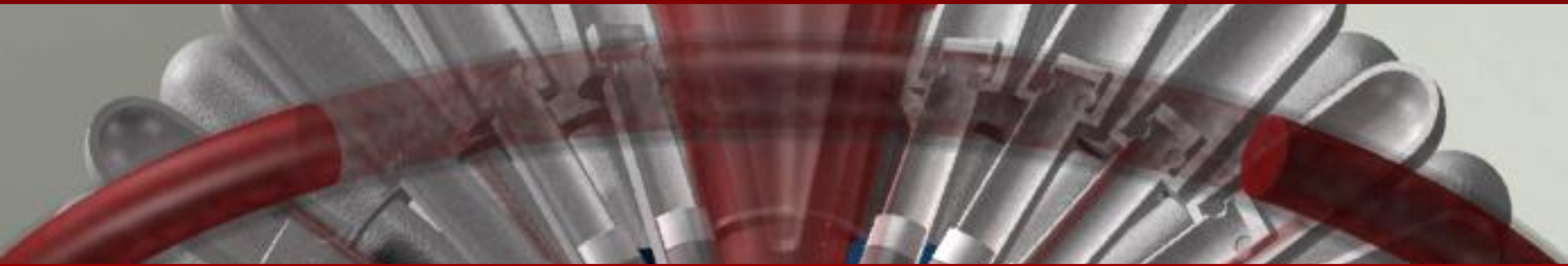
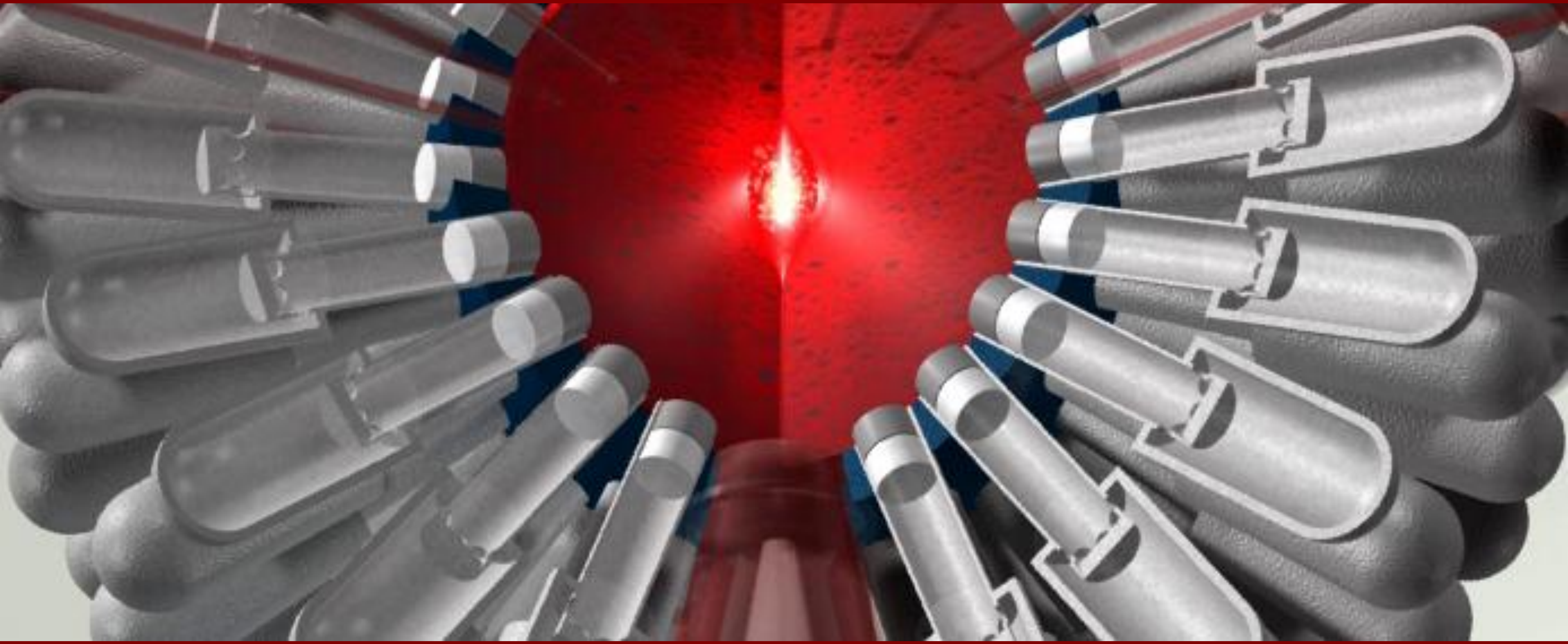
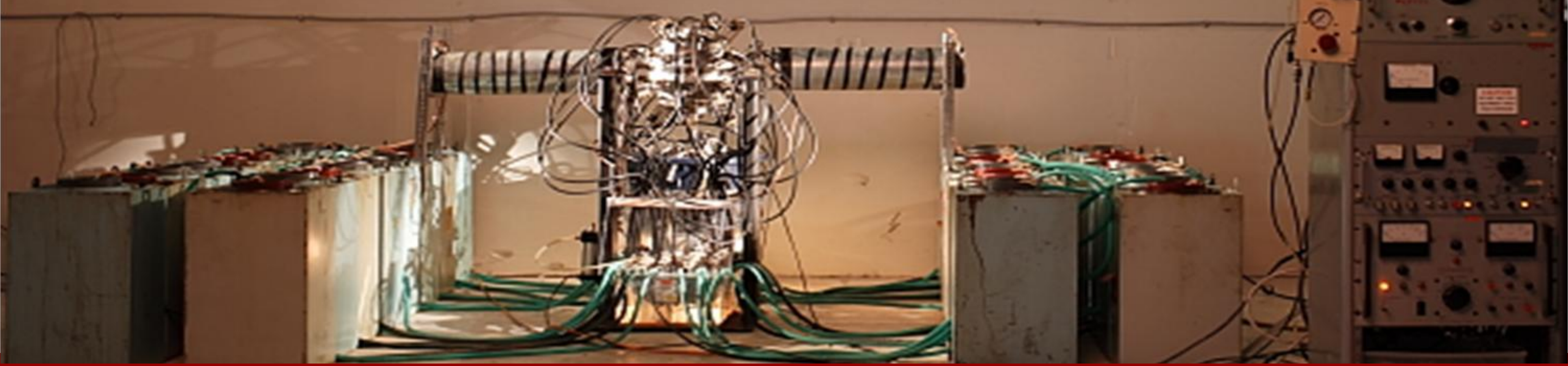


General Fusion



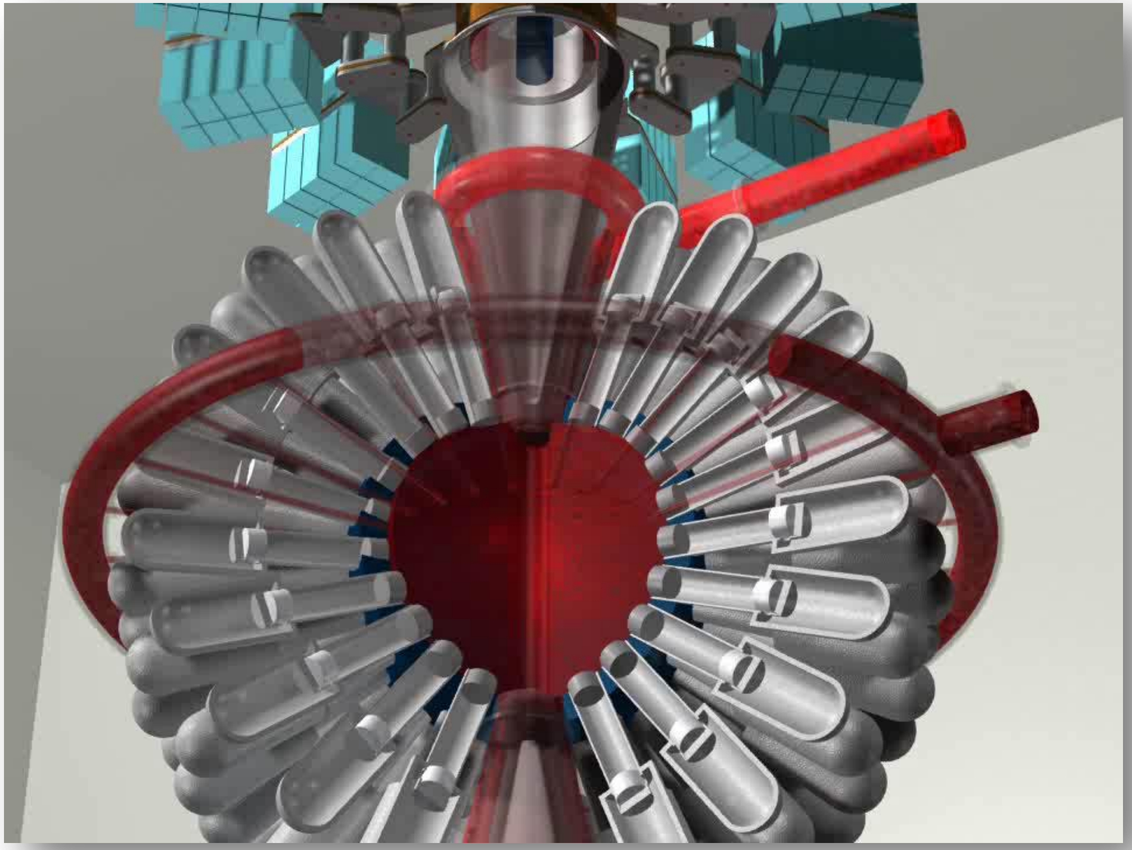


General Fusion

Making commercially viable fusion power a reality.

- Founded in 2002, based in Vancouver, Canada
- Plan to demonstrate a fusion system capable of “net gain” within 3 years
- Industrial and institutional partners including Los Alamos National Lab and the Canadian Government
- $32.5M in venture capital, $4.5M in government support

General Fusion's Acoustically Driven MTF



Commercialization Advantages

Fusion Challenge	General Fusion Solution
Neutron activation and embrittlement of structure	1.5 m of liquid lead lithium greatly lowers the neutron energy spectrum Low neutron load at the metal wall Low activation Low radiation damage
Tritium breeding	n,2n reaction in lead 4π coverage Thick blanket High tritium breeding ratio of 1.6
Heat extraction	Heat extraction by the working fluid Pb-Li
Tritium safety	Solubility of tritium in Pb-Li is low 100 MW plant size Low tritium inventory (2g)
System cost	Pneumatic energy storage >100X lower cost than capacitors
Cost of targets in pulsed systems - “kopeck” problem	Liquid metal compression No consumables

Development Plan

2009 PHASE IIa
Construct key components at full scale
Prove system can be built
Plasma compression tests

2012 PHASE IIb
Build net gain prototype

2014 PHASE IIc
Test prototype –
Net Power out

4 years

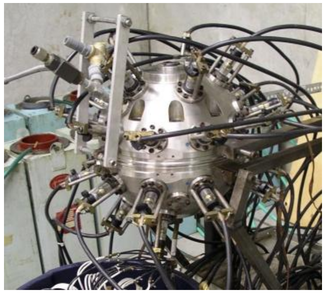
2.5 years
$30M

2 years
$35M

8 months
$15M

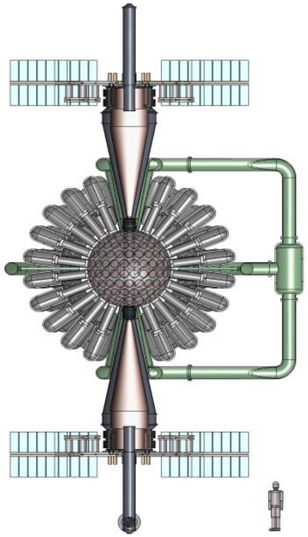
5 years

PHASE I
Proof of principle
Completed



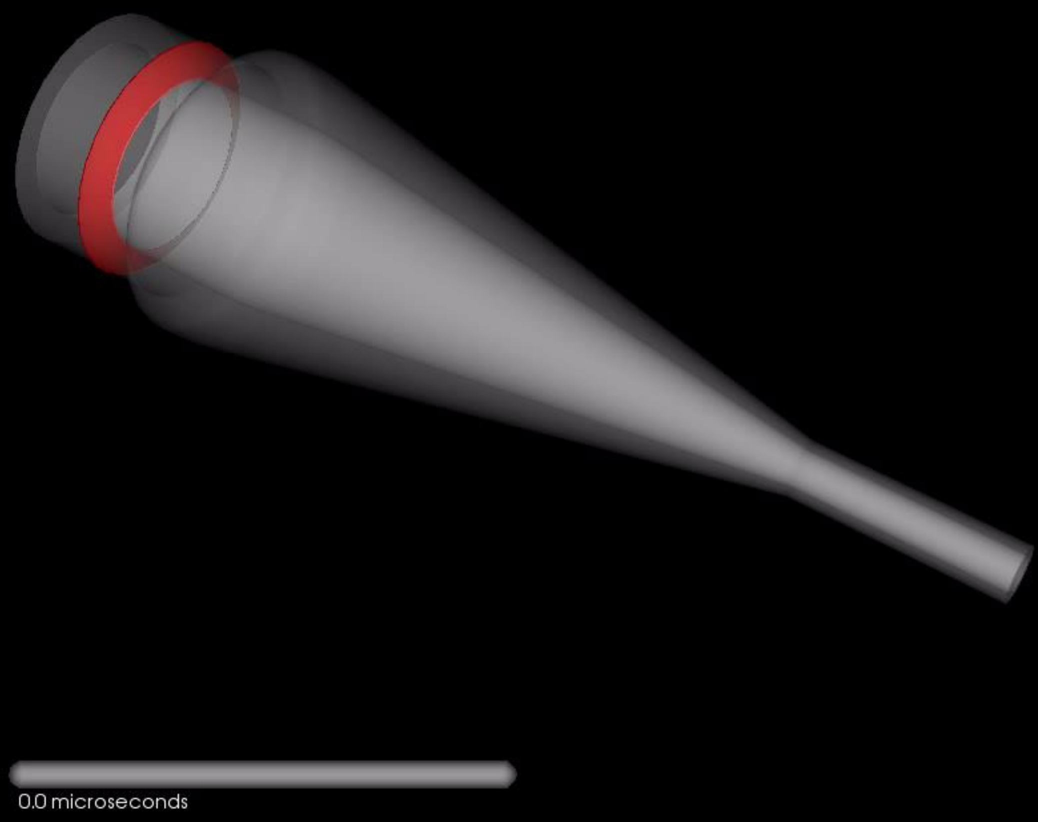
Progress to Date

PHASE II
Demonstration of Net Gain
2014

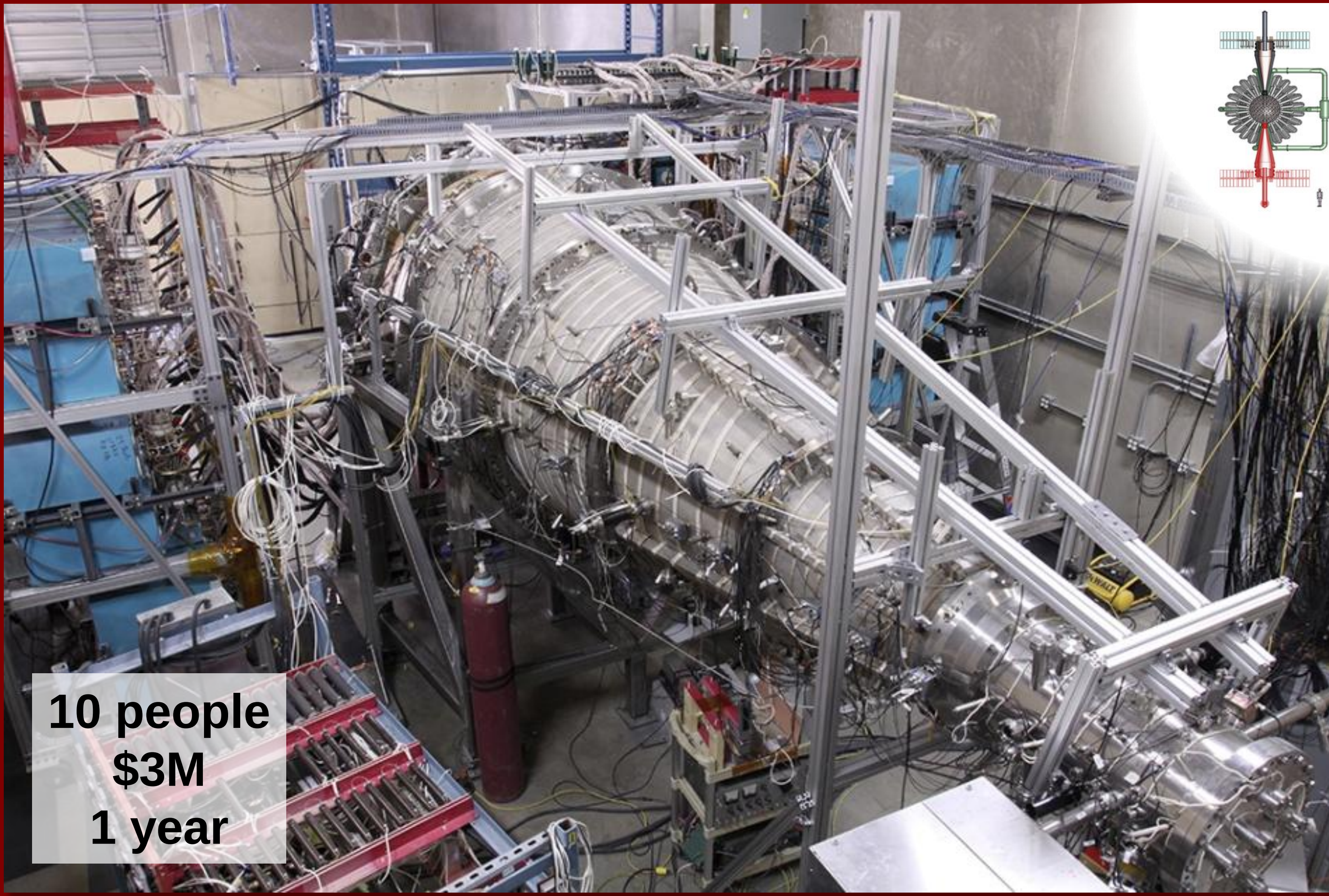


PHASE III
Electricity generation and commercialization
$1 billion+
2019

Plasma Injector Simulation

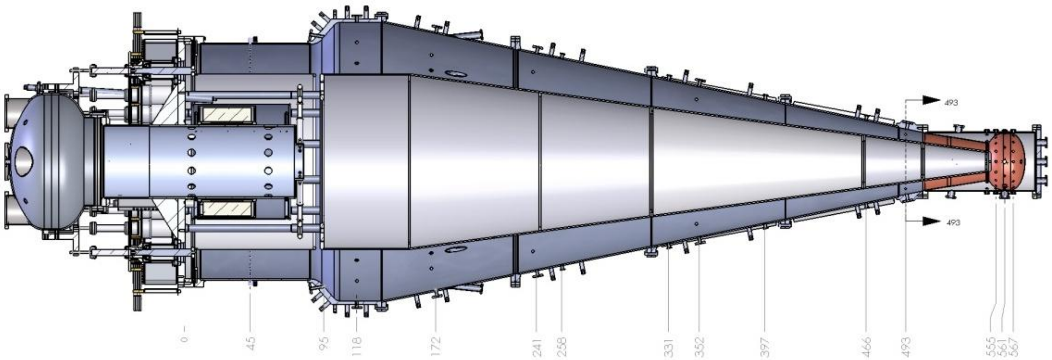


Plasma Injector

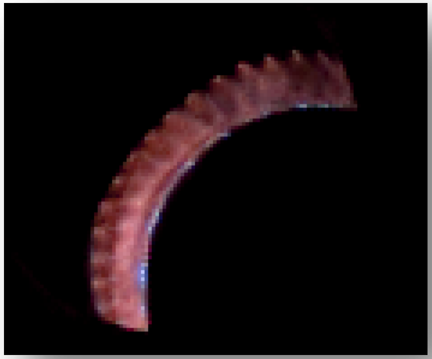


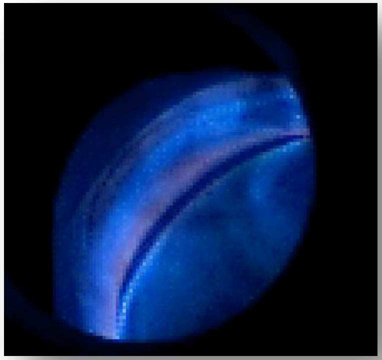
10 people
$3M
1 year

Plasma Injector Science



	Density (cm^{-3})	**Lifetime** (μs)	**Temperature** (eV)
Formation	**2x10^{14}**	**500**	**87**
Target	**2x10^{16}**	**80**	**300**





Power Supply

- 2.4 MJ pulse power supply (22 kV formation, 44 kV acceleration)
- programmable pulse shaping control
- 1 MW DC stuffing flux power supply

Diagnostics

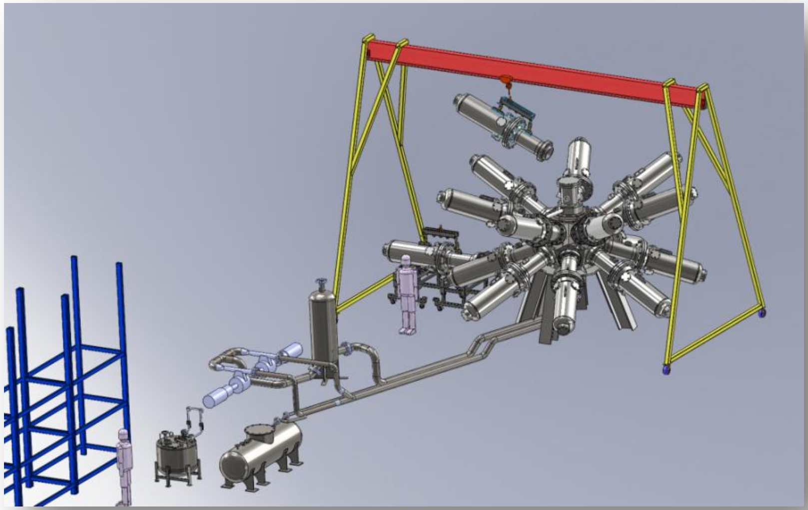
- Thomson scattering
- X-ray photo diodes
- triple Langmuir probe
- 5 interferometer chords
- >12 Rogowski coils
- >50 B-dot probes with in-situ integration
- high resolution time resolved spectroscopy
- 1 million frame/second video camera

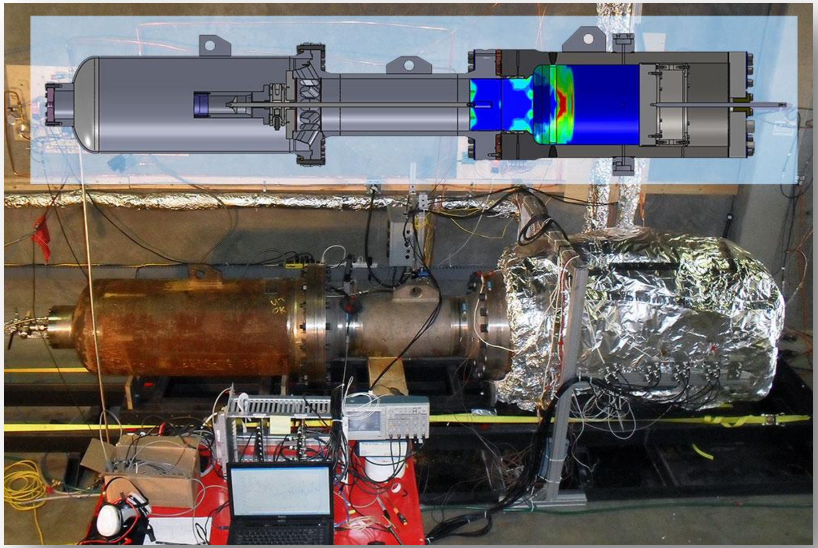
Acoustic Driver Development

- Full scale piston for servo development
- Servo control meeting requirements
- Material failures at higher velocities being addressed

Single Piston Requirements	Impact Velocity (m/s)	Impact Timing (µs)
Target	50	± 10
Achieved	40	± 4

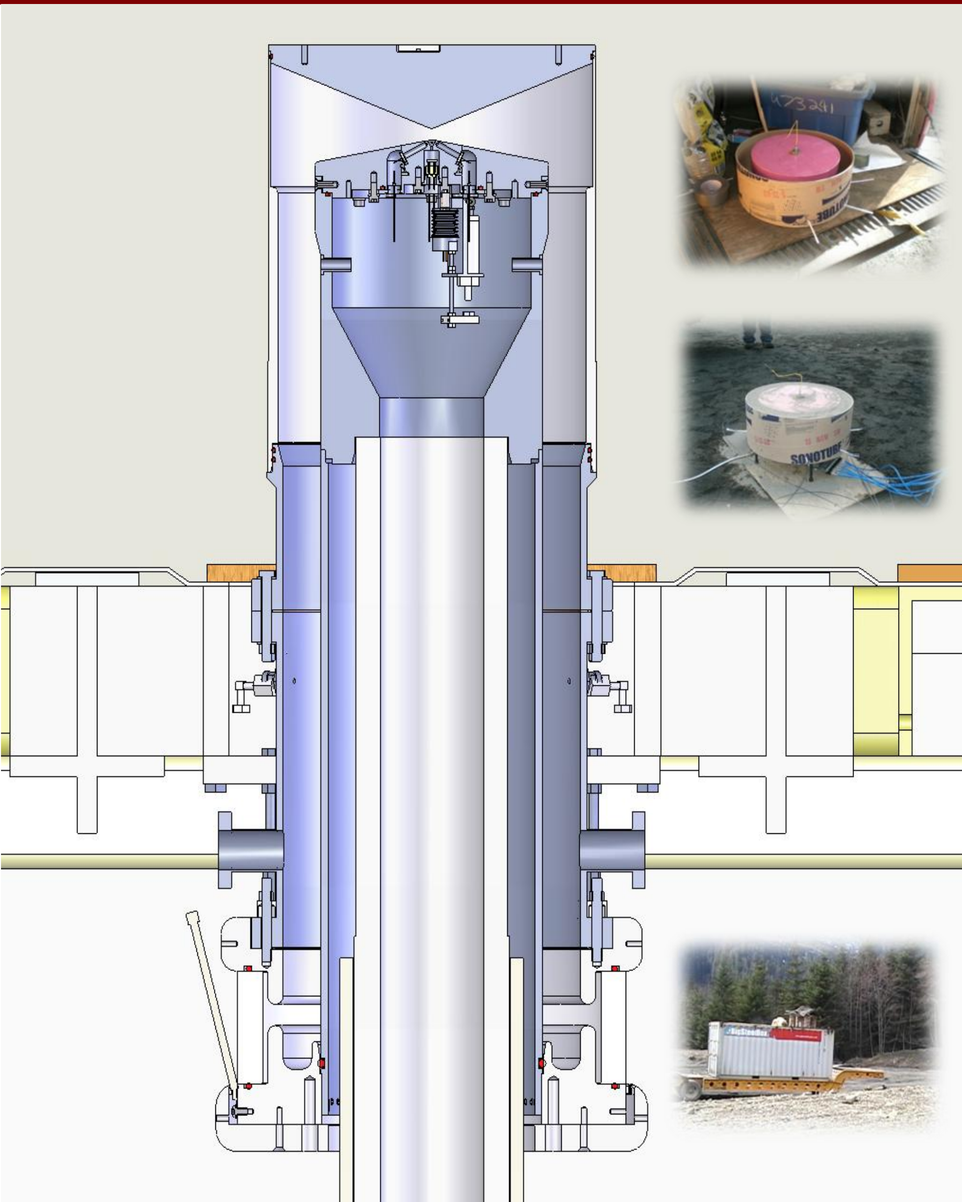
Acoustic Driver: Mini-Sphere

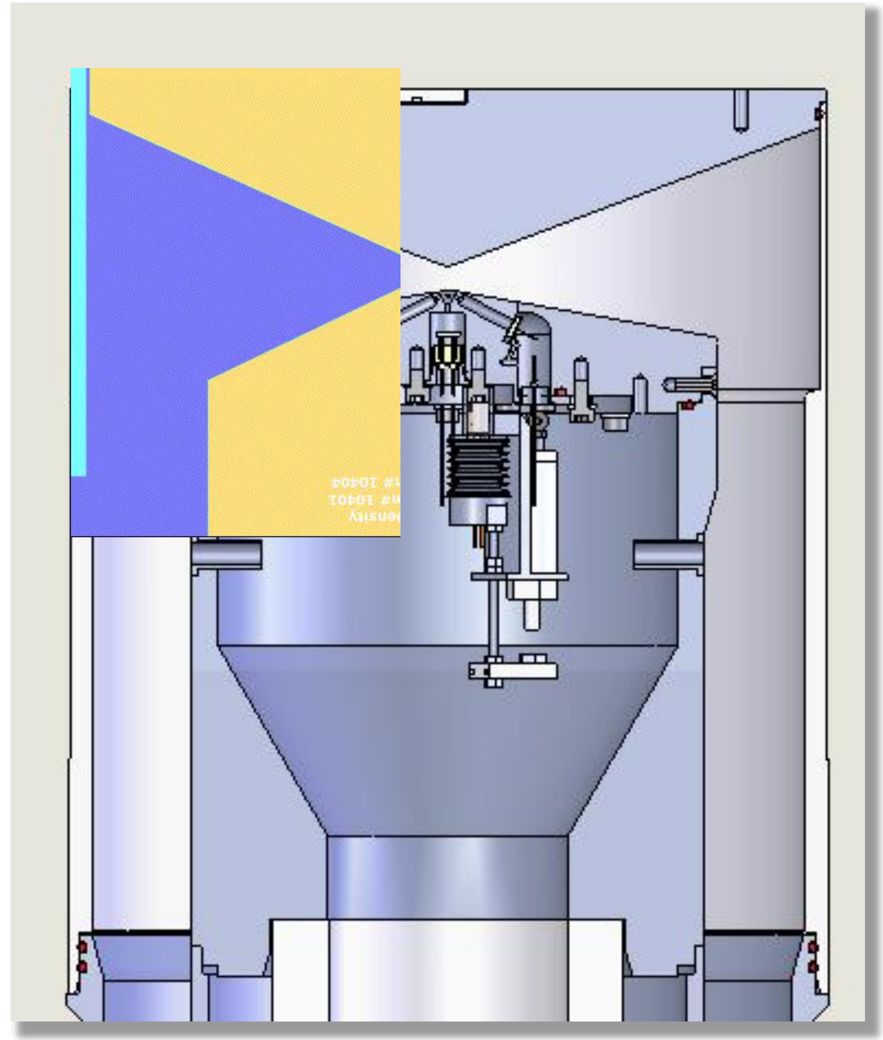




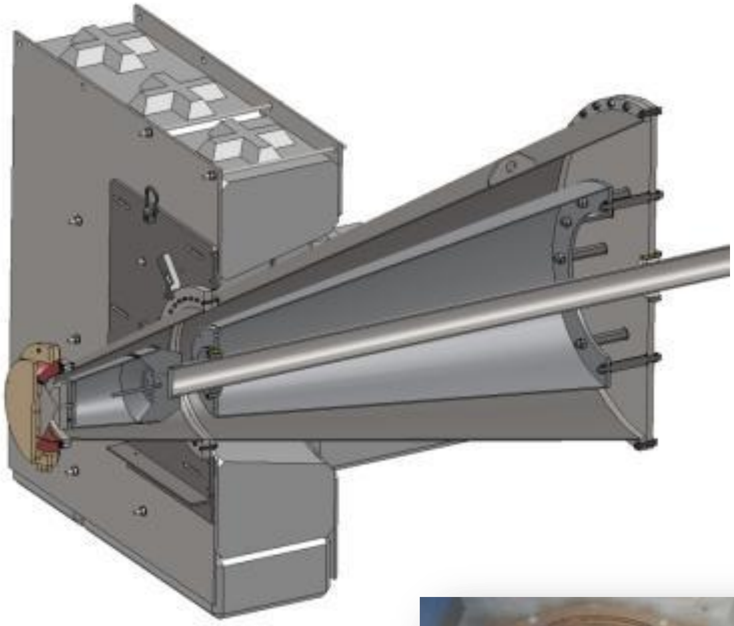
12 people
\$3.5M
14 months

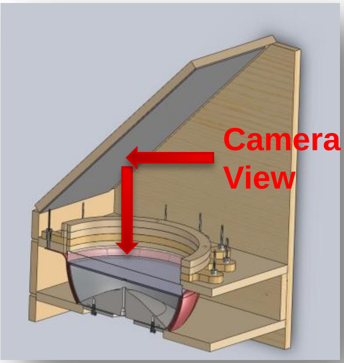
Plasma Compression Experiments





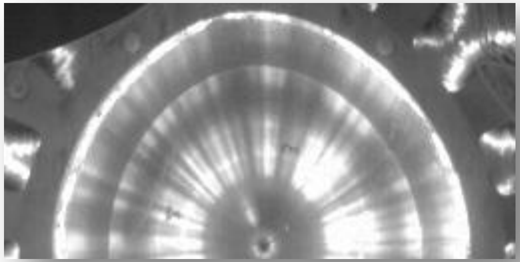
Plasma Compression Experiment Preparation





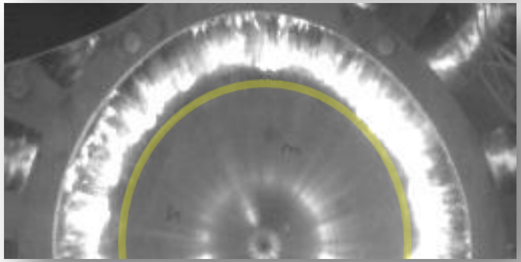
6.5 µs

Radial compression =0



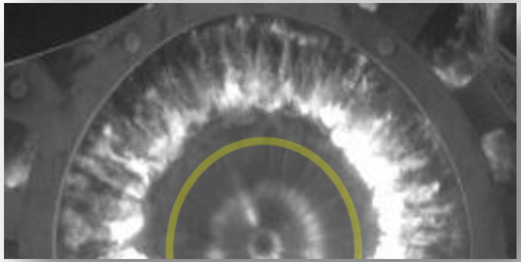
32.5 µs

Radial compression = 1.42
Velocity ~ 3200 m/s



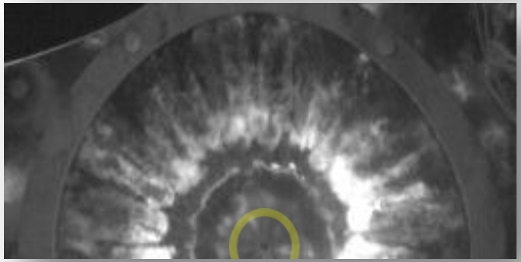
45.5 µs

Radial compression = 2.22

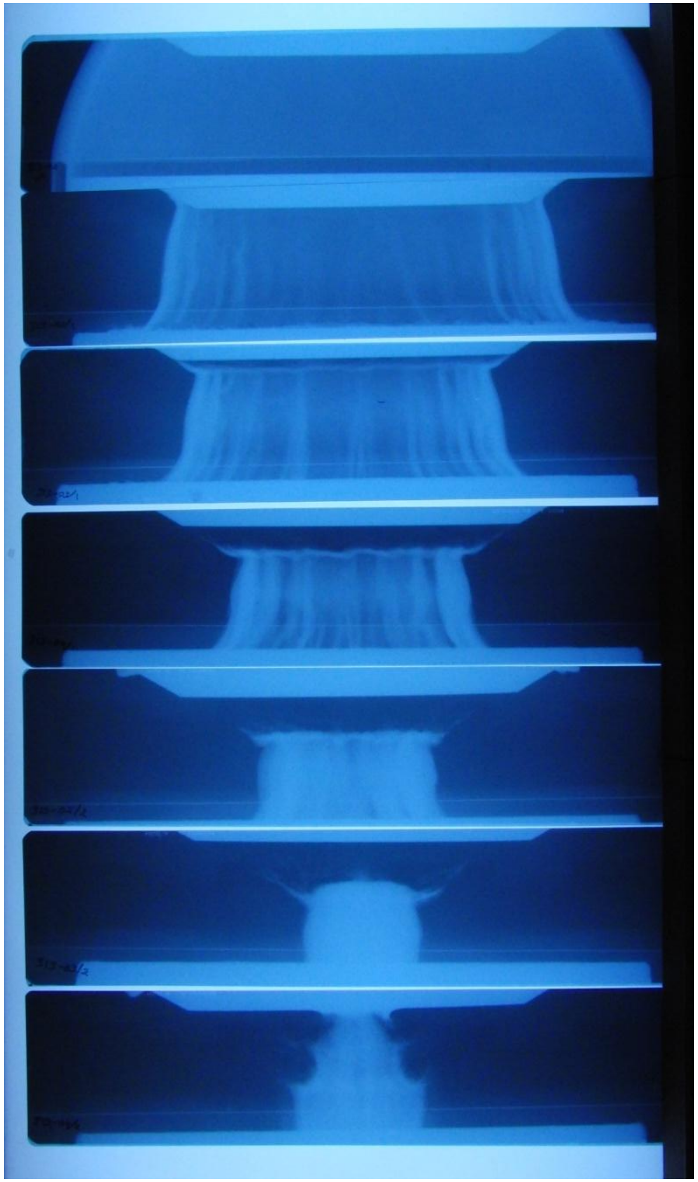


58.5 µs

Radial compression = 7.44
Velocity ~ 4500 m/s

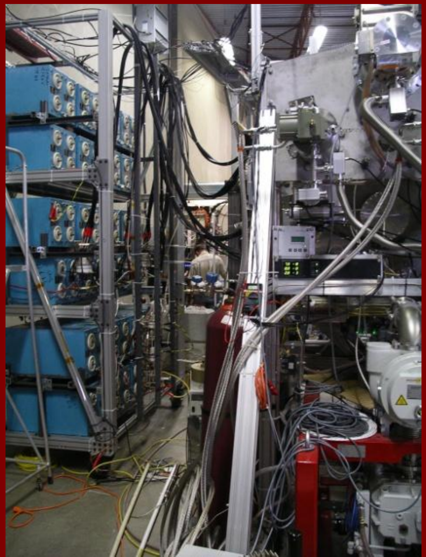


X-ray Imaging of Compression Chamber




June, 2009

Today
27,000 sq. ft.



Team

- 60 Employees, 5 more expected this year.
- 50 R&D staff
- 29 engineers, 12 PhDs
- Expertise in plasma physics, simulation, mechanical and electrical engineering, regulatory/nuclear safety, project management, prototyping, materials, business development, IP, and finance

Phase IIb, IIc - Net Gain Prototype

- Construct a full scale system, 2012-2015
- Objectives:
  - Address major fusion system integration risks
  - Demonstrate net gain in a full scale system configuration
- Control costs:
  - 1000 shot life
  - Repetitive operation optional
- Investment: $50M - $100M

MTF projects

- **LINUS NRL (10 ms)**
- **General Fusion spheromak (100 us)**
  - Heating of spheromaks by compression, 300eV temperatures
- **Los Alamos/AFRL FRX-L (10 us)**
  - MTF experiment using Shiva Star
- **OMEGA laser (1 ns)**
  - 30% neutron yield improvement via magnetized ICF implosion
- **Sandia Z-Pinch (100 ns)**
  - MagLIF research proposal

Private Fusion Efforts

- **General Fusion (32 M$)**
  - Thick Liquid Liner Magnetized Target Fusion
- **Tri Alpha Energy (120 M$)**
  - Fast ions stabilized colliding FRC
- **Helion**
  - Compressed Colliding FRC
- **Woodruff Scientific**
  - Compact toroid plasmas
- **Lawrenceville Plasma Physics (2M$)**
  - Dense Plasma Focus
- **MIFTI**
  - Staged Z-Pinch for Magneto Inertial Fusion
- **EMC^2 (~5M$)**
  - Polywell Inertial Electrostatic Confinement
- **Fusion Power Corporation**
  - Heavy Ion Fusion

THANK YOU

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