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The heart and brains of a renewable energy system

Telecom Site Northern Canada

Lee Gordon

Lee Gordon, president and founder of Morningstar Corporation, gave PES an interesting insight into this employee owned company. They provide over-spec' components, with their smart digital designs and serve the whole spectrum of the solar industry. They took a chance and it paid off.

PES: Hi Lee, welcome back to PES Solar. It's great to talk with you. Happily, we have many new readers so please could you begin with a brief overview of Morningstar?

Lee Gordon: Sure. When Ken Gerken and I were laying the groundwork for our second successful start-up, solar energy was still a new field. At that time sinking fossil fuel prices and the tail end of a recession had just finished off one of the industry's leading solar power-generation companies, while fledgling solar panel technology was still clawing its way toward that magic 10%

efficiency milestone. Solar simply didn't look like the best number on which to place a strategic bet.

Fortunately for the emerging solar industry in 1993, we were in a gambling mood and started Morningstar Corporation anyway. Our new company went on to set standards and break records, and established benchmarks which stand tall 25 years later: over four million products sold to mission-critical customers in diverse industry sectors, well over 100 distributors on six continents (and even a loyal installer following in Antarctica), and the lowest hardware failure rate in the industry.

PES: You provide your solar systems to several industry sectors, which is the most important market for you?

LG: It's really all off-grid, since as the leader in charge controllers, we're pretty much in all sectors. A solar charge controller can be described as the 'heart and brains' of a renewable energy system. Even DC systems without an inverter almost always have a charge controller to control loads and maintain battery health and effectiveness.

We're almost everywhere solar is, from rural homes being electrified for the first time to oil and gas fields, lighting systems, and telecommunications towers.

It's an interesting contrast—one of our smaller EcoBoost charge controllers that's providing basic electricity service in Brazil, for example, is also used in Australia and other developed countries for recreational vehicles and other leisure uses. While one of our professional TriStar charge controller models provides critical large-scale highway lighting on the roads surrounding Rio De Janeiro, it can also provide power in a remote home in Quebec.

So, we are able to serve both the developed and the developing world with a single product built to one standard, since it can cover a wide range of applications.

PES: Please could you tell us something about the technology you use?

LG: We actually have a very long list of proprietary technologies, since we're known for advanced hardware and software engineering, and design all our own products ourselves. I'll highlight several here that really set us apart.

Importantly, there are no cooling fans, ever, on any of our products. That's a huge advantage. All solar charge controllers over a specific range need cooling fans because they generate prodigious amounts of heat. What we do is employ advanced thermal engineering to eliminate that weak link by eliminating the fans ... and it's a very weak link in the system.

First, fans pull in dirt, dust and debris into sensitive electronics, shortening their life. Second, fans have a short life themselves—some of our competitors actually put shorter warranties on their cooling fans since they expect them to fail over time. This means expensive servicing in the field, which no one wants to do, especially at remote solar sites. And third, fans themselves require power to run, which means some of the solar 'harvest' has to be diverted to run them which reduces overall efficiency.

We worked very hard to rid our components of fans, and the fact that we have the lowest hardware failure rate in the industry shows that we did it well. As we like to say, 'the others just survive in harsh conditions—we thrive in them.'

Then we couple superior hardware design—with over-spec'd components -- to very advanced software and signal processing to optimize it fully. We lay out circuitry for the best performance and durability, instead of the best economics. There's a simple reason why we can afford to do all this. We're an employee-owned company, and standing behind our products is our highest value, since our own reputations literally ship with everyone.

So, we can't and don't take the shortcuts as others do who have to chase a bottom line. We build them like we own them, because we actually do. Our performance and liability are why we're the first choice in mission-critical applications around the globe.

PES: We would love to hear about your solutions for off-grid applications, where are they, who are your clients etc...?

LG: We'll tell you about one that happens to be the largest residential off-grid project on the planet: Tozzi Green in Peru. Tozzi is an

MultiWave high-frequency inverter-charger

Italian company we're partnering with, to bring electricity to over 200,000 homes and 3,000 community centers in Peru—and some one million people— currently without it.

The program provides a 'DC energy box' to these homes with a high-tech battery sealed inside and a small solar PV array to power the home; homeowners can easily set it up and activate it themselves and have access to enough electricity for basic needs. Tozzi turned to Morningstar to manufacture the very specialized enclosure and on-board electronics to make such a system possible.

PES: We see that you have started the Morningstar's Energy Storage Partner™ program (ESP), could you explain the type of partnership and how it works?

LG: We started it to solve a problem. A lot of solar installers were increasingly turning to lithium and other advanced battery chemistries, in new systems and also in upgrading existing ones. But the requirements are different from traditional

lead-acid in many cases, so they'd ask the charge controller company for the right information, and get bounced to the battery company, which often bounced them back.

We heard that this was happening more and more with competitors. So, we took a proactive approach and got with the leading battery brands, evaluating their batteries and, working with them, coming up with the exact settings and programming needed to ensure installer success.

A system designer or installer has complete, free access to exactly the information they need to drop-in a lithium battery or specify them up-front, courtesy of Morningstar and that battery brand.

All the homework has been done for them so they don't have to bounce between two companies trying to figure things out. We have almost 20 brands now active in the program, including Trojan, SimpliPhi, and RELiON. We have partners from North America to Australia (PowerPlus Energy).

PES: What about back-up storage, how key a topic is this to your company currently and why?

LG: Extremely important, which is why our forthcoming MultiWave high-frequency inverter/charger will meet UPS (uninterrupted power supply) criteria, for use in back-up systems. We can offer this level of performance because its electronic design is far more agile and responsive than traditional, 'big iron' low frequency inverters.

PES: What makes your products stand out amidst the competition and how do you intend to stay one step ahead?

LG: Well really there are seven advantages, we mentioned some before:

1. Smarter digital design delivering faster, more agile processing on-board and extracting all possible performance from our hardware
2. Internals laid out for performance, not economics (because as employee-owners, we not only can but we have to, in order to achieve our unparalleled low hardware failure rate)
3. 'Over-spec' components: with our smarter digital design and better internal engineering, we could get higher performance using the same components

Tozzi Green DC energy box with Morningstar technology

Railroad solar installation

other companies use. Instead we raise the bar and surpass them, by using over-spec components

4. Superior, 'fanless' thermal design: no fans to fail, waste electricity, or shorten the life of the controller by blowing in dirt and debris
5. Dedicated engineering center with our own advanced R&D facilities, test lab, EMI and environmental chambers, full-thermal modeling
6. Products built in fully automated world-class ISO 9001 facilities
7. Quality Control– 100% functional testing of every product, using the latest computerized test equipment and processes

PES: Is specific training needed for you products, if so, do you provide this service and who to?

LG: As our products are used in such a wide range of applications, and in developing and remote areas around the globe, we engineer a great deal of fault-tolerance and protection into them which makes them easier to use in many applications. But we do double-down on training, with monthly webinars listed for continuing education credits, and will have full on-line training for our new inverter/charger.

PES: Moving into the second half of 2019, what are your predictions for the solar industry in general and your company in particular this year?

LG: The off-grid markets we mainly serve are more removed from the political 'footballing' afflicting both residential and utility power generation, so we're confident in steady, consistent growth.

An addition to that business will likely come from increasing consumer interest in residential and recreational solar. In areas where off-grid electricity generation is becoming more desirable, such as California, which now is expected to experience frequent grid shut-downs for safety reasons, we expect that homeowners and installers will want to turn to solar charging solutions fully proven in demanding applications and environments, which bodes very well for Morningstar.

www.morningstarcorp.com/

TriStar 600V fanless solar controller

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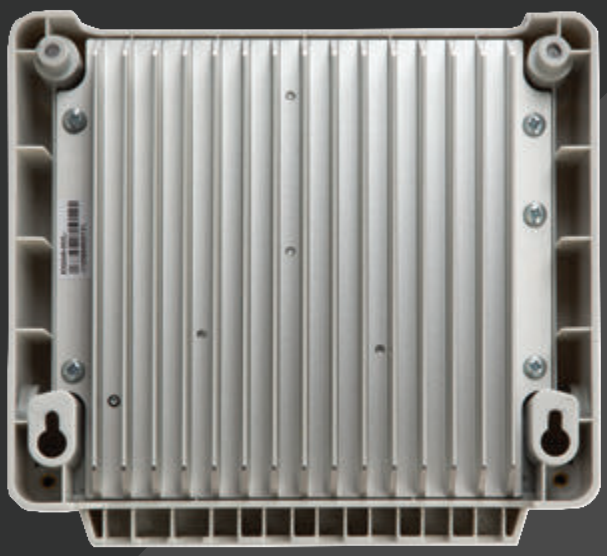

THE ONLY SOLAR CONTROLLER THAT DARES TURN ITS BACK ON YOU

At Morningstar, this is our best side.

Because we're the only complete line of full-powered solar controllers that don't need cooling fans. All of our controllers, including the legendary ProStar MPPT, get rid of excess heat more intelligently, through advanced passive cooling.

From the single-module SunGuard to the breakthrough TriStar 600V, Morningstar controllers—unlike our competition— have no moving parts to fail, no fans to suck in dirt and debris, no fan motor loads to affect solar harvest. It's one reason why leading solar professionals in the oil & gas, telecommunications, security, transportation and other industries have put over four million Morningstars into service since 1993. Learn how we can help your next project at www.morningstarcorp.com