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Using a Clean Energy Version of Moore's Law to Plan for the Extreme Efficiency of the Future

ROBERT VAN BUSKIRK, Lawrence Berkeley National Laboratory

In 1965, Gordon Moore predicted a decade of exponential growth in the transistor density growth (and hence computing power) for integrated circuits that—with some modification—has held to the present day. In this talk, we discuss to what extent clean energy technologies are subject to similar laws of long term exponential improvement and how these improvement rates may be accelerating due to recent developments. We review a range of long term energy efficiency and technology productivity improvement trends ranging from lighting, televisions, refrigerators, HVAC, batteries, motors, power electronics and solar PV. After reviewing historical and recent trends, we discuss several factors that may lead to an acceleration of improvement rates in the clean energy technology sector. Finally, we discuss the Baumol effect which predicts how differential trends in technology productivity may affect trends in relative prices in the economy. We conclude with a discussion of some of the implications that Baumol's theories may have for the development of extreme levels of energy efficiency in the coming decades.