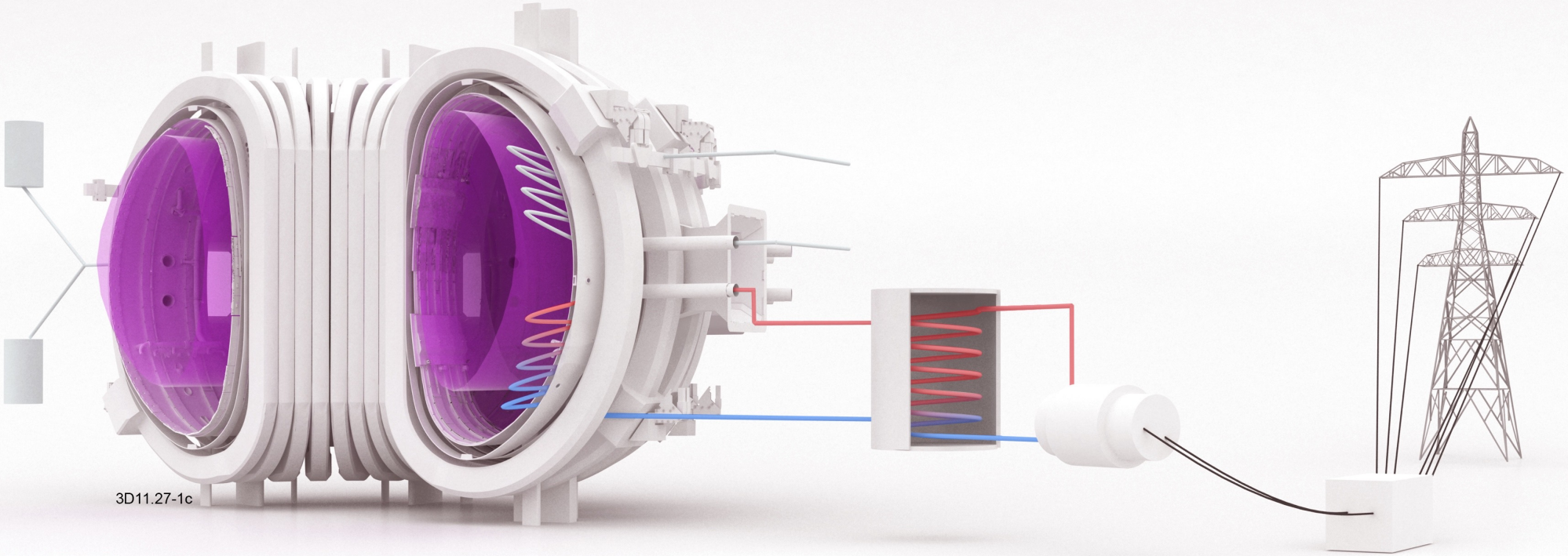
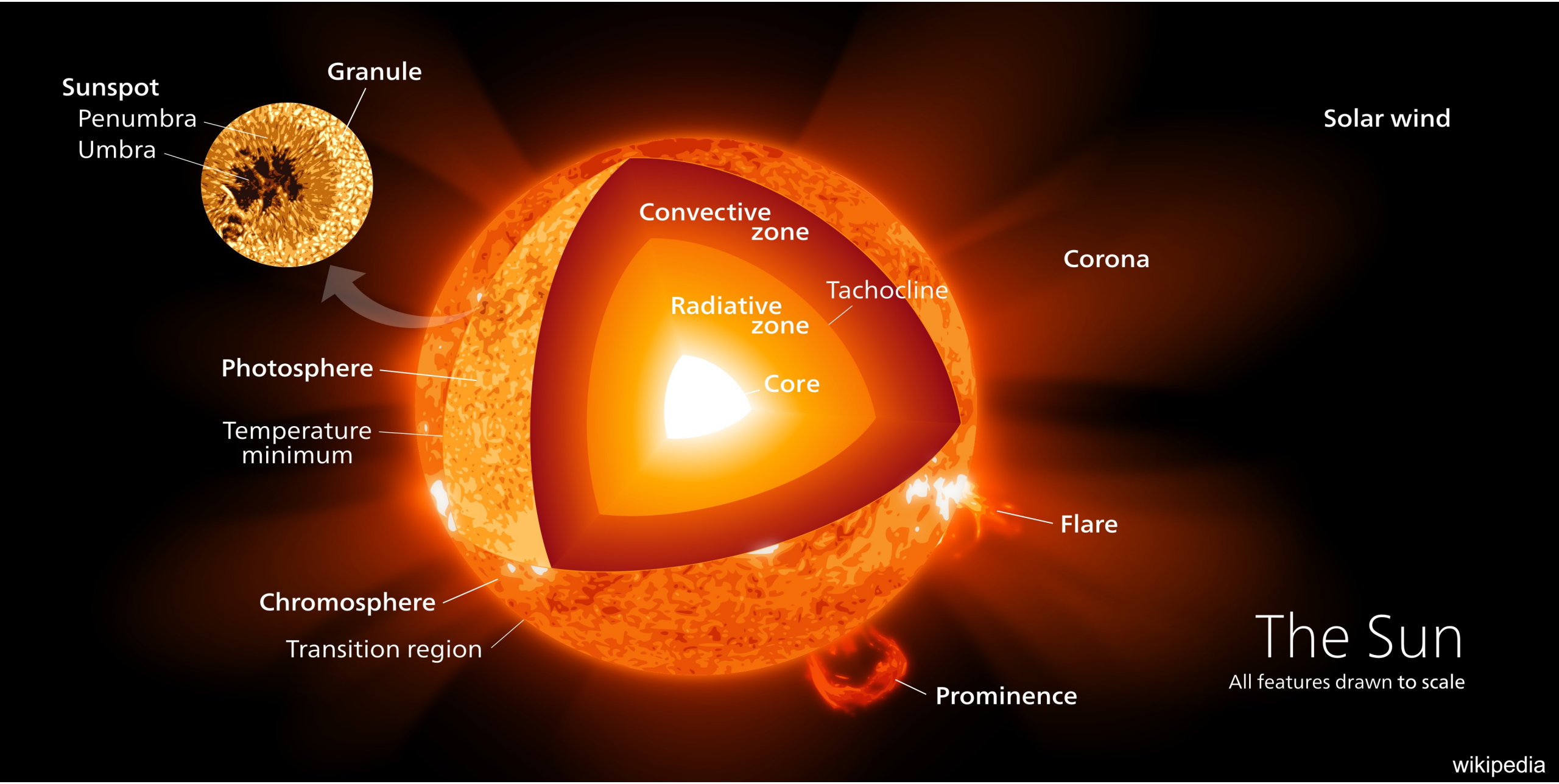
# Fusjonsenergi – evigvarende energikilde

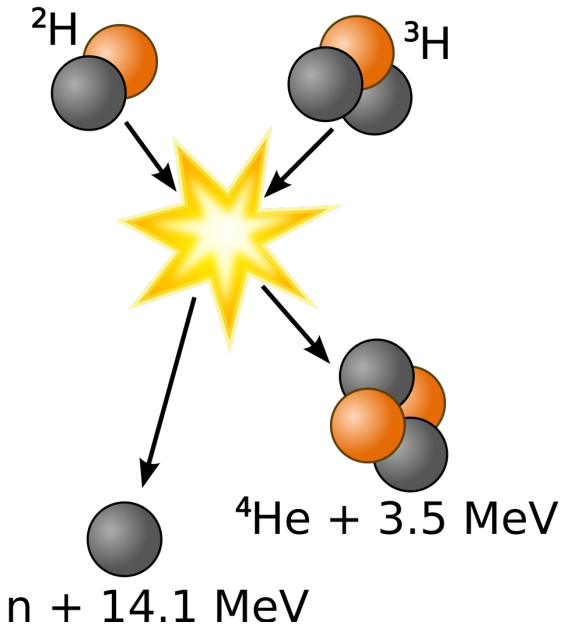


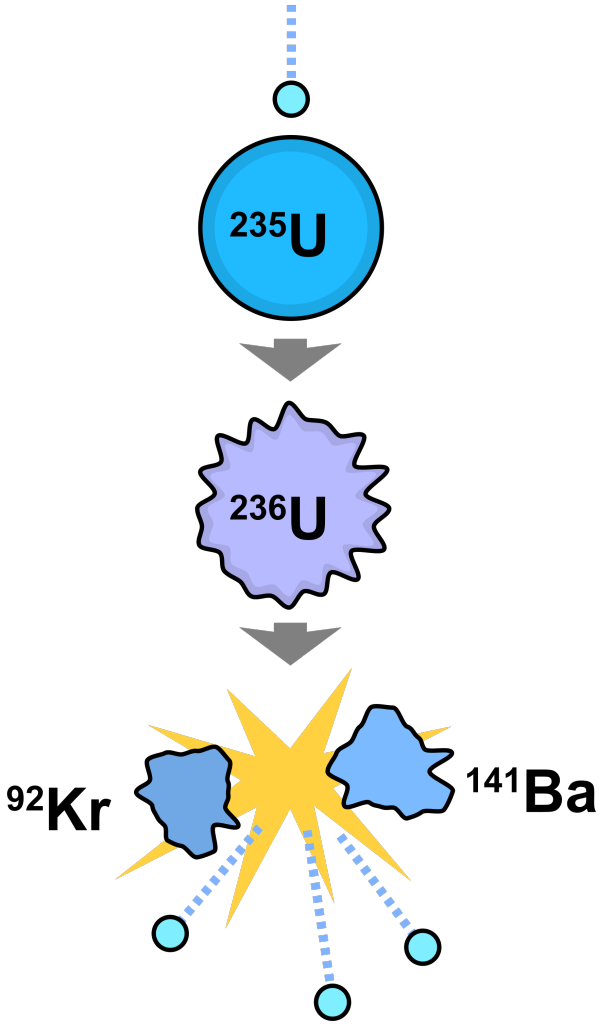

Professor Odd Erik Garcia
UiT Aurora Centre DYNAMO
Institutt for fysikk og teknologi

UiT Norges arktiske universitet


Sunspot
Penumbra
Umbra
Granule
Solar wind
Convective zone
Corona
Tachocline
Radiative zone
Photosphere
Core
Temperature minimum
Flare
Chromosphere
Transition region
Prominence
The Sun
All features drawn to scale
wikipedia

# Kjernekraft: fusjon versus fisjon



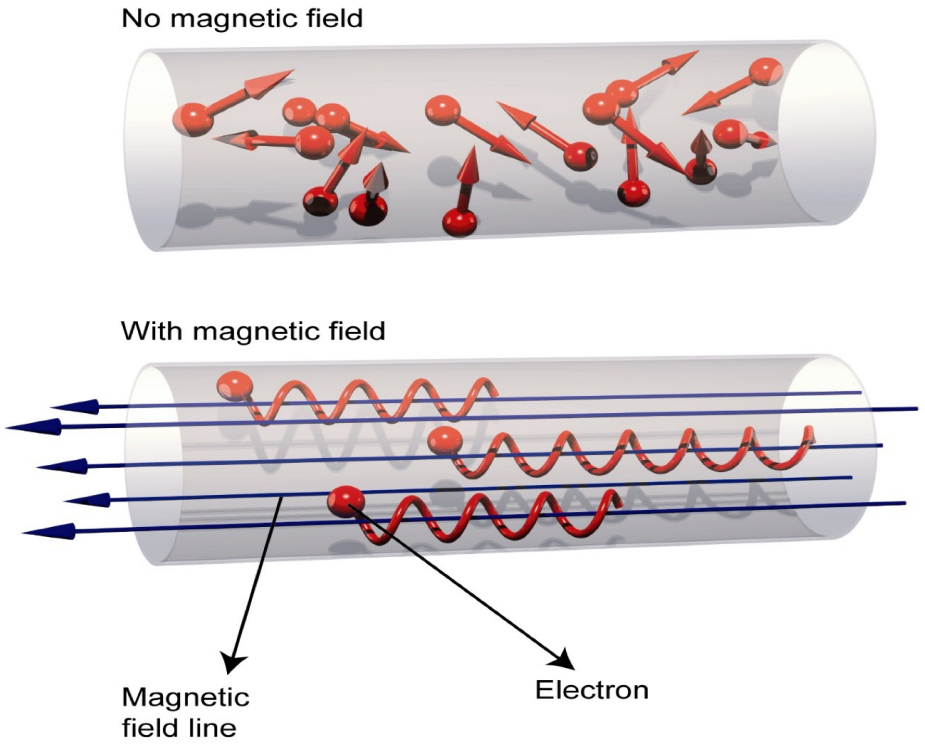

Ikke radioaktivt avfall fra fusjonsreaksjoner

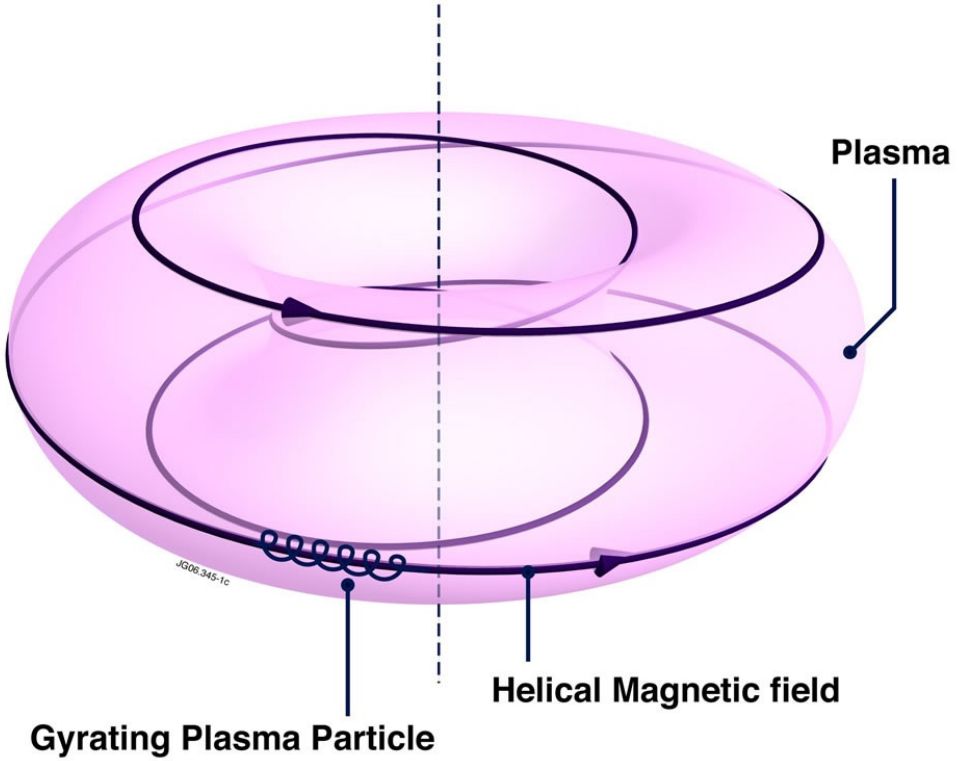
Ikke muligheter for løpske kjedereaksjoner

Ingen utslipp av drivhusgasser

wikipedia

# Fusjon basert på magnetisk innesperring av plasma



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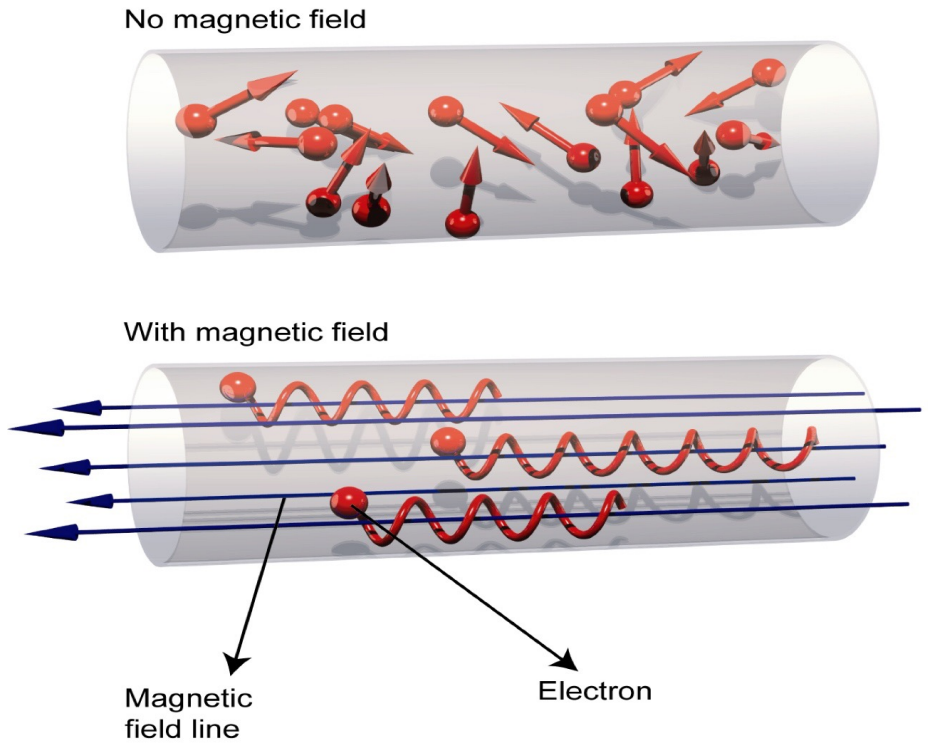
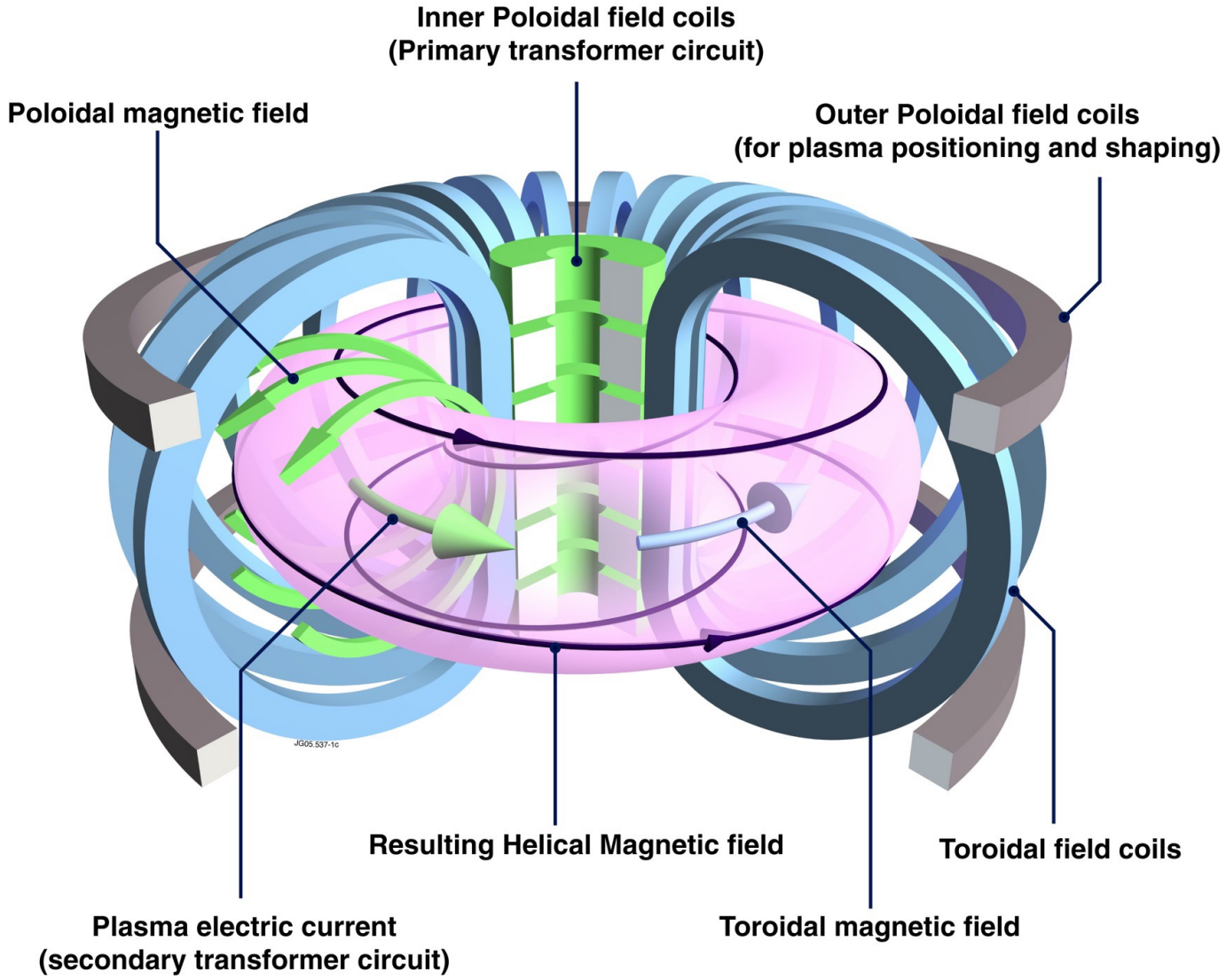


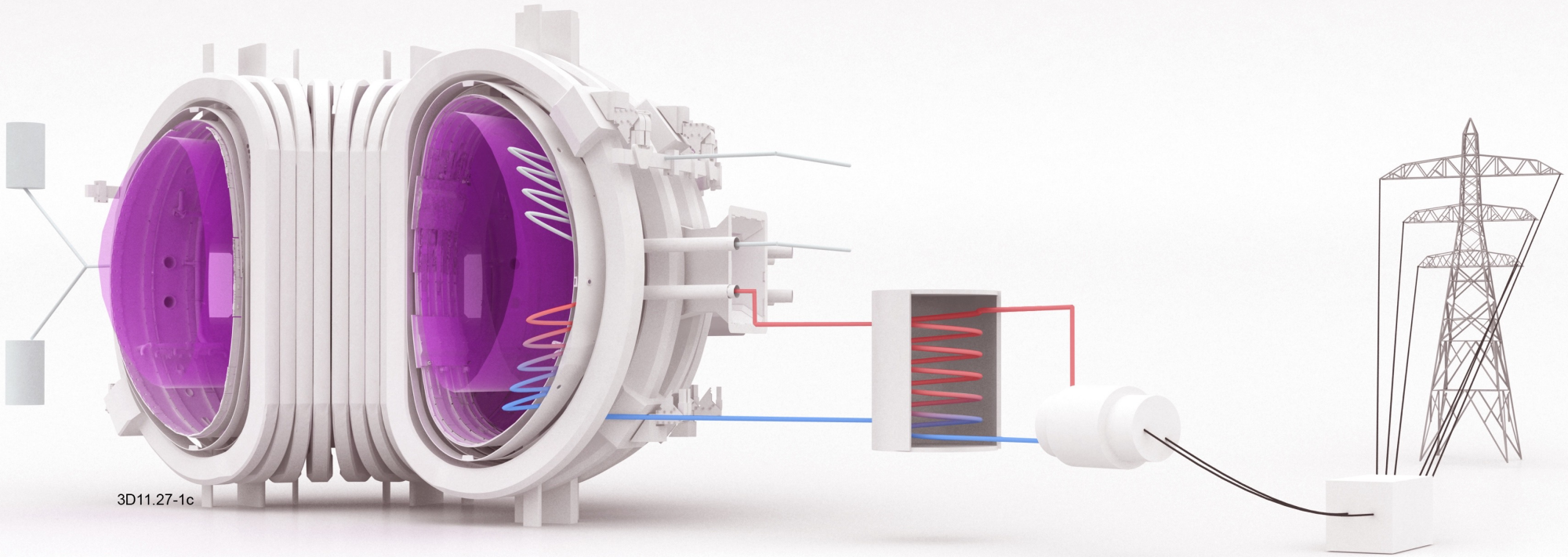




EUROfusion

# Nærmest uendelige ressurser for fusjonsenergi

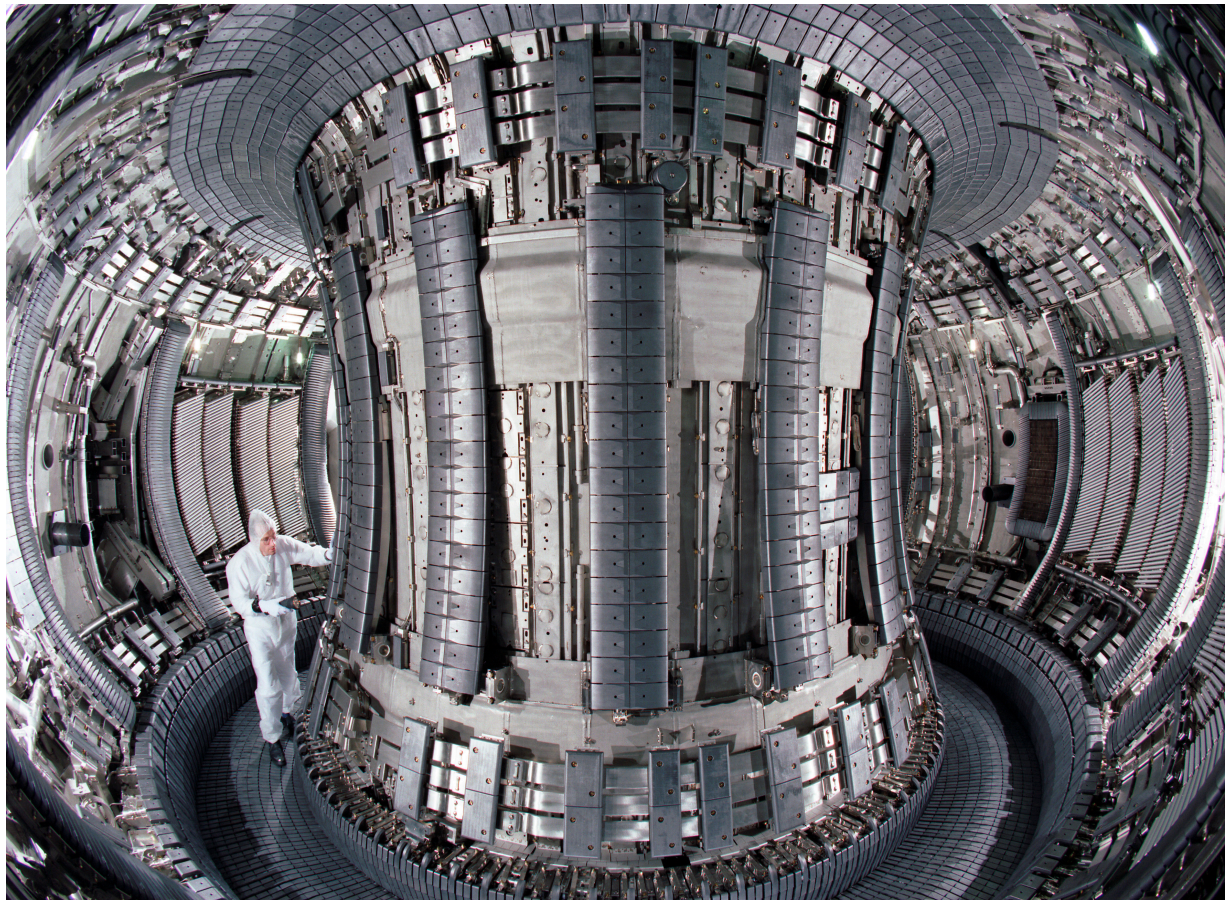
Råstoffene for fusjon er deuterium, som finnes rikelig i havet, og tritium, som kan utvinnes fra litium

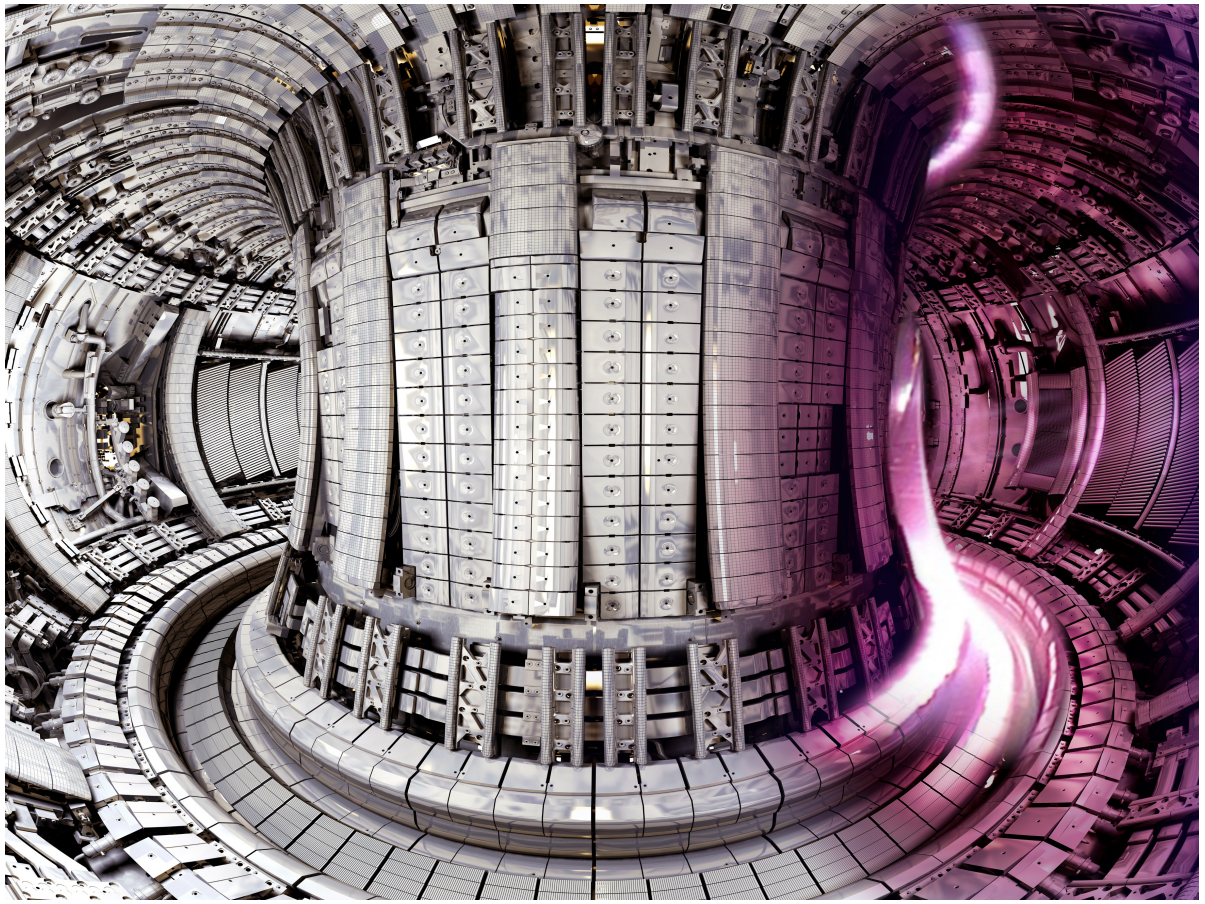
Litium fra batteriet i en bærbar datamaskin og deuterium fra ett badekar med vann kan gi all energi et menneske bruker i løpet av sin livstid – tilsvarende brenning av 300 tonn olje




D + T → Brennende plasma → Kappe av litium produserer tritium → varme driver dampturbin og genererer strøm

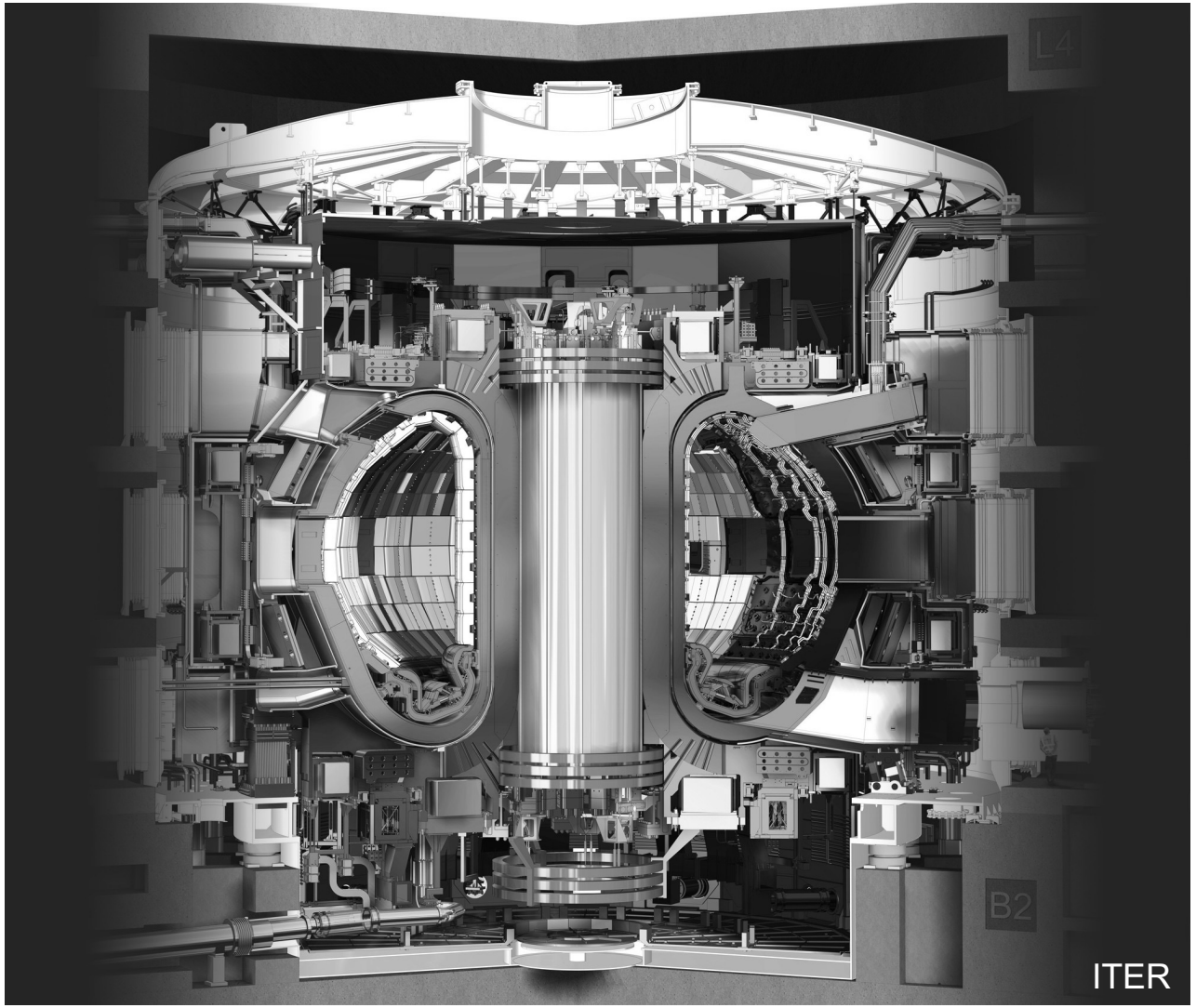
# Tokamak: toroidalt kammer med magnetiske spoler

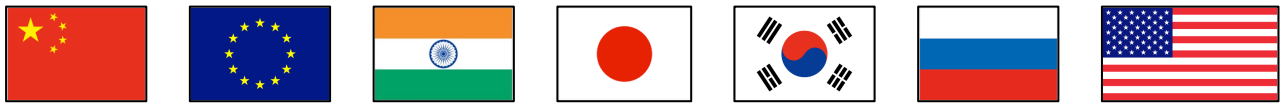




EUROfusion

# ITER – veien fremover



Bygges nå i Cadarache i Frankrike

Første plasma i 2025, DT-fusjon i 2035

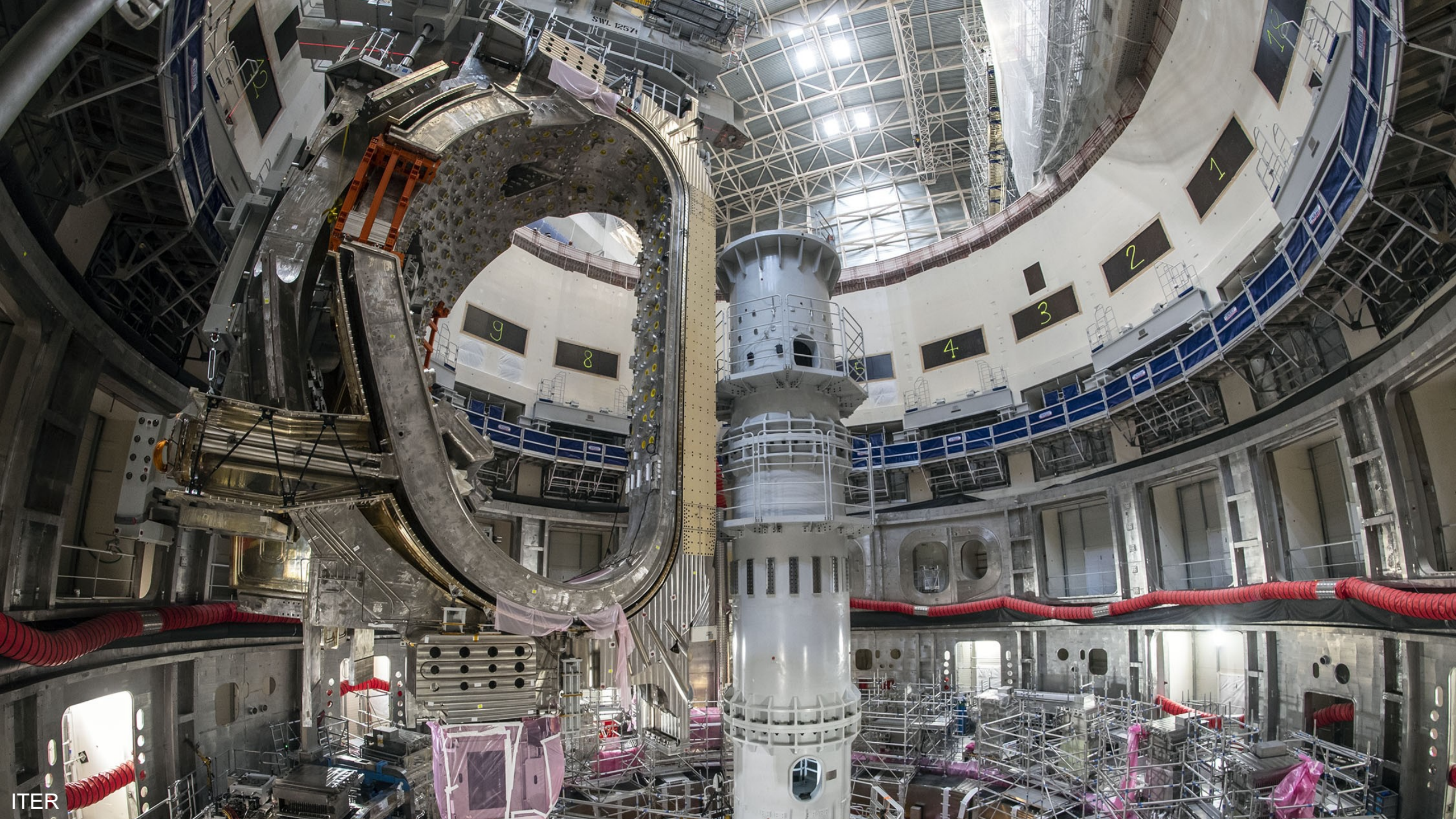
10 ganger mer energi ut enn inn

Skal *ikke* levere strøm til kraftnettet

Kostnad > USD 20 milliard = 100 IWD

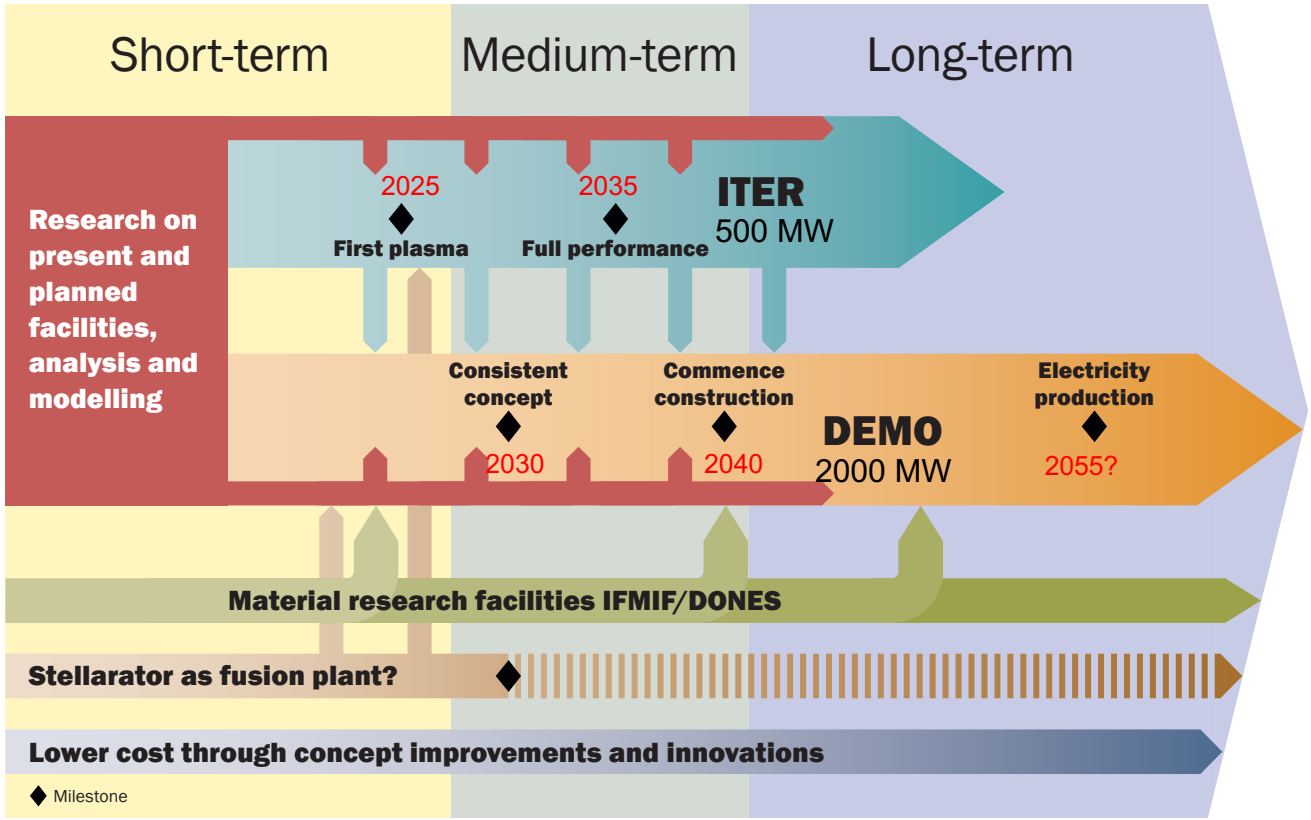
Oljefondet kan finansiere 50 ITER


ITER

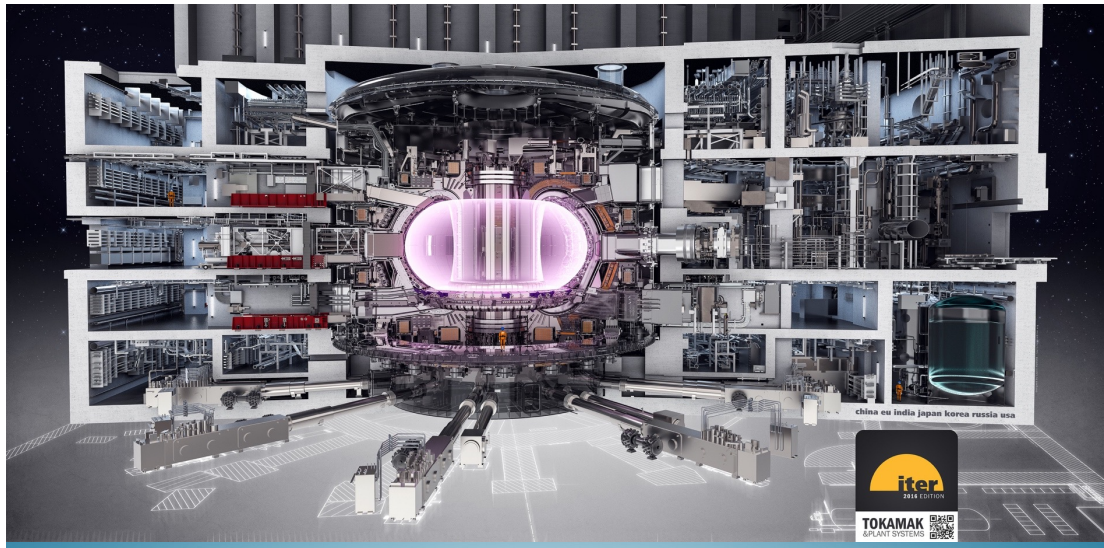



ITER

# EU’s veikart til fusjonsenergi




Fusion Power Plants

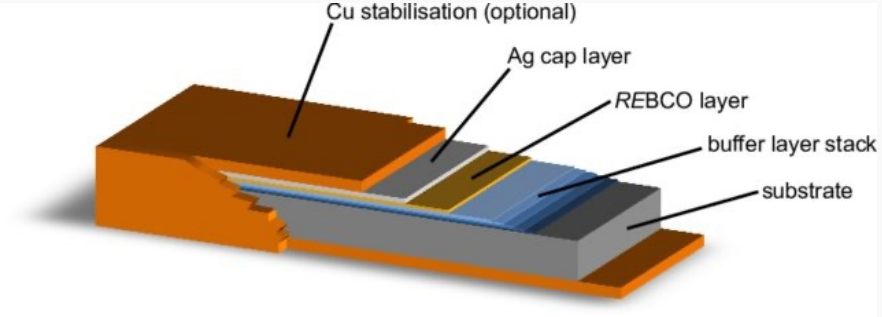




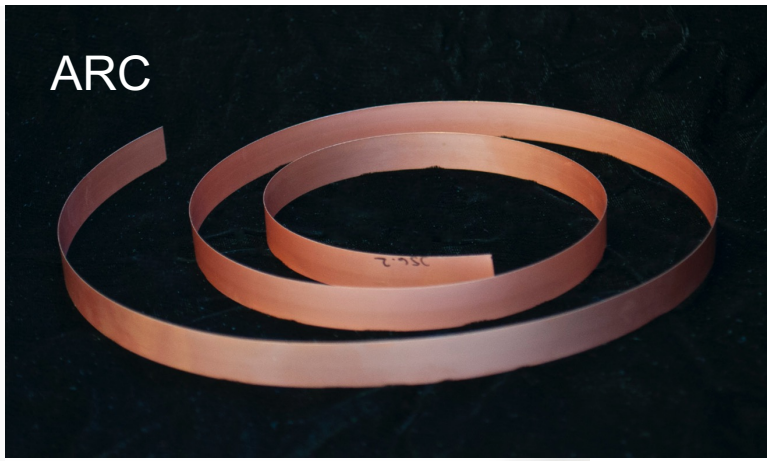
EUROfusion

# Ny teknologi med høytemperatur superledere

Commonwealth Fusion Systems, utsprunget fra MIT, har så langt tatt inn >1.8 G$ i privat kapital for utvikling av fusjon




CFS

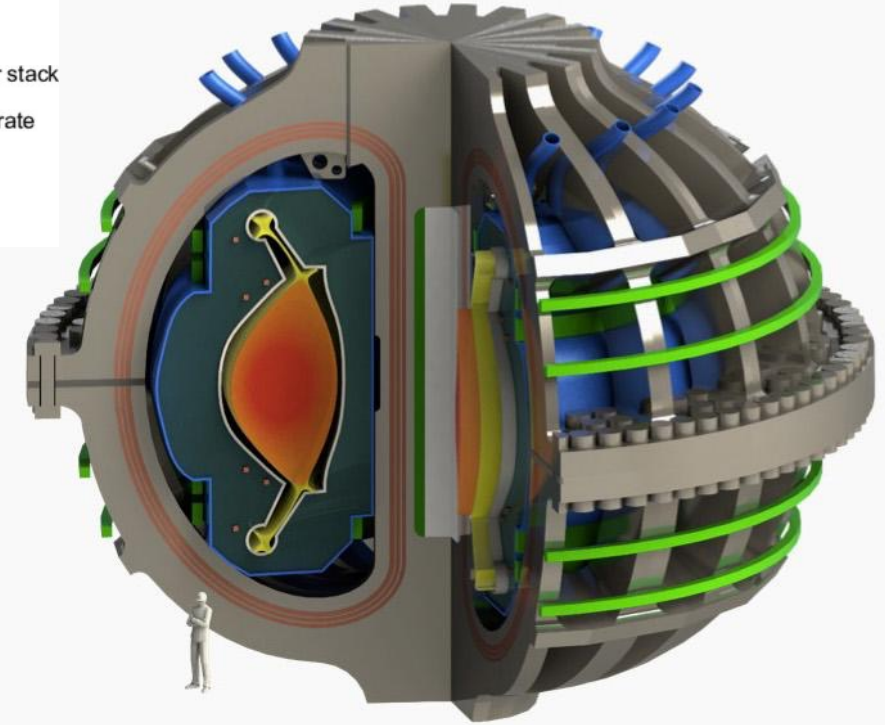



**C-Mod**

1993-2016

**SPARC**

2025



**ARC**

2030

ITER: T=4K

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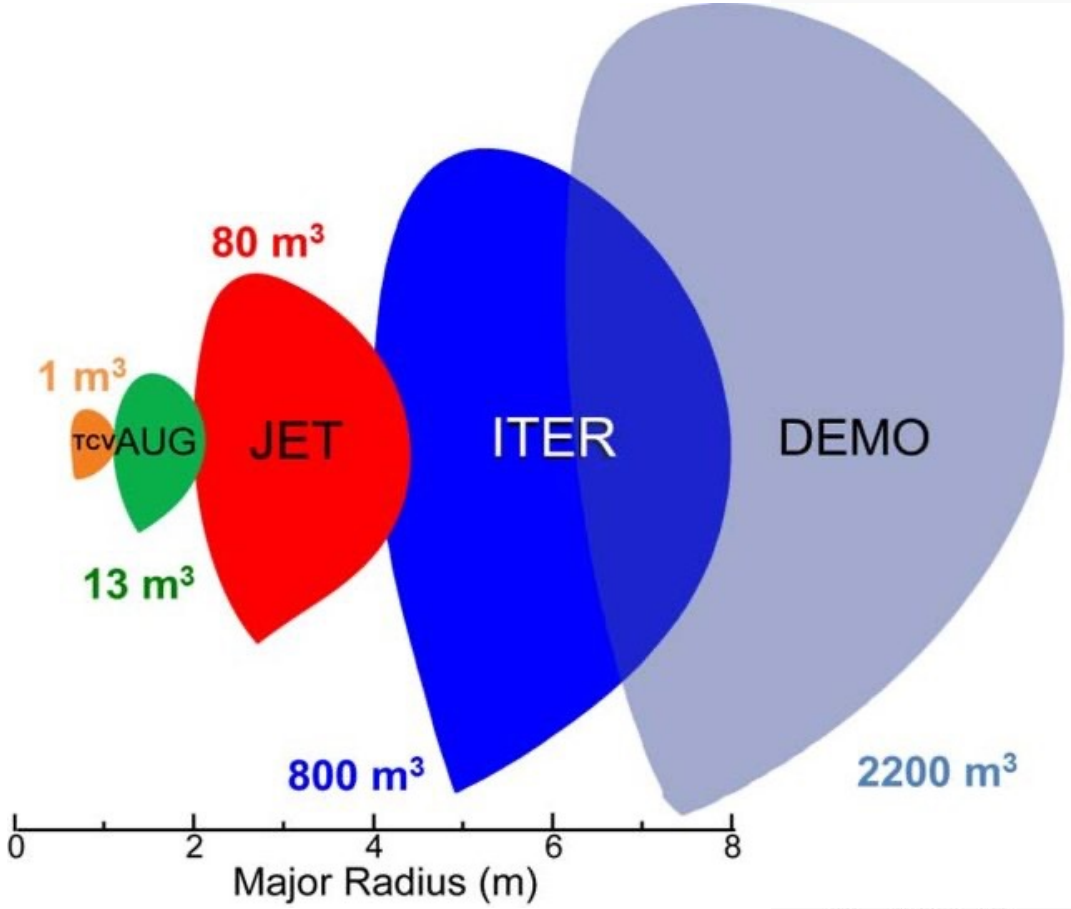
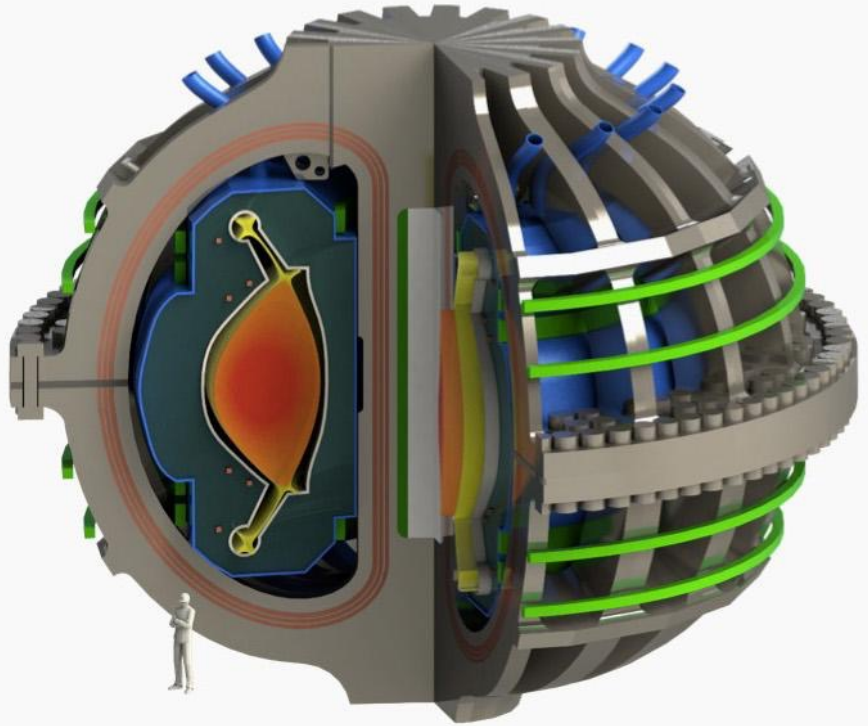



SPARC

2025




ARC

2033

CFS


CFS

# Equinor invests in fusion energy

Equinor Technology Ventures has acquired a minority shareholding in Commonwealth Fusion Systems (CFS), a leading developer of fusion energy technology.

CFS was spun out of the Plasma Science and Fusion Center at Massachusetts Instit
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Fusion energy has a nearly unlimited fuel supply. Fusion doesn't emit CO2 or other g
Fusion produces no high activity, long lived nuclear waste, only a small amount of lo
what's being produced at a hospital. And there is no risk for fusion reactions to run

equinor

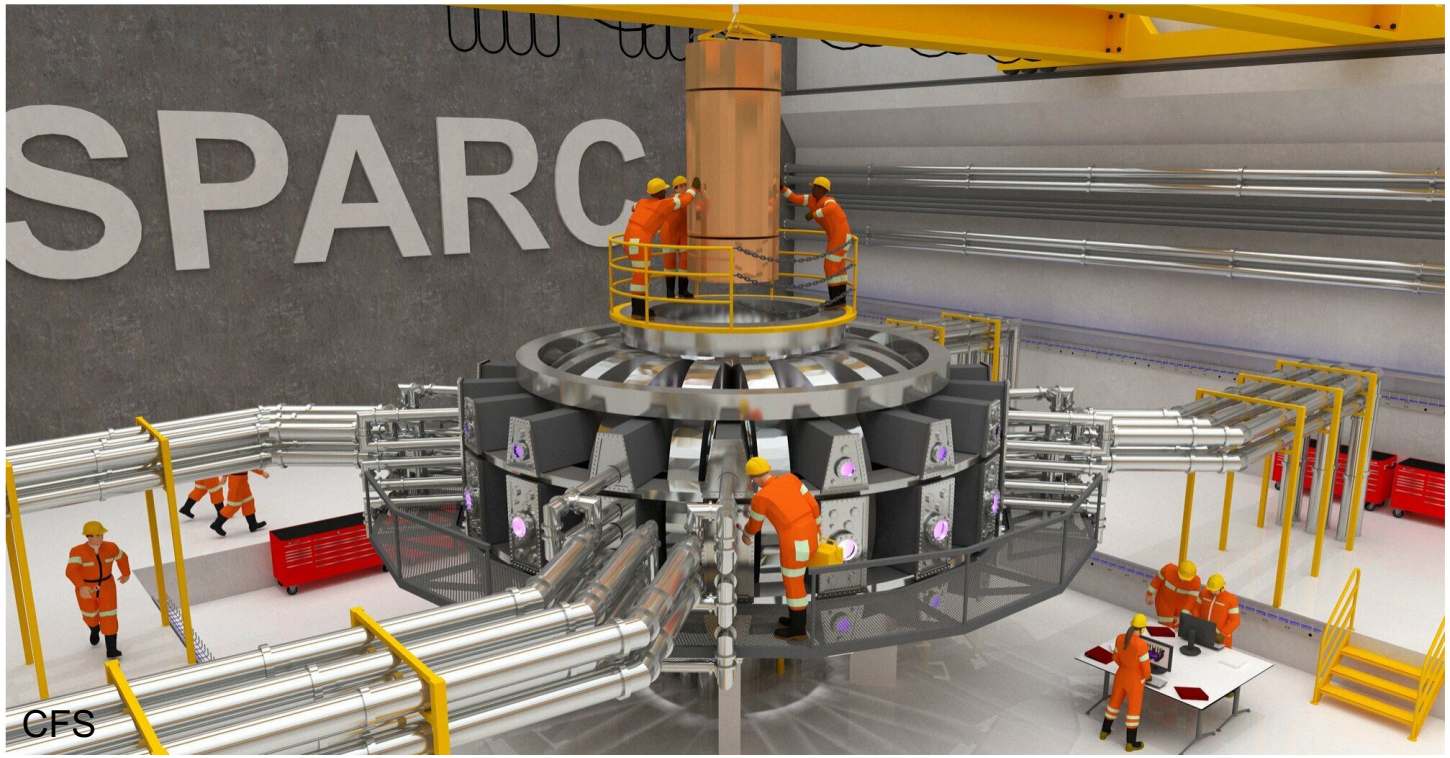
Equinor Ventures:
«Investeringen i CFS utgjør om lag 10 prosent av det 750 millioner USD mandatet»



EQUINOR TECHNOLOGY VENTURES – FUSJONSENERGI

# Equinor investerer i fusjonsenergi

**– Potensialet er stort, men trolig er det et ultraløp.**



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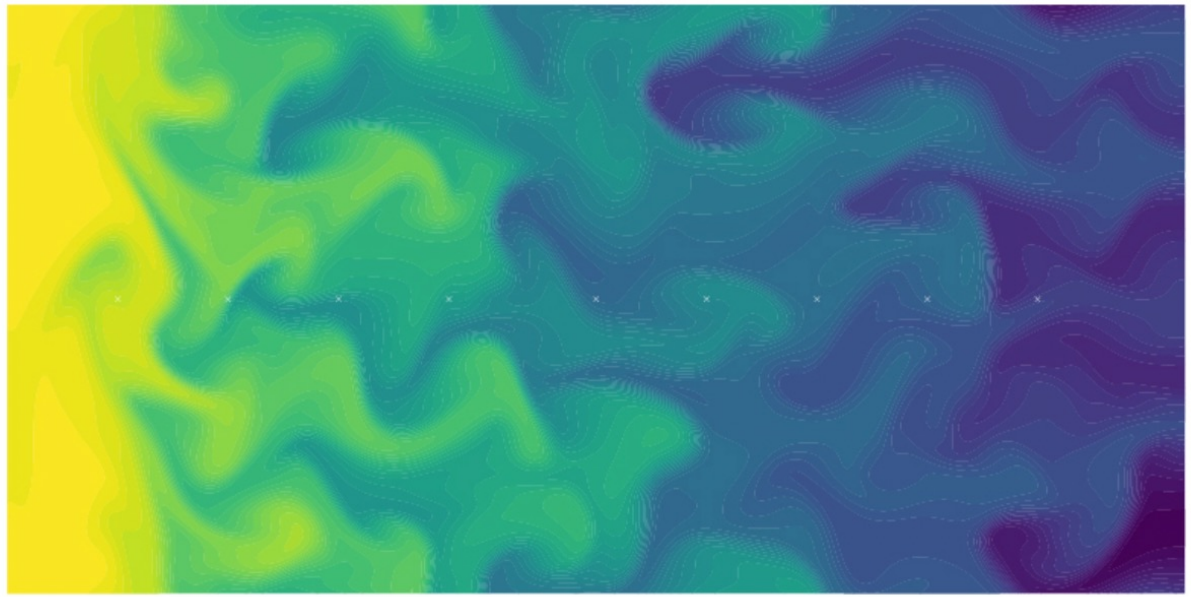
SPARC site
September 2022


DYNAMO
UiT Aurora Centre for Nonlinear Dynamics
and Complex Systems Modelling
dynamo.uit.no
Etablert i 2020 som intern UiT satsning på 30 MNOK

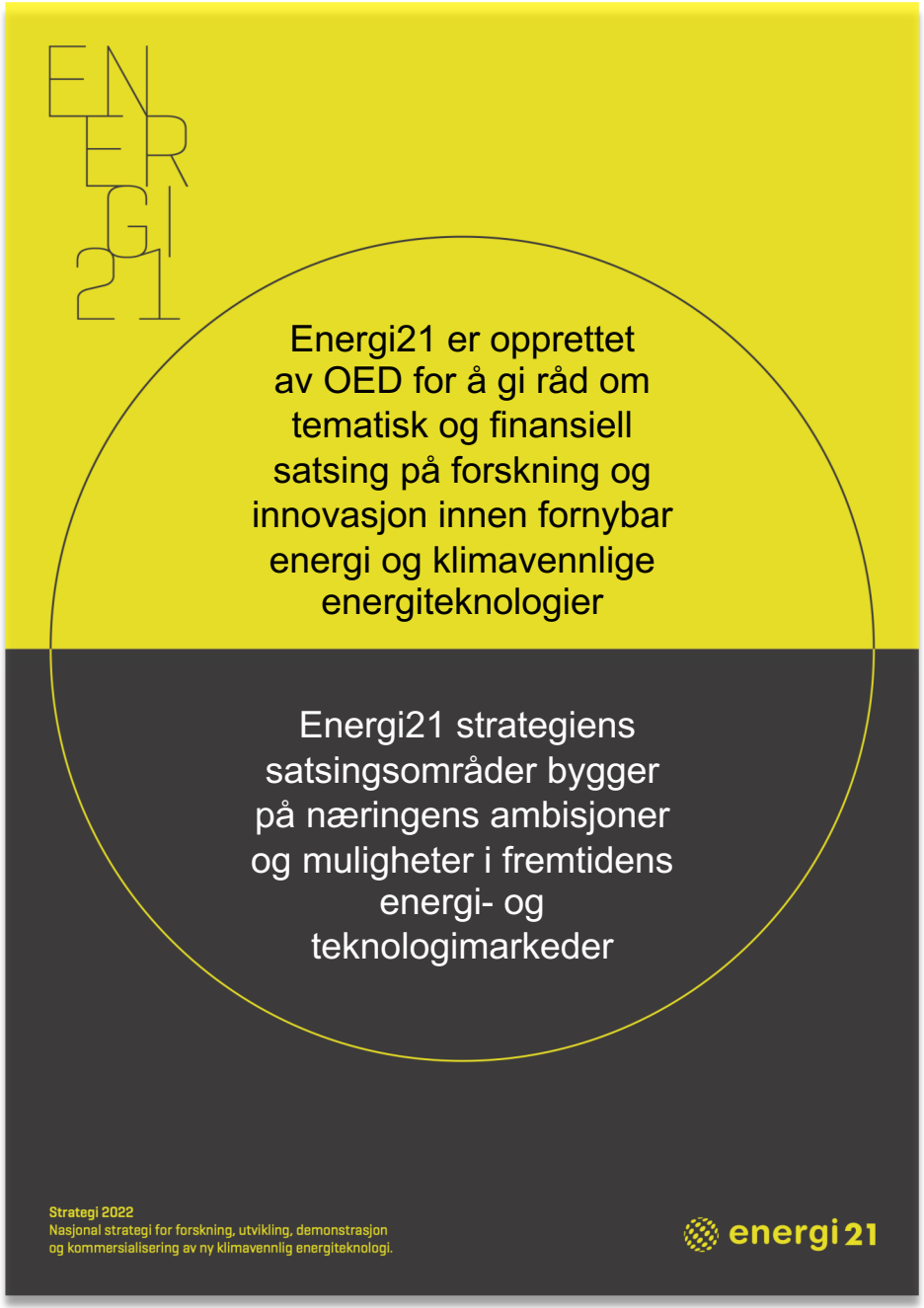
# EUROfusion welcomes new partner from Norway

> *EUROfusion aims to bring together Europe's best minds to develop fusion as a clean, safe and sustainable energy source. That is why we are thrilled to welcome UiT the Arctic University of Norway (UiT) as an associate partner to our consortium!*

In the Norwegian city of Tromsø, the plasmas are free. Situated within the arctic circle, the Northern Lights—nature's biggest display of the charged gasses called plasmas—can fill the night skies a few times a week during winter. A natural place for UiT the Arctic University of Norway in Tromsø to set up its dedicated plasma research centre DYNAMO.



*EUROfusion is the European research consortium for fusion energy, with members and associate partners across Europe. Credit: EUROfusion consortium.*




# Fusjon i Energi21-strategien

Sentrale forsknings- og innovasjonsbehov inkluderer:

- Materialteknologi spesielt knyttet til magneter og superledere
- Småskala reaktorer og skalerbare systemer, modularisering
- Varmevekslingsteknologi

Utvalgte tiltak inkluderer:

- Støtte til sentrale forsknings- og innovasjonsbehov
- Norsk deltakelse i EUROfusion
- Støtte til deltakelse i internasjonale forsknings- og innovasjonssamarbeid