Recommendation for the Palo Alto Airport on the use of Solar Panels Based on Case Studies

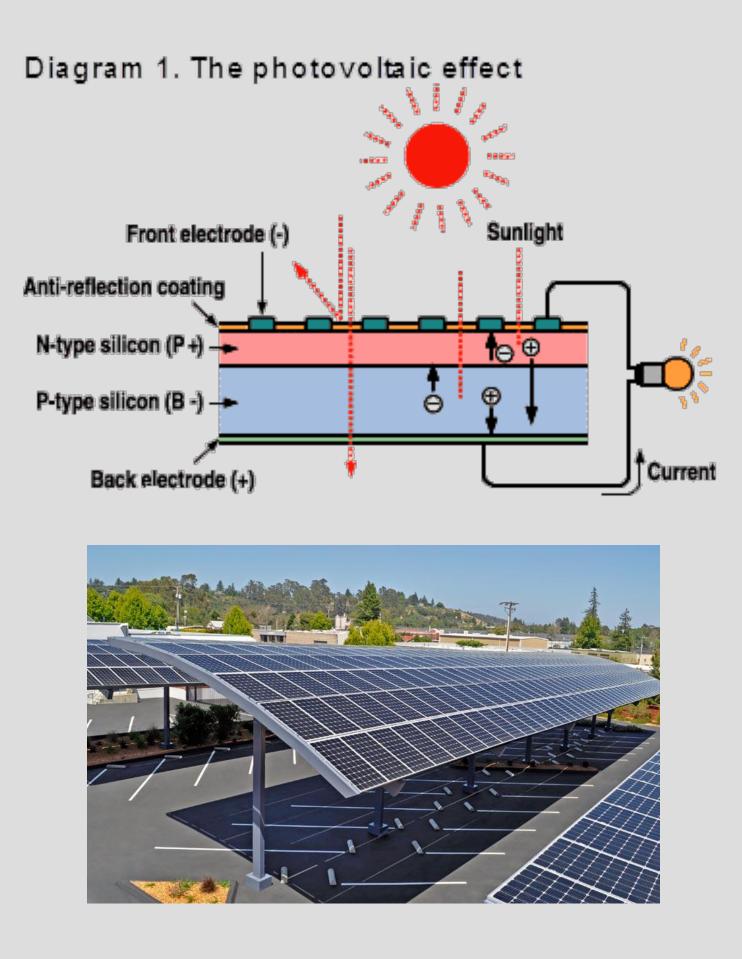
INTRODUCTION

Abstract: The Palo Alto airport needed a plan to become more energy efficient. Through the examples of two case studies on Walmart and Alice Springs Airport in Australia, evidence on the efficiency and use of commercial solar panels was found. After the collection of the annual energy usage of the airport over a two year period of time, the case studies could be applied to the airport. Commercial solar panels only produce 15-20% of the daily energy use for both the Alice Springs Airport and Walmart, therefore, the Palo Alto airport could not rely solely on solar panels. The recommendation for the Palo Alto Airport is to install solar panels in the side area of the airport to produce energy for the airport terminal.

Background



- Recently returned back to the City of Palo Alto
- 10th largest single runway airport
- Single runway: 2443 x 70 feet
- Current State: Does not meet
- FAA guidelines
- Wants to have t-shades



Solar Panel T-shades for car parking. The airport wants to implement a similar design for airport parking.

How Solar Panels Work:

Photovoltaic: Electricity is generated directly from sunlight

Solar panels made of two layers of silicon: n-layer and p-layer

- N-layer: Has extra electrons floating around -- makes it negatively charged
- P-layer: Missing some it positively charged

Most efficient solar panel turns 46% of sunlight captured into energy, while the most efficient commercial solar system turns only 15-20% of sunlight captured into energy. ("How do Solar")

Simran Pujji¹, James Wadleigh², Dr. Choe³

1. Palo Alto High School, 2. Palo Alto Airport, 3. Palo Alto Unified School District

electrons, so has holes -- makes

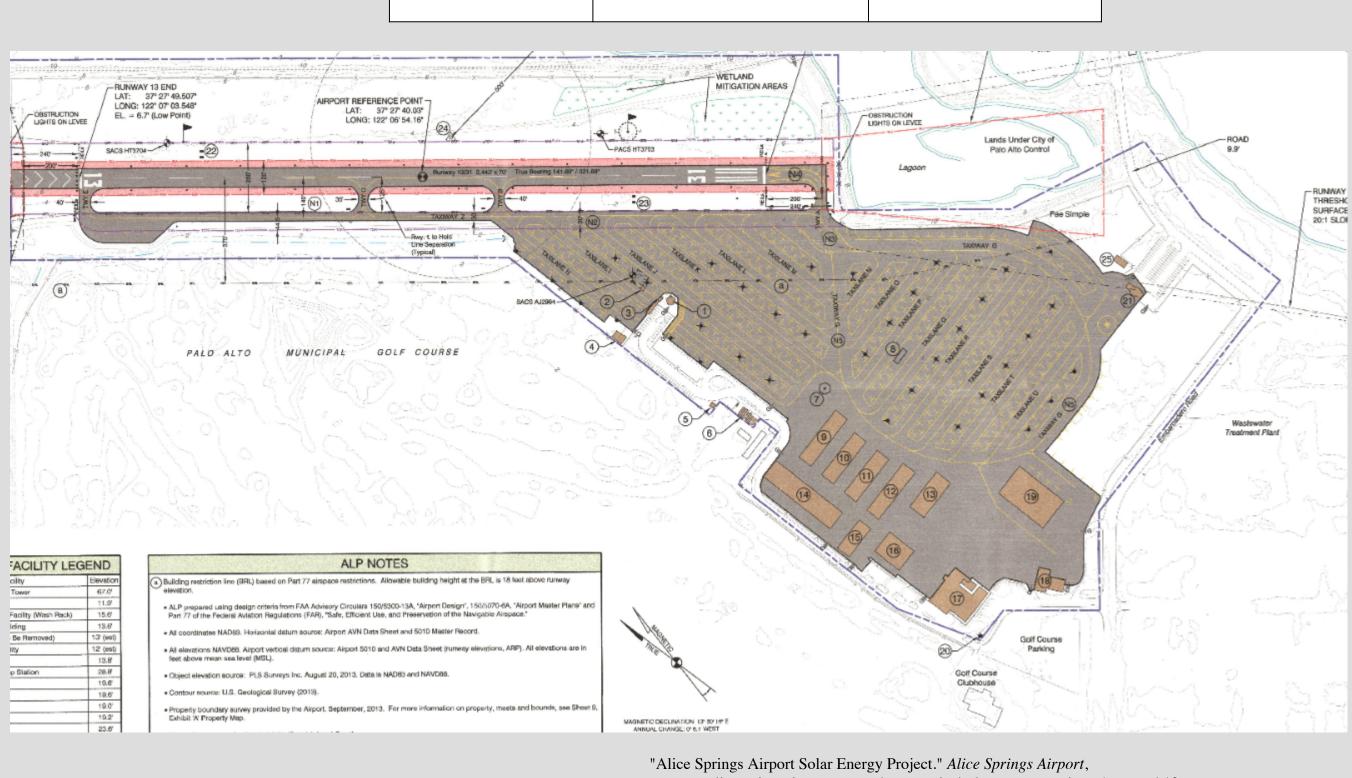
Case Studies

Case Study 1: Walmart -- In 2007, Walmart pledged to become more energy efficient by using solar panels.

- Promotes a better public image
- Working energy model

Based on these case studies, we can see that there is not a previous example on t-shades for airplane parking. These case studies, however, do provide a model for how the airport can use solar panels in the airport. Based on more research into solar panels companies, there are also multiple approaches to installing solar panels. Businesses can pay for the energy they use instead of paying for the solar panels upfront. These contracts usually last for 20 years.

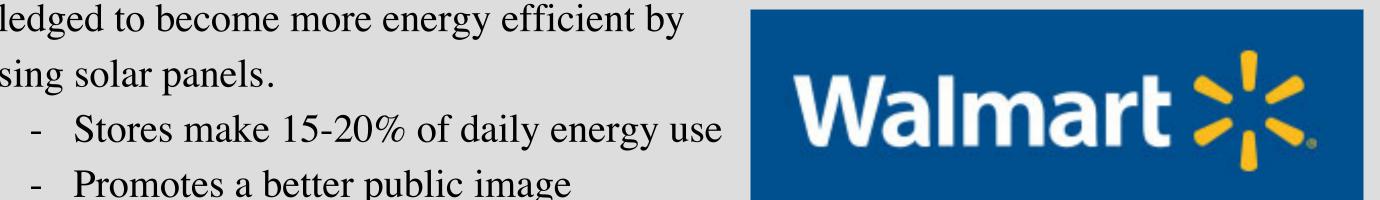
		v
	kWh in 2015	2016
Jan	54402	55082 kWh
Feb	47195	38620
Mar	46911	45190
Apr	43466	43233
May	47743	46040
Jun	45341	43798
Jul	53390	47107
Aug	53979	47372
Sep	49626	45984
Oct	48981	45913
Nov	47223	45882
Dec	50787	52659



Palo Alto Airport Map

Jan. 2017. commitment-to-solar.

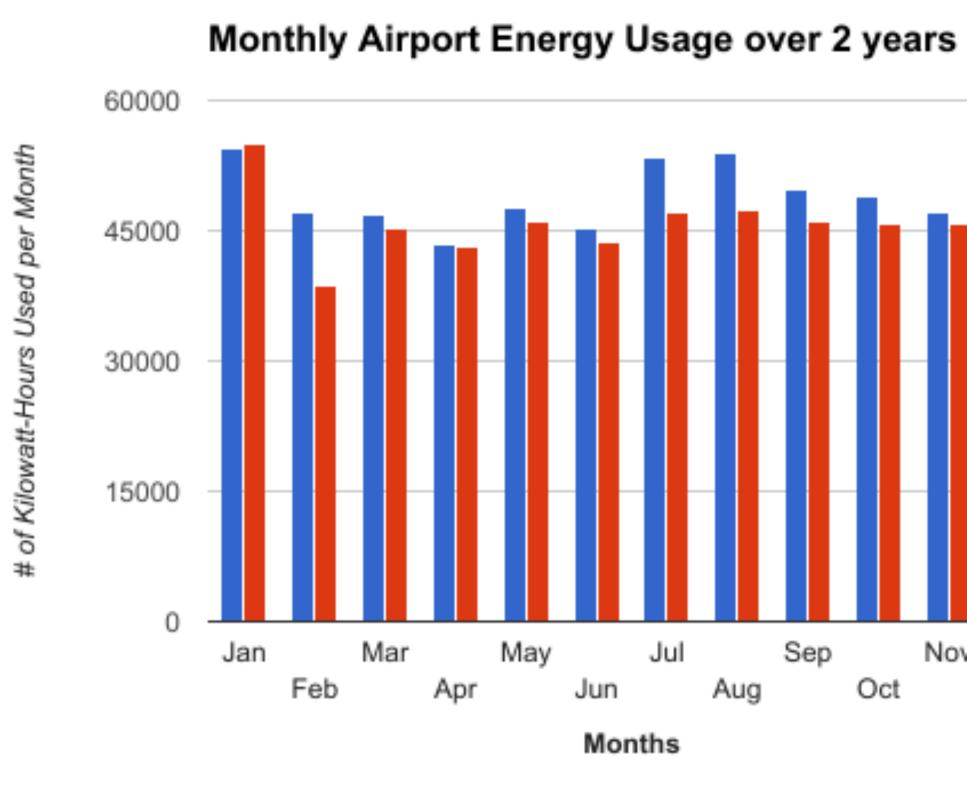
Works Cited:



Case Study 2: Airport in Australia using T-shades for Car Parking -- This case study correlates directly with what we hope to see in the airport: tshades. The airport wants to use t-shades for airplane parking



www.alicespringsairport.com.au/community/solar-energy-project. Accessed 12



This data shows the monthly energy usage of the airport in kilowatt hours. Based on the graph and data table, we can see that the energy usage of the airport stays fairly consistent over the two year period. Some discrepancies may be due to the weather or the amount of air traffic in a given time period.

Recommendation for the Airport: I would recommend that the airport install solar panels in two phases: Phase 1) Install solar panels in the side lot to power the air traffic control tower and the airport terminal. Phase 2) Install t-shades in the airplane parking to power the rest of the airport.

> Poltronieri, Palmiro. "Alternative Energies And Fossil Fuels In The Bioeconomy Era: What Is Needed In The Next Five Years For Real Change." Challenges (20781547) 7.1 (2016): 1. Advanced Placement Source. Web. 25 Sept. 2016. Says, John Fergus. "What Factors Determine Solar Panel Efficiency? - Energy Informative." Energy Informative. N.p., n.d. Web. 14 Oct. 2016 Scansen, By Don. "Variables to Consider When Designing Solar Power Applications." DigiKey Electronics. N.p., n.d. Web. 7 Oct. 2016. Shields, By Mark, and 201. PV Systems: Low Levels of Glare and Reflectance vs. Surrounding Environment (n.d.): n. pag. Web. "Solar Panel Efficiency and the Factors That Affect It." wwwpursolarazcom. N.p., n.d. Web. 14 Oct. 2016. "Sources of Greenhouse Gas Emissions." EPA. Environmental Protection Agency, n.d. Web. 06 Nov. 2016. "Sustainable Airport Manual." Airports Going Green. Chicago Department of Aviation, n.d. Web. 20 Oct. 2016. "What's the Best Angle for My Solar Panels?" EnergySage. N.p., n.d. Web. 14 Oct. 2016.

By The Numbers Air Traffic Plans and Publications Environmental Reviews Flight Information. "Airport Sustainability." FAA Home. Federal Aviation Administration, 11 Oct. 2016. Web. 20 Oct. 2016 Helman, Christopher. "How Walmart Became A Green Energy Giant, Using Other People's Money." Forbes, 4 Nov. 2015,

www.forbes.com/sites/christopherhelman/2015/11/04/walmarts-everyday-renewable-energy/#17a761f34894. "How Do Solar Panels Work?" Ted-Ed, 5 Jan. 2016, www.youtube.com/watch?v=xKxrkht7CpY.

Martin-Nagle, Renee, and Klauber, Adam. Lessons Learned from Airport Sustainability Plans. Washington, D.C.: Transportation Research Board, 2015. The National Academies of Science, Engineering and Medicine. Web. 20 Oct. 2016.

Ozment, David. "Walmart's Commitment to Solar." Walmart Today, 9 May 2014, blog.walmart.com/sustainability/20140509/walmarts-



