

Renewables vs. Energy Storage: Evaluating Characteristic Classes

My last seminar evaluated the motivation to move away from imported petroleum-based transportation fuels and fossil fuels for electricity production. This semester I will examine the problem of intermittency of renewable electricity sources. The mechanisms by which that intermittency can be mitigated and accommodated will be described and compared. The evaluation of the effects of three such mechanisms, geographic diversity, resource diversity, and demand management lead to the conclusion that, by themselves, they are insufficient. The two remaining mechanisms are energy storage and dispatchable substitute generation. I will focus principally on energy storage, which must be quantified by the ratio of energy to power, which results in a parameter with units of time. Of the storage mechanisms discussed, two stand out in serving dual roles, which has the pivotal effect of rewriting the rules of financial feasibility. One of these is Vehicle-to-Grid (V2G), wherein energy may be stored in the batteries of a fleet of plug-in vehicles. Issues associated with V2G include the change through time of the effective size of the resource as vehicles are disconnected from the electric grid and used for transportation. The conclusion of this presentation will be the questions I wish to pursue for my dissertation which derive from the considerations of intermittency and characteristics of energy storage.