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Committee approves $1B ion collider, which could come to Jefferson Lab

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The world of fundamental physics just got a lot more interesting for Hampton Roads.

On Thursday, the federal Nuclear Science Advisory Committee unanimously approved moving forward with a billion-dollar, high-energy electron ion collider (EIC) to explore a new frontier in physics research, and Jefferson Lab in Newport News is one of two national laboratories vying for the project.

In fact, the committee calls the collider the country's next "highest priority" in new facility construction, and is one of four main recommendations contained in its 2015 Long Range Plan for Nuclear Science.

The U.S. Department of Energy which funds national labs still must approve the collider and the rest of the long range plan, a process that could take a year or two. But the recommendation alone signals the start of what will likely be a vigorous effort by Jefferson Lab to win the project away from Brookhaven National Laboratory on Long Island, which also wants it.

Article continues below ↓

"This is the starting gun," said Robert McKeown, deputy director for science at Jefferson Lab and the Governor's Distinguished CEBAF Professor at the College of William and Mary in Williamsburg.

"Obviously it has special importance for Virginia as well as New York," McKeown said.

At the College of William and Mary, physics professor David Armstrong said he was "delighted" at the news.

"It validates the fact that the nuclear physics community has come to the conclusion that the next important scientific instrument we need to answer basic important questions about protons and

neutrons that make up 99 and a half percent of the visible mass of the universe, they've come to the consensus that there is one instrument we need to construct — and that's the electron ion collider," Armstrong said.

Forefront of physics

Whichever lab ultimately wins the collider, it will propel its home state into a global leader in nuclear science research.

The EIC will smash an electron with a moving ion, enabling physicists to peer even deeper inside nucleons and nuclei to better understand the gluons that bind them together. Gluons are the carriers of the so-called strong force that bind quarks inside nucleons. And, while they generate nearly all visible mass, they remain much of a mystery.

Each of the two labs already holds a different piece of the collider puzzle: Jefferson Lab the electron beam and Brookhaven the ion beam.

Jefferson Lab's concept is an underground collider facility in the shape of a figure-eight, the better to get higher spin polarization of the particles in the beams. The spin of the constituent parts of the nucleon is a long-standing puzzle that the collider is intended to address, McKeown said. The Brookhaven facility, meanwhile, would be working with its current footprint, which is a circular shape.

The facility that secures the collider will bring thousands of jobs to its community and roughly $1 billion in spending over about a decade of construction, according to Jefferson Lab. In Hampton Roads, that means a total of 4,900 jobs over seven to 10 years, as well as expanding the lab's population by 50 percent and drawing thousands of new researchers to the region.

"It will mean there is one place in the world in which these kinds of fundamental experiments will be done — and that will be here in Hampton Roads," said Armstrong.

"So it will be an attracter to scientific talent from around the world," he said. "It will be an energizer of young students interested in probing the mysteries of the universe."

As for Jefferson Lab's chances of securing the collider, McKeown said, "I think there's reason to be optimistic."

U.S. Sen. Tim Kaine, D-Virginia, has thrown his support behind the effort.

"During my visit to Jefferson Lab in April, I saw how this high-level theoretical research not only

improves general scientific understanding but lays the groundwork for practical applications like the MRI or microwave that profoundly affect our everyday lives," Kaine said in a statement Thursday.

"Jefferson Lab is an economic boon to Hampton Roads and a source of prestige for Virginia, and I stand with the governor and others to do whatever we can to bring the electron ion collider here," the senator said.

Community support

It could be another year or two before the Energy Department even decides whether to accept the committee's recommendation. And, if it does, yet another year or two before it chooses a site.

Meanwhile, each lab will now begin to prepare its own concept for a collider. McKeown said it's doubtful the Department of Energy will want to support two separate design efforts for long.

So once a lab is chosen, he said, a rough timeline wouldn't see construction start until 2021 or later, and the collider not operational until about 2030.

Meanwhile, community, state and congressional support is key to securing the project, he said. But that hasn't always been easy.

Two years ago, the General Assembly denied Jefferson Lab $4.6 million it needed for preliminary site work, but earlier this year reconsidered and restored $3.95 million in funding.

The lab has already identified a neighboring parcel of land for the new collider, although some of that acreage belongs to the city of Newport News. Securing city land would involve relocating a school bus depot, which McKeown says has been politically sensitive with the School Board.

Just last month the School Board gave the OK for the city to relocate its school bus facility, although it has no "present need" to do so, as long as the city pays for the new facility and it meets the board's list of requirements.

And while city leaders express support for the project, he said, "we'd like them to be a little more explicit."

Should Jefferson Lab win out in the end, said Andrew Hutton, associate director for the lab's accelerator division, "First of all, it would be the right decision. And, to be honest, we believe we have a much better technical solution. But usually these things tend to be political."

Other recommendations

Every five to seven years since 1979, physicists that comprise the Nuclear Science Advisory Committee devise a long-range plan for nuclear science research to present to the DOE's Office of Science and the National Science Foundation Directorate of Mathematical and Physical Sciences.

Such recommendations require huge budgets and take years to implement.

In 2002, for instance, the committee recommended a $340 million upgrade of the electron beam accelerator at Jefferson Lab, called CEBAF for Continuous Electron Beam Accelerator Facility. But construction didn't start until 2009 and, while the work is essentially complete, the last experimental hall still won't be fully functional until 2017.

The committee issued another long-range plan in 2007, and Thursday's was its most current version.

The plan's three other recommendations are:

to complete the upgrade of the CEBAF as well as continue investing in other ongoing major projects

to delve even deeper into mysterious neutrino particles by developing a U.S.-led ton-scale neutrinoless double-beta decay experiment

increasing investment in small- and mid-scale research at universities and laboratories.

Staff writer Teresa Clift contributed to this report.

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Content Continues Below