

# General Atomics Energy Group Update

*Presented by:*

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# General Atomics History

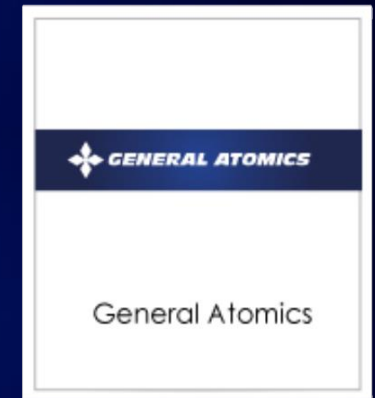
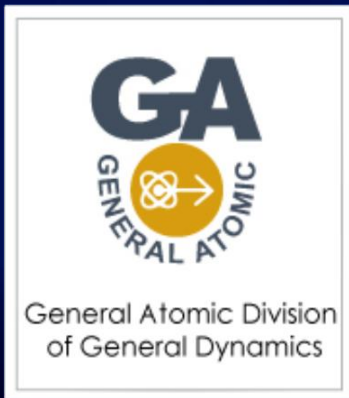


## TORREY PINES GENERAL ATOMICS

Location: San Diego

Founded: 1955 by General Dynamics

Business: High-technology research, design, manufacturing and production for industry and government worldwide



1955 - 1967

PRESENT

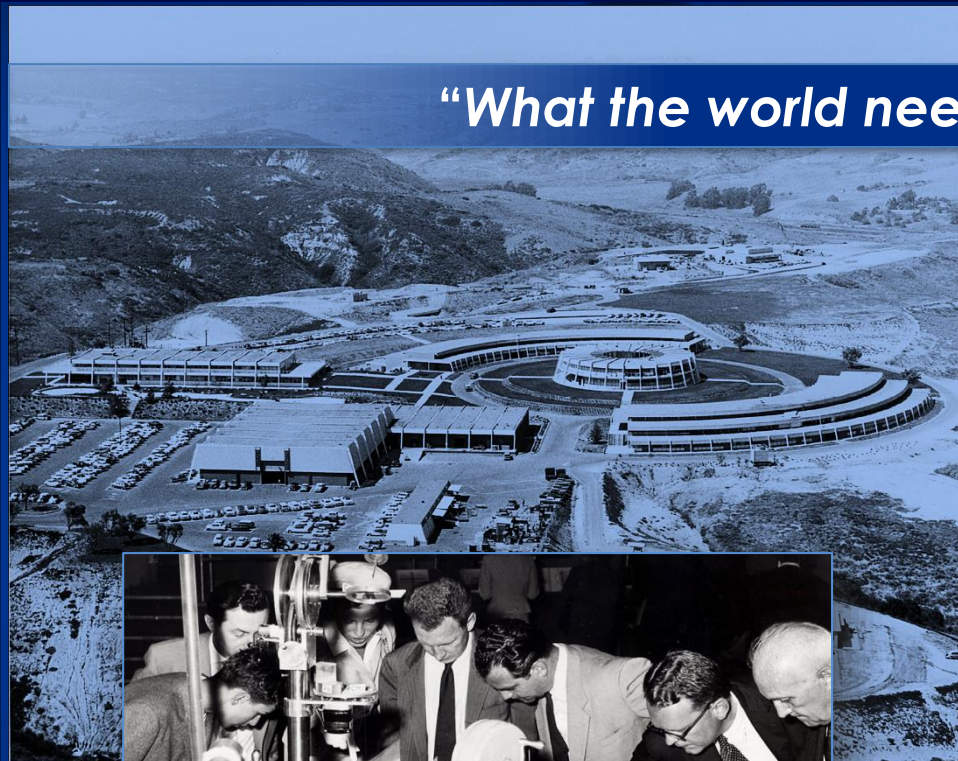


# GA's Innovative Culture Originates with TRIGA

*"What the world needs is a safe reactor."*

– Edward Teller, San Diego, 1956

- Developed at General Atomics in San Diego
- First reactor started up in 1958 – three years after GA was founded
- 69 TRIGAs built in 23 countries



One of the first TRIGAs on display at the second UN Conference in 1958

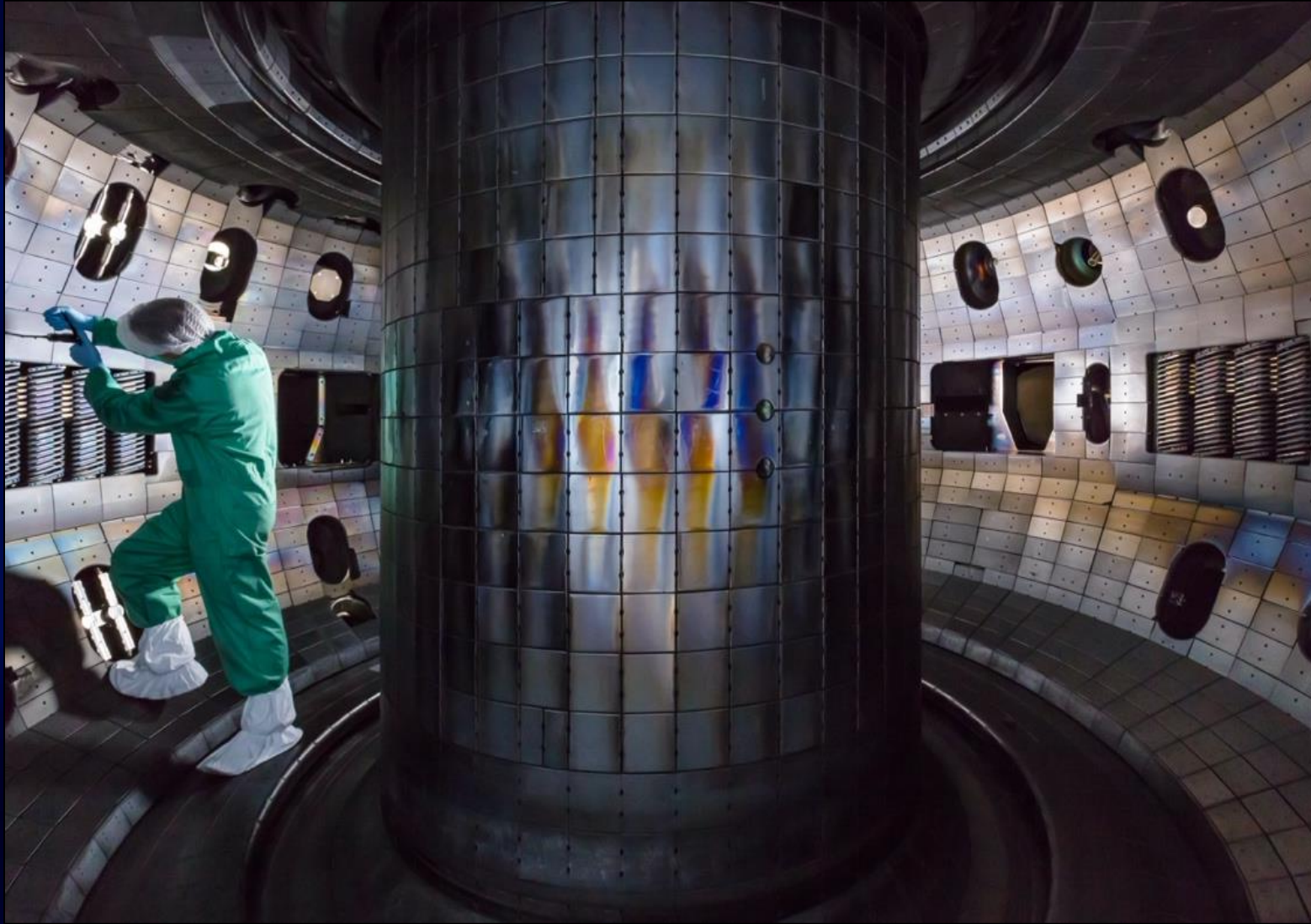
Training Research Isotopes  
General Atomics

# Fusion Offers Limitless Carbon-Free Energy

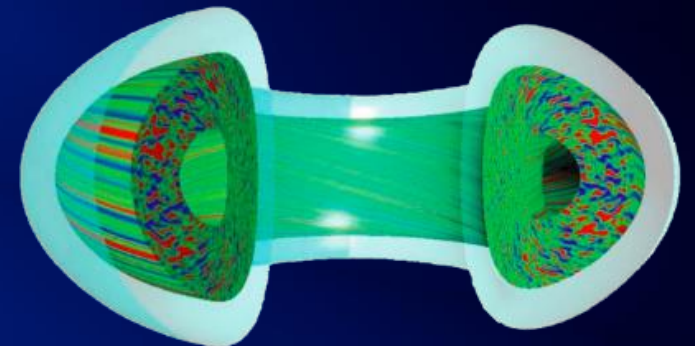
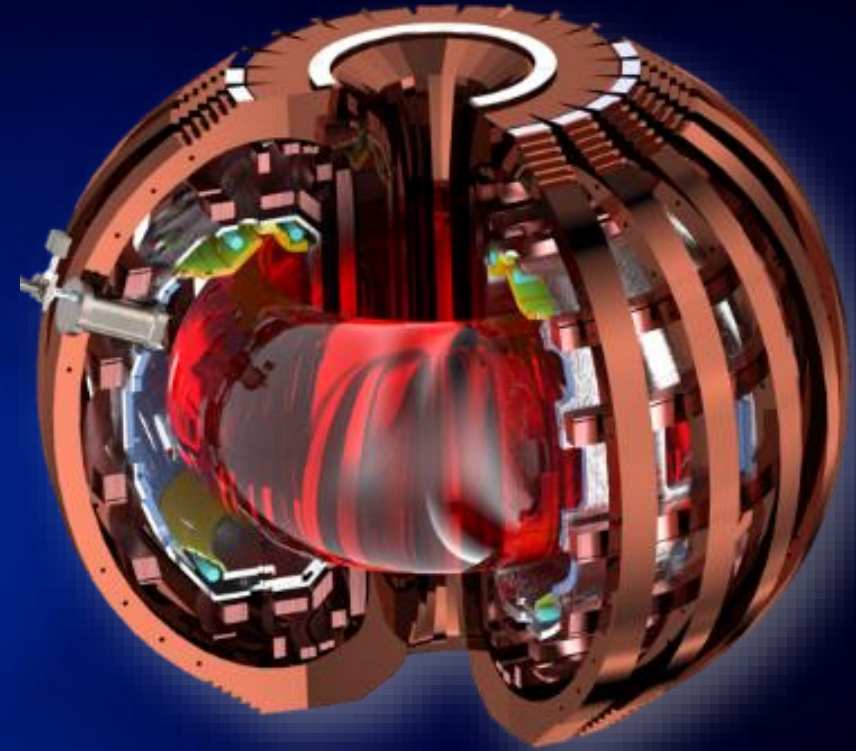


*A bathtub of water and two laptop batteries can supply an individual's energy needs for an entire lifetime!!*

# Magnetic Fusion in a Tokamak Reactor



DIII-D field chamber



# ITER Facility in Cadarache, France (~ 80% Complete)



# ITER Facts

## ITER Management

The seven ITER members, representing 35 nations, are the United States, European Union (host), Japan, Korea, India, China, and Russia. Each member provides in-kind hardware and financial contributions to support project success. As an ITER member, the U.S. contributes ~9% to ITER construction and ~13% to ITER operations, for 100% of ITER science and intellectual discovery.

## Project Background

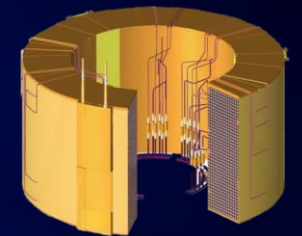
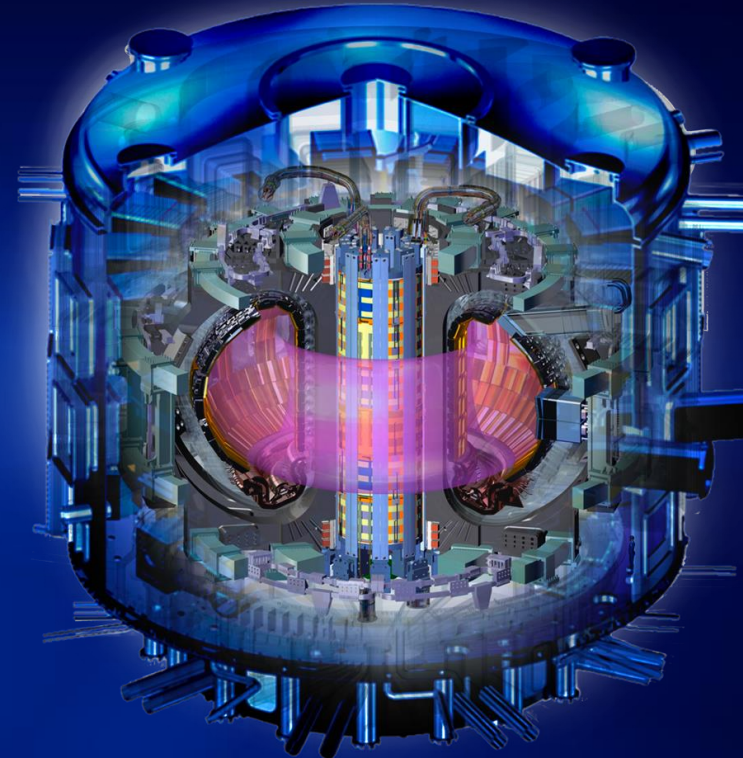
The ITER project evolved from post-cold war discussions between the United States and the Soviet Union. During the Geneva Summit in 1985, Presidents Reagan and Gorbachev discussed a collaboration to develop fusion for peaceful purposes.

## Value

ITER will produce and control a self-sustaining fusion power source plus deliver a first-of-a-kind fusion R&D resource to support practical fusion energy development:

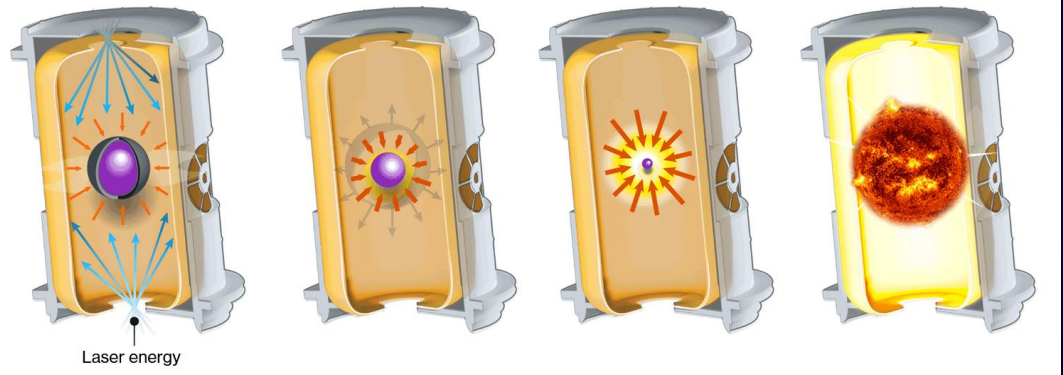
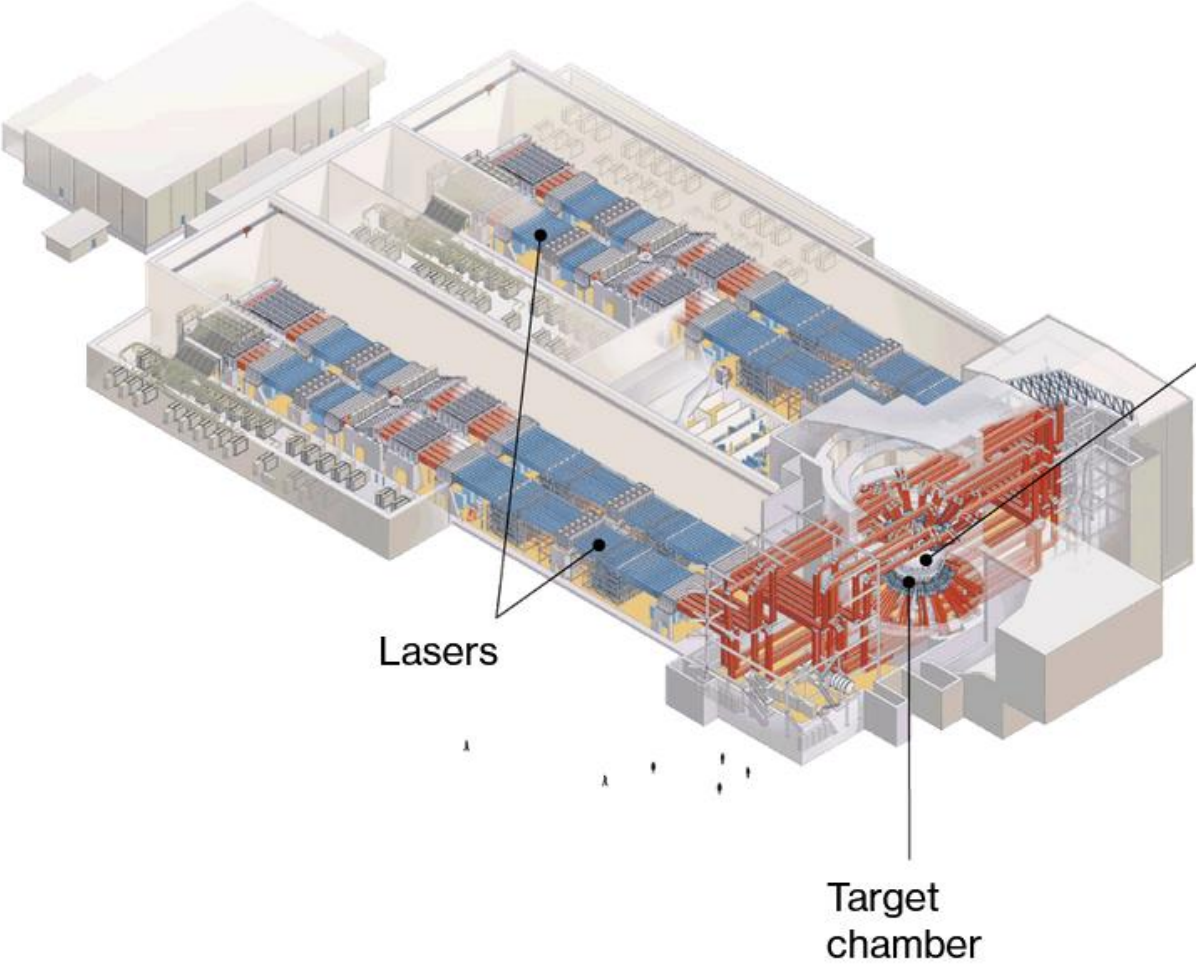
**Fusion gain** up to a Q of 10 (10 x power out)

**Fusion power** up to 500 MW



# Inertial Fusion Progress

## Lawrence Livermore's National Ignition Facility



High power lasers compress a capsule to high pressures and temperatures to achieve fusion



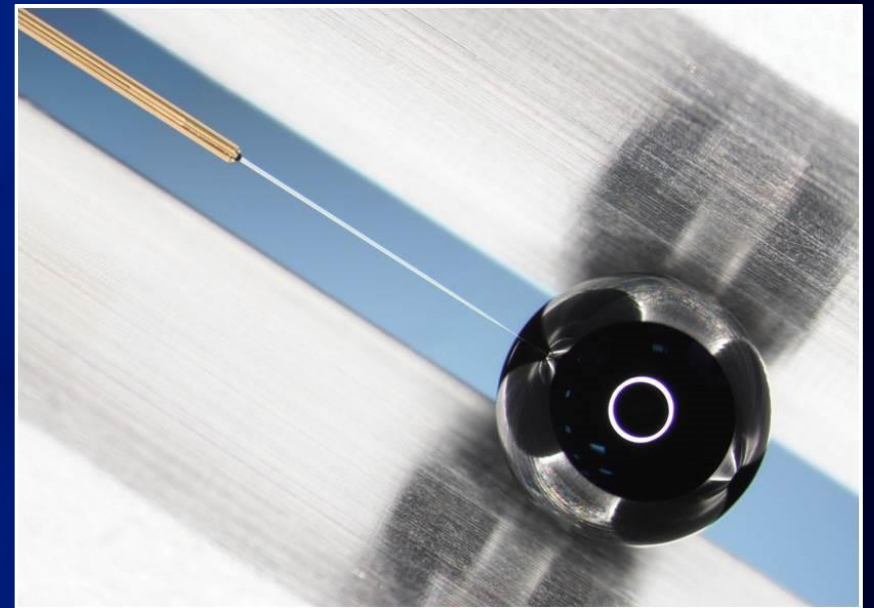
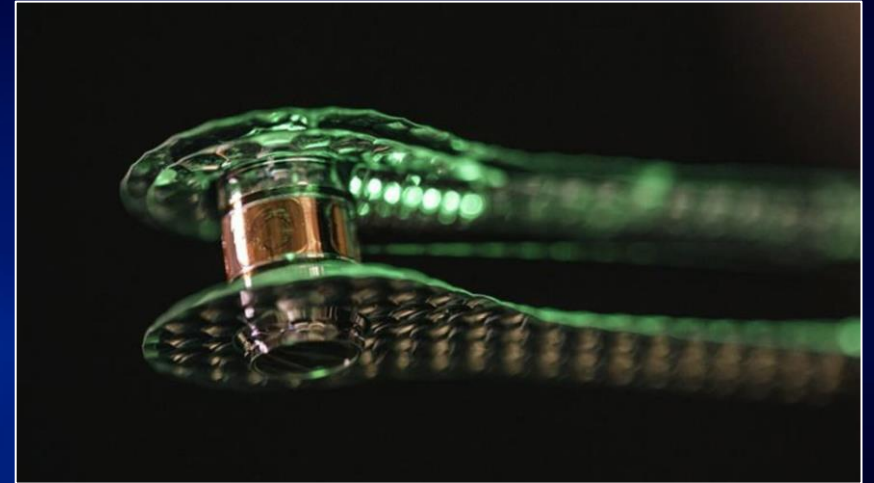
# GA Facilitated the World's First Controlled Fusion Ignition

- **Achieving Ignition**

- Achieved 50% gain on 12/05/2022
  - Target capsule / target assembly
  - Fill tube
  - Comprehensive metrology, proofing, and characterization

- **Precise Tolerances**

- **2mm target capsule** – the size of a peppercorn
- **85-micron wall thickness** – the diameter of a human hair
- **2-micron fill tube** – 1/4th the diameter of a human red blood cell
- **50 nano-meter measurements** – the length a human fingernail grows in one minute

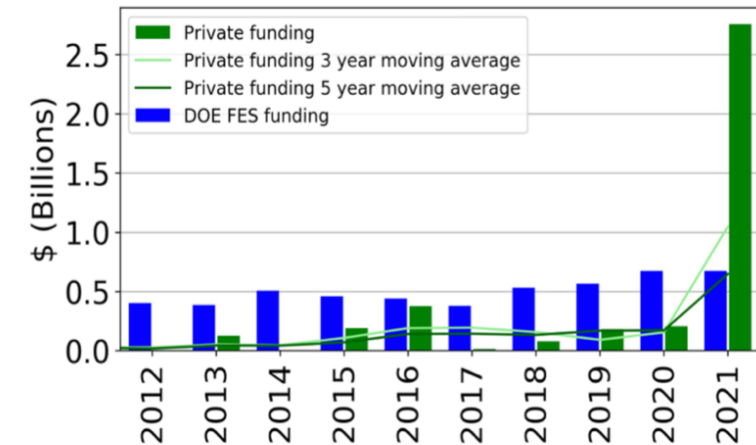


# Historic Interest in Commercial Fusion Energy

- **Government Support**
  - White House Fusion Summit (March 2022)
  - Announcement of “Bold Decadal Vision”
  - CHIPS and IRA have added several \$100M to support Fusion and related technologies
  - Milestone-based program
- **International Advancements**
  - Records broken; new technologies
- **Private Sector**
  - \$5 billion + in private investments/commitments
- **GA is bringing its long experience and its leading-edge science & technology expertise to enable the success of commercial fusion energy**



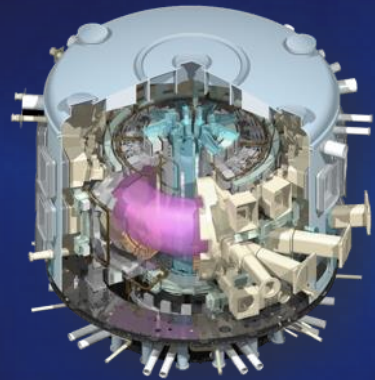
## Growth of private funding enables this opportunity



Plot credit: Sam Wurzel, Technology-to-Market Advisor, ARPA-E

U.S. DEPARTMENT OF ENERGY

# U.S. is Targeting a Fusion Pilot Plant (FPP) in the 2030s



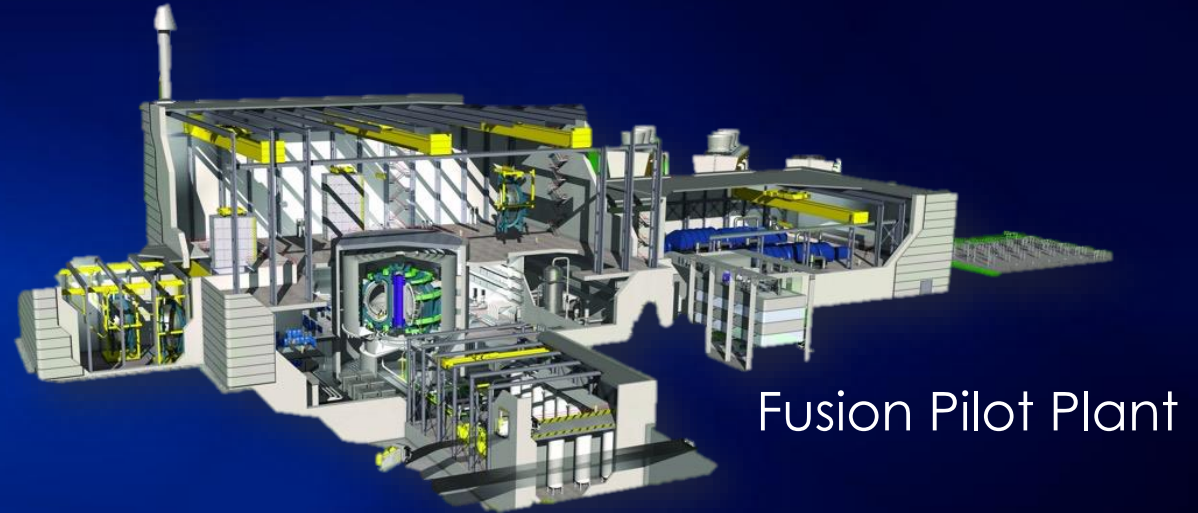
ITER



Advances in Tokamak Design



Advances in Fusion Technologies



Fusion Pilot Plant

- **Interest in the potential of fusion has never been higher**
  - Record fusion energy production at JET
  - Ignition achieved on NIF
  - Progress on ITER construction
  - Private capital investment
  - Recent NRC ruling

# California Coalition for Fusion

1. Brings together experts from academia and industry to develop the fusion workforce
2. Leverages existing collaborations and competencies
3. Increases the pipeline of scientists, engineers and technicians/technologists for future opportunities in fusion.
4. Develops new opportunities for historically underrepresented groups
5. Collaboration to include UC campuses, California State University system, Community Colleges and Industry



# Developing the Future Fusion Workforce

- Partnerships with Universities, Community Colleges, Vocational Schools
- Engagement at the High School level
- Supporting Local, National & International Conferences and Events
- Engagement with the Economic Development Council of San Diego



# Summary

- **GA is pushing the leading edge of technologies needed for clean fusion energy**
- **GA operates the largest and the only operational Tokamak Fusion user facility (DIII-D) in the US, right here in San Diego**
- **GA employs a range of personnel: physicists, chemists, material scientists, engineers and technicians in support of our missions**
- **GA is partnering with companies, national laboratories and academia in the pursuit of commercial fusion energy**

*Stay tuned! The next few years promise to be very exciting as the entire community pursues the promise of Fusion energy*