

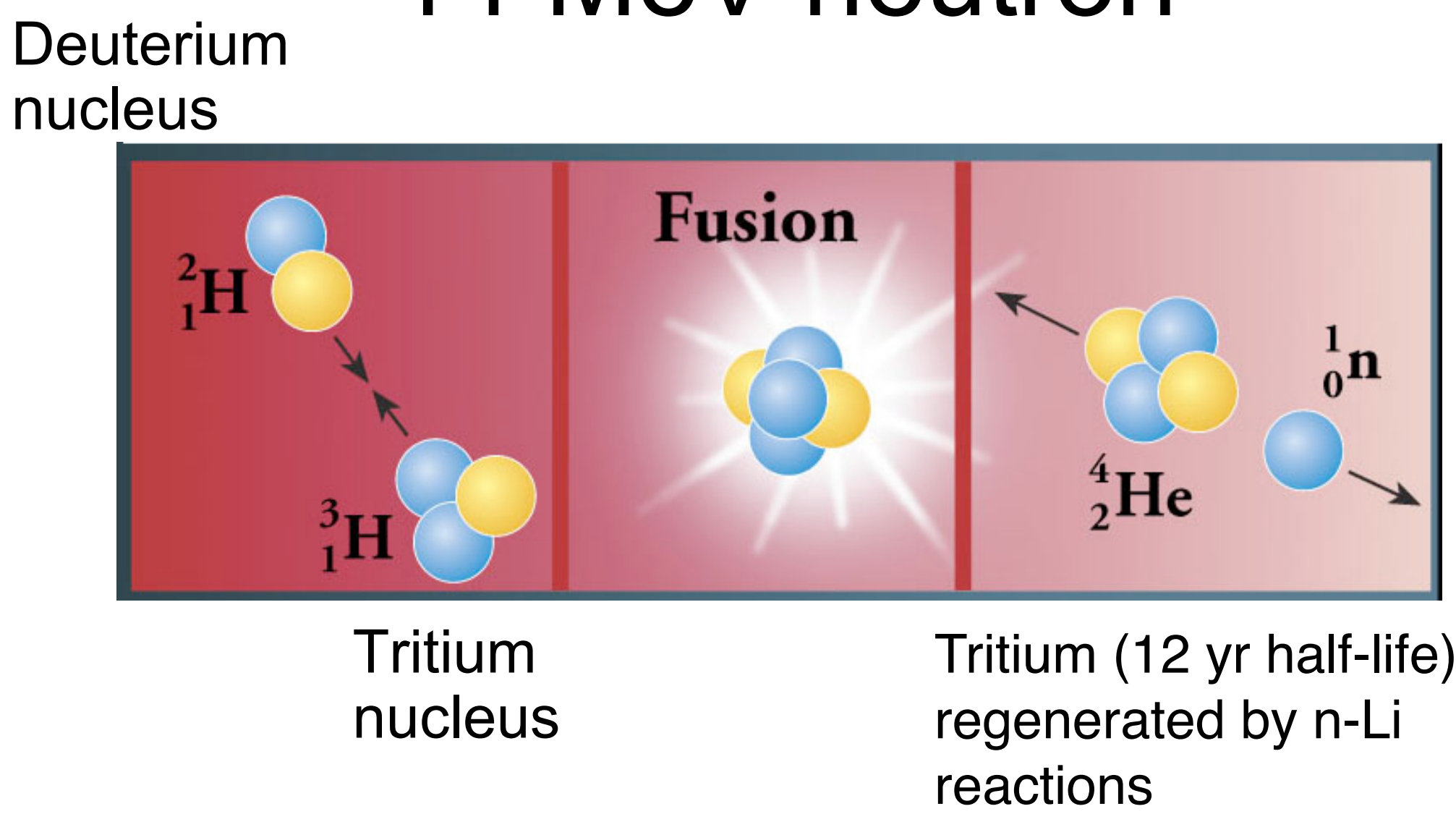
Radio Frequency Accelerator Driven Heavy Ion Fusion

... the proper way to do fusion!

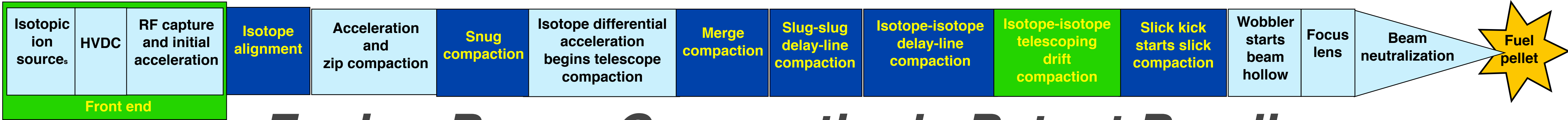
Accelerator Design Rules Applied to HIF

- Particle energy is straightforward
- Space charge effects set beam current limits
- Liouville Theorem governs beam brightness after the ion sources
- Telescoping beams (of multiple isotopic species) increase available phase space
- Maintaining phase space of μ bunches from linac maximizes intensity at target

The practical problem is the 14 MeV neutron



Clean & Green ... and very Safe!



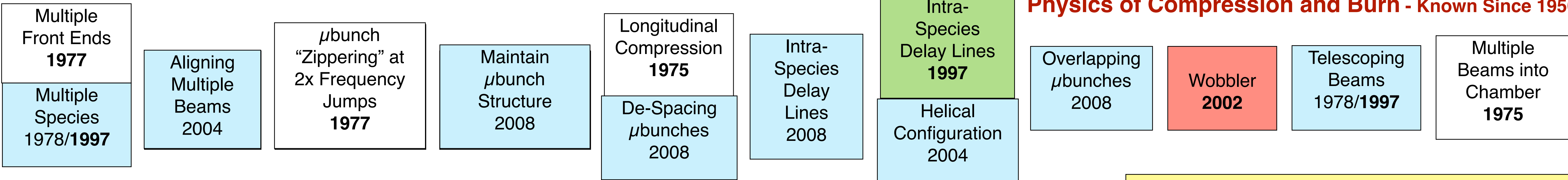
Fusion Power Corporation's Patent Pending ...

'Single-Pass Heavy Ion Fusion Driver System and Method'

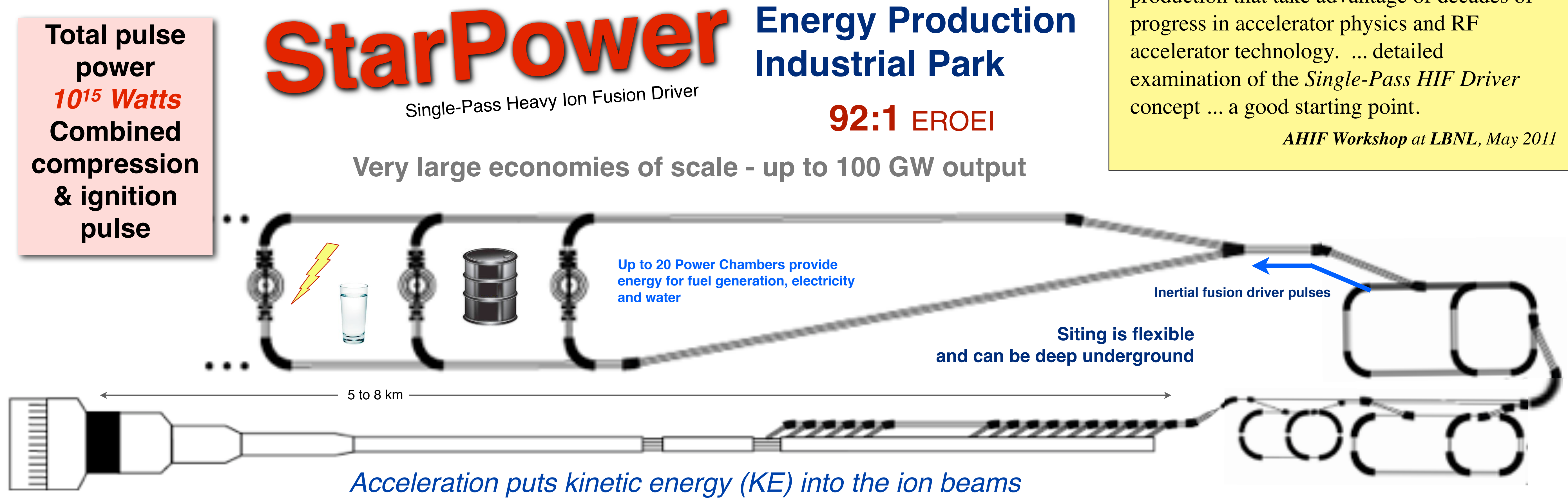
Three Decades of Experiments with ICF Implementation Efforts

Essence of all ICF drivers is energy compression in time and space

- Function and **date** added to international toolkit (conceived/accepted, where different)
- Historical features (white), German (green), FPC (blue), Russian (red)
- Some historical storage ring functions not shown because no analogue in FPC driver.
- Contemporaneous HIF accelerator developments for other than compaction not shown.



FPC's Patent Pending Innovative and Novel Beam Manipulations Compact Ion Beams in Time and Space



2011 Endorsement - RF Accelerator WORKGROUP SUMMARY - #1. Now is the time for developing detailed conceptual designs for economical energy production that take advantage of decades of progress in accelerator physics and RF accelerator technology. ... detailed examination of the *Single-Pass HIF Driver* concept ... a good starting point.

AHIF Workshop at LBNL, May 2011

HIF System Delivers Large Economic Value Energy Equivalent of a Giant Oil Field ... Anywhere You Need It Driver System Can Be Implemented TODAY!

“... heavy ion accelerators are regarded as the best bet for drivers.”

Burton Richter
Nobel Laureate, Stanford
1994

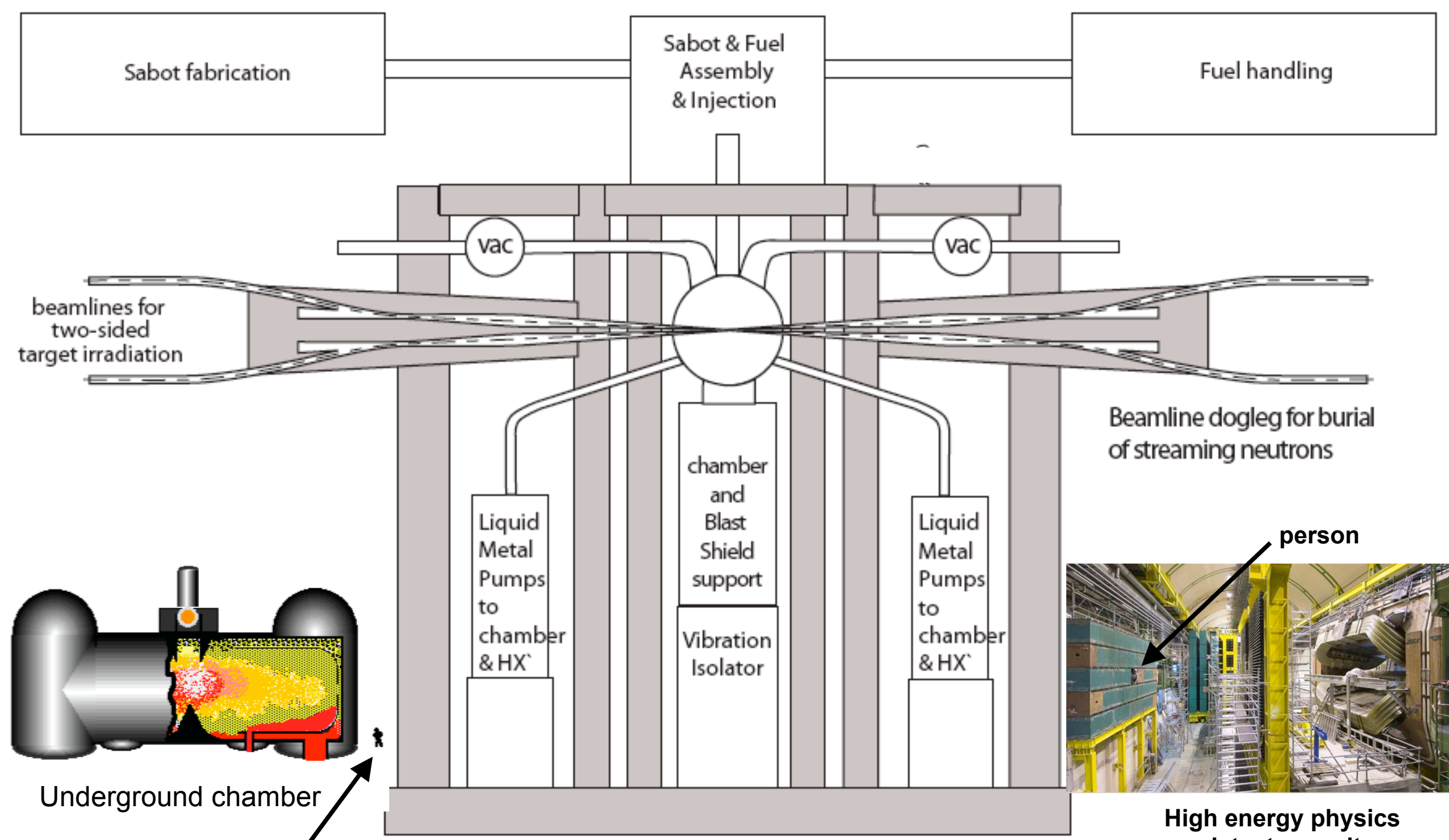
HIF 35 Years of Endorsements from the Science Community

RF Accelerators Meet the Need

- Beams focus to small spots
- Energy in beam pulse many times internationally recognized ignition requirement
- Ion energy couples efficiently in target
- Chamber interface focus magnet is shielded
- Modest chamber vacuum adequate for beam propagation
- Rep rated, efficient, durable

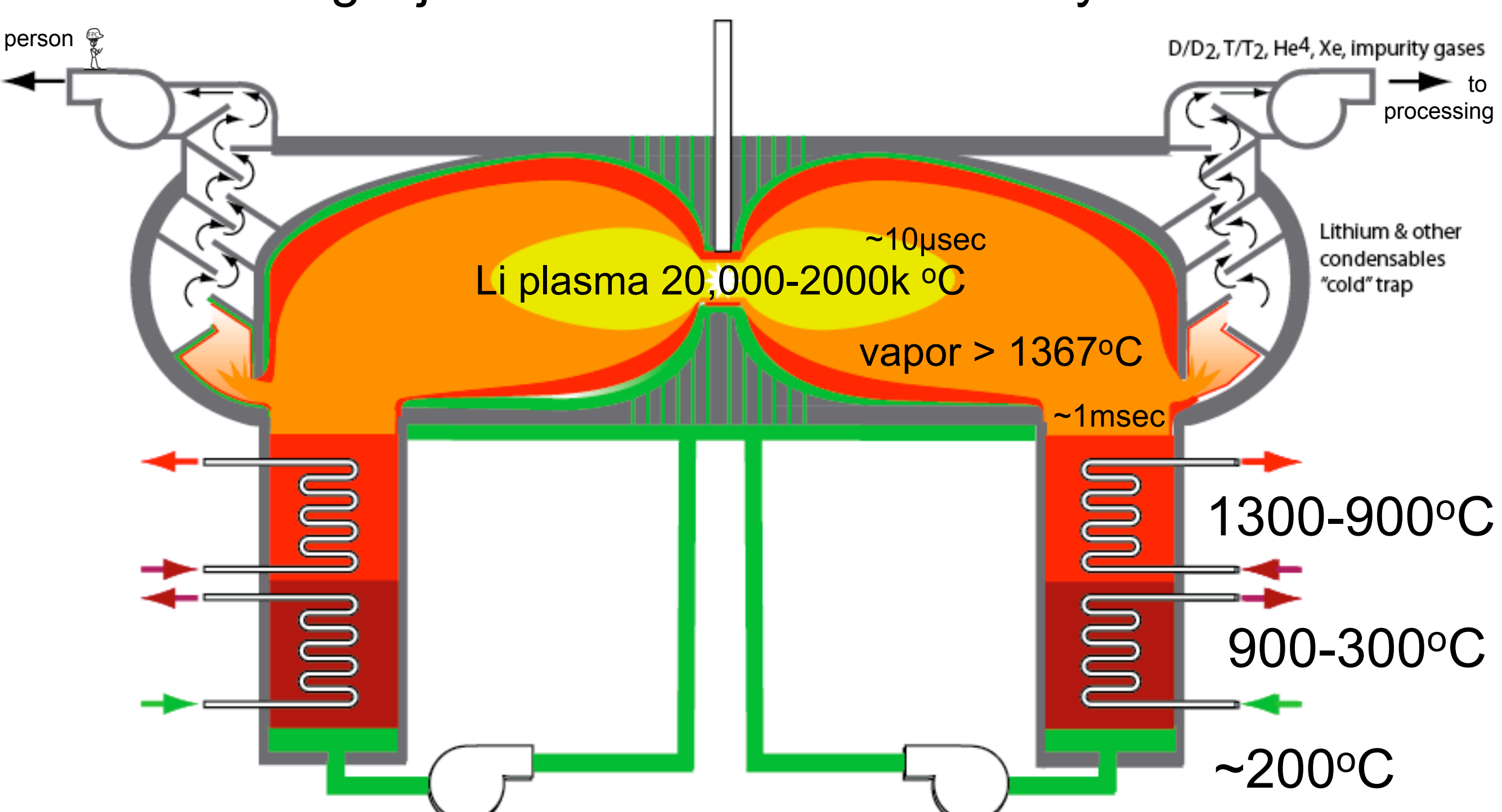
Chamber Vault

Most important function is control of the neutrons



Chamber Functions: Handling Energy

- Conducting high temperature heat to exchangers
- Maintaining low wall temperature
- Evacuating gases
- Starting injection of next fuel assembly



The Excitement of HIF

Heavy-ion fusion in the US 8 October 2010 Physics Today
I was the director of the Office of Laser Fusion at the Energy Research and Development Administration (ERDA) in 1976, as mentioned by Robert Burke in his letter (PHYSICS TODAY, June 2010, page 59). The participants in the first workshop on what became known as heavy-ion fusion (HIF) were an exceptional group from the fusion and accelerator communities.

Their conclusions warranted high confidence. Accordingly, I stated in my remarks at the close of the meeting that the heavy-ion approach to inertial fusion faced “no showstoppers.” From that time on, I have believed that HIF is the approach to take for fusion energy.

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1979 “...heavy ion accelerators have great promise as reactor candidates because of their inherently high efficiency, developed repetitive-pulse technology, and favorable theoretical predictions of target coupling.”

Foster Committee Report to the Energy Research Advisory Board at its May 3, 1979, meeting.

John Foster was LLNL Director in 1960s, later DoD Director of DDR&E

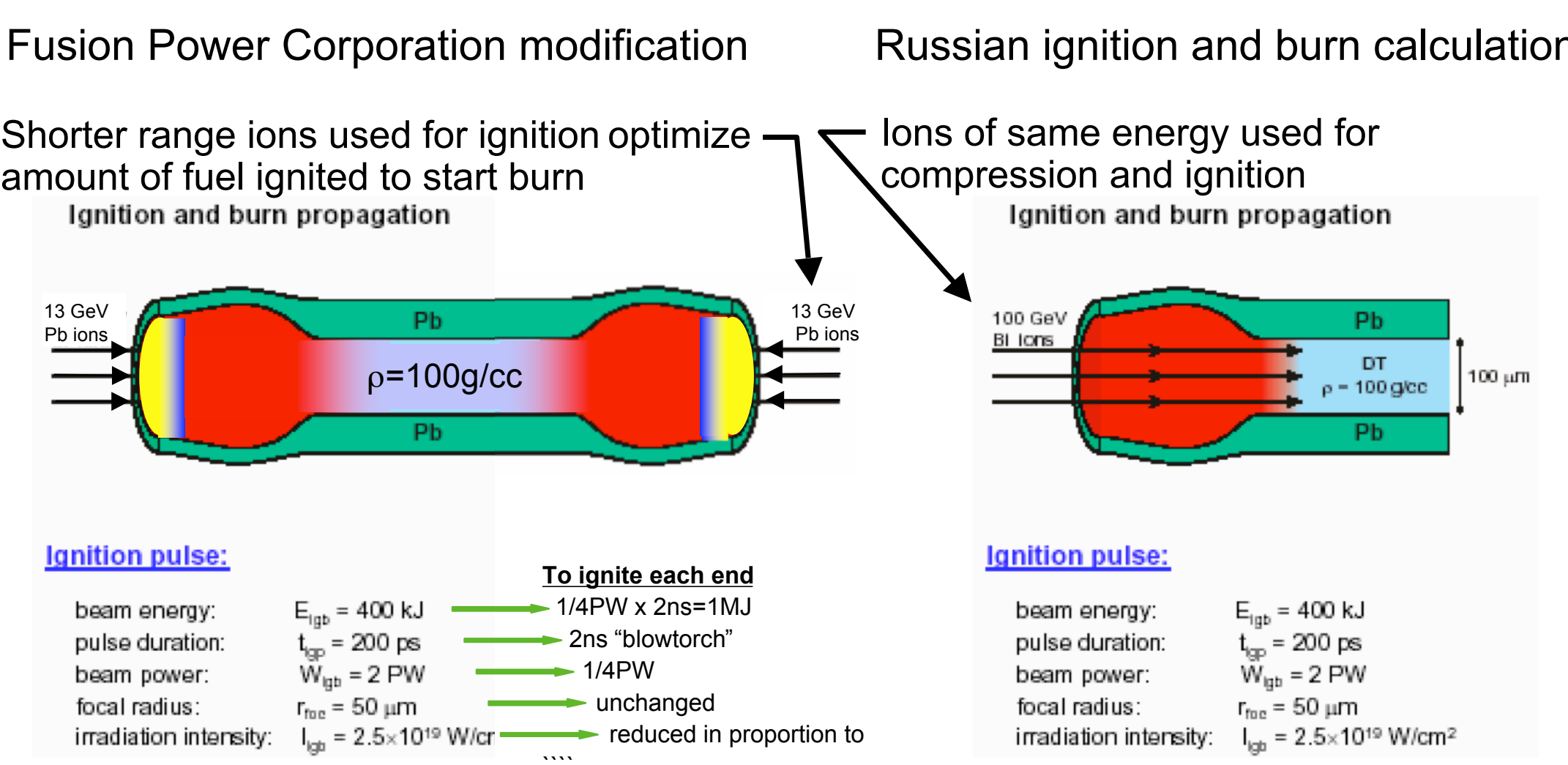
Mankind has already produced fusion energy

... since 1952 ...

the challenge has been the development of a driver to replace the fission trigger

FPC's Patent Pending Modifications Reduce Power Needed for Fast Ignition

Beam power is much harder to get than beam energy.



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