Coalition to
BanBillboardBlight **Protecting Public Space □ Defending the Visual Environment**

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California Energy Commission
Dockets Office, MS-4
Re: Docket No. 12-AAER-2A
1516 Ninth St.
Sacramento, CA 95814-5512

I am submitting the attached report entitled "Illuminating the Issues: Digital Signage and Philadelphia's Green Future" for consideration in setting energy efficiency standards for digital billboards.

Thank you,

Dennis Hathaway, President
Coalition to Ban Billboard Blight

Illuminating the Issues

Digital Signage and Philadelphia's Green Future

by Gregory Young

In the world of outdoor advertising, successive technological and stylistic advancements have prompted cities and states to rethink their signage regulation and policy. There has been much controversy regarding the potential safety hazard posed by digital signage. Many studies show that such signage can lead to driver distraction and traffic delays (Wachtel, 2009). This research, and the resultant outcry from activists and concerned citizens, has led some policymakers to regulate distracting, electronic signage displays. There has been relatively little research, however, regarding the environmental and energy-consumption issues raised by this new technology.

The Basics of Digital Signage and Energy Consumption

First, *what exactly is digital signage*? Digital signage packages consist of three key pieces: player, extender(s), and display. The player is essentially a computer, equipped with software to generate the displayed content. Players are typically mounted behind the screen, and must be kept cool (via internal or accessory fan) and must be easily accessible for repairs or rebooting. These player/fan arrangements typically consume between 200 and 300 Watts[1] while running, slightly more than a home dishwasher. Depending on the relative location of the player to the screen, there may be a need for a video extender, essentially a cable which connects the player to the screen. This brings us to the most important component of any digital sign: the screen, or, in industry parlance, "the display." There are three main categories of digital display: LCD, plasma, and LED.

[1] **Watt**—a unit of power which measures the rate of energy conversion. It is defined as one joule per second. The kilowatt (kW) is equal to one thousand watts. For a sense of perspective, one kilowatt of power is approximately equal to 1.34 horsepower. A small electric heater with one heating element can use 1.0 kilowatt. If that heater is used for one hour, it will have used one kilowatt hour.

LED is the name used for Light Emitting Diode (aka LED) boards, commonly used in small to medium sized on-premise electronic advertising[2]. They are the overwhelming preference for large off-premise[3] digital billboards; designed for long-distance impact, they are often up to 1200 sq. ft. in size (20'x60'). According to the U.S. Department of Energy, LEDs produce more light (in lumens per watt) than incandescent bulbs, and their efficiency is not affected by shape and size, unlike traditional fluorescent light bulbs or tubes. Proponents of digital signage tout the "greenness" of LEDs; lower wattage and greater luminance[4] than the more traditional fluorescent, incandescent, or halogen bulbs.

State Rd. & Academy Rd., Philadelphia
Off-premise LED sign

These claims overlook one key bit of common sense: whereas traditional, static signage is illuminated by two or three "inefficient" lamps at nighttime, digital signs are comprised of hundreds, if not thousands, of "green" LED bulbs, each using between 2-10 watts, lit twenty-four hours a day. For instance, a 14'x48' LED billboard can have between 900 and 10,000 diodes.

3051 Front St., Philadelphia
Off-premise LED sign

Considering this simple fact, intrinsic to digital billboard design, it is no surprise that overall energy consumption of digital signage exceeds that of static signage, and makes bulb-to-bulb comparisons irrelevant in this context.

Additionally, with all digital display types, the players which control the changeable images and the fans required to cool them must be taken into account, as they too increase energy consumption. Adding auxiliary equipment, such as extenders, further increases the power demand.

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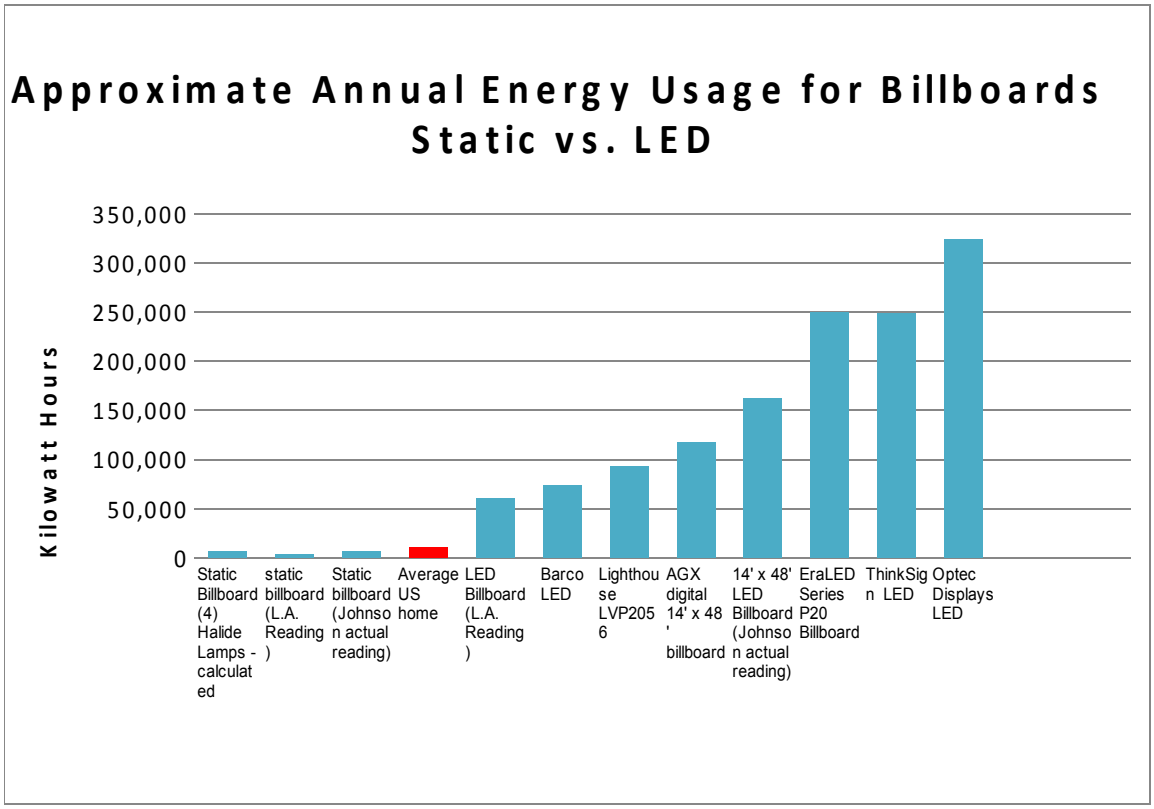
[2] **On-premise** or **accessory** signage is defined as a business establishment's on-site advertisements.
[3] **Off-premise** or **non-accessory** billboards/signs are those which advertise a business or product not sold at the signs' location. Roadside billboards are a popular form of off-premise advertising.
[4] **Luminance** is a measure of the perceived brightness of a light-emitting surface, such as a digital sign. Its unit of measure is candela per square meter (c/m^2), informally referred to as "nits."

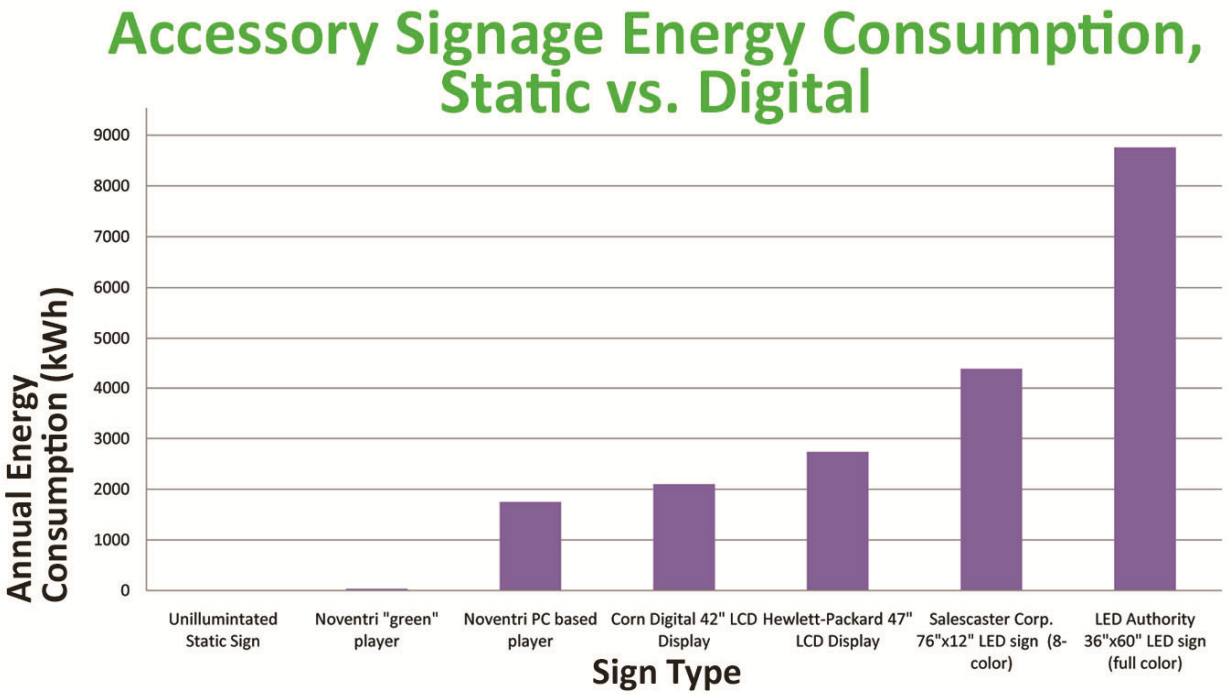
Determining the exact power consumption for a digital billboard is difficult; usage is dependent upon many variables, including size, resolution (how close pixels are spaced, aka diode density), how many LEDs are in each pixel, the color capabilities of the board (tri-color or full color), the image being displayed and time of day (daytime operation requires more power than nighttime operation, as the lit image must compete with the brightness of the sun). Despite these difficulties, we have compiled an objective chart of consumption rates. Our information was provided by a variety of sources, ranging from manufacturers, fellow researchers, advocacy groups, and independent meter readings.



LED units generate heat, and cannot function well in heat which reduces the unit's life expectancy. As a result of the tremendous amount of heat generated in LEDs , and the additional impact of hot weather on the signs, an air conditioning unit is incorporated to cool the components. The energy drawn from the grid is highest during the summer months when the heat from the sun coupled with the heat generated by the higher brightness of the LED unit requires increased demand on the air conditioning system installed for cooling the LED unit. This energy use corresponds directly with maximum peak demands from businesses and residences. Utility companies now provide a discount for homeowners if they can disconnect their air conditioners from the grid during the peak load demands. There is no discussion or plan that we are aware of to disconnect LED air conditioners or darken signs during periods of high demand. If traditional billboards continue to be replaced by LED signs, the growing draw of energy during peak hours could negate the efforts of Utility companies to reduce demand during peak times.

Rates of Energy Consumption		
Product type	**Annual Usage, kWh***	**Annual cost****
Unillumintated Static Sign	0	$0
Noventri "green" player	35	$4.80
Noventri PC based player	1,752	$240
Corn Digital 42" LCD Display	2,103	$288
Hewlett-Packard 47" LCD Display	2,737	$375
Salescaster Corp. 76"x12" LED sign (8-color)	4,380	$600
Static Billboard (4) Halide Lamps - calculated	**7,008**	**$960**
LED Authority 36"x60" LED sign (full color)	8,760	$1,200
Average US home	**11,040**	**$1,512**
LED Billboard (L.A. Reading)	61,032	$8,361
Barco LED	73,584	$10,081
Lighthouse LVP2056	92,715	$12,792
AGX digital 14' x 48 ' billboard	117,866	$16,148
14' x 48' LED Billboard (Florida actual reading)	**162,902**	**$22,318**
EraLED Series P20 Billboard	249,690	$34,208
ThinkSign LED	248,993	$34,112
Optec Displays LED	323,773	$44,357
* Energy Usage (((24))((365))/1000		
** Average costs per kWh=$.137 (Metro Area)		

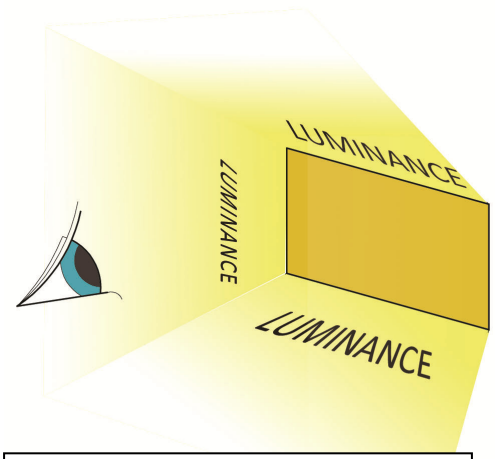
In many applications---such as television/computer display, general lighting, and small electronics---LCD, plasma screen, and LED technological advancements have proven more energy efficient than their predecessors, but research indicates that out-of-home advertising is simply not an appropriate or responsible application for digital technology.



Sign Brightness

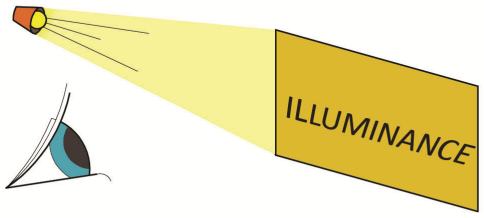
Measuring Sign Brightness

Apart from energy consumption, there are the important issues of light trespass and light pollution, which cause distraction, obscure stars in the night sky, and, like any other form of pollution, disrupt ecosystems and cause adverse health effects for humans and wildlife alike. Light trespass[5] is measured in two ways: luminance or illuminance. *Luminance* (measured in nits[6]) quantifies surface brightness, or the amount of light an object gives off. *Illuminance* (measured in footcandles[7]) quantifies that amount of light which falls onto an object.



This sign (above) gives off light.
Its **Luminance** is measured in **nits.**

By either measure, digital signage can create significant problems. "During daylight, an unlit static billboard will have a brightness which "fits in" with its surroundings; it will not cause excessive distraction because of excessive luminance" (Carhart, 2010, p.4). But, to capture drivers' attention, digital signs must be set to very high luminance levels, as they are essentially competing with the sun, which has a luminance level of 6,500 nits. If this extreme brightness is not modulated to fit nighttime conditions, we face issues including very high energy consumption during the day, light pollution in the evening, and potential driver distraction at all times. The OAAA (Outdoor Advertising Association of America) has guidelines to address brightness limits, but they are not mandated.



This sign (above) is being lit by a light source.
Its **Illuminance** is measured in **footcandles.**

[5] **Light trespass** occurs when unwanted light enters one's property, for instance, by shining over a neighbor's fence. A common light trespass problem occurs when a strong light enters the window of one's home from the outside

[6] **Nit**—term used to describe a metric unit of luminance. It it is defined as candela per square meter (cd/m^2). The unit is based on the candela, the modern metric unit of luminous intensity; and the square meter.

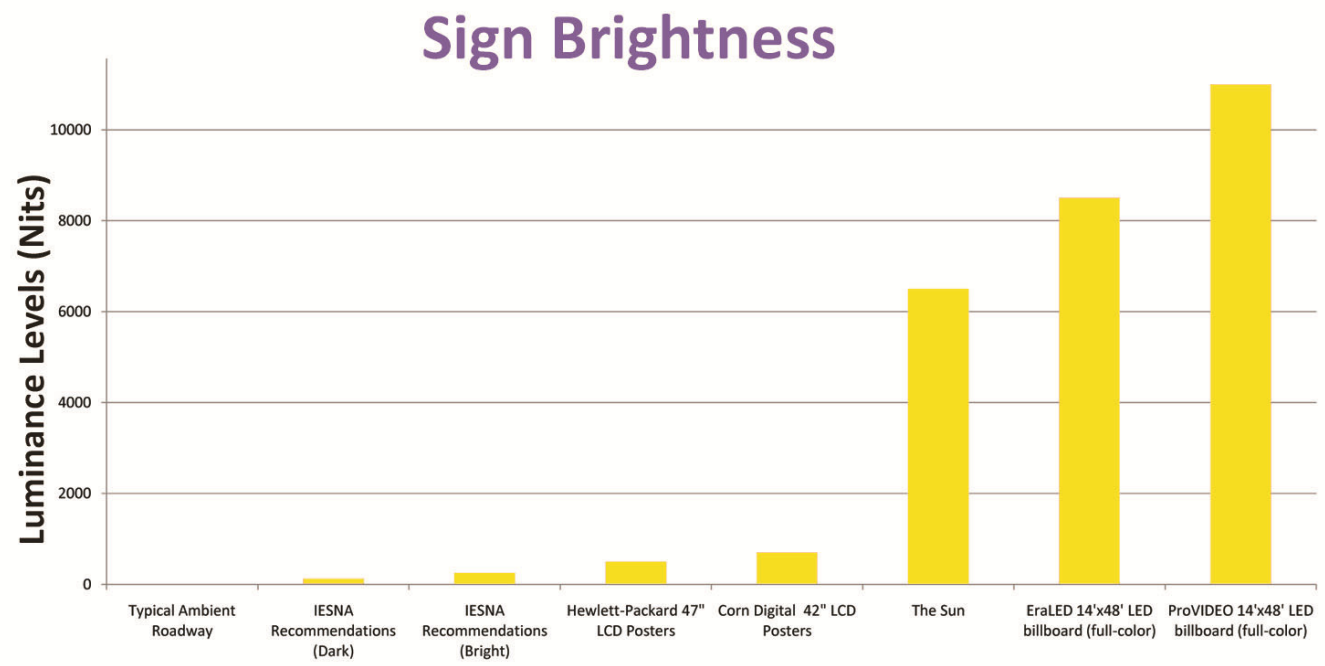
[7] **Footcandle** – Unit of light density incident on a plane (assumed to be horizontal unless otherwise specified), and measurable with an illuminance meter, a.k.a. light meter.

Observed and Recommended Levels of Brightness		
Information Source	**Product type**	**Luminance (surface brightness)**
(C.Luginbuhl study)	Typical Ambient Roadway Illumination	1 Nit
(C. Luginbuhl study)	Typical Floodlit Billboard	approximately 100 Nits
Digital Billboards: New Regulations for New Technology by Drew Carhart	Traditionally lit static billboards	98% were under 150 Nits, 83% were under 100 Nits (Arizona Study); 124 Nits average (New York Study)
IESNA recommendations	Recommendations for Digital Billboard Luminance	250 Nits (day), 125 Nits (night)
Outdoor Advertising Association of America (Ian Lewin Study)	Recommendations for Digital Billboard Luminance	300-350 Nits suggested (study based on light trespass readings)
Hewlett-Packard (Specifications)	47" LCD Digital Signage Display	500 Nits
Corn Digital (Specifications)	32" & 42" LCD Posters	500 Nits (32") 700 Nits (42")
Carhart study	Daytime sky (sunny)	5,000-7,000 Nits
Virginia Tech Transportation Inst.	The Sun	6,500 Nits
Senzen Top Technology Co., Ltd (specifications)	seires PH12 (14'x48' full-color LED billboard	8,000+ Nits
EraLED (Specifications)	Series P20 full-color LED billboard (assorted sizes)	8,500 Nits
ProVIDEO Billboard Panels (specifications)	Series 1515-4, 14'x48' full-color LED billboard	11,000+ Nits
Optec Displays (specifications)	model 1248, 14'x48' full-color LED billboard	11,000+ Nits
Optec Displays (specifications)	model 2040-5, 14'x48' full-color LED billboard	11,000+ Nits

Limiting Sign Brightness

Proposed limits on sign brightness have caused much debate. Research provided by the Illuminating Engineering Society of North America (IESNA) states that drivers should be subjected to points of brightness no greater than 40 times the average brightness level of their general surroundings; this proportion is known as the contrast ratio. "As roadway lighting and automobile headlights provide ambient nighttime lighting levels of about one nit, this implies signage should appear no brighter than about 40 nits" (Luginbuhl, 2010, p.1). Surprisingly, the IESNA's own recommendations for signage luminance suggest limits between 250-1400 nits---greatly exceeding their stated maximum contrast ratio of 40:1.

The OAAA, has deemed 300-350 nits an acceptable level of night brightness. However, their guidance is based on the use of the IEEE standard for light trespass (IESNA-TM-11-00), when, for reasons of traffic safety and glare in drivers' eyes, it should have been based on IEEE's standard for roadway sign lighting (IESNA RP-19-01).
Traditionally floodlit static billboards rarely exceed 100 nits; experts on both driver distraction and light pollution recommended that, as a means of compromise, the new technologies should not exceed this value. In many areas, including Philadelphia, brightness levels are currently unregulated, and many manufacturers publicize their signs' capabilities to reach up to 11,000 nits.



Digital signage advocates mention the horizontal louvers[8] included in many billboards as an effective measure to prevent light pollution. In reality, these louver systems were designed primarily to shade each diode from sunlight (thus increasing their prominence), not to limit nighttime glow.[9] As Luginbuhl states in "Lighting and Astronomy," horizontal light (that which is emitted between 0° and roughly ±20°, and not restricted by horizontal louvers) contributes even more to skyglow than light emitted at higher angles. The effects of lower-angle lighting----such as that used to captivate approaching drivers---- are visible over a much broader area (Carhart, 2010).

A better option is to simply operate signs at less than maximum brightness. Not surprisingly, sign brightness and energy usage are directly related; beyond reducing light pollution and distraction, lowering luminance reduces total power consumption. One manufacturer experimented with running their digital displays at half-brightness; they were able to reduce power usage by nearly 40%, while maintaining full sign readability (Noventri, see in chart). Another option for reducing unnecessary brightness (and thus power usage) is to equip signs with sensors which automatically lower light output in accordance with atmospheric conditions. For example, sign brightness would mechanically be dimmed during dusk, early morning hours, or during cloudy or overcast weather. Again, OAAA does have guidelines for dimming, but they are not mandatory.

[8] A **louver** is a slat that is angled to keep out rain, direct sunshine, etc. The angle of the slats may be adjustable or fixed.
[9]Retrieved from http://www.optec.com

Materiality and Recyclability

Life Span

Light Emitting Diodes have a lifespan of 100,000 hours. According to Bryant, this equates to roughly eleven years for LED billboards, compared to the fifteen years for traditional static billboards. At that point, the diodes will be operating at 50% of their prime brightness. Of course, considering the return on investment that the sign owner has received by that time, he or she will likely not hesitate to replace the sign quickly (Bryant, 2008). As these large digital displays and their associated digital players increase in popularity, will we soon face an abundance of difficult to recycle, discarded technology?

Techno-Waste

Obsolete technology is a valuable source for secondary raw materials, if treated properly; if not treated properly, it can be a source of toxins and carcinogens. Rapid industrial advancement, decreasing initial cost, and even planned obsolescence could result in a fast-growing surplus of "techno-waste" (Morgan, 2006). LED's, plasma and LCD screens, and digital players and extenders *are* recyclable, but their de-manufacturing and reuse is not always mandated or monitored.

In the US, the main federal law governing solid waste is the Resource Conservation and Recovery Act of 1976; as far as electronics are concerned, it covers only cathode ray tubes (televisions and computer monitors popular before LCDs, plasma and LEDs), though state regulations may differ, according to the U.S. Environmental Protection Agency. Volumetrically, digital signage does generate more waste to be recycled than the paper, vinyl sheets, and plywood or canvas facing of static billboards, but lacks the potentially toxic adhesives.

Technological Graveyard: A massive collection of now-obsolete Cathode Ray Tube televisions. Could digital signage one day face a similar fate?

Future Technological Innovation

Digital display types have become increasingly energy efficient since their inception, a trend that will likely continue. While early generations of LED lamps could produce only 20 lumens per watt (compared to about 15 lumens/watt for incandescent), current models can achieve over 100 lumens/watt (Klipstein, 2009). More energy efficient players are also in development, including a model that uses only 4 watts of electricity, the equivalent of a single small light bulb. As technology continues to progress, there is hope that digital signage may one day be a truly green option, but we are not there today.

Solar Power

Solar power is one promising advancement recently used in the installation of a 6,000 sq. ft. digital billboard in Times Square which is fully powered by solar panels and photovoltaic solar modules, and illuminated by floodlights. It consumes no additional electricity. According to Cooley's Commercial Graphics, manufacturer of the solar sign, "These lightweight systems could be installed on some portion of the 450,000 billboards currently in the United States. Each of these billboards would generate clean renewable energy to either power the billboard lighting system or would be sold back to local utility companies through net metering or feed in tariffs programs" (Connor 2010).

A similar program has been implemented in San Francisco, and successfully generates up to 3.4 kilowatts of excess energy, distributed to local utility customers.[10] Some are skeptical, however; an industry insider states, "illuminating signage via solar power poses a significant hurdle, because harvesting and processing solar energy is relatively inefficient," and estimates that approximately only 20% of energy collected could be retransmitted as sign illumination (Aust, 2007). While these green advancements are laudable, they are climate-dependent, and their high initial costs make them unlikely for mainstream usage without government mandates or incentives.

Carbon Footprint						
	Average 2008 Air Travel (Total US Commercial air travel for 2008 / Census Estimate of total US population)	Average 2008 travel by passenger car: calculated for small car	Average 2008 travel by passenger car: calculated for SUV	Average Home	Digital Billboard (L.A. Reading)	Optec Displays LED
Total annual emissions (tons)	0.93	2.48	6.59	8.28	45.77	242.82
No. of trees to offset per year	4.66	12.38	32.96	41.4	228.87	1,214.10

[10] (2007, December 3). Retrieved from http://www.environmentalleader.com/2007/12/03/pges-green-campaign-gets-solar-powered-billboard/

Economic Feasibility and Return on Investment

Off-Premise, Non-Accessory Billboards

In addition to their environmental impacts, we looked into the profitability of digital billboards, and received mixed results. Although LEDs are expensive, manufacturers frequently claim that cost is recouped over time and in reduced energy usage and maintenance costs. For off-premise advertising, the initial investment in a digital sign is large---$250,000-$500,000 (Goldstein, 2008)---but future overhead for the advertising company is low, as graphics can be remotely changed and replaced. Often, they are also able to rent out the advertising space for a higher premium than on static billboards.

Space on a digital billboard rents at the same rate, or higher, as a comparably sized static billboard, even though each ad will be featured only intermittently, sharing space with up to eight other advertisements in the rotating lineup. This means huge profit increases for the outdoor advertising companies, and a quick return on investment. Digital billboards provide operators with an average of $14,000 per month in rent (typically from multiple advertisers), compared with $1,000 to $2,000 per month for traditional billboards, which serve only one advertiser (Goldstein, 2008).[11] Total revenue from the outdoor digital signage equipment market in the United States, including hardware, software, installation, and maintenance, grew by about 33% in 2009, a trend that is expected to continue. The Federal Highway Administration estimates that in 1996 there were over 400,000 billboards on federally controlled roads, which generated revenues in excess of $1.96 billion (Schueller, n.d.).

On-Premise, Accessory Signs

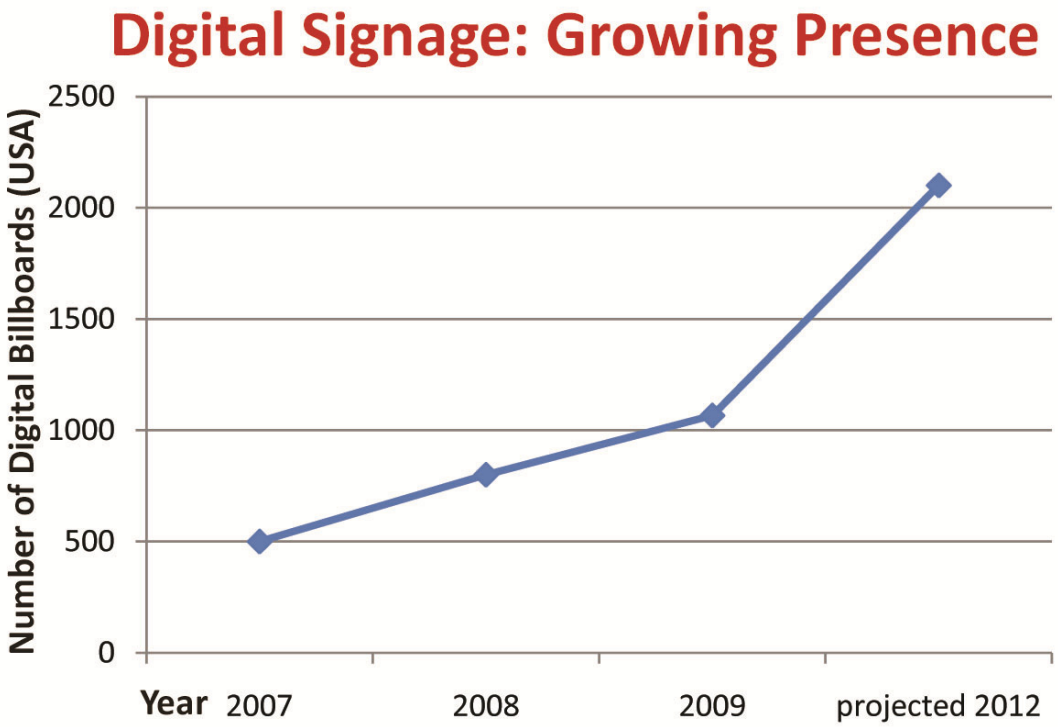
On-premise advertising appears to be less cost-effective. The initial cost of installing a digital signage network has not been recouped by many of the operators interviewed, to say nothing of the dramatic increase in energy expenditures when compared to static signage (Noventri, 2010). Additionally, the burden of providing frequently-changing content falls on the operator; many small businesses simply do not have the creative staff or technical knowledge to create changeable graphic displays.

Despite uncertain profitability for on-premise signs, market statistics and lay observation point to the growing popularity of digital signage, both off-premise and on-premise. In the absence of guaranteed profits, their chief selling point is their uniqueness---the fact that they "stand out." However, as this type of advertising becomes more mainstream, and the market becomes saturated, how long can simple novelty justify its high financial and environmental costs?

[11] Sales prices reflect market averages in Bangor, PA. Rates may vary with location.

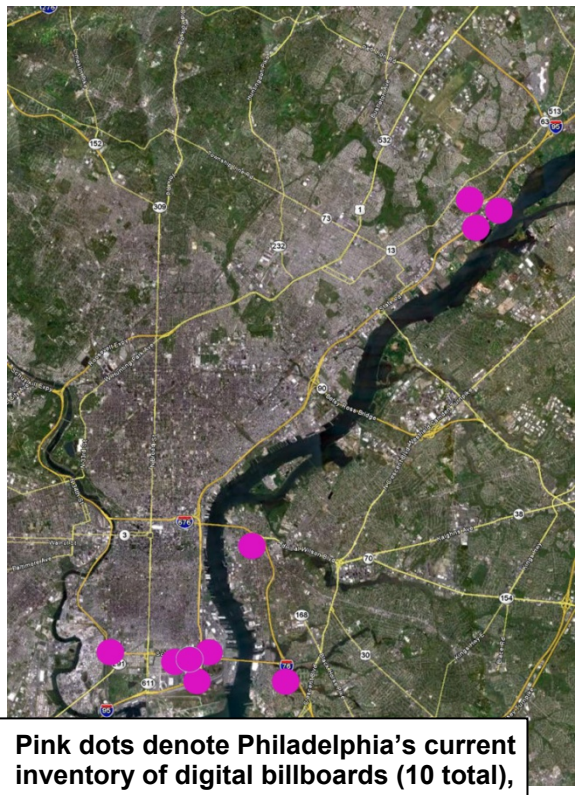
Current Trends

How big of a problem do unregulated energy consumption and luminance levels pose? Right now, only a small fraction of American outdoor advertising is digital. This number is growing, however, and the trend shows no sign of slowing. Rapidly-dropping prices for large LED screens have led to a growing increase in the number of digital signage installations. Today, there are nearly 800 of these digital billboards in the U.S. It's a small number compared with 450,000 traditional billboards across the country, but it's growing fast. The Outdoor Advertising Association of America, an industry trade group, projects that the number of digital billboards in the U.S. will expand at a rate of several hundred per year (Goldstein, 2008). Clear Channel Outdoor Holdings, an industry powerhouse, says it is expanding its digital billboard business in markets such as Los Angeles, Chicago and Philadelphia (Hau, 2007). Philadelphia is home to an estimated 1,800 billboards, including a handful of digital signs---the effects of widespread conversion from static to digital would raise significant safety and environmental issues.

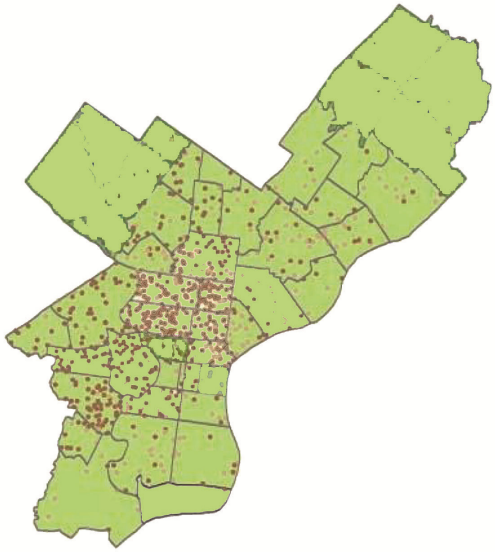


Rapid Growth: The number of digital billboards is increasing at an increasing rate in the US, as evidenced by the above graph. On-premise digital signage has shown an even more dramatic increase in popularity (Urazbaev, 2009).

How Does Philadelphia's Current Zoning Code Regulate Electronic Signage?



Pink dots denote Philadelphia's current inventory of digital billboards (10 total), concentrated along I-95 and the Schuykill Expressway



Simply put, it doesn't address the technology. Signage regulation within the Philadelphia zoning code (Section 14-1604) was passed in the early 1990s and does not specifically address electronic outdoor advertising. The code for on-premise signage (storefront signage) is equally devoid of controls on electronic signage, opening an opportunity for these kinds of signs in all commercial districts.

A leader in the outdoor advertising industry, Clear Channel, has embraced the digital trend. The company has revamped several of its existing static billboards to LED format along the I-95 corridor in Philadelphia. In order to proceed with the conversions, Clear Channel sought the approval of Philadelphia's Department of Licenses and Inspections (L&I), which granted permission for the conversions to take place with few requirements. This interpretation was made in spite of clear language in the code prohibiting an outdoor advertising sign from carrying more than two messages at one location. Under L&I's current interpretation of the code, any billboard that is 500 feet or more away from residentially zoned property may be converted to electronic as of right. If this interpretation remains in place, this could translate to hundreds of converted electronic billboards – the only factor moderating conversions right now is the (continually decreasing) expense involved.

Examples from Other Cities

To date, no known city has passed limits on sign energy usage, but about one quarter of states in the U.S. prohibits moving or animated signs, and roughly one third have specifications for dwell time ranging from four seconds to several minutes. Most states prohibit flashing red lights and anything that causes a glare or vision impairment.

Pittsburgh, Pennsylvania

A proposed amendment to Pittsburgh's zoning code states that no electronic sign may exceed .3 foot candles illumination above ambient light level to prevent distraction and interference with traffic signals. As discussed earlier in this paper, OAAA recommends foot candles in its guidelines but the usefulness of this measurement has been questioned and nits is the preferred measurement for detecting brightness and glare emitted from digital signs). Additionally, Pittsburgh's amendment sets a dwell time of at least ten seconds, and prohibits animation of any kind.[12]

Concord, New Hampshire

Some cities and states have banned electronic message boards outright, including Concord, New Hampshire. There, the ban on electronic message centers was upheld on appeal to the First Circuit Court, on grounds that the ban promoted both traffic safety and community aesthetics (Carpentier, 2009). [13]

Panama City Beach, Florida

In the absence of a cohesive state or federal policy, residents and policy makers in Panama City Beach, Florida decided they could not allow digital signage to continue to proliferate unfettered. They drafted a set of restrictions on sign size, placement and brightness which have been incorporated into the City Code. "The specifications make regulation seem like an exact science, when it's really just public and private actors negotiating acceptable limits," voices one critic. While imperfect, it sets a valuable precedent for regulation because the proposed ordinance limits the amount of light digital signs can emit, their illumination must be measured and monitored by an instrument widely available and specially designed for this purpose.

Tulsa, Oklahoma

The study "Digital Billboard Recommendations and Comparisons to Conventional Billboards" recommends billboard brightness of 342 nits for an average sized (10'6" x 36') billboard under average ambient lighting conditions (Lewin, 2008).[14] In response to these recommendations, the Planning Commission of Tulsa, Oklahoma recommended a limit of 300 nits for all signage, but this was raised to 500 nits before becoming law, due to pressure from the outdoor advertising industry.

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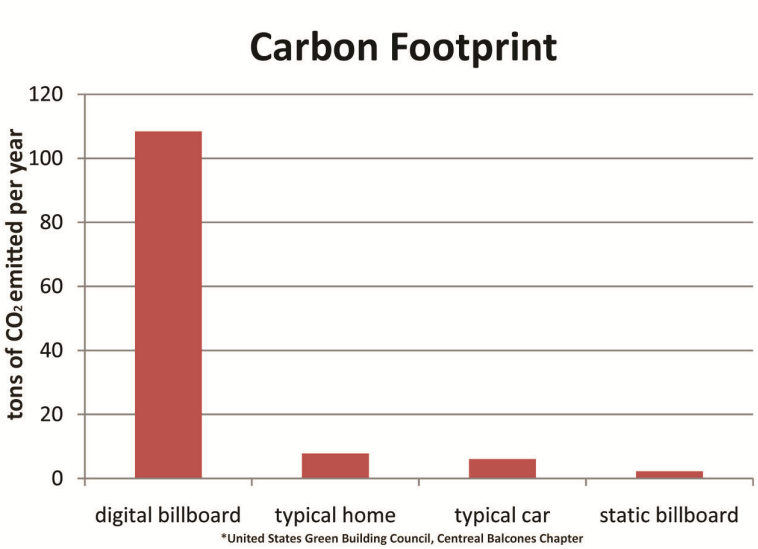
[12] The Pittsburgh Code, Title Nine, Zoning Code, Article VI, Chapter 919, Signs.
[13] Naser Jewelers, Inc. v. City of Concord, 2008. WL 162521 (C.A. 1 N.H. 1/18/2008)
[14] n.b. This study was funded by the Outdoor Advertising Association of America.

Municipalities that ban or limit digital billboards

STATE	CITY/COUNTY	ACTION TAKEN
Alaska	(state)	Ban
Arizona	Gilbert	Ban
Arizona	Pima County	Moratorium
California	Los Angeles	Moratorium
California	San Francisco	Ban
Colorado	Denver	Ban
Florida	Largo	Ban
Florida	Pinellas County	Moratorium
Florida	St. Petersburg	Ban
Georgia	Atlanta	Moratorium
Hawaii	(state)	Ban
Maine	(state)	Ban
Michigan	(state)	Considering Moratorium
Minnesota	Minnetonka	Moratorium
Minnesota	Oakdale	Moratorium
Minnesota	(state)	Considering Moratorium
Missouri	Lake St. Louis	Ban
Missouri	St. Louis	Moratorium
Montana	(state)	Ban
North Carolina	Durham	Ban
Rhode Island	(state)	Moratorium
Tennessee	Knoxville	Ban
Texas	Amarillo	Ban
Texas	Austin	Ban
Texas	Dallas	Ban
Texas	El Paso	Moratorium
Texas	Ft. Worth	Ban
Texas	Galveston	Ban
Texas	Houston	Ban
Texas	San Antonio	Moratorium
Vermont	(state)	Ban

Policy Recommendations:
Electronic Signage and Philadelphia's Future

Philadelphia is currently in the process of a complete overhaul of its zoning code and comprehensive plan, bringing the city into the present and preparing for its future. A recently released draft of the updated code does aim to control digital advertising, but more (and better) regulation is needed; the draft focuses on off-premise advertising, and is particularly relaxed regarding on-premise electronic message boards.



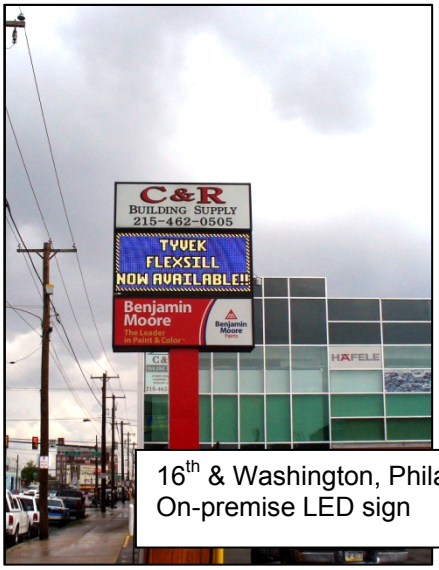
For the purposes of controlling light pollution and energy consumption, the distinction between on-premise and off-premise signage is of little relevance; as such, we offer similarly cautionary restrictions for both sign types, from a traffic safety perspective, on–premise signs may be worse. They can be bigger, closer to the roadway, have motion and animation (Wachtel, 2009).

Our first issue with the draft is one of semantics: currently, the draft specifically regulates any sign with action or motion, animation, rotation, scrolling, flashing or color changes, or upon which illumination is not maintained at a constant stationary intensity and/or color, as a means (we assume) of regulating digital signage in general. We anticipate that this language could create the opportunity for misinterpretation; electronic and digital message boards are not necessarily flashing/animated/intermittent, as they are capable of the display of static, yet still excessively bright, imagery. Advertising companies often specifically describe their digital signage as "static," as a way to circumvent inexplicit regulation such as this.

We suggest revising the zoning language to include any and all digital signage, defined as any sign capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means,[15] ***not*** just those that are animated, flashing, or intermittent, which can be subjective descriptions.

[15] From Oklahoma City Municipal Code, 2007, Chapter 3, Article V, Section 3-82.

The current draft states that off-premise digital billboards are not to be located within 500 feet of an entrance or exit ramp to any major highway, or within 200 feet of any intersection of the street or highway on which it is intended to advertise to. For off-premise signage, the proposed code prohibits flashing signs, signs with intermittent illumination, or signs with mechanically or electronically changing messages within 500 ft. of any residential district. It also prohibits them from facing any residential district within 1,000 ft. For on-premise digital signage, these distances are lowered to 150 ft. and 300 ft., respectively.



16th & Washington, Philadelphia
On-premise LED sign

We recommend that this regulation be expanded and increased; best practices from the Australian states of Queensland, Victoria and New South Wales, South Africa and The Netherlands illustrate the rigor with which the situation of electronic advertising must be assessed before it can be deemed safe for motorists and other road users. Among the considerations these governments require in assessment of the placement of outdoor advertising are: traffic speed on the adjacent roadway, sign content, legend height, vicinity of official traffic control devices, type of street or interchange, sign brightness, hold time, sign content, the potential that an advertisement will be mistaken for a traffic control device, the amount of information communicated, the concision and legibility of the advertising message, and an advertising structure's obstruction of key sightlines. These best practices are detailed in the attached Appendix D, Excerpt from *2009 AASHTO Report*. (Wachtel)

According to the present draft, signs may be illuminated, but the illumination shall be focused upon the sign itself, so as to prevent glare upon the surrounding areas, and digital billboards must have a luminance level appropriate to the ambient environment in keeping with the standards set forth by the Illuminating Engineering Society of North America (IESNA). These regulations are too vague; we propose specific limits to prevent light trespass and light pollution. As such, the illumination projected from any use shall at no time exceed 0.1 footcandle onto a residential use, and 1.0 footcandle onto a non-residential use. This should apply to light emitted from any form of signage, on-premise or off-premise. We also propose specific luminance limits of 100 nits for nighttime conditions, applicable to all digital signage. (Lebenbuhl)

Additionally, there must be prescribed methods for determining compliance with the aforementioned illuminance and luminance limits. Again, ***illuminance*** measures the amount of light which falls onto an object; ***luminance*** measures the amount of light an object gives off. To gauge light trespass on neighboring properties, illumination shall be measured (in footcandles) at any time and from any point on the receiving property line using an illuminance light meter. While an illuminance meter is a practical device with which to measure light trespass, inherent sign brightness is best measured using a luminance meter, which is capable of directly measuring the surface brightness of signs. Luminance meters are quite costly; sign owners should be financially responsible, by means of permit fees, for any and all equipment/operational costs needed to ensure that their luminance levels remain in compliance with aforementioned limits.

Luminance limits between the full sunlight limit and the nighttime limit may also be specified for overcast or foggy days. Regulations should require an automated control of sign luminance based on current ambient lighting conditions. To further control light pollution, off-premises digital signs shall be extinguished automatically no later than 11:00pm each evening until dawn. Signs for establishments that operate or remain open past 11:00 p.m. may remain on no later than one half hour past the close of the establishment.

Where new digital signage construction or digital conversions *are* permitted, there should be a "trade-off" policy, based on power consumption. For every square footage of digital signage an outdoor advertising company installs, via new construction or conversion, they must remove a specified amount of square footage of their existing static signage, in order to maintain or reduce their carbon footprint. Such a policy has been implemented in many cities and states. Finally, obsolete or otherwise discarded digital signage, and all accessory components, must be fully recycled at the expense of the manufacturer**.**

Conclusion

Our research and the resultant policy recommendations could not come at a better time, as digital signage figures prominently on several hot-button issues regarding Philadelphia urban development. For example, the Market East corridor of Philadelphia is in great need of renewal and rethinking; the look and feel of the "new" Market East is a very controversial topic. Councilman Frank DiCicco's Outdoor Advertising Bill 100013 takes away the city's ability to regulate signage and will allow massive outdoor advertising signs including LED digitals and rooftop billboards along Market Street between 7th and 13th Streets, transforming Market East into a garish thoroughfare reminiscent of the Las Vegas Strip.

Paul Levy, president and CEO of the Center City District and a key player in the revitalization of Market East, is amenable to the sorts of eye-catching wraps, digital and LED signs, though he says the city must make sure they stimulate development.

“Building owners shouldn't get to throw up a giant ad on a tiny decrepit storefront. They should only be able to profit from these signs --- and thus generate tax revenue for the city --- if they renovate their properties in line with city standards and fill them with people” (Rubin 2010).

Over the past ten years, many studies of digital signage have focused on the issue of driver distraction and road safety. These studies have been conducted in many countries (e.g. U.S., U.K., Australia, South Africa, The Netherlands, Norway, and others) and they have used a variety of research methods, including simulator and laboratory investigations, opinion surveys and focus groups, on-road studies in instrumented vehicles, and longitudinal analysis of summaries of traffic collision reports. With only two exceptions, those recent studies performed by government agencies, universities, and non-profit traffic safety organizations, have found a detrimental effect on driver distraction (or other measures of traffic safety) in the presence of billboards. The only studies that have reported no adverse safety impact of digital billboards have been those sponsored by the outdoor advertising industry.

And we use the word "reported" advisedly. That is because, in one case, despite the study authors reporting no distraction from digital billboards, the actual data collected clearly showed such an adverse impact. And, in the other case, despite the study authors reporting that the presence of digital billboards had no effect on traffic crashes, the authors have been challenged by experts, both in peer review and in public forums, for using improper statistical methods - with the results that their reported conclusions are unjustified and should be retracted.

The Federal Highway Administration is nearing completion of its own on-road research study looking at levels of driver distraction as measured by eye movements in the presence and absence of digital billboards. This report is expected to be available in the first quarter of 2011.

Higher electricity consumption, increased light pollution, and recyclability issues should make us pause and question the growing popularity of digital signage. As America at last embraces sustainability and Philadelphia strives to become the “greenest city in America,” is a proliferation of digital signs along our highways and storefronts sending the right message?

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Visit http://www.publicvoiceforpublicspace.org/ for more information.

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