Nathalie Rozot/USA

(em)Powering Times Square.

How can a quintessentially energy-hungry light environment such as Times Square show environmental stewardship for higher performance 21st-century nightscapes? In this paper, we present the preliminary results of "(em)Powering Times Square," a research initiative which uses Times Square as a case study for a computation of the light output in electronic displays from renewable energy input. In the lineage of a historical cultural context which has bred an unprecedented "electrical sublime", today's large media displays capitalize on 24/7 brightness, and the yearly consumption of digital signs averages fifty times more than that of conventional lighting applications. We will hypothesize sustainable models of adaptive lighting and energy solutions, and assess economic and environmental differentials between models.

Moreover, we approach Times Square as a system – a whole rather than a sum of parts. We argue that a City

Ordinance from the 1980's (which uniquely requires the presence of façade lighting throughout Times Square to preserve its cultural character) signifies the hybridization of private signage and civic lighting.

"(em)Powering Times Square" creates an opportunity to re-interpret the ubiquitous lighting technologies that are embedded in the constructed environment as evolved ecosystems. By extension, this project illustrates the studies and research undertaken by PhoScopeTM, a "photocentric" think-tank that aims at engaging the general public, as well as stakeholders in public space and land-use, into new trans-disciplinary debates about the lighting ecologies that comprise nightscapes.

Cultural historical framework

Times Square was born out of New York's early 20th century spatial-temporal context. When a new subway station opened in 1904, infrastructure channeled large crowds into the square's atypical typology (a large open space at the intersection of 7th Avenue and Broadway, surrounded by low structures that were well suited for large signs). Times Square promptly became a fertile breeding ground for electric advertisement technologies, which surpassed the district's gaslit publicity.

In the settling American culture, a synergistic evolution of society, technology and economy facilitated a robust urban ecosystem of lit displays in the public realm.

Abroad, electric advertising was deemed visually intrusive, and in New York it was opposed by the upper-class elite. Yet it flourished in the capitalistic American urban habitat in general, and in Times Square in particular. "Super-sized" lit advertisements soon became an integral part of American popular culture. While utility companies were branding "Great White Ways" across the country, in Times Square the dazzling urban spectacle stole the show.

Early on, illuminated advertising also benefited from the progress of connected technologies: mechanized controls, lamp technologies and special effects all contributed to animating the ever-greater electric sign.

Light also meant added value, and new intertwined economies proliferated. Signage developers capitalized on novel technological applications to lease advertising space to advertisers who could trademark their brands to consumers. This economic model has been sustained to this day: rents for signs range from $400,000 to $4 million a year, and all the combined signage is valued at $140 million and adds $75 million to taxable property values. (Times Square Alliance).

Importantly, Times Square is a global portal. Every day, 500,000 people go through Times Square – 250,000 employees and residents, 250,000 tourists and passersby and ten million remote users are exposed to it through virtual environments, advertisements plus film and television. It has 25 million visitors every year; it is the 7th global tourist destination for Americans, and the estimated global television audience of its New Year's Eve event is one billion (Times Square Alliance).

We therefore argue that Times Square should capitalize on this stupendous public exposure to pioneer a sustainable urban ecosystem, and serve as a vector to scale-up forward-thinking lighting and energy models in the contemporary context.

Project development – Survey

The project's footprint extends from North 42nd Street to South 47th Street. For the purpose of a preliminary study, we evaluated billboard size through field surveys, and electrical loads with data obtained online and from manufacturers. This method allowed us to compute mean average loads, which was appropriate for the purpose of a preliminary assessment.

⇛ LED Displays (Type A) (Figure 1, Figure 2) Estimated at 97,500 square feet (2.25 acres)

Figure 1: WalGreens Spectacular, One Times Square. Photo: Stephen Horner

The manufacturer D3 LED claims 80 percent of the district's digital displays. The balance is almost entirely provided by a second manufacturer (Barco), and a small percentage by other manufacturers, with technologies at times obsolete. D3 provided us with data for their LED modules, which we combined with on-line documentation to confirm the size and power requirements of digital displays.

⇛ Floodlit Banners (Type B): Estimated at 60,000 square feet (1.4 acres)

Providers and service companies reported using 250 watt or 400 watt metal halide floodlights, and our field observations revealed numerous 1000 watt projectors. Moreover, we estimated over a third of all equipment to be significantly dated. We used our photographs to count fixtures (our count of 500 fixtures is probably underestimated), and assigned fixture wattages based on an informed visual grouping of fixture type.

Figure 2: Floodlights in Times Square. Photo: Stephen Horner

For the most part, banners are stretched over building-mounted structures. Maintenance and installation providers indicated that most banners are 20 x 20 feet or 20 x 40 feet, but on-site observations showed considerable variety (some of the more dynamic banner systems are patchwork arrangements of different sized banners used for an advertising campaign) (Figure 3).

⇛ Other Types of Lighting (Type C): Estimated at 7,000 square feet (ten percent of all signage)

This category represents a mix of lighting technologies.

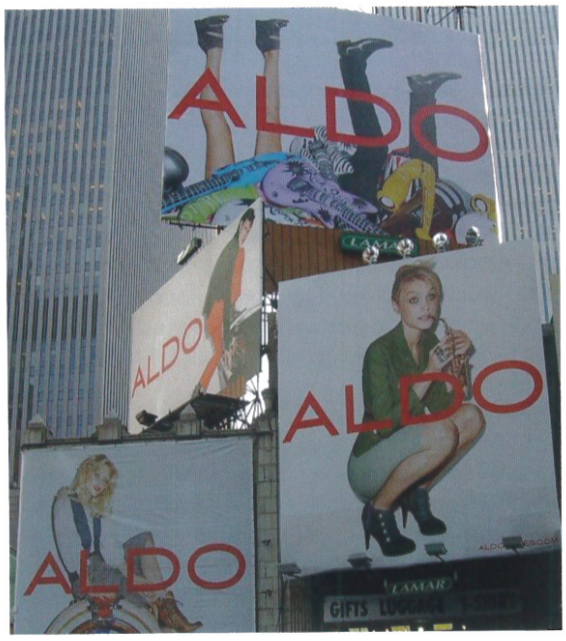

Figure 3: Banner Patchwork. Photo: Stephen Horner

Many of these are remnants from the 'Spectacular' tradition, which anchored signage and dynamic detail in the vernacular architecture.

We also assigned a location and estimated size and watts per square foot to significant back-lit fluorescent banners. (Figure 4)

Figure 4: Fluorescent banner lighting. Photo: Stephen Horner

Results

We compiled all data to perform comparative studies between the respective area and energy intake of the three billboard types.

Description	Total Estimated Area	Total Estimated Power requirements
Architecture & Public Right of Way	700,000 square feet	
Architecture Only	550,500 square feet	
All Media	162,555 square feet (23 percent of architecture and public right of way)	1,600,200 watts
LED boards	97,500 square feet (60 percent of all media)	1,150,000 watts (72 percent of total)
Flood lit banners	58,000 square feet (36 percent of all media)	310,500 watts (19 percent of total)
Other types	7,000 square feet (nine percent of all media)	140,000 watts (nine percent of total)

As we assessed global loads and power requirements for all signage combined; we engaged energy specialists in the project to estimate alternative energy systems. Their preliminary results for renewable energy generation indicate that three acres of photovoltaics would be needed to meet the power requirements of the study's footprint.

Figure 5: Lit advertisement in Times Square, 2011. 3D rendering, Photic

Analysis

For a lighting professional, Times Square represents a conundrum. Lit far beyond typical outdoor light levels with a cacophonous assemblage of lighting technologies, it is also a commanding public space that marries public excitement and enchantment. We spent a lot of time discussing Times Square's photo-spatial qualities, and outlined several areas of analysis to develop:

⇛ Cultural history: it is critical to develop more research to contextualize the future sustainability of digital urban environments.

⇛ Perception: Times Square feels saturated with digital dynamic movement, yet media represents only 23 percent and LED boards 14 percent of the available area. Both the flow of pedestrians and vehicles, as well as the heightened human response to dynamic light stimuli induce this perception. We began analyzing perceptual variations among what we categorized as the One-Off, the Occasional and the Habituated observers.

⇛ Light Models and Metrics: we will translate the A, B and C sign typologies into spatial models of emitted versus reflected light, and compute quantitative variables (content for LED displays and reflectance in banners) and modulated light levels. (Figure 6)

We will also model how civic lighting could be integrated into the district's commercial displays. In Times Square, requiring façade and signage lighting by City

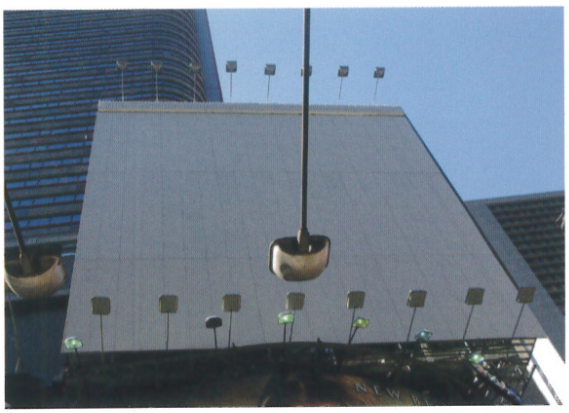

Figure 6: Reflected light in Times Square. Photo: Stephen Horner

Ordinance establishes these features as hybrid commercial/civic lighting solutions. Moreover, Business Improvement Districts are hybrid public-private partnerships whose legal jurisdictional framework could support new energy and lighting propositions for sustainable 21st century nightscapes.

⇛ Renewable Energy Models: we will complement our preliminary findings with technology research, and study on-site/off-site, grid-metered/off-grid energy models

⇛ Lighting and Display Technologies: we will study the tectonics of existing and upcoming lighting and display practices and technologies.

Future research

"(em)Powering Times Square" was initially undertaken as a research project, but our results to date are encouraging and call for a feasibility study. Moreover, we will extend this study to other locations worldwide, as well as develop related critical studies. Exploring light and lighting and advertisement systems jointly through the lens of critical research exposes the context and legacies of political and jurisdictional frameworks that regulate public space and lighting systems.

Another line of research echoes William Mitchell's provocative question in Placing Words: "What does a pixel want to be?" While 20th century artists and architects alike embraced the American sign as a form of vernacular, the typology of billboards in the constructed environment has not significantly evolved. As contemporary and future markets and technologies drive formal change, they will need to be accountable to a sustainability agenda.

Moreover, this work expands beyond the limited framework of today's conventional lighting master-planning strategies. We posit that lighting systems are lighting ecologies that are integral to the cultural history of our constructed environments' forms and functions. As elements of a vital civic system, they call for the development of revised lighting rationales. New scientific and design criteria and critical frameworks must be established for the emergence of 21st century sustainable lighting systems within varying and evolving urban typologies.

In 2011, I launched PhoScope™, a new think-tank that aims at advancing 21st century nightscapes, critical studies, as well as the conventions of lighting practice and education. PhoScope™ will explore speculative and applied models to promote improved social and environmental practices by integrating research in health and vision science, social sciences, sustainability, art, aesthetics and economics.

Conclusion

As a lighting design practitioner and an educator, I relentlessly advocate the significance of urban nightscapes. Lighting design is still a young discipline, and one which lacks critical study. A field at the crossroads of health sciences (the physiology of vision), social sciences (the psychology of perception), physics, design and technology, lighting needs to initiate new research, planning and design endeavors.

Projects such as "(em)Powering Times Square" can reveal the meta-patterns concurrently emerging at the global scale of the metropolis. A research framework such as PhoScope™ will help bring recognition to this largely unknown but vital design discipline, and to the need for innovative and sustainable lighting models for the urban realm.

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