SuperGen™

Variable Speed Genset
and Ultra-capacitor

50kW~2000kW

- Super diesel efficiency within all load range
- Super reliable power buffer high level impact

Breakthrough Power Solutions for Primary Power
Hybrid Renewable Systems and Microgrids

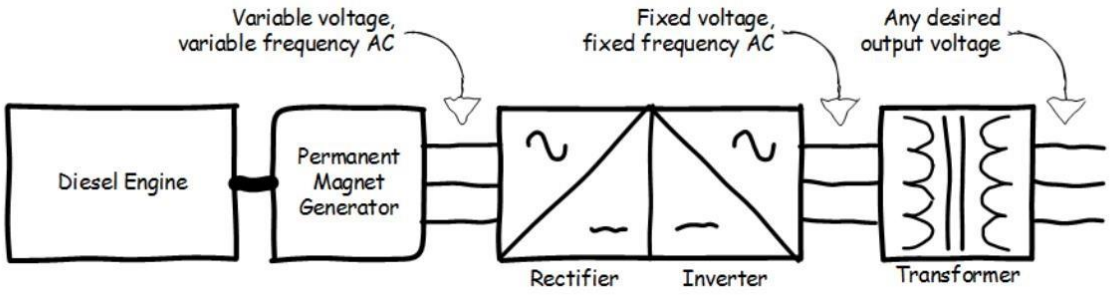
FossilPower

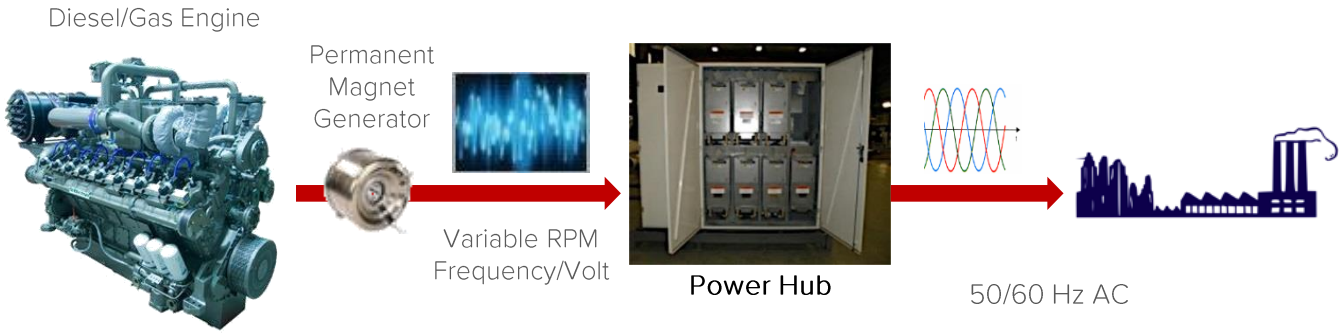
A company of TEX

CAIGATETEX
ENERGY SOLUTIONS

SuperGen key features

- ISO Containerized Module
- Mobile with CSC certificate
- Cloud management
- Scalable up to 30MW
- Plug & Play





Unlocking Benefits

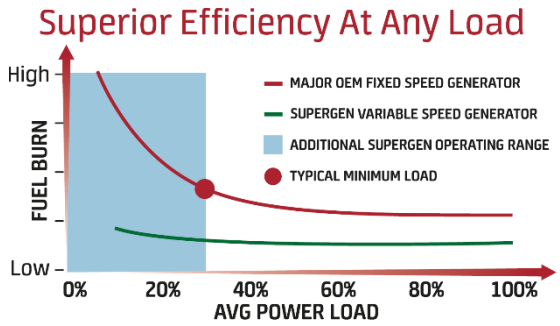
- Improved Renewable Pairing
- Improved Fuel Efficiency
- Improved Dynamic Response
- Improved Emissions intensity
- Expanded application

More efficiency, More reliable and Cleaner

☑ Improve product efficiency

SuperGen will lower fuel, operating, and Maintenance costs to provide a customer return on investment that pays for the system in under 2 years.

- Reduce fuel consumption up to 60%
- Engine Operating hours Reduction up to 40% (with energy storage)
- Maintenance by -40% (with energy storage)

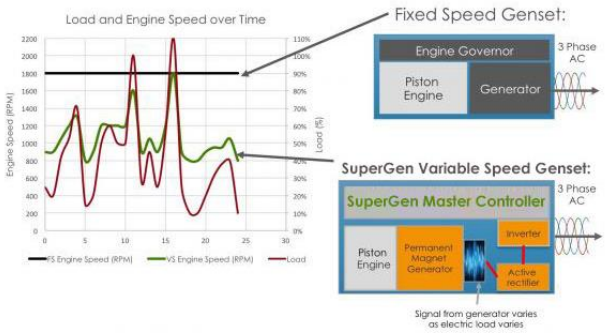


☑ Higher power quality

SuperGen will provide utility grade power quality and reliability in all applications.

- Recovery time < 100ms
- Transient Frequency dip < 1.5Hz
- AC: Transient Voltage dip < 3%

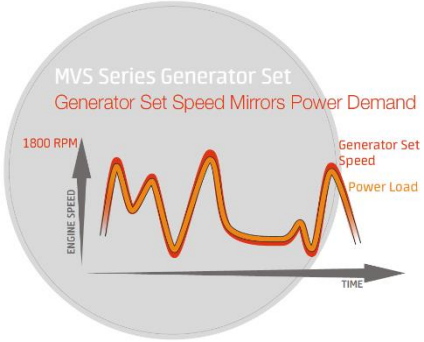
  DC: Transient Voltage dip <15%



☑ Reduce carbon footprint

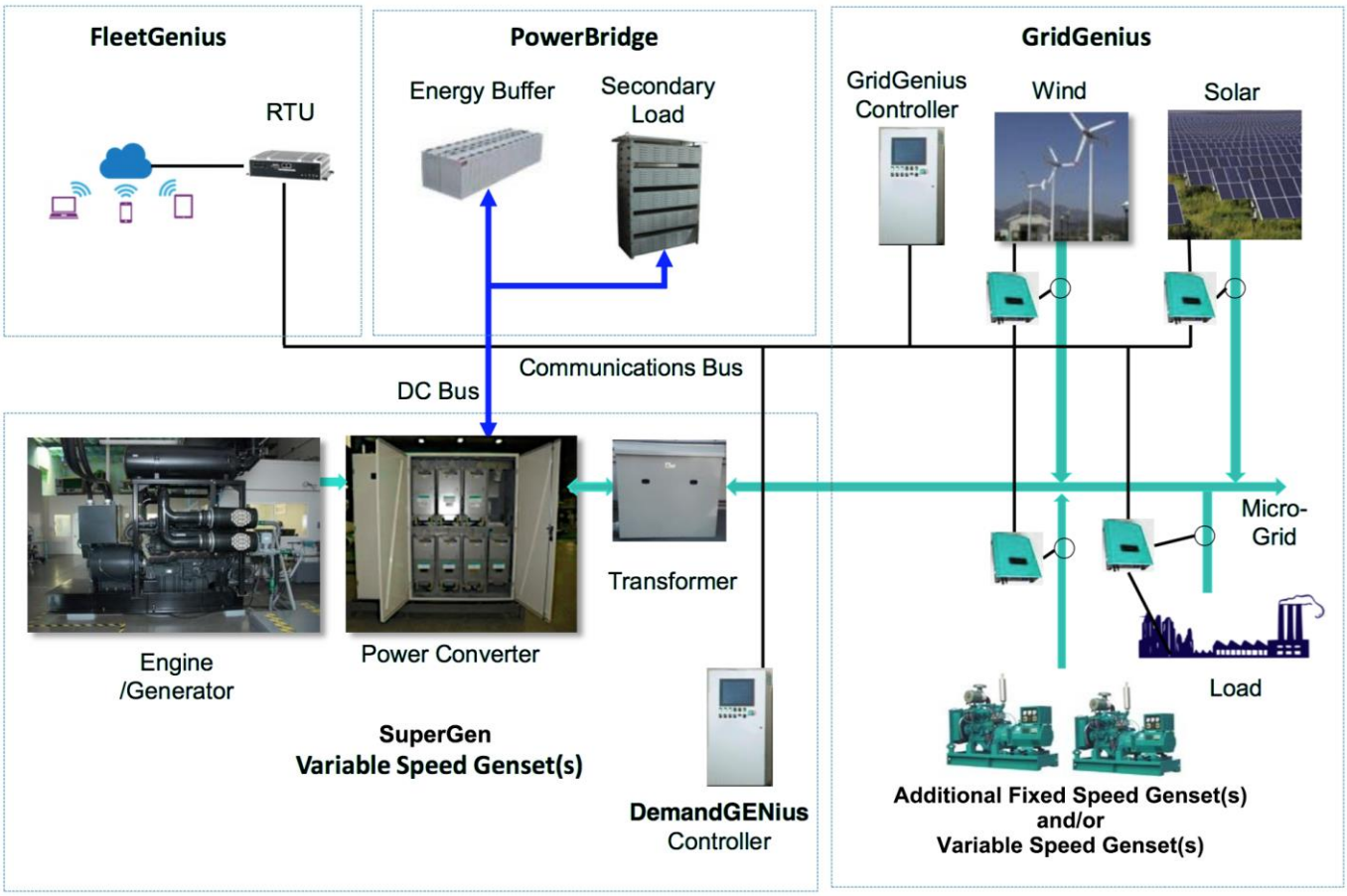
SuperGen will provide the best available carbon emissions utilizing most current, low emission internal combustion engines.

- 100% penetration of Renewable in diesel Hybrid Systems
- Passible to reduce size of genset
- From 20% to 80% less CO2 emitted
- Increase time between service and overhaul by 25% or more



Application for Hybrid Microgrid

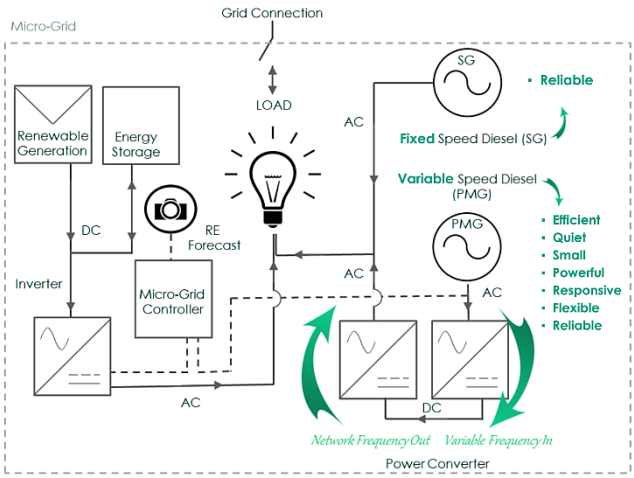
System composition



Minimize + Optimize + Maximize

- **Minimize** power LCO & emissions
  - ➝ Grid-tied, Microgrid, Off-grid
- **Optimize** power configuration
  - ➝ Diesel, Gas Solar, Wind, Storage (AC or DC coupled)
- **Maximize** power quality and grid stability
  - ➝ Real & Reactive power

Single line diagram



SuperGen is changing the traditional market

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Oil & Gas

Construction

RTG

Marine

Off-grid Microgrid

Hybrid power station

Railway

Telecom

Mine

Military

SuperGen 600 product description

590 kW / 737 kVA
Prime Power
Variable Speed Diesel Generator Set

Overview

The SuperGen 600 prime power commercial generator set (genset) is a fully integrated power generation system. It provides optimum performance and reduced operating costs through SuperGen Power's Variable Speed Technology. By decoupling engine speed from electrical frequency, our system can run the engine at the most advantageous operating speed for any given load. With the application of Ultra capacitor, which buffer the impact from the load, stabile the power supply and significand improve the power quality.

Proven MTU Engine

The SuperGen 600 uses the MTU 12V-1600 C70 diesel engine, which meets U.S. EPA Tier 4 final emissions requirements. This engine deploys high-pressure common rail injection, 2-stage turbo-charging and cooled exhaust gas recirculation, without the use of after-treatment.

Permanent Magnet Generator (PMG)

The high-efficiency PMG is designed specifically for SuperGen Power's Variable Speed Technology.

Power Converter

SuperGen Power's variable speed operation is accomplished through proven power converter technology commonly deployed in the renewable energy industry. The power converter used in the SuperGen 600 is designed for high reliability, high power density, and easy maintenance through modularity.
It provides a variety of grid support features such as automatic grid synchronization, paralleling, and volt ampere reactive (VAR) support without additional equipment.

Key Features

Fuel Savings

Conventional fixed-speed gensets waste fuel when running below rated load. By setting the engine to the optimum speed for a given load, SuperGen Power's Variable Speed Technology achieves up to 35% fuel savings.

Reduced Emissions

By reducing fuel consumption and optimally loading the engine, SuperGen Power's Variable Speed Technology reduces emissions up to 40% when compared to conventional fixed-speed gensets.

Extended Operating Life

Since the engine normally operates at lower speed when compared to a fixed-speed genset, engine wear and tear is greatly reduced. Running the engine at optimum speed reduces service issues due to "wet stacking" and "coking", which result from incomplete combustion at low load, high RPMs. Engine speed optimization extends periods between overhauls and reduces maintenance costs.

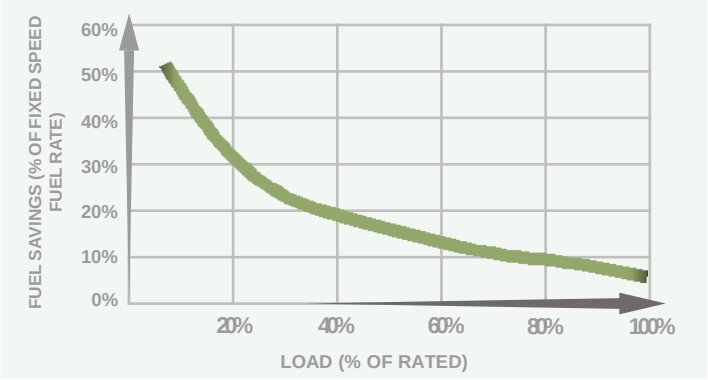
Variable Speed Cooling System

By running the cooling fan at the optimum speed for the ambient conditions and load, SuperGen Power's Variable Speed Technology minimizes parasitic loss thereby maximizing system efficiency.

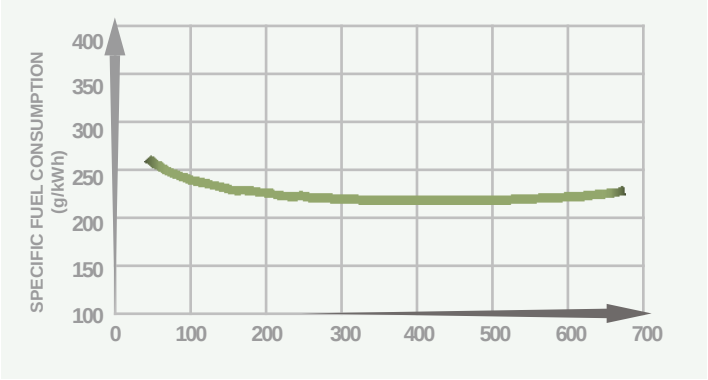
PowerView™

PowerView is SuperGen Power's proprietary Supervisory Control and Data Acquisition (SCADA) and visualization system. It provides a user interface with extensive data logging and complete system diagnostics. PowerView provides secure remote monitoring and fleet management from internet connected devices.

Variable Speed Fuel Savings



Specific Fuel Consumption



SuperGen 600 technical data

Generator Set Specifications

System	
Prime Power Rating	590 kW / 737 kVA at 50 or 60 Hz
Overload Rating	10% for limited time
Reactive Power Support	Any power factor, total kVA < 737
Nominal Rated Output Voltage	480V standard, any other voltage selectable
Nominal Rated Output Frequency	50/60 Hz selectable without derating
Generator set Performance Class	ISO 8528-5 G2/G3 optional
Total Harmonic Distortion (THD)	<3%
Allowable Load Imbalance, Ø to Ø	±33% of rated power
Engine	
Manufacturer	MTU
Model	12V-1600 C70
Design	4 cycle, OHC, turbo-charged and after-cooled
Displacement	21 L (1281 cu. In.)
Cylinder Configuration	12-Cylinder, 90° V
Bore/Stroke	122 mm/150 mm (4.8 in./5.9 in.)
Fuel System	Direct injection
Starting Voltage	24V, negative ground
EPA Emissions	Tier 4 Final
Generator	
Generator Type	Interior Permanent Magnet (IPM)
Number of Poles	8
Insulation Rating	Class H
Temperature Rise	Class B
Generator Cooling	Liquid-cooled
Coupling Type	Torsional soft rubber coupling
Bearings	2-bearing, L10 180,000 hrs.
Converter	
Rectifier	Active rectifier
Switching Device	IGBT
Cooling	Liquid
Circuit Breaker	Included
Output Terminal Provisions	Bus bar tabs w/M12 studs
Environmental	
Temperature Range, Operating	-15° C to 50° C
With Cold Weather package	-40° C to 50° C
Temperature Range, Storage	-40° C to 55° C
Full Power Operation Temperature Limit , Without De-rate	35° C
Temperature De-rating	4% per 10° C
Full Power Operation Elevation Limit, Without De-rate	1,200 m
Elevation De-rating	1% per 100m
Humidity	0-90% non-condensing
Physical Characteristics	
Power Pack (engine and generator), L x W x H	
Dimensions, L x W x H	3048 x 1270 x 1524 mm (120 x 50 x 60 in)
Weight, Dry	5602 kg (12350 lb.)
Converter	
Dimensions, L x W x H	2082 x 930 x 2150 mm (82 x 37 x 85 in)
Weight, Dry	2200 kg (4850 lb.)
Cooling System (Remote Radiator Skid)	
Dimensions, L x W x H	2463 x 2057 x 2438 (97 x 81 x 96 in)
Weight, Dry	3084 kg (6800 lb.)
System Options	Cold weather package
	ISO Container Packaging
	Revenue-grade power/energy meter

Monitoring and Control

Engine Speed Control	Variable speed for optimum efficiency
Cooling System	Variable speed for optimum efficiency
Grid Synchronization	Automatic, built-in
Communication Interface	Modbus TCP, Modbus RTU
I/O Interface	
Digital Inputs	Start/stop, fault reset, load-on warning
Digital Outputs	Warning alarm, fault alarm
Analog Outputs	Two, configurable
Panel Interface	
Annunciators	Control power on, system on, ready, warning, fault lights, starting beeper
Buttons	Pre-heat, start, stop, reset faults, emergency stop
User Interface Display	15-inch touch panel with PowerViewTM displays comprehensive real-time data, active and historic alarms, trends and events
Data Acquisition	PowerViewTM stores over 200 parameters in a exportable database
Remote Software Updates	With customer-provided Internet connection
Alarms	Over 2000 diagnostic alarms including complete engine and power system.

PowerView™ User Interface

Case study

Variable Speed Generators for Canada Arctic Communities

Aklavik, NT An NTPC Project

Population: 590~Households: 300

Access: Airport, road-Barge, Ice Road

Fuel savings: 80,000 litres/year

Emissions: 210 Tonnes GHG reduction

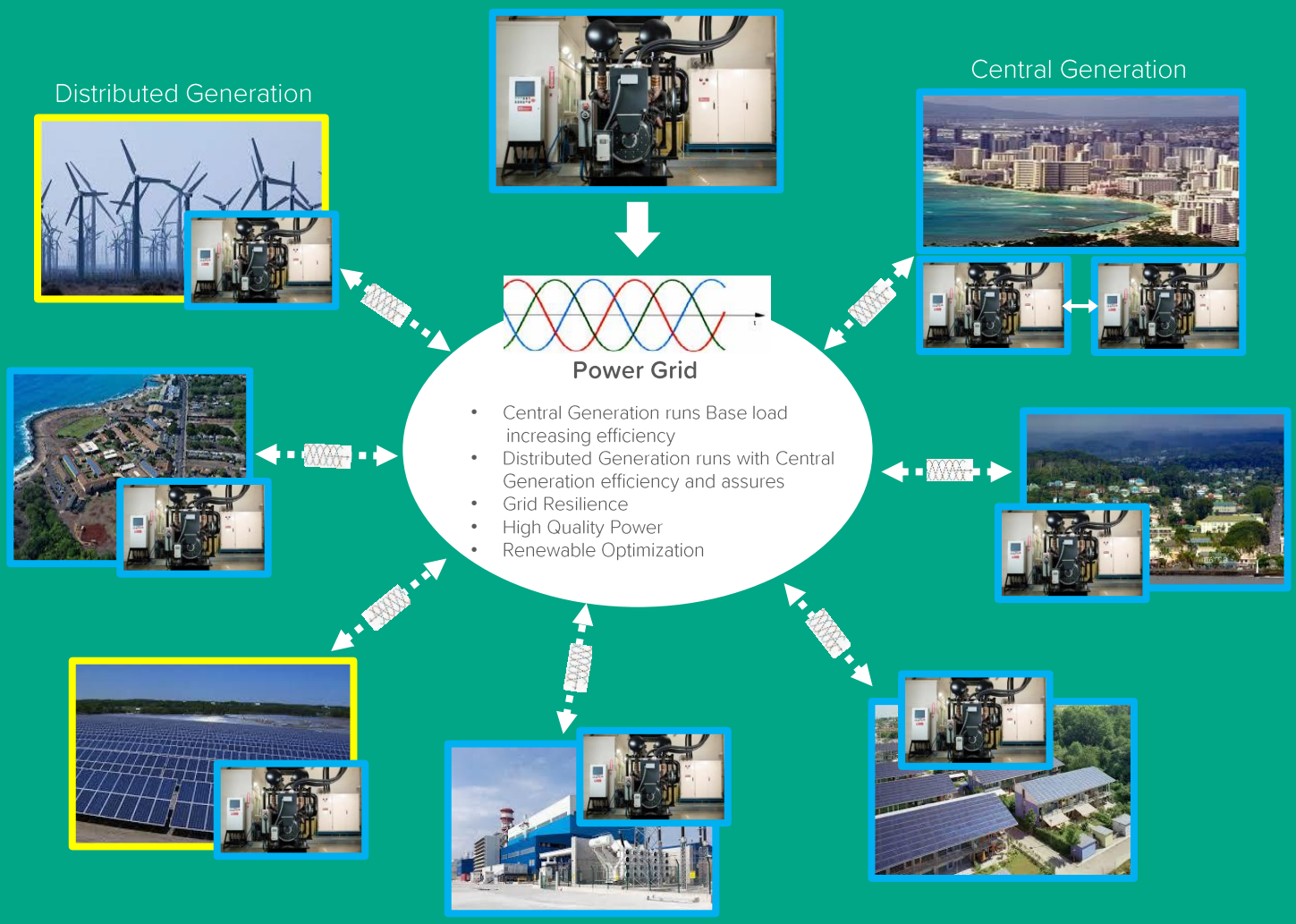
Peak Rating: VSG 590 kW Prime Power

System Configuration: Diesel Generation with Solar

Solar: Low Penetration 1st Phase-55kW

LT Goal: High penetration Renewables

New era of energy – distributed generation



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