Earth's health could benefit from space solar power, self-sustaining farms and your diet

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Peter Schubert is an electrical and computer engineering professor and director of the Richard G. Lugar Center for Renewable Energy. From Indiana farms to the moon, the researcher has ideas to make energy and the planet more sustainable. Credit: Photo by Tim Brouk, Indiana University

What will it take to save this blue marble we call Earth?

Peter Schubert has ideas—global and Indiana-focused—that could make our beloved home more sustainable, but it will take significant scientific and technological leaps to get there. Some of these ideas are almost ready. Others will take a generation or two, but as director of the Richard G. Lugar Center for Renewable Energy, Schubert has the duty to look at this big picture from all perspectives—from the Central Indiana farm to outer space.

Fresh from giving the keynote addresses at the Gateway to Space 2018 conference in St. Louis, Schubert finds his lunar research has been gaining orbit.

"One of my talks was called 'Pathway to Power'—using lunar villages to save the Earth," said Schubert, also a professor of electrical and computer engineering and CEO of Green Fortress Engineering. "The moon is 21 percent silicon. We can use silicon to make solar panels. We can use silicon to make computer chips. With technology I have patented through the university, we could use it to store hydrogen."

Schubert's research is on NASA's radar, too. In November 2017, his work was among 25 national finalists for the space program's iTech and Space Technology Mission Directorate initiatives, which strive to find innovative ideas that address important problems on Earth while overcoming critical technology hurdles in future space exploration. Schubert's project, "Orthogonal Loops in a Circular Cislunar Economy," explored governance on the moon.

Today, Schubert is focused on energy from both the sky and beneath our feet.

Question: How does your silicon/hydrogen technology work?

Peter Schubert: We take a silicon wafer, and we make it porous so it can store hydrogen. If you compare it to a battery, a battery stores lithium. On the periodic table of elements, lithium is light, but compared to hydrogen, it's heavy. We can store at least seven times as much energy as a battery can do using lithium.

Q: What is the goal?

PS: The overarching approach is that we want to use renewable energy to save the planet because nonrenewable sources, extractive resources, are polluting and geographically limited. There are wars over them. They cause all sorts of harm to humans. If we can use renewable sources and make it available to everybody, we can all live on this beautiful planet for all time to come.

Q: What about solar energy here in the United States?

PS: If you think cities, if you think industrial parks, they need gigawatts of power. You can't use solar panels for gigawatts. The other problem with the sun is that it inconveniently goes behind the Earth half of the time, and the biggest energy use in most communities is in the evening hours when people are at home doing all their stuff. The other approach is to collect sunlight where the sun never sets, which is in orbit. But the challenge there is how do you deliver that power back to the surface of the Earth? You can't have an extension cord, so you have to beam it wirelessly.

One of the projects we are working on here at the Lugar Center along with Crane naval base is a method to beam energy wirelessly. Coming from space, that's a big project. It's far off, and it's going to take a lot of money and time. But we're beaming power to drones so we can recharge them in-flight so that they never have to land. So, precision agriculture,

surveillance, utility pole monitoring, all of those applications where they want the drones to stay up a long time—we can make sure they do.

Q: Where will these proposed orbital solar farms be? How will they be built?

PS: If we can build them already out in space, we don't have to go through the incredible hassle of lifting them off of this incredibly dense planet. That's really expensive and takes a lot of energy. So, if you're returning the energy back, you have to ask the question, "How much energy does it take to get up there compared to how much it returns back?"

If we can make solar panels from material abundant on the moon, that completely changes the economics, and that's what we're working for. It's called space solar power. We want to do it with lunar source, so we can save the Earth.

Q: What's the latest in energy sustainability for here in Indiana?

PS: Think of a farm. In the '50s, we electrified the rural areas, but what if farms could generate their own electricity and heat? Maybe we could use the leftover corn stover—the leaves, the husks, the stalks—and convert that into energy to help run a farm. We have the technology that's patented by the university that can do biomass conversion into a clean synthesis gas. The syngas can be used to make electricity, and it can be used to make heat. We can also make transportation fuels. It's high in hydrogen, so if you have a fuel-cell tractor, we can have the farmer fuel their tractor from their farm waste.

Q: What can we do while we wait for lunar solar

farms and synthesis gas?

PS: Three words: Think for yourself. The most important thing people can do as an individual is eat lower on the food chain. That helps your health, that helps the world and that helps animals. I've been a vegan for 29 years. Seventy percent of our crops are fed to animals, which are then fed to people. But the same protein you get from a vegetarian diet is up to 40 times less environmentally intense. That means you don't have to have as much pesticide. You don't have to have as many herbicides. You don't need the fungicides. You don't need all of the fertilizer. Every bite of food takes an enormous amount of fuel and energy to arrive to you.

We need to eat more locally and lower on the food chain. That's what an individual could do that has a huge leverage for the future.

Provided by Indiana University

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