AS FUSION GAINS MOMENTUM

# IAEA Fusion Energy Conference Draws Thousands

by Charles Notley

Oct. 27—The International Atomic Energy Agency's 29th biennial Fusion Energy Conference, Oct. 16-21, drew 1,000 fusion scientists, engineers, policy makers, regulators, and entrepreneurs from more than 80 countries; another 1,600 joined online. There were 23 technical sessions, over 100 talks, and more than 800 poster presentations. According to the conference website:

> The conference aims to serve as a platform for sharing the results of research and development efforts in both national and international fusion programs.... Furthermore, the conference will also set these results against the backdrop of the requirements for a net energy-producing fusion device and a fusion power plant in general, and will thus help in defining the way forward.

ITER

*The Experimental Advanced Superconducting Tokamak (EAST) at the Institute of Plasma Physics in Hefei, China, on Dec. 30, 2021, became the first tokamak to demonstrate a thousand-second steady state plasma. In tokamaks, the hot plasma is contained in a torus-shaped chamber like this one for EAST—using powerful electromagnets. Plasma stability is a significant engineering problem.*

The ITER International Fusion Energy Organization and the European Atomic Energy Community (Euratom) participated, as did more than 40 countries and a great number of research institutes and organizations, including those working on smaller devices.

## A World Fusion Energy Group

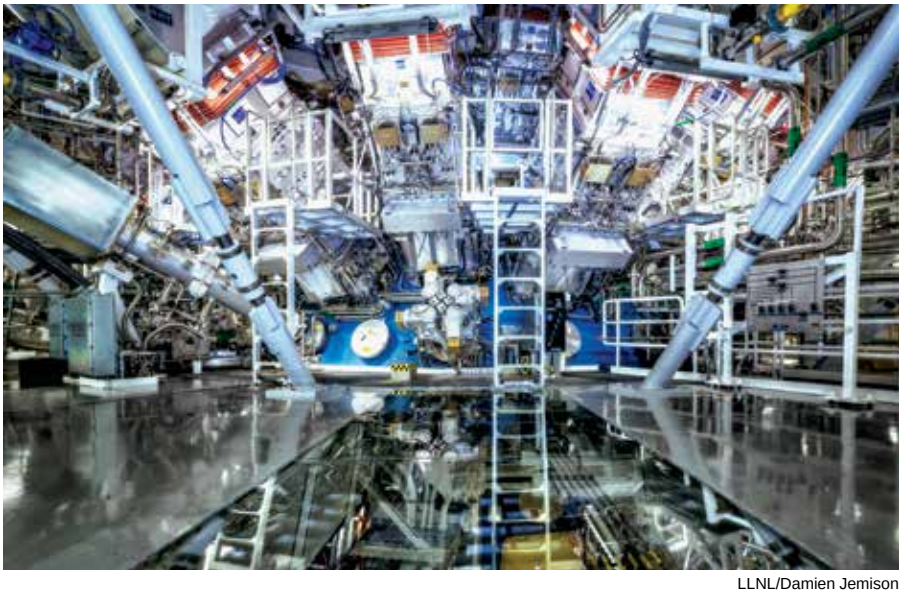
In his opening remarks, IAEA Director General Rafael Mariano Grossi announced that he would shortly invite fusion experts to work with the IAEA to outline Fusion Key Elements such as definitions, characteristics, and criteria for fusion energy. The Fusion Key Elements are expected to be identified in time for the inaugural gathering of the World Fusion Energy Group next year. This group will bring together not just scientists and engineers from laboratories and experimental centers, but also policy makers, financiers, regulators, and private companies. Such collaboration, the organizers believe, will enable these stakeholders to keep pace as the fusion energy journey continues from the experimental stage, to demonstration, to commercial fusion energy production.

Grossi announced a new publication, *IAEA World Fusion Outlook* (*WFO*), intended as a comprehensive guide on fusion's journey from vision to reality. The IAEA aims for *WFO* to become a global reference for authoritative information regarding the latest developments in fusion energy. It also publishes the journal, *Nuclear Fusion*.

The announcement came as interest in fusion energy research is gaining momentum around the world. Fusion is being promoted as a better alternative to

fossil and so-called renewable energy sources as having the potential to provide a source of limitless, inherently safe, clean, and affordable energy. Online conference material omits, however, any mention of fusion's massive *qualitative* advantage: far higher energy-flux density than all other known energy sources, for transformative applications of power, and space-flight propulsion.

A Women in Fusion side event drew 100 participants from 13 countries. Launched in March, Women in Fusion, a mentoring program to support the professional development of women working in all aspects of the fusion sector, has more than 500 members. Women currently constitute 20% of the fusion workforce.



LLNL/Damien Jemison

*On Dec. 5, 2022, the National Ignition Facility, at the Lawrence Livermore National Laboratory in Livermore, California, using inertial confinement, produced more energy from a fusion reaction than the energy needed to spark it. In inertial confinement, powerful lasers are trained on a tiny fuel capsule—not visible here, but situated in the middle of the picture.*

In the scientific sessions, participants discussed achievements made in the two years since the previous conference, in magnetic confinement, inertial fusion, materials science, machine designs, plasma physics, and more. Examples: Commonwealth Fusion Systems' high-temperature superconducting magnet, the Experimental Advanced Superconducting Tokamak's (EAST) long-pulse operation; the Joint European Torus's (JET) world energy record; MIT's ARC compact fusion reactor; and the National Ignition Facility's (NIF) first-ever energy gain.

In addition to large government-sponsored programs, billions of dollars are flowing into private-sector fusion research, as reflected in the Pathways to Fusion session. Currently, around the world, there are almost 130 experimental fusion devices and testing facilities operating, under construction, or being planned, and a dozen or so demonstration plant or pilot plant designs under development.

ITER Organization/EJF Richie

*Facilities for the giant International Thermonuclear Experimental Reactor (ITER)—the world's largest magnetic confinement tokamak fusion reactor—in Cadarache, France. Thirty-five nations are collaborating in its construction.*

The IAEA supports fusion research by providing physics data through seven fusion databases, and supports other opportunities for scientific collaboration through its Fusion Portal, which will publish papers from this conference, and the Fusion Device Information System (FusDIS).

The next conference, to be held in 2025, will be in Xi'an, China, "the city of light and eternity."