《China Breakthroughs: Warming up to Artificial Sun research》

By Tom McGregor, CCTV.com Panview commentator and editor

The Sun is the center of our universe as the Earth and seven other planets orbit around it. The Sun brings light and warmth to our world. But should we ask another question: Can we create an artificial sun?

Chinese scientists have already accomplished the task by initiating the experimental project in 2006 at the Hefei Institute of Physical Sciences under the Chinese Academy of Sciences (CAS).

The Hefei-based group has embarked on achieving major breakthroughs on artificial sun research and developing new technologies to accomplish record-breaking innovations.

The artificial sun is known as the Experimental Advanced Superconducting Tokamak (EAST), a Soviet-designed device that can make core temperatures even hotter than the sun.

Record-breaking evening

On the evening of July 3, Chinese scientists had set a world record by reaching 101.2 seconds of steady-state H-mode operations via a Tokamak device to harness energy - fusion.

In other words, they turned on an artificial sun, which continued to burn at scorching hot temperatures for nearly two minutes. The prior record - about 60 seconds - was set by the same team a year earlier.

They could set up a long-pulse with an H-mode discharge that can convert into energy, such as what occurs at a nuclear power plant.

Chinese scientists have received support from experts all over the world as they collaborate on the International Thermonuclear Experimental Reactor (ITER), a large-scale scientific cooperation project.

Scientists from over 30 nations are participating in order to prove a fusion device can create energy, based on principles that power the sun and stars.

Make nuclear energy great again

Nuclear energy deserves recognition as green energy, since it's carbon-free and can provide a large supply of power to households.

Creating an artificial sun can upgrade nuclear power capacity. The EAST team had tapped contained super hot plasma for record lengths of time.

By replicating the energy-generating process of the sun, Chinese scientists have gotten "closer to clean and virtually unlimited energy offered by nuclear fusion," according to ECNS (English-language China News Service).

During the record-setting experiment, the EAST team could heat up H-mode plasma to 50 million Kelvins (49.999 million degrees Celsius).

The ultimate goal for ITER members is to produce 500MW (megawatts) of fusion power with only 50-MW - input power.

Chinese government officials have shown vital support for EAST, including from Yang Hongwei, director of the energy efficiency center under the National Development and Reform Commission.

Shifting out of fossil fuels

Yang believes developments on the artificial sun would represent the future direction of green energy innovations.

"This breakthrough is an important step amid the transition from fossil fuels to clean and renewable energy," ECNS quotes Yang as saying.

Nevertheless, not everyone supports creating an artificial sun for commercial purposes. Lin Boqiang, dean of the China Institute for Studies in Energy Policy at Xiamen University expressed concerns that fusion energy is too expensive for production.

Scientists are at the initial stages of developing fusion energy. They have not set up the commercialization and application of the technology for daily life.

The potential costs could be exorbitant and that must be taken into consideration for wider application in households, said Lin.

There's a long way to go before the artificial sun can serve as a reliable and affordable source of fusion energy.

Witness to developments

Serving as the chief operator of EAST, Gong Xianzhu has witnessed every advance made in the Tokamak device along with its setbacks.

"EAST will continue to play a key role on both the physics and engineering fronts of steady-state operations and has significant scientific implications for ITER and the future of of China Fusion Engineering Test Ractor

(CFETR)," said Gong.

Chinese scientists have worked with their peers from abroad to solve key technical and physical issues on operations, while conducting in-depth scientific research on integrated operations scenarios.

The EAST team will wrap up experiments on the artificial sun in Hefei later this month and will conduct another round later in autumn this year.

They set a goal for the Tokamak device to hit the 100 million degrees Celsius mark for 1,000 consecutive seconds.

Top-ranking as fusion maker

Constructing an artificial sun to make it run three times hotter than the sun’s core may not seem practical. The costs are enormous, as well as the time and efforts required for scientists to work on the project.

Yet, new discoveries could await as the EAST team has not only succeeded in breaking records but stand poised to achieve groundbreaking scientific innovations that could lead to an energy transformation.

Reducing pollution and cutting carbon emissions would allow all Chinese to breathe easier, which can reverberate to positive outcomes all over the world.

Perhaps an artificial sun could indeed produce a new source of energy that will offer strong commercial appeal, but if that occurs they should find ways to make the new energy source more affordable for families.