The Savings of Sustainability

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Abstract

This study investigates whether investing in solar panels can help school districts offset rising utility costs and secure long-term budget stability in the wake of reduced federal education funding. Using data gathered from public sources, the research modeled potential savings for Fort Bend ISD schools based on varying percentages of roof coverage. Results showed that higher solar panel coverage led to substantial reductions in electricity expenses and, at certain thresholds, the potential for additional revenue through surplus energy sales. The return-on-investment period remained a consistent 13.5 years across all scenarios. Despite these limitations, the study concludes that sustainable infrastructure offers meaningful financial benefits, and recommends future research focus on real-world case studies with verified provider quotes and localized conditions to improve accuracy and application.

Introduction

President Joe Biden's Executive Order 14057 (2) and the Federal Sustainability Plan (1) set a national goal for net-zero carbon emissions by 2050, inspiring cities like Houston to adopt water- and energy-efficient construction codes (3). Studies such as Ismail's *The Eco-Finance Paradox* (4) and Blum's *Greening the Office* (5) emphasize that eco-friendly practices not only reduce environmental impact but also offer long-term financial benefits. This study will explore how the implementation of solar panels can help Texas schools and reduce costs over time despite high initial investments.

Summary

The purpose of this research is to assess whether sustainable investments can provide school districts and municipal entities with increased financial flexibility as they face shrinking federal education budgets. Prior studies, such as *The Eco-Finance Paradox* (4) and *Greening the Office* (5), lacked precise financial ranges and were either too generalized or sector-specific, which limited their direct applicability to public education systems. This study narrows the focus to Sugar Land, Texas, and predicts that school districts could potentially save between $1 million and $5 million within a five-year timeframe, depending on the level of sustainable investment.

Methodology

This study gathered data through online research to determine key values, including the average square footage required per solar panel (8), the cost per kilowatt-hour (kWh) in Texas (9), annual kWh output per panel (10), and installation costs (11), and used official Fort Bend ISD sources to obtain school electricity expenses (8) and average building sizes by grade level (7). Using these values, calculations were performed to determine energy consumption, potential panel coverage at 5%, 15%, 25%, 50%, 75%, and 100%, projected energy output, total installation costs, annual savings, return-on-investment timelines, and percentage decreases in electricity spending. These metrics were chosen for their direct relevance to financial and energy efficiency outcomes, ensuring the research could accurately model both the cost and long-term savings potential of solar panel adoption across elementary, middle, and high schools in the district.

Results & Discussion

Figure 1 (Elementary School)

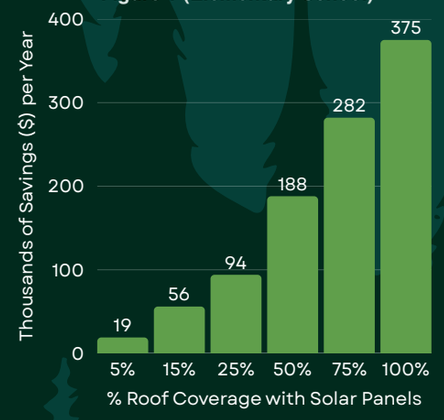


Figure 2 (Middle School)

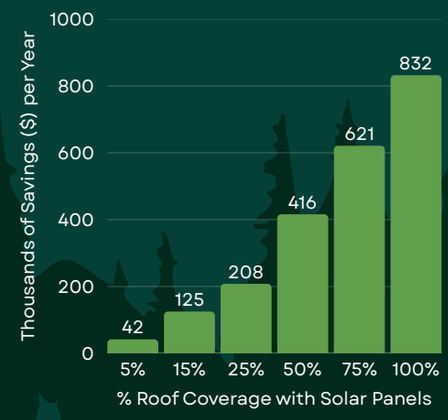


Figure 3 (High School)

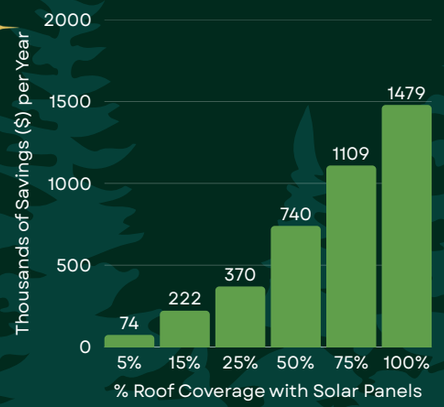
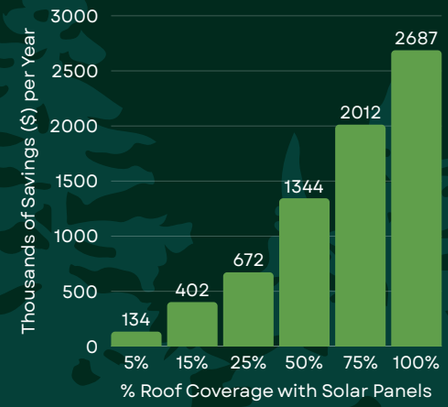


Figure 4 (Total)



This study faced several limitations, including reliance on non-peer-reviewed sources, generalized averages for school sizes, and self-calculated estimates for solar panel installation costs and potential energy earnings, all of which introduced possible bias and reduced precision. An unexpected and unlikely uniform return-on-investment period of 13.5 years across all scenarios highlighted the effects of oversimplification and suggested the need for more specific data and refined calculations in future research. Although the methodology was too broad to produce highly accurate results, the study still demonstrated that sustainable energy investments like solar panels could offer significant long-term financial benefits, and future research would be more reliable if narrowed to a single school, provider, and localized data to improve both accuracy and applicability. Future research should prioritize real-world case studies involving specific schools, verified provider quotes, and accurate local energy policies to better reflect practical outcomes.

Findings/Conclusion

The data indicates a clear trend: as the percentage of roof space covered by solar panels increases, the financial benefits also increase, including both reduced electricity costs and, at higher coverage levels, the potential for revenue through surplus energy sales (Figure 4). While the original hypothesis projected savings between $1 million and $5 million over five years, the results demonstrate that actual savings are highly dependent on the extent of solar panel installation—for example, a 5% roof coverage for one high school yields $370,000 in savings over five years (Figure 3), whereas 50% coverage results in combined savings and earnings of $1,850,000 over 5 years. Additionally, the data consistently shows that regardless of initial investment, schools can expect solar panel systems to fully repay their cost within approximately 13.5 years, supporting the hypothesis that sustainable infrastructure offers long-term financial viability.

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