



# EPSON®

## Projection or dvLED?

A thoughtful discussion on selecting the right display technology for your space.

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# Introduction

When choosing display technology for medium- and large-venue settings — such as higher education, corporate or live-event spaces, like houses of worship — buyers are often faced with an important decision: Which display type is best? Today, the choice often comes down to two — **projection or direct-view LED (dvLED)**? If you haven't had this conversation recently at a trade show, you've certainly read about the topic online. It's an important decision for end users. As with all technology projects, there's a lot on the line.

Of course the application, whether indoor or outdoor, plays a huge factor (more on that later). But, interestingly, many in the industry tend to lean toward one or the other; they're either Team Projection or Team LED. We argue that's not the best way of thinking. Why? Because new innovations and advances in audio-visual technology mean new considerations. As AV innovates, the projection versus dvLED debate gets reshaped. Now, more than ever, it's worth viewing with a fresh set of eyes.

Advancements in laser light and solid-state technology over the last decade have breathed new life into projectors. This has put projection well ahead of dvLED for many common applications in terms of cost (projection typically costs much less), complexity (it's simpler and, often, physically easier to manage), flexibility (easy to change display size, move or change the projector) and image quality. Projection technology allows for closer viewing distances in most cases. This white paper will explore the top four considerations within the debate.

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**Environment and Light Conditions**

2

**Physical Space and Viewing Distance**

3

**Complexity: Installation, Design and Maintenance**

4

**Budget and Total Cost of Ownership (TCO)**



# Projection vs. dvLED:

## Four Key Considerations

### 1 Environment and Light Conditions

Environment is a key consideration in the projection versus dvLED debate. Ambient, or “encompassing,” light — the light that hits our projector screens or displays — greatly influences the design of display systems. Indoors, ambient light sources come from both task lighting and decorative lighting, including overhead lights, recessed downlights, ceiling-mounted lights, floor and table lamps, or natural light that comes through the windows. Outdoors, direct sunlight is the biggest factor at play.

LED walls were originally designed exclusively for outdoor use where there is significant direct sunlight and high ambient light — consider digital billboards, spectacles or displays used in outdoor stadiums. That said, dvLED has made its way indoors, as narrowing pixel pitches have made it possible for them to be used in applications in which the audience is closer, and the need for more flexible technology spaces has required brighter displays in rooms with windows or other ambient lighting. Does this movement toward using dvLED indoors really produce better results for AV/IT and viewers of the display? Many argue it does not, because in most indoor applications, laser projection is still the best choice of display technology, even before costs are considered.

Laser projectors are ideal indoors, certainly for any application with moderate light. A projected display is merely reflected light, only visible when the projector is on, so it works more harmoniously with other interior design elements. Projectors are often more in sync with the overall interior design and lighting template of a space. With an LCD or LED wall often permanently installed onto wall structures, you don’t get that same luxury of being able to “hide” or disguise the display surface when it’s not in use. Outdoors and during the daytime, where more ambient light comes into play, dvLED is often the more appropriate choice.



*Copyright of The Temple House*

It’s worth revisiting how far projection has grown. With advances in laser light source technology, projectors have become [brighter and more compact](#) than ever, overcoming many challenges via new technology. Take the development of ALR, or ambient light-rejecting, screens, which literally “reject” unwanted light and restore image quality. While ambient light is still a concern with projection in extremely bright situations (such as those with direct, full sunlight), projectors are now a viable, affordable option in many applications with a considerable amount of ambient light. Choosing projection at the start of the project allows teams to make optimal design choices for the space — like minimizing overhead lighting and other ambient light — from the beginning.

# Example Application: Corporate Lobby

If the environment is suitable for it, consider that you have options with projection that you may not have had in the past. For example, the typical corporate lobby has 200 lux (a measure of light intensity or how much light falls on a certain area) of ambient light. With a 200-inch display screen, and the audience viewing the content from between 5 and 25 feet away, you could employ an [Epson EB-PU2216B laser projector](#) with 16,000 lumens.<sup>1</sup> In this scenario, you need only account for roughly 50 pounds of weight (not including the lens), with merely 1,118 watts of power consumption. Juxtapose this with the LED alternative: a Planar TWA Series 1.8 mm pixel pitch and 16-cabinet LED. With this option, you have to account for 1,000-plus pounds of weight (not including mounts), with power consumption totaling 7,570 watts.<sup>2</sup> Alternatively, to overcome a brighter environment or for higher image contrast, a brighter projector can be utilized. Two projectors with matching brightness can also be stacked.

## Choosing Technology for a Corporate Lobby: A Side-by-Side

### Direct-View LED

Technology: Planar TWA Series; 16 cabinets; 1.8 mm pixel pitch

Weight: 1,096 lb., not including mounts

Power Consumption: 7,570 watts

### Laser Projection

Technology: Epson EB-PU2216B; 16K lumens<sup>3</sup>

Weight: 53.3 lb., not including the lens

Power Consumption: 1,118 watts



*Projected image simulated.*

## 2

## Physical Space and Viewing Distance

Designers know they need to consider viewing distance when specifying display technology. How far will the audience be from the display or screen while viewing it?

The closer viewers are to the dvLED display, factoring in pixel pitch and wall size, the more they see the black gaps between pixels and the poorer the content looks. Therefore, dvLED walls typically require the viewers to be significantly further away for optimum viewing. As dvLED technology advances, pixel pitch — the distance from the center of an LED cluster (or pixel) to the center of the next one — narrows considerably. The smaller the pixel pitch, the higher the pixel density and the closer a viewer can be without noticing the pixels. The problem is, smaller pixel pitch and higher resolution in dvLED come at a price. And it's a premium price. To remedy this, some LED manufacturers provide options (either "acceptable" or "optimum" pixel pitch) based on recommended viewing distance: 1 millimeter of pixel pitch per 8 feet of viewing distance. Still, because of the very high cost of a smaller pixel pitch, users are often forced to choose merely a satisfactory viewing experience (acceptable pixel pitch) over what's called "maximum visual acuity" (optimum pixel pitch) at specific distances.

With projection, you don't have to settle to get the optimal viewing experience; projection affords users the best-resolution option in almost any circumstance in which budget allows. For a display of similar size and resolution, the acceptable viewing distance for projection is closer, as projection does not have the non-luminescent area — the unlit area between LED lights — that leads to a low-definition image for the viewer. Projectors' reflected light display paired with a high resolution means spectators are able to get closer to the screen or content. Additionally, 4K and [ultra short-throw lenses](#) further enable close viewing distances. Projectors with ultra short-throw lenses, in particular, can be on the ceiling just a few inches from the screen or wall and still provide incredibly large display images.

Advancements to projection, and to complementary hardware and software, have enabled extremely immersive applications. While dvLED displays can be curved, both concave and convex using unusual shapes, projection has evolved brilliantly to accommodate groundbreaking techniques like projection mapping and multi-projector edge blending. You can do projection on practically any surface, and even a single high-brightness projector works beautifully on curved surfaces, corner walls and any 3D object, wall or structure. In fact, today, the majority of 360-degree immersive environments [use projection technology](#).



*Multiple projectors projecting onto a curved wall — a simpler alternative to the dvLED equivalent. Disclaimer: Images have been simulated.*



*A projector, hidden in the ceiling, used with an ultra short-throw lens that minimizes shadows. Disclaimer: Images have been simulated.*

## Direct-View LED

### Still Very Expensive.

Direct-view LED allows for large-screen applications — there's no true limitation on screen size — and smaller pixel pitch allows viewers to get closer to displays. But LED walls still generally require significantly further optimum viewing distance, and narrow pixel pitch walls come at a hefty price.

## Laser Projection

### “Maximum Visual Acuity” for All.

Projectors afford users the best-resolution option in almost any circumstance. Viewers can get much closer to the projector's content, allowing for added creativity in AV designs. While LEDs are known for use in large venues, projectors are tried and true in small, medium *and* large venues.



### 3

## Complexity: Installation, Design and Maintenance

Projection and dvLED differ vastly in how complex they are. And complexity trickles into every phase of the project — from design to installation to maintenance. When specifying any new technology, especially something as important as displays, you want to feel confident in all aspects of the project. That's harder to accomplish with dvLED, because half the battle with dvLED is just navigating the complexity around it.

Direct-view LED video walls require panels, frames, data and power cables, and image processors; and the complexity only increases with larger sizes, requiring more panels and additional calibration. Direct-view LED installed on curved or corner-wall displays, as opposed to a flat wall, adds another layer of installation complexity. There are few distributors who specialize only in dvLED, meaning there's less widely available specialized support. When AV and IT end users have to deal with dvLED manufacturers directly, it requires tremendous added effort to make sure the right questions are asked: What are the shipment lead times, with most LEDs largely sourced from China, how do you ensure panel supply and image consistency when every LED manufacturing run produces slightly different image outputs? Additionally, because there are so many dvLED manufacturers claiming to have the brightest and cheapest LEDs, there's a lot of questions around the reliability of certain technology and hardware.

Video walls, using any display type, are also physically big and heavy, and structural engineers are often a requirement during the design phase. Not just any wall or construction material can support video wall installations. And in retrofits, the damage to existing structures may be significant. Think about, for example, the difficulty of mounting video walls in historical buildings or churches. Safety is also a significant consideration, both on the jobsite for installers and after completion, when viewers walk or stand under or near video wall displays. Large, bright projectors in multi-projector designs and very large projection screens are physically significant installs, as well. But with the advent of smaller, lighter projectors, projection-based applications are almost always easier, faster, cheaper and safer to install and maintain than large video walls.

### **Laser projection offers the flexibility to change the space configuration in both fixed and temporary installs.**

Avoid costly and complex installation builds by simply choosing laser projection, which offers the flexibility to change the space configuration in both fixed and temporary installs with ease. Now, it's easier than ever to scale projector images to different screen sizes and shapes, matching different room designs instantly. A benefit to projection is that the calculations around content and resolution are vastly easier to understand than those in dvLED. (Think of projection calculations like instant cake mix, while dvLED's are a complicated macaroon recipe.) Epson's large-venue projectors, like the Pro Series, include useful tools (e.g., Epson Projector Professional Tool, aka EPPT software) to help users realize these creative techniques, even on curved walls and corners. Blending, for example, automates edge blending with multiple projectors in a tiled configuration. With tools like blending, auto color calibration and screen matching, EPPT helps simplify and speed up installations, delivering a seamless projection experience.



Note that another major element of complexity is around maintenance: It's true that, in the past, AV/IT managers had to deal with projectors that required a lot of maintenance. Why? Lamps. With the evolution of solid-state light sources for projectors, rest assured that labor costs around projection maintenance are now minimal, arguably even nonexistent, thanks to the elimination of lamps and advancement of air filters that are virtually maintenance-free for up to 20,000 hours.<sup>4</sup>

## Direct-View LED

- ✗ Easy installation process (low installation complexity; installation flexibility)
- ✗ Low system cost
- ✗ Low design and install cost
- ✗ Low power consumption
- ✓ Long life cycle
- ✓ Fixed or temporary installs
- ✗ Ease in changing space configuration (Layout change requires panel additions)

## Laser Projection

- ✓ Easy installation process (low installation complexity; installation flexibility)
- ✓ Low system cost
- ✓ Low design and install costs
- ✓ Low power consumption
- ✓ Long life cycle
- ✓ Fixed or temporary installs
- ✓ Ease in changing space configuration (Layout change requires zoom or lens swap)



*Multiple projectors used with a super-wide, curved screen — a simpler alternative to the dvLED equivalent. Disclaimer: Images have been simulated.*

## 4

## Budget and Total Cost of Ownership (TCO)

Just because this category is last doesn't mean it's any less important. In fact, for many, budget is the number-one consideration. Notably, budget goes well beyond the initial system purchase. Consider TCO — including costs around maintenance, power consumption and life span — and not just the upfront cost of the equipment.

On the surface, prices are generally dropping for dvLED, a commonplace trend as any technology matures. But this doesn't necessarily account for total costs. When working with dvLED, you've got to consider costs related to image size, pixel pitch, maintenance and infrastructure upgrades; like any system, you'll pay more for better-quality images and longer-term warranties. We already know the price of narrow-pixel-pitch dvLED can be significant, and that's just the upfront cost. Installation, often with large-scale video walls that have safety considerations and require site surveys, gets pricier with every added layer. Of course, panel uniformity must always be maintained too — and a dead pixel replacement on an LED wall typically requires the recalibration of the entire wall and specialized labor. During installation, expensive required accessories include specialized mounts and LED video processors. If a panel fails, a back-up panel produced during the same manufacturing run is required. The costs add up.

One of the best arguments for dvLED is its extremely long life cycle — which, even with high upfront costs and maintenance, helps even out the TCO as compared to competitive display types. However, the advantage of displays that could last decades usually only makes sense for outdoor applications, those for which dvLED has traditionally been used (e.g., spectacles and billboards). In those applications, the upside of dvLED, including its longevity, is more important than the need to update technology more regularly. In indoor applications in which dvLED is now technically a possibility, such as classrooms or houses of worship, organizations are less likely to want to wait decades before changing out technology, even if it's possible. If there's one thing the last 10 years have shown, it's how quickly display technologies can evolve.

### The TCO of projection remains significantly lower than the TCO of dvLED.

Cost savings are one of the most well-known benefits to projectors. Though a projector's product life is shorter than that of an LED system's, projector life span only continues to improve. Still, the TCO of projection remains significantly lower than the TCO of dvLED in most circumstances — projection offering low installation complexity, minimal maintenance thanks to laser light-source technology, lower power consumption, lower design and install costs, and lower overall system costs. Projection saves yet another dollar by utilizing existing electrical and cable infrastructure, as well: one less headache and one more Advil saved.

## Direct-View LED

### TCO Is Not Realized in Indoor Applications.

The advantage that dvLED traditionally offers, lower TCO, only applies if you keep the installation for a very long time . But we know, today, that technology advances rapidly year after year; it's unlikely anyone will want to keep the same dvLED for their indoor applications that long. Additionally, the upfront costs of dvLED are drastically higher than those of projection, so the lower TCO benefit that dvLED offers in outdoor settings does not usually apply in indoor ones. In other words, dvLED's advantage of lower TCO is not realized in most indoor applications.

## Laser Projection

### Lower TCO Is the Way to Go.

Estimated TCO outlines for projection have vastly improved in recent years; projectors now need less maintenance, and they last longer than their lamp-based models. The lower upfront price point of projection also means dvLED rarely beats projection on the TCO front in most applications today. Compared to dvLED, the TCO of projection typically remains lower in indoor settings.

## Total Cost of Ownership (TCO)

When looking at TCO, make a quick budget sheet and add up the costs over time, factoring in:

- Design and install costs
- Layout change costs (for projection, it's a zoom/lens swap; for dvLED, it's a full panel addition/recalibration)
- Power consumption costs over time
- Overall system and equipment costs
- Expected or desired life span of installation



# Summary

## How to (and How Not to) Choose the Right Solution for Your Space

Seemingly every year, the dvLED versus projection debate is revisited, with new angles, new perspectives and new specifications to explore. This is all a good thing: When technology advances, usually improving year after year, we have an opportunity to revisit our display solutions to see if we're offering customers the best system for their needs. Ten years ago (really, five years ago), we'd be having a different conversation than we are today. That said, the foundational arguments made here remain the same: Projection remains the simpler, more cost-efficient choice, performing for customers project after project.

With its reputation for high-brightness detail, dvLED has been popular in outdoor applications. And dvLED may very well be the best choice for your needs. But as dvLED has made its way indoors — in reception areas, airport terminals, retail stores, even large corporate meeting rooms — too many end users are buying into the “brighter, better” angle. End users too often assume dvLED is better due to these feature sets but don't recognize that projection provides a high-performing, incredible-brightness option at the lowest overall cost plus many image quality and space aesthetic advantages.

With always-changing technology and system upgrades, one of the best decisions you can make is the one that will grow with you over time. In the context of choosing projection over dvLED, the four key factors noted above make the answer simple and clear. Don't choose based on assumptions or old habits. Be informed on both sides.

*To learn more about achieving high-brightness projection experiences in education, corporate or live events, visit [Epson.com/LargeVenue](https://Epson.com/LargeVenue)*



*Projection used in a lobby-type setting, showcasing creative techniques like projection mapping.  
Disclaimer: Images have been simulated.*



Pictured on page 1: Projection used in a bar-type setting, with a large display space but minimal effect on the existing interior design. Disclaimer: Images have been simulated.

<sup>1</sup> Target contrast 7:1, 200-inch diagonal display, screen gain 1.0

<sup>2</sup> Per Planar blog post, “How much does an LED video wall cost?” 5/4/2017 and Planar “DESIGN A CUSTOM VIDEO WALL” calculator

<sup>3</sup> Color brightness (color light output) and white brightness (white light output) will vary depending on usage conditions. Color light output measured in accordance with IDMS 15.4; white light output measured in accordance with ISO 21118. Some lenses will not support the maximum brightness level of this projector

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<sup>4</sup> No required maintenance for the light source for up to 20,000 hours. Approximate time until brightness decreases 50% from first usage. Measured by acceleration test assuming use of 0.04–0.20 mg/m<sup>3</sup> of particulate matter. Time varies depending on usage conditions and environment. Replacement of parts other than the light source may be required in a shorter period.