

Yeni Teknolojilerde Nükleer

TÜBİTAK Bilim Söyleşileri 2024

Taşköprü Fen Lisesi

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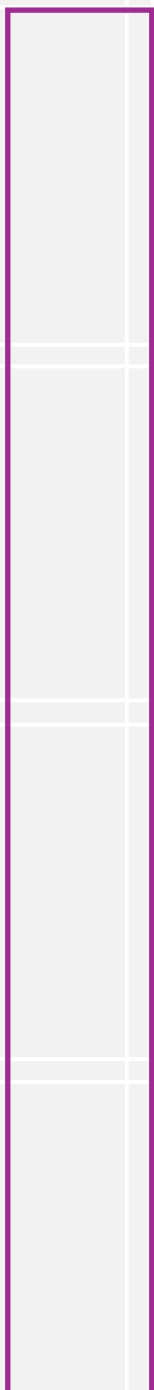




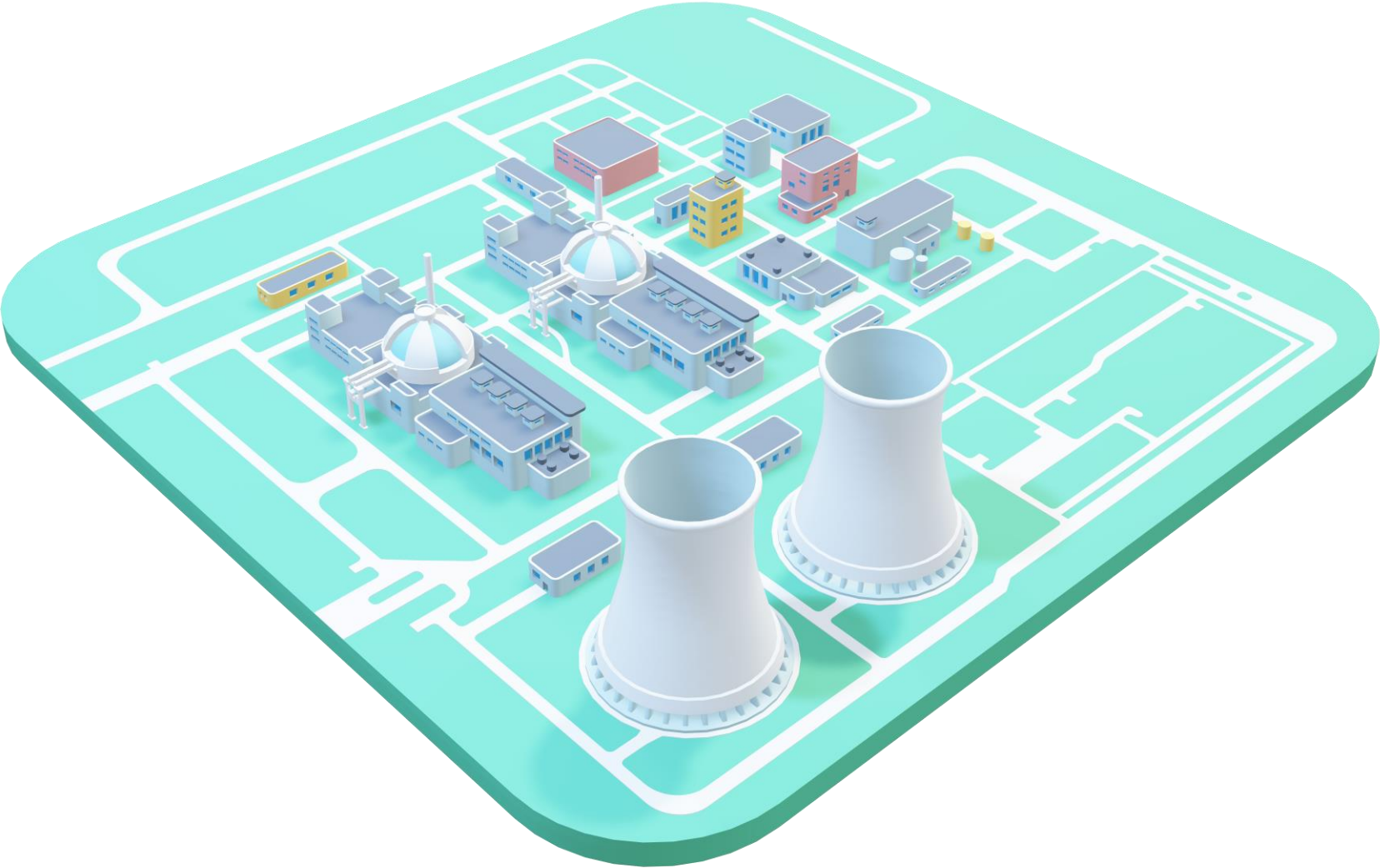
GÜNEŞ



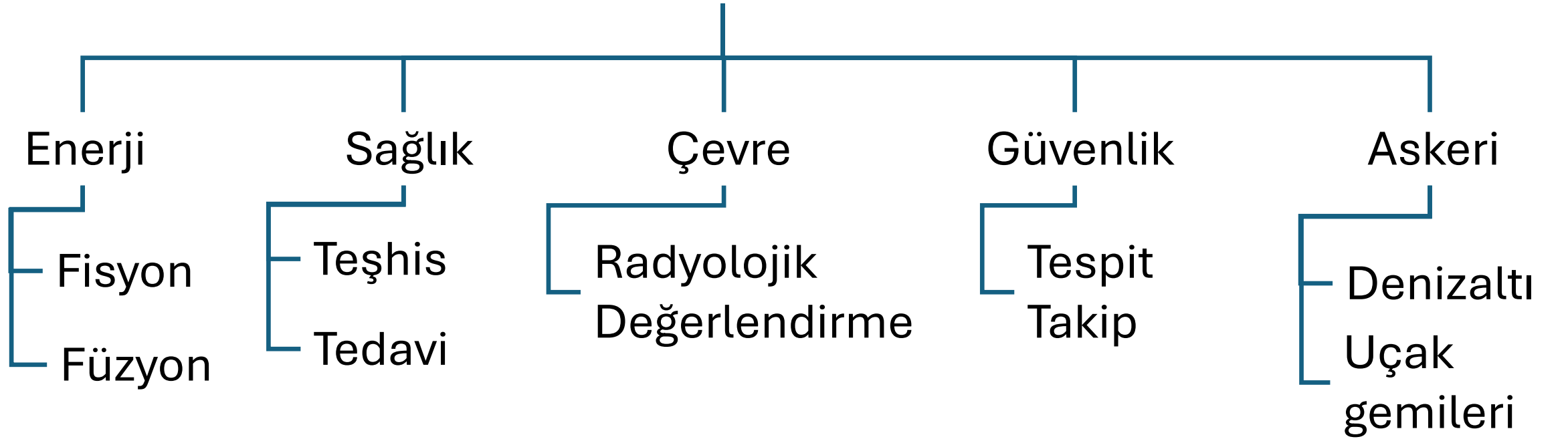








Nükleer Uygulama Alanları

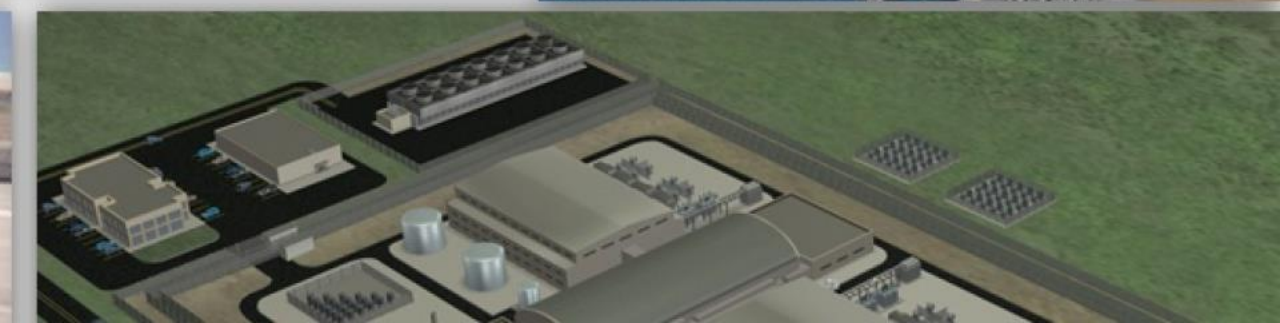
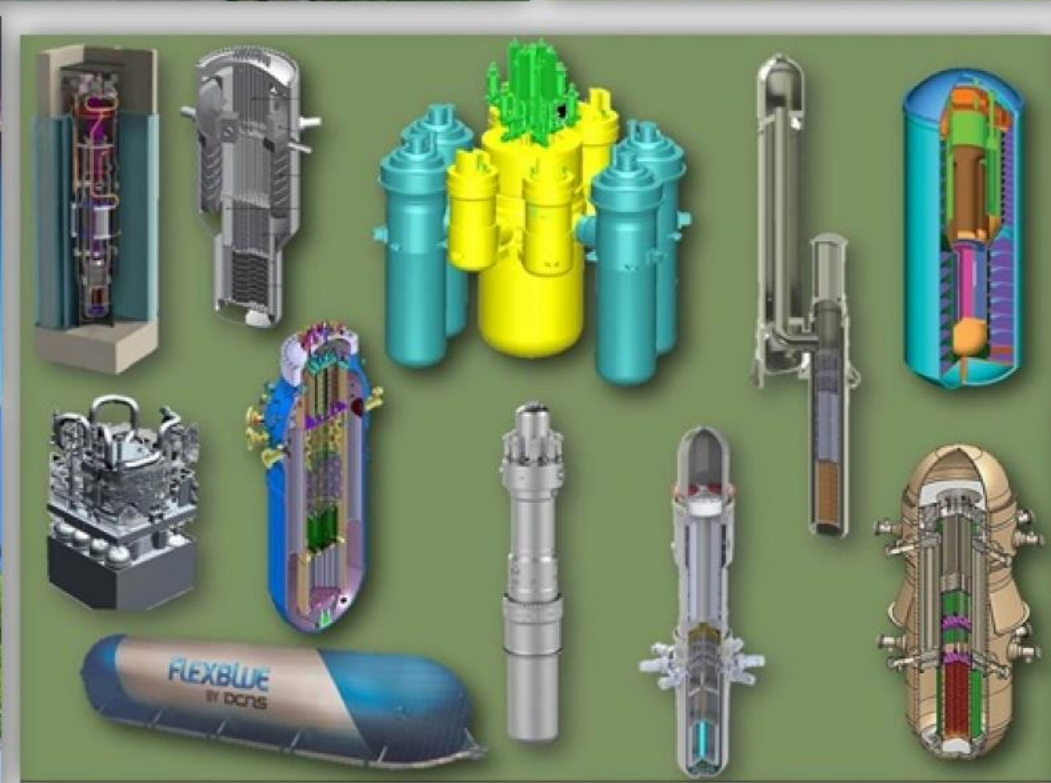


Yeni Nesil Reaktörlerde Hedefler

- Daha ekonomik reaktörler (yapımı, işletmesi, nötron, enerji)
- Daha küçük tasarım
- Gelişmiş güvenli- Pasif güvenlik
- Aktif güvenlik
- Yapımı daha kolay tasarım (kompleks olmayan)
- Lisanslaması daha kolay
- İşletmesi daha kolay
- Nükleer silahlanmanın yayılmasına karşı dirençli tasarımlar
- Daha az atık üreten reaktörler



Güvenlik



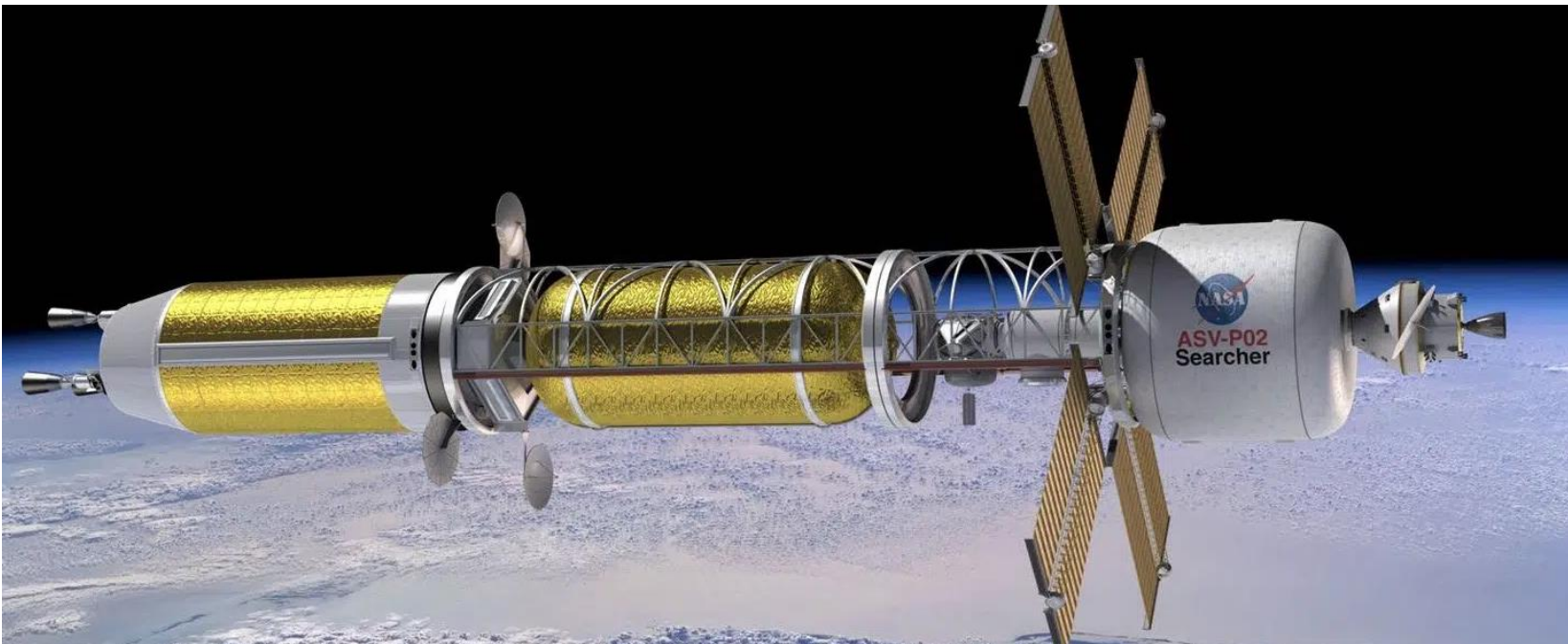
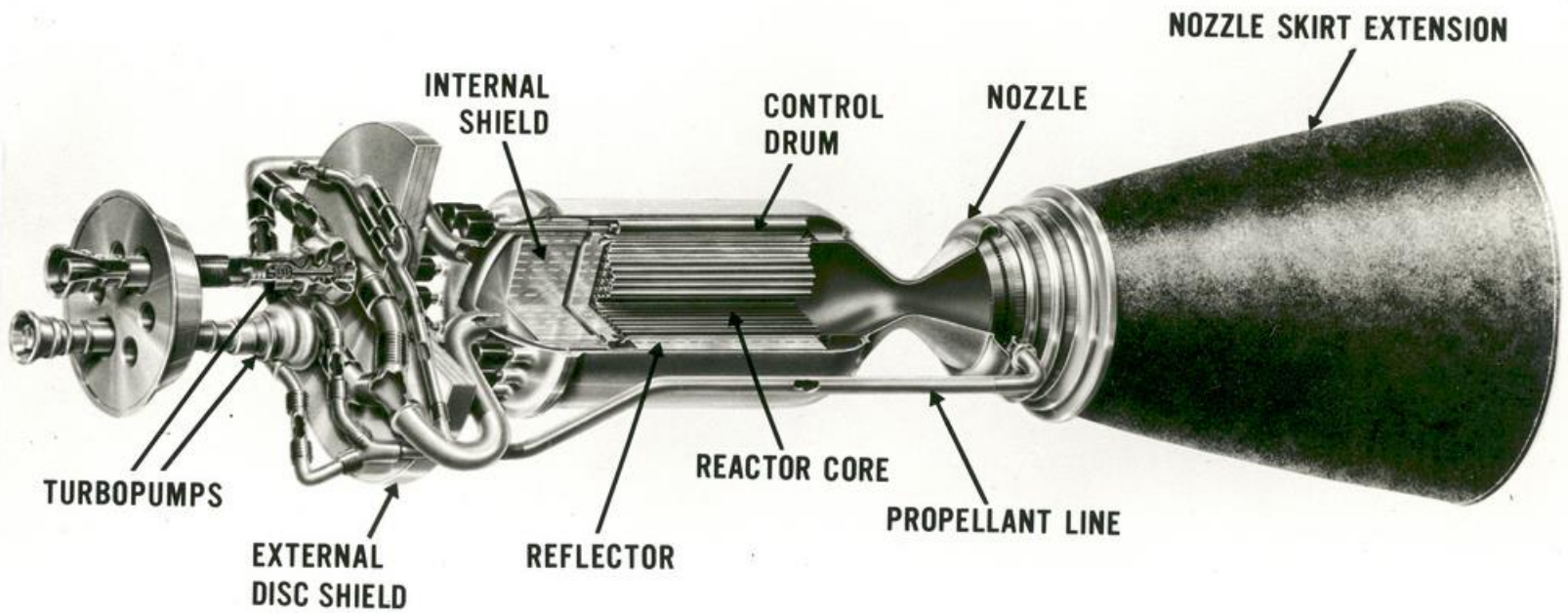
Askeri veya Sivil Amaçlı Gemiler

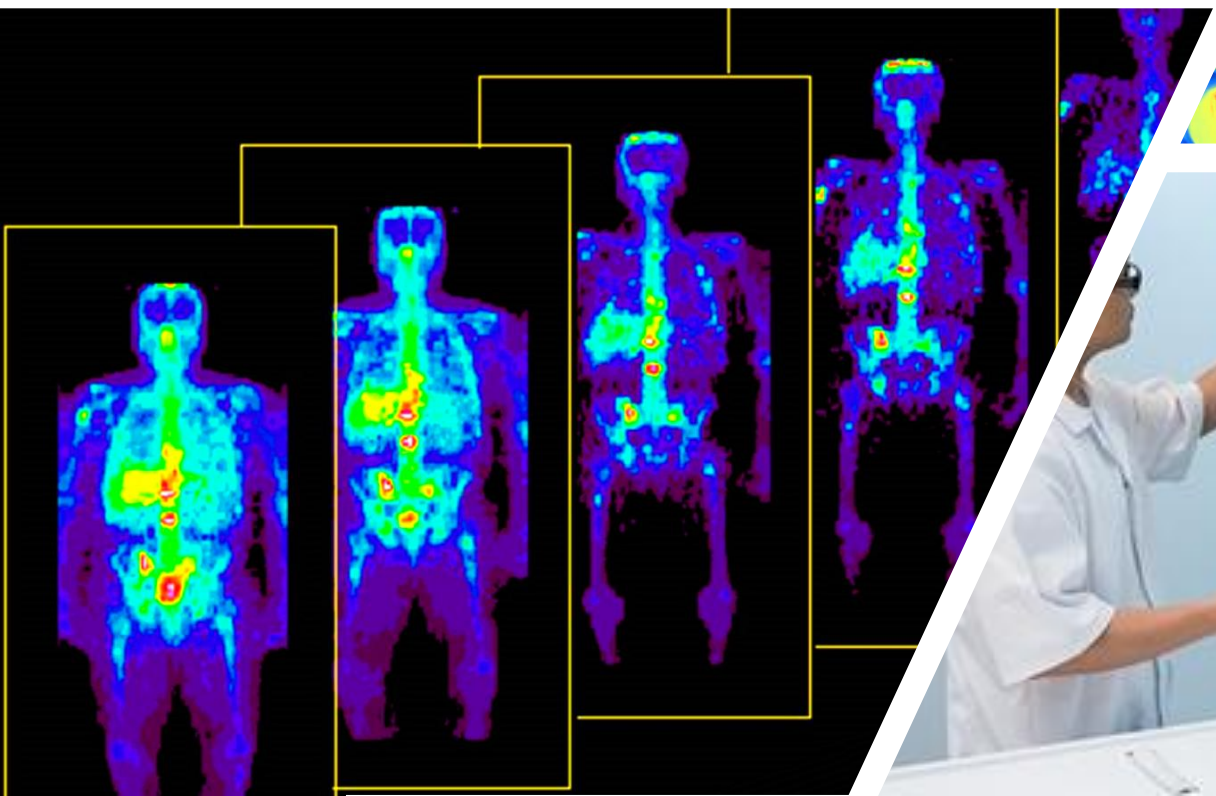
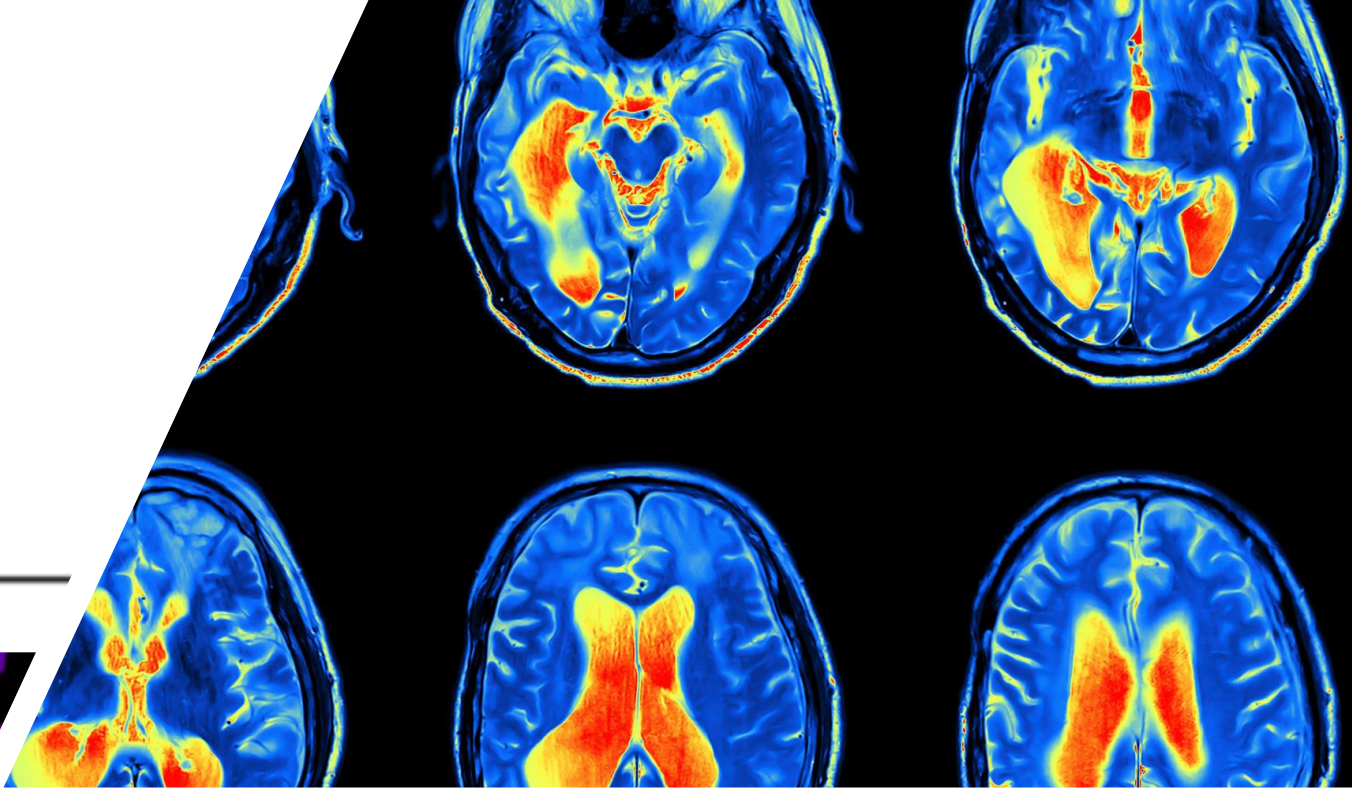
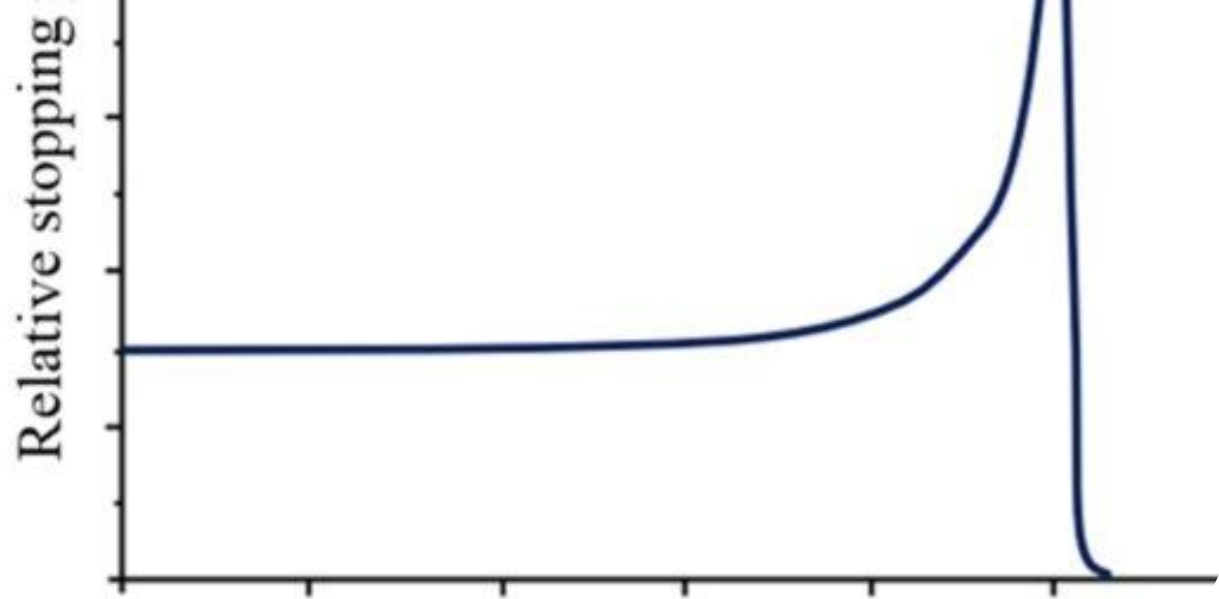
- Düşük enerjili PWR (x100MWe)
- Mekanik Dönme
- Düşük yakıt / daha hızlı
- Korozyon
- Mekanik titreşimler



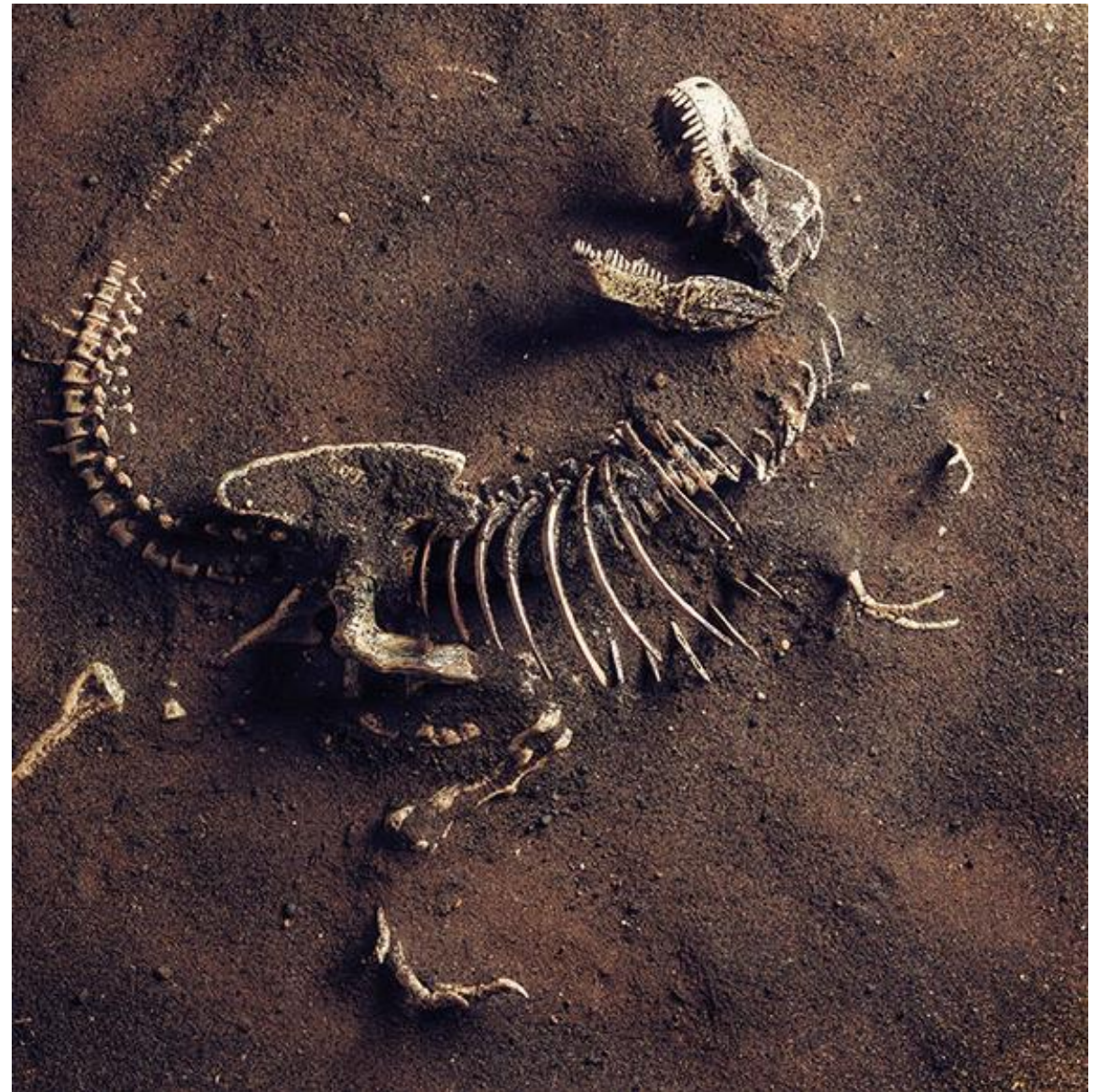
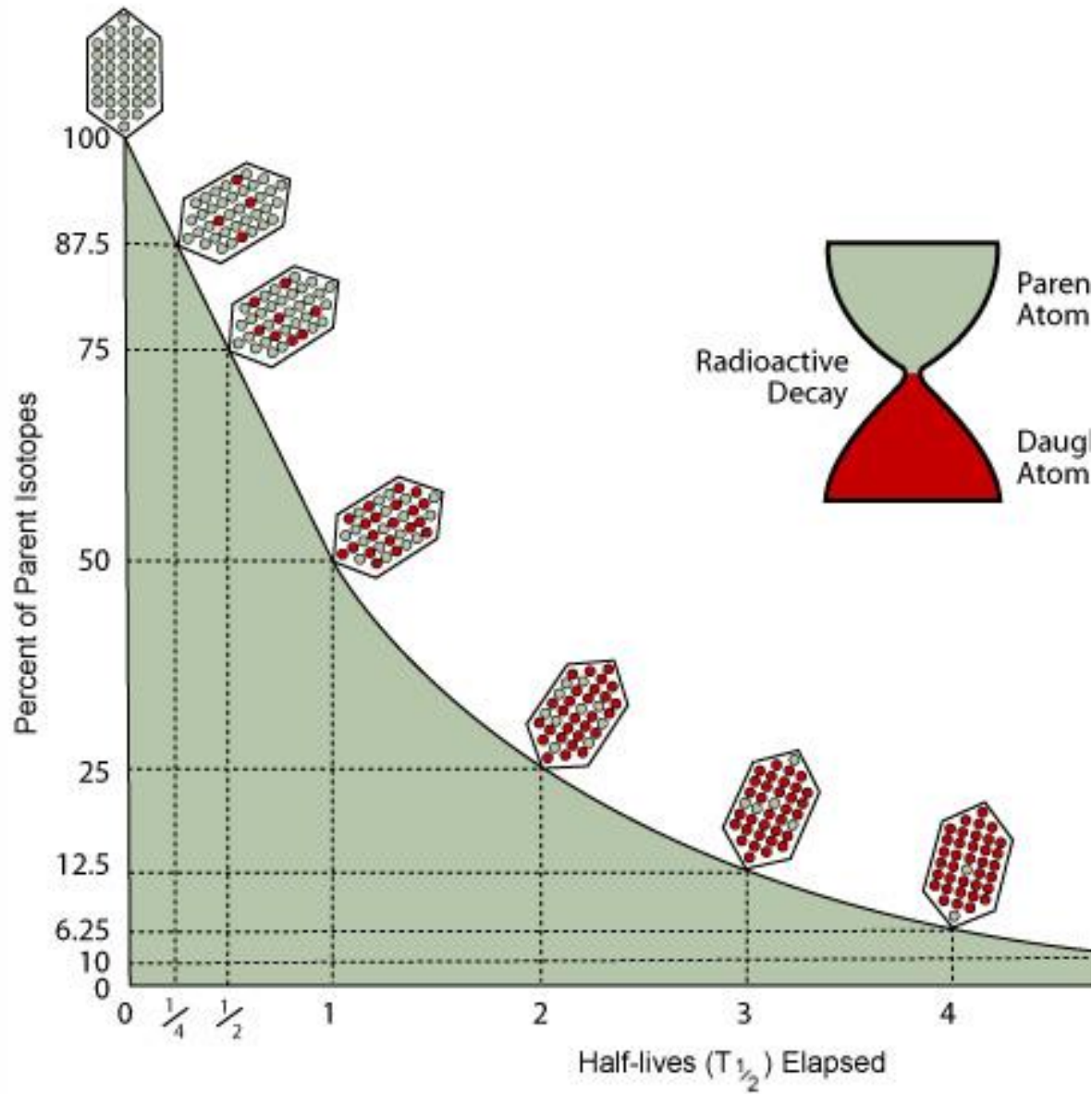
Uzay alıřmaları

- Nkleer reaktr gle itme
- H gazı retimi
- Solar enerjinin dıřında kıř, gece, dřk gneř ıřığı
- Doęal bozunma ısısı (Decay heat) Pu-238
- Pillerin dolumu
- İlk 1961' de ve bu zamana kadar 27 dnya dıřı misyon
- %0.7 verimden kayıp
- ASRG sistem %55 verimli





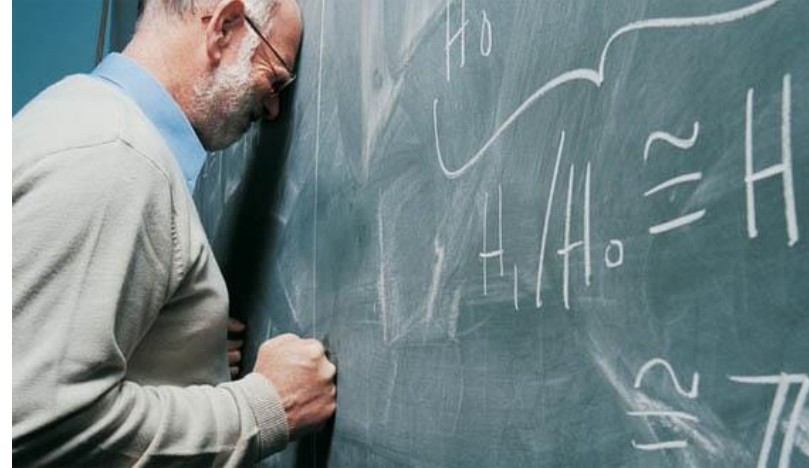




Sorular

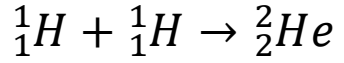


Cevaplar

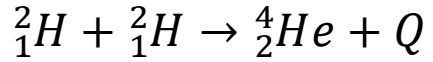


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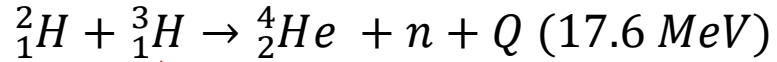
Nükleer Füzyon



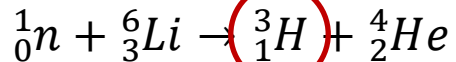
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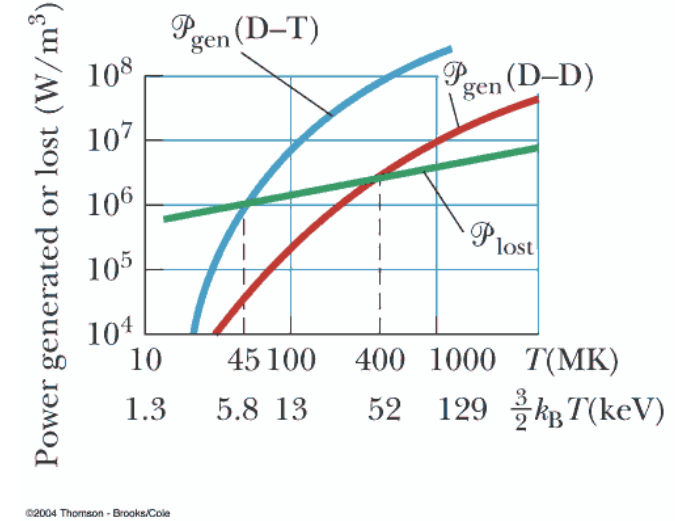
- Döteryum denizde bulunabilirliği
- Radyoaktif ürün olmayışı



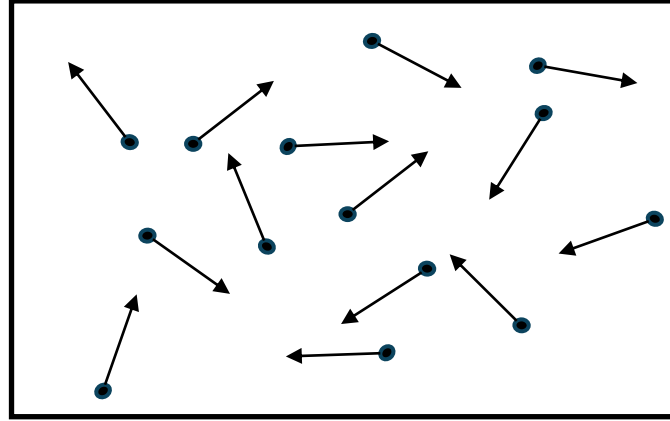
- Tritiyum radyoaktif oluşu
- Tritiyum bulunabilirliği



- Tritiyumu madende aramaya gerek kalmaz
- Reaktörün içerisinde üretilebilir



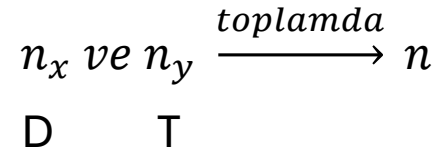
Nükleer Füzyon



- Yüksek enerjide (Plazma) parçacıklar hızlanıyor ve yavaşlıyor
- Plazma durumunda pozitif yüklü çekirdekler ve negatif yüklü elektronlar
- Yüklü parçacıklar yön değiştirdiklerinde veya yavaşladıklarında enerjilerini radyasyon olarak kaybederler

Nükleer Fusyon

Gerekli Enerji



Çekirdek sayısı kadar elektron

Sonuç olarak $2n$ parçacık

$$E = \frac{3}{2} kT$$

$$E = \frac{3}{2} kT \times 2n = 3kTn$$

Çıkan Enerji

$$RR = n_x n_y (\sigma v)$$

$$= \frac{n^2}{4} (\sigma v)$$

$$E = \frac{n^2}{4} (\sigma v) \tau Q$$

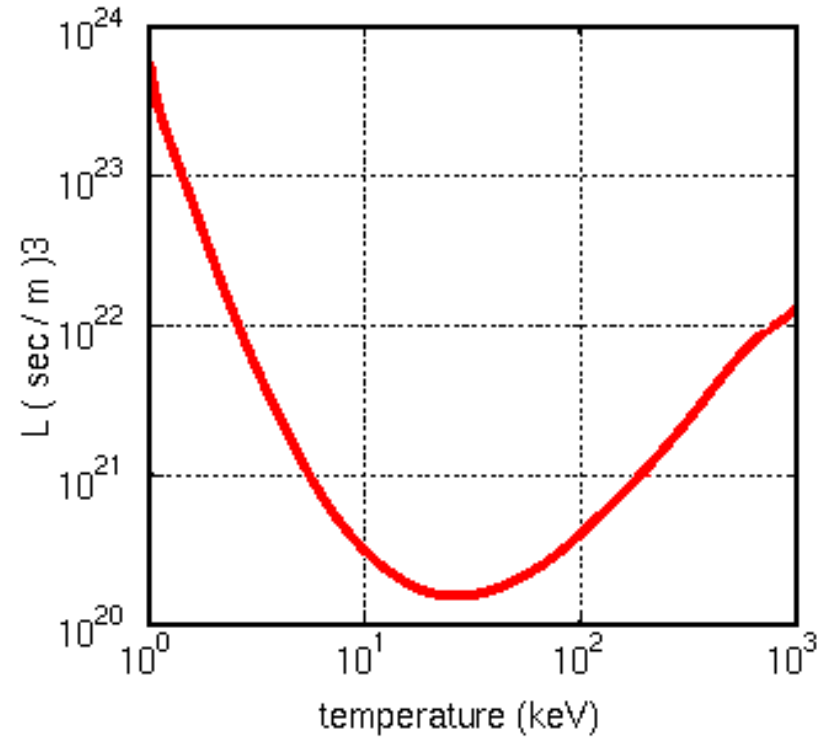
Çıkan enerji gerekli enerjiden büyük olmalı

$$\frac{n^2}{4} (\sigma v) \tau Q > 3kTn$$

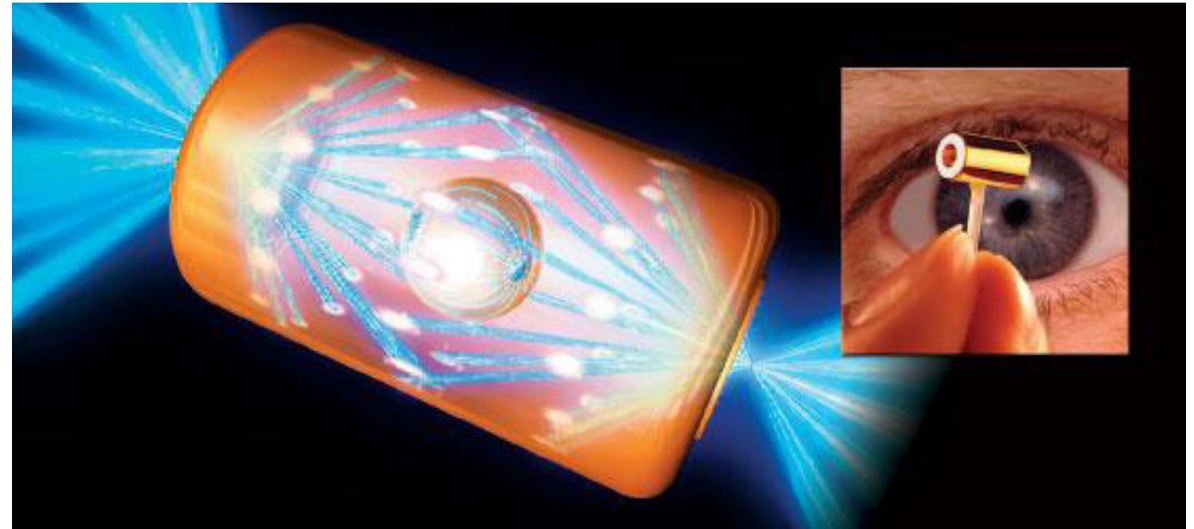
$$n\tau > \frac{12 kT}{(\sigma v)Q}$$

Lawson kriteri

Nükleer Füzyon

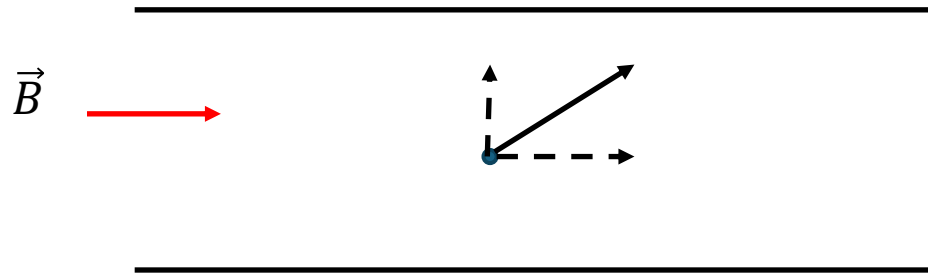


$$T = \frac{E}{k} = \frac{25 \times 10^3 \text{ eV}}{9 \times 10^{-5} \text{ eV/K}} \cong 3 \times 10^8 \text{ K}$$

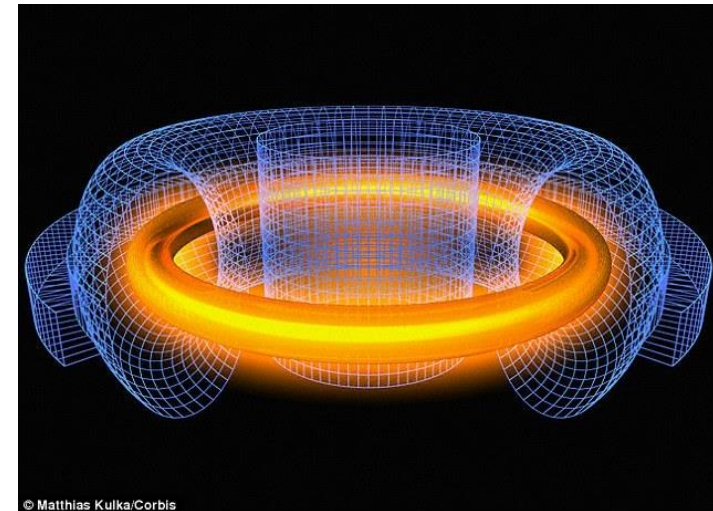
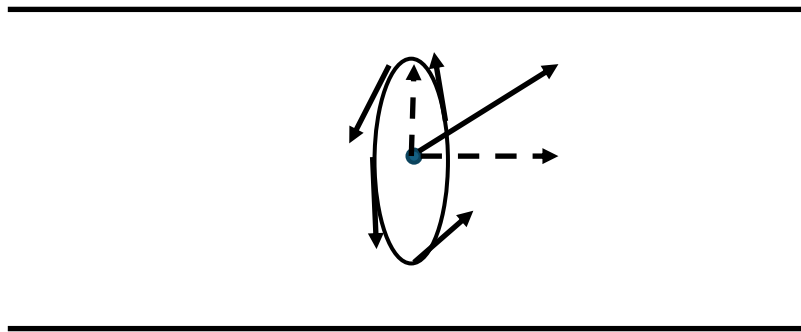


Nükleer Füzyon

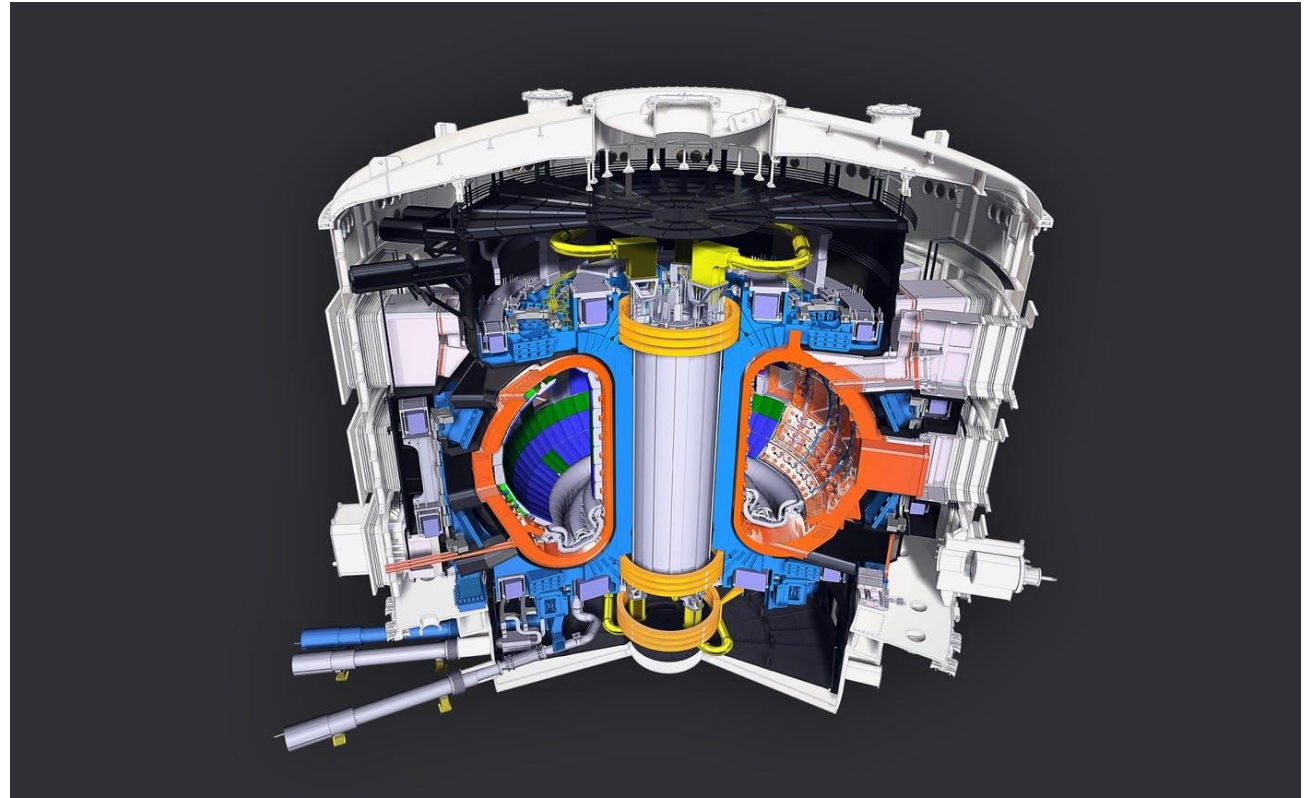
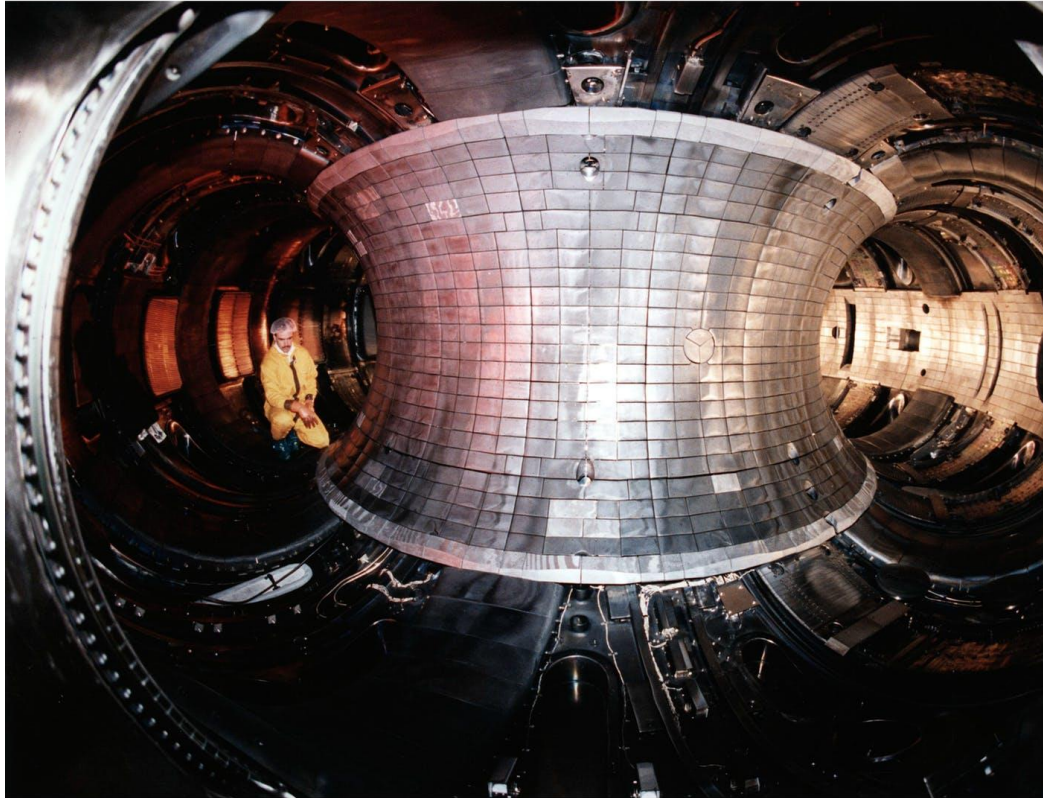
Bu sıcaklığa dokunan her şey erir. Ne olmalı?



$$\vec{F} = q\vec{V} \times \vec{B}$$



Nükleer Füzyon



Nükleer Füzyon

$$E_{out} \cong \%70 E_{in}$$

