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High Efficiency Photovoltaics – The Key to Grid Parity

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For three decades the photovoltaic (PV) industry has enjoyed roughly a 22% price reduction for each doubling of cumulative production volume. Recently, the PV market has exceeded this trend with module prices dropping to all-time lows. This trend has come mainly from economies-of-scale, incremental efficiency increases, and over supply. However, this PV learning curve is likely to flatten (or even rise) as unsustainable profit margins weed competition and devices near minimal material usage and practical efficiencies. The current market climate, and the strong weighting factor of balance-of-system costs, favor higher efficiency devices. Technologies that cannot reach a minimum module efficiency of about 18% will likely not be competitive. This paper will discuss several evolutionary and revolutionary scalable wafer and thin-film photovoltaic technologies that are likely to remain competitive, and will identify several areas within these technologies in need of scientific breakthroughs.