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## High energy recycling $e^+e^-$ colliders

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Future electron-positron colliders face unprecedented challenges to deliver the high luminosities and high energies beams, required to study the constituents of matter and to address today's questions about our Universe. The power consumption of such facilities has steadily increased and necessitates advances in accelerator science and technology to allow research in a sustainable manner while providing the high luminosities and energies required for physics studies.

The high-energy, high-luminosity electron-positron collider designs using Energy Recovery Linacs (ERL) proposes to recycle the energy and beam particles, reducing the power consumption. ERL-based colliders reach higher center of mass energy than conventional circular designs and delivers a factor of four higher luminosity compared to present linear collider designs. It will advance the development of high energy, high luminosity accelerators for particle physics research, and will provide an alternative option, if proven feasible the best option, for future electron-positron collider designs.

The research, led by Stony Brook University, leverages R&D performed for the Electron Ion Collider and will require additional R&D to prove its feasibility. The authors request P5 to support accelerator R&D performed at universities in collaboration with national laboratories for sustainable research.

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