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Wavelength-Selective Photovoltaics for Power-generating Greenhouses SUE CARTER, MICHAEL LOIK, DAVID SHUGAR, CARLEY CORRADO, CATHERINE WADE, GLENN ALERS, University of California, Santa Cruz — While photovoltaic (PV) technologies are being developed that have the potential for meeting the cost target of $0.50/W per module, the cost of installation combined with the competition over land resources could curtail the wide scale deployment needed to generate the Terrawatts per year required to meet the world's electricity demands. To be cost effective, such large scale power generation will almost certainly require PV solar farms to be installed in agricultural and desert areas, thereby competing with food production, crops for biofuels, or the biodiversity of desert ecosystems. This requirement has put the PV community at odds with both the environmental and agricultural groups they would hope to support through the reduction of greenhouse gas emissions. A possible solution to this challenge is the use of wavelength-selective solar collectors, based on luminescent solar concentrators, that transmit wavelengths needed for plant growth while absorbing the remaining portions of the solar spectrum and converting it to power. Costs are reduced through simultaneous use of land for both food and power production, by replacing the PV cells by inexpensive long-lived luminescent materials as the solar absorber, and by integrating the panels directly into existing greenhouse or cold frames. Results on power generation and crop yields for year-long trials done at academic and commercial greenhouse growers in California will be presented.

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