

ONE NATION

USA Today

SEARCHING FOR NEXT CLEAN -GEN , ENERGY ; Climate concerns are the catalyst for researchers, innovators who are no longer titling at windmills

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893 words

10 January 2016

Dayton Daily News

DDNW

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English

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DES MOINES, IOWA Emily Heaton says clean energy from the 12-foot- tall miscanthus she grows at an Iowa State University farm can help cut the carbon that's warming the planet.

"I should be able to start my truck or turn on my lights at home, and it makes the air cleaner," said Heaton, 37, an agronomy professor who is researching how to use perennial grasses to cost- effectively generate electricity and fuel.

At Caltech, Sonja Francis, 30, searches for a catalyst that will turn sunlight, carbon dioxide and water into a fuel that can power our cars, trucks and other vehicles. "There was a time when we couldn't fly airplanes. We didn't have cars," Francis said. "What seems impossible won't always remain impossible."

Or maybe the next generation of energy will come from the tides, from "windmills" floating 2,000 feet high in the sky, or from spent nuclear waste. Or the answer might lie with removing carbon from the air and reusing it.

The world's leading nations -- and some of its richest business leaders -- propose investing billions of dollars to find technology that can transform how we power our countries.

"Energy drives the economy. But the world has been relying on

-- with the exclusion of nuclear -- a series of technologies that we were using in the late 19th and early 20th century," said Josh Freed, vice president for clean energy at Third Way, a think tank based in Washington, D.C.

"There are any number of big, even seemingly small ideas, that could have dramatic impact on our energy system," Freed said. "We need to put money into them to determine which one works and which ones fail."

Growing concern about climate change has ignited a massive effort to develop energy technologies that are dramatically cleaner than fossil fuels, which make up most of the world's energy portfolio. Last month in Paris, 195 nations pledged to lower greenhouse gases that are believed to cause climate change.

But Scott Tinker, director of the Bureau of Economic Geology at the University of Texas-Austin, said major new energy sources are "multiple, multiple decades away." And enchantment with them diverts attention from a more pressing climate change challenge: reducing carbon pollution that will come with exploding energy demand from developing countries, home to half of the world's population.

"They need coal and are using coal, and they need natural gas and are using natural gas," said Tinker, producer of the documentary, SWITCH. "They're not going to stop doing that. We need to deal with that, rather than just try to legislate ... their fuel sources away."

Scientists warn that human activities are creating carbon dioxide and other greenhouse gases that get trapped in the atmosphere. The gases are raising the average global temperature, which triggers more frequent extreme weather events, including droughts and hurricanes.

In emerging countries, about 1.3 billion people have no access to electricity. Microsoft founder Bill Gates sees the rising electricity demand from those nations as a call to vastly increase investment that will accelerate the discovery of "energy miracles." He has pledged to invest \$2 billion over five years to drive the effort.

Gates and President Obama announced at the Paris talks that 20 nations would double their research and development investment to \$20 billion, and 30 private investors would pour billions of dollars into the public-private initiative, although an exact amount wasn't released.

The investment is overdue, some experts say, especially in the United States. "We have felt the energy R&D budget has been woefully underfunded for years," said Phyllis Cuttino, director of the clean energy initiative at The Pew Charitable Trusts.

By comparison, the U.S. government spends about \$30 billion on health research each year and \$80 billion annually on defense research. Ramping up energy technology requires significant investment, she said. "It's not like Google, where it can be developed by two guys in a garage," she said. "It has to be scaled."

Another vital piece to the puzzle: government policies that support low- or carbon-free energies, said Robert Brown, an engineering professor at Iowa State University. "We have to make sure that renewable fuels don't just complement petroleum. They need to actually displace them," said Brown, who is developing a process that can turn biomass like Heaton's miscanthus into renewable fuels and chemicals. It creates a carbon byproduct -- called biochar -- that can be used to enrich depleted soils.

Tinker, the Texas energy expert, said politicians rarely get policy right when it comes to energy. "Every time governments try to legislate energy changes, unintended consequences happen," he said.

Tinker noted that wind and solar are still only a small portion of the U.S. electricity-generation mix after three decades of development. He sees next-generation technology taking the same path. "It would take a tremendous amount to alter that path," Tinker said. "It's changing slowly, but not because of politics."

Caption: Emily Heaton aims to use perennial grasses to cost-effectively generate electricity and fuel. ZACH BOYDEN-HOLMES, THE DES MOINES REGISTER

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