



Photo courtesy of Air Force Research Laboratory

Shown is an artist's rendition of the Active Denial System, a laser weapon designed to incapacitate without causing injury. Now, thanks to Princeton Power technology, the device will be light enough that the military will be able to mount it on a Humvee and use it for controlling crowds and clearing buildings.

Generating interest

Princeton Power prepares to introduce varied products

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PLAINSBORO — Many companies are developing machines that may someday replace dirty fossil fuels with clean power from the sun or the wind.

Many other companies are developing cutting-edge weapons for our nation's military machine.

Few companies, however, are doing both.

Princeton Power Systems stands out then, thanks to versatile technology that works with weapons, windmills and nearly everything else that makes or uses large amounts of electricity.

The company evolved from a homework assignment that founder Erik Limpaecher was given for a business class when he was a senior at Princeton University.

Now, less than three years after Limpaecher's theoretical business plan won him top marks in that class, a very real company is preparing to bring a very wide variety of products to market.

"Things have gone both slower and faster than we expected," said Darren Hammell, a classmate of Limpaecher's who is chief executive at the Plainsboro-based company.

"It took longer than we thought to take our patents and transform them from ideas to prod-



Hammell

ucts. We thought that we had worked things out so thoroughly in the paper stage that it would be easy to jump to physical objects. Instead, it required a lot of fundamental research and a lot of development.

"On the other hand, it has taken us less time than we expected to generate interest in our technology. Word about our company's technology has spread very quickly and allowed us to land all sorts of development money, which, in turn, has enabled us to do all that research."

Princeton Power separates its business into three distinct divisions: industrial motor control, renewable energy and military applications.

In the first division, industrial motor control, Princeton Power has a first-generation device that converts power from the grid into a format that allows industrial motors to work at varying speeds. The company is currently using a \$250,000 grant from the New Jersey Economic Development Authority to create a second-


generation device that is 30 percent smaller and 30 percent less costly than the current model.

If all goes according to plan, Princeton Power will complete work on this second model in the next few months. The new device may be ready for commercial production and sale by summer's end.

In the second division, renewable energy, Princeton Power has just finished testing a prototype device that converts the motion of small wind turbines into electrical energy. The company is currently designing a second model for field testing. It is also developing a prototype device that would work on very large wind turbines, which are becoming very popular, particularly in Europe.

In the third division, military applications, Princeton Power has finished designing a device that will reduce the size and weight of an experimental Air Force weapon, a weapon that makes people feel extraordinarily hot but does no permanent physical damage.

A stationary prototype of the weapon, called the Active Denial System, made headlines a couple of months back. Now, thanks to Princeton Power technology, the device will be light enough that the military will be able to mount it on a Humvee and use it for controlling

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crowds and clearing buildings.

"The AC-link technology (that Princeton Power has developed) has been one of the critical underpinnings for this project," said Bill Siegel, division manager for the Electric Power Technologies Division at Science Applications International Corp., the main contractor on the Air Force Project.

"In addition, Princeton Power Systems' expertise, enthusiasm and passion for service have been invaluable assets."

Princeton Power is also working on a second military contract, this one for the U.S. Navy. The Navy wants to replace old engine technology, which uses mechanical couplers, and embrace engines that are powered by electricity.

Princeton Power is designing a device that would take electricity generated aboard the new ships and convert it for use by the engines. The company has yet to move from paper designs to physical models, but its engineers believe they can make a device that measures half as large and weighs half as much as any other system the Navy can find.

"All this technology may sound completely different," Hammell said, "but it actually operates on one basic platform. The larger wind turbine system, to use one example, will probably use the hardware we develop for the Navy engine and the software we have developed for the smaller wind turbine."

Princeton Power believes that its products will outperform existing competitors in all three lines of business.

On the industrial motor front,

for example, the majority of motors still run on systems that require them to run all out, all the time. The Princeton Power system, which allows motors to run at variable speeds, can reduce a motor's energy consumption by as much as 50 percent.

Plus, unlike other variable speed drives, which are already on the market, the Princeton Power technology does not distort energy, so it does not damage industrial motors or affect energy on the grid.

"Companies now find themselves in a no-win situation. If they use a variable speed drive, they have to spend extra on motor maintenance. If they use a one-speed drive, they waste a lot of money on power," Hammell said.

"Our product offers them the best of both worlds, and although we expect that we will charge a small premium for it, we will keep the price very close to the other variable speed drives that are already on the market."

In the renewable energy market, Princeton Power prototypes have demonstrated that they convert far more of the power absorbed by a solar panel or a windmill into usable electricity. Indeed, with wind power already cost-competitive with natural gas, their converts, which reduce waste by 20 percent to 30 percent, may push the windmill into the mainstream, particularly if natural gas prices remain as high as they have been recently.

In the military market, Princeton Power is attempting to attract customers on grounds that its products are smaller and lighter than competing products. The size of Princeton Power's prototypes has already enabled the creation of a mobile heat gun for the Air Force. If the company can do the same for the Navy,

Princeton Power technology may well appear aboard the next generation of American warships.

"We are a long way from building a full-sized prototype, let alone getting a contract to supply working ships," Hammell said. "However, the Navy program offers an extremely exciting opportunity for us. If they choose our technology, that will be an enormous contract."

So far, Princeton Power has expanded its staff and its facilities at a measured pace. The company still employs only 13 people, though Hammell expects to add another few bodies soon.

The company's growth may explode next year if its products sell well and it chooses to launch a full-scale manufacturing operation.

Such an expansion would send the company out in search of investors willing to fund such efforts. However, for the time being, Princeton Power is not hunting for money.

Aside from one investment it received just before opening its doors and a second cash infusion earlier this year, the company has managed to sustain itself on grants from military contractors, the U.S. Department of Energy and state government agencies, such as the EDA.

Government officials explain that Princeton Power receives such funds because it is doing promising work. "This company meets all the criteria for our Springboard Grant program," said Glenn Phillips, an EDA spokesman.

"We have studied their business plan. We have conducted interviews. And we have evaluated their technology and the potential they have for success in the marketplace," he continued. "We believe the companies that qualify for these grants have the potential to provide a big boost to the state's economy."