Using Science to Support National Security

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

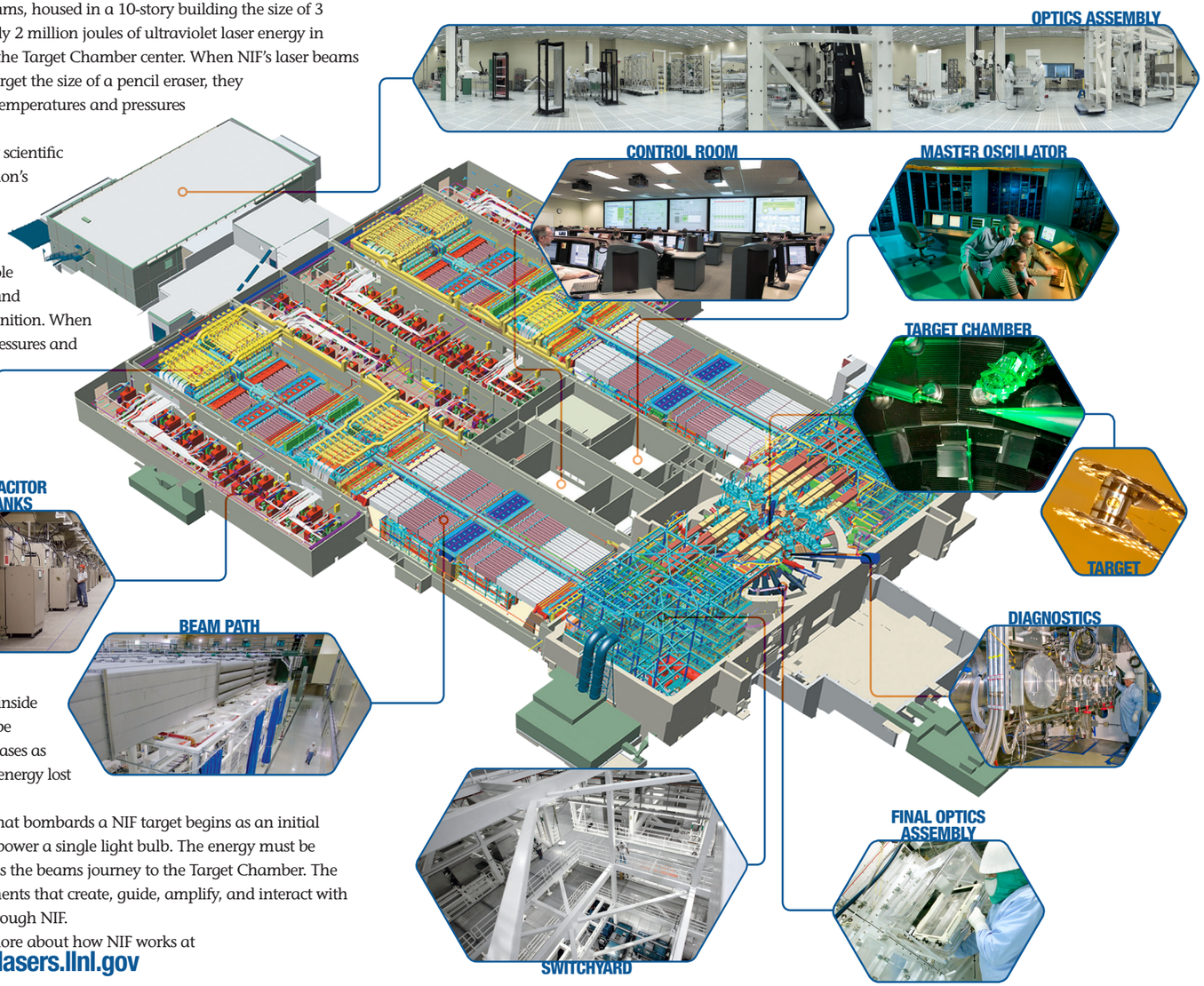
Lawrence Livermore National Laboratory is home to the National Ignition Facility (NIF).

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 temperatures and pressures inside the target.

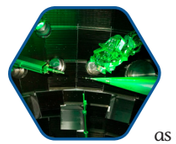
NIF's chief goal is to conduct scientific research to help further our nation's security, including ensuring the safety and reliability of the nuclear stockpile. But the laser facility also plays a vital role in understanding the universe and achieving nuclear fusion and ignition. When fired, the laser energy creates pressures and temperatures so intense that hydrogen atoms inside the target fuse – a process that mimics what occurs constantly inside the Sun and stars. Ignition will be achieved when the reaction releases as much or more energy than the energy lost in creating the reaction.

The powerful laser energy that bombards a NIF target begins as an initial laser beam that is too weak to power a single light bulb. The energy must be amplified a quadrillion times as the beams journey 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



NIF is a national resource— a unique experimental facility addressing compelling national security, science, and energy 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 provide valuable data that support national security missions.

Discovery 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

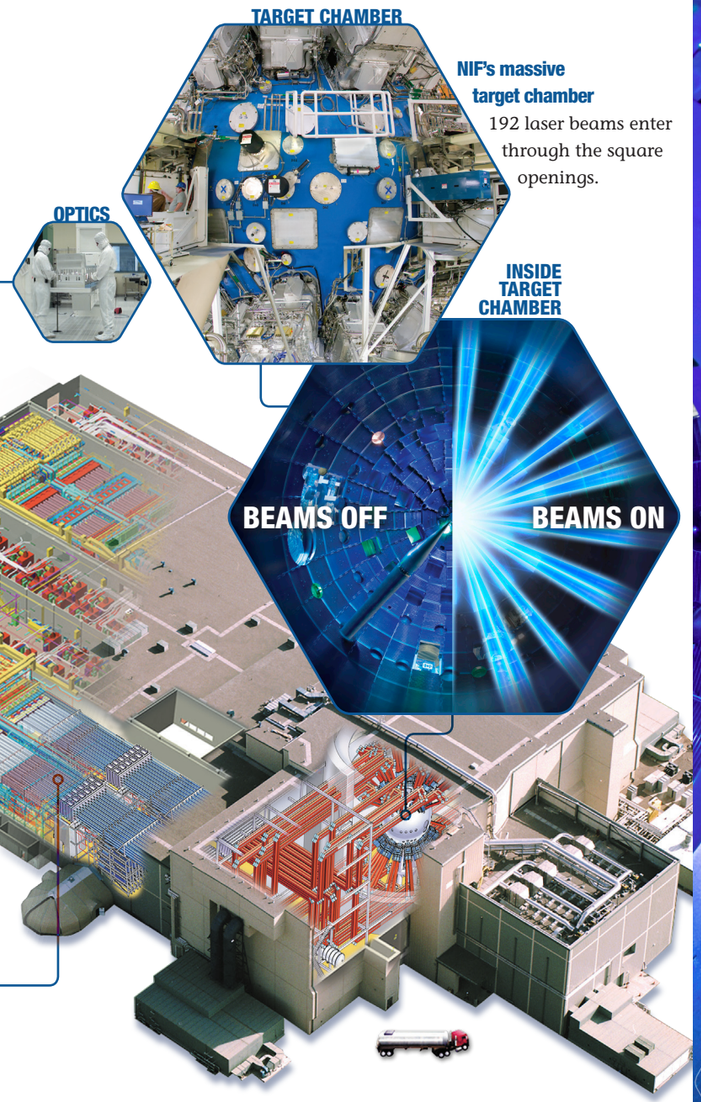
Because nuclear fusion has the potential to provide safe, virtually unlimited energy, the U.S. Department of Energy has made fusion a key element in the nation's long-term energy plans, leveraging the investments from the National Nuclear Security Administration's defense programs that support NIF. Ignition experiments on NIF will supply data to scientists and policymakers for evaluating fusion as a potential commercial power source.

Stewards of Tomorrow

NIF experiments help maintain the skills of nuclear weapons scientists and train the next generation of experts to maintain the stockpile.

From tours of the facility to our highly competitive summer student program, to collaborations with universities, to our postdoctoral scholar appointments, NIF is teaching future science stars.

Learn more at
lasers.llnl.gov



For NIF news and information, go to:

lasers.llnl.gov

NIF&PS

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's Stockpile Stewardship Program and is a key international scientific resource. NIF is used to understand issues about high energy density science and to explore aspects of astrophysics, material science, plasma physics, and many other areas of Discovery Science.

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

Please enjoy,

Jeff Wisoff

Jeff Wisoff
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NIF & Photon Science

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