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### ***“How Shall We Choose? Making Useful Comparisons Between Petroleum Alternatives”***

The world is beginning a long, and certainly painful, transition between the fossil energy sources, particularly petroleum, that have powered our economic growth over the last couple of centuries, and whatever energy carriers will come next. If we are to make sound choices between our petroleum alternatives, we will need to agree on metrics to guide our choices and then make sure we implement those metrics on a fair, consistent basis. Biofuels are becoming a test case for the metrics we will use to choose between petroleum alternatives and how we will employ those metrics to make good choices. So far, we are not making very rational, fair comparisons.

Key metrics for choosing between petroleum alternatives should include at a minimum: potential scale, likely environmental impacts (including greenhouse gases), ultimate cost and energy return on investment (EROI). The EROI metric is particularly important and therefore, it is particularly important to implement it correctly. This presentation evaluates these metrics for several petroleum alternatives, including different biofuels. Cellulosic biofuels show great promise when evaluated using these criteria.

Given the perceived land use issues and potential conflict with food production that accompany all discussions of biofuels, the analysis is broadened to determine how cellulosic biofuels might be gracefully integrated with existing agricultural systems to provide large net benefits. The results are frankly startling. If we redesign a relatively small fraction of our agricultural system to coproduce food and fuel, we can produce enough biofuel to replace about 70 billion gallons per year of gasoline while still generating all the food and feed currently produced from that land and reducing total US greenhouse gas production by 10%. Cellulosic biofuel production does not

seem to be limited by hard technological or resource constraints: it is more a matter of the choices we make.