

Grid Power Solutions: Distributed Generation & Ride-Through Technologies

FUEL CELLS

FLYWHEELS

MICROTURBINES

RENEWABLES



BATTERY UPS

STATIC TRANSFER
SWITCHES

SMES

SUPER CAPS





VDC's Power Conversion & Control Practice

Custom Proprietary Consulting & Multiclient Market Studies

UPSs

Batteries

Chargers

Fuel Cells

Gen Sets

Flywheels

Microturbines

AC/DC Power Supplies

DC/DC Converters

Inverters

Motors and Controls

Switchgear

PFC Units

Telecom Power

Power ICs

Transformers

TVSS Components

Wire/Cable

Switches

Relays

Semiconductors





Distributed Generation

- ◆ Fuel Cells
- ◆ Microturbines
- ◆ Reciprocating Gen Sets
- ◆ Small Gas Turbines
- ◆ Solar & Wind Power

Ride-Through

- ◆ Flywheels
- ◆ Induction Rotors
- ◆ Battery UPS
- ◆ SMES
- ◆ Super Capacitors

“Big-big” players: GE, DTE, ABB, Siemens, UT, Caterpillar



Total \$2.4B
North America DG/RT Product Market
(11% to 37% CAGR 2000 -2005)

| <u>Product</u> | <u>Size (\$)</u> | <u>Share</u> | <u>CAGR</u> |
|-----------------------|-------------------------|---------------------|--------------------|
| Fuel Cells | 45M | 1-3% | 50-200% |
| μTurbines | 24M | 1-3% | 30-150% |
| Flywheels | 150M | 4-8% | 15-20% |
| UPS | 2B | 70-85% | 12-18% |
| STS | 150M | 4-8% | 10-20% |



Product 1 Fuel Cells

- ◆ **\$45M market with 50 - 200 % CAGR**
- ◆ **Proton Exchange Membrane (PEM)**
- ◆ **Solid Oxide (SOFC)**
- ◆ **Molten Carbonate (MCFC)**
- ◆ **Phosphoric Acid (PAFC)**
- ◆ **Alkaline (AFC)**
- ◆ **Players- Ballard, H Power, IdaTech, PlugPower, Energy Partners**
- ◆ **~ 40 NA suppliers; only Ballard selling FCs**





Product 2 Microturbines

- ◆ **\$24M NA market with 30-150% CAGR**
- ◆ **30-100 KW is commercially available**
- ◆ **Players: Capstone, Honeywell, Elliott, Ingersoll-Rand, DTE**
- ◆ **< 10 NA suppliers;**
- ◆ **only these 5 companies are selling product**





Product 3 Flywheels

- ◆ **\$150M market with 15-20% CAGR**
- ◆ **Applications: remote energy supply & storage, energy management, standalone power supply & storage.**
- ◆ **PQ-filter energy, convert & maintain power signal**
- ◆ **Players:**
Active Power (CAT), Acumentrics, AFS Trinity, Beacon, Piller, Precise Power, US Flywheel





Product 4 Battery UPS

- ◆ **\$2B market with 12-18% CAGR**
- ◆ **DG/ RT lends itself to ≥ 1 KVA UPS**
- ◆ **Relatively mature product line**
- ◆ **Players: Invensys, APC, MGE, Liebert, Chloride, Alpha Tech, Hitec, Piller, Toshiba, On-Line Power and at least 250+ worldwide suppliers.**





Product 5 Static Transfer Switches

- ◆ **\$150M market with 10-20% CAGR**
- ◆ **Potential Combination with PDUs**
- ◆ **Players: ABB, ASCO, Custom Power, Cutler-Hammer, Cyberex, Generac Power, Inverpower, Liebert, MGE, On-line Power, PDI, Piller, Power Paragon (L3), S&C, Solidstate Controls, SPCO...**





The DG Market

- ◆ **Products and players...you'll see relationship building everywhere, some will pan out, some won't**
- ◆ **Domination of a few players**
- ◆ **Market scene and market drivers next ...most MT, FC , and FW vendors serve and market to application niches: co-gen, peak-shaving, base-loading, low emissions, resource recovery etc. until prices come down...**





Utilities Market

- ◆ **Utilities are simultaneously vendors, distributors, channel partners, and end users of generation and ride through.**

Utilities should:

- ◆ **accept & educate end users plus new partners**
- ◆ **work closely with DG/RT suppliers**
- ◆ **be open to new solutions (FW, FC, MT, SMES)**





Market Growth Drivers

- ◆ Growing need for PR and PQ
- ◆ Continuing technology developments
- ◆ Reducing initial costs
- ◆ Commercial quantities available
- ◆ Increasing production capacity
- ◆ Government sponsorship & regulations
- ◆ Combined Heat & Power (CHP)
- ◆ Distribution channel creation for MT & FC
- ◆ End user awareness and education





A Series of Small Paradigm Shifts

- 1. Market DG/ RT Together in Continuous Power Systems**
- 2. Examine & Sign Up Marketing /Distribution Partners**
- 3. Establish Collaboration/Feedback Loops with:
Suppliers, Contractors, Consulting Engineers,
Service Organizations, R&D Firms & Utilities**
- 4. Join Together to Educate End Users About Options**





THANK YOU!

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Information on this project is also available at:

<http://www.vdc-corp.com/products/br00-23-frames.html>

