Enhancing energy harvesting by coupling monostable oscillators

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The performance of a ring of linearly coupled, monostable nonlinear oscillators is optimized towards its goal of acting as energy harvester—through piezoelectric transduction—of mesoscopic fluctuations, which are modeled as Ornstein–Uhlenbeck noises. For a single oscillator, the maximum output voltage and overall efficiency are attained for a soft piecewise-linear potential (providing a weak attractive constant force) but they are still fairly large for a harmonic potential. When several harmonic springs are linearly and bidirectionally coupled to form a ring, it is found that counter-phase coupling can largely improve the performance while in-phase coupling worsens it. Moreover, it turns out that few (two or three) coupled units perform better than more.