Soft Fusion Energy Path: Isotope Production in Energy Sub-critical/Economy Hypercritical D+D Colliding-Beam Mini Fusion Reactor ‘Exyder’ TIM HESTER, BOGDAN MAGLICH, California Science & Engineering Corporation (CALSEC), CALSEC COLLABORATION — Bethe\(^1\) and Sakharov\(^2\) argued for soft fusion energy path via isotope production, substantiated by Manheimer\(^3\). - Copious T and \(^3\)He production\(^4,5\) from D(d, p) T and D(d, n) \(^3\)He reactions in 725 KeV D+D colliding beams was measured in weak-focusing Self-Collider\(^6,7\) radius 0.15 m, in B = 3.12 T, non-linearly stabilized by electron cloud oscillations\(^8\) to confinement time = 24 s. Simulations\(^6\) predict that by switching to strong focusing\(^9\), 10 deuterons 0.75 MeV each, generate 1 \(^3\)He +1T +1p + 1n at total input energy cost 10.72 MeV. Economic value of T and \(^3\)He is 65 and 120 MeV/atom, respectively. We obtain economic gain 205MeV/10.72 MeV $\sim$ 2,000\% i.e. \(^3\)He production funds cost of T. If first wall is made of Thorium n’s will breed \(^{233}\)U releasing 200 MeV/fission, at neutron cost 5.36 MeV \textit{versus} 160 MeV in beam on target, resulting in no cost \(^3\)He production, valued $75K/g. 1. Physics Today, May 1979, p.44; 2. Memoirs, Vintage Books, (1992); 3. Phys. Today, May 2012 p. 12; 4. Phys. Rev. Lett. \textbf{54}, 796 (1985); 5. Bull. APS, \textbf{57}, No. 3 (2012); 6. Part. Acc.1, (1970); 7. ANEUTRONIC FUSION NIM \textbf{A 271} 1-167 (1988); 8. Phys. Rev. Lett. \textbf{70}, 1818 (1993); 9. Part. Acc. \textbf{34}, 13 (1990).