

Economic Issues in Wasted and Inefficient Outdoor Lighting

Let's consider the energy use of inefficient outdoor lighting fixtures. A very common fixture seen everywhere throughout the United States, in cities and in the country, is the 175 watt dusk-to-dawn mercury vapor light. It is used for yard lighting, security lighting, and street lighting. It contains a photocell sensor switch to turn it on at dusk and off at dawn, hence the name "dusk to dawn". Quite a number of fixture manufacturers make such a unit, and many utility companies promote its use for "security" or "safety" at night. We see ads proclaiming "Light Up the Night", all in the interest of security or safety or some such thing. All this is in light of the fact that there is more crime in the daytime than at night, that there is more crime in well-lit areas than in dark areas (compare the light level in New York City to that in a typical rural Midwestern city, and the crime level in both locations, for example).

Due to all this advertising, most of us have come to identify lighting at night (good or bad) with safety. The world runs on perception, not on reality. IDA believes that quality lighting can and does promote safety, security, and utility at night. We are definitely not opposed to quality lighting. We are definitely against poor lighting-lighting that causes glare, light trespass, urban sky glow, and that compromises visibility rather than helping us to see. Such poor lighting wastes light and energy and money.

Let's look at the 175 watt dusk-to-dawn mercury vapor light in some detail. It retails for \$29.95 or even less. The system uses about 210 watts of overall energy when we consider the ballast and other factors. Most security lights and street lights are switched on and off by a photocell, sometimes

as part of each fixture, sometimes controlling a group of fixtures. These dusk-to-dawn lights burn approximately 4100 hours a year ($4100 / 365 = 11.23$ hr per night), and this value is nearly independent of the latitude of the location, as the seasonal effects average out over the year.

Multiply: 210 watts x 4100 hours = 861 kilowatt-hours (KWH) energy used each year. At 8¢ per KWH (the national average electrical energy cost: some places are lower, but just as many are higher, some even twice as high), the average cost of operating such a lamp is about \$69 per year. That is over twice the purchase price of the fixture. Where energy costs are high, the annual energy usage costs over three times as much as the fixture or more. And this is for a fixture designed to last 20 to 30 years. Here we have a prime example of how those who look only at the initial cost are unaware of the real costs. We must take a long-term view.

Tucson (about 600,000 population) probably had over 20,000 such lights until a mass change-over to better lighting sources was accomplished. (The local utility replaced several thousand of these mercury lights that they owned; think how many more are owned by private citizens.) So the annual operating cost of those mercury fixtures in Tucson alone was nearly 1.4 million dollars. The population of the United States is about 500 times that of Tucson. So the annual operating cost of that single type of fixture is over 700 million dollars. If all of these fixtures were replaced with quality 35 watt low pressure sodium fixtures (getting better lighting as well), the country would save over 500 million dollars per year.

continued

Let us consider now the wasted light. At least 30 percent of the light coming out of the fixture is totally wasted (without even considering the energy inefficiency of the mercury lamp). It is light going up to brighten the sky, and light coming out at nearly horizontal angles. Such light only causes glare and light trespass, doing nothing to light up the owner's property, but doing a lot to offend neighbors like you. Some have estimated the wasted light at well over 30 percent. Have a close look at one of these fixtures. What do you think?

Thirty percent of \$700 million is about 200 million dollars. That is money totally wasted. The wasted light is doing nothing to provide security, safety, or utility at night. It is only burning coal (most of the power in the United States is produced by coal burning), producing additional air pollution and acid rain. We have enough of that already.

Consider now all the other bad lighting. Billboards and other signs lit from below (much of the light output is wasted). Advertising searchlights. Lighting up of building facades with lighting fixtures that are not well controlled. Poor quality street lights, parking lot lights, and other area lighting. The many lights that burn all night whether they are needed or not. How many lights do you see nightly that have too much glare or too much wasted light? Look around!

Let us conservatively assume that the added wasted light from all other outdoor light sources is five times the amount coming from the 175 watt mercury vapor lights. Then the total wasted money being used to produce the totally wasted light is five times 200 million = One Billion Dollars a year!

Let's look at the amount of coal or oil being wasted to produce the wasted light. It takes, on the average, 0.47 tons of coal (940 pounds) to produce 1000 KWH of electricity, so one ton of coal can produce 2100 KWH of electricity. It takes about 1.8 barrels (76 gallons) of crude oil to produce 1000 KWH of electricity, so one barrel of crude oil

can produce 556 KWH. The wasted light therefore equates to an annual waste of at least six million tons of coal (think of the added acid rain and air pollution!) or 23 million barrels of oil (think of the added oil imports). These are non-negligible amounts, to be sure.

While the wasted energy and money from any one person's poor fixture is not all that much (say, \$5 to \$10 a month added to their utility bill), the overall amount is truly "astronomical" (mind boggling) when one takes into consideration the sum of all these individual contributions. The solution is for each of us to do better, to be aware of the issues, and to eliminate wasted light wherever we can. We will save money and energy as a nation by doing more as individuals, at home and at work. We must.

All this wasted light and energy is doing nothing to promote safety, or a better life at night. In fact, it does the opposite. It costs us money and energy to have a trashy nighttime environment and to wipe out our dark skies. Bright skies, glare, and light trespass help no one. Glare never helps visibility-never. Light trespass often offends neighbors, and it is always unnecessary. Glare and light trespass are also factors in many accidents at night, by blinding or confusing drivers or pedestrians. All this costs the nation far too much in money and in pain. We shouldn't tolerate it. We must stop such waste. Now.

If we had a water sprinkler system that wasted much of its water by scattering water everywhere-onto the street, through our neighbor's windows, and upward to encourage evaporation, we'd not tolerate it for long. If together we wasted over a billion dollars a year this way, we'd declare it a national disaster and begin conservation measures and efficiency improvements immediately. We must build a greater awareness of the adverse effects of poor lighting and get on with the task of using only quality lighting.

For more information about these outdoor lighting issues, contact the International Dark-Sky Association at the address at the beginning of this Information Sheet. Other information sheets available from IDA address the issues of energy savings (for example, the retrofit of street lights in San Diego to LPS is saving the city about 3 million dollars a year), the 175 watt mercury vapor light, the operating efficiencies of different kinds of light sources, and other quality lighting issues. Join us in our efforts to promote better outdoor lighting and energy savings. We will all benefit! The International Dark-Sky Association is a tax-exempt member-supported non-profit organization.