

# ***What Light Through Yonder Window Breaks?***



IEPEC 2015

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Scott Walker

David Barclay

Andrew Correia

Lynn Hoefgen

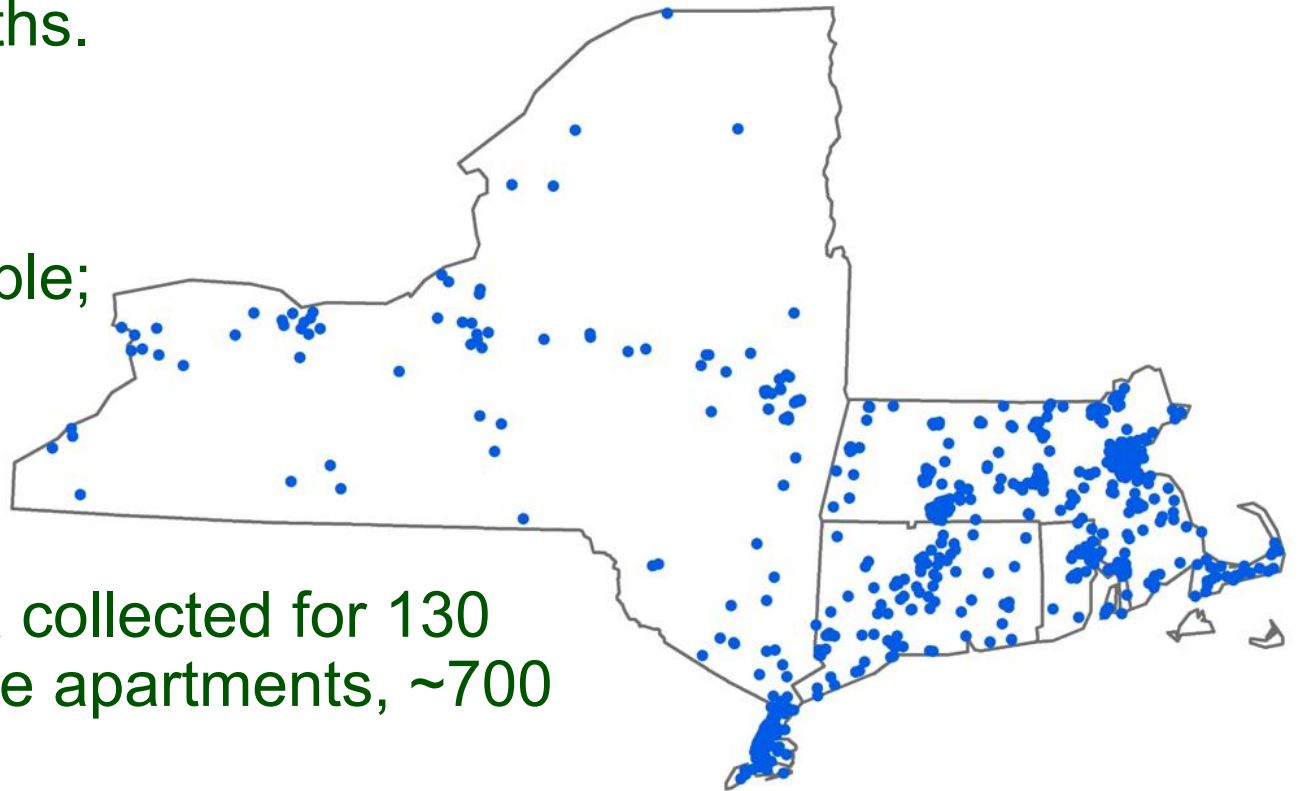
Victoria Engel-Fowles

Ralph Prah

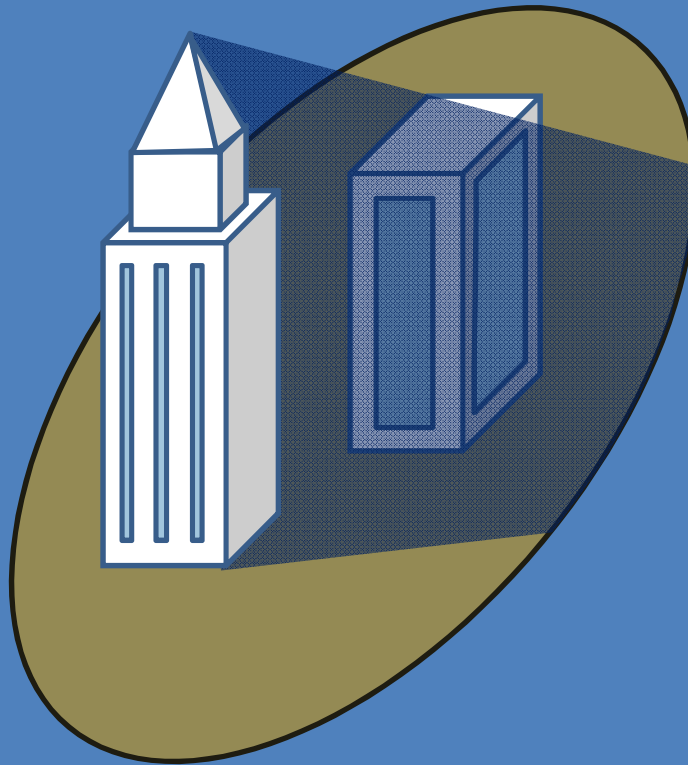
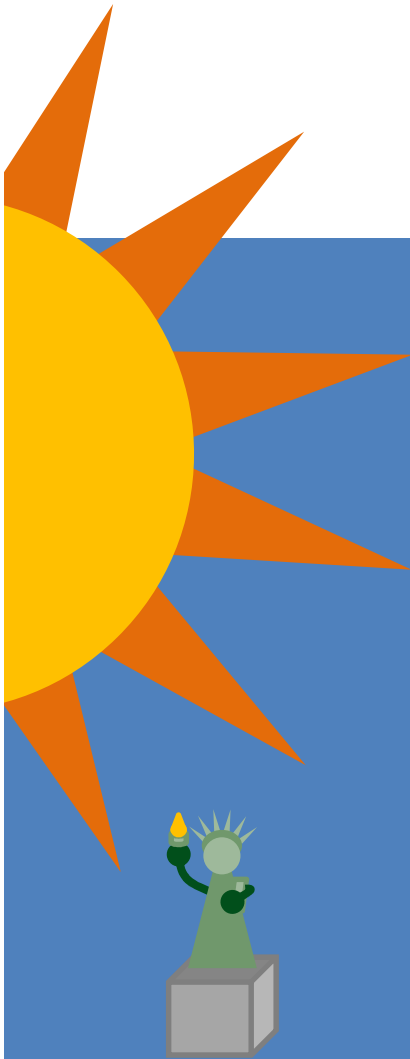
Methods to Study  
the Effects of  
Urban Canyons on  
Lighting Usage

# Northeast Residential Lighting Hours-of-Use Study

- 5,730 lighting loggers installed in 848 homes for ~5 months.
- High-rise oversample; “Urban canyons”
- Solar shading data collected for 130 Manhattan high-rise apartments, ~700 loggers.

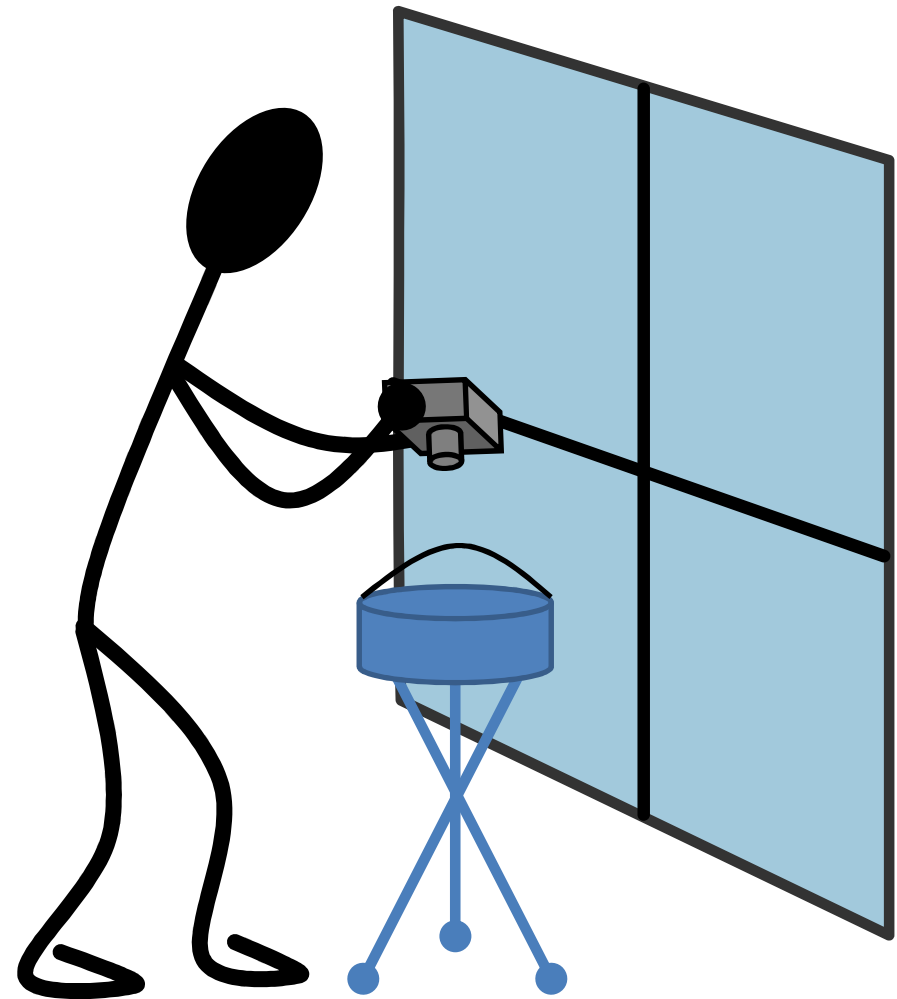
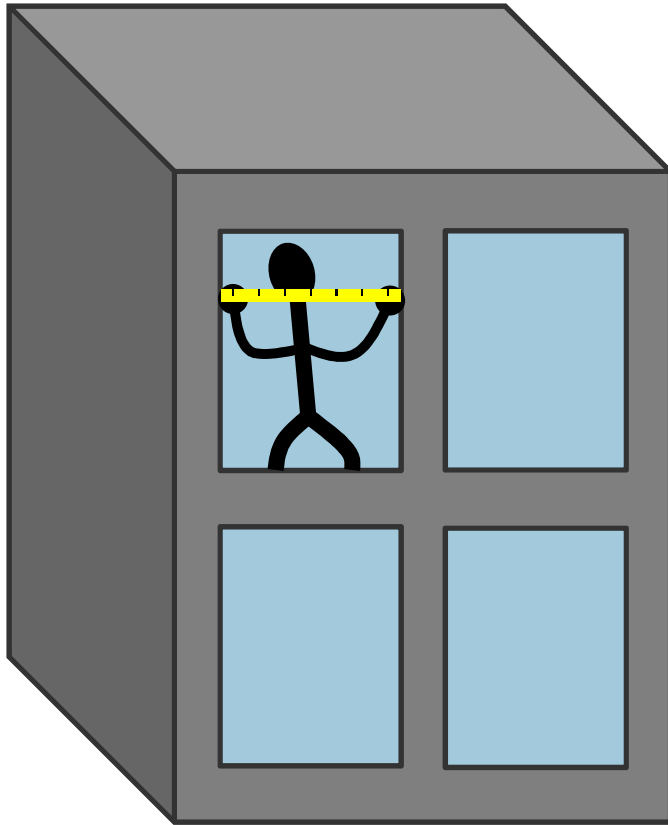


# Factors Determining Natural Light

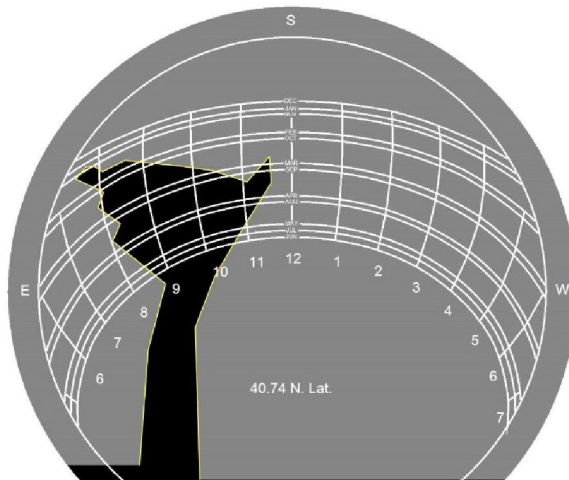


- Availability of direct sunlight
- Glazing size and direction

# Measurement Methods



# Solar Pathfinder



**NMR**  
Group, Inc.



## Solar Site Analysis Report

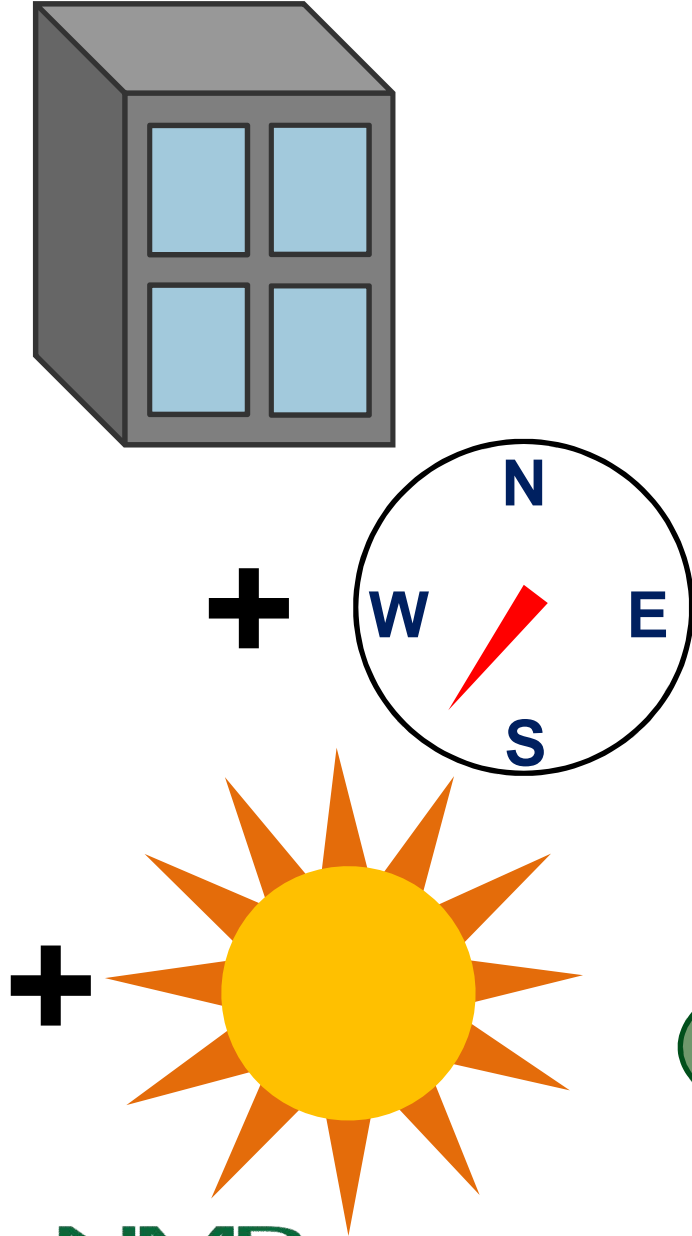
Image File 145-SE-1-SP.JPG

### Solar Obstruction Data

Month	Actual Unshaded Solar Radiation Azimuth=180.0 Tilt=90.0 kWh/m <sup>2</sup> /day	Actual Shaded Solar Radiation Azimuth=180.0 Tilt=90.0 kWh/m <sup>2</sup> /day
January	3.02	0.00
February	3.58	0.20
March	3.68	0.92
April	3.03	1.06
May	2.61	0.68
June	2.66	0.55
July	2.79	0.66
August	3.08	1.01
September	3.42	1.06
October	3.68	0.36
November	3.08	0.00
December	2.76	0.00
<b>Totals</b>	<b>37.37</b>	<b>6.50</b>
	<b>Effect: 67.47%</b>	<b>Effect: 11.74%</b>
	<b>Sun Hrs: 3.11</b>	<b>Sun Hrs: 0.54</b>

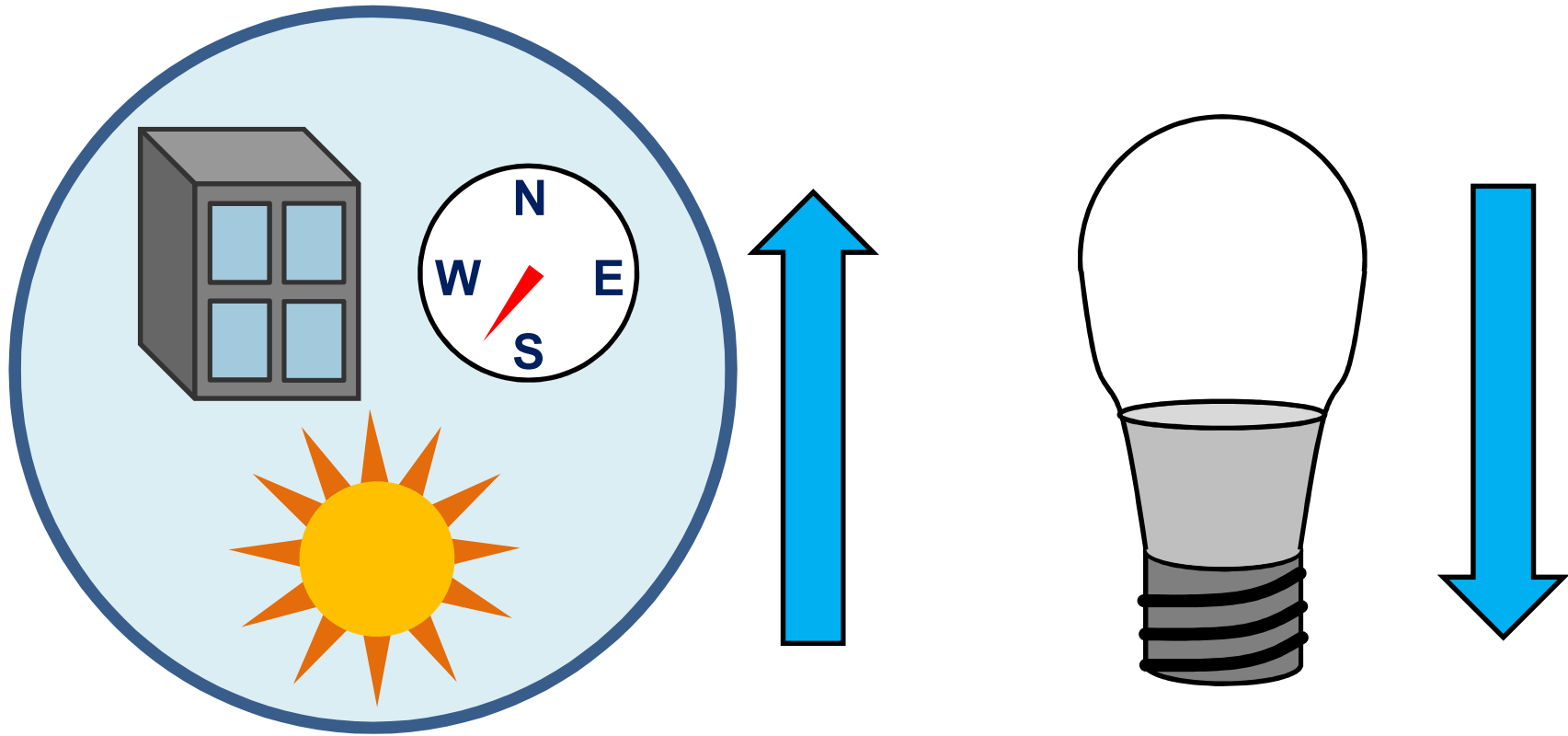
Notes: None

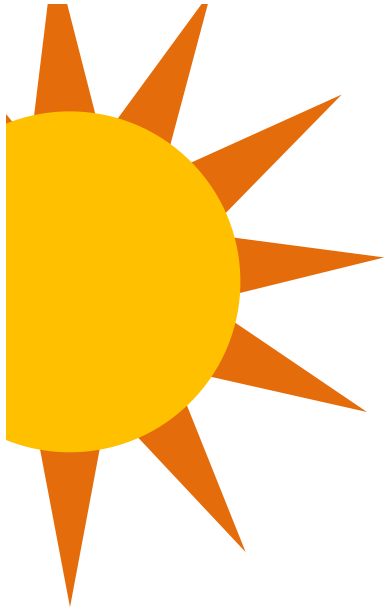
# Analysis



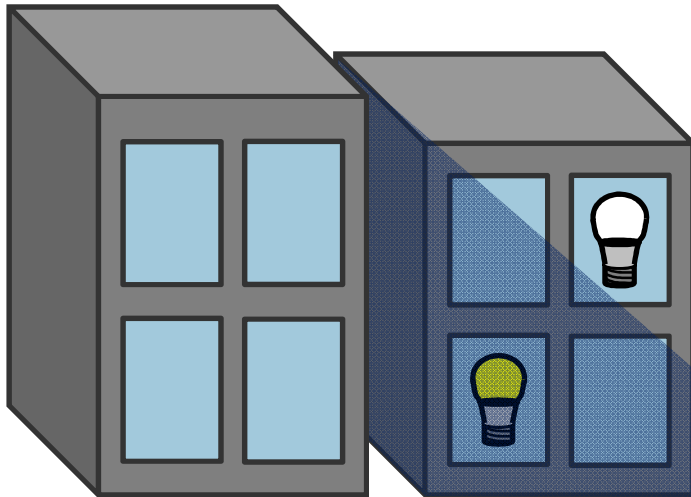
- Glazing class (1-4)
  - +
  - South-facing glazing class (1-3)
  - +
  - Solar exposure (1-4)
- 
- Sum of class values (3-10)
  - Binned sum (1-3)

# Model Results





# Conclusions



- HOU is higher in high-rise units
- Natural light is a factor
- Solar shading can be quantified with simple methods
- *Future research*