

**ASES SOLAR 2023**

**August 8-11, 2023**

# Visualizing Solar Harvesting Potential with Solar Irradiance Dataset across Elevation and Income

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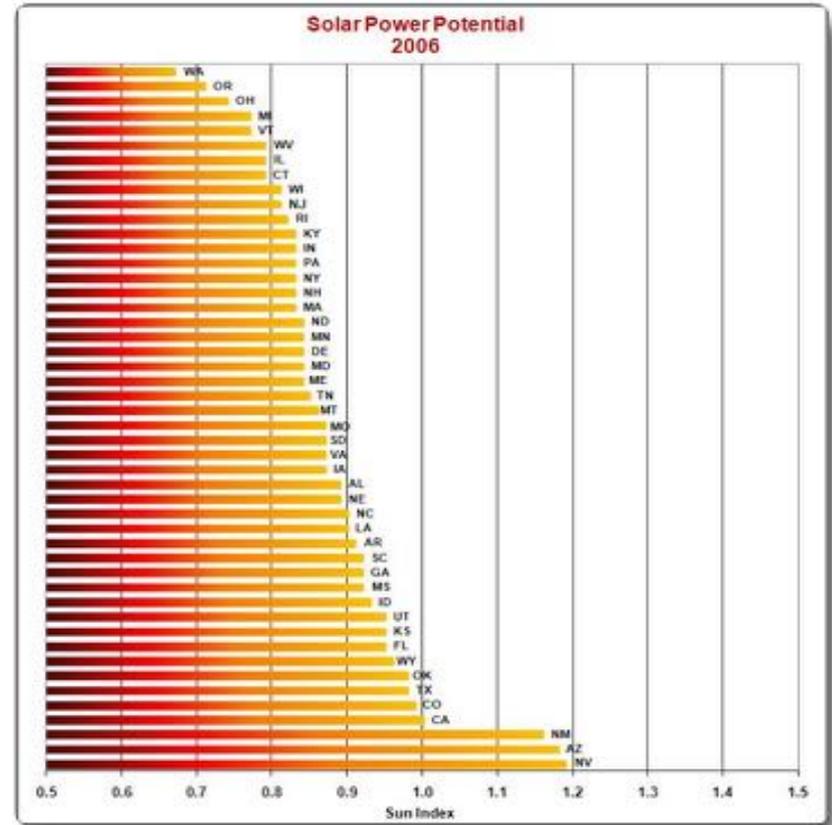
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Engineering**



# Motivation

- Increasing penetration of distributed-generation photovoltaic systems
- New Mexico having the 3<sup>rd</sup> highest solar power potential in the United States
- Support for residential solar being high in Albuquerque in comparison to rural areas of the state



# Objectives

- Analyze how solar irradiance varies in the city of Albuquerque
- Investigate possible correlations between solar irradiance, median household income, and terrestrial elevation
- Identify if solar irradiance is a useful parameter for solar valuation in real-estate transactions

# Region of Study

Google Earth



# Data Analysis

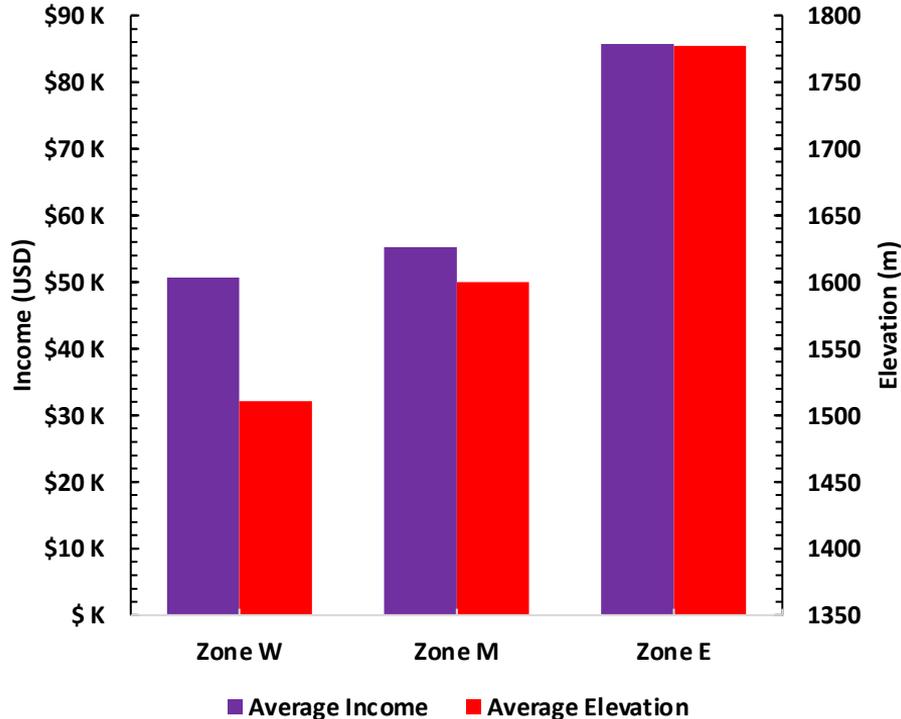
- The National Solar Radiation Database was utilized
- Python code was employed for statistical averaging
- MS Excel was used for data post-processing

Location (TUT,PRJ)	2001 Average (W/m <sup>2</sup> /hr)	2001 Average (W/m <sup>2</sup> /hr) Cont.	2001 Average (W/m <sup>2</sup> /hr) Cont.	2001 Average (W/m <sup>2</sup> /hr) Cont.
<b>W1 High (Zone 1)</b>				
(S, 100000, 100, 400000)	1830		1,370	19070
(S, 100000, 100, 500000)	1730		1,260	18070
(S, 100000, 100, 600000)	1830		1,370	19070
(S, 100000, 100, 700000)	1730		1,260	18070
<b>W1000m (Zone 2)</b>				
(S, 100000, 100, 100000)	1830		1,370	19070
(S, 100000, 100, 200000)	1730		1,260	18070
(S, 100000, 100, 300000)	1830		1,370	19070
(S, 100000, 100, 400000)	1730		1,260	18070
<b>South Station (Zone 3)</b>				
(S, 100000, 100, 600000)	1830		1,370	19070
(S, 100000, 100, 700000)	1730		1,260	18070
(S, 100000, 100, 800000)	1830		1,370	19070
(S, 100000, 100, 900000)	1730		1,260	18070
<b>Average Zone</b>				
	1730		1,260	18070
<b>Percent Error</b>				
	5.28%		5.28%	5.28%
	6.87%		6.87%	6.87%
<b>2002</b>				
Location (TUT,PRJ)	Average (W/m <sup>2</sup> /hr)	2002 Average (W/m <sup>2</sup> /hr) Cont.	2002 Average (W/m <sup>2</sup> /hr) Cont.	2002 Average (W/m <sup>2</sup> /hr) Cont.
<b>W1 High (Zone 1)</b>				
(S, 100000, 100, 400000)	1830		1,370	19070
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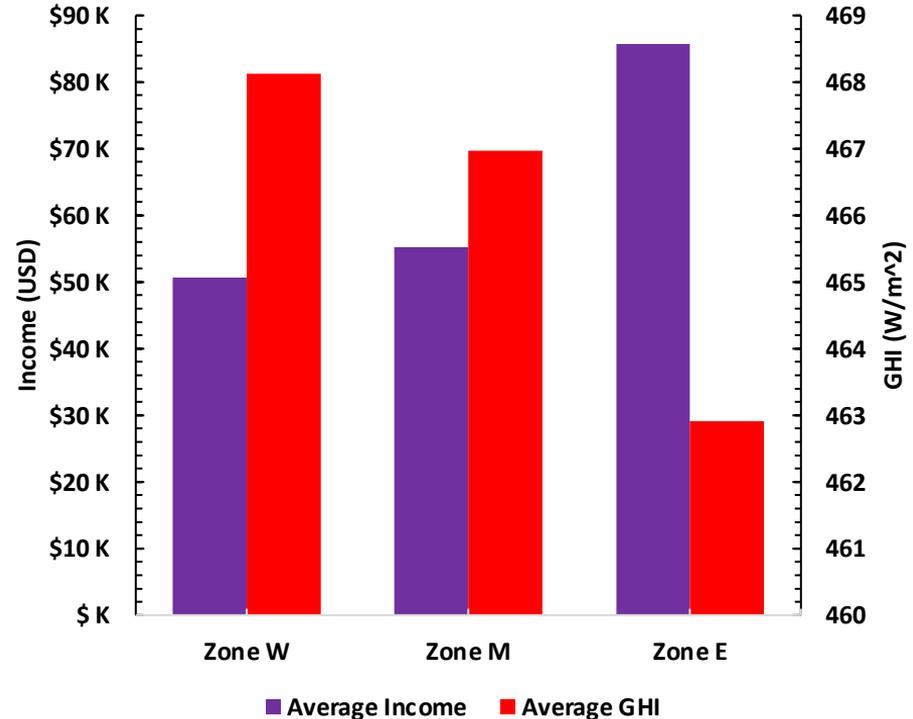


# Results

## Average Median Household Income & Terrestrial Elevation

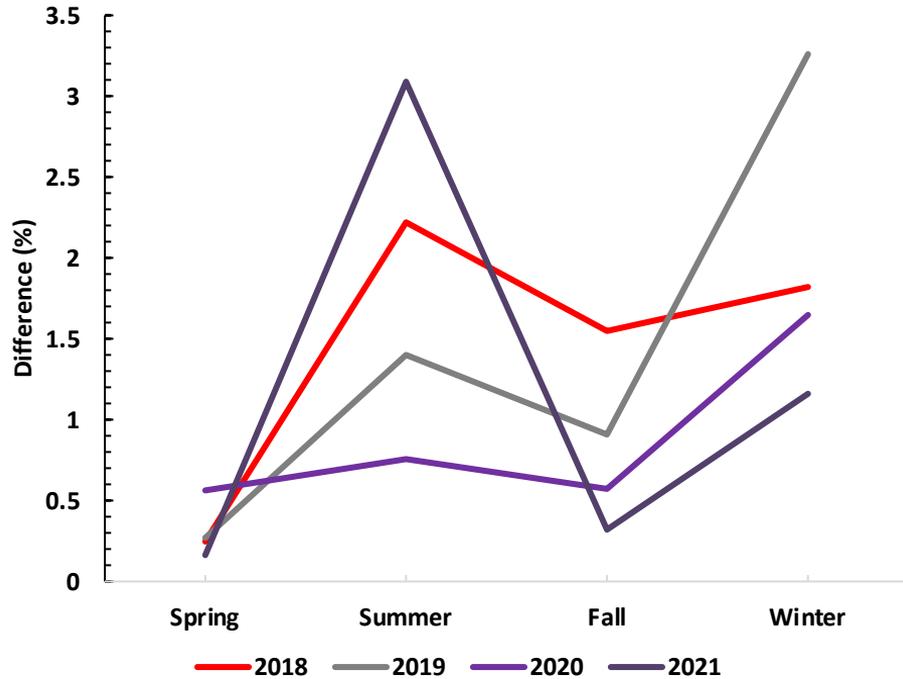


## Average Median Household Income & Global Horizontal Irradiance

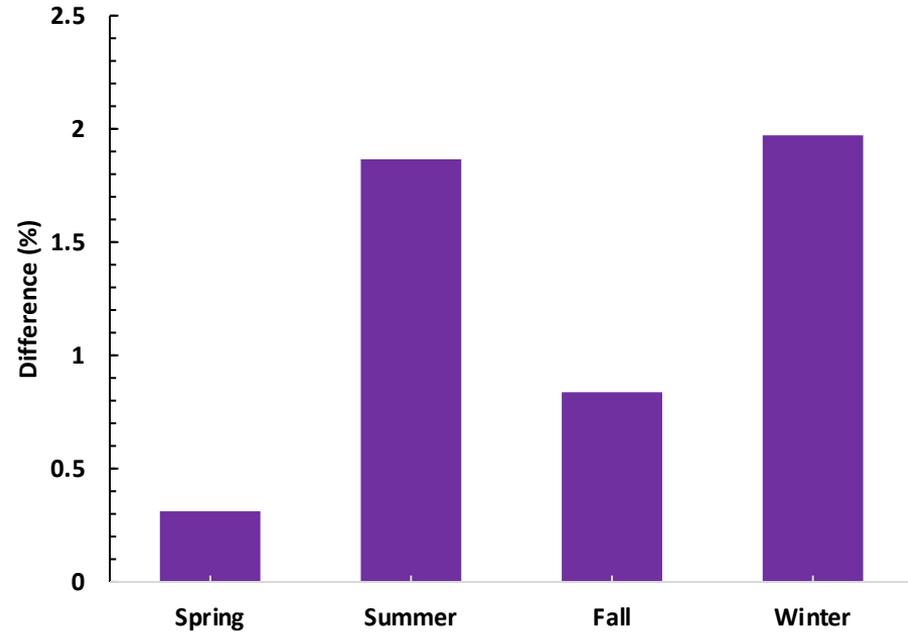


# Results

## Seasonal Differences: Zone W & E



## Average Seasonal Differences: Zone W & E



# Conclusions

- A positive correlation exists between median household income and terrestrial elevation
- A negative correlation exists between median household income and solar irradiance
- Seasonal solar irradiance differences between zones were always less than 3.5%
- Solar irradiance could be used as a supplemental variable during valuation of real-estate

# Acknowledgments

- The National Renewable Energy Laboratory (NREL) Student Training in Applied Research (STAR) Program
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