

A Business Case for Smart-Tinting Glass

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HALIO[®]

Smart-Tinting Glass



The Halio Advantage

Halio smart-tinting glass is the first and only smart glass that's responsive and looks natural at the same time. Halio gives architects and designers freedom to design without restraint, to create amazing spaces that become excellent places to work and live.

Halio delivers both tangible and intangible benefits. The tangible benefits are evident in reduced upfront and monthly overhead costs. The intangible benefits center on employee workplace experience made possible by Halio; these are more challenging to quantify, so we rely on academic research and anecdotal evidence to demonstrate the type and magnitude of benefits from smart-tinting glass.

We recently conducted a cost benefit analysis for a developer considering Halio for a future project. A 5-story, 235K square foot office building, the design incorporated several technologies to improve energy efficiency, including fixed interior fins and louvers, automated interior shades, and high-performance glazing.

We recommended two Halio options for this project. The first would use Halio on all facades, and the second blends Halio and Halio Black, with Halio on the north facade and Halio Black on the south, east, and west facades. The blended option would provide full flexibility of desk layout near the facades where direct sun would be problematic.

To illustrate the tangible and intangible benefits of Halio smart-tinting glass, we'll use this real-world project to exemplify the impact of smart-tinting glass.

Project Example Building Details

Building Type	Commercial office
Building Location	Pacific Northwest
Building Height	5 stories
Building Size	235,000 square feet
Glazed Facade Tested	40,000 square feet

Tangible Benefits

Tangible bottom-line savings come from reduced initial construction cost and lower operational costs. Construction cost reductions result from eliminating building components and downsizing HVAC equipment. Building operation and maintenance savings result from reduced lighting, HVAC usage, and peak demand charges. Specifically, Halio:

- **Eliminates the need for physical sun control solutions.** With Halio, exterior sun control devices such as overhangs, fins, louvers, or awnings, and interior daylight controls such as roller shades and blinds become unnecessary.
- **Reduces solar heat entering a building, thereby reducing peak cooling demand.** The lower peak demand means building engineers can reduce the size of an HVAC system.
- **Recovers highly desirable near-window space.** Halio Black allows for better floor space utilization by enabling seating right next to the windows without sacrificing thermal and visual comfort.
- **Reduces energy expenses** by as much as 20%, depending on the configuration and location of the building.

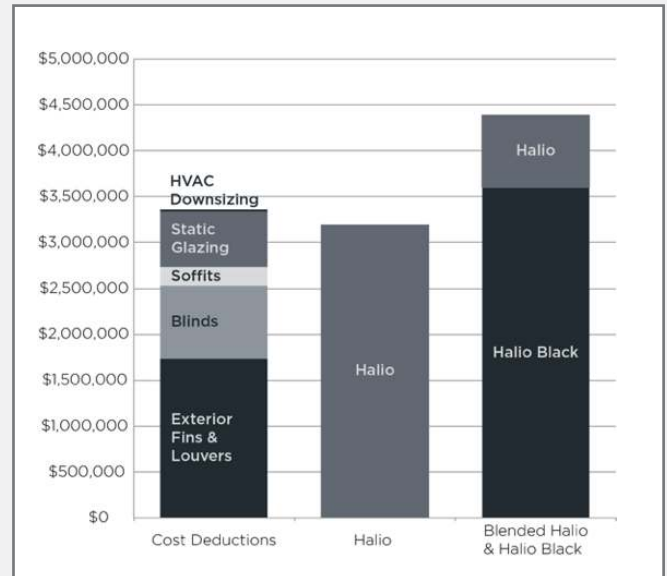
Construction Cost Savings

Installing Halio eliminates the need for fixed exterior shading (fins and louvers), traditional glazing, automated blinds, and blind soffits. The HVAC tonnage can also be downsized for a total savings of \$3.4M in our project example.

From the chart, it's easy to see that Halio will more than pay for itself. The infrastructure cost deductions (\$3.4M) in this example completely offset the cost of Halio smart-tinting glass (\$3.2M) for the building, and, in fact, result in a \$165K savings.

While the cost deductions do not completely offset the cost of the blended Halio and Halio Black option, it reduces the upfront cost from \$4.4M to \$1M.

Exterior Fins and Louvers	\$1,740,000
Static Glazing (high performance)	\$600,000
Blinds (motorized)	\$800,000
Blind Soffits	\$200,000
HVAC Downsizing	\$25,000
Halio for all Facades	\$3,200,000
Halio Black for all Facades	\$4,400,000



Operating Cost Savings

The proposed building's design incorporated energy-efficient technologies to reduce energy consumption by 15% compared to a building designed to meet the locale's energy code. Either Halio installation option, Halio only or a blend of Halio and Halio Black—both of which exclude exterior and interior shading—would save an additional 5% of energy consumption compared to the original design. The combination of the building's energy technologies and Halio smart-tinting glass would result in reduced energy consumption by 19% compared to a building designed strictly to meet code.

	Energy Use Intensity (kBtu /ft ² per year)	% Savings Over Code	Annual Value of Savings Over Code
Code	45.9		
Building as Designed (with interior and exterior shading)	38.9	15%	\$23,500
Building as Designed + Halio (without exterior and interior shading)	37.1	19%	\$35,250

Adding Halio would save the building owners an additional \$11,750 per year in energy costs.

Intangible Benefits

Intuitively, everyone knows that happy and healthy employees equate to higher retention rates and better productivity. While there are many factors that go into creating a great workplace, several independent studies have confirmed that employees in daylight offices with access to exterior views are happier, healthier, and perform better than those without.

The Impact of Daylight and Views in the Workplace

- **Boost employee productivity.** One study of a software development company showed that employees in a windowed office dedicated 15% more of their office time on work-related tasks. Another study of worker productivity at a call center showed that workers with views had a productivity of 6-12% higher than workers with no exterior view.
- **Improve employee health.** Daylight regulates our circadian rhythms as well as our endocrine systems. Employees with access to daylight during the workday are more physically active and sleep better at night (measured by REM and duration).
- **Reduce sick leave.** In a study of University of Oregon administrative staff, employees that were given improved daylight and views reduced their sick leave from 71 to 53 hours per employee, resulting in a 1% increase in annual work hours per employee.

The Halio Approach to Calculating the Intangible Benefits

Most people readily agree that working in offices with great daylight and views improves personal productivity; the challenge lies in calculating the productivity increases and determining who reaps the benefits - the building occupants (employees), developers, tenants, or the building owners (employers). Developers could point to productivity gains to attract high-quality employers. Employees in a daylit building could work the same number of hours but increase their output or maintain the same work output but work fewer hours. Either way, employees benefit. How much the employer benefits from installing smart-tinting glass is a more challenging calculation because most studies, including the academic studies cited in this paper, compare the productivity of employees in offices with windows against employees in windowless offices.

If productivity increases 10% or more when going from a windowless office to an office with windows and shades, can the same productivity increase be achieved when switching to an office with smart-tinting glass? After all, a poorly utilized window where shades are often left down is not the same as having no window. For these reasons, we believe it's appropriate to use a conservative productivity estimate and test the sensitivity by using a range.

Time Benefit of Productivity

A 1% increase in productivity can save an employee 30 minutes a week. Does Halio provide a 0.5%, 1%, 2%, or 10% increase in productivity? It is likely in the range of 0.5-10% but the needle is highly dependent and unique to each company and building.



Intangible Recurring Benefits

The following table shows the result of a 0.5%, 1%, 2%, and 10% increase in productivity. A quick analysis shows that companies can achieve a healthy return on investment (ROI), net present value (NPV), and payback period by using nominal productivity gains ranging from 0.5% to 2%.

Average Employee Salary	\$80,000			
Number of Employees in a 250,000 ft² Building	500			
Total Payroll of Building	\$40 million			
Productivity Increase	0.5%	1%	2%	10%
Annual Benefit to Employer of Increased Productivity (holding work time constant)	\$200K	\$400K	\$800K	\$4M
Annual Benefit to Employees of Increased Productivity (holding work output constant)	5,000 hours	10,000 hours	20,000 hours	100,000 hours

Halio Financial Benefit Analysis

The Halio-only option in our example would reduce the total project cost by \$165,000. The blended Halio and Halio Black option results in a \$1M initial construction cost.

To determine the savings in productivity, we used a conservative 0.5% productivity increase for the Halio-only option as there are times when employees may have to shift position to avoid glare. We applied a 1% productivity increase for the blended option to account for the increase in window access.

The results of the analysis show that both options have a large NPV. The Halio option doesn't have an ROI because it paid for itself in year 0, while the ROI for the blended option is a staggering 578%.

What is not included in this analysis is the value of the increased floor space gained by using Halio Black. Desks can be placed next to the facade, and there's no restriction on the facing direction. The analysis also doesn't include the savings from the maintenance expense that automated shades require or the building managers' time in responding to occupant complaints relating to heat and glare.

	Halio	Blended Halio & Halio Black
Year 0 Cost	-\$165,000	\$1,035,000
Recurring Tangible Benefit	\$11,750	\$11,750
Productivity Increase	0.5%	1%
Recurring Intangible Benefit	\$200,000	\$400,000
Discount Rate	7.5%	7.5%
Escalation (energy and salary)	2%	2%
Current Value of Tangible Benefit	\$170,772	\$170,772
Current Value of Intangible Benefit	\$2,906,749	\$5,813,498
Net Present Value (NPV)	\$3,242,521	\$4,949,270
Return on Investment (ROI)	-	578%
Simple Payback	0 years	2.5 years

Summary

Energy savings alone, though recurring, do not make a financial case for a smart-tinting facade. But developers and employers alike benefit from the intangible benefits provided by Halio smart-tinting glass. More natural light, views to the outdoors, and thermal comfort translate to healthier, happier employees – which improve recruitment and retention, especially important in a tight labor market. The Halio experience contributes to an owner's brand by underscoring the company's commitment to employee health and wellness by creating the most comfortable and healthiest workplaces possible. Developers, too, benefit by making it easier to attract innovative, forward-thinking companies.

