Sustainability and the Use of Non Renewable Resource, Australia as an Example

ALBERT A. BARTLETT, University of Colorado at Boulder — A government minister in Australia writes that Australian coal will last “110 years at present rates of production.” (1) But production is growing 5% per year, so the life expectancy will be less than 110 y. Assume production follows a Gaussian Hubbert curve. We can construct a family of curves for the future path of \( P(t) \) vs. \( t \), each of which is consistent with the 110 y. This envelope of this family of curves divides the graph of \( P(t) \) vs. \( t \) into allowed and forbidden areas. The curve with the current value of \( \frac{dP}{dt} \) is then the most probable future path of \( P(t) \). The curve reaches a maximum and then rapidly declines to zero. Australia’s growing population and these Hubbert curves combine to indicate frightening non-sustainability. Sustainability requires a curve of \( P(t) \) that declines exponentially with \( k = \frac{1}{110} \) per y.(2)

(1) Ian Macfarlane, World Energy, V.8, 112-117, 2005
(2) A.A. Bartlett, Am.J.Phys., V.54, 398-402, 1986