



Comparative Analysis of Dynamic VS. Static Shading Devices for an Office Building in Hot and Dry Climate

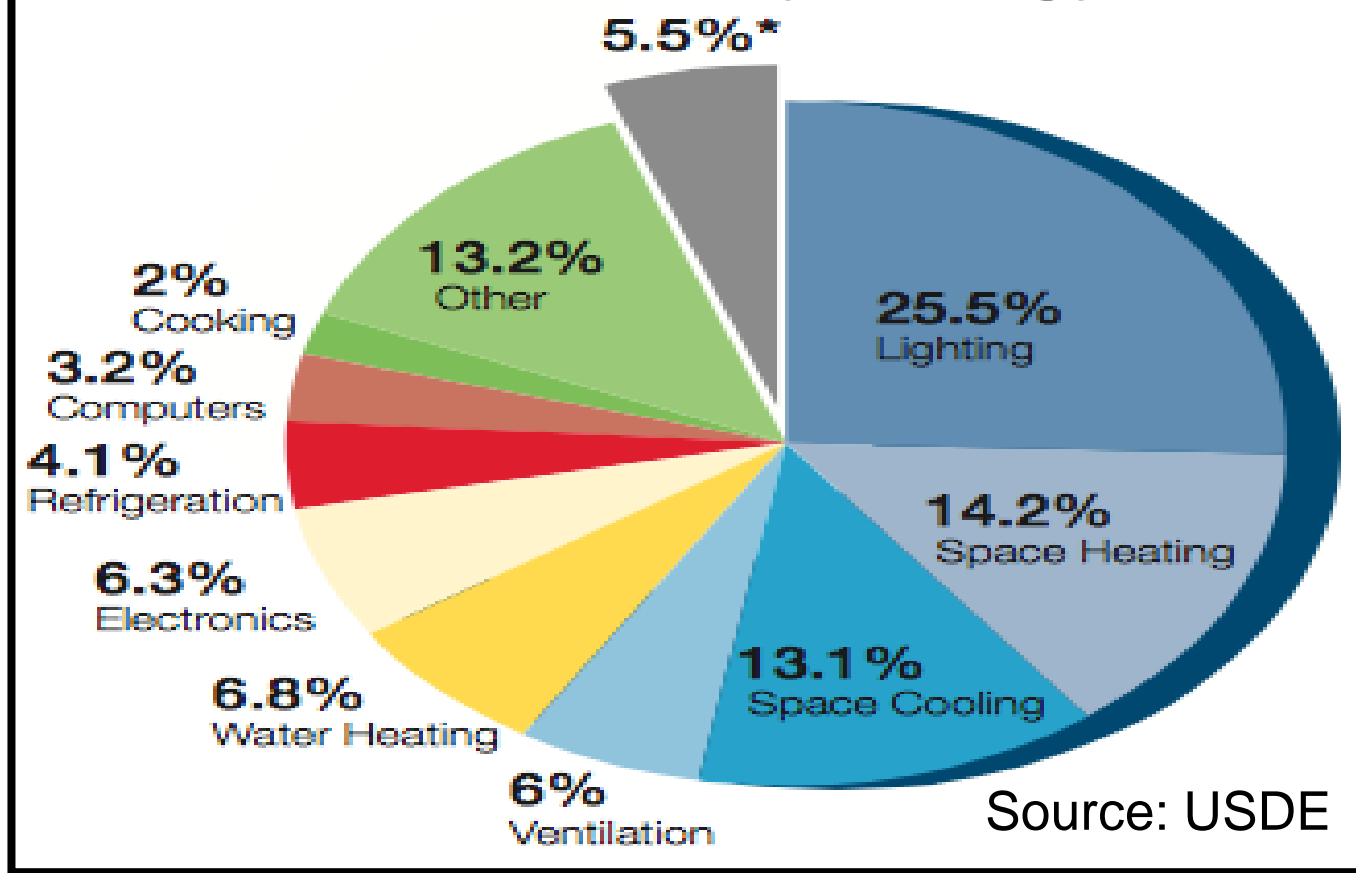


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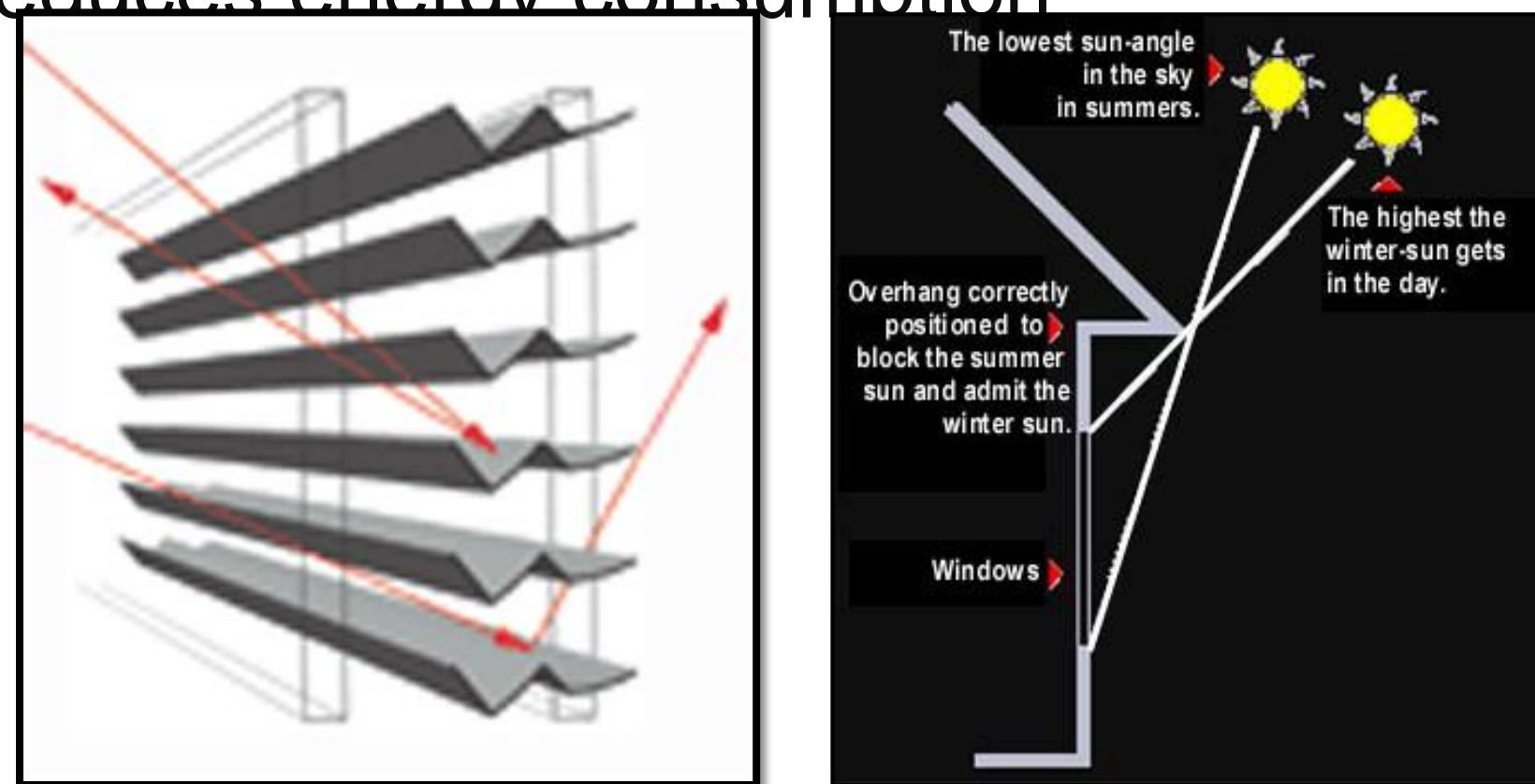
Introduction & Background

Energy consumption of commercial buildings are high due to the neglect of utilizing natural sources

Commercial Primary Energy Use



Dynamic shading on the exterior of buildings reduces energy consumption



Dynamic Shading Diagram Static Shading Diagram

- Systematic solar shading alters itself according to the angle of the sun
- Allows utilization of sunlight
- Lowers the need to use mechanical air conditioning

Objectives

- Determine whether dynamic shading would be effective to implement in office buildings
- Create a commercial building model using a 3D sketching software
- Conduct energy simulation to see benefits of dynamic shading

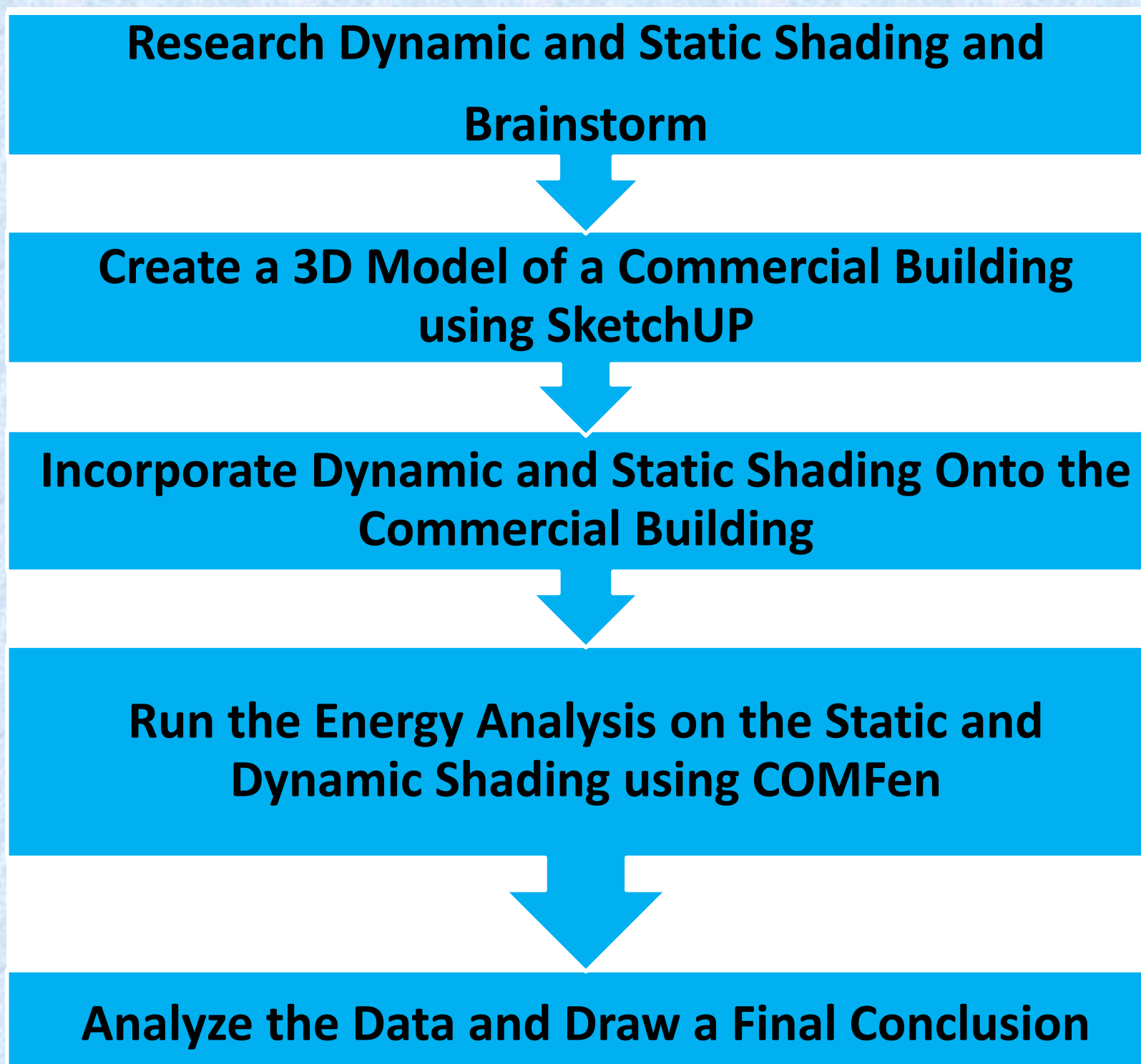
Significance

- In the U.S., \$30,600/yr. is spent on average for lighting one mid-high rise commercial building
- Solar dynamic shading systems can help reduce energy consumption by reducing the need of electrical lighting by 60%, cooling by 20%, and heating by 26%
- Money saved on lighting, heating and cooling can be used for other purposes
- Dynamic shading would add aesthetic appeal

Research Question

Comparative analysis of dynamic and traditional shading, to see their effectiveness for commercial buildings in terms of energy savings and occupant comfort.

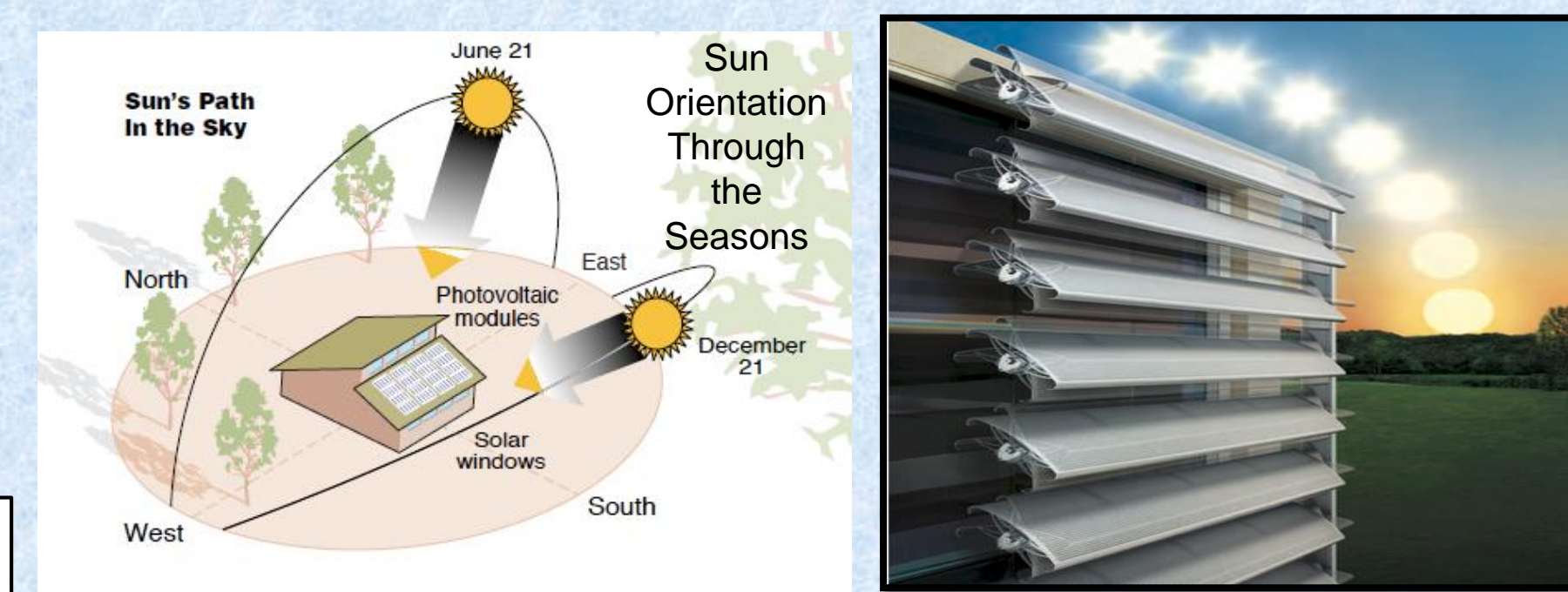
Methods and Tools



Aedas Al Bahr Towers



Kiefer Technic Showroom



Results

Dynamic Shading

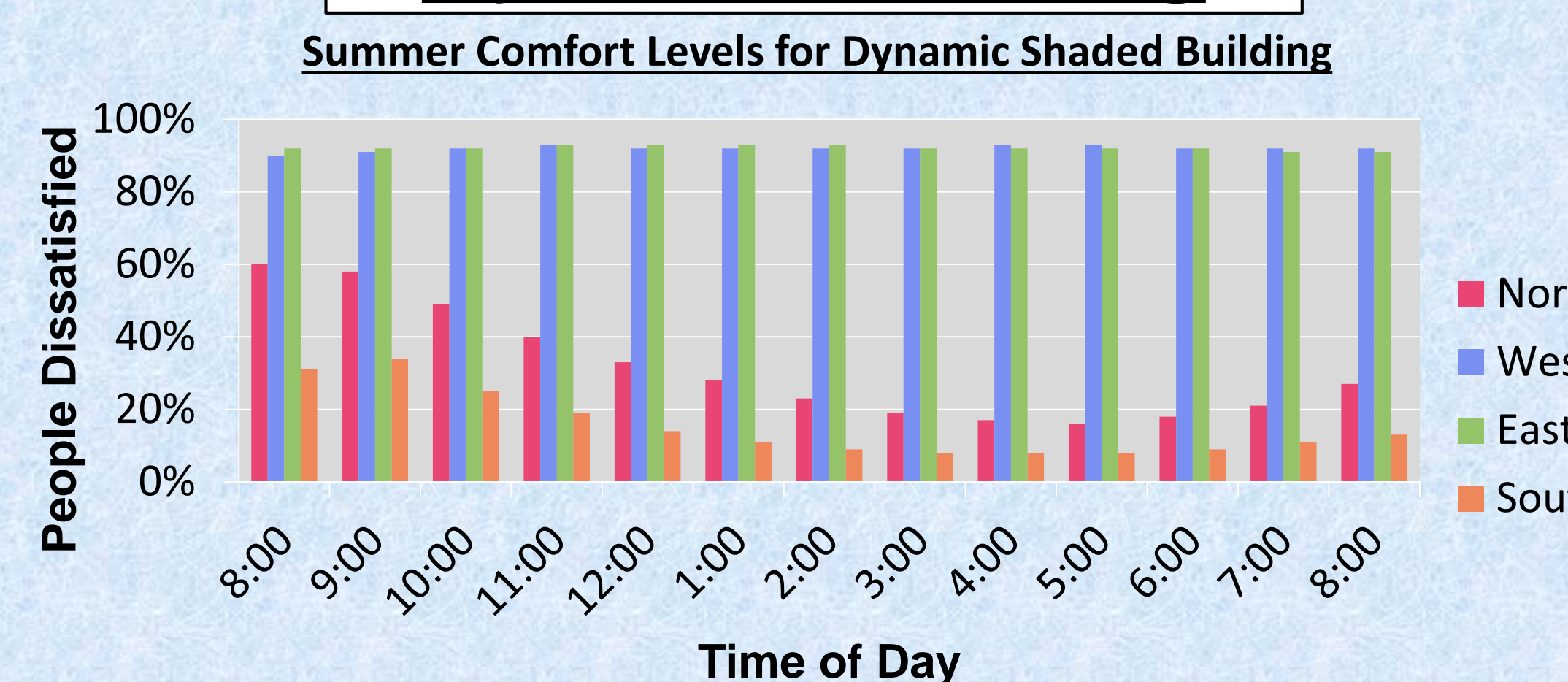
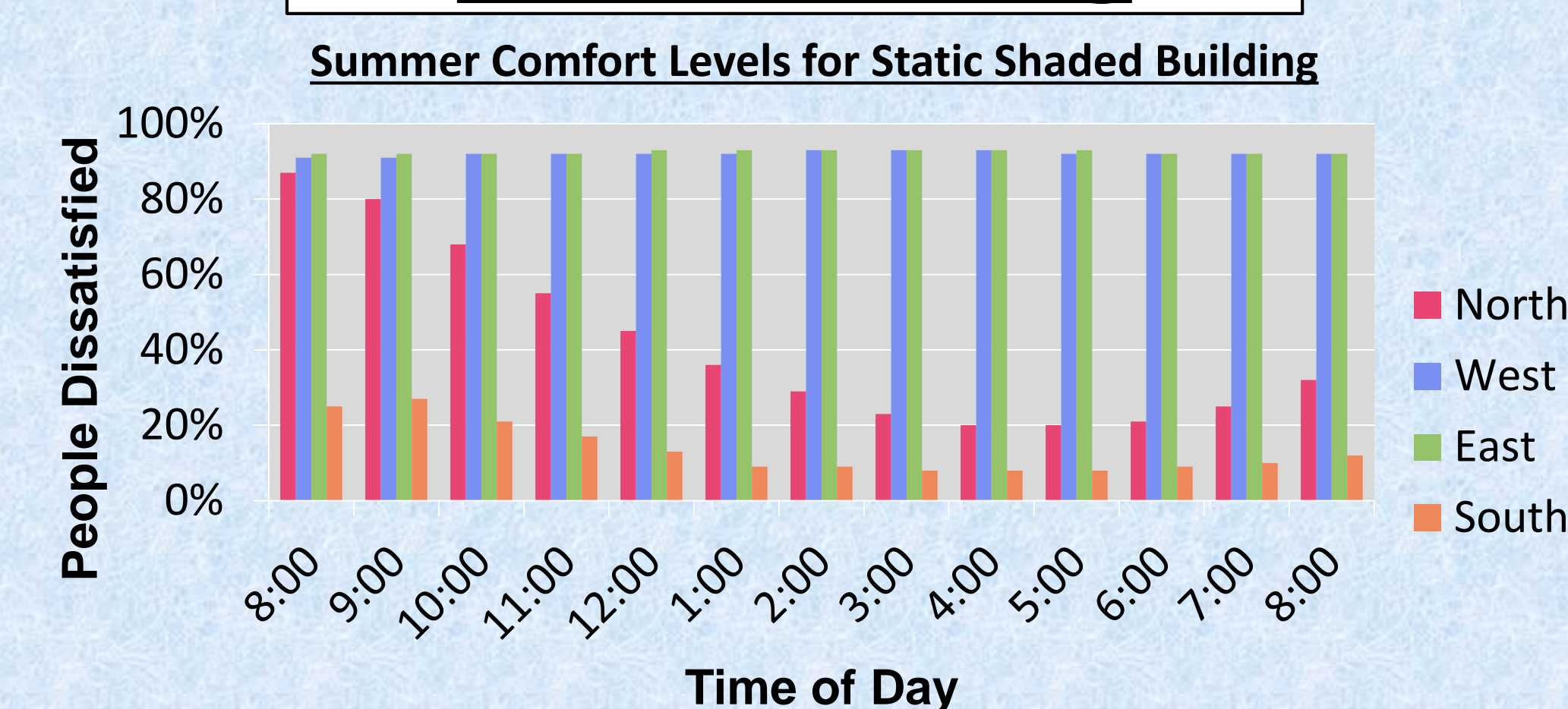
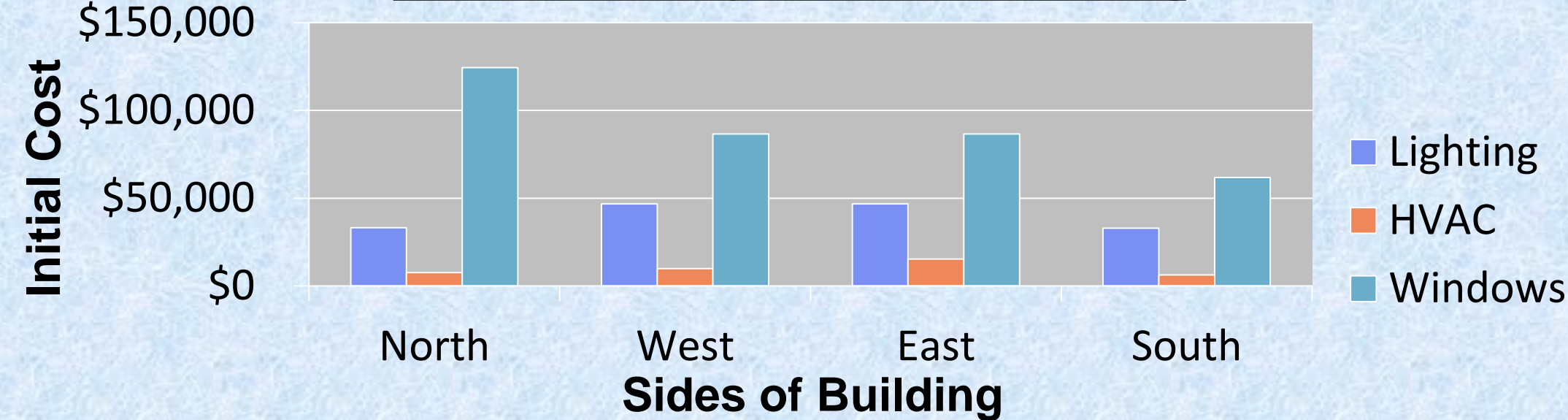


Figure 1: This graph comparison shows that dynamic shading on a commercial building would increase comfort levels for its occupants.

Static Shading



Initial Costs for Dynamic Shaded Building



Initial Costs for Static Shaded Building

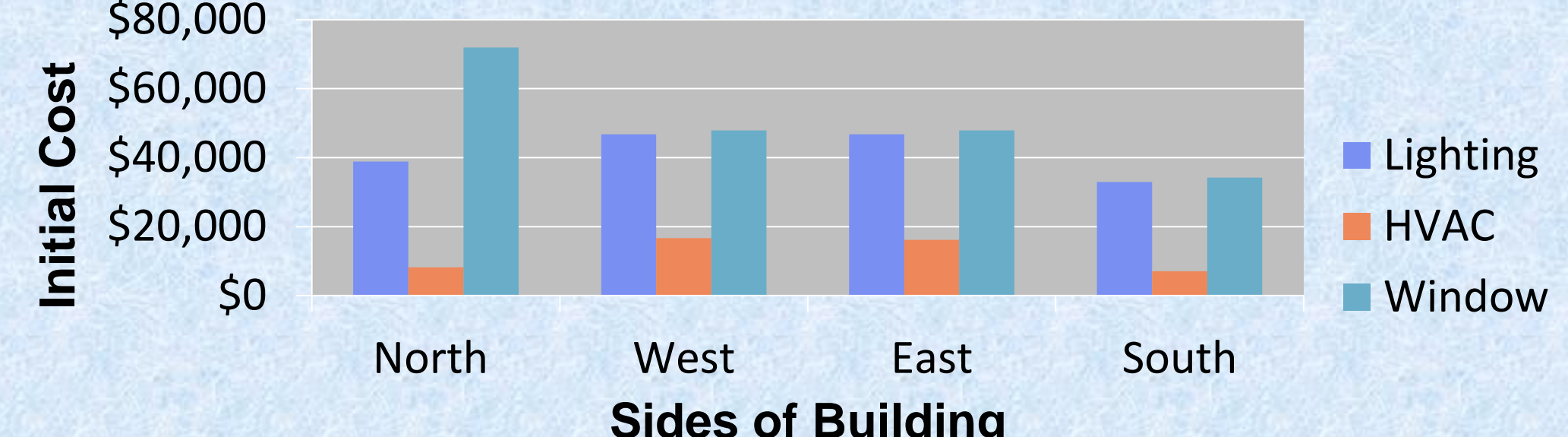
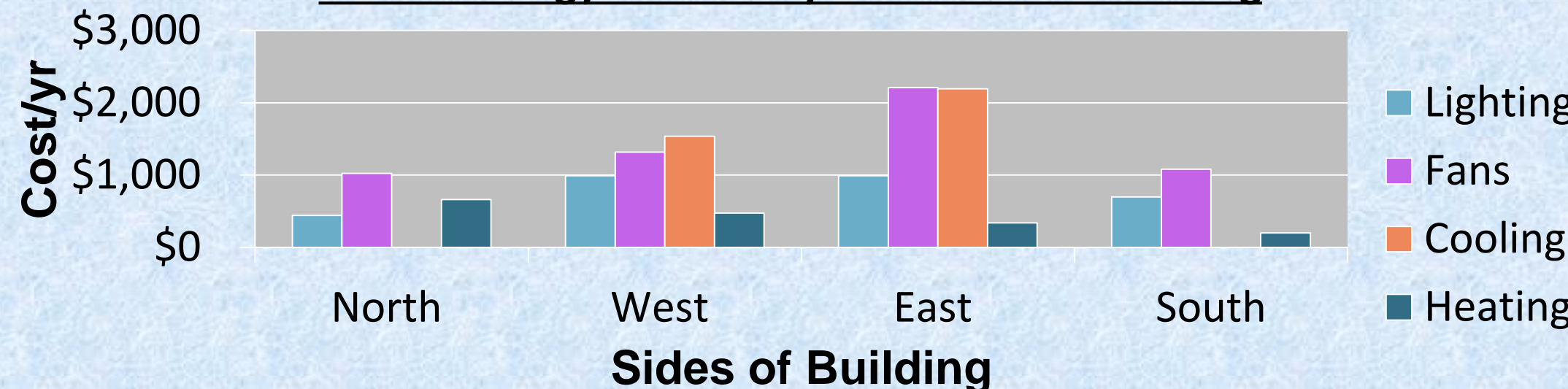


Figure 2: This graph comparison shows that dynamic shading would be less expensive than static shading initially.

Annual Energy Cost for Dynamic Shaded Building



Annual Energy Cost for Static Shaded Building

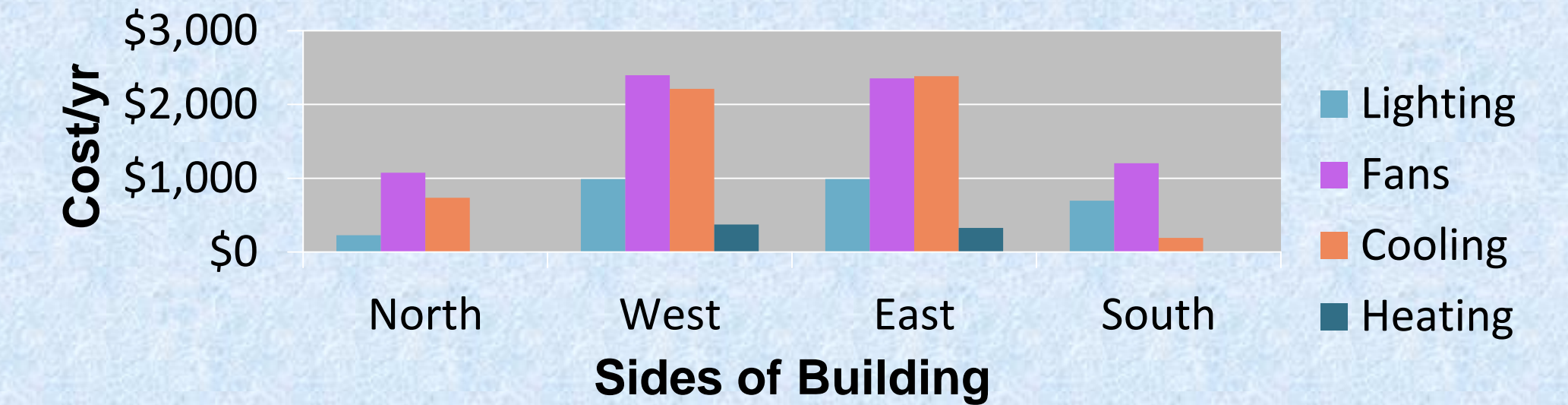
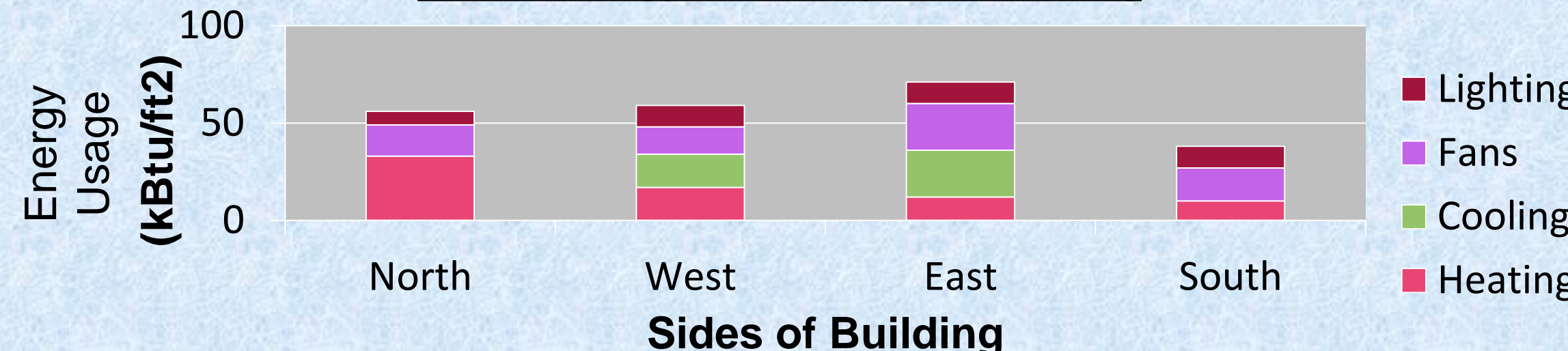


Figure 3: This graph comparison shows that dynamic shading would be more cost effective to implement for lighting, cooling, and heating.

Annual Energy Use for Dynamic Shading



Annual Energy Use for Static Shaded Building

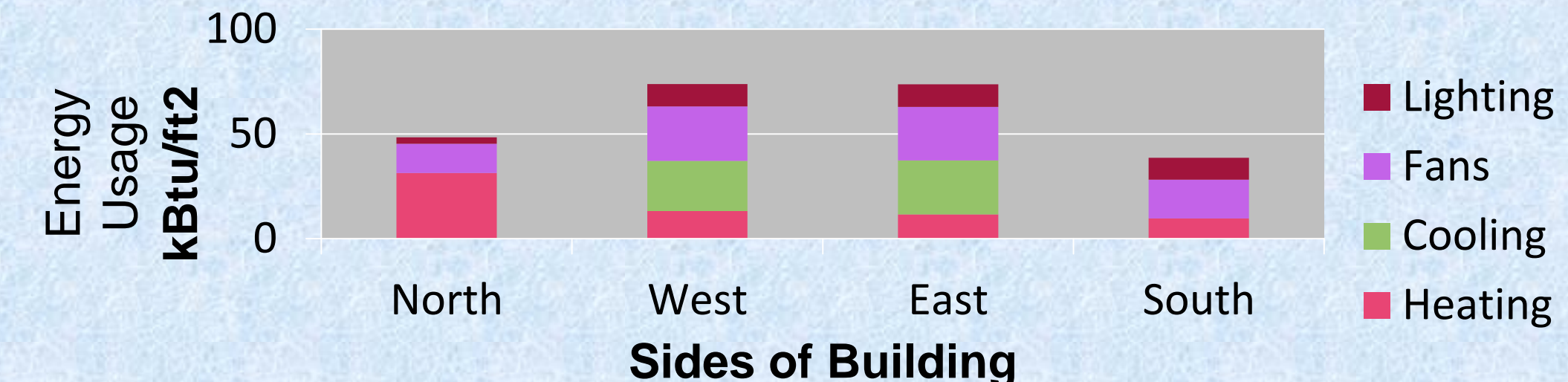


Figure 4: This graph comparison shows that dynamic shading is energy efficient in the aspects of lighting, fans, and cooling.



Main Entrance

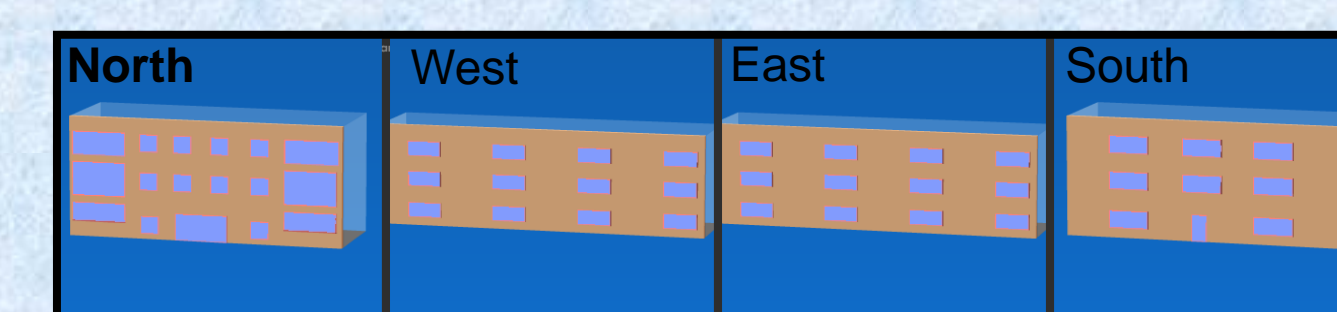


South and West Sides



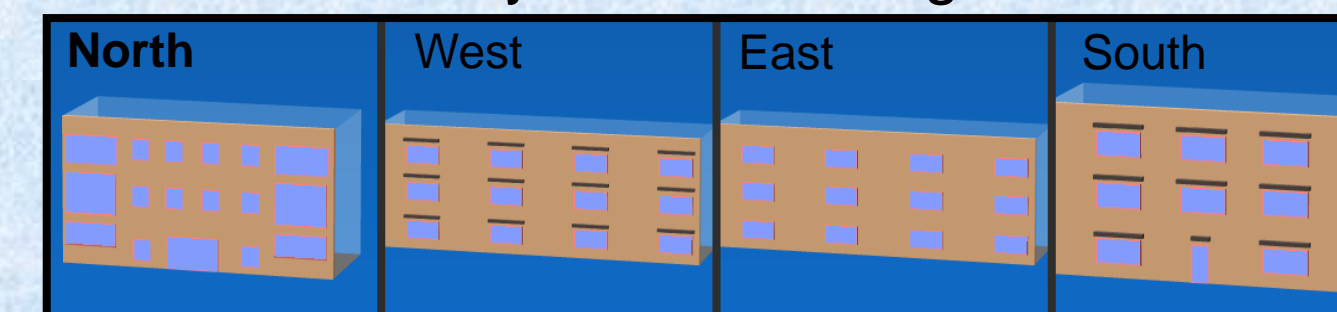
North and East Sides

SketchUp Model



Dynamic Shading

COMFen Energy Simulation



Static Shading

Discussion

- The results obtained from COMFen have shown that implementation of dynamic shading on a commercial building is more cost effective and energy efficient
- Comfort level for the occupants in the building for the summer season also increased
- Dynamic shading would be more expensive than static shading to install on a building initially, but would save money throughout the lifecycle of the building
- Dynamic shading would be great for El Paso TX because of the longer summers

Future Works

- Implementation of dynamic shading onto other building types such as; residential and schools
- Incorporating solar panels onto the dynamic shading to maximize energy efficiency.

References

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- Hutchins, Michael. *High Performance Dynamic Shading Solutions for Energy Efficiency and Comfort in Buildings*. Academic Journal.
- Lovorn, Kenneth L. *Lighting and the Energy Codes: Engineers have many Resources When designing energy-efficient lighting in nonresidential buildings but are not utilizing them*. Academic journal.
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Acknowledgement

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