Correlations enable lossless ergotropy transport

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"A battery powers a device" can be read as "work stored in the battery is being transported to the device." In quantum batteries, the total amount of stored work can be measured by ergotropy, which is the maximal work extractable by unitary operations. Transporting ergotropy is fundamentally different from transporting energy, and here we find that ergotropy can be *gained* even when the transmission channel is strictly energy conserving. We show that, generically, ergotropy transport is lossy whenever the two systems start uncorrelated. In contrast, for a large class of correlated initial states, transport can be gainful—the device receives more ergotropy than the battery sends. Furthermore, a single correlated state can be used multiple times, allowing us to transport without losses an order of magnitude more ergotropy than the battery capacity. This phenomenon is especially significant when the battery and device are large many-body systems. Correlations are thus a useful resource for ergotropy transport, and we quantify how this resource is consumed during gainful transport.