An Unlikely Solar Alliance

Boost From The Sun Could Help Gas Power Plants Generate More Electricity, Run More Cleanly

BY SANDI DOUGHTON © 2013, The Seattle Times

RICHLAND, Wash. - Solar power remains a hard sell in the United States, but researchers in Washington have developed a way to harness the heat of the sun to boost the efficiency of conven-

tional power plants. The new technology allows a natural gas-fired plant to generate 25 percent more electricity from the same amount of fuel. And it also reduces greenhouse-gas emissions, says Robert Wegeng, the Pacific Northwest National Laboratory (PNNL) engineer who's

leading the project. Wegeng and his colleagues are testing the system this summer on the PNNL campus near the Columbia River, where it's not uncommon

for the blistering sun to drive temperatures into triple digits. On a morning when the high

was forecast to hit 100 degrees, team members gathered around their apparatus to explain how it operates.

"It will work best in a dry, sunny environment," Wegeng said. "In Eastern Washington our sun is pretty good.'

The flashiest part of the device is a mirrored, parabolic dish that concentrates the sun's rays onto the business end of the operation: a sleek pod about 4 feet long crammed with wiring and machinery.

When the sun is shining, temperatures inside the pod approach 1,500 degrees — hot enough, with an assist from a catalyst, to blast apart the chemical bonds in a mixture of natural gas and water. The

result is another fuel, called syngas, which burns better and releases more energy than natural gas

Climate-altering carbon dioxide emissions drop because a power plant equipped with a solarbooster wouldn't have to burn as much fuel.

"Of all the projects I've worked on at PNNL, this is probably the most economically viable," said systems engineer Rick Cameron. "No matter what the price (of natural gas) is, you can improve the energy value.'

But as with all energy technologies, the system's commercial fate will hinge on cost and practicality, which have yet to be demonstrated.

"It's a development effort, and it's a stretch to get there," Wegeng said.

The PNNL approach builds on what's called solar thermal energy production. Instead of relying on photovoltaic cells to directly convert sunlight into energy, solar thermal plants use mirrored, parabolic troughs or dishes to concentrate sunlight and tap the resulting heat to drive steam turbines.

One complex in the Mojave Desert covers more than 1,600 acres and has a capacity of 350 megawatts. Another being built in the same area will have a capacity of 400 MW.

The PNNL system takes advantage of the solar heat to drive a chemical reaction instead of using it to create steam.

Wegeng and his colleagues estimate a 500-megawatt solar-gas hybrid plant — with enough capacity to power about 350,000 homes -

would require about 3,000 mirrored dishes equipped with the podlike

chemical reactors. Cara Libby, project manager for environment and renewable energy at the Electric Power Research Institute, called the PNNL system "intriguing." But while the cost of photovoltaic cells has dropped sharply in recent years, the price of mirrored solar concentrators is still high, she pointed out.

That means a steep upfront investment for any new natural-gas plant that might consider the solarbooster technology. "You're adding cost by putting a solar component into the project," she said.

With natural-gas prices so low, operators aren't likely to spend

that extra cash. Solar-gas hybrids might make

more sense in places, like Washington, that require utilities to include renewable power sources in their mix, Libby said.

"If a system like this can provide a more economic solar resource than a stand-alone solar project, then I think it would be attractive to utilities trying to meet those mandates," she said.

Another advantage over an allsolar plant is that a hybrid facility could continue operating when the sun isn't shining, by switching to natural gas.

Wegeng and his colleagues are working with industry and academic experts at Oregon State Unihigh-performing and economically

"We think we really have a good

The project was launched with \$750,000 in federal stimulus money. The experimental phase is funded with about \$3.5 million from the Department of Energy's SunShot Initiative to advance solar technology, and \$850,000 from industrial partner SolarThermoChemical LLC, which hopes to commercialize the

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versity to reduce the cost of their system and develop ways to massproduce it. The challenge is to produce a system that's reliable,

competitive with natural gas.

shot at it," Wegeng said.

technology.

Certain Bacteria May Help Fight Obesity

BY MELISSA HEALY

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The microorganisms in the human gut appear to play a pivotal role in determining whether a person is lean or obese, new research shows.

The study, published on-line Thursday by the journal Science, is the strongest evidence yet that what's inside an individual's digestive tract influences the risk of obesity and its related health problems, such as Type 2 diabetes. The work helps explain the nation's 30-year run-up in excess weight -

did their counterparts in the obese mice. In the mice that got transplants from a lean twins, undigestible starches passed through the digestive system more speedily, resulting in thinner mice.

"It was a very, very clear, elegant, well-thought-out study," said Dr. Lawrence J. Brandt, a gastroenterologist at the Albert Einstein College of Medicine in New York City who wasn't involved in the research. By stripping out the effects of genes and diet, the experiment helps refine experts' understanding of the specific ways that the gut's living organisms influevidence that the organisms from their lean housemates were becoming established in their guts.

The study is the first to show that changes in the microbiome cause changes in body shape and metabolic performance, rather than the other way around, said Dr. Karine Clement, an endocrinologist and nutrition expert at Pierre and Marie Curie University in Paris.

"You can really see the effect of gut microbiota here," said Clement, who wasn't involved in the study.

That step should pave the way for the use of microbiome research in the diagnosis and treatment of obesity and related metabolic disorders, such as Type 2 diabetes, experts said. As scientists home in on the specific bacteria involved, they may be able to introduce such organisms to people who are obese or predisposed to obesity. Antibiotics might also prove useful as a future therapy for obesity or diabetes. "If we knew there was a bug driving obesity, then one could target the elimination of that bacteria — or if one protected against obesity, then one could imagine giving that as a therapy for obesity," said Sarkis Mazmanian, a Caltech microbiologist who was not involved in the latest research. Mazmanian cautioned,

however, that the probiotic approach, which fosters the growth of "good bacteria" in the gut, will "probably be easier" because antibiotics can kill off lots of beneficial bacteria and allow other harmful bacteria to grow out of control.

The findings may also help experts figure out why obesity has roughly tripled in the last 30 years in the U.S., and why that pattern is happening even more swiftly in developing countries.

Researchers increasingly suspect that preservatives and antibiotics in food and medicine, along with the widespread adoption of antibacterial cleaners, have reshaped the population of the average gut in ways that may have set off changes in the metabolism, immune system and hormone balance of large groups of people, resulting in weight gain.

Missing NM Firefighter Found Dead In Forest

JEMEZ PUEBLO, N.M. (AP) — A firefighter missing for a week in a rugged New Mexico forest was found dead Friday atop a mesa, where he apparently had crashed his ATV, officials said.

Token Adams, a 41-year-old U.S. Forest Service fighter who disappeared Aug. 30 while checking a report of smoke, was found in a remote area not far from a road at about 11:45 a.m. Friday, authorities announced at an afternoon news conference

Hundreds of volunteers, firefighters, search and rescue teams and the Civil Air Patrol had spent the past week combing some 50 square miles of mesa tops and steep canyons

east of Jemez Springs for Adams. State Police spokesman Manny Gutierrez said Adams appeared to have been killed in a crash of his ATV, but authorities declined to speculate on whether he died immediately or how long he had been dead.

They said he was found by searchers using grids to cover the remote area.

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Engineers Dustin Caldwell, left, and Brad Fritz reattach the cover after making adjustments to their solar booster at the Pacific Northwest National Laboratory in Richland, Wash. A mirrored dish on top concentrates the sun's rays.



and it may supply a potential solution to the resulting epidemic, experts said.

Many factors contribute to obesity," said the study's senior author, Dr. Jeffrey I. Gordon, director of the Center for Genome Sciences and Systems Biology at Washing-ton University, St. Louis. For people whose gut organisms are not equipped to fight obesity, it may be possible to "add microbes to fill the vacancies" needed to keep a person lean and healthy, he said.

Gordon and a multinational group of scientists sought to isolate the gut microbiome's effect on obesity from better-known influences such as genes, diet and exercise.

They recruited four sets of identical female twins in which one twin was lean and the other obese. Through stool samples, the researchers gathered a representative collection of the bacteria, viruses and protozoans flourishing in each woman's gut. They transplanted that microscopic zoo into a large group of mice whose intestines were essentially a blank slate.

Almost immediately, the mix of living organisms inside a mouse's digestive tract began to resemble the one inside its human donor. Soon the mice came to resemble more and more the women whose gut microbiomes they had adopted.

Despite eating about the same amount of the same low-fat chow, mice that got transplants from an obese twin began to gain weight and lay down fat deposits. The mice that got transplants from a lean twin remained lean.

The intestinal flora of the lean mice also worked better at breaking down and fermenting dietary sugars than

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ence a complex phenomenon like weight gain, he said.

The study also demonstrated the protective power of cohabitation when it comes to microbiome quality and obesity - at least for rodents, which eat each other's droppings. On a typical diet of low-fat, plant-heavy food, mice that carried the microbiome of an obese twin stayed lean when they were housed with mice that got transplants from a lean woman.

While the lean microbiome appeared to dominate when the diet was healthy, cohabitation didn't help obesity-prone mice that were given a diet high in fat and low in plant matter. When the mice that got transplants from obese twins ate like typical Americans, there was no





"We've only scratched the surface of our understanding of the power of the microbiota." Mazmanian said.

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Yankton Medical Clinic, P.C. is pleased to announce the association of Carrissa Pietz, MD, Board Certified Family Medicine Physician.

Dr. Pietz is originally from Lesterville, SD and completed her undergraduate degree at Mount Marty College. She is a graduate of Sanford School of Medicine of The University of South Dakota, Vermillion, SD. Dr. Pietz completed her family medicine residency at Sioux Falls Family Medicine Residency, Sioux Falls, SD.

Dr. Pietz joins Drs. David Barnes, McKenzie Hanson, Scott Weber, and Certified Nurse Practitioner, Jennifer McGinnis, in providing family care.

Please join us in welcoming Dr. Pietz, her husband, Aaron, and their children, Noah and Carson, to Yankton.

Dr. Pietz will begin seeing patients at the Yankton Medical Clinic, P.C. September 9, 2013.

Appointments can be made by calling 605-665-8910.

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