7. Existing energy generation through renewables is not competitive with current carbon intensive energy sources.

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Renewable non-burning energy sources – wind, water, solar, geothermal (WWSG) – have potential (i) to fuel future world-energy supply; (ii) to significantly reduce global CO2 and other emissions;(iii) to decrease economic and political dependencies for fossil-fuel importing countries; (iv) to facilitate the development of a smarter, decentralized energy grid; and (v) to enhance global energy supply stability. However, aside from hydropower they are rarely competitive with conventional energy sources – nuclear, coal, gas, and oil.

Economic, financial, political, and technological aspects are the main obstacles to a fast, large-scale, and global development and deployment of WWSGs. Economic obstacles: Subsidies for conventional energy sources and current market-structures often constitute effective barriers of entry for WWSGs. Financial obstacles: Significant investment is required to construct WWSGs to appropriate scale and to develop the smart grid necessary to accommodate decentralized energy supply. Political obstacles: Political determination and coordination within and across countries is required to provide proper legislative and incentive structures to market players, to facilitate construction of a smart grid, and to steer public awareness. Technological obstacles: Most renewable energy sources have yet to reach their technological peak. In particular, solar power has a long way to go before becoming an economically viable energy source. At the moment, fossil-fuel subsidies are distorting price signals (Sims, 2011). Coupled with the technological gap between most WWSGs and conventional energy sources, the status quo is that '[WWSGs'] costs are often higher than current energy prices but can be competitive in various settings' (Sims, 2011). However, shifting world energy supply to renewable sources is feasible in the long run, desirable and necessary (Jacobson, 2011). It will require significant political efforts and a change in public perception (Pachauri, 2011; Jaccard, 2011), but 'the [economic, environmental, social] costs are increasing by not acting now.' (Sims, 2011).

> Incentivizing renewable energy – The Negative Case of German Solar Power: Subsidies can provide R&D incentives and render currently un-economical sources of renewable energy competitive against conventional energy production. In Germany, solar energy accounts for 20 percent of renewable energy (3 percent of overall German energy supply), yet it consumes 55 percent of renewable energy subsidies. Today's installed solar capacity amounts to 33 percent of German energy needs; however, of that, around 85 percent remains idle due to nighttime, winter, and generally cloudy weather. Avoiding CO2 emissions with solar power in Germany costs >1000$/ton, compared to 95$/ton for wind-power, and 25$/ton for CO2 emissions certificates traded at the European Energy Exchange in Leipzig (IEA, 2007). Thus the true danger of solar-power is not that it is expensive, but that it takes away subsidies from economically more viable alternatives, such as wind power or investments into a smarter grid.

'Close to 75 percent of the world's energy demand could be met by renewables by mid-century if backed by the right enabling public policies' (Sims, 2011). In fact, some researchers even claim that 100 percent of world energy demand could be met by renewables by mid-century (Jacobson, 2011). How? To overcome the lacking competitiveness of WWSGs, it is essential to remove incentives and other types of support for environmentally harmful energy technologies' (ISES Delegate, 2011). To realize WWSGs' potential, public policies need to ensure that the most competitive renewable energies receive appropriate funding. In 2010 alone, 213 billion $ were invested in renewable energies, almost equaling the amount invested in fossil-fuel energy sources (Rhonel, 2011). Optimistic estimates predict that the complete range of WWSGs will be cost-effective by 2030, at least when accounting for externalities of conventional energy (Jacobson, 2011). The shift to renewable energy can be accomplished, but public policies need to balance cost and benefit of different technologies with utmost care.