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The Next Really Cool Thing

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If you hang around the renewable-energy business for long, you'll hear a lot of tall tales. You'll hear about someone who's invented a process to convert coal into vegetable oil in his garage and someone else who has a duck in his basement that paddles a wheel, blows up a balloon, turns a turbine and creates enough electricity to power his doghouse.

Hang around long enough and you'll even hear that in another 10 or 20 years hydrogen-powered cars or fusion energy will be a commercial reality. If I had a dime for every time I've heard one of those stories, I could buy my own space shuttle. No wonder cynics often say that viable fusion energy or hydrogen-powered cars are "20 years away and always will be."

But what if this time is different? What if a laser-powered fusion energy power plant that would have all the reliability of coal, without the carbon dioxide, all the cleanliness of wind and solar, without having to worry about the sun not shining or the wind not blowing, and all the scale of nuclear, without all the waste, was indeed just 10 years away or less? That would be a holy cow game-changer.

Are we there?

That is the tantalizing question I was left with after visiting the recently completed National Ignition Facility, or N.I.F., at the Lawrence Livermore National Laboratory, 50 miles east of San Francisco. The government-funded N.I.F. consists of 192 giant lasers — which can deliver 50 times more energy than any previous fusion laser system. They're all housed in a 10-story building the size of three football fields — the rather dull cover to a vast internal steel forest of laser beams that must be what the engine room of Star Trek's U.S.S. Enterprise space ship looked like.

I began my tour there with the N.I.F. director, Edward Moses. He was holding up a tiny gold can the size of a Tylenol tablet, and inside it was plastic pellet, the size of a single peppercorn, that would be filled with frozen hydrogen.

The way the N.I.F. works is that all 192 lasers pour their energy into a target chamber, which looks like a giant, spherical, steel bathysphere that you would normally use for deep-sea exploration. At the center of this target chamber is that gold can with its frozen hydrogen pellet. Once one of those pellets is heated and compressed by the lasers, it reaches temperatures over 800 million degrees Fahrenheit, "far greater than exists at the center of our sun," said Moses.

More importantly, each crushed pellet gives off a burst of energy that can then be harnessed to heat up liquid salt and produce massive amounts of steam to drive a turbine and create electricity for your home — just like coal does today. Only this energy would be carbon-free, globally available, safe and secure and could be integrated seamlessly into our current electric grid.

Last Monday at 3 a.m., for the first time, all 192 lasers were fired at high energy precisely at once — no small feat — at the target chamber's empty core. That was a major step toward "ignition" — turning that hydrogen pellet into a miniature sun on earth. The next step — which the N.I.F. expects to achieve some time in the next two to three years — is to prove that it can, under lab conditions, repeatedly fire its 192 lasers at multiple hydrogen pellets and produce more energy from the pellets than the laser energy that is injected. That's called "energy gain."

"That," explained Moses, "is what Einstein meant when he declared that E=mc2. By using lasers, we can unleash

tremendous amounts of energy from tiny amounts of mass."

Once the lab proves that it can get energy gain from this laser-driven process, the next step (if it can secure government and private funding) would be to set up a pilot fusion energy power plant that would prove that any local power utility could have its own miniature sun — on a commercial basis. A pilot would cost about $10 billion — the same as a new nuclear power plant.

I don't know if they can pull this off; some scientists are skeptical. Laboratory-scale nuclear fusion and energy gain is really hard. But here's what I do know: President Obama's stimulus package has given a terrific boost to renewable energy. It will pay lasting benefits. And we need to keep working on all forms of solar, geothermal and wind power. They work. And the more they get deployed, the more their costs will go down.

But, in addition, we need to make a few big bets on potential game-changers. I am talking about systems that could give us abundant, clean, reliable electrons and drive massive innovation in big lasers, materials science, nuclear physics and chemistry that would benefit, energize and renew many U.S. industries.

At the pace we're going with the technologies we have, without some game-changers, climate change is going to have its way with us. Yes, we'll still need coal for some time. But let's make sure that we aren't just chasing the fantasy that we can "clean up" coal, when our real future depends on birthing new technologies that can replace it.