NIF is the world's largest and most energetic laser.

Lawrence Livermore National Laboratory is home to the National Ignition Facility (NIF), which began full operations in March 2009. NIF's 192 powerful laser beams, housed in a 10-story building the size of 3 football fields, can deliver nearly 2 million joules of ultraviolet laser energy in billionth-of-a-second pulses to the target chamber center. When NIF's laser beams focus all of their energy on a target the size of a pencil eraser, they briefly produce extraordinary temperature and pressure conditions within the target.

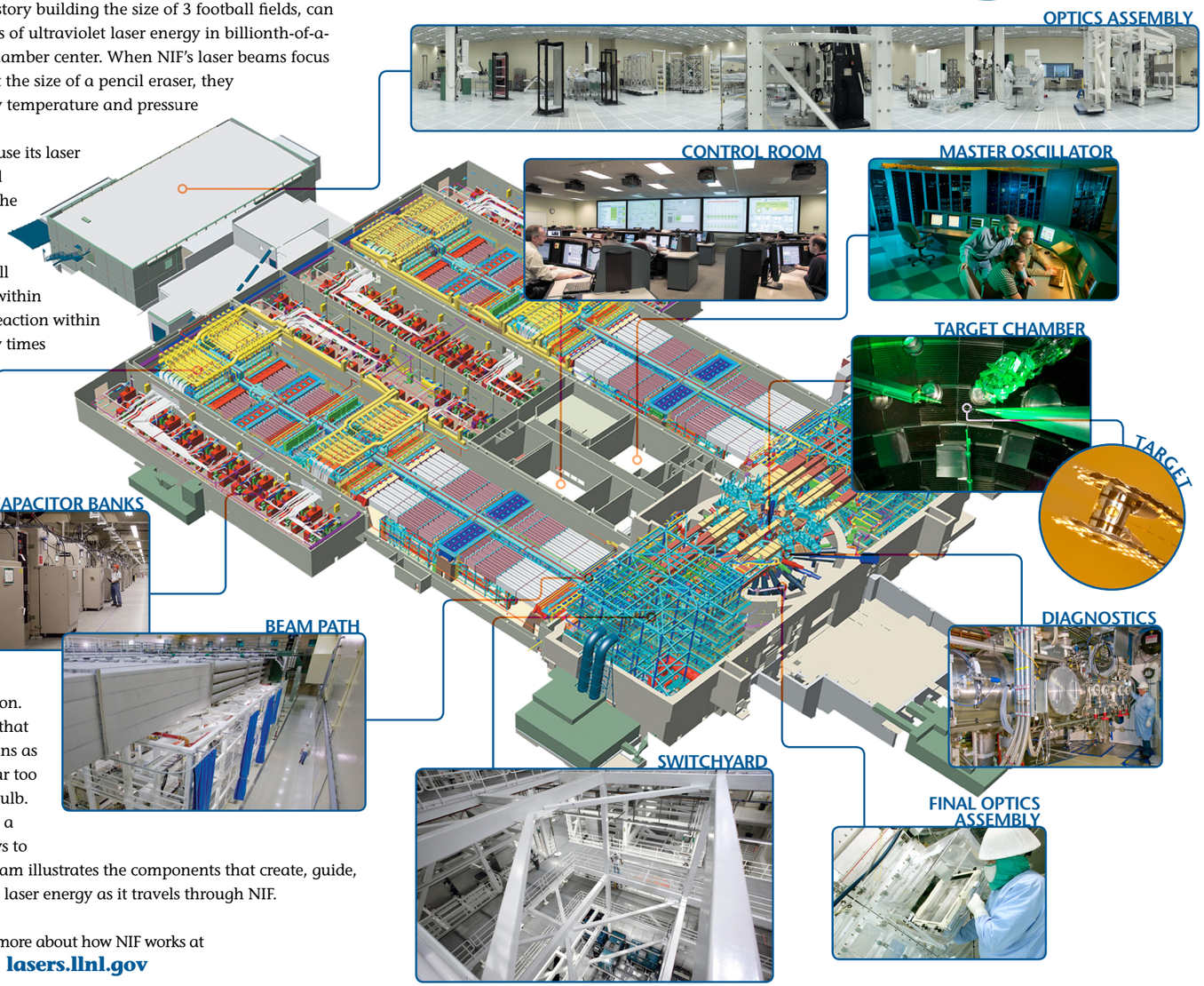
The chief goal of NIF is to use its laser energy to create pressures and temperatures so intense that the nuclei of hydrogen atoms within a target fuse—a process that mimics on a small scale what occurs constantly within our Sun. A successful fusion reaction within a NIF target will release many times more energy than the laser energy required to initiate the reaction; this reaction is referred to as ignition.

The powerful laser energy that bombards a target at NIF begins as an initial laser beam that is far too weak to power a single light bulb. The energy must be amplified a quadrillion times as it journeys to the target chamber. The diagram illustrates the components that create, guide, amplify, and interact with the laser energy as it travels through NIF.

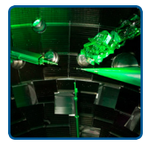
Learn more about how NIF works at
lasers.llnl.gov

Bringing Star Power to Earth

lasers.llnl.gov



NIF is a national resource—a unique experimental facility addressing compelling national security, energy, and science missions.



National Security

Maintaining the U.S. nuclear weapons stockpile as a deterrent against foreign aggression has been a mainstay of national policy since the end of World War II. The long-term success of stockpile stewardship depends on improving the predictive capability of simulation codes used to assess nuclear weapons performance; the simulations use simplified physics models because the calculations are too complicated for even the fastest computers. Experiments on NIF enable scientists to better understand the underlying physics, reduce weapons performance uncertainties, and improve codes. NIF's unique capabilities for studying materials under extreme conditions and other phenomena provide valuable data that support national security missions.

Fundamental Science

Humans have sought to understand how the universe began and how it works since the dawn of history. By recreating conditions that exist naturally only in the interiors of stars, supernovae, and giant planets, NIF will provide important insights into what happened in the first nanoseconds of creation and will help us understand how the fundamental particles of matter combined to become the stars, the planets, and the elements that make life possible. Scientists are using NIF to explore materials under extreme temperature, pressure, and density conditions that are not accessible at other experimental facilities, enabling research that will shed light on many aspects of our universe and its formation.

Energy Security

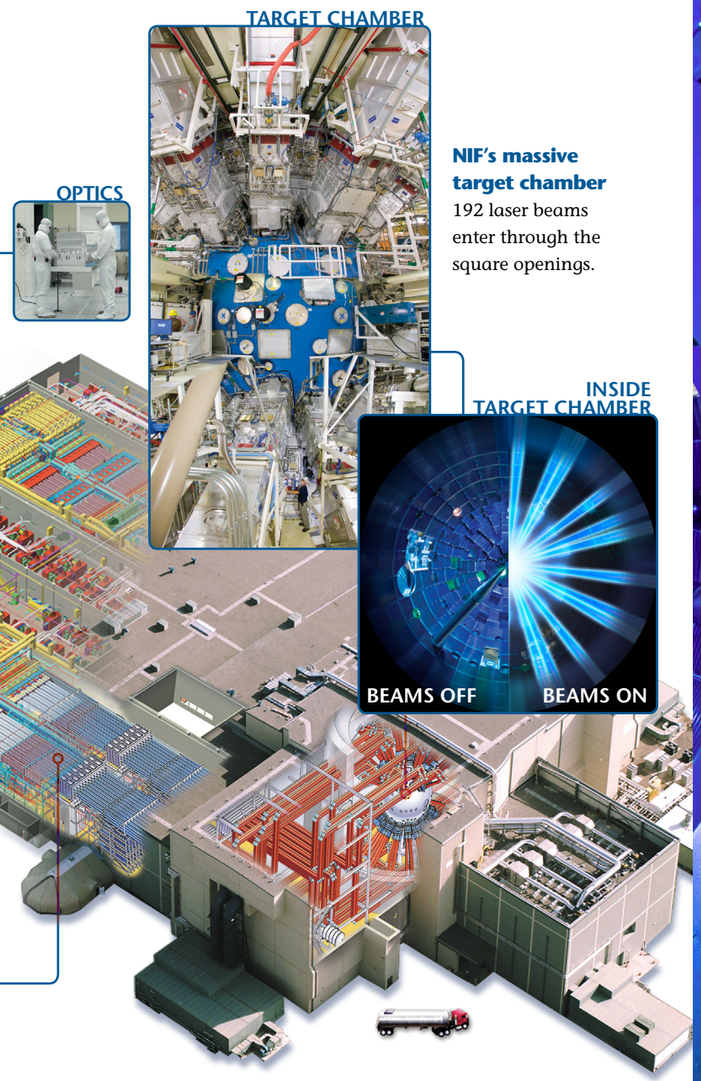
At our current pace of growth and consumption, the world will exhaust its chief non-renewable energy resources—oil and natural gas—before the end of this century. Coal will last longer, but the carbon dioxide and other greenhouse gases that are released when coal and other fossil fuels are burned could cause dramatic changes to the Earth's climate. A tantalizing alternative is fusion, which has the potential to provide safe, virtually unlimited energy without contributing to climate change or causing the environmental worries most other energy types entail. Ignition experiments on NIF will supply data to scientists and policymakers for evaluating fusion as a commercial power source.

National Competitiveness

NIF contributes to U.S. competitiveness by training future generations of scientists. From tours of the facility to our highly competitive summer student program to collaborations with universities to our post-doctoral scholar appointments, NIF is teaching future science stars.

Learn more at
lasers.llnl.gov

National Ignition Facility & Photon Science



NIF's massive target chamber
192 laser beams enter through the square openings.

For NIF news and information, go to:

lasers.llnl.gov

NIF

Download the NIF app to your mobile device at

lasers.llnl.gov/mobile

Thank you for visiting NIF

The National Ignition Facility (NIF) is the world's largest and highest energy laser system. By providing the capabilities to achieve fusion ignition and burn in a laboratory setting, NIF is a critical experimental facility for the National Nuclear Security Administration Stockpile Stewardship Program and will be a key international scientific resource. NIF will be used to understand issues about high energy density science and explore possibilities for a clean, sustainable energy future.

Additional information is available on the NIF & Photon Science web site at **lasers.llnl.gov**.

Please enjoy,

Jeff Wisoff
Principal Associate Director
NIF & Photon Science

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