EDITORS' PICK | Apr 27, 2020, 12:00am EDT

Is Fusion Really Close To Reality? Yes, Thanks To Machine Learning

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Fusion is energy's boy who cried wolf. GETTY

Fusion is energy's boy who cried wolf. It's been just around the corner for so long that people can't believe it's just around the corner now.

"As a physicist, we always joke that fusion has been 50 years away for 50 years," said Daniel Kammen, a professor of energy at the University of California, Berkeley. "But in the last four or five years, with the effort that's going on here,

the effort that's going on with Commonwealth Fusion in Massachusetts, you're suddenly seeing that old idea—*that fusion is great but infinitely far away*—has gone away."

The old idea has gone away because of achievements in computing, Kammen said yesterday at a virtual workshop on Tackling Climate Change with Machine Learning.

"There are now people who are projecting small-trial fusion plants that couldn't have been done before without higher computing. We can't adjust the magnets, we can't do all kinds of things until we can do much better code. That is a transformative idea."

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Kammen was speaking in response to John Platt, head of the Applied Science branch of Google Research. Asked to describe his most- and least-impactful machine-learning projects, Platt had said both may be the same project:

"We've had a really great collaboration with TAE, which is a fusion company in Southern California, and we've helped them with optimization and Bayesian inversion, and that's been great for them, and they've achieved the physics goals that they've been working on for a bunch of years," Platt said.

"That's wonderful and that's great, because fusion has this potential for unlimited energy," Platt continued, "but the problem with working so far back in the energy pipeline is that it might not really have an impact until 2050 in terms of percentage of electricity being made. So that was a great intermediate step, but now we're looking for a project with shorter term impact because it's a very urgent problem."

Kammen accused Platt of being too modest.

TAE Technologies, formerly known as Tri-Alpha Energy, announced last year that its fusion reactor was five years from commercialization.

“The notion that you hear fusion is another 20 years away, 30 years away, 50 years away—it's not true," said Michl Binderbauer, CEO of the company formerly known as Tri Alpha Energy. "We're talking commercialization coming in the next five years for this technology."

Binderbauer’s announcement was met with predictable skepticism.

But TAE is not alone. Vancouver-based General Fusion Inc. is devoting the next five years, with support from the Canadian government, to developing a prototype of its fusion reactor. The Massachusetts Institute of Technology announced in 2018 that it expects to bring its fusion reactor to market in ten years. The 35-nation ITER project expects to complete a demonstration fusion reactor in France in 2025.

2025 is much sooner than 2050, but demonstration, and even commercialization, remains some distance from market infiltration.

“You might not see fusion on the ground for a while,” Kammen said. “But fusion has gone from wonderful and theoretical and someone else’s lifetime to a next-generation project.”

Employees work outside the ITER (International Thermonuclear Experimental Reactor) construction site ... [+] AFP VIA GETTY IMAGES

Last year the Department of Energy convened a workshop on contributions machine learning could make to fusion energy, and it found many:

“Data science methods from the fields of machine learning and artificial intelligence offer opportunities for enabling or accelerating progress toward the realization of fusion energy by maximizing the amount and usefulness of information extracted from experimental and simulation output data.”

Read the DOE report on how machine learning can solve problems in fusion energy: