

GEOS 24705 / ENST 24705  
Problem set #9  
Due: Thurs. April 30

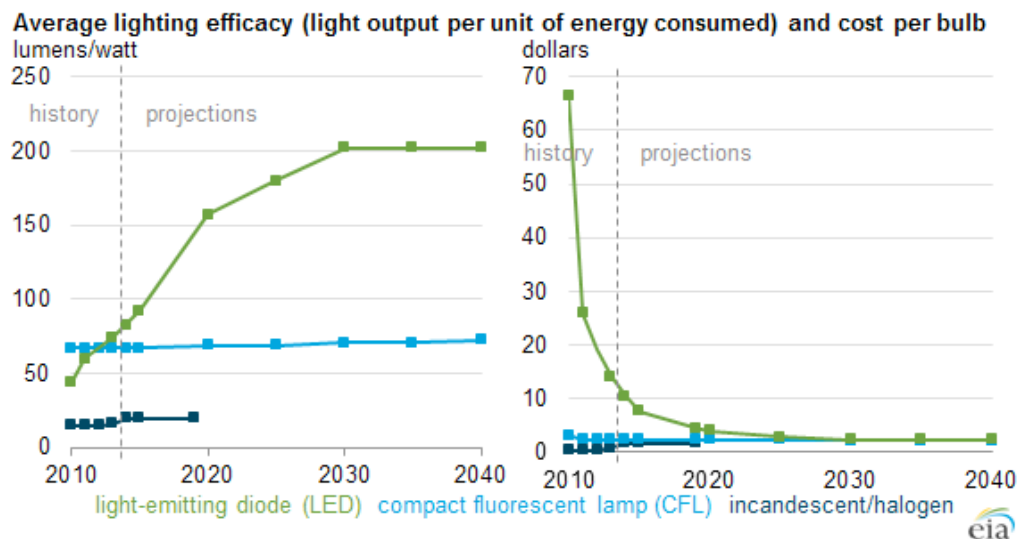
### Problem 1: Parsing newspaper articles about energy efficiency

One of the goals of this class is to give you the tools to analyze articles about energy in either the popular press or the scientific literature. In this problem set you'll read and comment on an op-ed in the U. Chicago Maroon.

#### Background:

As you saw from the efficiency chart of PS 8, incandescent bulbs are extremely inefficient at converting electrical energy into radiation energy that people can see. The incandescent lightbulb has not progressed much since Edison's first invention (and indeed the trend toward hipster "Edison-style" lightbulbs might mean that efficiencies are regressing.) You can see from the chart from PS 8 that compact fluorescent bulbs are much more efficient. In the early 2000s, efforts to switch to more efficient lighting became an environmental cause in the U.S. and other countries. Environmental groups pushed for replacement of incandescents, and in 2007, Congress passed the 2007 U.S. Energy Independence and Security Act, which imposed rising efficiency standards on household lighting that were stringent enough to force the eventual phase-out of incandescent bulbs (by 2020). The act produced vigorous opposition by those who saw it as an unacceptable intrusion on personal choice by Big Government. (In fact, in 2011, before the standards were to take effect, Congress quietly defunded any enforcement.)

At the University of Chicago, student environmental groups pushed for the university to switch to compact fluorescents (CFLs). At the time, CFLs were the only viable option to incandescent bulbs. (The price landscape for lighting has changed dramatically; see figure below, which shows history from 2010-2013 and projections.) CFLs tended to produce harsher, whiter light than incandescents, but had substantially better efficiency.



**Fig. 1:** Lightbulb efficiency and cost (EIA). Lumens are essentially radiation energy scaled by the response of the human eye – that is, they measure that part of light that people can see.

The U. of C. Maroon joined the debate in 2009 with an op-ed piece by a student decrying the foolishness of switching from incandescent to compact fluorescent bulbs. Read the article at <http://www.chicagomaroon.com/2009/1/27/a-light-headed-plan>.

Beyond the fact that the author does not seem to know the provisions of the 2007 U.S. Energy Independence and Security Act, there are many other things to comment on. First, the author claims that U. Chicago's direct electricity savings from switching to CFLs would be trivial. Second, he argues that there are hidden costs that may outweigh those savings. In paragraph four, he asserts that the net energy savings of CFLs would be negligible or zero because reduced electricity use would be offset by increased energy use for heating. Somewhat confusingly, he then backs off and states that the net energy savings would be very complicated to calculate.

**Comment on both those assertions, with numbers to back you up.** Discuss both based on what you have learned in class.

You need no information other than class materials to make informed judgments (and please don't spend time Googling). If I were giving this as the first problem set in class, I would guide you through some calculations. Since it's PS9, I'm asking you instead to invent the calculation/s yourself, write them out, and make an argument in words based on them. No more than a page total, nothing complicated or lengthy, just a solid discussion or argument backed by some back-of-the-envelope numbers.