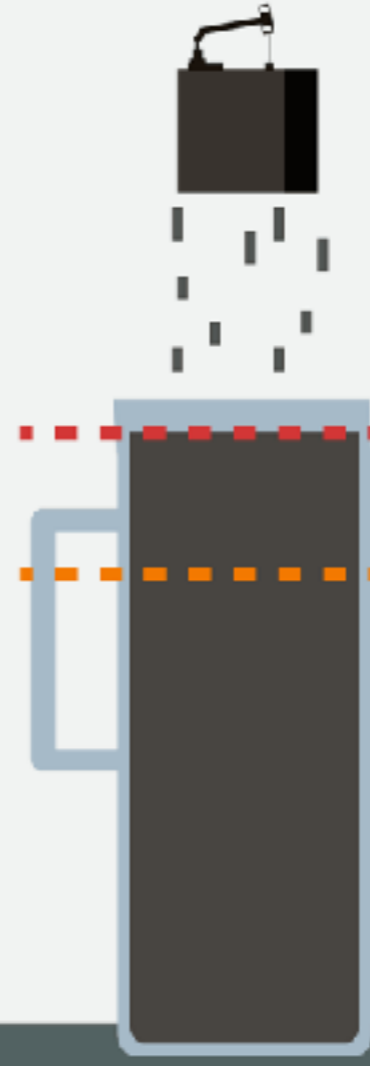


Ultrafast Shutter for Magnetized Target Fusion

Akshiv Bansal

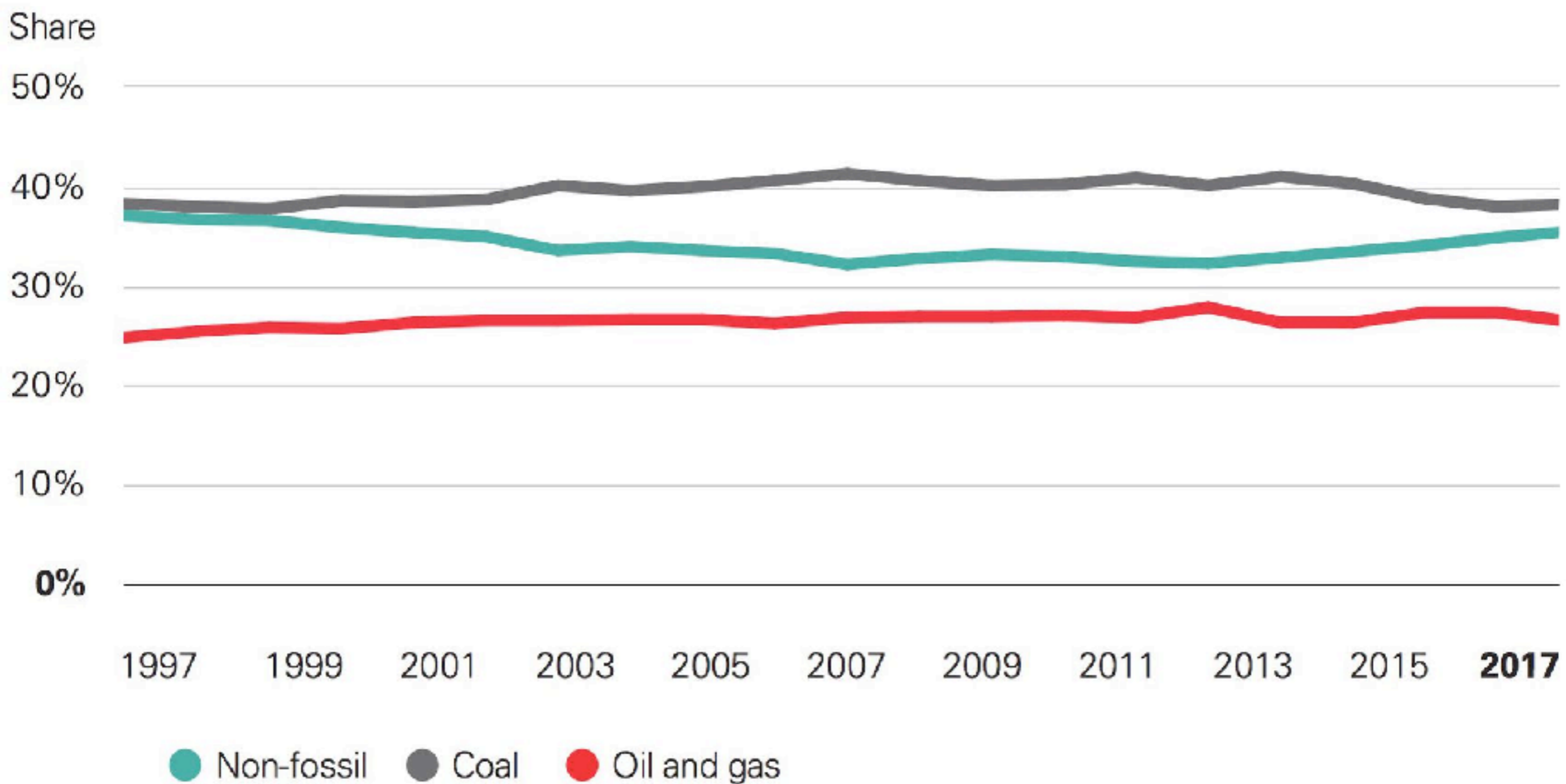
All the fossil fuel we've identified and can recover with current technology

The portion we are currently harvesting



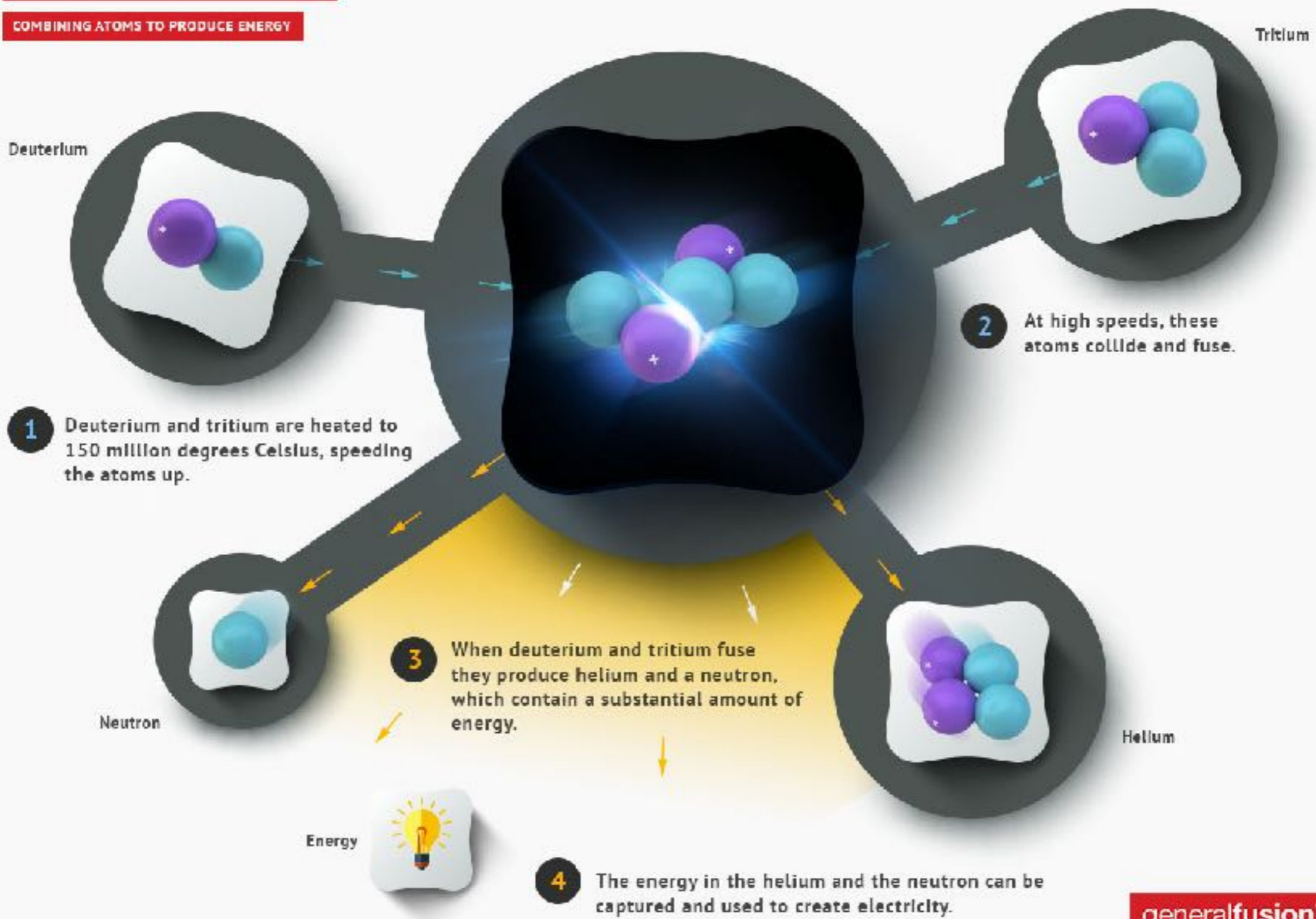
- **1.1 trillion tons**
CO₂ we would emit with all fuel we're already harvesting
- **843 billion tons**
CO₂ we can emit to likely limit warming to **2° Celsius**

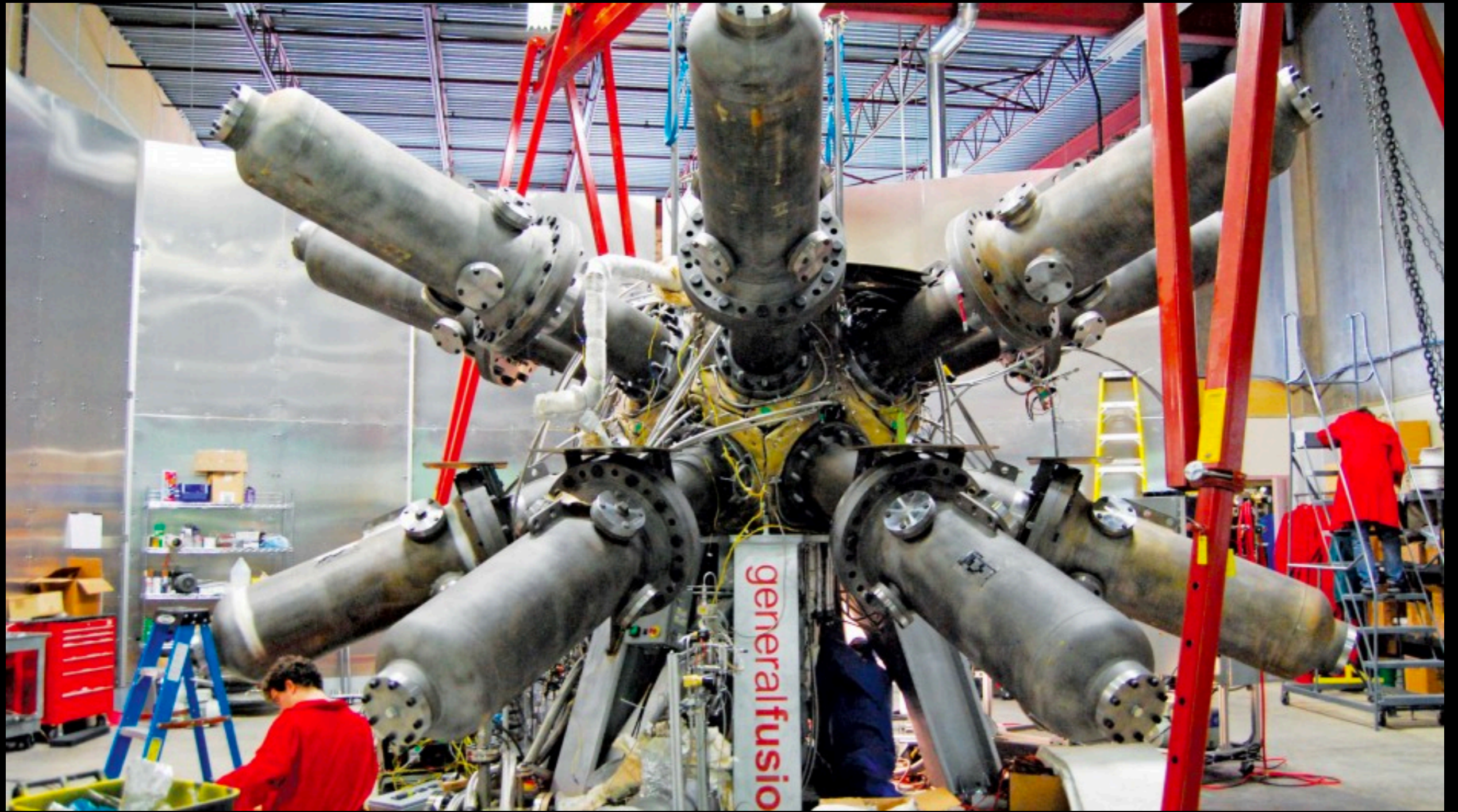
Fuel shares in power generation

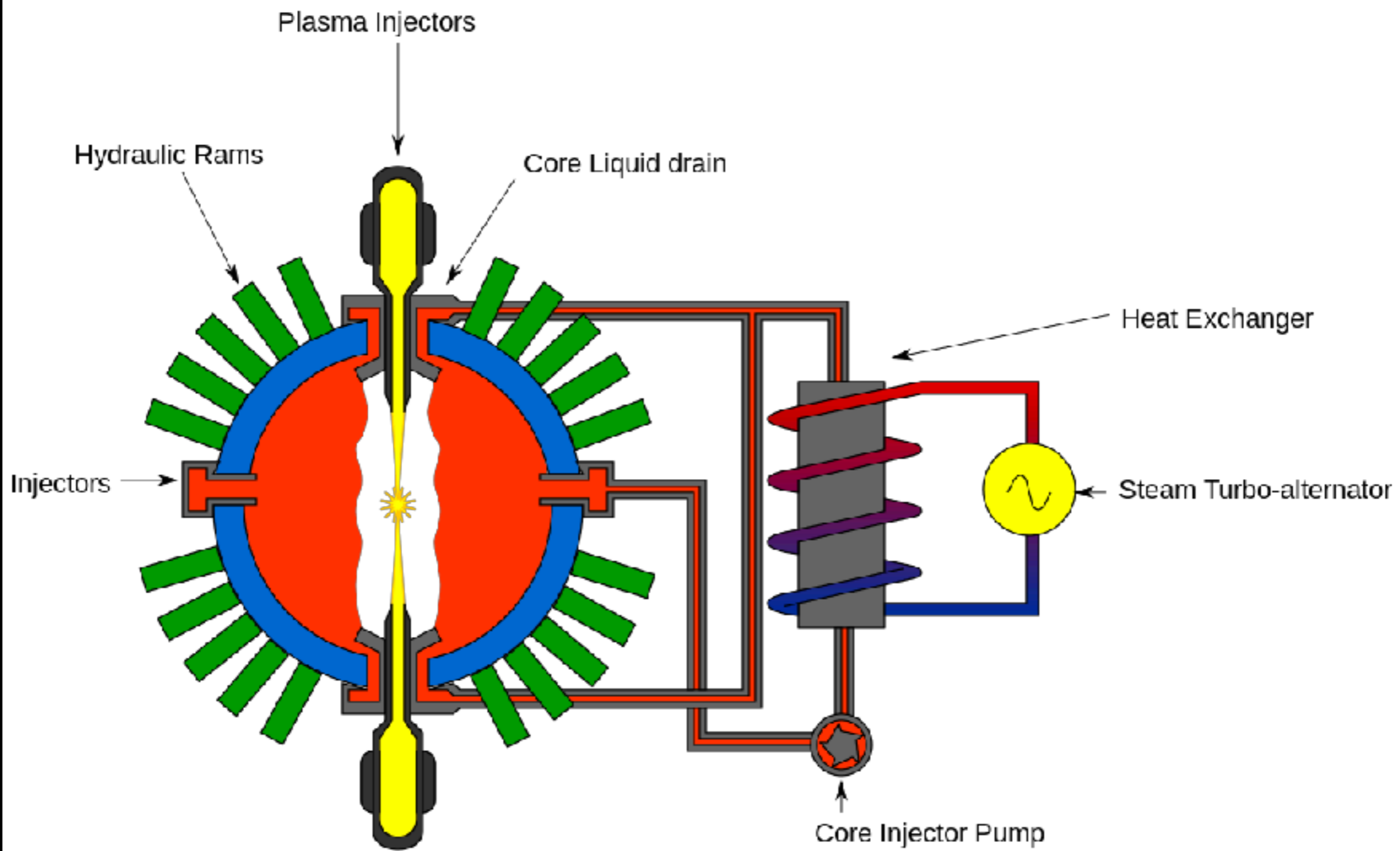


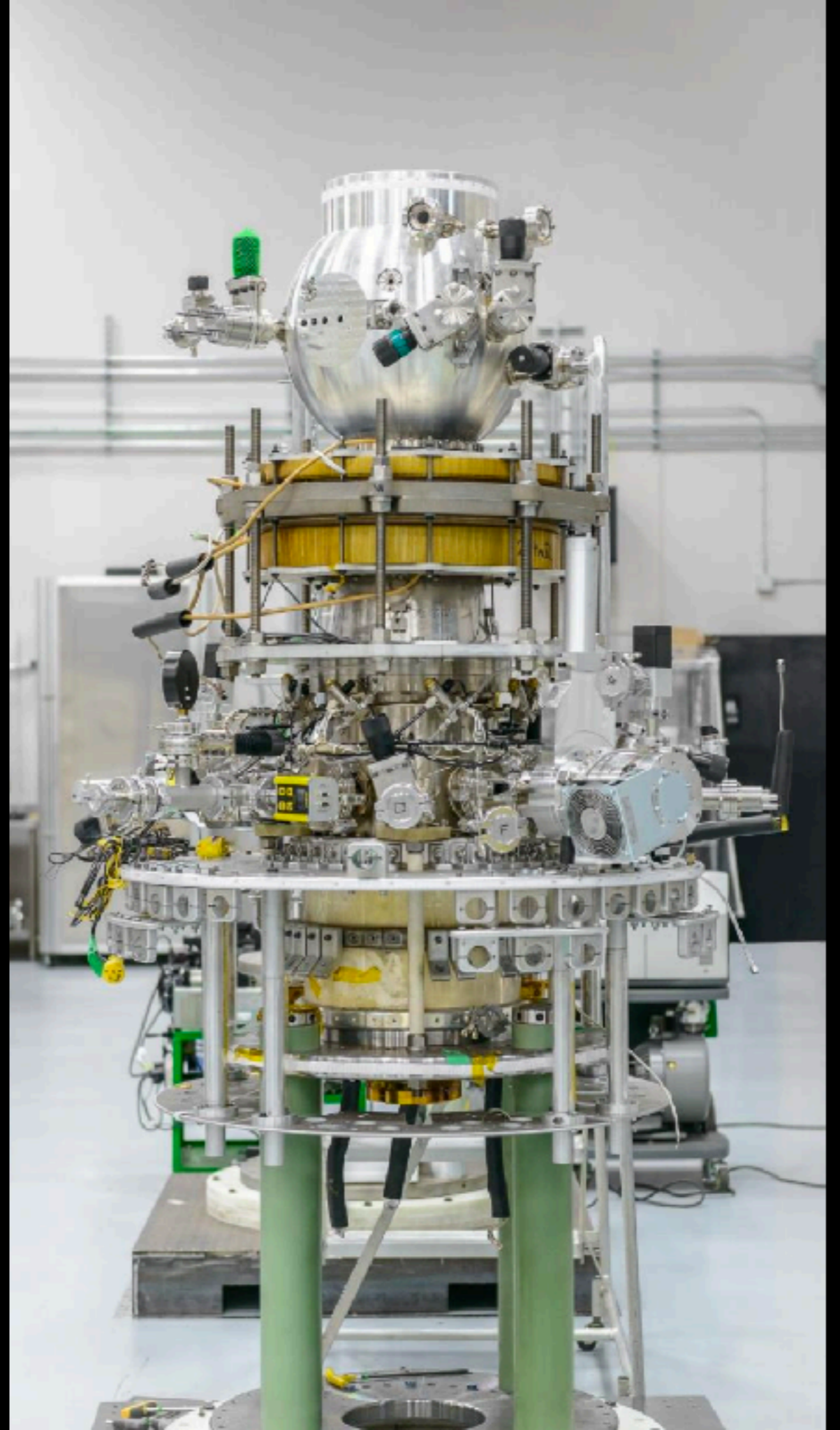
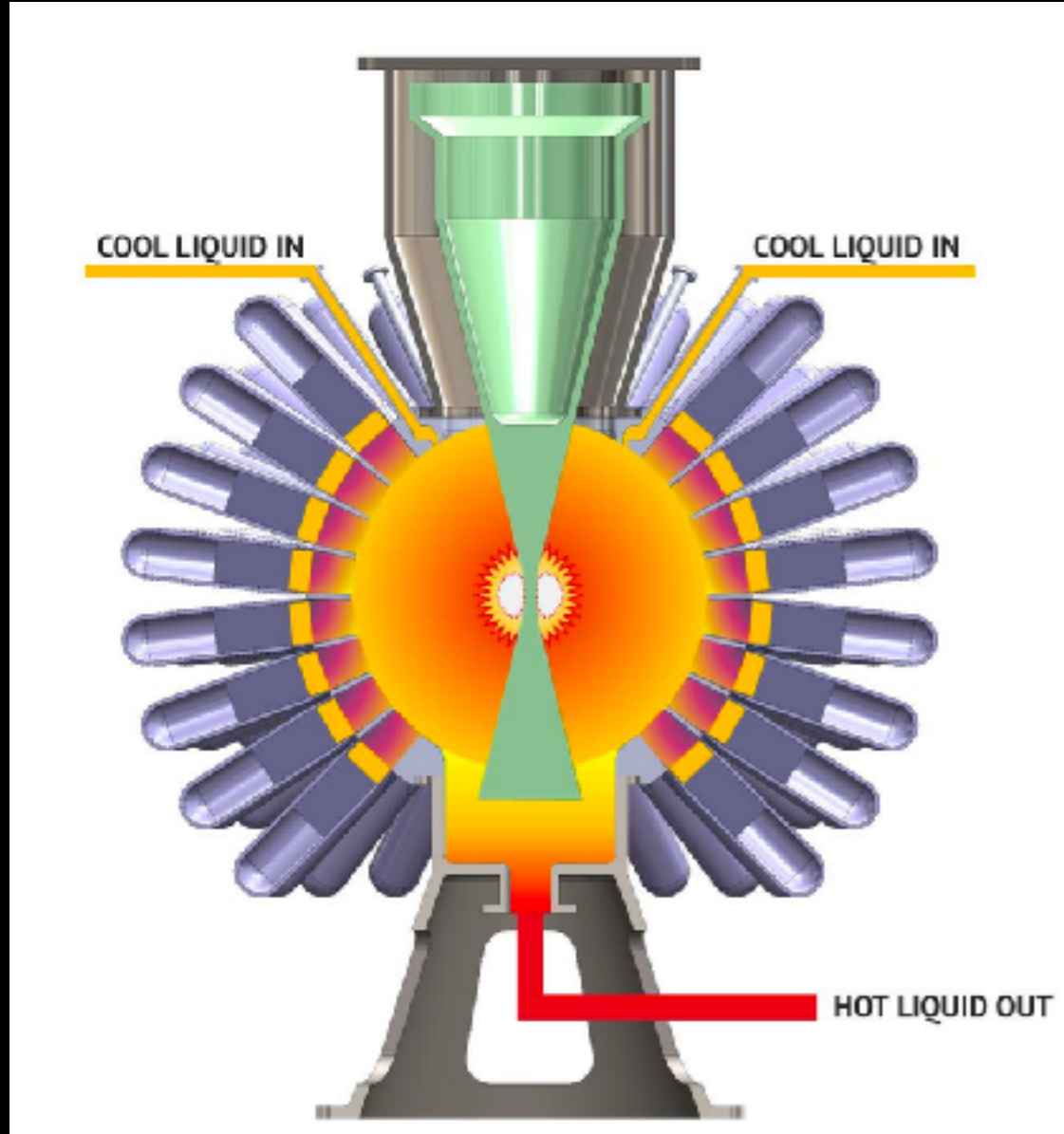
WHAT IS FUSION?

COMBINING ATOMS TO PRODUCE ENERGY







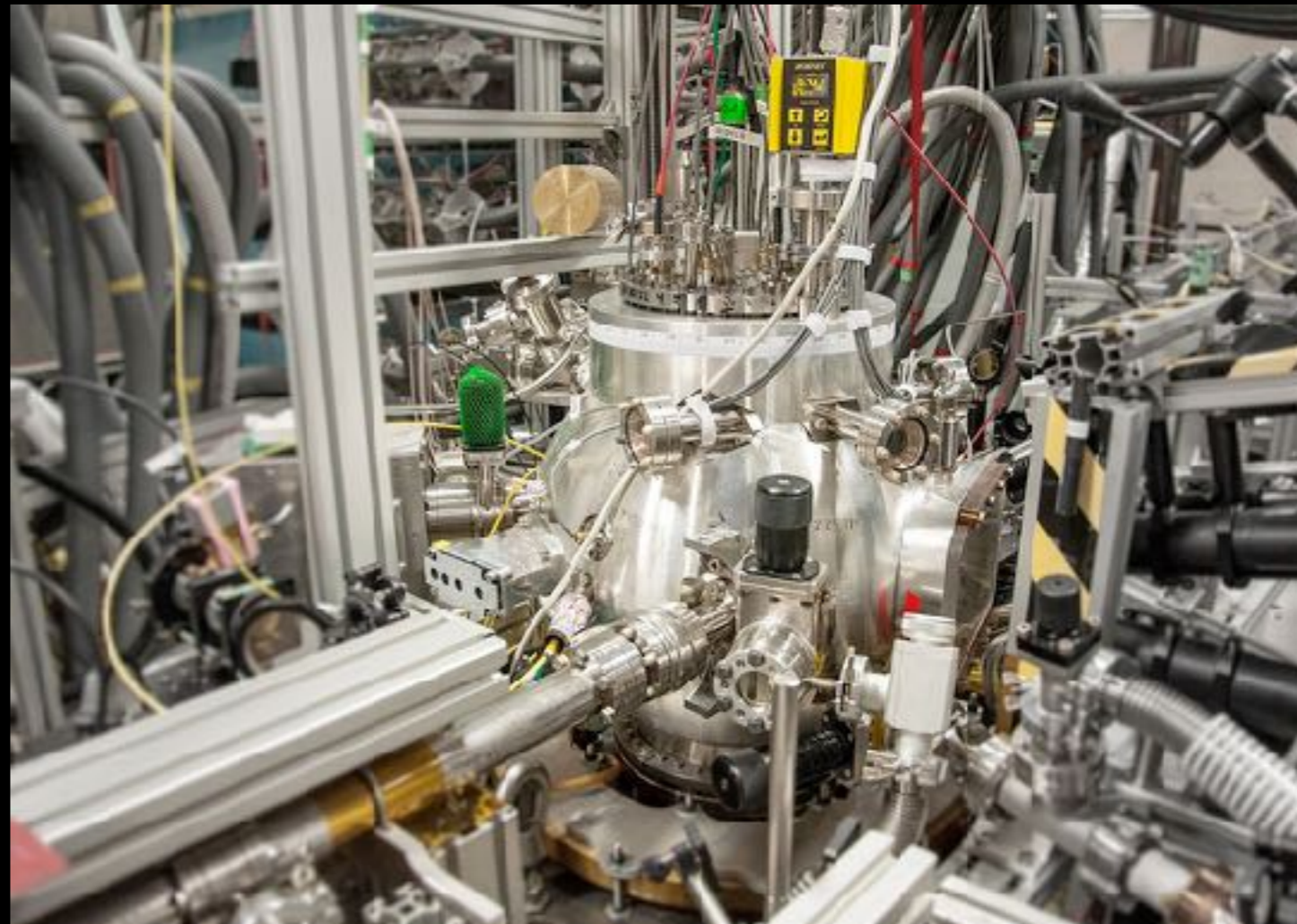


Problem

Design something to protect sensitive diagnostic equipment from splashes of liquid lithium.

Must allow light diagnostic to see plasma ($\sim 2\text{ms}$) and close before lithium splash ($\sim 4\text{-}5\text{ ms}$)

Must be self sufficient for multiple tests to avoid opening pressure vessel

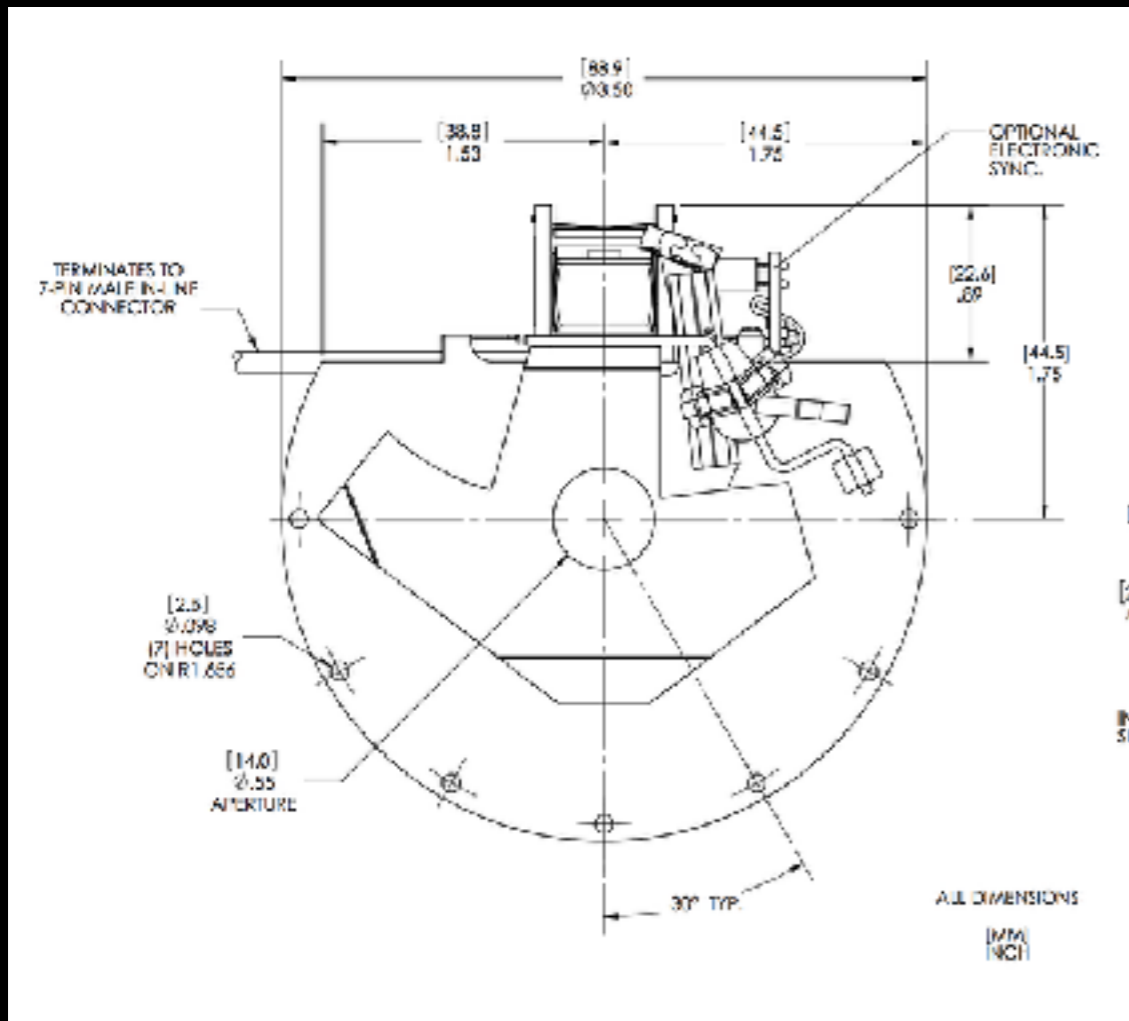


Other Challenges

- High Temperature ~2-5 million degrees Celsius plasma, ~200 degrees liquid lithium
- High magnetic pressure
- Operation in ultrahigh vacuum ($\sim 10^{-9}$ torr)
- Constraints on material choice

Solution 1

Modify an existing product



Advantages

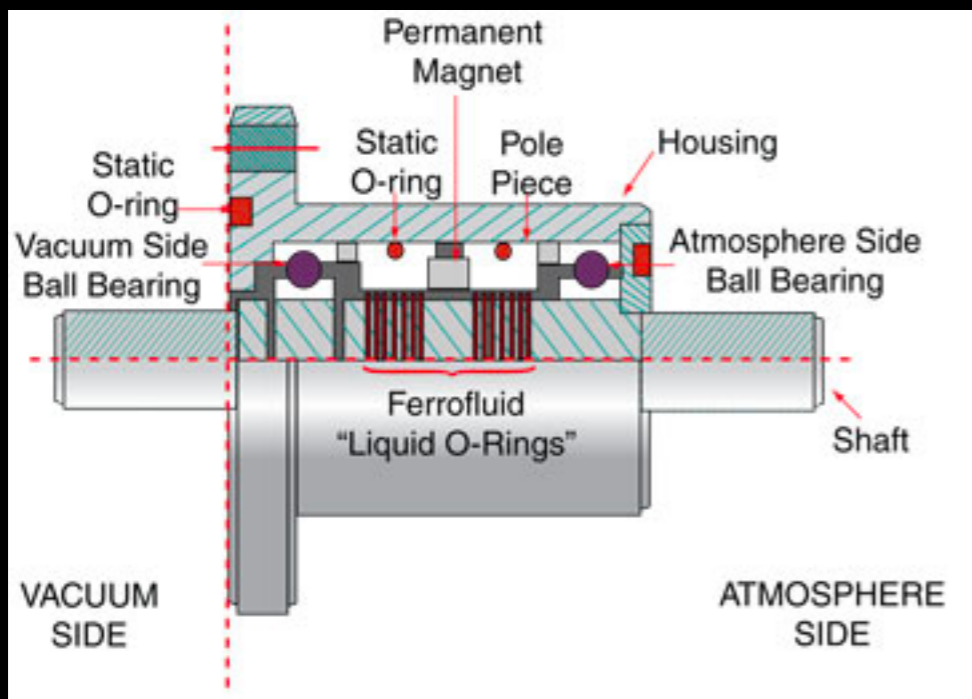
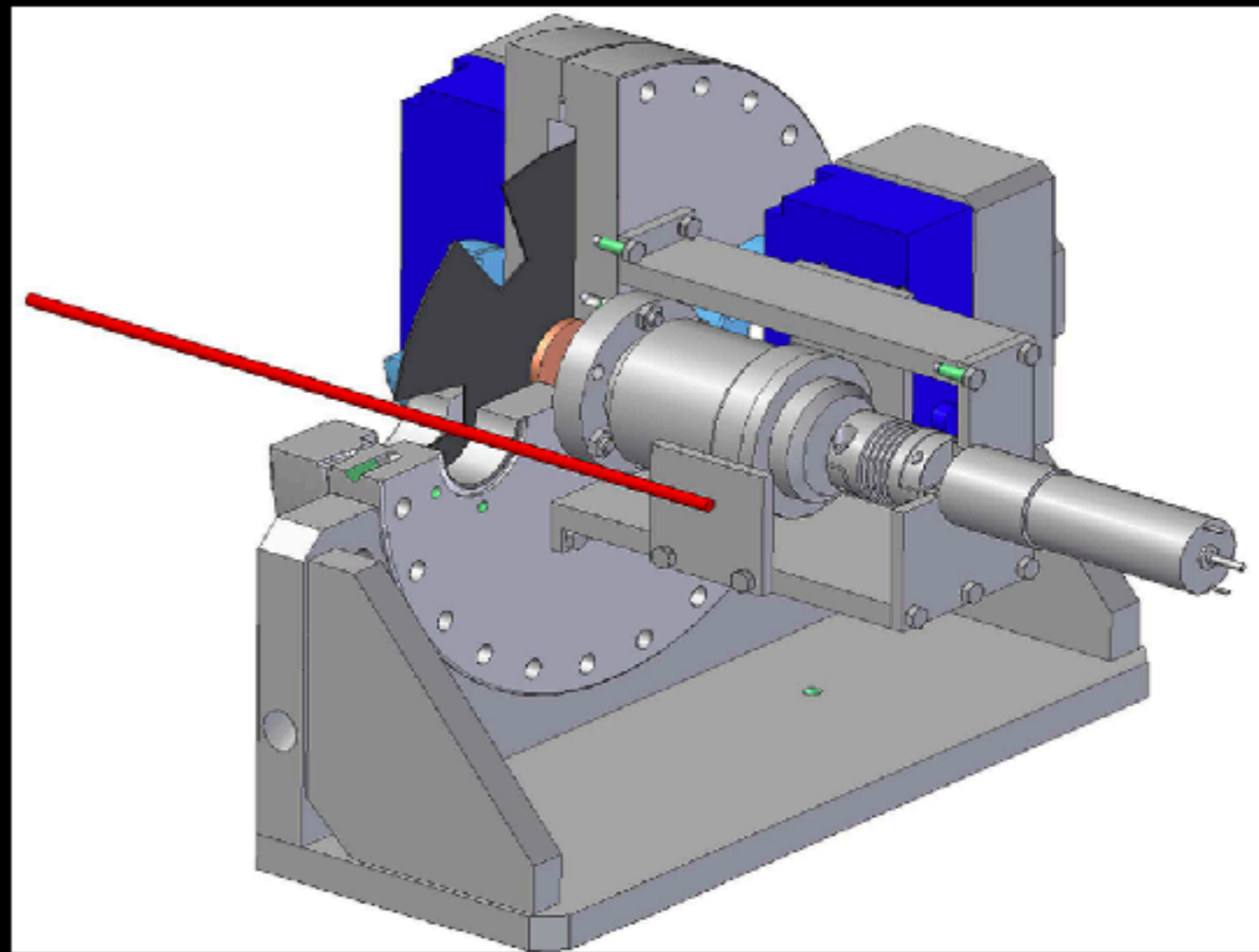
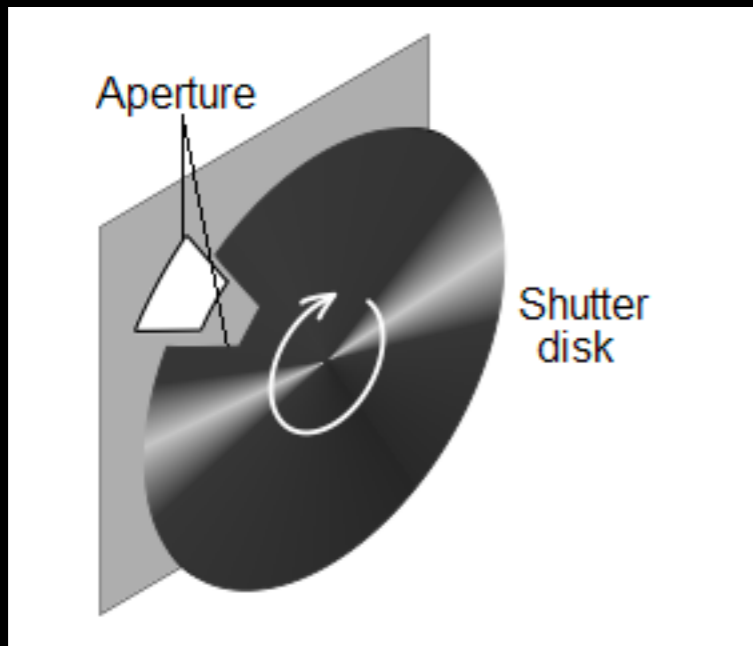
- Lower cost than homespun solution
- Greater reproducibility/reliability
- Doesn't take time from other projects

Disadvantages

- Lower modifiability
- Doesn't scale well
- Not quite to specifications needed

Solution 2

Rotating Disk Shutter



Advantages

- Highly flexible/scalable
- Very robust
- Simple in design and execution

Disadvantages

- Requires integration in shot timing
- Engineering time needed to add more
- Another project to maintain

generalfusion



The image shows a large industrial facility, likely a fusion reactor, with a complex network of pipes, cables, and structural beams. A prominent red vertical banner on the right side of the frame contains the text "generationalfusion" in white, lowercase letters. The facility is situated in a large, open industrial space with a high ceiling and various pieces of equipment, including a tripod-mounted camera on the left and a utility cart in the foreground. The overall scene is one of a sophisticated, high-tech industrial environment.

generationalfusion