Fusion power can provide clean, safe baseload electricity for the world

- Fusing 112.5 tons of D (deuterium) and T (tritium) would provide 1 year of total US electrical power; equal to:
  - 1.35 BILLION tons of coal
  - 450 tons U²³⁵
- Fusion fuel (deuterium) is abundant
- Produces no long-lived radioactive wastes
- Minimal nuclear-proliferation concerns

In its simplest form, a thermonuclear plasma (whether repetitively pulsed or steady-state) generates copious amounts of heat to generate electricity:

- High implosion velocity overcomes target stability/lifetime challenges
- Plasma liner formed by plasma jets: eliminates repetitive hardware destruction → economical reactor designs
- High shot rate and good diagnostic access → rapid, cost-effective R&D
- Multiple magnetized-target formation methods
- Potential compatibility with liquid wall or presently available plasma-facing materials (avoids multi-$B₀$ material development effort)
- Plasma guns are low cost with many possible near-term spinoff applications

Potential electricity marketplace is HUGE (2.7 TW worldwide in 2015; 4.5 TW by 2040)

Faster, cheaper development paths needed for fusion to impact carbon-free electricity generation by midcentury

Mainstream fusion approaches cost many billions of dollars per R&D facility, and, if successful, will take 30+ years at present rate of progress to obtain a prototype fusion reactor.

ITER, first plasma ~2020; ~$20B (final cost unknown)

NIF, Livermore, CA; in operation; ~$3.6B.

There is a low-cost “sweet spot” in fusion parameter space in between ITER and NIF, i.e., magneto-inertial fusion (MIF), that offers the potential to accelerate and transform fusion-energy research, as recognized by ARPA-E and multiple private fusion companies:

Our ARPA-E project, the Plasma Liner Experiment-ALPHA (PLX-α), will demonstrate spherically imploding plasma liners as a transformational fusion driver

To form a plasma liner, supersonic plasma jets traveling at 50–100 km/s are created and accelerated by innovative, low-cost plasma guns that are developed and built by HyperV Technologies Corp. (with earlier support from DOE's Office of Fusion Energy Sciences):

The plasma jets merge to form a spherically imploding plasma liner (up to 60 jets in our ARPA-E project, hundreds of jets in a fusion reactor) that will compress a magnetized target plasma to fusion conditions:

Our fusion approach, PJMIF, is a reactor-friendly embodiment of MIF

PJMIF: a plasma liner implodes magnetized plasma fuel to fusion conditions

- High implosion velocity overcomes target stability/lifetime challenges
- Plasma liner formed by plasma jets: eliminates repetitive hardware destruction → economical reactor designs
- High shot rate and good diagnostic access → rapid, cost-effective R&D
- Multiple magnetized-target formation methods
- Potential compatibility with liquid wall or presently available plasma-facing materials (avoids multi-$B₀$ material development effort)
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PLX-α project objectives:
- Position PJMIF for private investment
- Remove initial scientific and technical risks of proposed 9-year, ~$400M PJMIF-development plan to achieve energy breakeven (plan details available upon request)
- Advance engineering performance/capabilities of our plasma guns
- Demonstrate formation of a spherically imploding plasma liner for the very first time
- Establish viability and scalability of plasma liners as an innovative fusion driver
- Validate a suite of computer codes for designing scaled-up PJMIF experiments

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