Table 2

Land Required to Produce one Exajoule of Energy per year (EJ yr^{-1})[a] by Type of Energy

1. Fossil Fuels (Base Case)	Three 150,000 barrel a day oil refineries operating 365 days a year.
2. Hydroelectricity	All U.S. hydroelectricity capacity installed in 1988 = 2.1 EJ: delivered electricity to point of use = 0.9 EJ year[b] Only 0.5 EJ remain to be developed Canada: Completed James Bay ~19,300 sq. Km per EJ installed; ~.5 EJ delivered[c]
3. Biomass	Short rotation tree crops, 19,000 to 46,000 square Kilometers
4. Methanol	50,000 to 120,000 square Kilometers of short rotation trees
5. Ethanol	32,000 square Kilometers of arable land suitable to sugar cane[d]
6. Wind	846 square Kilometers housing 268 thousand wind turbines of 500 kW capacity; three per hectare, centered in 12 great plains and western states
7. Solar (at 15% solar cell efficiency)	a) Tucson, Arizona: photovoltaic cells requiring 2820 sq. Km of land b) Seattle/Duluth: photovoltaic cells requiring 8,870 square Kilometers of land
8. Solar-Hydrogen	In addition to land for photovoltaic cells, 57.4 million gallons of water per day are needed, or enough to supply a city of 500,000 people

[a] U.S. consumed 80.8 Quads or 85 EJ in 1988. U.S. Department of Energy, National Energy Strategy, Interim Report, April 1990. It consumed approximately 95 EJ in 1998.

[b] At 0.40 actual capacity factor

[c] At an estimate capacity factor of 0.5 to 0.6

[d] Total U.S. cropland is approximately 1.56 million sq. kilometers

Source: H. Douglas Lightfoot and C. Green (1992) The Dominance of Fossil Fuels: Technical and Resource Limitations to Alternative Energy Sources. McGill University, Center for Climate and Global Change Research (C^2GCR). Working Paper 92-6, May. (mimeo). Also see Lightfoot and Green (1998).