

Energy Analysis of End-of-life Options for Personal Computers: Resell, Upgrade, Recycle

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Abstract

Governments, firms, and civil society are increasingly taking action to manage the end-of-life of computers. While appropriate treatment of the waste stream via recycling and other technologies is required, it is also important to address the flow upstream through reduction of final demand via improved utilization. This article evaluates end-of-life options for computers via quantitative assessment of life cycle energy use in three cases: reselling to secondary markets, upgrading of key components, and recycling to recover materials. Results indicate that reselling or upgrading 10% of end-of-life computers reduces life cycle energy use by 8.6% and 5.2% respectively. In contrast, recycling 10% of computers only saves .43% of life cycle energy, suggesting that reselling and upgrading are far more effective from an environmental standpoint. The origin of this dramatic difference between reuse and recycling lies in the fact that much of the energy investment in the life cycle of a computer is in producing its complex form rather than its physical substance. Thus, the environmental payback of recycling materials is poor compared to many goods. This strongly suggests that management strategies for waste electronics should emphasize extension of lifespan.

Keywords

computers, resell, secondary markets, upgrade, recycling, energy, environment

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