Scientist receives massive computing project award to develop magnetic fusion energy

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Choong-Seock Chang, a research professor at New York University's Courant Institute of Mathematical Sciences, has received a Department of Energy (DOE) award to carry out ultra large-scale computation using the Cray XT supercomputer at the department's Oak Ridge National Laboratory in Tennessee. The awarded 20 million hours of computing time—roughly equivalent to running a single-processor desktop computer for more than 2,280 years—is among the largest awards given to a single project. The computation will be using more than 100,000 processors at a time.

Chang, who is also a professor of physics at Korea Advanced Institute of Science and Technology, heads the multi-institutional Center for Plasma Edge Simulation (CPES), which is supported by DOE's SciDAC program and housed at Courant. He and his research collaborators are conducting work in plasma fusion, which seeks to harness energy from the sun to produce environmentally safe electricity.

"If successful, the plasma fusion energy can provide the carbon-free energy to humankind for over a million years," explained Chang.

The most advanced plasma fusion device in existence is called "tokamak," a doughnut- shaped magnetized device that confines hot charged particles (plasma) at the energy over 100 million degrees. The international political and research community joined together, under an umbrella organization, ITER, to build an experimental tokamak reactor in 2001.

But in order to maximize tokamak's capability, scientists must first have a greater understanding of the plasma fusion process. This necessity brought about the establishment of CPES.

Chang and his colleagues have been simulating plasma behavior in an effort to shed light on plasma fusion. The DOE's Innovative and Novel Computational Impact on Theory and Experiment (INCITE) award will allow the research team to simulate an aspect of plasma behavior on one of the world's most powerful computers.

Chang's is one of 66 projects, announced by DOE's Office of Science, that seek to address some of the greatest scientific challenges by using some of the world's most powerful supercomputers at DOE national laboratories. The projects—-competitively selected for their technical readiness and scientific merit—-aim to advance research in a range of areas: astrophysics, climate change, new materials, energy production, and biology.

"From understanding the makeup of our universe to protecting the quality of life here on earth, the computational science now possible using DOE's supercomputers touches all of our lives," said DOE Under Secretary for Science Raymond Orbach, who launched INCITE in 2003. "By dedicating time on these supercomputers to carefully selected projects, we are advancing scientific research in ways we could barely envision 10 years ago, improving our national competitiveness."

Source: New York University