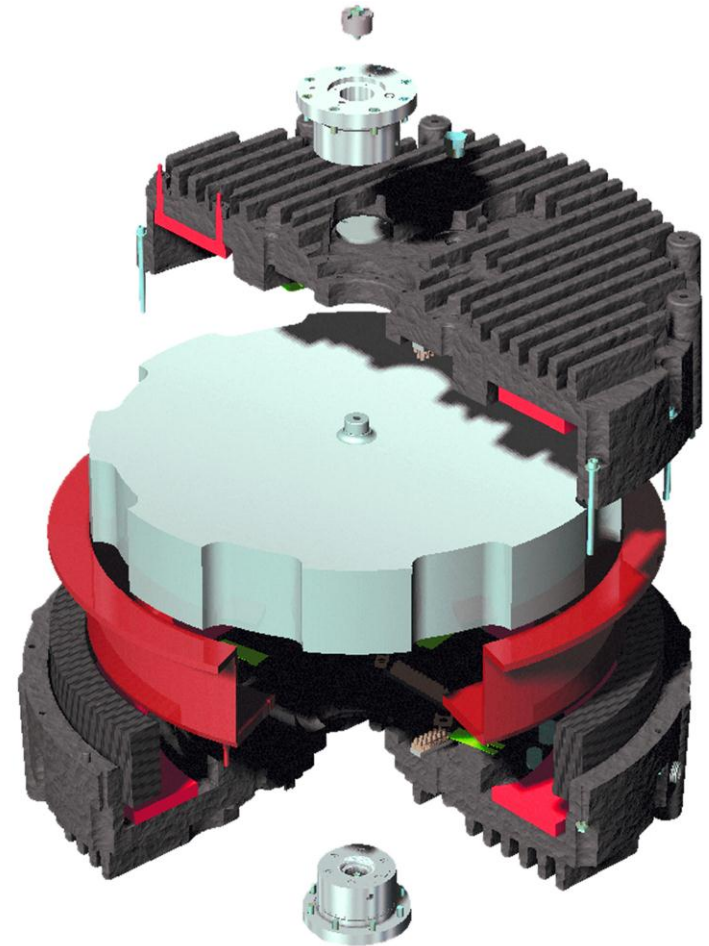
Key Technology: Unique Integrated Flywheel

- » A flywheel takes the place of batteries typically used in traditional UPS system
- » In a nearly frictionless environment, the spinning flywheel stores energy as motion (kinetic energy) when electric power is flowing
- » When power is interrupted, inertia keeps the flywheel spinning at high-speed
- » The spinning flywheel acts as a generator: converts kinetic energy back to electricity



CleanSource® Flywheel

- » Flywheel spins constantly at 7,700 rpm in a vacuum
- » Spinning flywheel stores kinetic energy
- » When input power is interrupted, kinetic energy keeps the flywheel spinning
- » Magnetic fields on spinning flywheel act as a generator
- » Generator converts kinetic energy to electrical energy – up to 250kVA / 225kW discharge rate for 15 seconds



CleanSource® Flywheel Technology

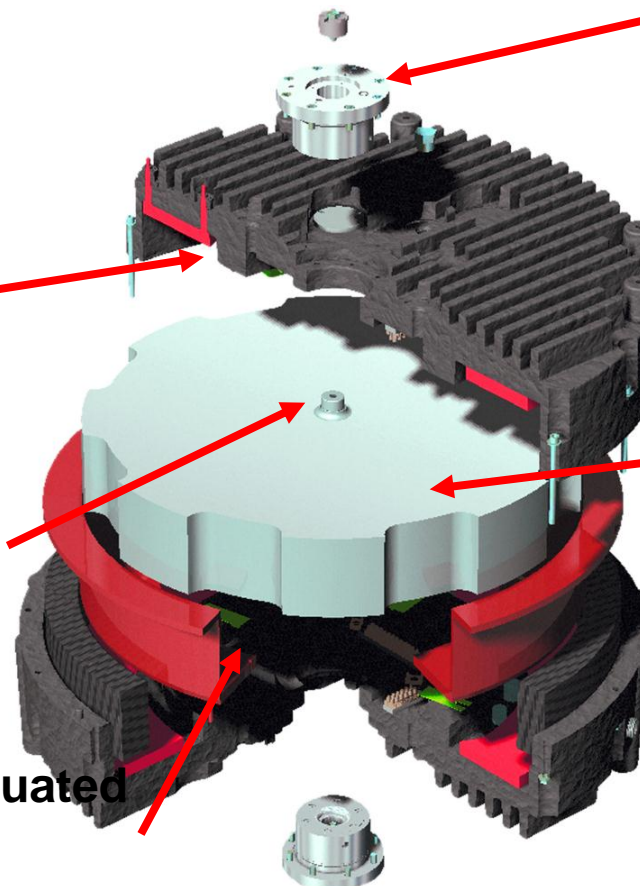
250kW Flywheel Motor/Generator

4. Upper magnetic field lifts weight of flywheel off bottom bearing to further reduce friction losses

journal

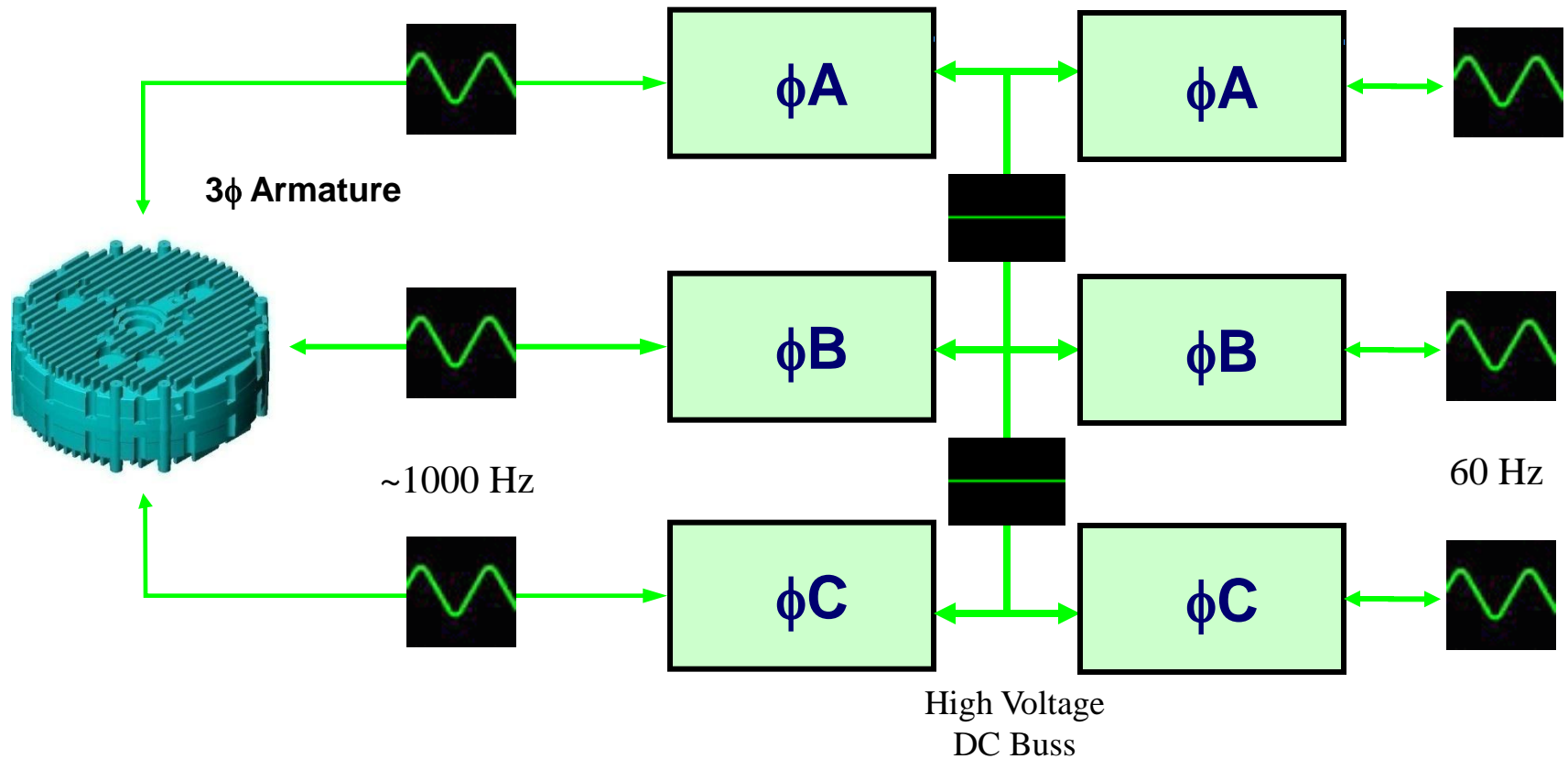
1. Field-replaceable ball-bearing cartridge holds flywheel captive by top and bottom machined journals

2. Electronics are used to motor flywheel up to speed when utility power is present. Spinning flywheel in magnetic field functions as short term generator during an outage



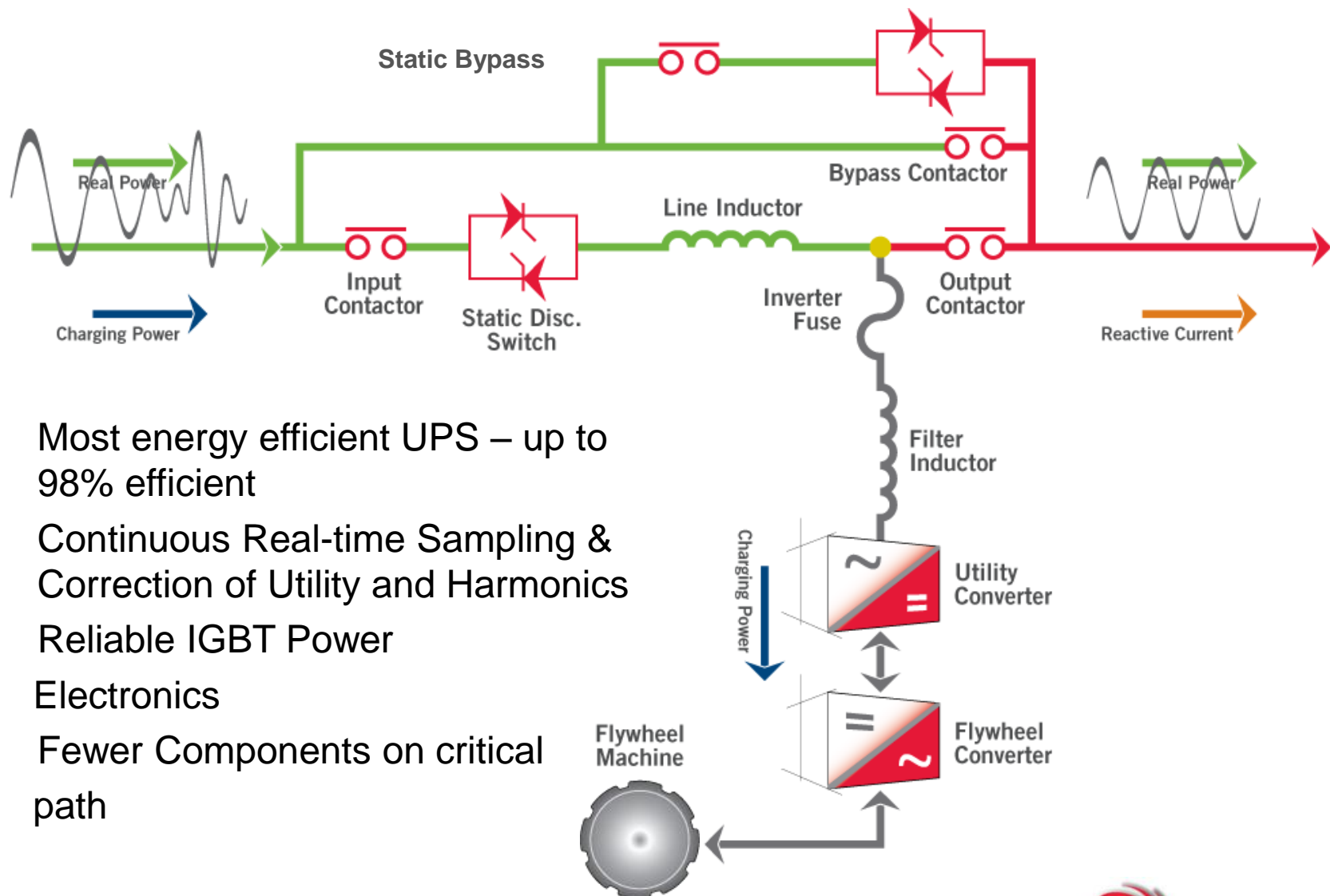
3. Internal chamber is evacuated by vacuum pump thereby eliminating air friction losses

Flywheel IGBT Power Conversion



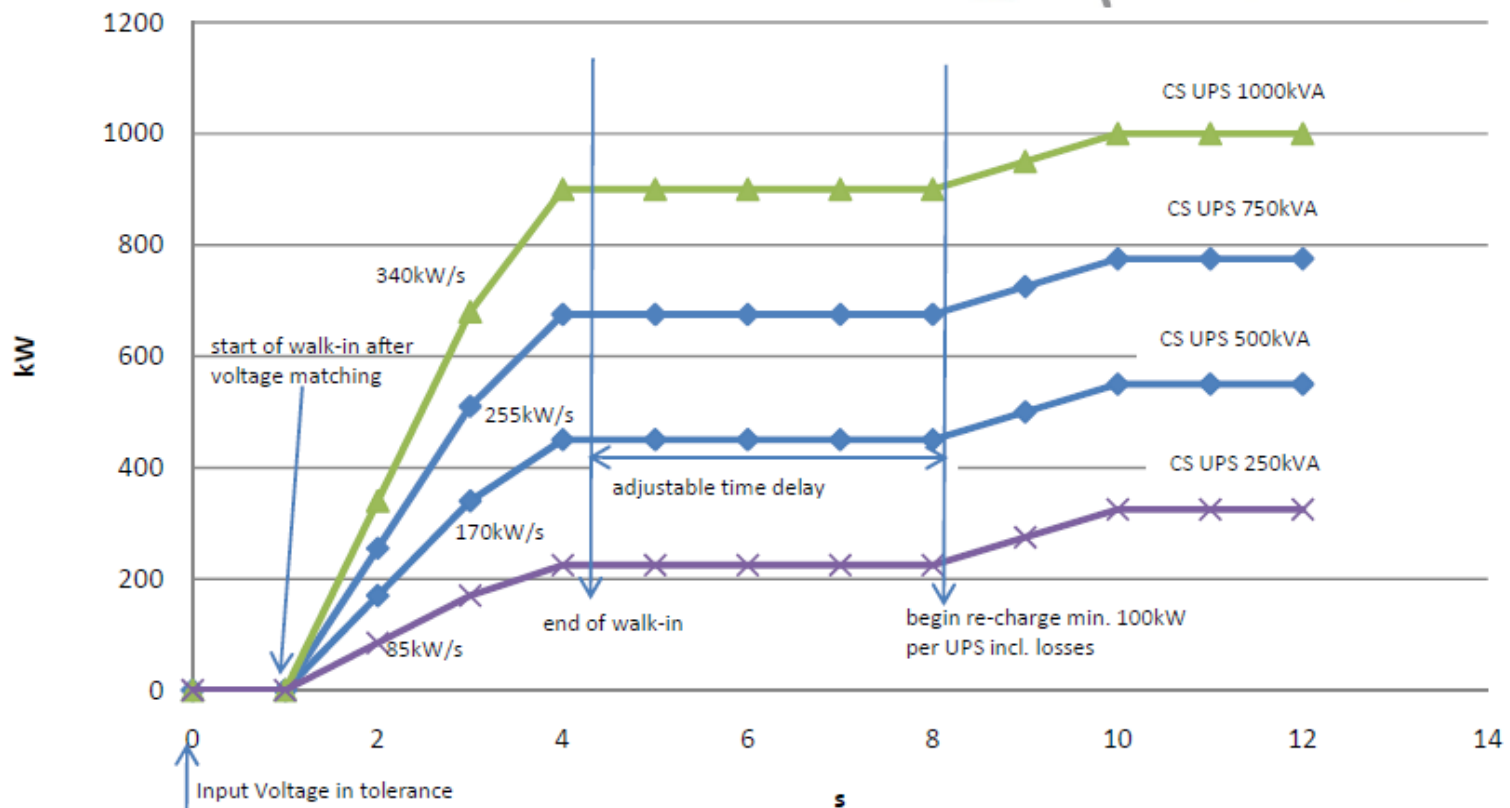
Power Conversion via Bi-Directional IGBT's

Flywheel UPS Parallel Online Architecture



Load transfer to diesel generator

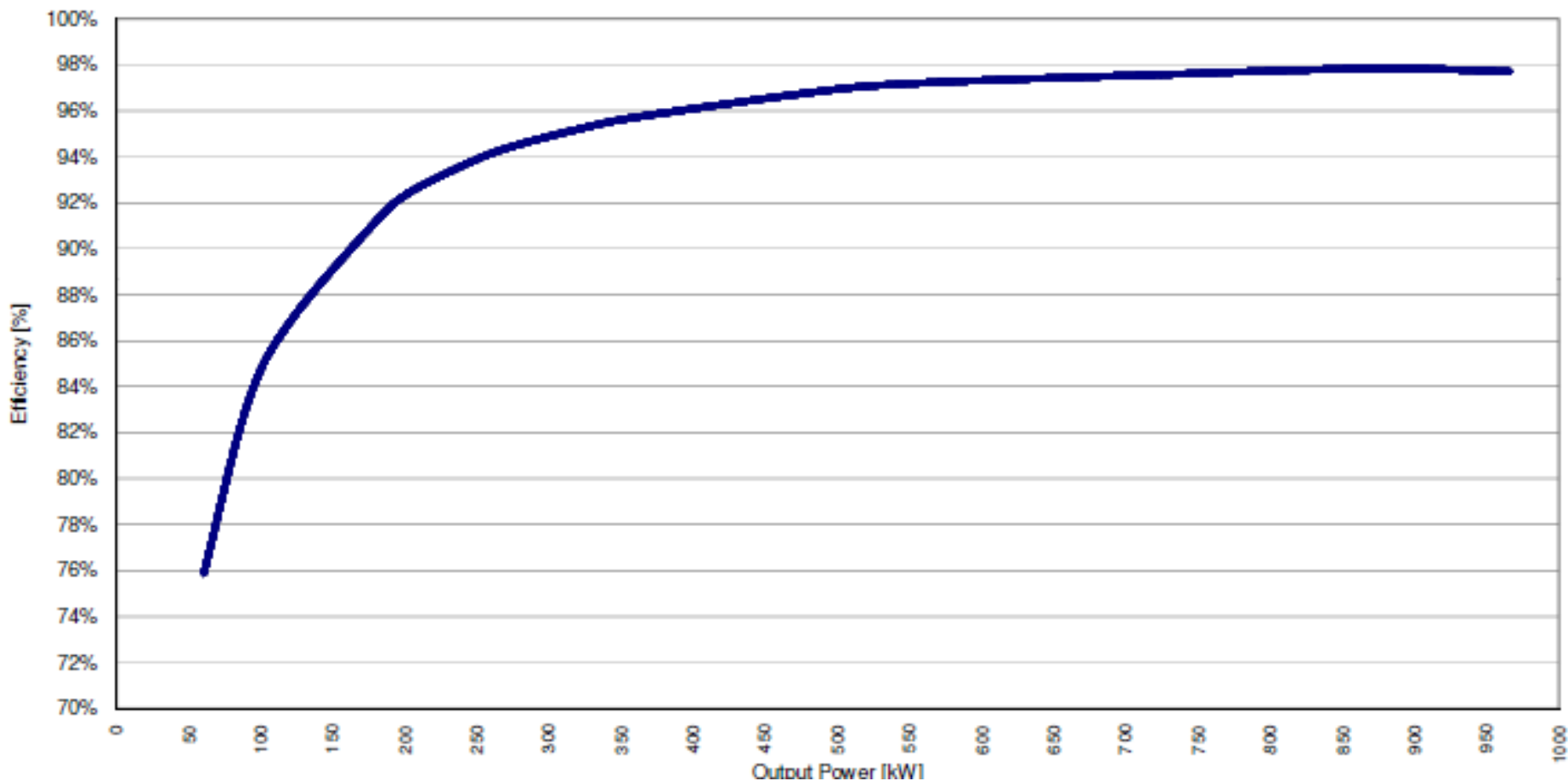
Real Power Chart UPS Input at full load



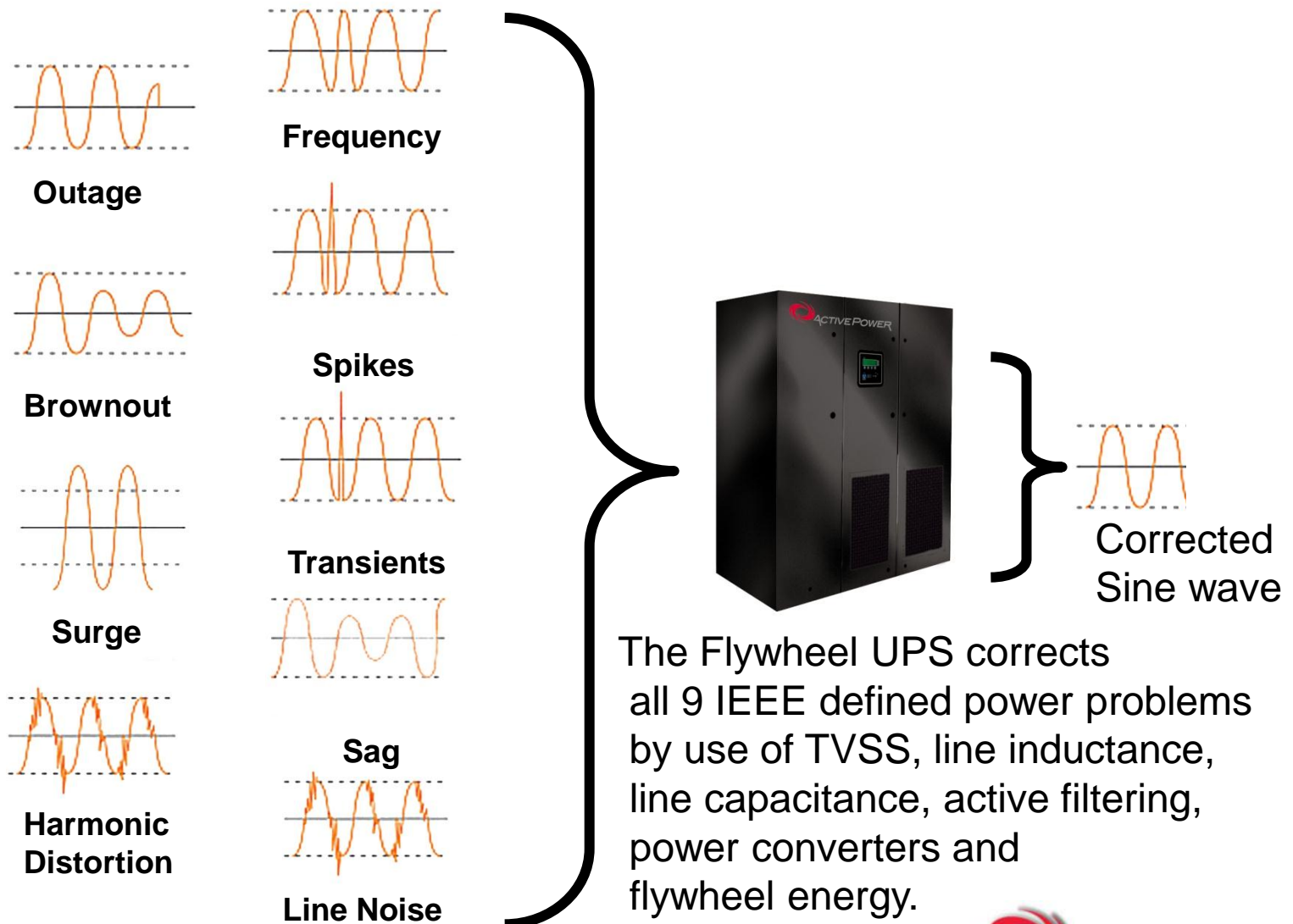
Efficiency



Efficiency Curve 1000iZ



Power Conditioning



CleanSource® Integrated Flywheel UPS Systems



CleanSource UPS

- » The industry's only patented integrated flywheel UPS
- » **Single Module Systems**
 - 120 kVA; 150kVA and 250 kVA
- » **Multi Module Systems**
 - 250 kVA to 1500 kVA systems
 - Add modules for ride-through, redundancy or capacity in **250kVA / 225 KW increments**
 - **Paralleling capability for Multi-Megawatt Systems**

Modular - Scalable - Flexible

- » **Modular * Scalable * Flexible**
- » **Field Upgradeable * Grows with Customer Needs**
- » **Paralleling Capability for Multi-Megawatt Solutions**



The CleanSource UPS Family

UPS 120kVA, 150kVA & 250kVA



UPS 500kVA

UPS 250kVA N+1



UPS 750kVA

UPS 500kVA N+1



UPS 1000kVA

UPS 750kVA N+1



Product Matrix to 1000kVA / 900kW

System	kVA rating	PF	kW rating	SMS	MMS	# MMU	Redundant option	Max kVA capacity	MBP Option	Paralleling support
SMS										
120i	120	1.0	120	X				120	Manual internal option	
150i	150	0.9	135	X				150	Manual internal option	
250i	250	0.9	225	X				225	Manual internal option	
G-Series										
250iG	250	0.9	225		X	1	X +1 MMU	500	Standard	X (w/other G)
500iG	500	0.9	450		X	2	X +1 MMU	500	Standard	X (w/other G)
Z-Series										
250iZ	250	0.9	225		X	1	X +1 MMU	1000	External only	X (w/other Z)
500iZ	500	0.9	450		X	2	X +1 MMU	1000	External only	X (w/other Z)
750iZ	750	0.9	675		X	3	X +1 MMU	1000	External only	X (w/other Z)
1000iZ	1000	0.9	900		X	4		1000	External only	X (w/other Z)

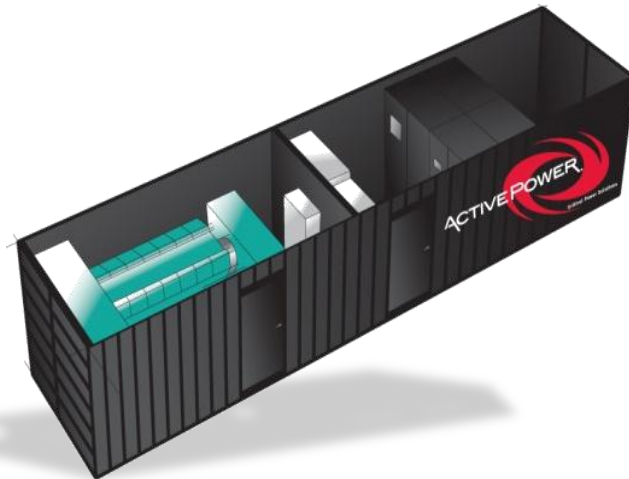
CleanSource UPS 1500iC



PHYSICAL DATA

Height (w/o wireway or DC bus)	92.0 in 2,337 mm
Width	269.0 in 6,833 mm
Depth	40.0 in 1,016 mm
Weight	21,638 lbs 9,815 kg
Cable Entry	Top

PowerHouse Continuous Power System



PowerHouse

- » The industry's only complete continuous power system
- » Includes standby generator, UPS, switchgear, cooling and monitoring systems, packaged in 40' custom-built enclosure
- » Supports both critical (IT) and short-break (i.e. chillers) loads
- » Scalable for your needs
 - 200 kW critical / 500 kW short-break
 - 400 kW critical / 800 kW short-break
 - 600 kW critical / 1200 kW short-break
 - 800 kW critical / 1500 kW short-break
- » Redundant designs available

PowerHouse solutions



PowerHouse solutions



Active Power Solutions

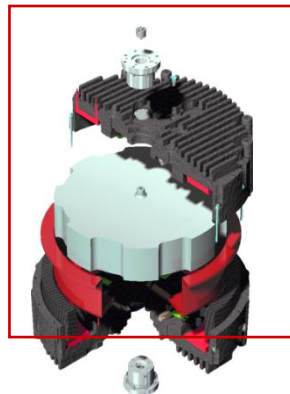
100+ patents world wide
2,900+ Flywheel sold
100+ million operating hours



UPS Systems



PowerHouse solutions



Energy Storage

All based on the high
efficiency UPS with reliable
Flywheel energy storage
(NO batteries)

Service Portfolio



» ASSESS

- Site Survey
- Site Validation
- System Design

» IMPLEMENT

- Install Assistance
- Start Up
- Commissioning
- Project Management
- Turnkey Installation

» SUPPORT

- Maintenance Programs
- Training
- Remote Power Management
- Technical Support
- Warranty

Key Marketplaces for Reliable Power



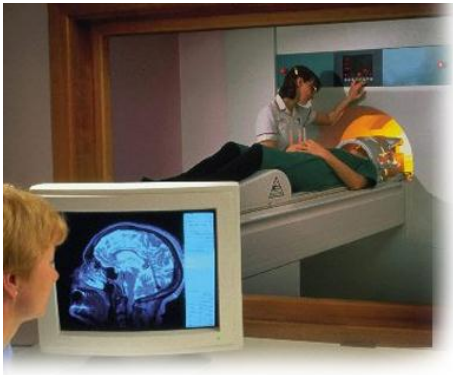
Datacentre



Airport



**Power Generation
& Distribution**



Healthcare



Financial



Industrial

Global Sales & Operations

CENTERS OF OPERATION

- Austin, Texas
- Birmingham, UK
- Osterode, Germany
- Beijing, China
- Tokyo, Japan

CAPABILITIES

- Sales
- Service
- Design & Project Management
- Packaging & Integration
- UPS Manufacturing * Austin



CATERPILLAR®



What Makes Flywheel UPS Technology Different



*...Intelligently **EFFICIENT***

- Precision engineered to be up to **98% efficient vs 92%** with legacy battery based UPS systems
- Delivers **up to 60% TCO** (total cost of ownership) **savings** to bottom line by reducing power consumption costs



*...Inherently **RELIABLE***

- Unique design delivers **predictable, consistent back up power**
- Proven **7x less likely to fail** than legacy UPS systems with batteries





























*...Economically **GREEN***

- **75% reduction** in carbon footprint vs. batteries
- No expired battery waste disposal issue

Clients, Partners & Affiliations



Growing Diversified Client Base

Utilities	Communications	Industrial	Technology
    	        	       	         

Healthcare, Government & Other



Why customers choose Active Power

- » World's most energy efficient ups solution
- » Green technology - No chemical batteries
- » Space efficient * High power density
- » No need for air-conditioned rooms
- » High reliability, 7x less likely to fail
- » 20 year design life
- » Less Maintenance
- » Proved technology
- » Easy to install and scalable



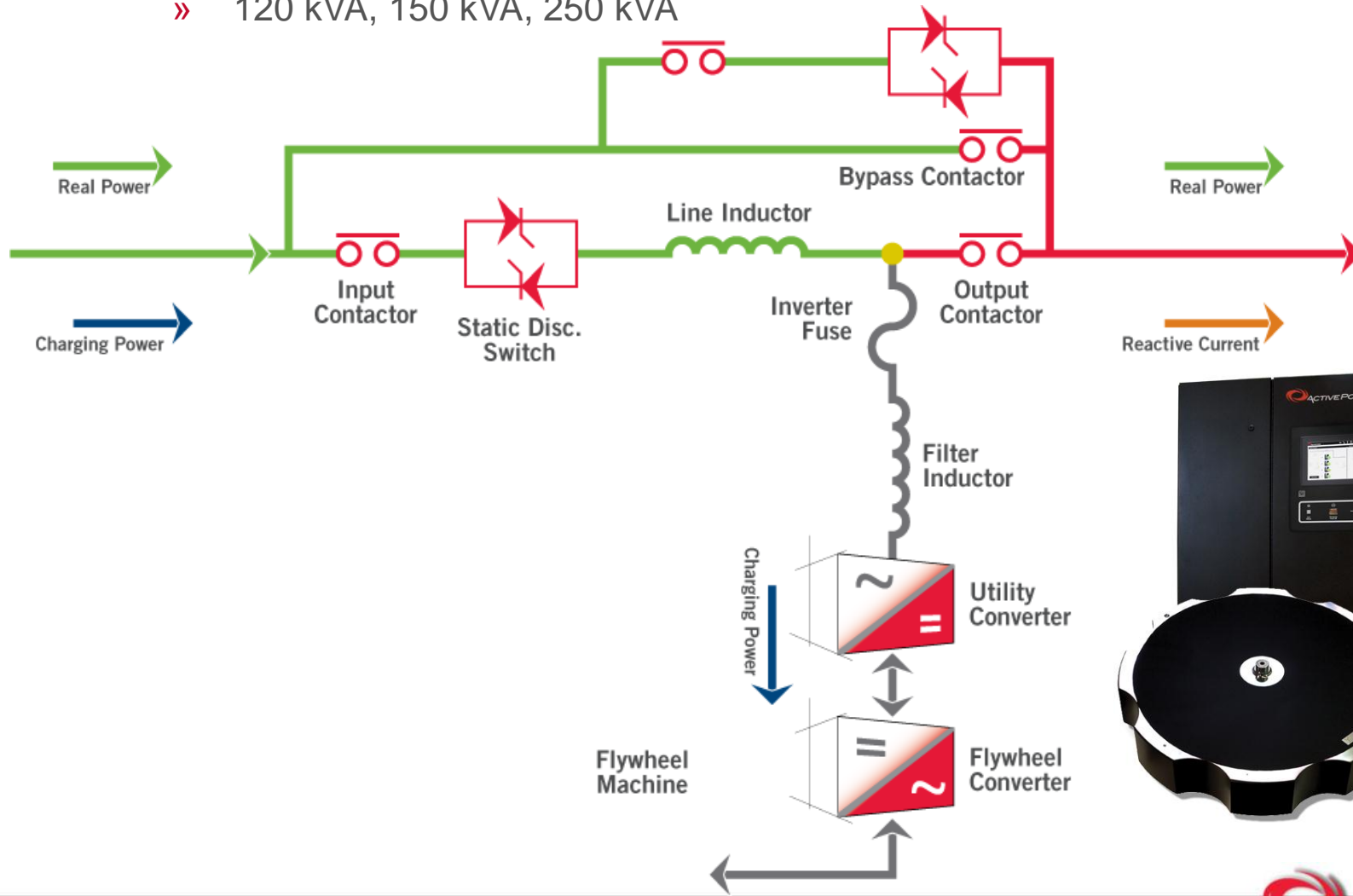


PRODUCTS & SOLUTIONS

CleanSource® UPS - SMS

» Single Module Systems (!!!NO parallel operation!!!)

» 120 kVA, 150 kVA, 250 kVA



CleanSource® UPS - SMS

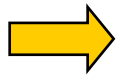
- » **Single Module Systems (!!!NO parallel operation!!!)**
 - » 120 kVA, 150 kVA, 250 kVA



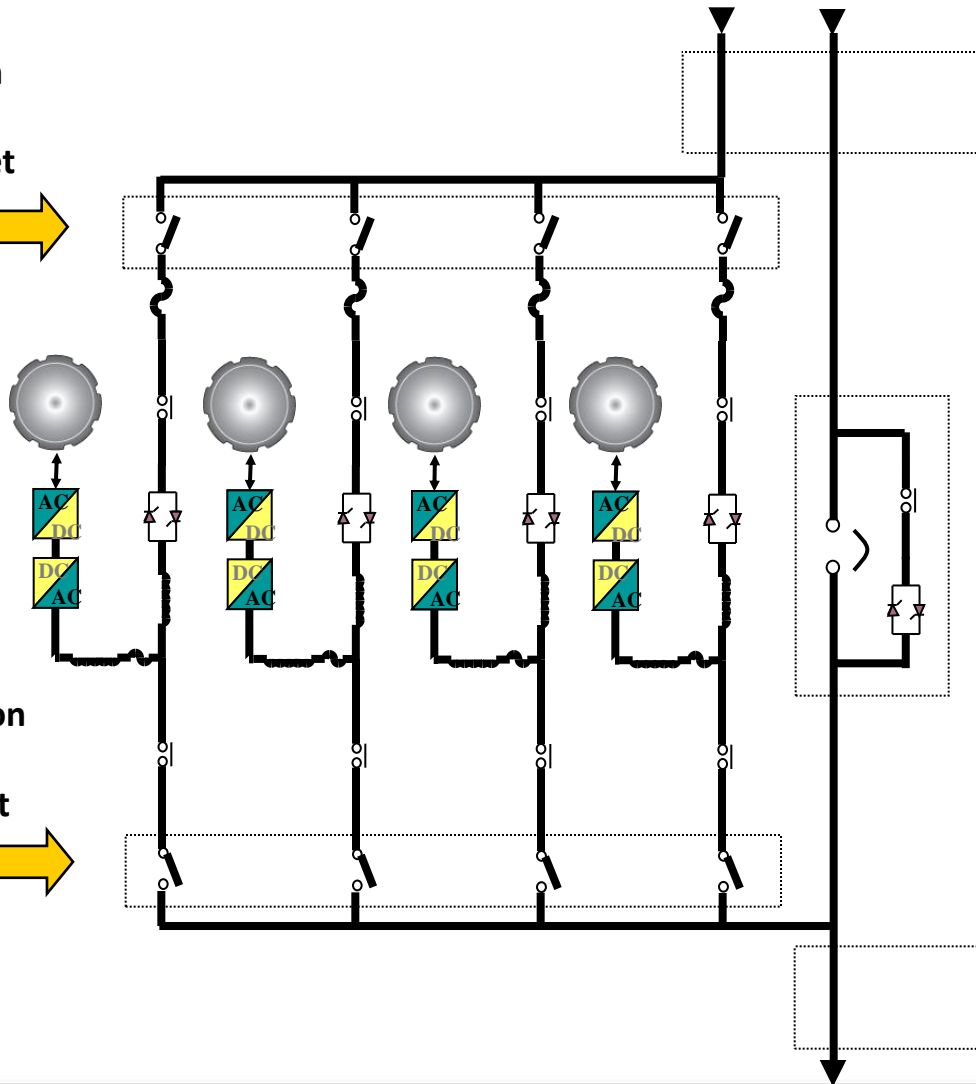
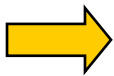
CleanSource UPS Multi-module Systems 1000iZ Frame(MMS)

MMS One-line

Input Isolation
Switches
System Cabinet



Output Isolation
Switches
System Cabinet



Dual Input Option
MBP External Only

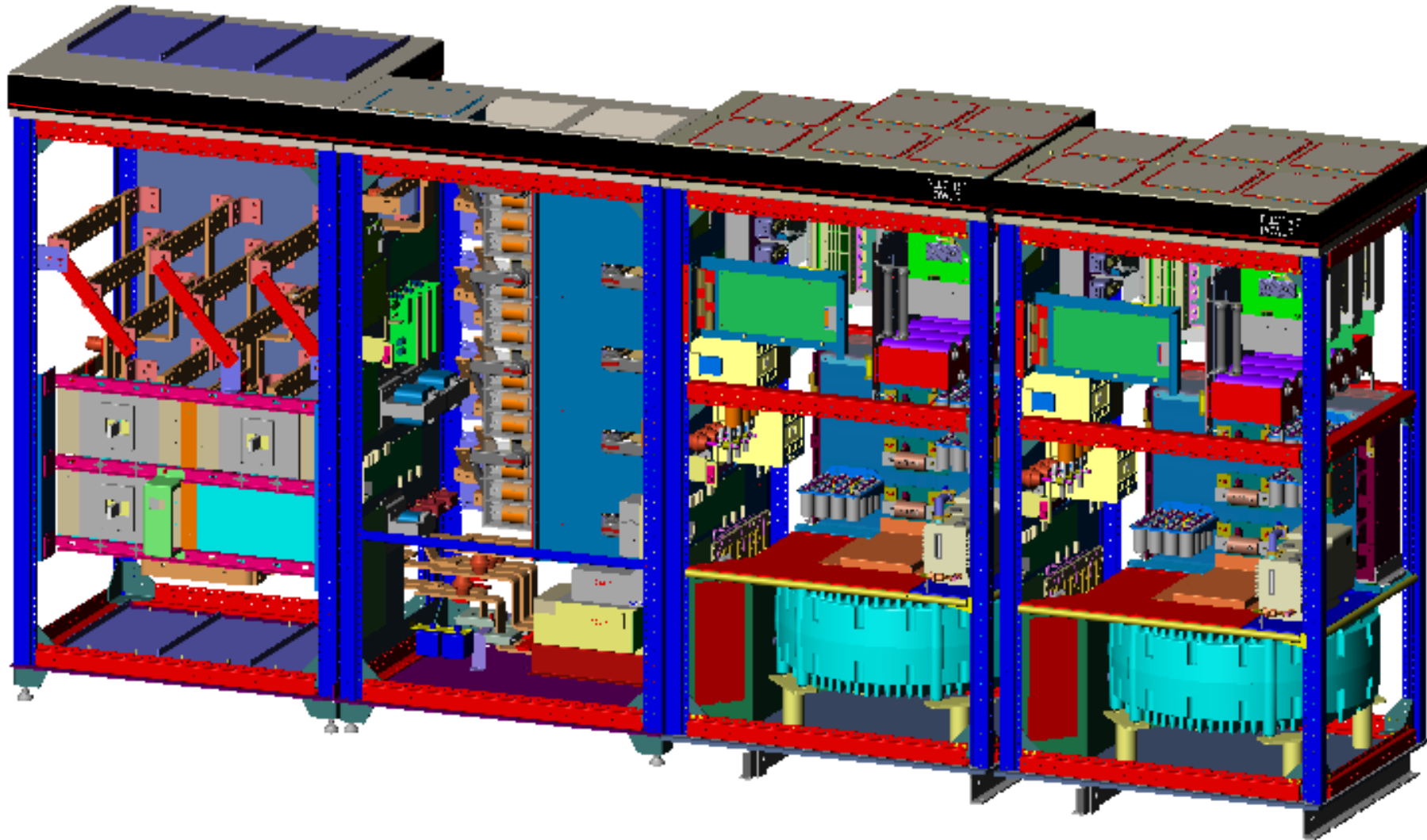


Built in:
Maintainability
Scalability
Redundancy

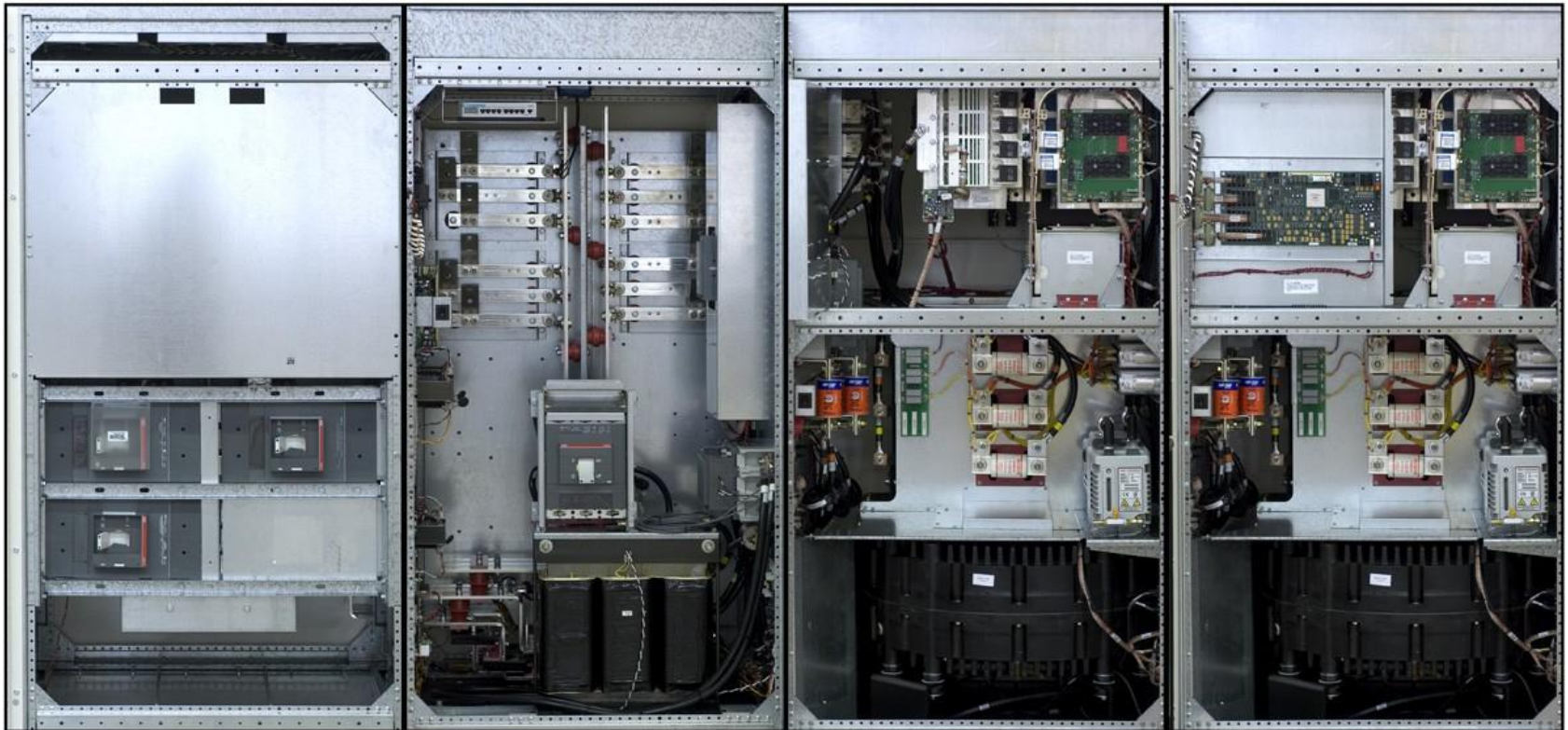
CleanSource® UPS – MMS



CleanSource® UPS – MMS



Multi Module System – 500kVA/450kW



I/O

System

**MMU
#1**

**MMU
#2**

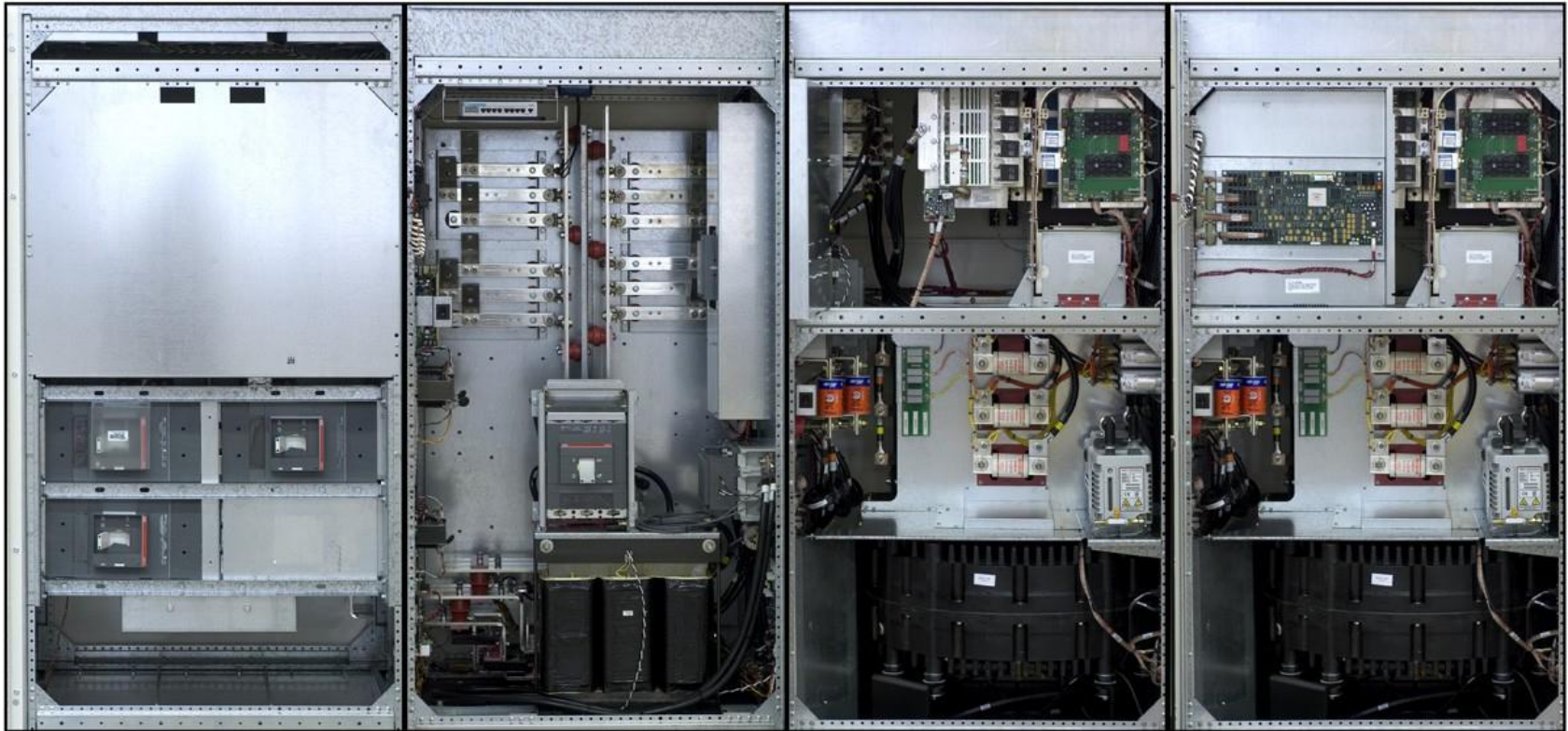
Multi Module Systems

I/O

System

MMU #1

MMU #2



- **Input-output cabinet**
 - Input-output connections
 - Optional maintenance bypass
 - Optional dual input

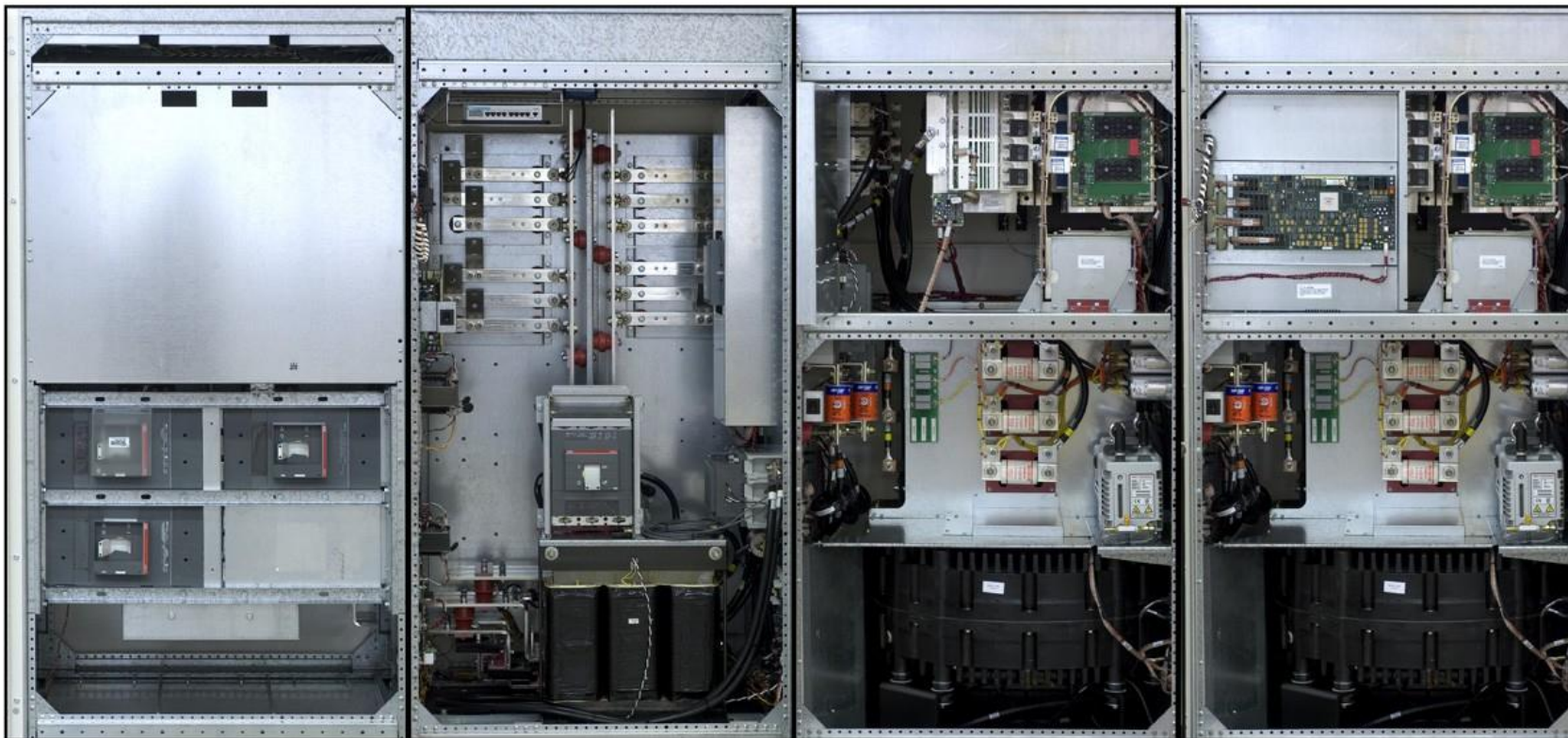
Multi Module Systems

I/O

System

MMU #1

MMU #2



» **System cabinet**

- Static bypass
- 4-Wire Option
- Optional MMU isolation
- Optional N+1 MMU connection

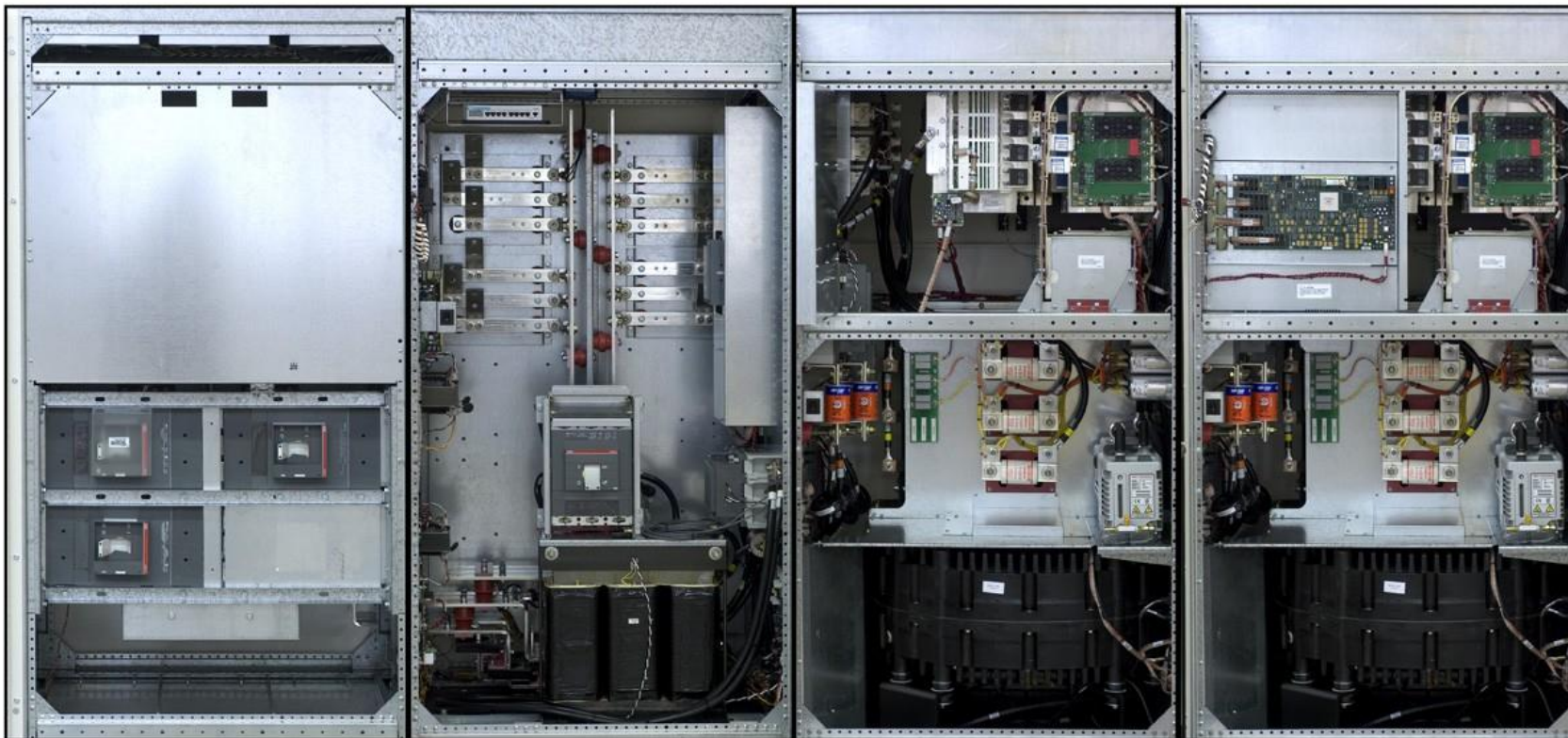
Multi Module Systems

I/O

System

MMU #1

MMU #2



MMU – Multi-Module Units

- Flywheel energy storage
- Bi-directional converters

CleanSource® UPS – MMS – 500iG Frame

» Multi Module Systems (parallel operation possible)

» 500iG – 800A (max. 500kVA/450kW)

» 1 x MMU - 250kVA

» 2 x MMU - 250kVA (N+1)

» 2 x MMU - 500kVA

» 3 x MMU - 500kVA (N+1)



CleanSource® UPS – MMS – 1000iZ Frame

» Multi Module Systems (parallel operation possible)

» 1000iZ – 1600A (max. 1000kVA/900kW)

» 1 x MMU - 250kVA

» 2 x MMU - 250kVA (N+1)

» 2 x MMU - 500kVA

» 3 x MMU - 500kVA (N+1)

» 3 x MMU – 750kVA

» 4 x MMU – 750kVA (N+1)

» 4 x MMU – 1000kVA

» Parallel operation possible

CleanSource® UPS – MMS – 1500iC Frame

» Multi Module Systems (!!!NO parallel operation possible!!!)

» 1500iC – 2500A (max. 1500kVA/1350kW)

- » 1 x MMU - 250kVA
- » 2 x MMU - 250kVA (N+1)
- » 2 x MMU - 500kVA
- » 3 x MMU - 500kVA (N+1)
- » 3 x MMU – 750kVA
- » 4 x MMU – 750kVA (N+1)
- » 4 x MMU – 1000kVA
- » 5 x MMU – 1250kVA
- » 5 x MMU – 1000kVA (N+1)
- » 6 x MMU – 1500kVA
- » 6 x MMU – 1250kVA (N+1)
- » 7 x MMU – 1500kVA (N+1)



GenSTART Starting Module

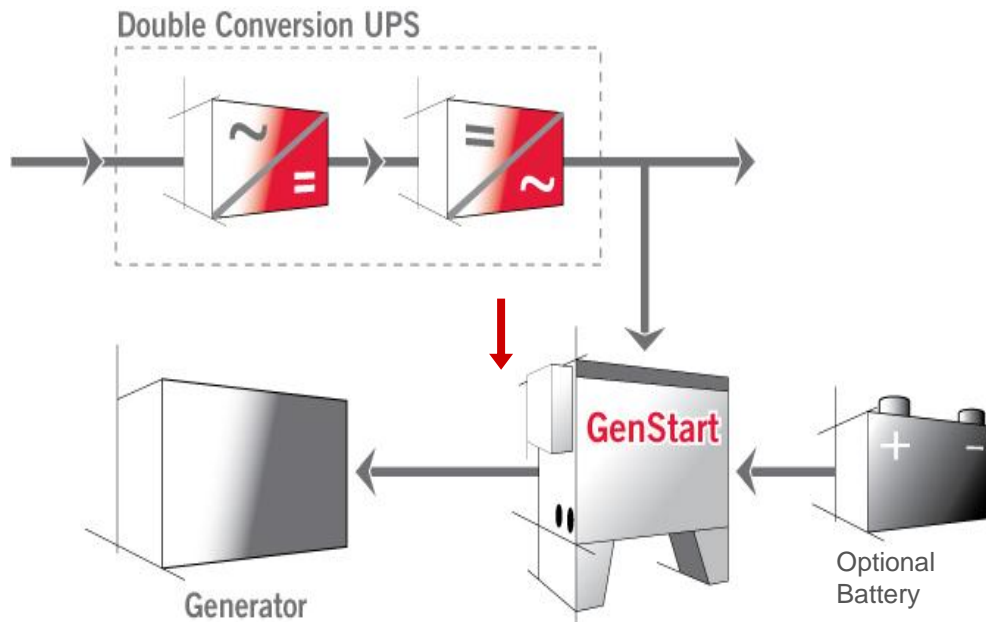
GenSTART™



- » Significantly improves starting reliability
- » Extremely low maintenance
- » Built in AC disconnect
- » Thermal protection with automatic reset
- » Status monitoring capability
- » Continuous control power availability
- » Floor- or wall-mount configurations

Battery-free, starting modular system that adds additional nines of availability to multiple standby generator sets

GenSTART™ Theory of Operation



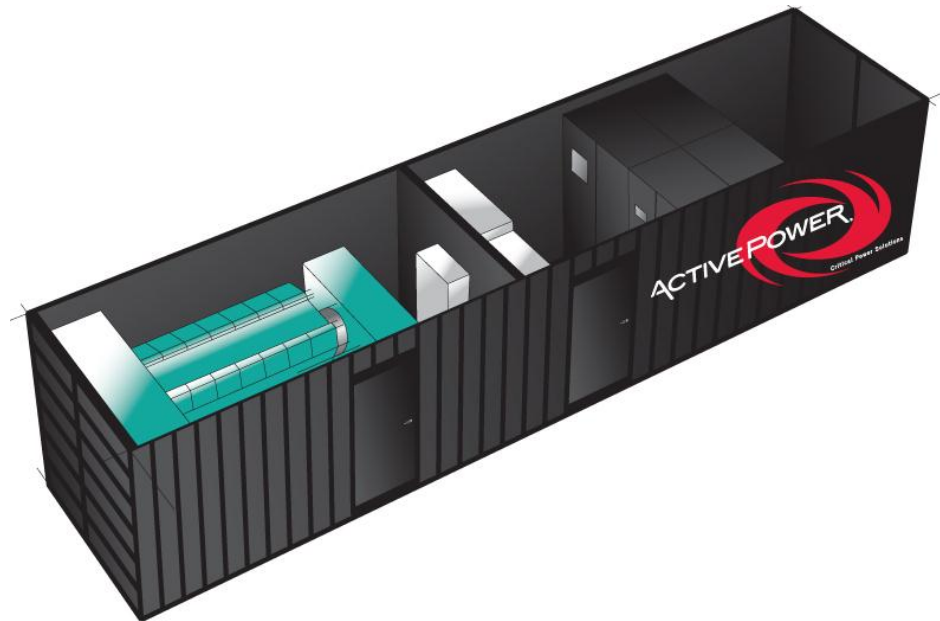
- » 1728 Cold Cranking Amps
- » Reliable power to a generator set engine's starting motor
- » Dead batteries are the number one reason for generator start failures



PowerHouse™
Continuous Power System

PowerHouse™

A modular, portable continuous power system available for rapid deployment in eight standard configurations based on Active Power's high efficiency and highly resilient architecture.



Up to 25% lower CapEx and 60% lower overall TCO!

LESS IS MORE

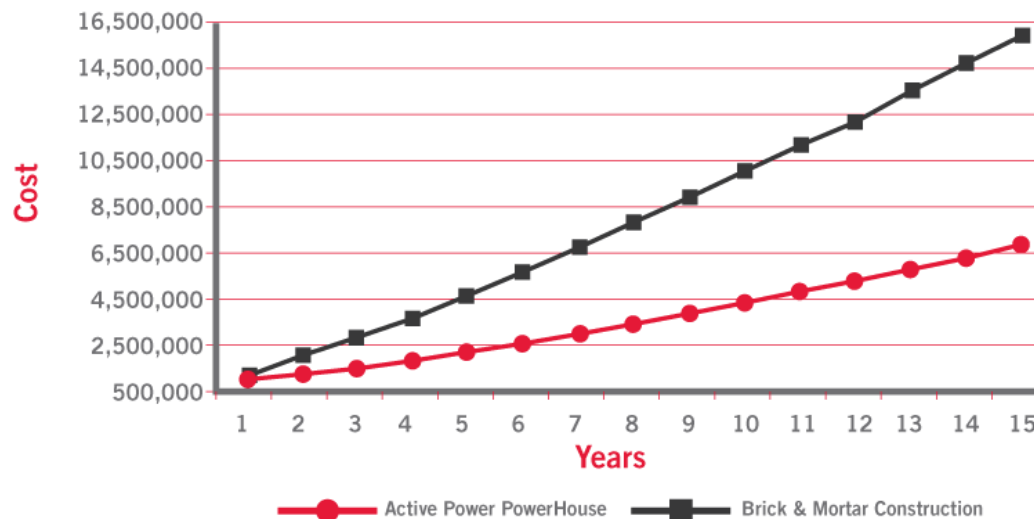
Less cost
Less time
Less space
Less energy

More efficient
More reliable
More predictable
More repeatable

Less Cost

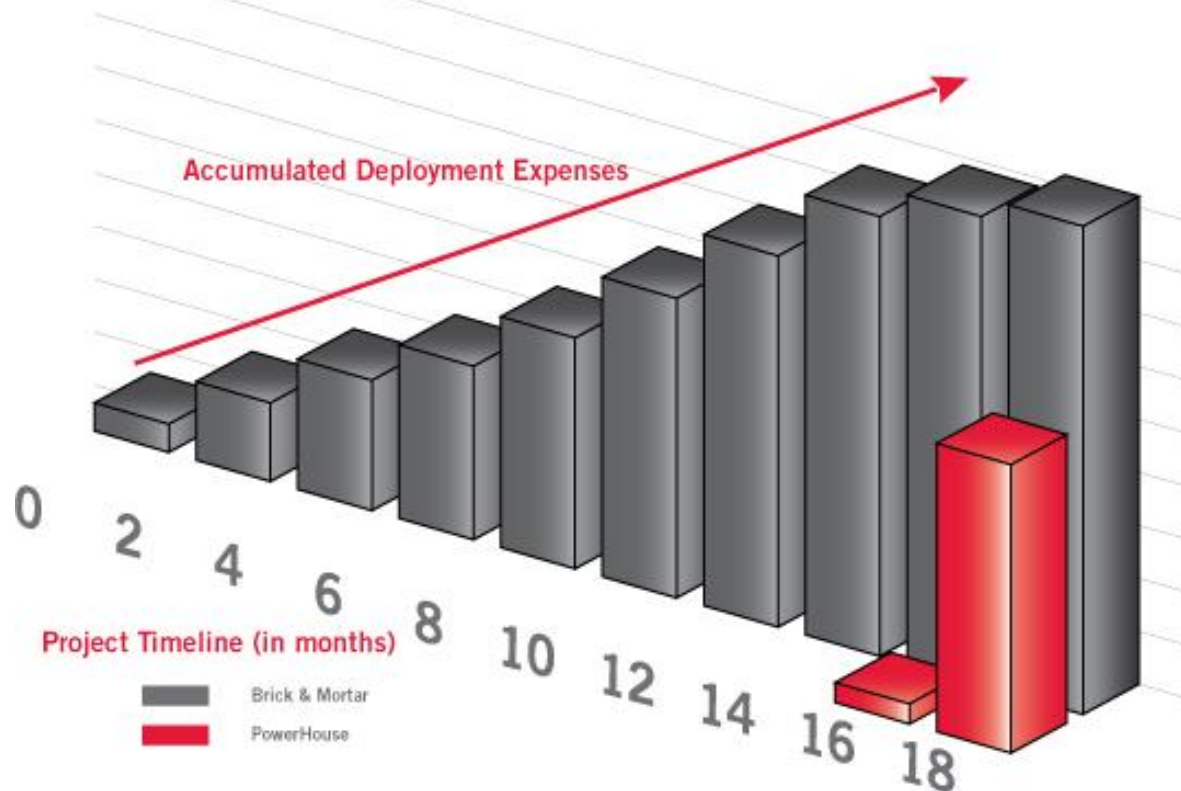
- » Labor component is significantly reduced
- » Typically a customer spends €1 on labor for every €1 of hardware
- » Reduction in design and engineering
- » Standardized components driving repeatability in reliability and volume
- » One-piece flow through manufacturing

Realize 25% CAPEX Savings and up to 60% Total Cost of Ownership

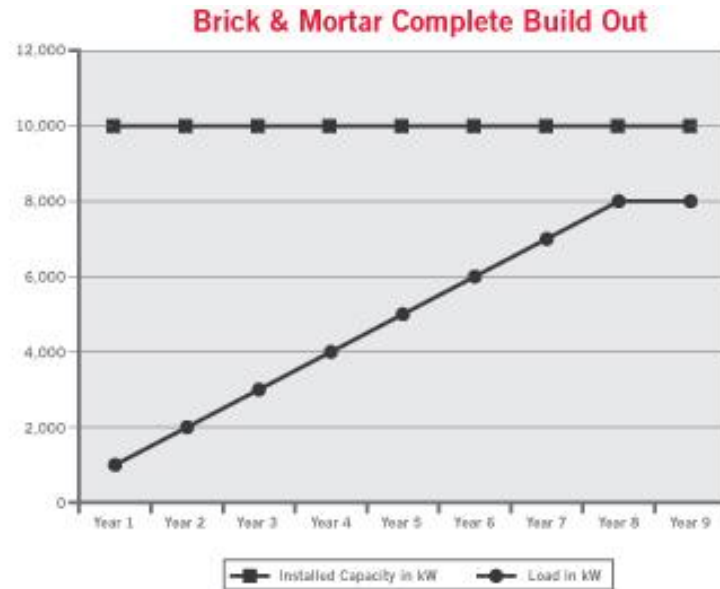
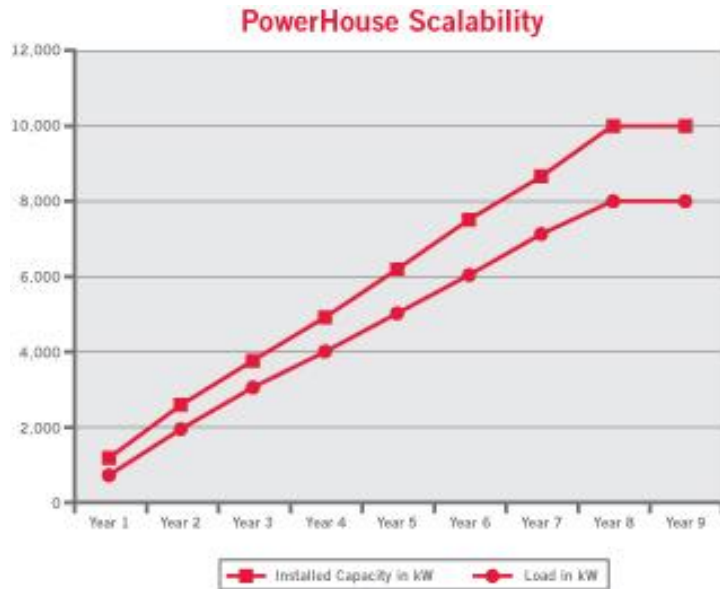


Just In Time Capital Deployment

- » Legacy data center builds can take 18 months or more
- » Cost of capital is a significant cost driver in legacy construction
- » PowerHouse provides Just-In-Time capital spending



More Scalability



- » Modularity is challenging to design into a legacy architecture
- » PowerHouse provides a highly modular architecture that drives out waste
- » Improves operational efficiency through better infrastructure utilization

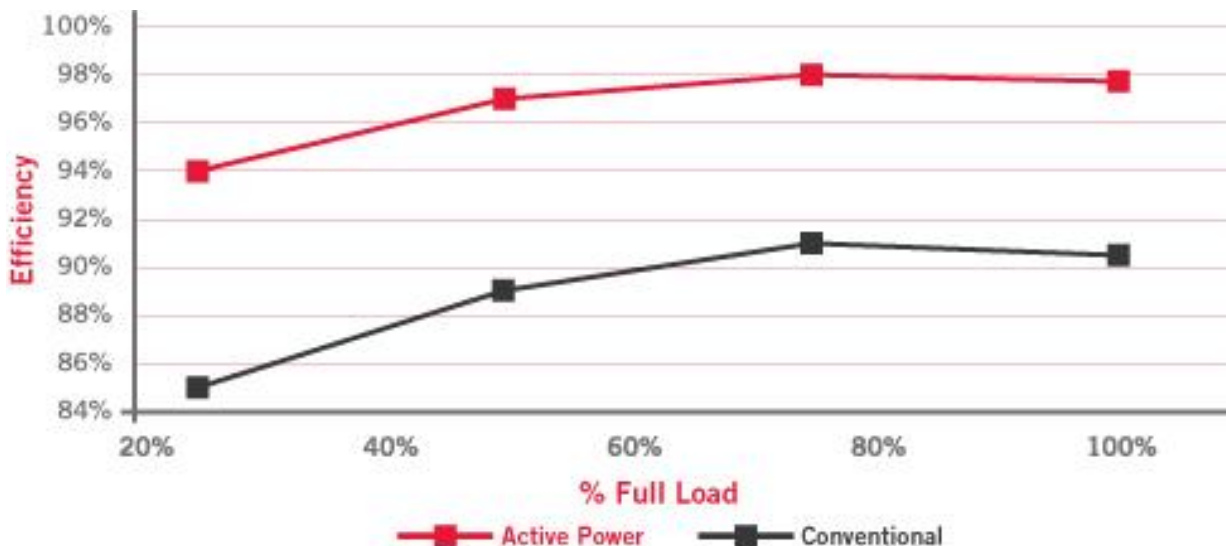
More Repeatability

- » PowerHouse is engineered as a system
- » Pre-assembled, pre-tested and pre-commissioned at the factory
- » Integrated controls and monitoring of a system versus individual products
- » Shared learning eliminating risk and cost of inconsistencies

	Brick & Mortar Deployment		PowerHouse Deployment	
	Factory Work	On-Site Work	Factory Work	On-Site Work
Engineering		X	X	
Component Logistics		X	X	
Testing		X	X	
Installation		X	X	
Site Testing		X		X
Commissioning		X		X

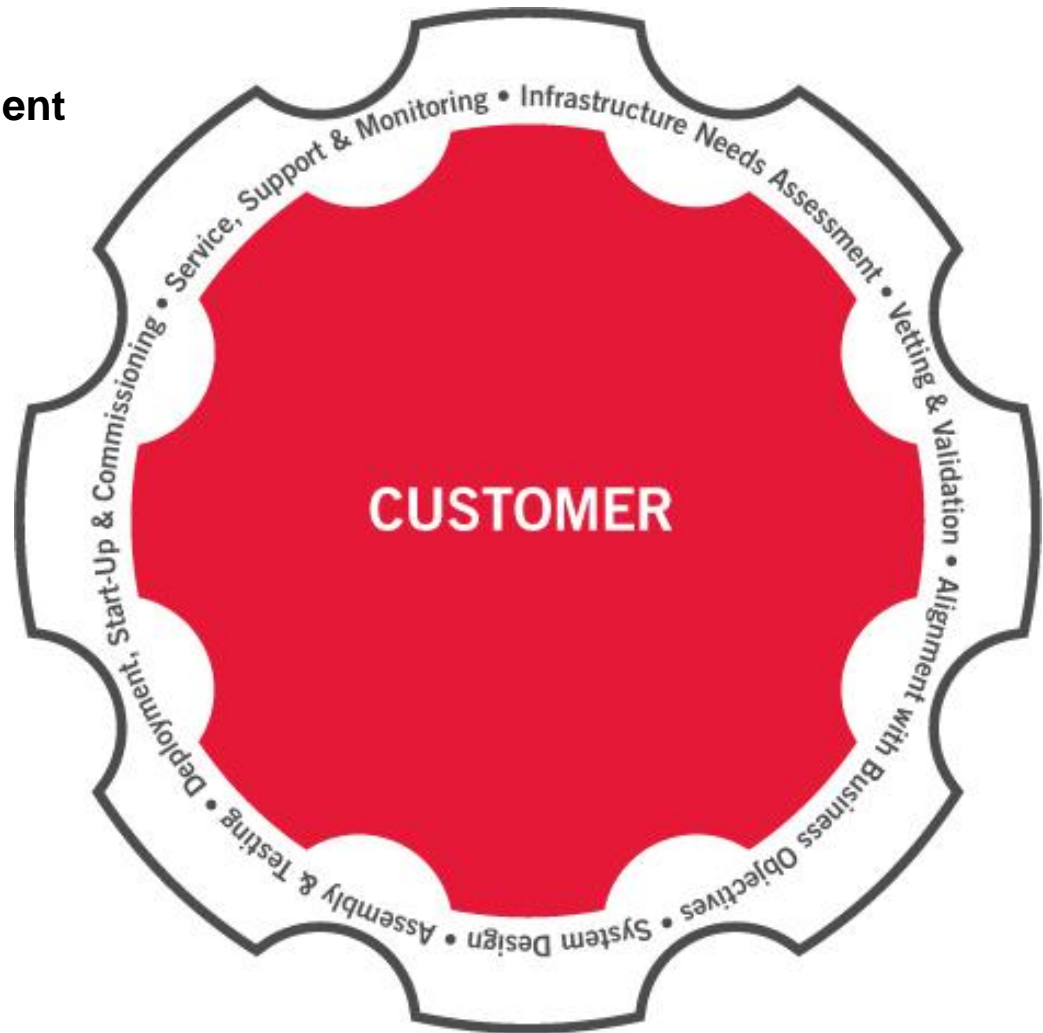
More Efficient

- » The critical power path demonstrates up to 98% efficiency
- » High partial load efficiency
- » If you LOSE less energy you USE less energy
- » Batteries not included
- » Lower real estate rent/lease
- » Lower tax on real estate (typically 1% of construction cost)
- » Lower building maintenance



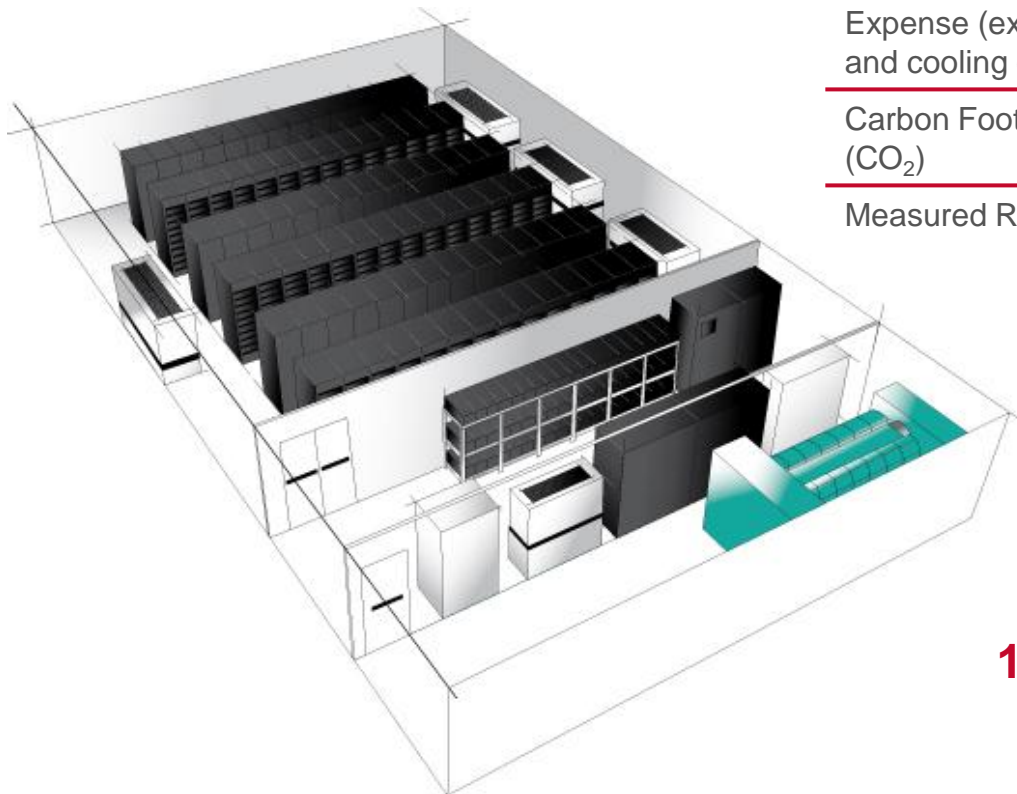
Customer Focused Project Management

- » Infrastructure Needs Assessment
- » **Vetting & Validation**
- » Alignment with Business Objectives
- » **System Design**
- » Deployment
- » **Start-Up & Commissioning**
- » Service, Support & Monitoring



Less Space

Legacy Data Center Build!



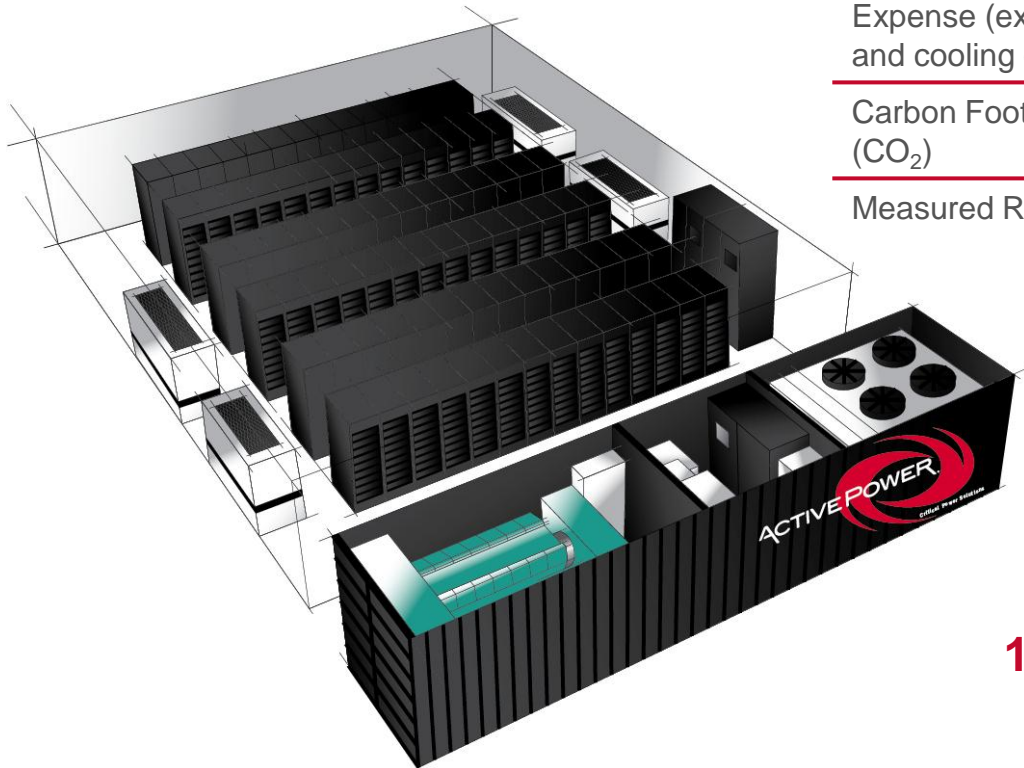
	Legacy	PowerHouse	Savings
Total Room Required	215 m ²		
Electrical Room vs. PowerHouse Cost	€673,000		
Annual Electricity Expense (excl. IT load and cooling cost)	€16,470		
Carbon Footprint (CO ₂)	159 Tons		
Measured Reliability	No		

100 Watts / Sq. Ft. Data Center

200kW N+1 IT Capacity

Less Space

PowerHouse™ Deployment!



	Legacy	PowerHouse	Savings
Total Room Required	215 m ²	171 m ²	21%
Electrical Room vs. PowerHouse Cost	€673,000	€504,000	25%
Annual Electricity Expense (excl. IT load and cooling cost)	€16,470	€4,347	74%
Carbon Footprint (CO ₂)	159 Tons	42 Tons	74%
Measured Reliability	No	7 times less likely to fail!	

100 Watts / Sq. Ft. Data Center

200kW N+1 IT Capacity



Technical Overview

PowerHouse Configurations

» Eight standard sizes, with options to support either:

- Critical (no-break) loads only
- Both critical and essential (short-break) loads

Single Output Rating (kW)	Dual Output Rating (kW)
200	200/132
400	400/266
600	600/360
800	800/480

» No-break and short-break loads

- No-break is fed directly from the UPS and backed up by the generator
- Short-break (optional) is fed directly from the generator

» Typical short-break loads:

- Chillers, air-handlers, lighting and other essential loads

PowerHouse Components



Air-Conditioning



Lighting



ATS



20' or 40' ISO Container



Diesel Generator

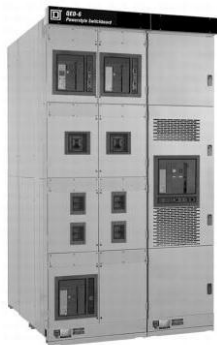
Regulatory Items



CleanSource UPS



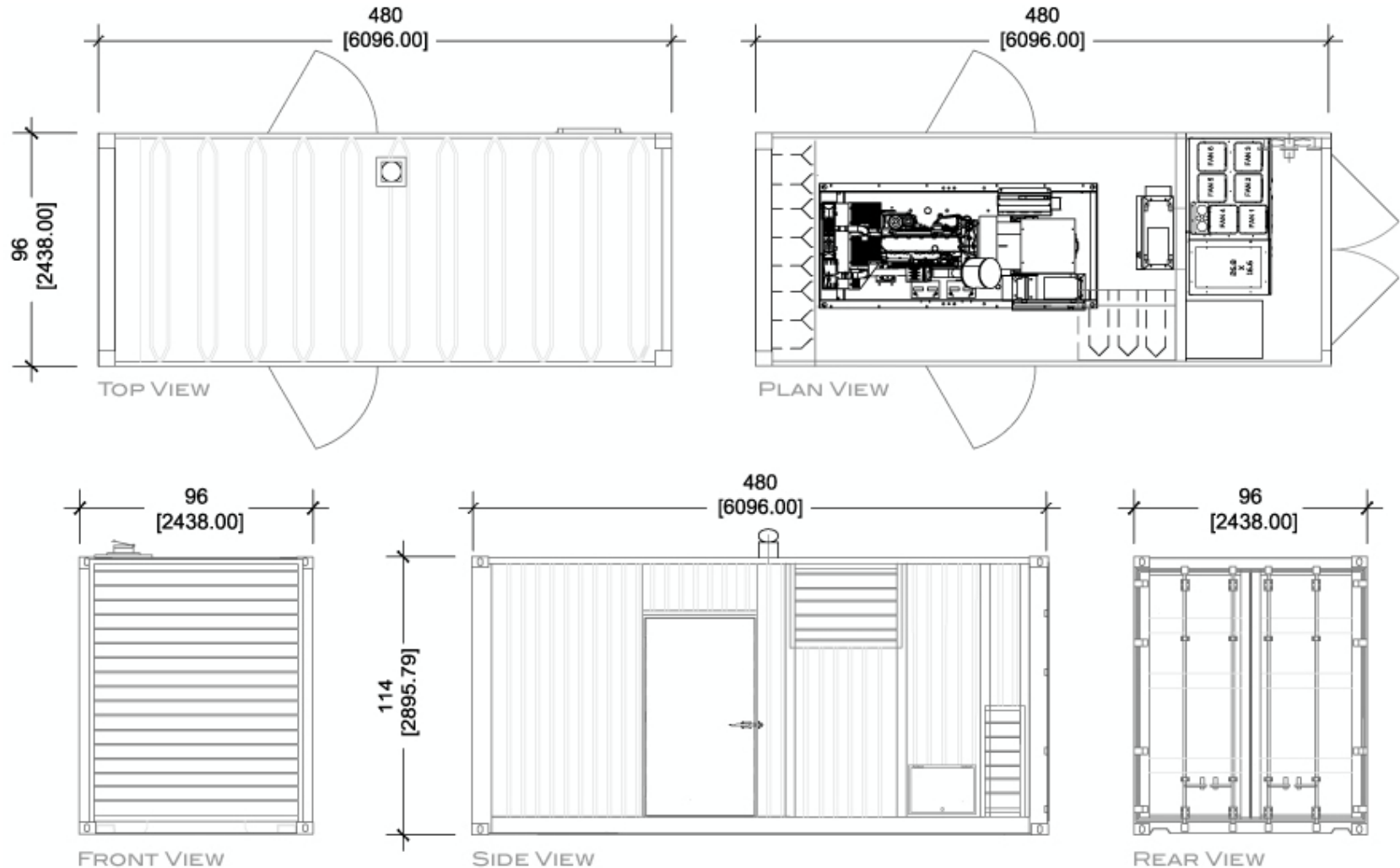
Fuel Tank



Switchboard

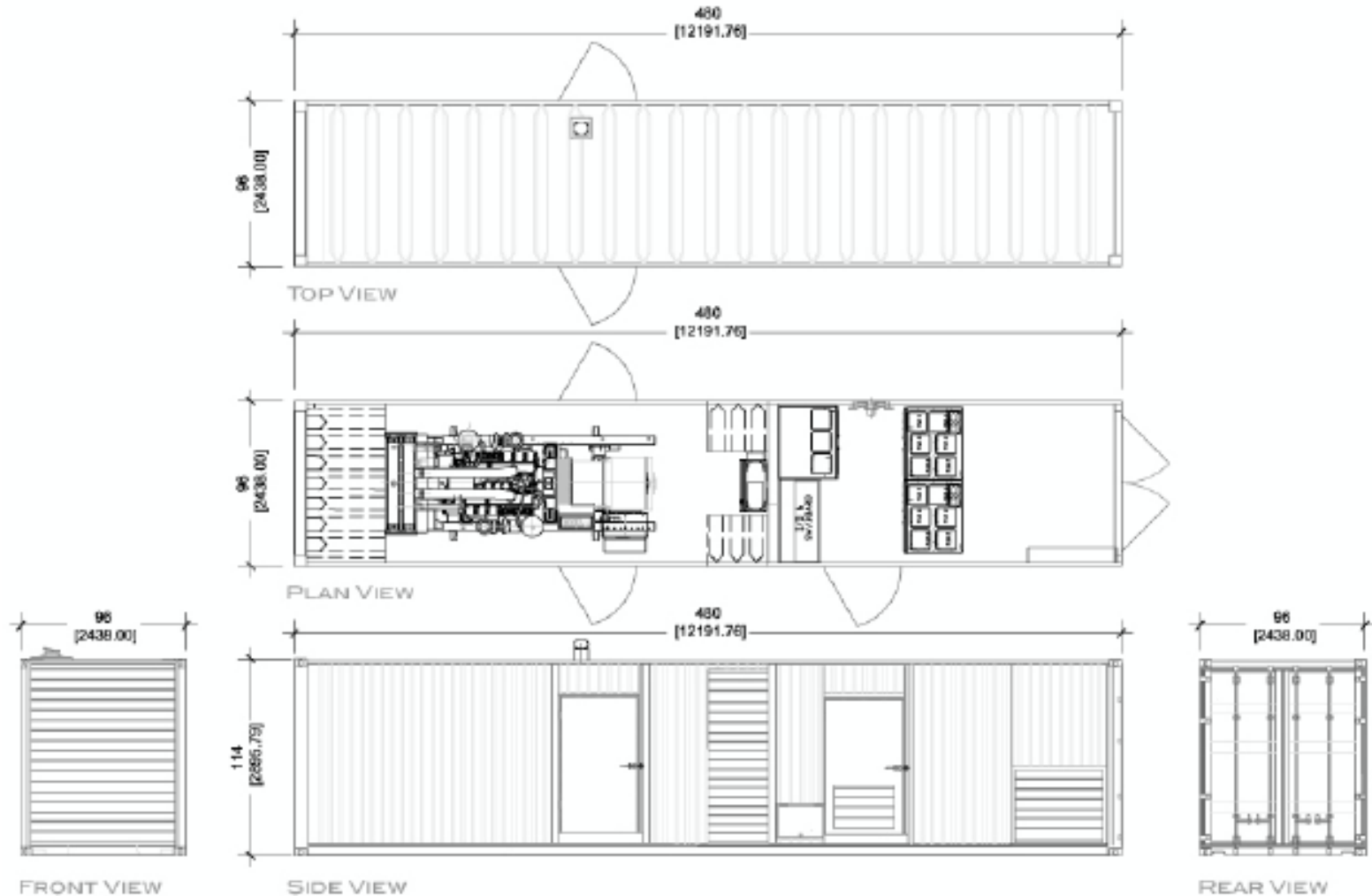
200kW Single and Dual Output Layout

1 20' ISO container



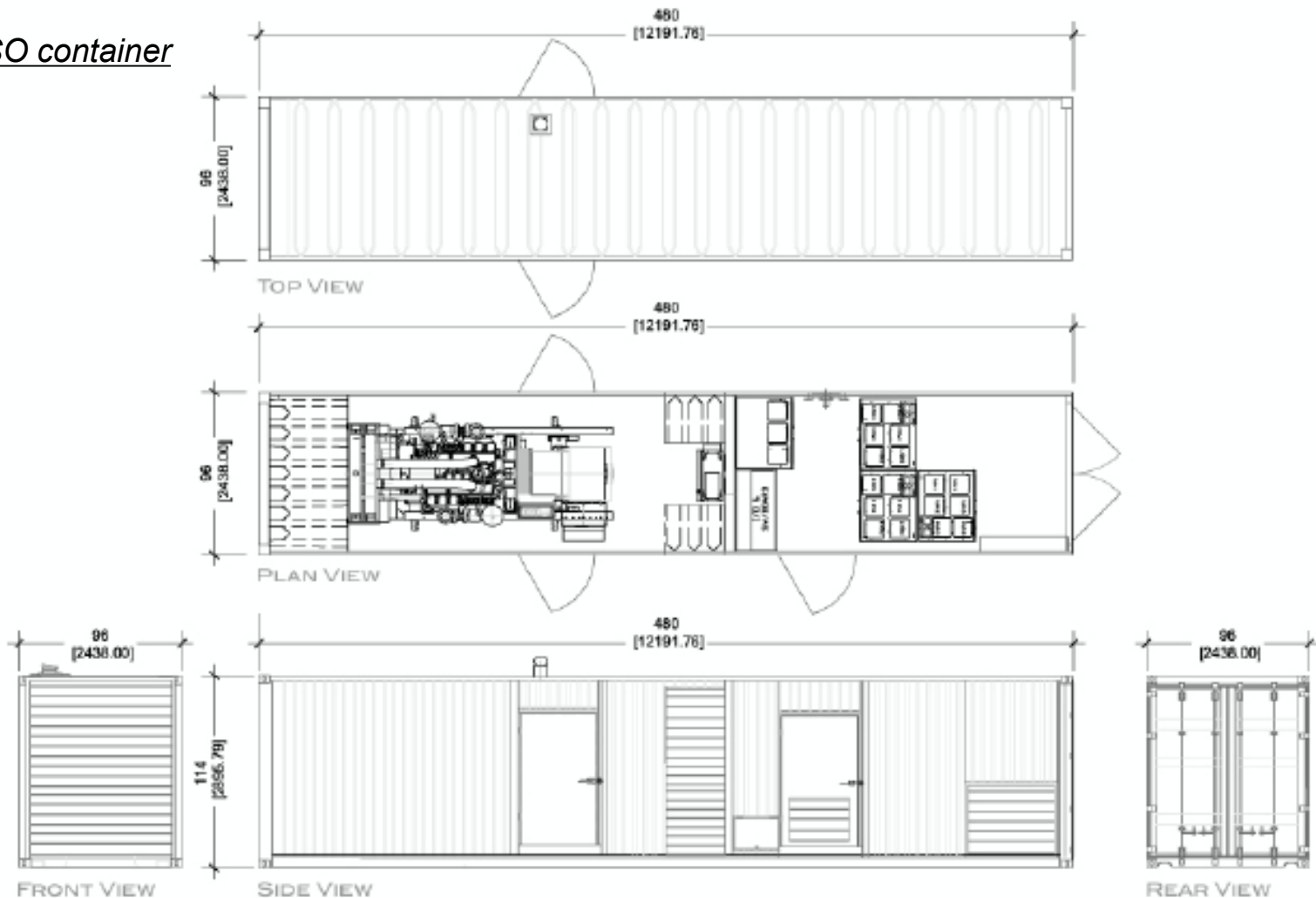
400kW Single and Dual Output Layout

1 40' ISO container



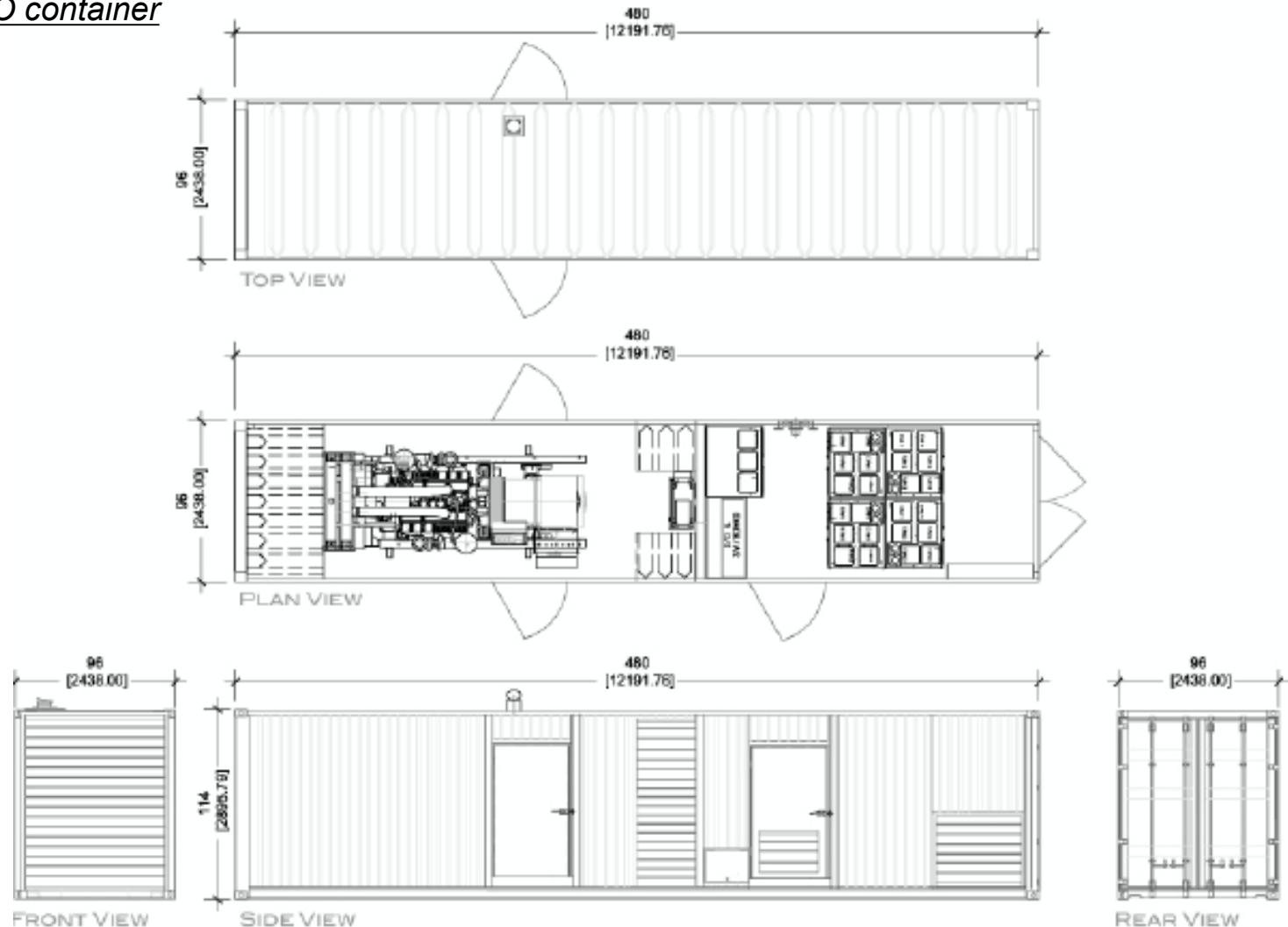
600kW Single and Dual Output Layout

1 40' ISO container



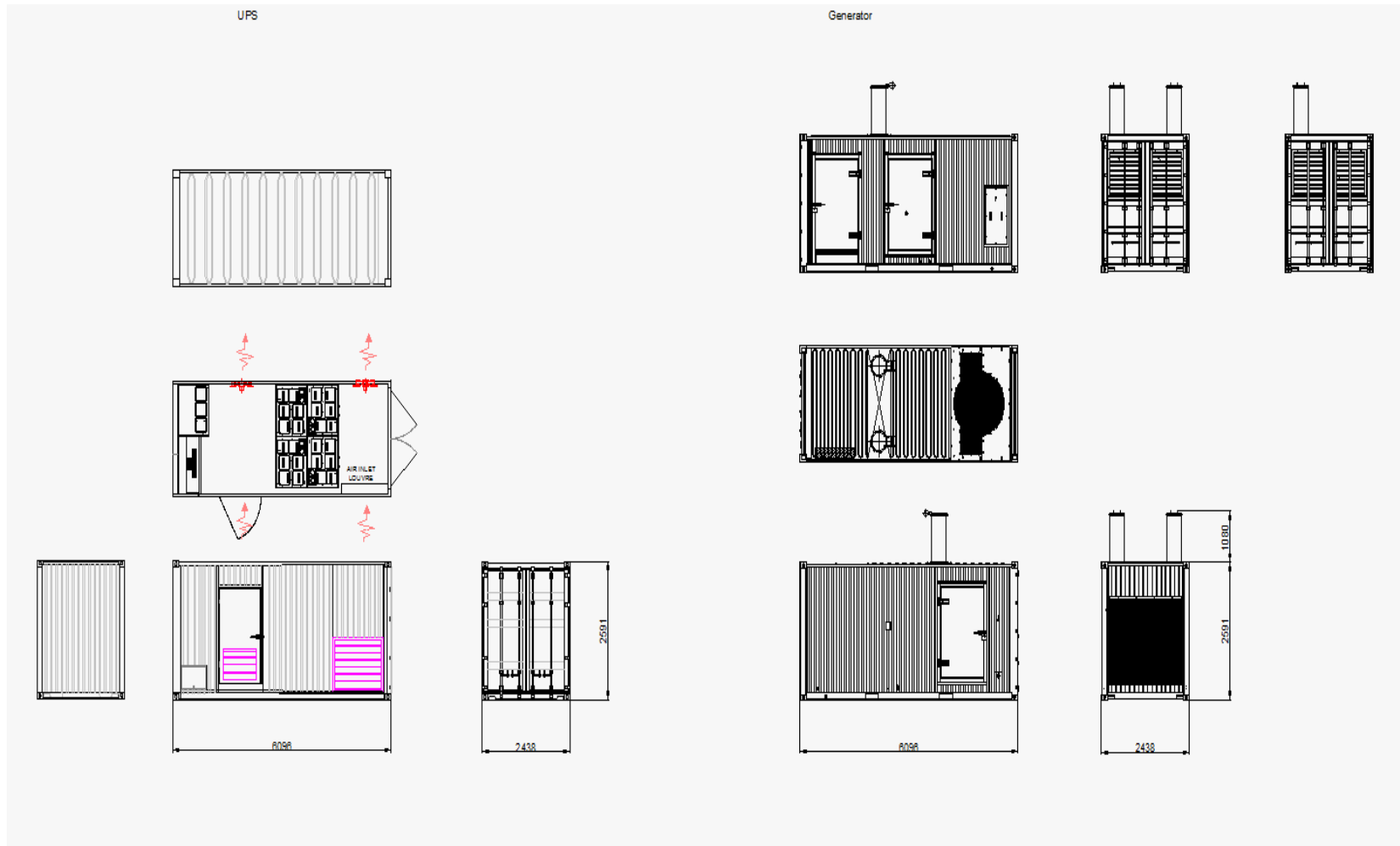
800kW Single Output Layout

1 40' ISO container

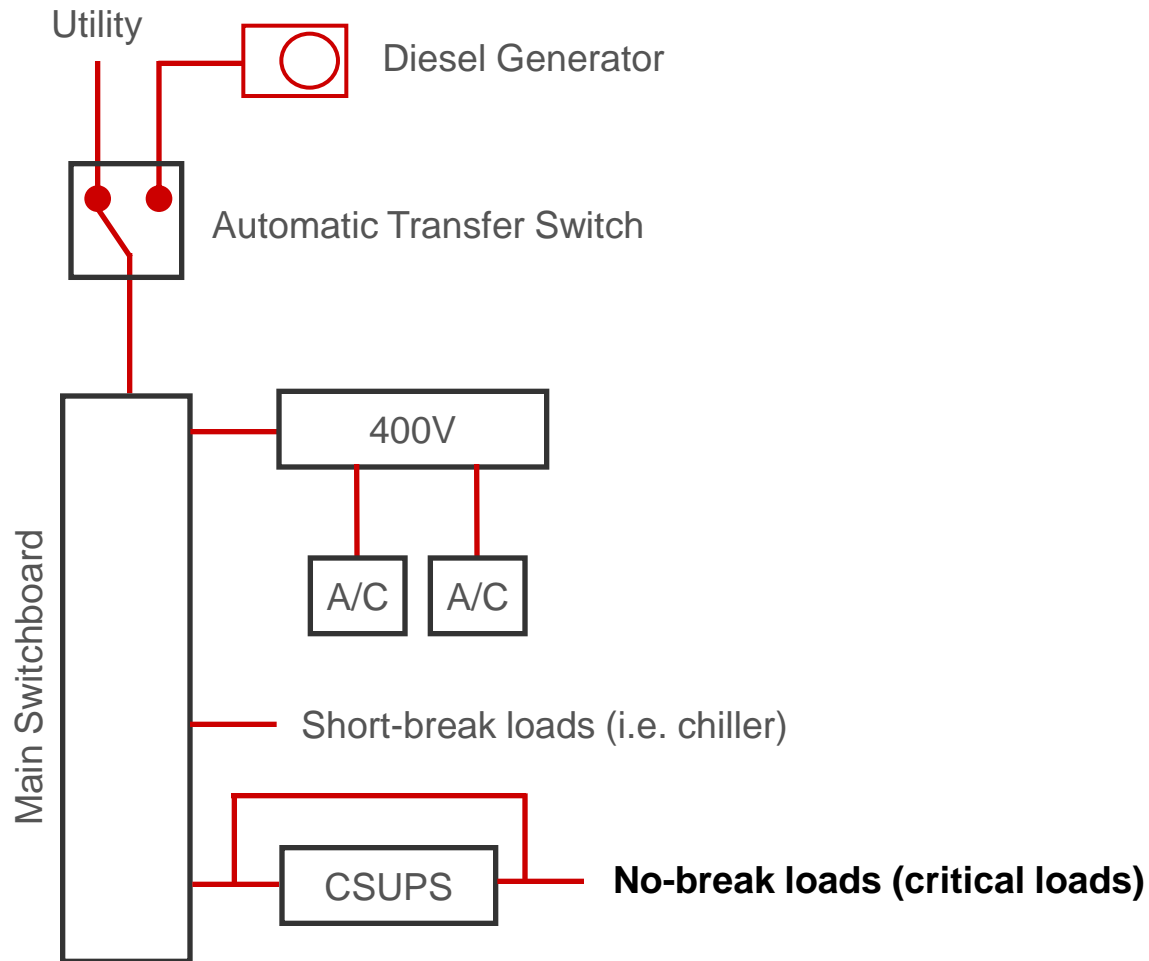


800kW Dual Output Layout

2 20' ISO containers



Typical One-Line



Options

- » External UL-2085 fuel tank (concrete encased)
- » Side electrical entry and exit
- » UL listing on the full container
- » Indoor space heaters
- » Draw-out switchboard breakers
- » UPS redundancy
- » Custom sizes



Specifications

Specifications – Dual Output

MODEL	PowerHouse™ 200kW	PowerHouse™ 400kW	PowerHouse™ 600kW	PowerHouse™ 800kW
RATING				
No-Break Capacity ¹ (kW)	200	400	600	800
Short-Break Capacity ² (kW)	133	266	360	480
ELECTRICAL				
INPUT				
Voltage	380/400/415 VAC 3-phase, 4-wire plus Ground			
Voltage Range	+10% / -15% (programmable) +/-10% 380VAC			
Frequency	50 Hz +/- 10% maximum (programmable) +/- 3% (default)			
Power Factor	0.8 at rated load and nominal voltage			
Surge Withstand	Meets IEEE 587/ANSI C62.41			
Generator Walk-In	1 to 15 seconds (programmable)			
Harmonic Distortion				
Linear Load	<3% at 100% load			
Non-Linear Load ³	<8% at 100% load			
Current - Nominal (380 VAC)	552	1104	1579	2106
Current - Nominal (400 VAC)	525	1049	1500	2000
Current - Nominal (415 VAC)	506	1011	1445	1927
Current - Max. Continuous	800	1600	2000	2500
Current - Max. Non-Continuous	840	1680	2100	2625
OUTPUT				
Voltage	380/400/415 VAC 3-phase, 4-wire plus Ground			
Voltage Regulation				
Steady State	+/-1% for +/-10% input			
Flywheel Mode	+/-1% steady state			
Transient	+/-1% within 50 mSec for 100% load step			
Voltage Distortion ³	<3% linear loads and <5% for 100% non-linear loads			
Frequency	50Hz (mains synchronised) (normal operation +/- 0.2% free running)			
Slew Rate	Adjustable from 0.2Hz/second to 3.0Hz/second			
Current - Nominal (380 VAC) No-break/Short-break	380 / 255	760 / 509	1140 / 684	1520 / 912
Current - Nominal (400 VAC) No-break/Short-break	361 / 242	722 / 484	1083 / 650	1443 / 867
Current - Nominal (415 VAC) No-break/Short-break	348 / 234	696 / 467	1043 / 626	1391 / 835
Short Circuit Capacity	10 x input (mains connected) Up to 10 x input (emergency operation)			
Critical Power Efficiency ^{4,5}	98%			

Specifications – Dual Output

GENERATOR				
Generator Size	440 kW	880 kW	1250 kW	1650 kW
Tank Capacity (Liters)	470	1,000	1,500	1,500
Autonomy @ 75% load (hours)	7	7	9	7
ENVIRONMENTAL				
NOISE AND PROTECTION				
Audible Noise	85dB(A) @ 1 Meter			
Protection	NEMA 2 / IP 12			
TEMPERATURE				
Operating	14 to 104 degrees Fahrenheit -10 to 40 degrees Celsius			
Storage	-13 to 158 degrees Fahrenheit -25 to 70 degrees Celsius			
HUMIDITY	Up to 99% (non-condensing)			
ALTITUDE ⁶	Up to 3,000 feet Up to 1,000 meter			
EMISSIONS AND IMMUNITY	EN 50091-2			
PHYSICAL DATA				
Container A (main components)	Generator and UPS		UPS	
Height	9 feet 6 inches			
	2,896 mm			
Width	8 feet			
	2,438 mm			
Length	20 feet	40 feet		20 feet
	6,096 mm	12,192 mm		6,096 mm
Weight	24,250 lbs	48,501 lbs	57,320 lbs	34,000 lbs
	11,000 kg	22,000 kg	26,000 kg	17,000 kg
Container B (main components)			Generator	
Height			9 feet 6 inches	
			2,896 mm	
Width			8 feet	
			2,438 mm	
Length			20 feet	
			6,096 mm	
Weight			34,000 lbs	
			17,000 kg	
Electrical Entry	Side / Bottom			
SAFETY	EN62040-1-1			
STANDARDS	IEC88528-11			

¹ Load protected by uninterruptible power supply and generator

² Load supported by generator; 10 second break (programmable), sized for mechanical loads

³ EN59001-3

⁴ DC energy storage off-line

⁵ Engine pre-heater off-line

⁶ Please contact Active Power for higher elevations

Specifications – Single Output

MODEL	PowerHouse™ 200kW (single output)	PowerHouse™ 400kW (single output)	PowerHouse™ 600kW (single output)	PowerHouse™ 800kW (single output)
RATING				
No-Break Capacity ¹ (kW)	200	400	600	800
ELECTRICAL				
INPUT				
Voltage	380/400/415 VAC 3-phase, 4-wire plus Ground			
Voltage Range	+10% / -15% (programmable)+10% 380VAC			
Frequency	50 Hz +/- 10% maximum (programmable) +/- 3% (default)			
Power Factor	0.99 at rated load and nominal voltage			
Surge Withstand	Meets IEEE 587/ANSI C62.41			
Generator Walk-In	1 to 15 seconds (programmable)			
Harmonic Distortion				
Linear Load	<3% at 100% load			
Non-Linear Load ²	<5% at 100% load			
Current - Nominal (380 VAC)	421	842	1263	1684
Current - Nominal (400 VAC)	400	800	1200	1600
Current - Nominal (415 VAC)	386	772	1158	1542
Current - Max. Continuous	520	1040	1560	2000
Current - Max. Non-Continuous	540	1080	1620	2080
OUTPUT				
Voltage	380/400/415 VAC 3-phase, 4-wire plus Ground			
Voltage Regulation				
Steady State	+/-1% for +/-10% input			
Flywheel Mode	+/-1% steady state			
Transient	+/-1% within 50 mSec for 100% load step			
Voltage Distortion ²	<3% linear loads <5% for 100% non-linear loads			
Frequency	50Hz (mains synchronised) (normal operation +/- 0.2% free running)			
Slew Rate	Adjustable from 0.2Hz/second to 3.0Hz/second			
Current - Nominal (380 VAC)	380	761	1141	1521
Current - Nominal (400 VAC)	361	723	1084	1445
Current - Nominal (415 VAC)	348	696	1045	1393
Short Circuit Capacity	10 x input (mains connected) Up to 10 x input (emergency operation)			
Critical Power Efficiency ^{3,4}	98%			

Specifications – Single Output

GENERATOR				
Generator Size (kW)	350	630	800	1,000
Tank Capacity (Liters)	470	1,000	1,500	1,500
Autonomy @ 75% load (hours)	8	7	7	6
ENVIRONMENTAL				
NOISE AND PROTECTION				
Audible Noise	85dB(A) @ 1 Meter			
Protection	NEMA 2 / IP 12			
TEMPERATURE				
Operating	14 to 104 degrees Fahrenheit			
	-10 to 40 degrees Celsius			
Storage	-13 to 158 degrees Fahrenheit			
	-25 to 70 degrees Celsius			
HUMIDITY	Up to 99% (non-condensing)			
ALTITUDE ⁵	Up to 3,000 feet			
	Up to 1,000 meter			
EMISSIONS AND IMMUNITY	EN 50091-2			
PHYSICAL DATA				
Container A (main components)	Generator and UPS			
Height	9 feet 6 inches			
	2,896 mm			
Width	8 feet			
	2,438 mm			
Length	20 feet	40 feet		
	6,096 mm	12,192 mm		
Weight	24,250 lbs	44,092 lbs	57,320 lbs	37,479 lbs
	11,000 kg	22,000 kg	26,000 kg	17,000 kg
Electrical Entry	Side / Bottom			
SAFETY				
STANDARDS	EN62040-1-1			
	IEC88528-11			

¹ Load protected by uninterruptible power supply and generator

² EN59001-3

³ DC energy storage off-line

⁴ Engine pre-heater off-line

⁵ Please contact Active Power for higher elevations

Q & A

