

# Que son las TR/RE?

7

- "Rare earth elements" (REEs)
- "Rare earth metals" (REMs)
- "Rare earth oxides" (REOs)

## Light Rare Earth Elements (LREEs)



**La**  
Lanthanum

**Ce**  
Cerium

**Pr**  
Praseodymium

**Nd**  
Neodymium

**Pm**  
Promethium

**Sm**  
Samarium

**Eu**  
Europium

## Heavy Rare Earth Elements (HREEs)



**Gd**  
Gadolinium

**Tb**  
Terbium

**Dy**  
Dysprosium

**Ho**  
Holmium

**Er**  
Erbium

**Tm**  
Thulium

**Yb**  
Ytterbium

**Lu**  
Lutetium

8

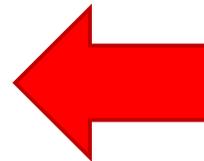
# Ni Tierras, ni tan Raras

2

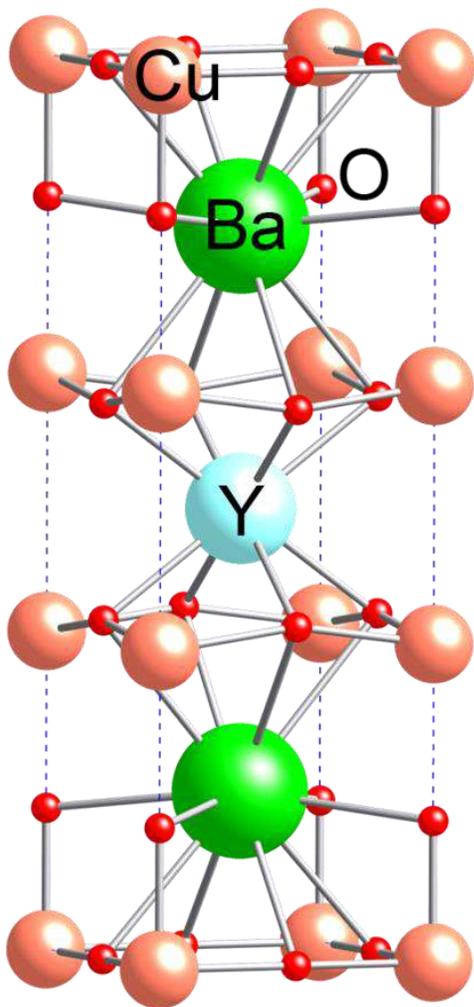


**Sc**  
Scandium

**Y**  
Yttrium



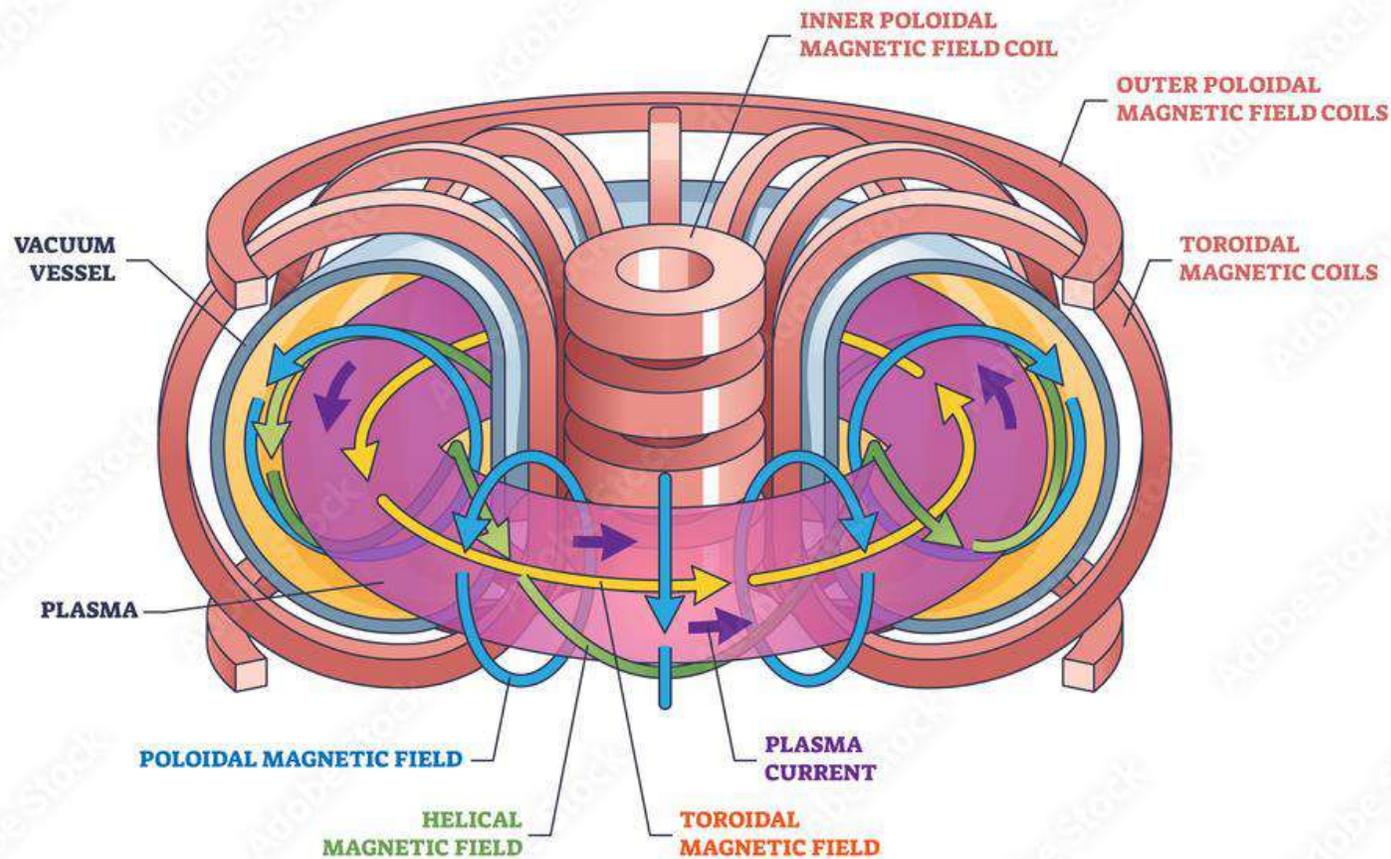
# LA SUPERCONDUCTIVIDAD (HTS), LA ENERGIA DE FUSION y la IA SON LA NUEVA CARRERA LA LUNA



**YBCO**

(yttrium barium copper oxide)

## NUCLEAR FUSION REACTOR



Adobe Stock | #485842514

Todos los HTS demandan REBCOs

# EAST: Chinese "artificial sun" sets new record toward fusion power generation



**Temperature records:** In March 2025, reached electron temperatures of 160 million degrees Celsius

**High-temperature superconducting magnets:** In March, Energy Singularity, surpassed MIT and Commonwealth Fusion Systems record (+35 Teslas)

**Institutional commitment:** In July, China created Fusion Energy Co. Ltd. With \$2.1 billion capital to bring fusion to market.

**Strategic positioning:** China leads globally in fusion technology patent applications and has ambitious plans for demonstration reactors by the 2030s.

# 1. China - Global Dominant Leader

- Only country capable of handling all processing stages
- Controls 85-90% of global mineral refining capacity
- 99% of heavy rare earth element processing (2023)
- 25,000+ rare earth patents (vs. 10,000 for US)
- Perfected solvent extraction process over decades

Key

## 2. Australia

- 42.9% of global exploration spending
- Lynas operations in Australia & Malaysia
- New Kalgoorlie facility (mid-2024)
- AU\$400M Eneabba refinery investment

## 3. United States

- Shipped most REEs to China until 2024
- Building domestic supply chains
- MP Materials & Lynas expansion (facing delays)

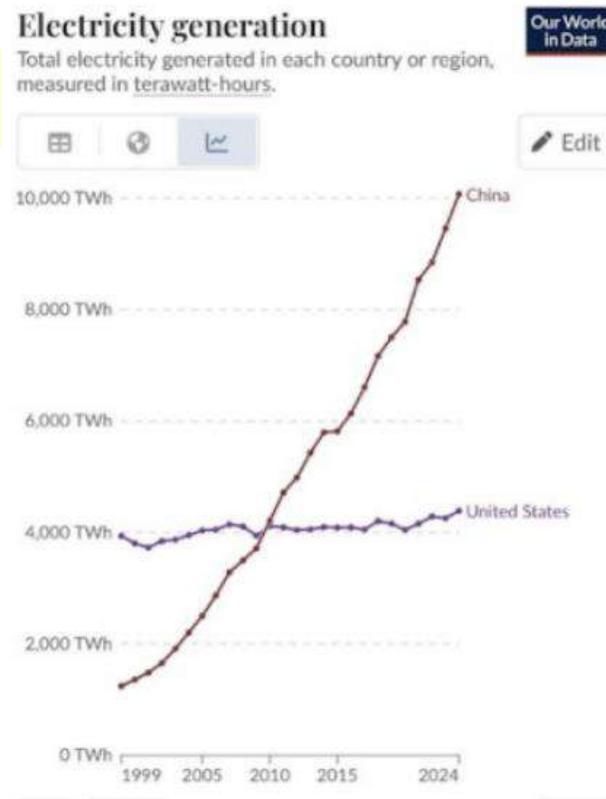
**Other Players:** Malaysia (Lynas refining facility), UK (Pensana - US\$195M plant), Estonia (3,000 MT/year from tailings)

# SIN ENERGIA, NO HAY IA

## Power Plays: China and the United States

▶ As the two major superpowers race to power their AI aspirations, China pulls ahead to a dominant lead:

	United States		China
Capacity Added (2024):	48.6 GW	→	429.0 GW
Capacity Retired (2024):	7.5 GW	→	~3.3 GW
Net New Capacity Additions (2024):	41.1 GW	→	427.7 GW
Effective Operating Reserve Margin:	29%	→	~37%
Renewable Curtailment Rate (2025):	~5.2%	→	6.1%
Thermal Fleet Capacity Factor (2024):	40.4%	→	39.3%
Transmission Investment (2024):	\$30.1B	→	\$84.7B
SAIDI - Outages (2023):	2.1 h/year	←	~6.9 h/year
Carbon Intensity per kWh (2024):	384 gCO <sub>2</sub> e	←	560 gCO <sub>2</sub> e
Industrial Electricity Tariff (2024):	8.15 ¢/kWh	←	8.90 ¢/kWh



~ denotes estimate due to lack of concrete public data. Within each nation, measures can vary heavily by region\*

stateof.ai 2025

# INICIATIVA GÉNESIS: ACELERANDO LA CIENCIA Y LA INNOVACIÓN CON IA

LANZAMIENTO & MECANISMO CENTRAL

INTEGRACIÓN & RECURSOS

OBJETIVOS ESTRATÉGICOS & ÁREAS DE ENFOQUE



ORDEN EJECUTIVA  
(NOV 2025)



DEPARTAMENTO  
DE ENERGÍA (DOE)



PLATAFORMA DE  
IA INTEGRADA  
(PLATAFORMA AMERICANA  
DE CIENCIA Y SEGURIDAD)



CONJUNTOS DE DATOS  
FEDERALES MASIVOS

SUPERCOMPUTADORAS  
NACIONALES  
(LABORATORIOS)

COLABORACIÓN  
SECTOR PRIVADO  
& ACADEMIA



ACCELERAR DESCUBRIMIENTOS CIENTÍFICOS  
(PROYECTO APOLLO DEL S. XXI)



DOMINIO ENERGÉTICO  
(FUSIÓN, NUCLEAR, RED)



SEGURIDAD NACIONAL



BIOTECNOLOGÍA & SALUD



SEMICONDUCTORES &  
COMPUTACIÓN CUANTICA



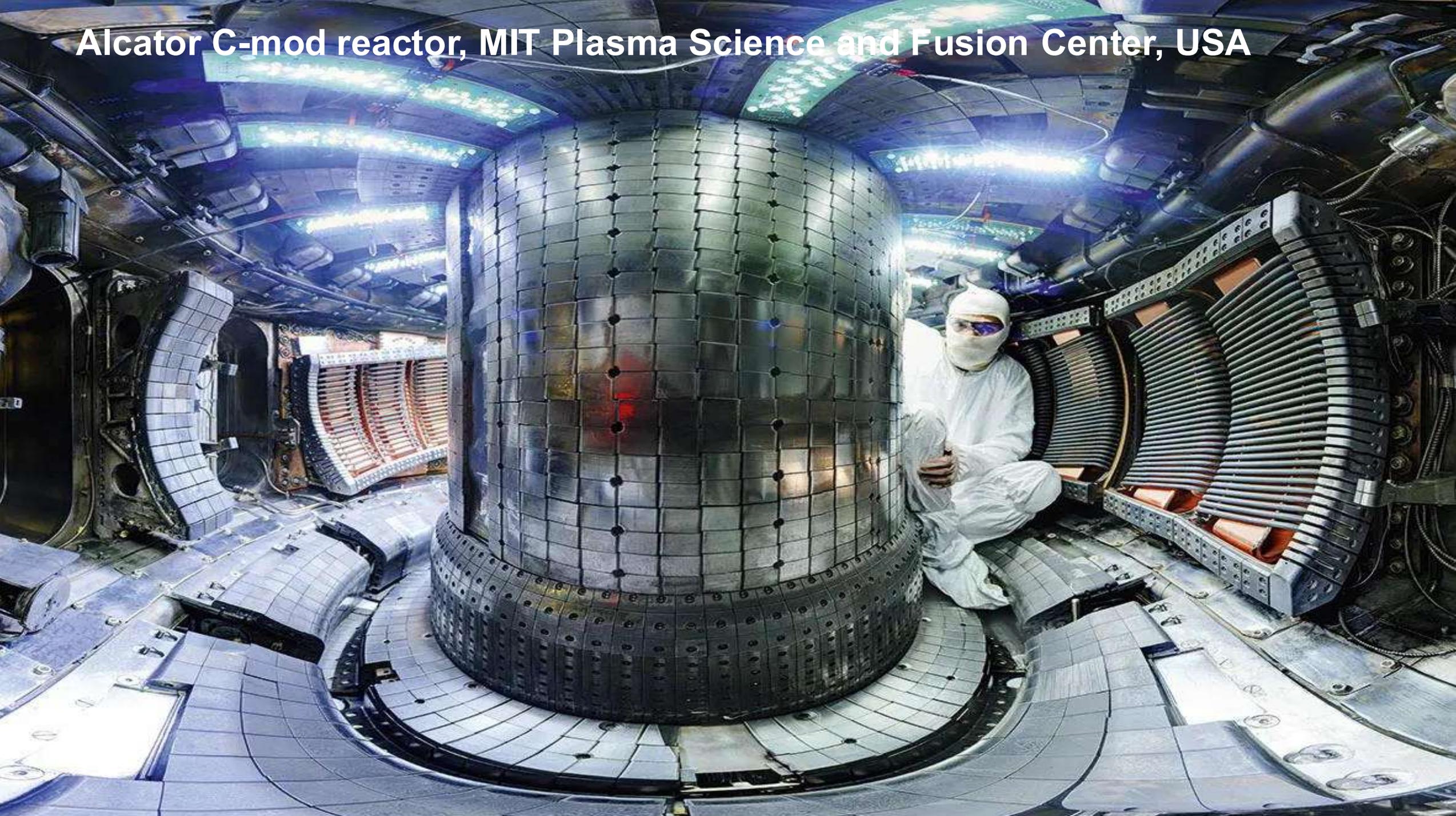
MANUFACTURA AVANZADA  
& MATERIALES CRÍTICOS

DOBLAR LA PRODUCTIVIDAD CIENTÍFICA EN UNA DÉCADA & MANTENER EL LIDERAZGO TECNOLÓGICO DE EE.UU.

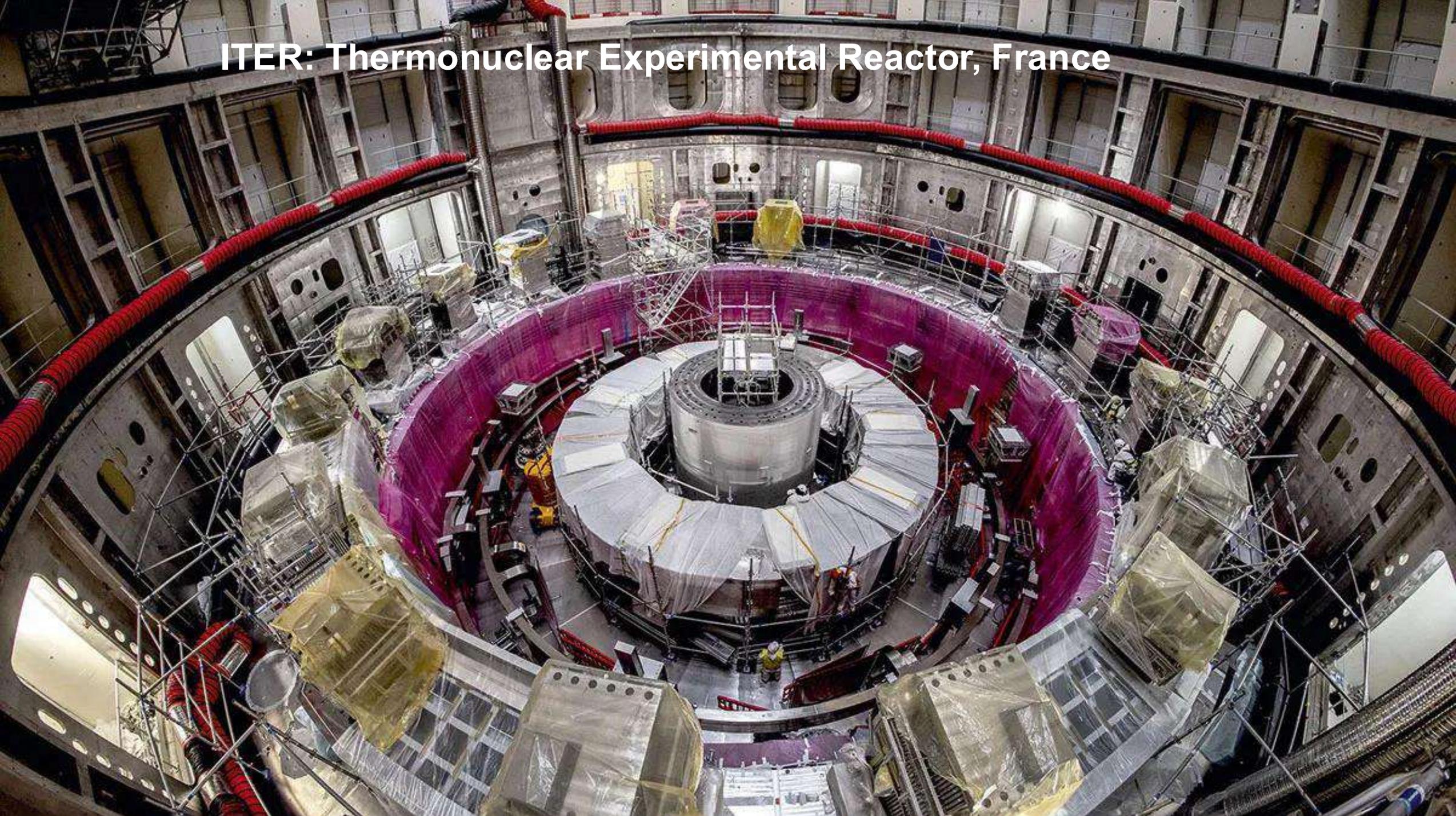
# The platform for **INDUSTRY 5.0**



Alcator C-mod reactor, MIT Plasma Science and Fusion Center, USA

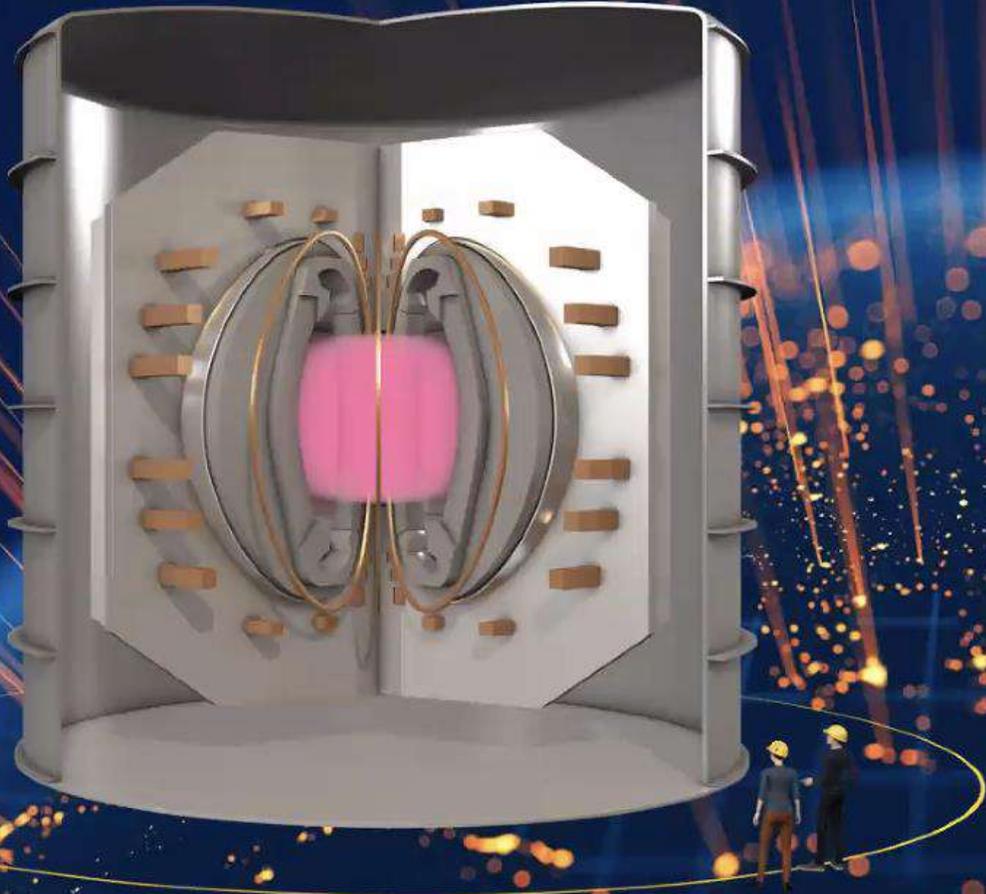


# ITER: Thermonuclear Experimental Reactor, France



# Magnetic Confinement Fusion (MCF) Fusión de Confinamiento Magnético (FCM)

*ST40, el ST privado de mayor campo magnético*

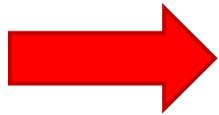


2025

**Tokamak Energy**

\*ST Spherical Tokamak/Tokamak Esférico; Tokamak TOroidalnaja KAmera i MAgnitnyje Katushki/Cámara toroidal y bobinas magnéticas

**Strategic Rare Earth** shaping the energy transition and advanced technology



## Short Term (2025-2030)

4 strategic elements

### Neodymium (Nd)

Light REE

Critical

Applications: EV motors, wind turbines, consumer electronics

Demand: High & Growing

### Praseodymium (Pr)

Light REE

Critical

Applications: Permanent magnets (paired with Nd)

Demand: High & Growing

### Dysprosium (Dy)

Heavy REE

Extremely Critical

Applications: High-temperature magnet enhancement

Demand: Very High - Supply Risk

### Terbium (Tb)

Heavy REE

Extremely Critical

Applications: Magnet enhancement, phosphors

Demand: High - Supply Risk

## Medium Term (2030-2040)

5 strategic elements

### Neodymium (Nd)

Light REE

Critical

Applications: EV expansion, offshore wind

Demand: Tripling from 2022 levels

### Praseodymium (Pr)

Light REE

Critical

Applications: Continued magnet demand

Demand: Tripling from 2022 levels

### Dysprosium (Dy)

Heavy REE

Extremely Critical

Applications: Advanced EV motors, defense

Demand: Price surge expected (+340%)

### Yttrium (Y)

Increasingly Critical

Applications: REBCO superconductors for fusion prototypes

Demand: Rapidly Growing

**+Gadolinium (Gd)**  
**Emerging Critical**

Heavy REE



## Long Term (2040+)

5 strategic elements

### Yttrium (Y)

Heavy REE

Extremely Critical

Applications: Commercial fusion reactors (YBCO magnets)

Demand: Massive - 1000s of km of tape per reactor

### Gadolinium (Gd)

Heavy REE

Critical

Applications: REBCO alternatives, neutron capture

Demand: Very High

### Europium (Eu)

Heavy REE

Critical

Applications: Advanced superconductors, quantum tech

Demand: High

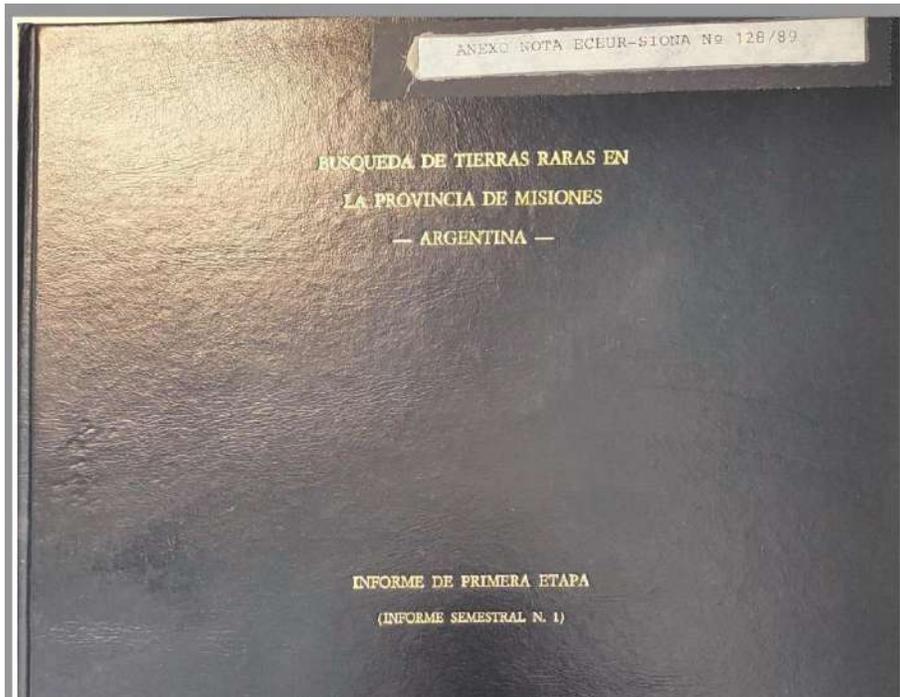
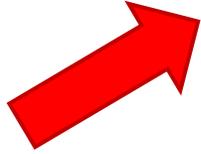
### Dysprosium (Dy)

Heavy REE

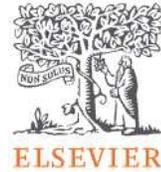
Critical

Applications: Continued magnet applications

# Recomendación: Proseguir la exploración por arenas pesadas en la Patagonia (1998/9)



**Primera exploración dirigida a Tierras Raras en Argentina (1998/9)**



Physica C: Superconductivity  
Volumes 185–189, Part 3, 1 December 1991, Pages 1959-1960



## Biaxially aligned $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ thin film tapes

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