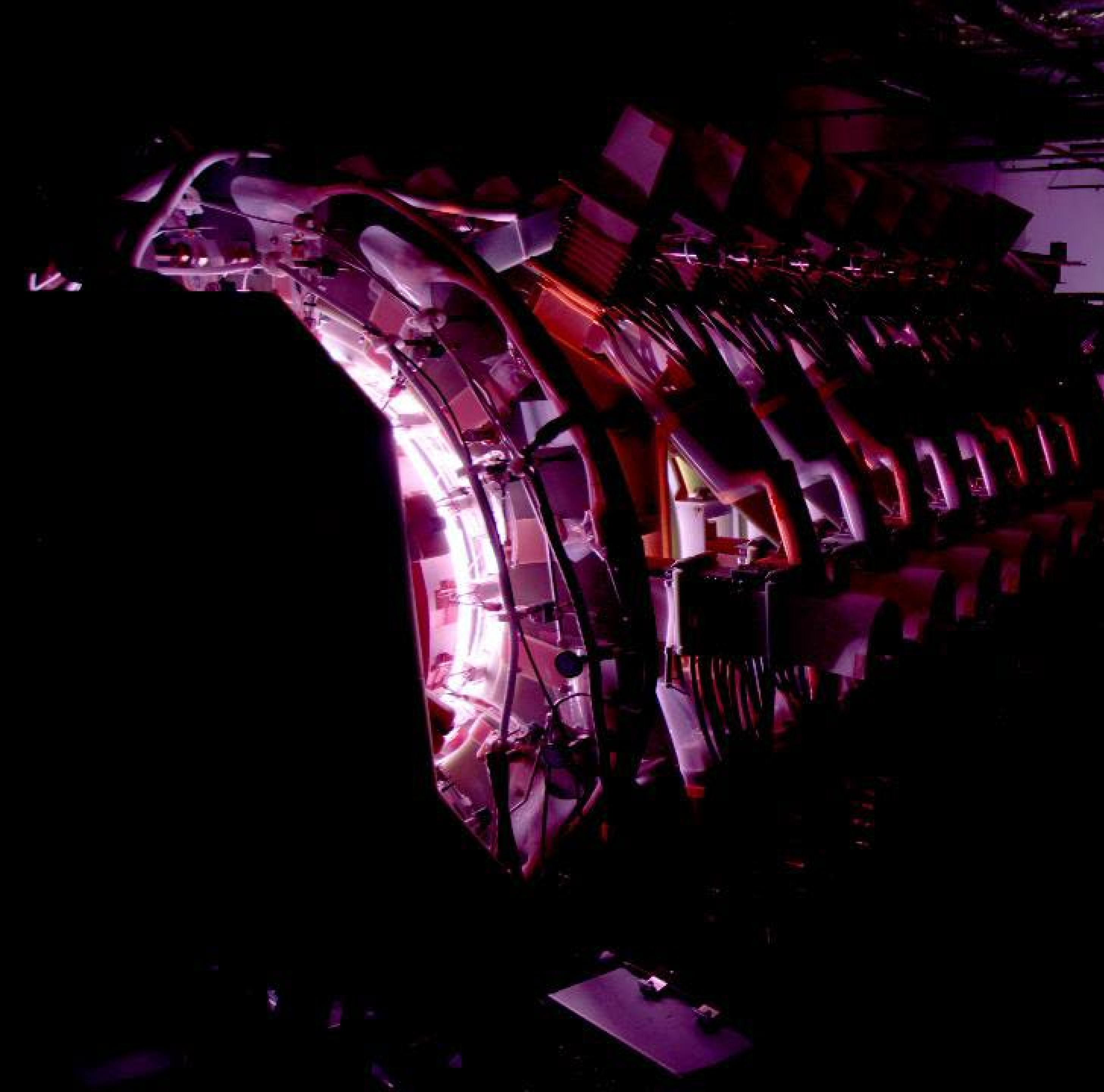


About Helion Energy

Sachin Desai | General Counsel
2023 LLRW Forum
March 22, 2023

Fusion's Promise

Fusion is a **reliable** source of **zero-carbon, baseload** power.

One 500ml bottle of deuterium water can power a home for **865 years.**

Clean	Reliable	Abundant
• Zero carbon	• 24/7 power generation	• Fuel comes from water
• No high-level waste	• No meltdown risk	• 50 MW plant in ~15 acres

Fusion's Arrival

1 FORMATION

Deuterium and helium-3 are heated to plasma conditions. Magnets confine the plasma in a Field Reversed Configuration (FRC).

2 ACCELERATION

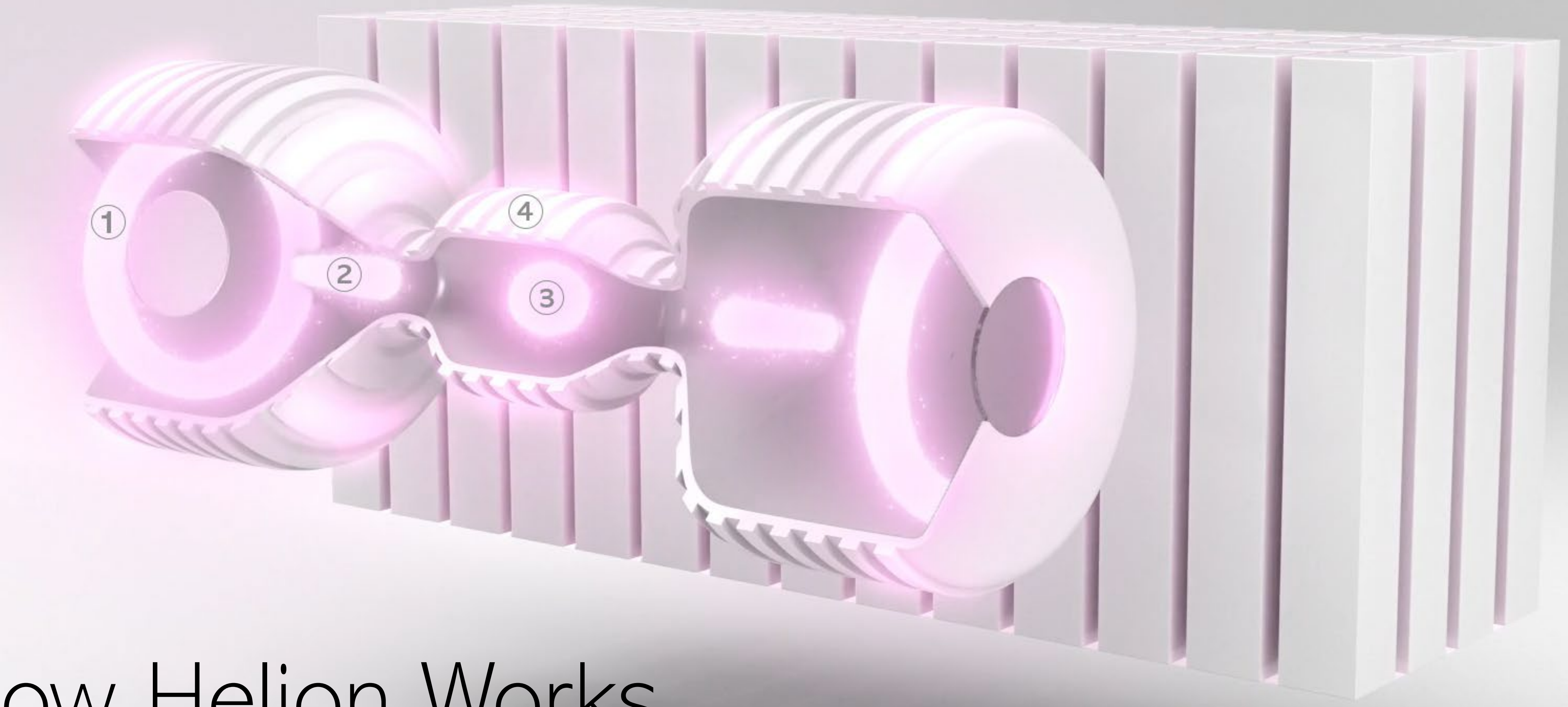
Magnets accelerate the FRCs until they collide in the center of the device.

3 COMPRESSION

The merged plasma is compressed until it reaches 100 M°C. Fusion occurs and the plasma expands.

4 ELECTRICITY RECAPTURE

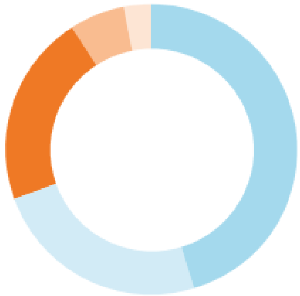
As the plasma expands, it pushes back on the magnetic field. The change in field induces current, which is directly recaptured as electricity.



How Helion Works

HELION

The Ecosystem



General approach

- 15 Magnetic confinement
- 8 Inertial confinement
- 7 Magneto-intertial
- 2 Electrostatic Hybrid
- 1 Muon-catalyzed fusion

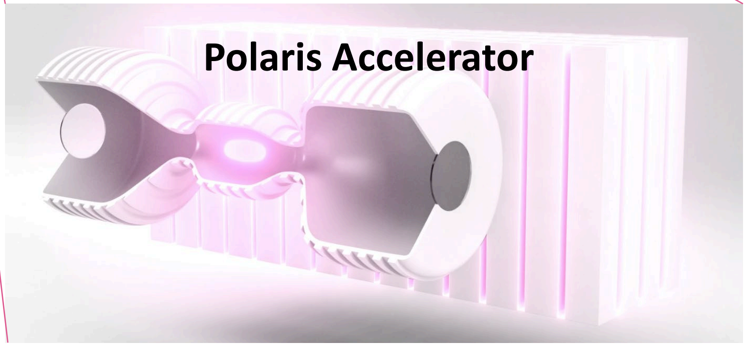
Specific approach

- 4 Field Reversed Configuration
- 4 Stellarator
- 3 Tokamak/Spherical Tokamak
- 2 Z-pinch
- 1 Dense Plasma Focus
- 1 Epicyclotron: a hybrid beam background approach
- 1 Hypervelocity Gradient Field Fusion
- 1 Laser-driven inertial confinement
- 1 Magnetic mirror
- 1 Magnetized target fusion
- 1 Modified Stellarator
- 1 Muon-catalyzed fusion with high density fuel
- 1 Non-thermal laser fusion
- 1 Orbitron (Electrostatic ion orbiting a cathode with magnetron (ExB) electron confinement)
- 1 Oscillating fusion-fizzle cycles with direct EMF extraction
- 1 Plasma Jet driven Magneto Inertial Fusion
- 1 Plectonemic reconnection
- 1 Poloidal magnetic confinement, e.g. Levitron, LDX, Intrap
- 1 Shock-driven inertial confinement
- 1 Spheromak
- 1 Spindle cusp, superconducting shielded-grid

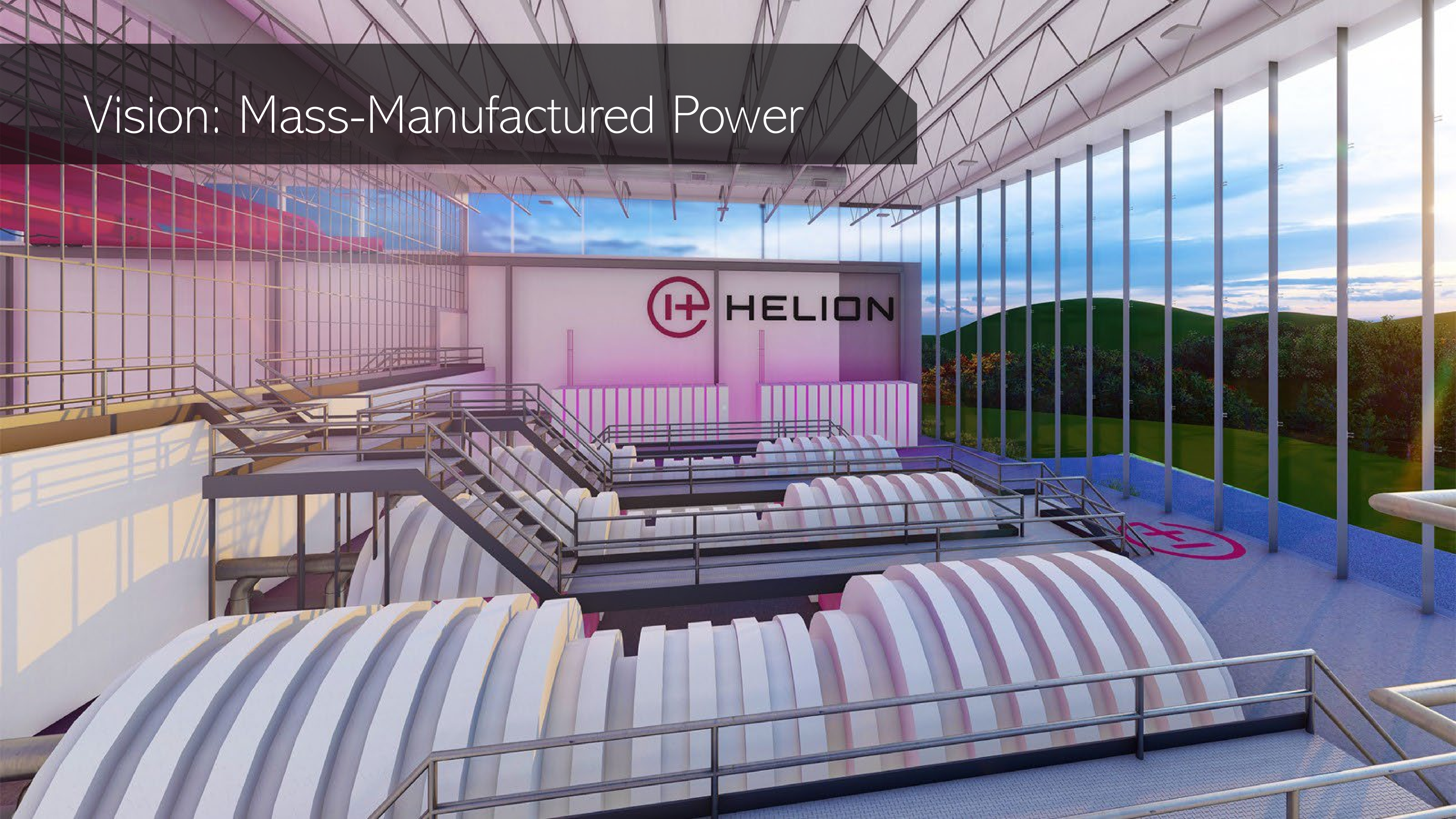
Source: Fusion Industry Association

Polaris

- Helion's 7th gen facility
- Regulated by WA DOH
- **Goal: Electricity Production**



Vision: Mass-Manufactured Power



Simplified Device Release Analysis

- Simplified Analysis (extreme hypothetical):
  - All tritium gas released and converted to HTO (~ 0.015 mg)
  - Entire vacuum vessel wall turned to dust
- Tritium Release Evaluation:
  - 0.015 mg → 4.0 μrem (max value at 470m)
- Dust Release Evaluation:
  - Primary dust concern: ^{31}Si created w/ 2.45 MeV neutrons
  - Dust equilibrium: 190 Ci in hours (2.6 hr. half life, 1.27 MeV γ)
  - Vacuum chamber wall → 11.3 mrem (max value at 460m)
- Physically realistic impacts would be much less.

Analytical Tools

- Release Mapping – HotSpot v.3.1.2
- Dust Activation Rate Analysis – MCNP6.2

Silica Dust Profile

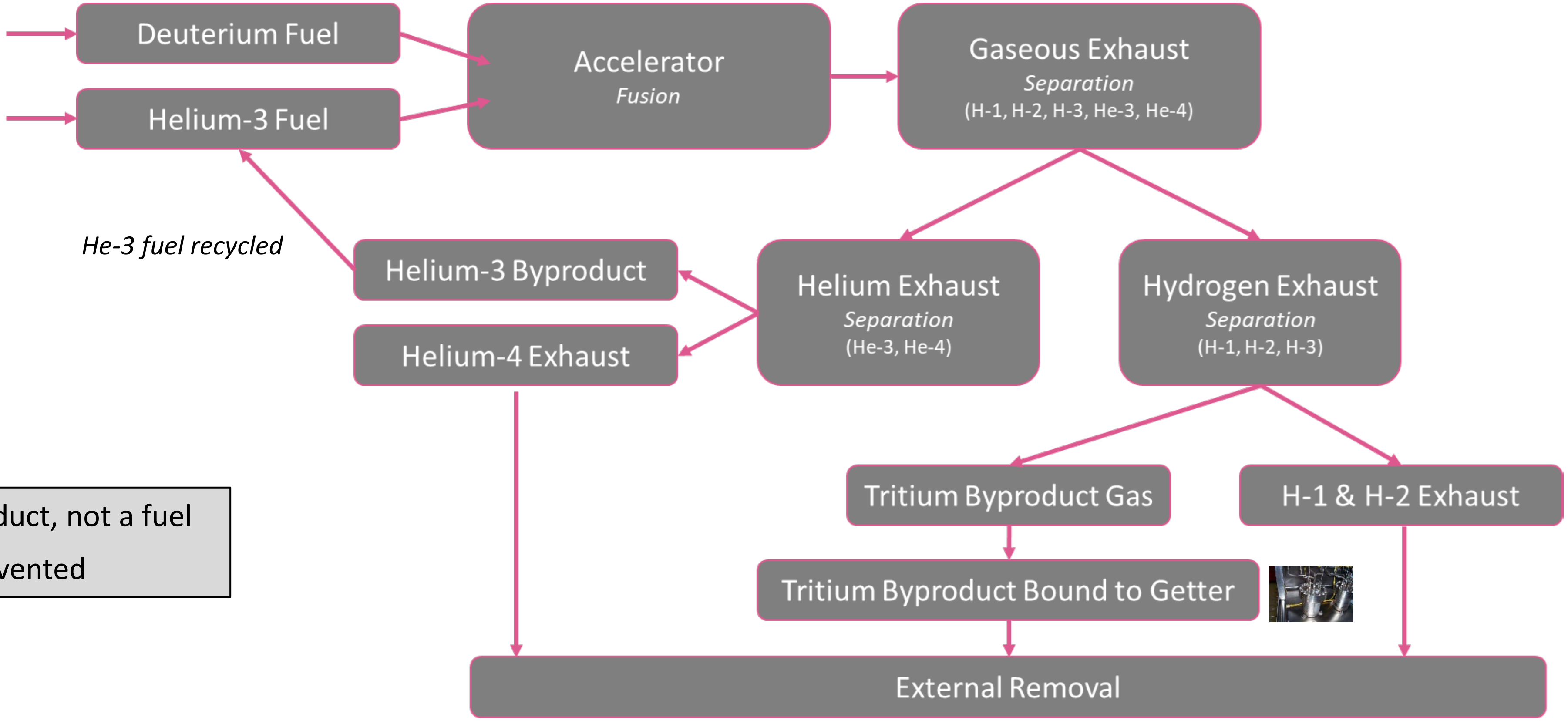
Table 1
Relevant reactions for 14 MeV and thermal neutrons

Reaction	Abund. %	$\sigma_{14 MeV}$ or thermal,mb	E_T, MeV	σ, mb	E_{eff}, MeV	σ_o, mb	Half-life	Gamma energy, MeV
$^{28}Si(n, p)^{28}Al$	92.2	250	4.01	4.0			2.3 m	1.78(100%)
$^{29}Si(n, p)^{29}Al$	4.7	100	3.1	2.7			6.52 m	1.28(91%)
$^{30}Si(n, p)^{30}Al$	3.1	60	~8				0.05 m	2.23(61%)
$^{30}Si(n, \gamma)^{31}Si$	3.1	110_{th}					2.6 h	1.27(.07%)

H. Sorek, H.C. Griffin, "Fast Neutron Activation Analysis of Silicon in Aluminum Alloys," *Journal of Rad. Chemistry*, **79**, 1, 1983.

<u>Key Takeaway</u>: Device impacts are fundamentally limited compared to fission systems, and akin to industrial facilities.

Fusion Tritium Cycle for Alternative Fuels



- Tritium is a byproduct, not a fuel
- Tritium gas is not vented

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