decentralized energy

Concentric Power fulfilling an essential need for modern agriculture

By Diarmaid Williams
International Digital Editor

Concentric Power is a next generation provider of high-efficiency energy modules for onsite electric power generation and low temperature refrigeration. Their "power plant as a product" has led to **a 25 percent reduction in greenhouse gas emissions and energy costs** for leaders in agriculture.

Growing up in a rural part of central California, CEO and founder **Brian Curtis** saw first-hand the need for the services Concentric Power provides. He spoke to Decentralized Energy.

Looking at the context of how the agricultural and food sectors in his local area were dealing with challenges associated with getting fresh produce to market, Curtis noted efforts at keeping down costs, and an ever-increasing eye on sustainability.

"Concentric Power is a six-year old company that is founded on the need to solve problems for power supply in the food industry and agricultural sector."

"Here in California, power is expensive and there is a need for reliability and lower cost. It's very competitive. Sustainability is a real driver for most businesses. If you look at the food sector, they're

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shipping product all over North America and globally, too. From a supply chain perspective, there is a need for high efficiency."

Curtis is a mechanical engineer by trade, with 20 years' experience in the power and process industry, garnered from stints in China and beyond. He noticed on his return home just how expensive electric power is, and what appeared to be lacking in terms of support for domestic food producers.

"The U.S. is very aggressive on renewables and there is also pressure on the grid. In my opinion, there is a real need for firm, flexible and fast response distributed generation. Distributed energy resources (DER) have been around since the beginning of electricity, but there's been a renaissance lately. The next generation is where it's getting very interesting. You have fast, flexible and smart DER helping to support all renewables coming in."

Concentric Power's modular cogeneration products, focusing primarily on reciprocating engines, use Caterpillar natural gas engines as part of a typical set-up. Each pre-engineered Clean Power Station integrates into any existing refrigeration system. Apart from those key fundamentals there are other elements that make the overall offering appealing to clients in the agri-business sector.

"We added a variety of other functions that bring cogeneration into the next wave of sustainable infrastructure, such as a software layer that helps us do some advanced load following and an ability to see stats in a responsive and automated way, while taking advantage of the fact that engine technology has dramatically improved over the last 10 years."

"In the old days, the conventional wisdom for sizing a cogeneration plant was to size it for baseload running flat out as much as possible, maxing out the capacity factor."

"Fortunately the engine technology and software is now better allowing engineers to size up a platform and take full advantage. On the mechanical side of the system, engine performance curves have greatly improved. You can run an engine down from 100 percent to 50 percent without losing much efficiency, which is pretty exciting."

"The transient response times have also gotten better. In real time, you can stay ahead of spikes and manage demand charges, which will be very critical going forward in terms of battery storage."

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The Concentric chief is an avowed fan of storage, and getting as much of it on to grids as possible, but equally sees the opportunity for more speed and flexibility when it comes to distributed energy and a rapidly evolving landscape.

"We've taken it one step further by doing cogeneration in a networked way – this means we can take a whole portfolio of distributed assets and manage them together in a way that is advantageous for the site host on individual sites and also for the whole network of power plants."

The service is of interest to system operators, too, with *California Independent System Operator* (CAISO), for example, looking for ways to dispatch generation capacity in ways not done before.

Concentric Power is also facilitating clients to capitalise on their power assets.

This is done by sizing cogen plants large enough to serve all the load behind the meter while also having ability to

monetize any excess capacity or volume. The company can do this through its practice of intimately integrating with the site host and its subsequent understanding of individual load profiles.

Over the years, Curtis has taken a lot from his engineering and operational roles, while supplementing that experience with stints at the U.S. Department of Energy and various venture capital firms. He saw the growing influence of distributed energy and the different ways it was likely to impact, which helped inform the kind of company Concentric Power was to become. Energy storage has been a common thesis in his long view of North American power markets, but Curtis opted for the more underserved middle market of industrial and ag sectors.

"If you look at renewables, many sites have maxed out their renewables and still only get to 25 percent of their power and the rest of it has to get picked up by CHP if you want to be as efficient as possible."

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Curtis has learned a lot from engaging with the DOE during both the Obama and George W. Bush administrations, but there is less clarity about what Donald Trump wants to achieve. It means the operators in the field are driving progress themselves, while also networking old relationships to develop a clear path.

"Under Bush and Energy Secretary Bodman, there was a big emphasis on commercialisation and getting as much technology out of the universities and national laboratories as possible, whereas under Obama and Secretary Chu the emphasis shifted towards more fundamental research at the same institutions. I haven't seen the current administration articulate its direction. Overall, there is a great network of leaders who were – and still are – part of the DOE and are now in the private sector, which has led to an extended network infusing private equity and project financing."

In terms of heating, Concentric Power was guided by a need to serve a hitherto under-served market, and one Curtis himself was very familiar.

Having grown up in a farm town on the Californian central coast he was mindful of the opportunities involved and focused on using low temperature refrigeration in the form of an aqueous ammonia absorption cooler. It's a technology that's well understood and has been around for a long time, but has rarely been provided as a product; more of a customer-engineered solution for the smaller projects.

"Concentric's size range is generally in the 400 kW to 2.5 MW size range and because it's modular in format we can add those together to reach 10+ MW. Up to now, low temperature refrigeration hadn't addressed that small to medium size market segment. We have turned it into a real product line as against a custom deal for each market."

One of the company's clients is Salinas, California-based Taylor Farms, the largest producer, processor and marketer of fresh vegetables in the U.S.

"The Taylor project is a 2 MW cogeneration system running on natural gas and a 240 ton absorption chiller on the back of that. It integrates into their existing refrigeration system and what's especially interesting about that site is they have a megawatt of solar and a megawatt of wind turbine as well."

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"The wind and solar came before, but now it's all integrated. How we manage the system to the extent that the CHP is dispatchable and wind and solar are intermittent – that aspect of smart controls lands on us, which is exactly what we're designed to do."

From the customer's perspective, they've augmented their conventional refrigeration with compressors, condensers, and a very energy intensive process, with electric power being one of their biggest cost items to a much-reduced set-up in terms of costs and additional benefits from a more sustainable program.

"Fast forward a couple of years and they're effectively off the grid at this point – they're still interconnected but on many days they're effectively off the grid."

So is it the technology behind the service, much of it developed in-house, that gives Concentric Power its unique selling proposition?

"When you strip it all away – yes. We have good mechanical design and execution, but at the end of the day, that is not entirely unique. More of a pre-requisite. But the software side of it is, in fact, unique and we had a couple of patents issued last year related to that bigger platform for dispatchable energy over a network of cogen plants. That's one of the core technologies we are bringing to market."

In addition, the company is innovative in project finance, and is building on to a great extent by what has become common practice in the solar power industry.

Concentric offers different business models. They can either sell the equipment to the client and maintain it with a long-term service contract, or are happy to own the assets and do a power purchase agreement instead.

"There have been a lot of unique things we have contractually in terms of what is bankable in the project finance world, including performance and availability guarantees. One thing that drives economics with our projects and works differently from renewables is our ability to guarantee the reduction of demand charges."

"In order to do that, we need to be available 100 percent of the time during

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certain time of use categories. We had to figure out how to do that technically and reliably, and how to contract for that, too. Then, put it all together in a way that is actually bankable. There's been a ton of challenges, but I think we've got it cracked and we're excited the finance market for these applications is starting to mature."

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