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Teaching the Fundamentals of Energy Efficiency

ALAN MEIER, University of California, Davis

A course on energy efficiency is a surprisingly valuable complement to a student's education in physics and many other disciplines. The Univ. of California, Davis, offers a 1-quarter course on "understanding the other side of the meter." Lectures begin by giving students a demand-side perspective on how, where, and why energy is used. Students measure energy use of appliances in their homes and then report results. This gives students a practical sense of the difference between energy and power and learn how appliances transform energy into useful services. Lectures introduce the types of direct conservation measures–reducing demand, reducing fixed consumptions, and increasing efficiency. Practical examples draw upon simple concepts in heat transfer, thermodynamics, and mechanics. Graphical techniques, strengthened through problem sets, explain the interdependence of conservation measures. Lectures then examine indirect energy savings from measures and consider questions like "where can one achieve the greatest fuel savings in a car by removing one gram of mass?" Finally, students learn about conservation measures that circumvent physical limits by adopting new processes. By the end of the course, students have a gained a new perspective on energy consumption and the opportunities to reduce it.