

The following summarizes a presentation on Photovoltaic Systems by Ajeet Rohatgi, Regents' Professor for the School of Electrical and Computer Engineering and Director of the University Center for Excellence in Photovoltaics Research and Education at Georgia Tech, to the class on January 30th.

The Not-So-Distant Photovoltaic Future

Photovoltaic (PV) systems, which convert solar energy to electricity, have the potential to solve the two most important problems on the planet: energy supply and environmental degradation. Unlike fossil fuels such as crude oil, whose remaining reserves could sustain the population for only the next 43 years at current consumption rates, solar energy is free, unlimited and not localized. Solar power from a 10,000 square mile area in the Nevada desert could supply all of the electricity in the US. Furthermore, solar cells are environment-friendly by not producing noise pollution, not requiring waste heat disposal, and emitting only 5.3 g C/KWh of CO₂, compared to the 332.8 g C/KWh emitted by coal generation, in a total fuel cycle.

Despite its advantages, solar energy, of which PV comprises a fraction, accounted for 1% of renewables comprising 6.9% of US energy consumption in 2000. Although the cost of PV has decreased by a factor of 100 since production of the first 6% efficient solar cell in 1956, PV currently costs 2 to 4 times more than fossil fuels. Studies predict that if world PV production grows at a constant rate of 35%, PV cost will equal fossil fuel cost in 2015.

PV cost could be reduced by the creation of new markets through government subsidies, the smart integration of PV into buildings, and the development of more efficient cells. The production of PV devices, which utilize the photovoltaic effect of semiconductors, is analogous to making a pizza, with the semiconductor as an expensive topping. Georgia Tech is among many institutions researching a more efficient use of Silicon, found in 90% of solar cells, and

other semiconductors. Georgia Tech's PV system atop the CRC, which has prevented 400 tons of CO₂ emissions and has produced 3200 MWh of energy since 1996, exemplifies the reality of solar power and fuels researchers, such as Ajeet Rohatgi, to work towards a not-so-distant photovoltaic future.