

Unlimited Fuel



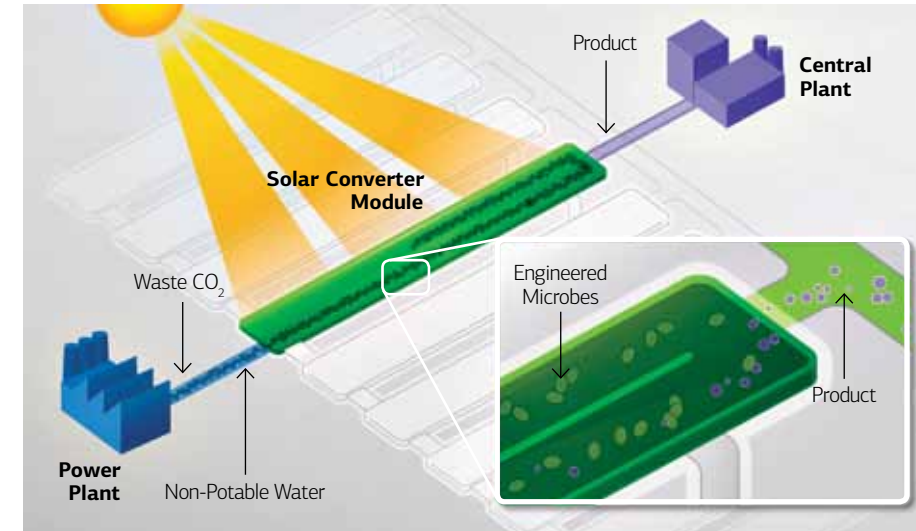
Fossil fuels are one of the important energy sources on earth. Without these fuels, many day-to-day operations would not be possible, like driving a car. Today's world relies on such fuels in order to economically function. What would happen if one day all these fuels disappeared or if oil-rich countries decided to no longer trade oil? Joule Unlimited, may be the answer to this question.

Text Ani Garibyan

The idea behind Joule Unlimited was followed by “years of work developing related technologies in fields of biological engineering, genomics and renewable fuels,” said founder and chairman of Joule Unlimited, Dr. Noubar Afeyan. The ingredients of this renewable fuel are simple: sunlight, waste carbon dioxide (CO₂) and non-potable water. The outcome is millions of gallons of clean, renewable fuel. “Renewable fuels are needed to partially replace fossil fuels. Over the last decade, there have been billions of dollars invested globally to develop new technologies that can produce replacement fuels to the current crude oil derived gasoline, diesel or jet fuel,”

explained Dr. Afeyan. Here is how it works: A typical solar converter array (consisting of modules) will encompass 1,000 acres. Each module contains microbes created by Joules, along with non-potable water (or untreated water) and micro-nutrients. Waste CO₂ is pumped into the module through a pipeline, keeping the microbes in motion, maximizing their exposure to sunlight. The sunlight charges the microbes, which consume the CO₂ and produce fuel. The produce fuel is then separated and sent to storage while the microbes that did not consume the CO₂ take another circle inside the module. Every eight weeks, the modules are flushed and the process is repeated. The arrays are best utilized in

areas where there is direct sunlight and where temperatures do not reach freezing conditions. Currently, the product is in the demonstration phase but once the end product is reached, it will be sold through the same channels that sell ethanol and diesel fuel. “Eventually, the solar ethanol product will be blended with regular transportation fuel (gasoline) and sold at gas stations or else placed into the diesel supply chain,” said Dr. Afeyan. Biofuels are the most promising approach so far as they convert agricultural products or waste into ethanol or what is called biodiesel. Dr. Afeyan explains, “Joule Unlimited, our company, invented a process called Helioculture, which can directly convert the sun's energy and



← An illustration showing how the end product is extracted.

In the News
The Guardian named Joule in the Global Cleantech 100. The Global Cleantech 100 represents innovation and highlights the companies most likely to make a significant market impact in the next five to ten years.



← A system containing microorganisms, non-potable water and micro nutrients.



→ Display of the eight-week process

“Joule Unlimited, our company, invented a process, Helioculture, that can directly convert the sun's energy and waste CO₂ emitted from power plants and other sources into ethanol or diesel,” says Dr. Noubar Afeyan.



In the News
In September 2012, Joule announced a strategic partnership with AUDI AG. “Audi selected Joule as its exclusive partner in the development of biologically-derived diesel and ethanol – the result of extensive evaluations of Joule's proprietary technology and commercial plans.”

waste CO₂ emitted from power plants and other sources into ethanol or diesel. We expect that as renewable fuel reach price parity with current crude-derived alternatives, there will be increased adoption of these renewable fuels that are generally far more environmentally friendly (producing less net greenhouse gases) and will lessen our dependence on imported oil.” The company expects that their product will be cost competitive, possible to produce at many locations, carbon neutral, and compatible with the current transportation fuel infrastructure and vehicles. Joule Unlimited is a hot topic in the technological and renewable energy outlets.

Just recently, the company was awarded the prestigious “Wall Street Journal Technology Innovation Award” in the Energy category. The company was also named the “2012 Technology Pioneer” by the World Economic Forum. In November 2011, Joule Unlimited came in 23rd, ahead of BP Biofuels and Chevron in the 50 Hottest Companies in Bioenergy, in the *Biofuels Digest*. “This type of disruptive technology development takes a lot of different disciplines and relies on many different breakthroughs in order to succeed. We are working to realize the promise and expect to demonstrate production at significantly larger scales than today's pilot scale over the next year,” explained Dr. Afeyan. ■