The Path to Commercial Fusion Energy

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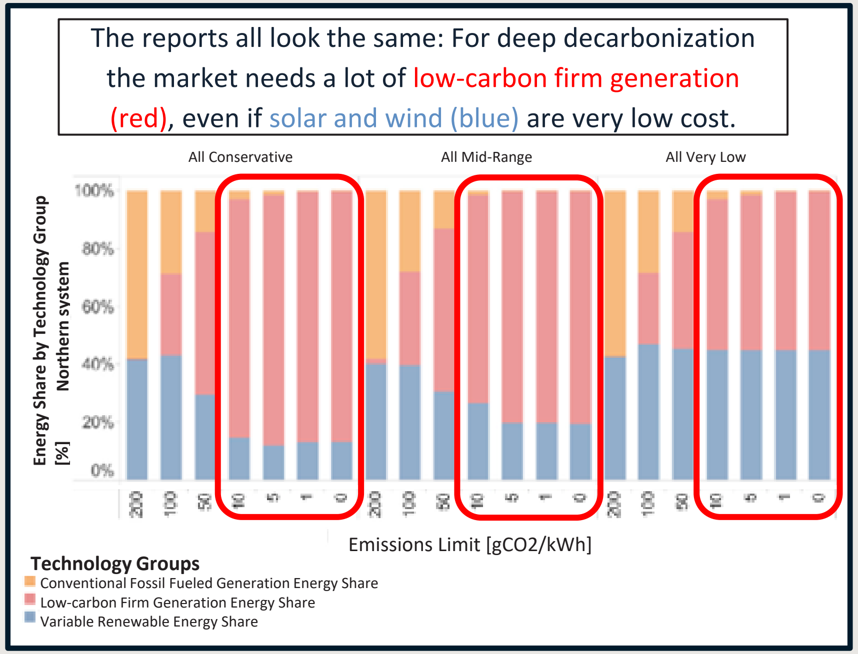
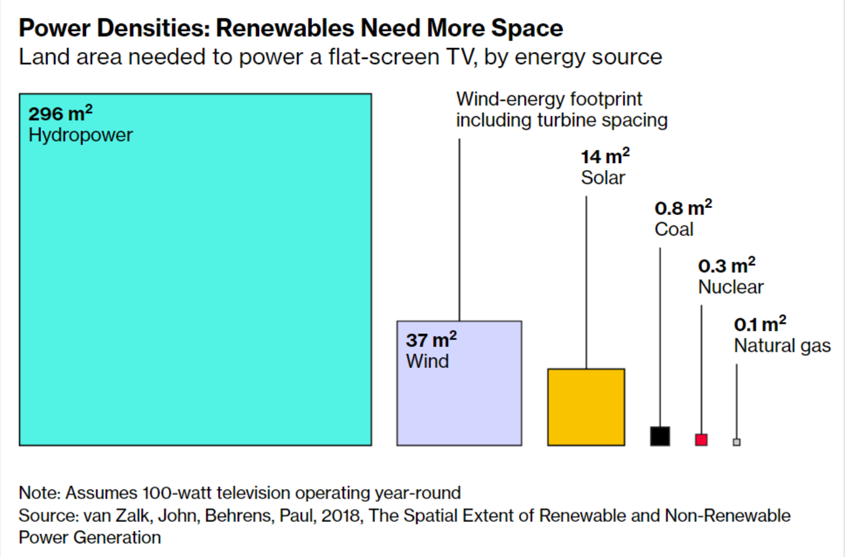
The world needs a new clean energy technology

- Electricity demand increasing
  - Global electricity demand projected to increase by at least 50% by 2050
- Geopolitical challenges looming
  - Supply chains, critical minerals, commodity prices, and interconnections
- Limitations of variable renewables
  - Seasonality, intermittency, and weather
  - Land use – many countries have limited renewables options

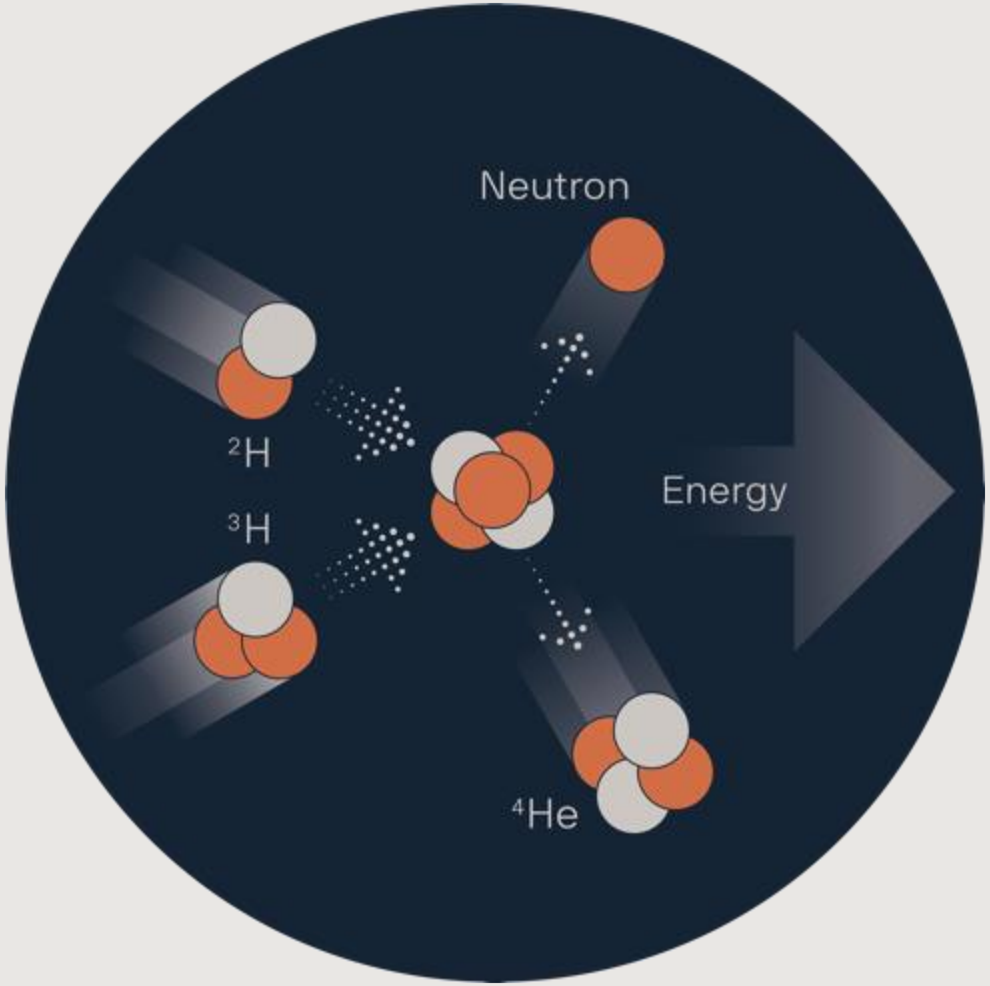
To decarbonize the grid, we need an affordable, dispatchable, zero-carbon power source





Fusion is the energy source to meet that challenge

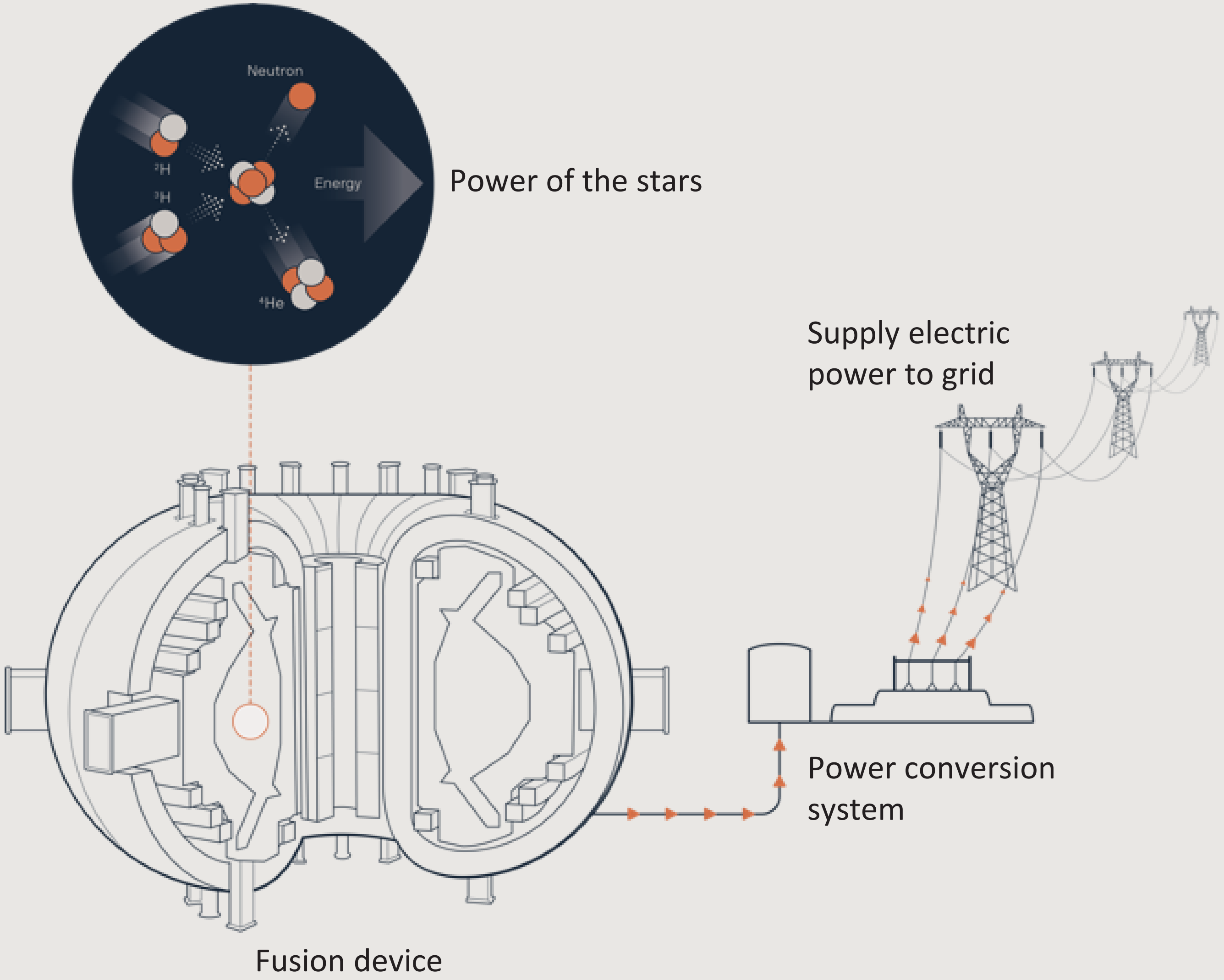
- Process that happens in stars like the sun
- Hydrogen fuses together into helium releasing enormous amounts of energy
- Generates 200 million times the energy per reaction as burning coal



The power of the stars

Why fusion is disruptive

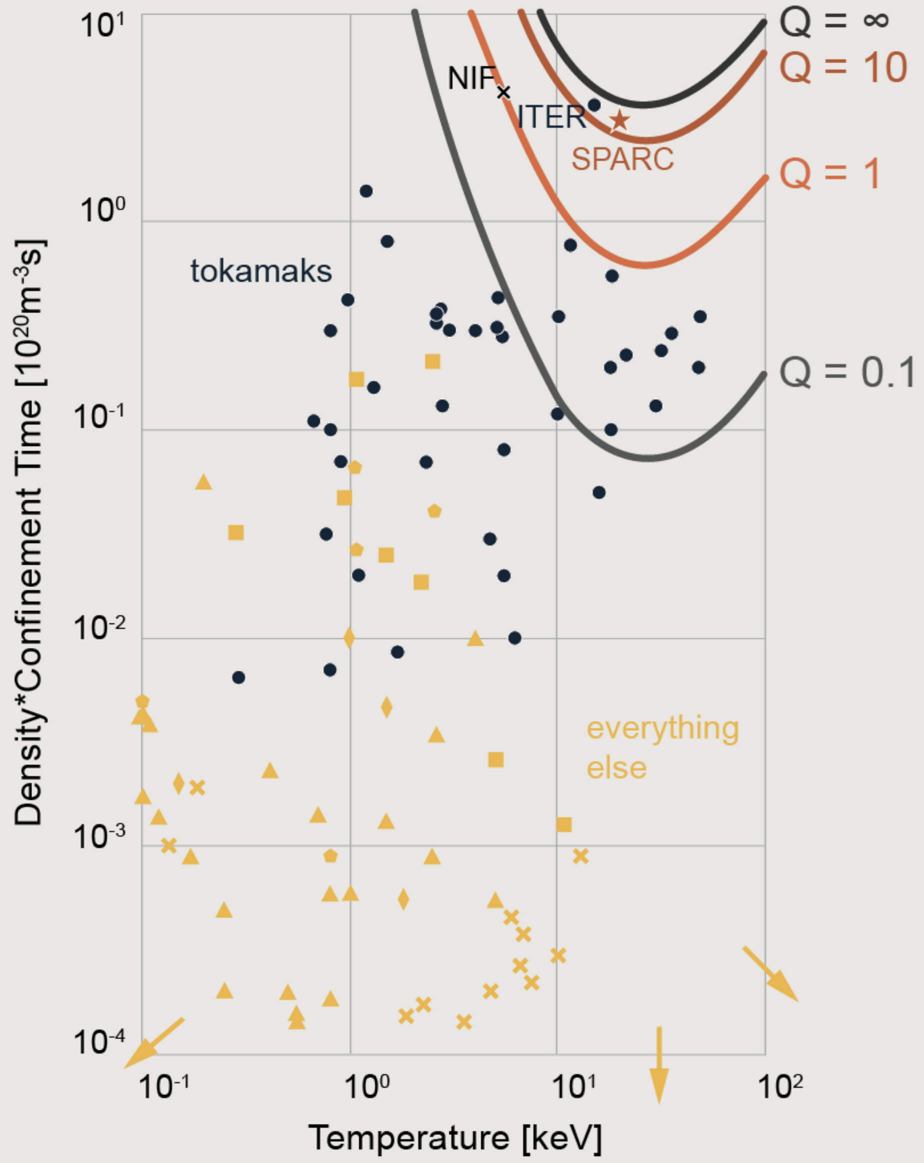
- Clean – zero emissions
- Dispatchable – able to provide baseload or on demand power
- Safe – no chain reaction, no risk of meltdown, no decay heat, walkaway safe, no high-level waste or proliferation
- Scalable – affordable, modular, capable of siting anywhere, leverages existing infrastructure
- Secure – no geopolitically fraught supply chain, minimal fuel which can all be procured up front



On the verge of commercially relevant fusion power

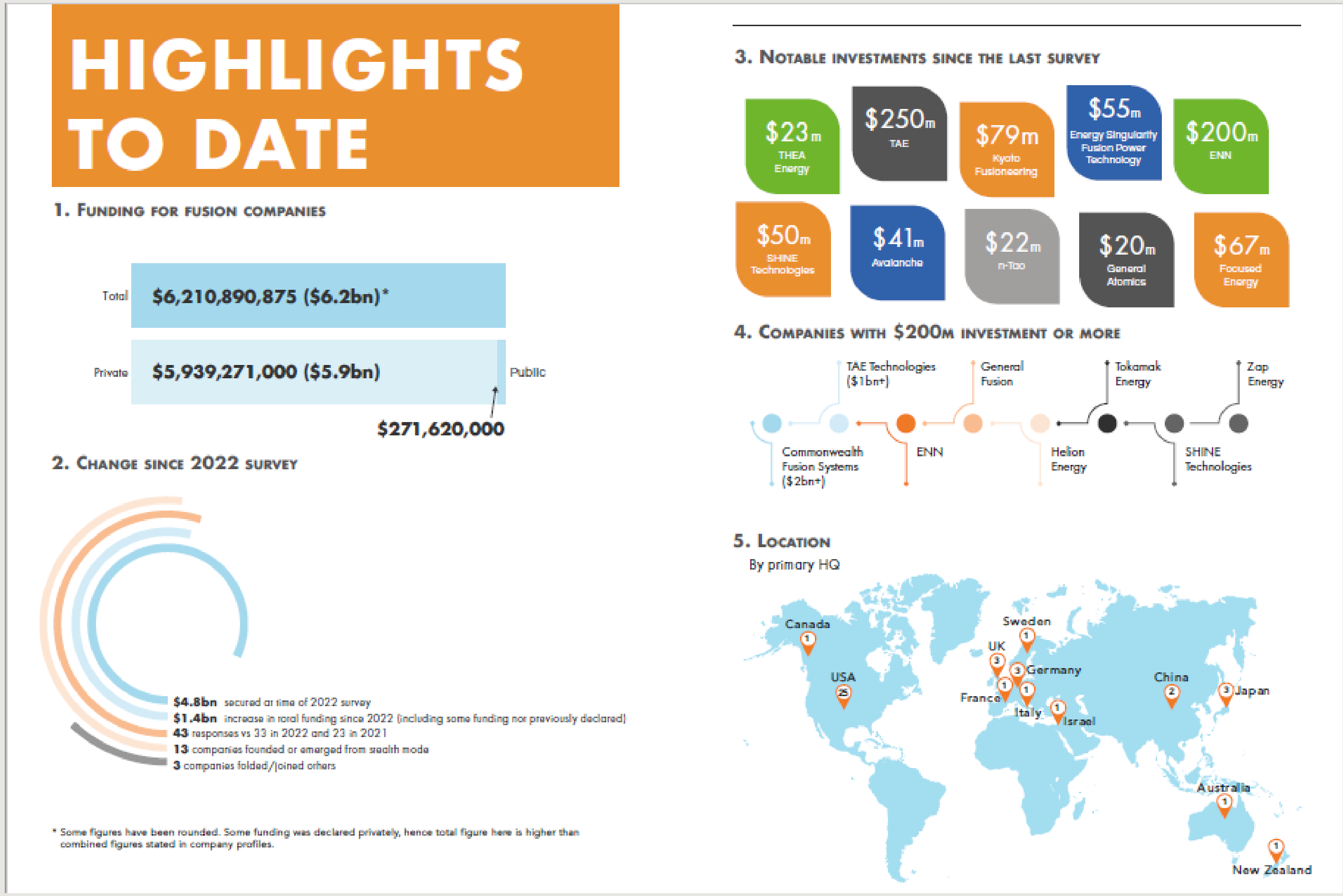
- On the cusp of a key milestone of commercially relevant net gain energy, more energy out than in (Q>1)
- Machines called “tokamaks” are closest
- >150 tokamaks have been built worldwide
- Magnets hold and insulate the plasma and very high magnetic fields make tokamaks smaller

$$Q = \frac{\text{Fusion power out}}{\text{Fusion power in}}$$



There is a growing global private fusion industry

- Nearly 40 global startups with the goal of commercializing fusion
- Over $6 billion in private investment
- 87% of companies believe that fusion electricity will be on the grid in the 2030s
- 2022 fusion supply chain spending was over $500 million, with projected supply chain growth of 1300%



Fusion Industry Association
2023 Industry Report

CFS' Plan

CFS is on a path to deliver commercial fusion energy

- CFS Founded in 2018, spun out of MIT with the goal of commercializing fusion energy to combat climate change
- Raised more >$2 billion
- Built a high caliber, diverse team
- >650 employees



Risk retirement in concrete steps

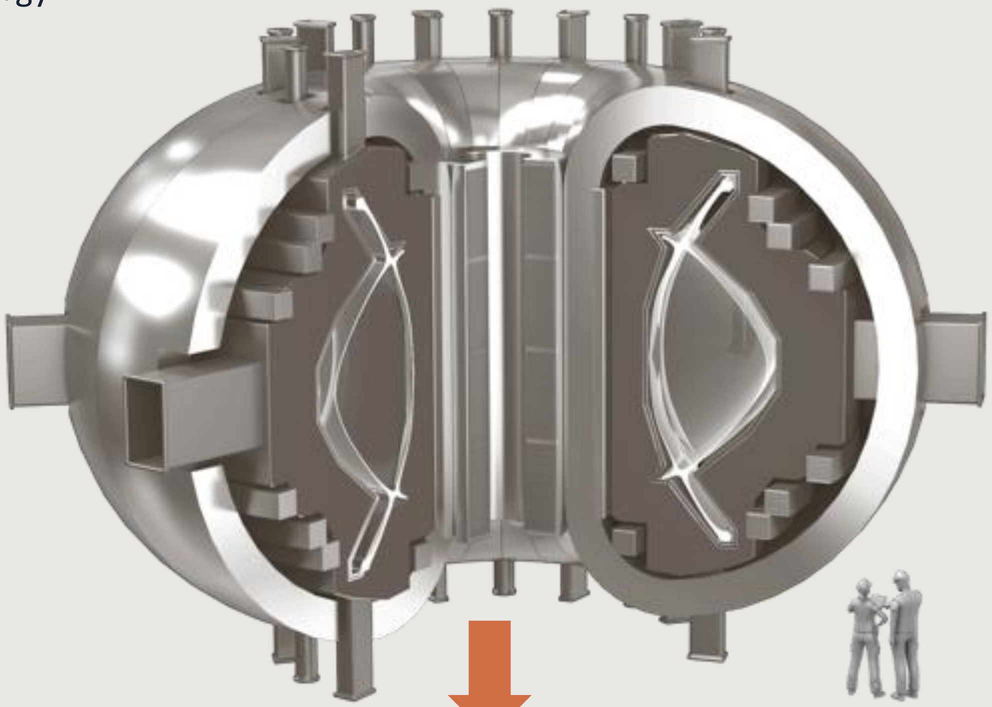
COMPLETED:
Alcator C-Mod
Record-setting tokamak

COMPLETED:
Demonstrate groundbreaking HTS magnets

CONSTRUCTION UNDERWAY for 2025 COMMISSIONING:
SPARC Q>1
Achieve net fusion energy

Commercially-relevant net fusion energy for the first time

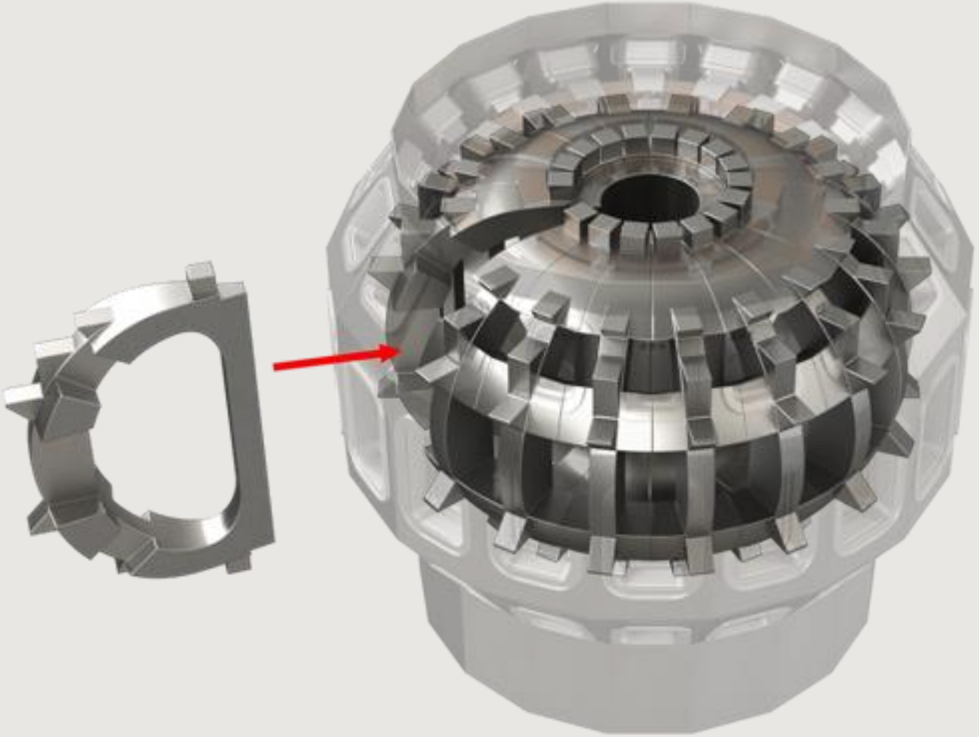
EARLY 2030s:
ARC deployed
~400 MW



Carbon-free commercial power on the grid

CFS proprietary magnets unlock new fusion path

- CFS invented world’s strongest High Temperature Superconductor (HTS) magnet
- Designed and built it in 3 years, demonstrated 20 Tesla
- Power plants can be >40x smaller, faster, and much lower cost



SPARC, first commercially relevant fusion machine

- **Validated approach**
  peer reviewed publications
- **Demonstrated technology**
  built world's strongest HTS magnets
- **Accelerated construction**
  we are building it now

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Overview of the SPARC tokamak

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The SPARC tokamak is a critical next step towards commercial fusion energy. SPARC is designed as a high-field ($B_0 = 12.2$ T), compact ($R_0 = 1.85$ m, $a = 0.57$ m), superconducting, D-T tokamak with the goal of producing fusion gain $Q > 2$ from a magnetically confined fusion plasma for the first time. Currently under design, SPARC will continue the high-field path of the Alcator series of tokamaks, utilizing new magnets based on rare earth barium copper oxide high-temperature superconductors to achieve high performance in a compact device. The goal of $Q > 2$ is achievable with conservative physics assumptions ($H_{98,y2} = 0.7$) and, with the nominal assumption of $H_{98,y2} = 1$, SPARC is projected to attain $Q \approx 11$ and $P_{fusion} \approx 140$ MW. SPARC will therefore constitute a unique platform for burning plasma physics research with high density ($\langle n_e \rangle \approx 3 \times 10^{20}$ m^{-3}), high temperature ($\langle T_e \rangle \approx 7$ keV) and high power density

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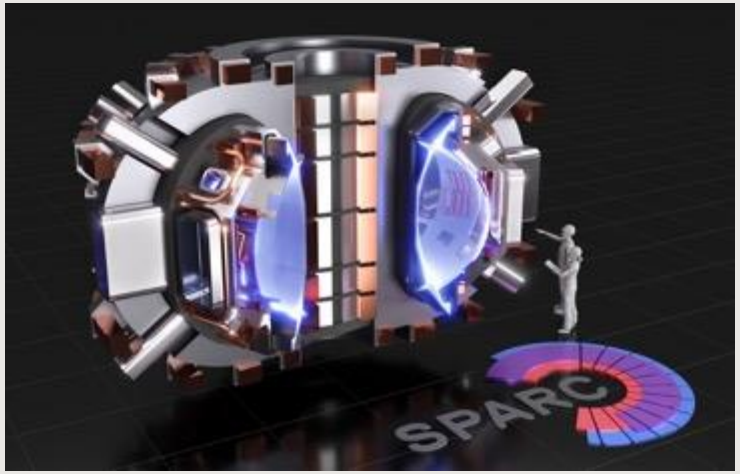
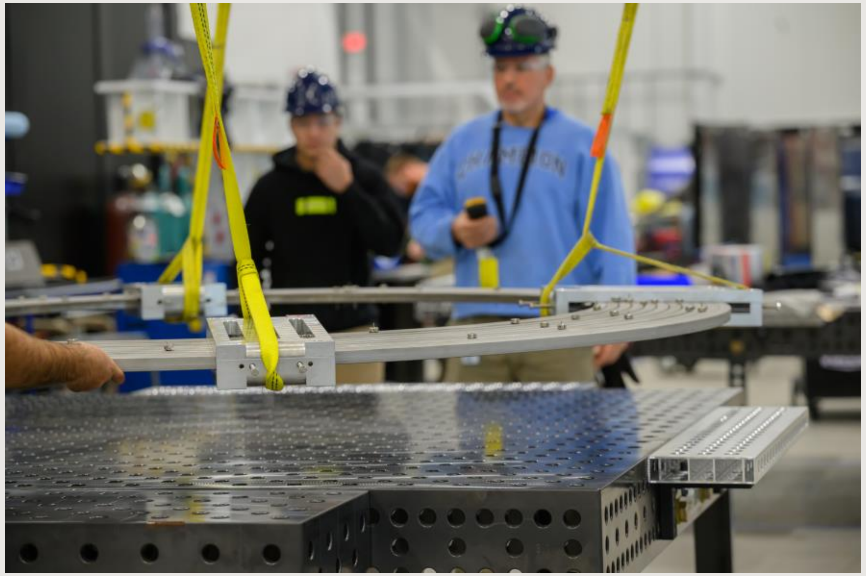


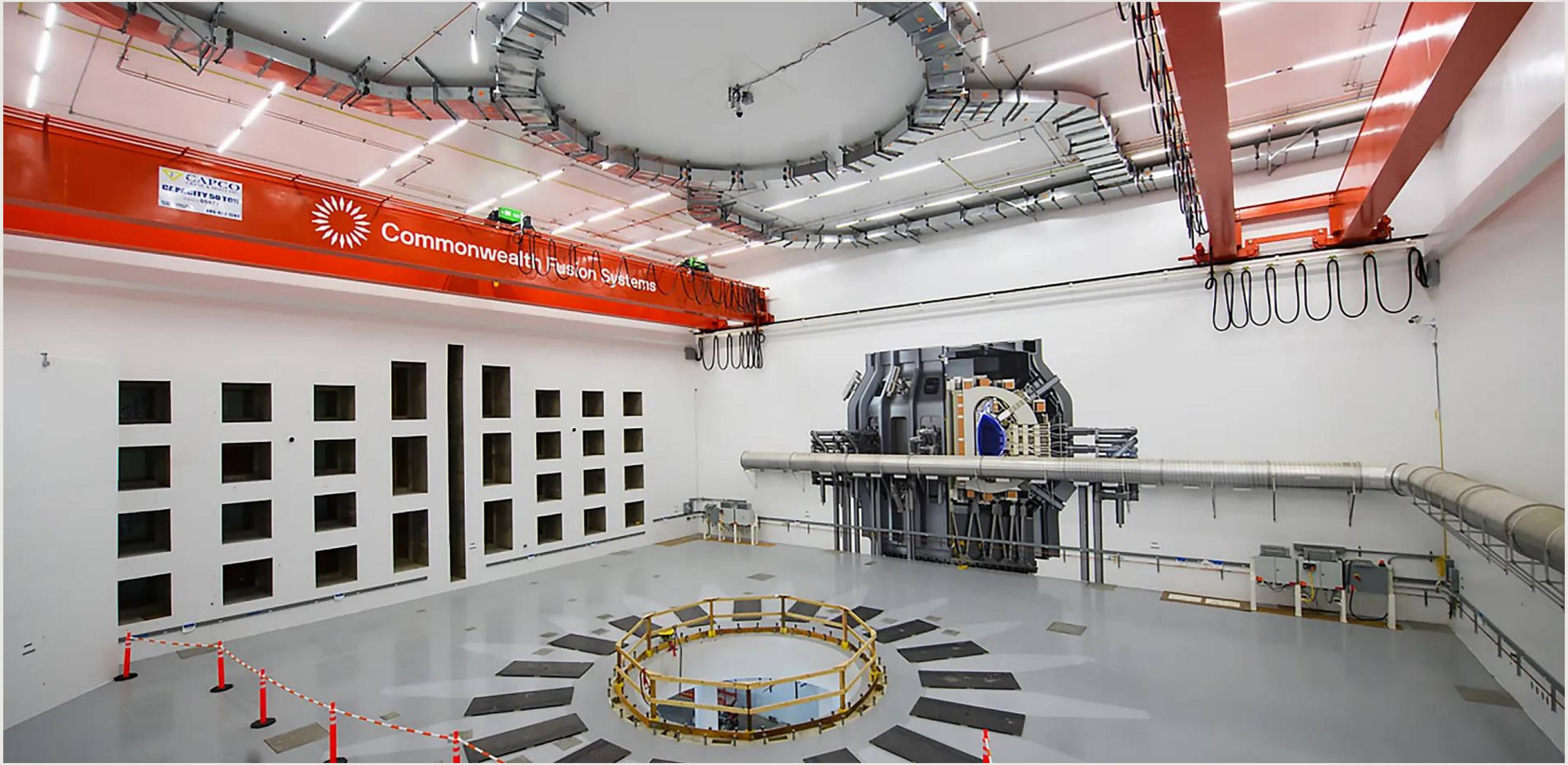
CFS Commercial Fusion Campus in Devens, MA

CFS Magnet Factory



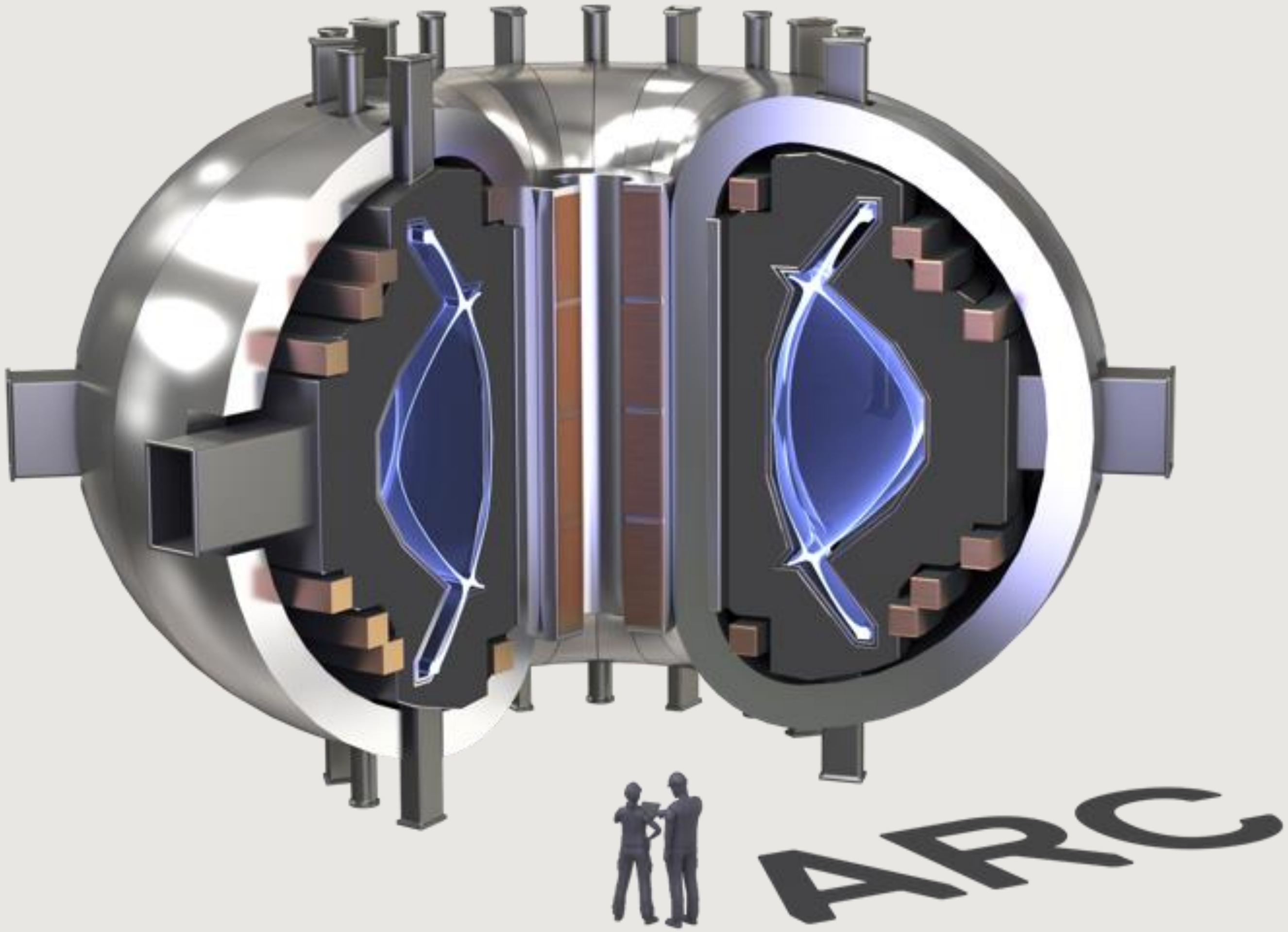
SPARC Facility

Tokamak Hall



ARC, world’s first commercial fusion power plant

- Validation from SPARC:
  - **Economics** de-risked using SPARC costs and supply chain
  - **Performance** de-risked using SPARC operations to optimize it
  - **Technology de-risked** using SPARC and innovative R&D pathways in parallel
- Global site search underway



Policy for Accelerating Fusion Deployment

Policy for accelerating fusion deployment

- Growing government support for fusion energy
- Governments advancing policies, strategies, and regulations include US, UK, China, Canada, Japan, South Korea, Germany, Italy, and EU
- Private fusion companies are moving quickly, but policy support will ensure fusion energy succeeds at scale in time to meet the climate challenge

Special Envoy for Climate Secretary John Kerry announcing the new International Fusion Strategy

Key policy areas:

- **Regulatory and Permitting**: Risk-appropriate regulation, distinct from fission; regulatory and permitting certainty
- **Financial Framework**: Enabling financial frameworks including incentives and tariff structures, commensurate with fusion's transformative role in addressing climate change and designed to accelerate deployment
- **Fusion Ecosystem**: Ecosystem development, including supply chain policies e.g., limited export control and workforce-related programs

German Minister for Education and Research Stark-Watzinger announcing additional investments as part of German Fusion Strategy

Fusion Policy in the U.S.

Regulatory and Permitting:

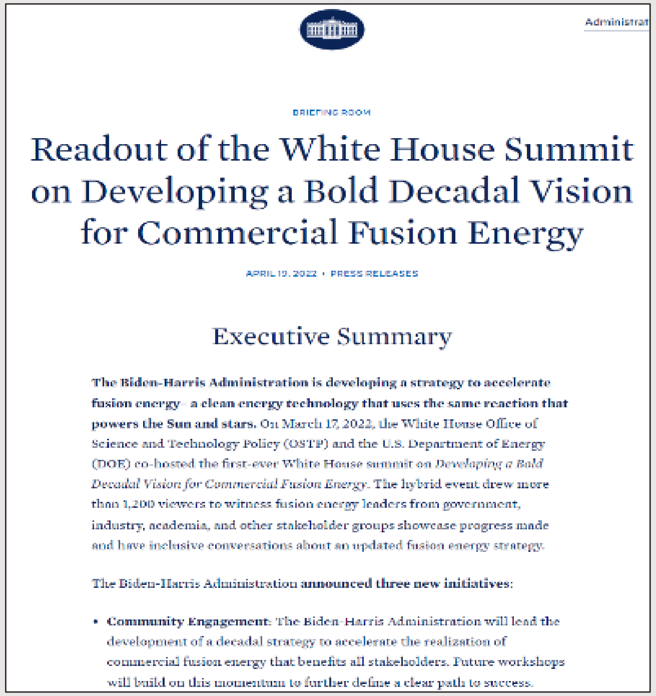
- NRC finalized their decision on commercial fusion regulation
- Part 30 “byproduct materials” framework as particle accelerators
    - This is distinct from fission, regulated under Parts 50 or 52

Financial Framework:

- *Inflation Reduction Act*: Technology-neutral tax credits provide up to 50% tax credit for power plants that meet decarbonization, labor, and other criteria
- *Milestone-based Fusion Development Program*: supports private companies meeting milestones towards a private fusion pilot plant

Fusion Ecosystem:

- *International Fusion Strategy* established goals for increased int. partnerships and collaborations to accelerate commercial fusion
- *DOE Infuse:* Provides funding to lab/university to help private companies overcome critical scientific and technological challenges



BRIEFING ROOM

Readout of the White House Summit on Developing a Bold Decadal Vision for Commercial Fusion Energy

APRIL 19, 2022 • PRESS RELEASES

Executive Summary

The Biden-Harris Administration is developing a strategy to accelerate fusion energy – a clean energy technology that uses the same reaction that powers the Sun and stars. On March 17, 2022, the White House Office of Science and Technology Policy (OSTP) and the U.S. Department of Energy (DOE) co-hosted the first-ever White House summit on *Developing a Bold Decadal Vision for Commercial Fusion Energy*. The hybrid event drew more than 1,200 viewers to witness fusion energy leaders from government, industry, academia, and other stakeholder groups showcase progress made and have inclusive conversations about an updated fusion energy strategy.

The Biden-Harris Administration **announced three new initiatives:**

- **Community Engagement:** The Biden-Harris Administration will lead the development of a decadal strategy to accelerate the realization of commercial fusion energy that benefits all stakeholders. Future workshops will build on this momentum to further define a clear path to success.

US Deputy Secretary of Energy David Turk announcing the Creation of Milestone Based Fusion Development Program
Photo by Fusion Industry Association

Fusion Policy in the UK

Regulatory and Permitting:

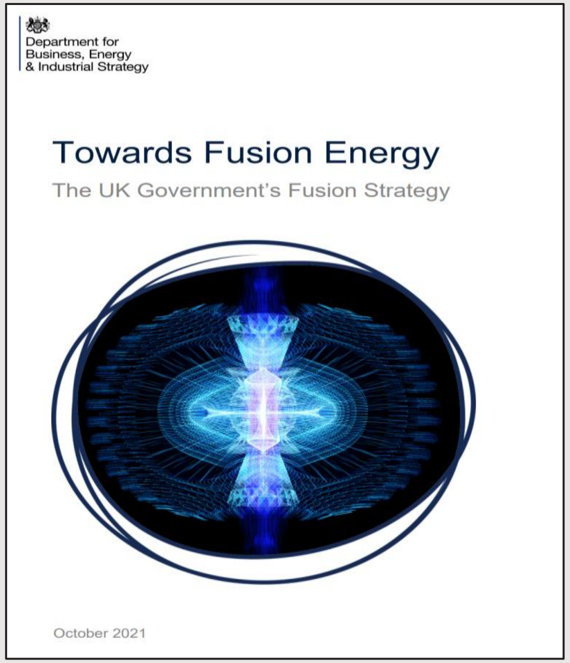
- Regulating fusion through Health & Safety Executive and Environmental Agency, not Office for Nuclear Regulation
- Enshrined into Energy Bill that fusion is distinct from fission
- Leading "Agile Nations" working group on fusion policy

Financial Framework:

- R&D: public and private coordination (new £650M in funding)
- Exploring other incentive programs (Fusion Fund)
- Discussing Contracts for Difference for fusion

Fusion Ecosystem:

- Fusion campus at UKAEA in Culham
    - Research partnerships for companies
    - Research into fusion supporting systems
    - Apprentice program



UKAEA fusion campus in Culham
Photo by UK Atomic Energy Authority (UKAEA)

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