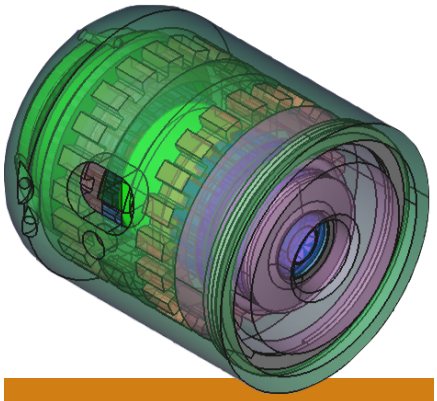
infiniRel
RESILIENT POWER CONTROL

Micro-flywheel Technology for Distributed Micro-Grids

GyroVerter™



TECHNOLOGY
Integrated homopolar motor-generator with GaN-controlled energy storage capabilities.

POWER SEGMENT
15-kW to 1,500-kW

STATUS
- ☑ 3 PCT patent applications
- ☑ Proven physics
- ☑ Proof-of-Concept modelled

BUSINESS MODEL
a) Global OEM sales & distribution
b) Licensing (hardware partners)

TARGET MARKETS
1. Solar-Wind **Microgrids** ($25B)
2. Diesel/Natgas Power Plants
3. Micro-turbines (mining, islands)

CUSTOMERS & PARTNERS
a UK-based PV Solar EPC with a 150-MW project pipeline (1)
USP&E Global (2)
Dynamo MicroPower (3)
SBE Inc., Electro-Dynamics, Inc.,

COMPETITION
Dresser-Rand (hispeed generator)
Maxwell, Ness (supercapacitor)
FlexGen (O&G drill-rig power)

FINANCING
2015: $ 1.5MM first pilots
2016: $ 4-MM early production
2017: $ 8-MM product scaling

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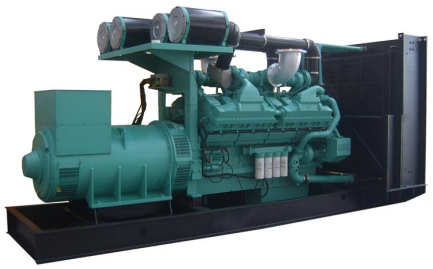
infiniRel solves the Energy Storage conundrum for distributed power generation with aircraft-inspired micro-flywheel generator technology for micro-grids.
Project Developers, who integrate multiple energy sources, would benefit from an adaptive power conversion and storage solution to stabilize grid power for:

- base camps,
- military forward bases,
- mining sites,
- oil&gas well and drill sites,
- storm-prone coastal regions,
- island utilities, and
- community micro-grids.

Cost-effective integration of renewables (solar, wind) with traditional energy resources (diesel, natural gas) reduces total cost-of-ownership, O&M burden, logistics and reverse logistics costs. and improves fuel efficiency that could accelerate pay-back by 12 months. Gyroverter technology uniquely combines proven **aircraft-inspired power** architecture with the high-power capabilities known of military rail-guns. Both have been deployed since the 90-ies on NAVY destroyers to catapult missiles up to 2,700-mph. The company has an agreement-in-principal to execute a share-swap with a still privately-held, global project developer and a pipeline of 150-MW of solar projects in India and Brazil. This translates into $30-MM in revenues in the next four years.

Unstable grids and islands suffering from poor power quality often deploy over-designed and less efficient reciprocal (e.g. Diesel and LNG) engines, that are inadequately slow to handle demanding cyclic loads, sometime even regenerative modes, of pump jacks, drill rigs, HVAC pumps and compressors. Traditional flywheels and containerized battery storage solutions are marginally economical, and only preferred when uptime is paramount. Consequently, premature failure of equipment, combined with global tightening of regulations on emission controls, increase production costs that translate into a **$25-Billion** micro-grid opportunity for micro-turbines, cost-effective solar-wind hybrids, more efficient turbo-diesel power plants, and robust nat-gas gensets.

Similar challenges are shared with Electric Vehicles at sea, road or rail, and fuel cells: all suffer from the lack of *affordable* (e.g. battery) energy storage.



Diesel/NatGas Turbo-generator

A Power Platform

GyroVerters are adaptive, integrated energy conversion and storage systems for renewable energy project developers, who develop a distributed power generation infrastructure: configured as a compact energy converter with integrated storage, GyroVerters integrate three core functionalities into a single unit:

a) a power-agnostic motor,
b) an adaptive generator, and
c) a flywheel for energy storage.

GyroVerters can be configured as a motor, generator, or simultaneous motor-generator for DC, AC, or 3-phase power applications. They are scalable from kilo-Watt to Mega-Watt power levels, providing fault-tolerant energy with superior line and load transient response, even under most adverse operating conditions.

What is special?

Unlike all permanent-magnet (PM) machines, GyroVerters are magnet-free and also eliminate the rectifier, grid-tie inverter, motor inverter, and gearbox. Controlled by an artificial magnetic field with only a fraction of power compared to conventional electronics in traditional flywheels (Gyro) and inverters, GyroVerters also store enough energy to function as an electronic shock absorber to the grid, however, without the cycle limitations of batteries or complexity of super-capacitors. In motor configuration, GyroVerters start a turbine on AC, DC, or even *dirty* power from unstable, fluctuating, power grids. Fault-tolerant under open and short circuit condition, its underlying physics principles and wound-field architecture have been proven in ocean-rated aircraft and high-powered military rail guns.

The Team

Founder/CEO Bert Wank served semiconductor industry leaders including Texas Instruments (TI), and Dallas Semi, creating over $10 Billion in acquisition value. Launching 14 novel power product lines, he generated more than $100-MM in new product revenues. He authored infiniRel's three pending patents, holds a B.S.E.E. in Control Systems Engineering from Germany and an MBA in International Business from Thunderbird (AZ). In 2012 he served as a Director on the Board at Pancon, a manufacturer of high-power film capacitors, and recently joined the Advisory Board of Supreme Gridtech, a remote management system company out of Bangalore, India.

Co-founder Tom Sutrina holds 36 patents, 12 of which claim inventions for electric motors, drives, and power electronics packaging applied to aircraft systems such as the Boeing 737 solid-state generator. While at Sundstrand, Tom's team also developed a 350-HP torpedo propulsion system that weighted only 100-lbs. Tom served as R&D project engineer on prototypes for NASA, Boeing and GE.

Our Advisors include Vess Johnson, PhD, who served as interim CEO of SemiSouth, a Silicon Carbide power device manufacturer acquired by Cree, and Dr. Silviu Darie, the father of power flow modeling, who developed the "EDSA" software for

TOP-10 ADVANTAGES

- ☑ 3-30 s full-power ride-through
- ☑ No grid-tie inverter
- ☑ No gearbox, Direct-Drive
- ☑ No costly (rare earth) magnets
- ☑ Power agnostic (AC, DC, dirty)
- ☑ VAr compensating
- ☑ Speed insensitive
- ☑ Small form factor (50W/cu-in)
- ☑ Integrated motor-generator
- ☑ Fault-tolerant

PRODUCT PLAN

Initial 15-kW GyroVerter pilot,
Production scaling:
30-kW, 65-kW, 125-kW, 250-kW
500-kW, 1-MW- 1.5-MW
Electric-Turbos & Turbogenerators

FUTURE EXPANSION

Adaptive High-Speed Motors for:

- ☑ pumps (i.e. hydraulic)
- ☑ blowers (i.e. aeration)
- ☑ compressors (i.e. gas)

EXIT TARGETS

Exit by acquisition, i.e. to
ABB, Bosch, GE, Siemens, WEG.

THE TEAM

Bert Wank
Founder & CEO
Power Electronics
3 patents pending
Texas Instruments
Dallas Semiconductor

Tom Sutrina
Electromechanical
Engineering
36 patents
Sundstrand
Electrolux

Silviu Darie,PhD
Advisor, modeling
160 research projects
120 white papers
19 production protos
Power Analytics

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