Energy Efficiency

Efficiency is a broad concept that refers, in general, to the elimination of waste. The efficiency of a system is measured as a ratio of the useful work it produces to the energy resources it consumes; a system becomes more efficient as the ratio approaches 1. Energy efficiency is a term used to describe using less energy to do the same amount of work; the corollary of increased energy efficiency is therefore increased productivity (using the same amount of energy to do more work).

Energy efficiency is often treated as a resource in itself, with the rationale that saving a unit of energy is functionally just as effective as (if not superior to) producing an extra unit of energy. Energy efficiency tends to be the easiest resource in which to invest, politically and economically speaking, as it generally costs less to save energy than to generate it, and financial payback for efficiency measures can be substantial.

Energy efficiency can be a confusing concept to work with, however, as it requires conceptualizing the absence of something as a tangible resource. The term “negawatt” was coined to describe a megawatt of power that didn’t have to exist due to efficiency measures, although most metrics will be in the form of “kilowatt-hours saved” or “MMBTu saved.” These units are only meaningful relative to a baseline. Baselines can be situated in either:

- a reference case (e.g., total energy consumption for a town during FY 2010) or
- a base “business as usual” projection. (This is more typical in discussions of stabilizing emissions reductions, in which “wedges” are calculated as segments of the area between the BAU line with positive slope, and the flat stabilization line.)

In a recent MA DOER report, Massachusetts is portrayed as meeting “about 10% of our electricity needs through energy efficiency.” This is not to say that 10% of our homes, streetlights, etc. are powered by a mysterious negative energy resource. Rather, it means that we use 10% less electricity than was projected for this point in time in the absence of energy efficiency measures.

Peak Load and the Forward Capacity Market

In addition to saving energy in general by reducing consumption, energy efficiency initiatives seek to reduce something called **"peak load."** Peak load is a number that represents the maximum demand for *power* at a given point during the day or year. For example, at 5:30 p.m. on a hot day in August, when everyone gets home from work and turns on their air conditioners, demand for a constant stream of energy from the utility is much higher than in the middle of a cool spring morning. Since a generating facility can only support so much demand at any moment in time, excess capacity must be added to the grid at times of peak demand (think of this as turning on more faucets). These extra facilities tend to be the oldest, dirtiest, and most expensive ones to run. Therefore, "flattening" the demand curve—while not directly *reducing* the amount of energy consumed overall—can contribute to cost savings and environmental benefits.

Good load management requires a level of technological sophistication that we have not quite yet achieved. Some utilities are beginning to experiment with time-sensitive pricing programs, where consumers can decide to run their dishwashers (or perhaps charge their electric cars) at times when the grid is less stressed, such as the early morning, cutting costs for both the customer and the utility. An ideal **demand-response program** will employ technology that allows supply and demand to "talk" to each other in real time, giving the grid the ability to (for example) automatically shut down non-crucial consumption when demand is too high. This would permit the system to become more efficient than if shutting off the lights, etc., was always left up to individual users.

The New England ISO recently established a **Forward Capacity Market** that allows "efficiency suppliers" to submit bids alongside electricity generators. The purpose of the Forward Capacity Market is to predict and provide for "peak load" by ensuring that contracts for sufficient capacity are made three years in advance. The innovative practice of recognizing efficiency and demand response resources as competitive with power resources has been very effective, leading to lower prices for consumers and the institutionalization of energy efficiency more generally.

What is the status of energy efficiency in Massachusetts?

In Massachusetts, the utilities are the primary agents of energy efficiency programs, having been required to provide efficiency services since the electrical restructuring in 1997.

The Green Communities Act of 2008 updated this process by requiring that all electricity/gas distributers and municipal aggregators develop and submit plans to the DPU for approval on a 3-year basis. The Act also established an Energy Efficiency Advisory Council (EEAC), which works with utilities and consultants to develop state-wide plans that "provide for the acquisition of all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply."

In 2010, Massachusetts announced a commitment to making energy efficiency its "first fuel" in an aggressive, state-wide, 3-year Energy Efficiency Investment Plan.

Utility efficiency programs are funded in part by a small surcharge on your monthly utility bill, known as the "systems benefit charge" (SBC). (This does not apply to municipally-owned utilities, but they can elect to administer their own SBC to be recycled into local efficiency projects.)

Proceeds from the Regional Greenhouse Gas Initiative (RGGI) and the Forward-Capacity Market (FCM) are also pooled to fund energy efficiency programs. Approximately 66% of the cumulative revenues from all RGGI auctions have been channeled into energy efficiency programs.