Utility Scale Rooftop Solar

Ability of neighborhood solar
to defer new electrical facilities

ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

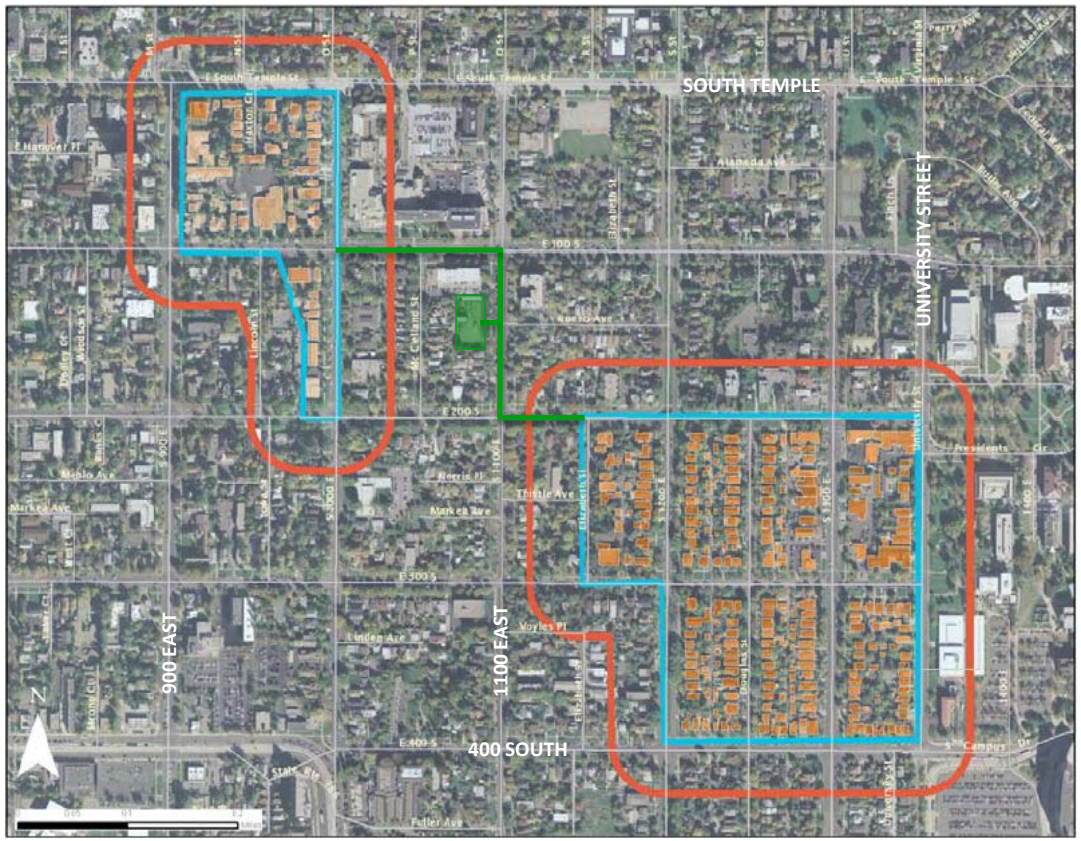
Purpose of presentation

- Describe Rocky Mountain Power's in-depth study of neighborhood solar to offset the need to build new infrastructure (power plants, substations and lines)
- Outline Rocky Mountain Power's progress on Utah carbon reduction goal
- Describe Rocky Mountain Power's support of customer-owned renewable energy

Customer use on the rise

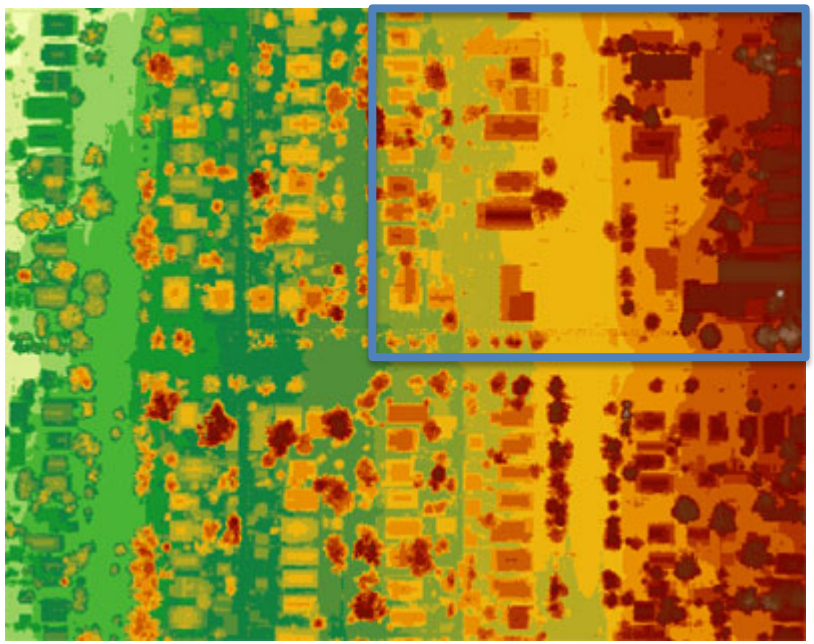
- Rocky Mountain Power residential customers use about 26% more electricity than 20 years ago
- To meet our obligation to serve, additional power supply resources, substations and power lines are needed to meet growing customer use
- New facilities are expensive and difficult to permit
- Advocates want different solutions

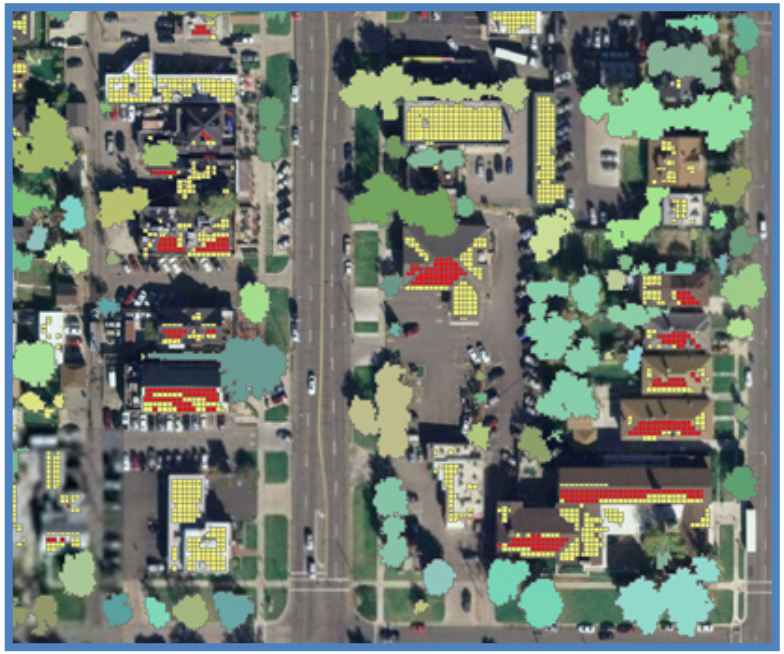
Can rooftop solar defer new facilities?



- Customers questioned substation expansion in an established neighborhood
- Public opposition delayed conditional use permit
- Undertook subsequent study of rooftop solar to determine its ability to meet customer use

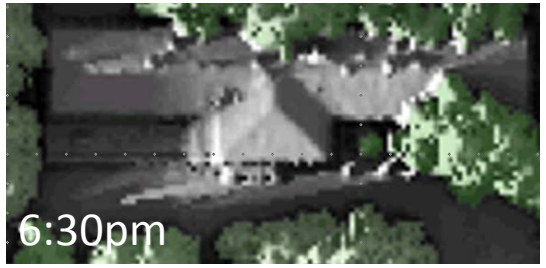
Scope of the solar opportunity



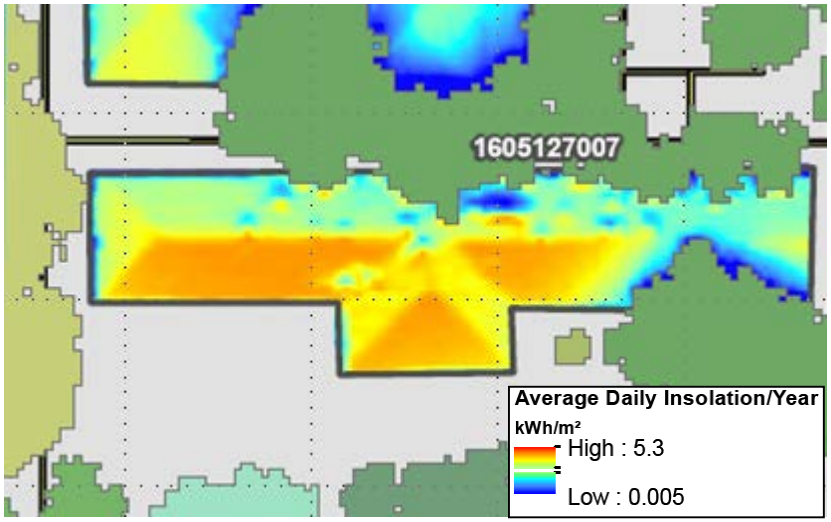


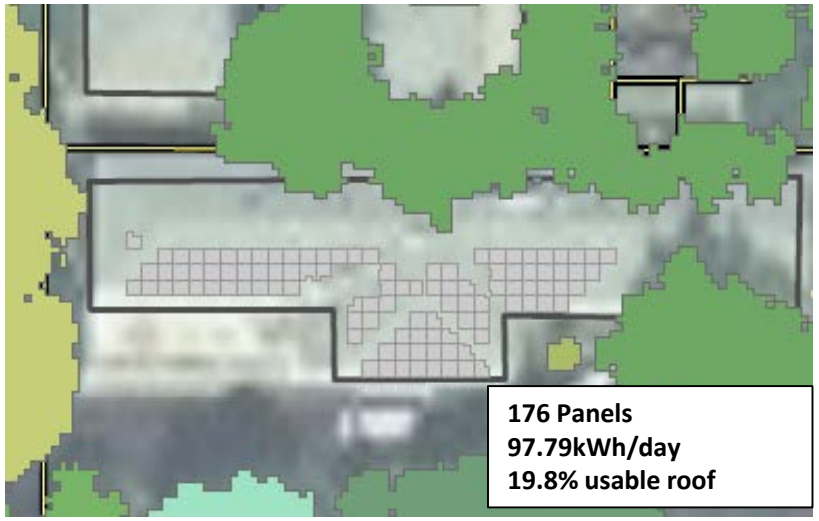
Category	Type of Building	Median Roof Footprint	Median # of PV Panels	Minimum # of PV Panels	Maximum # of PV Panels	Average Usable Roof Area
Residential	Single Family Residential	171 m^2	25	0	119	13.81%
Multi-Residential	Apartments, Condos, etc.	173 m^2	32	0	397	19.88%
Sm. Commercial	Restaurant, Commercial Retail	349 m^2	136	6	340	31.31%
Lg. Commercial	Offices, Hospitals, Churches	430 m^2	160	16	917	32.74%
Unknown	Unknown Land Use	196 m^2	26	2	262	14.57%

Determining panel location



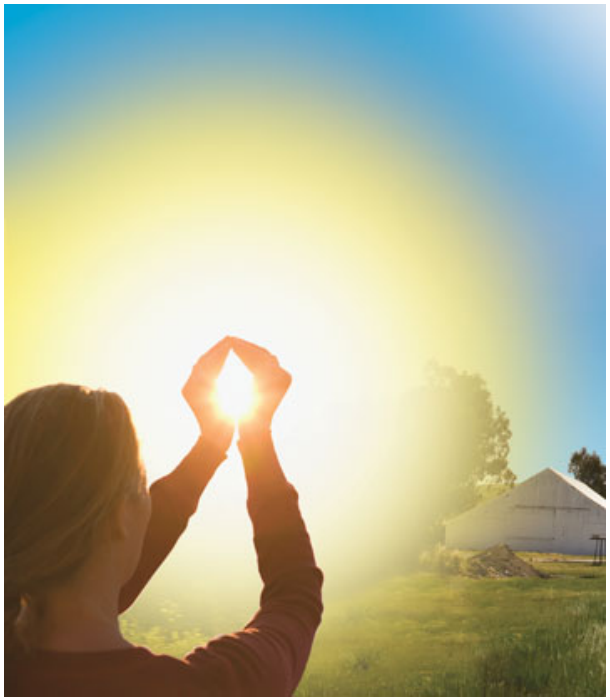
- Evaluated roof shading on every structure
- Determined solar exposure
- Locate solar panels where they produce the most energy



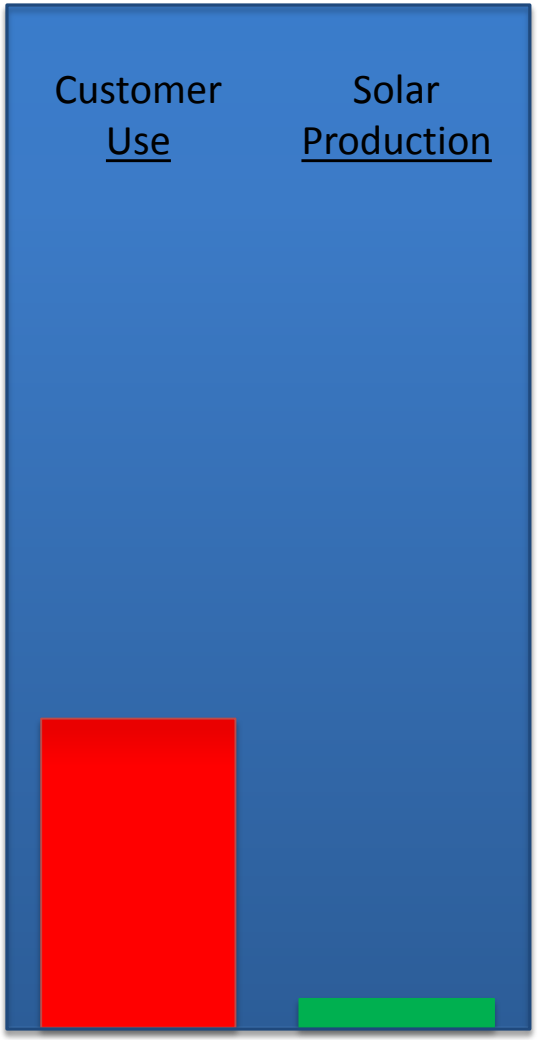


Study aims to maximize solar output

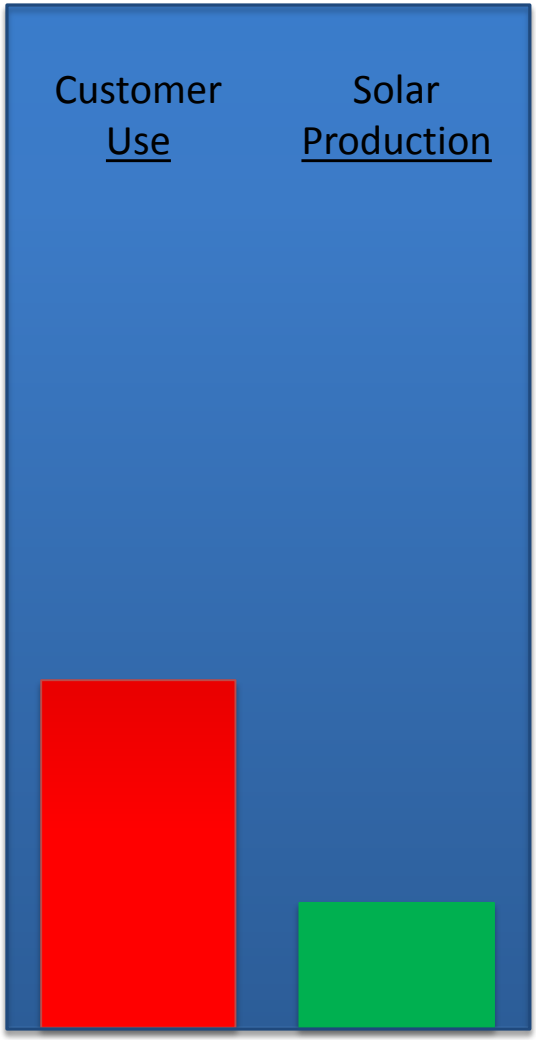
- Two-thirds of rooftops are suitable for solar panels (237 of 356)
- Total number of panels 13,304
- Study uses high efficiency panels; solar energy to electricity = 19%



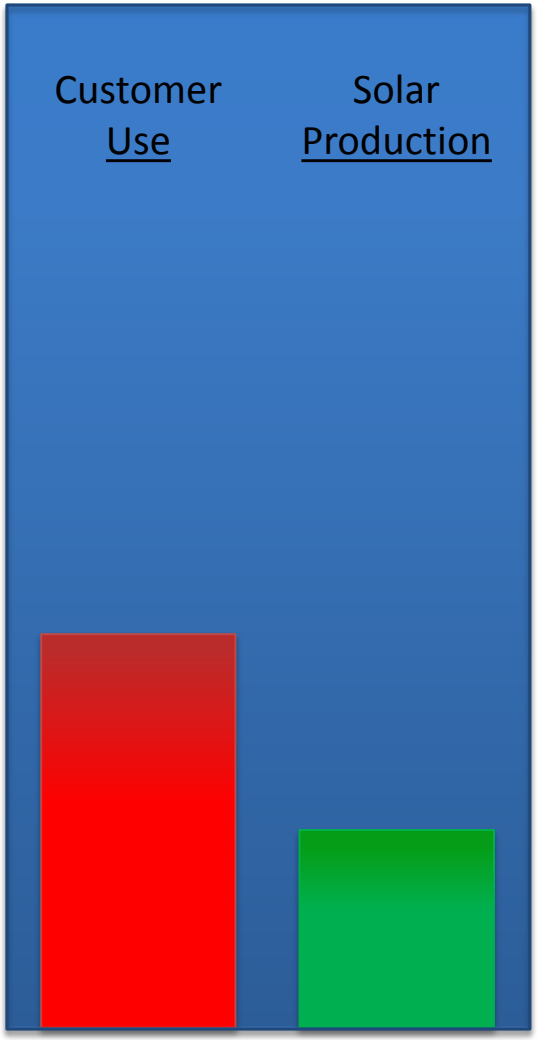
Here comes the sun



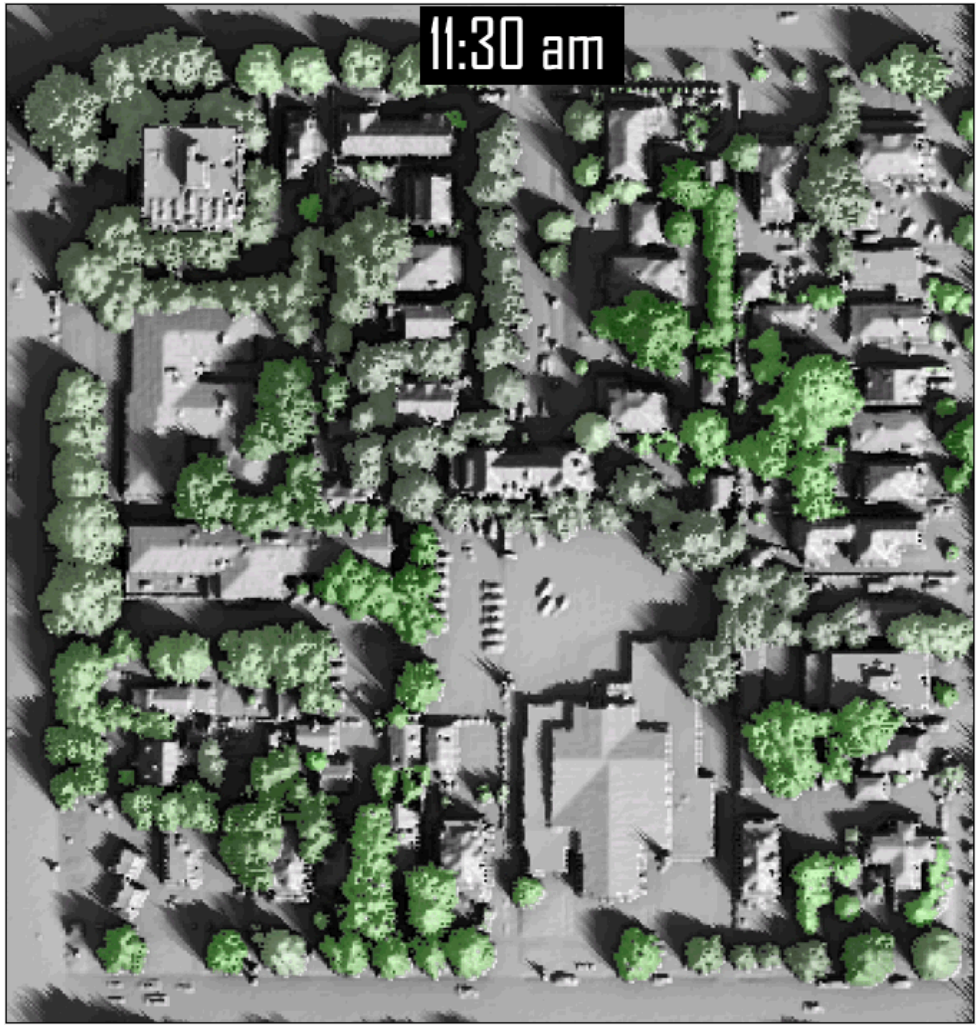
Here comes the sun

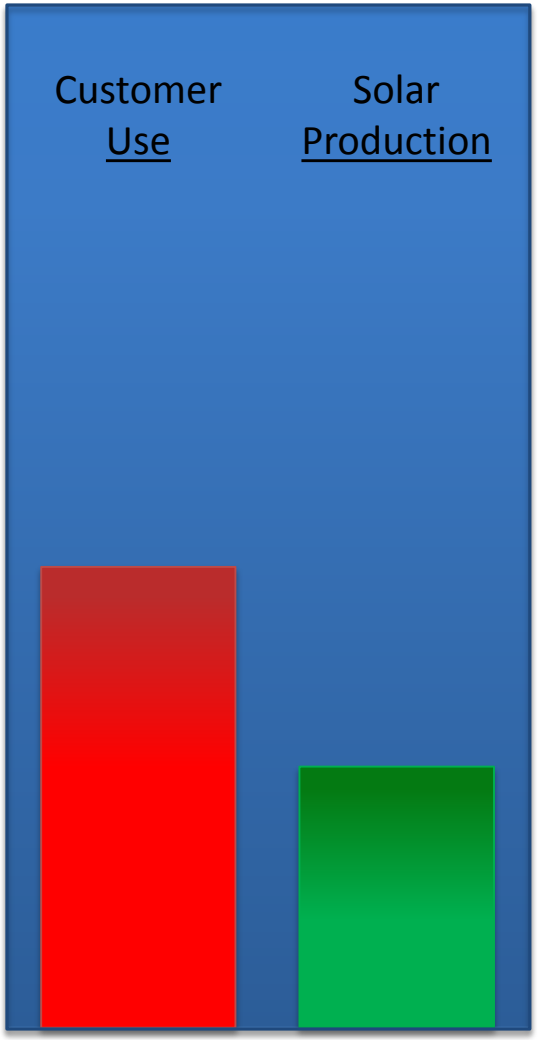


Here comes the sun

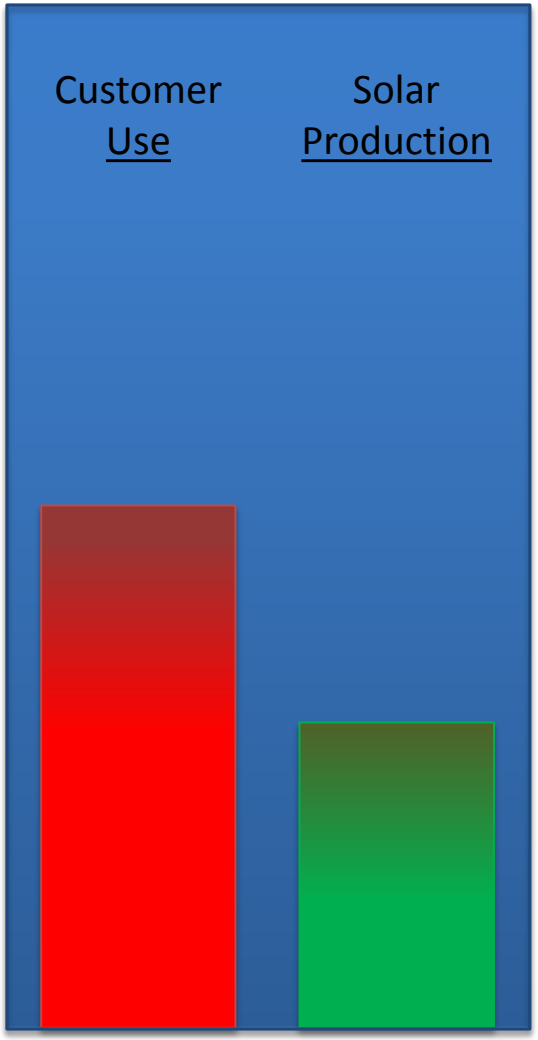


Here comes the sun

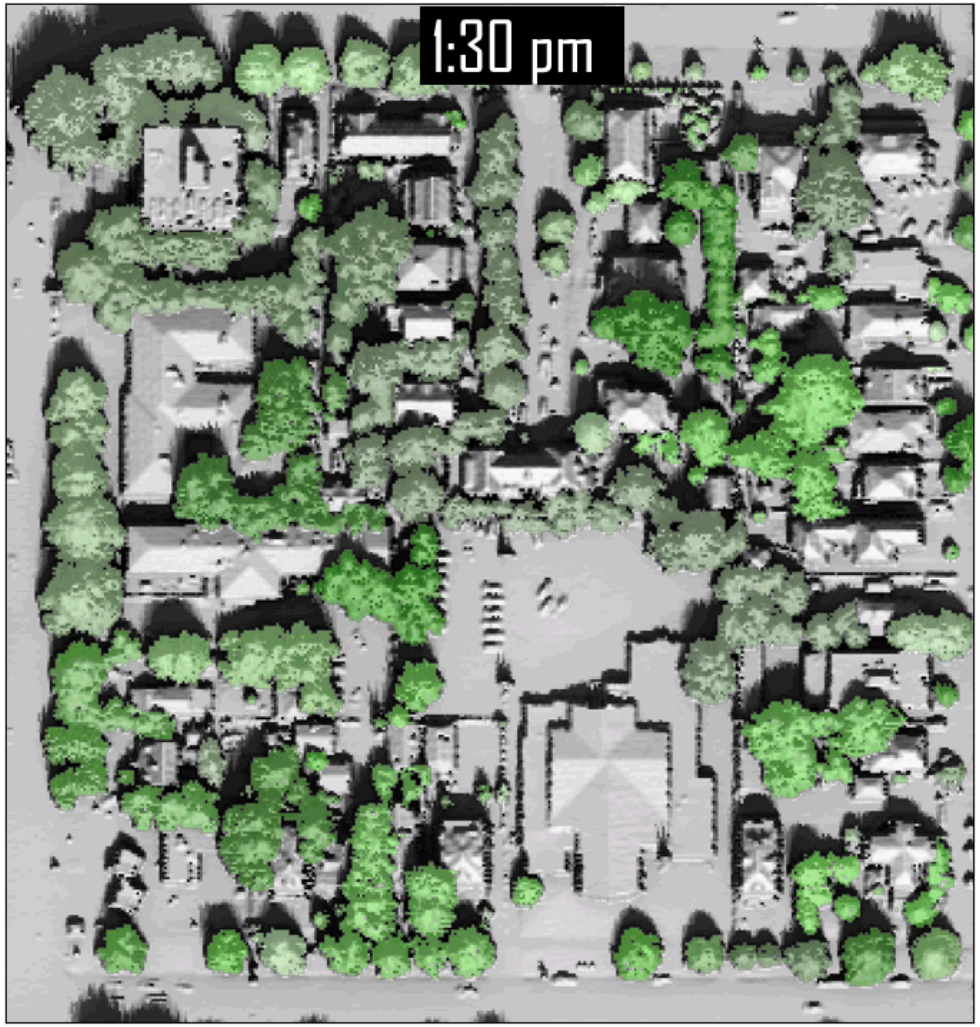


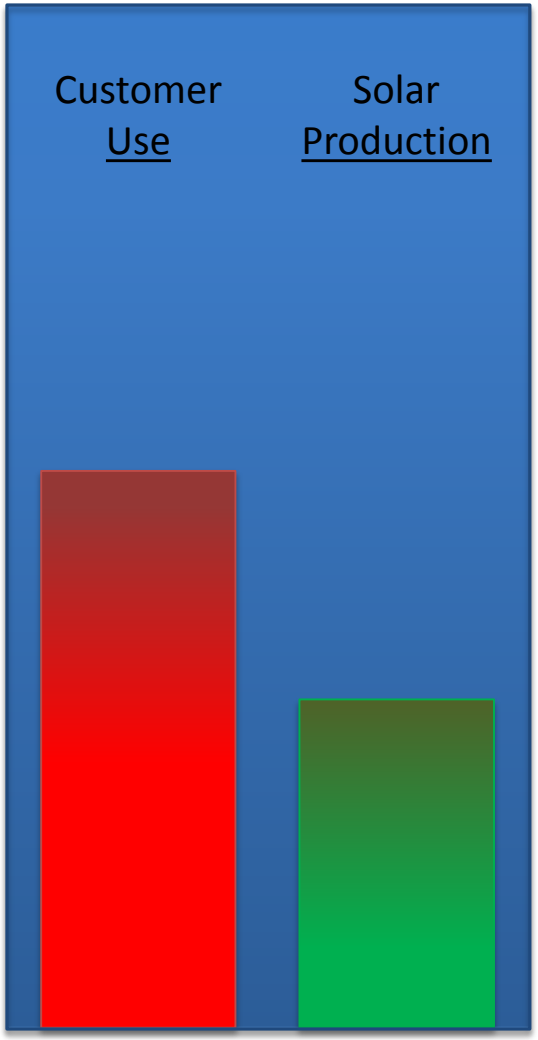


Here comes the sun

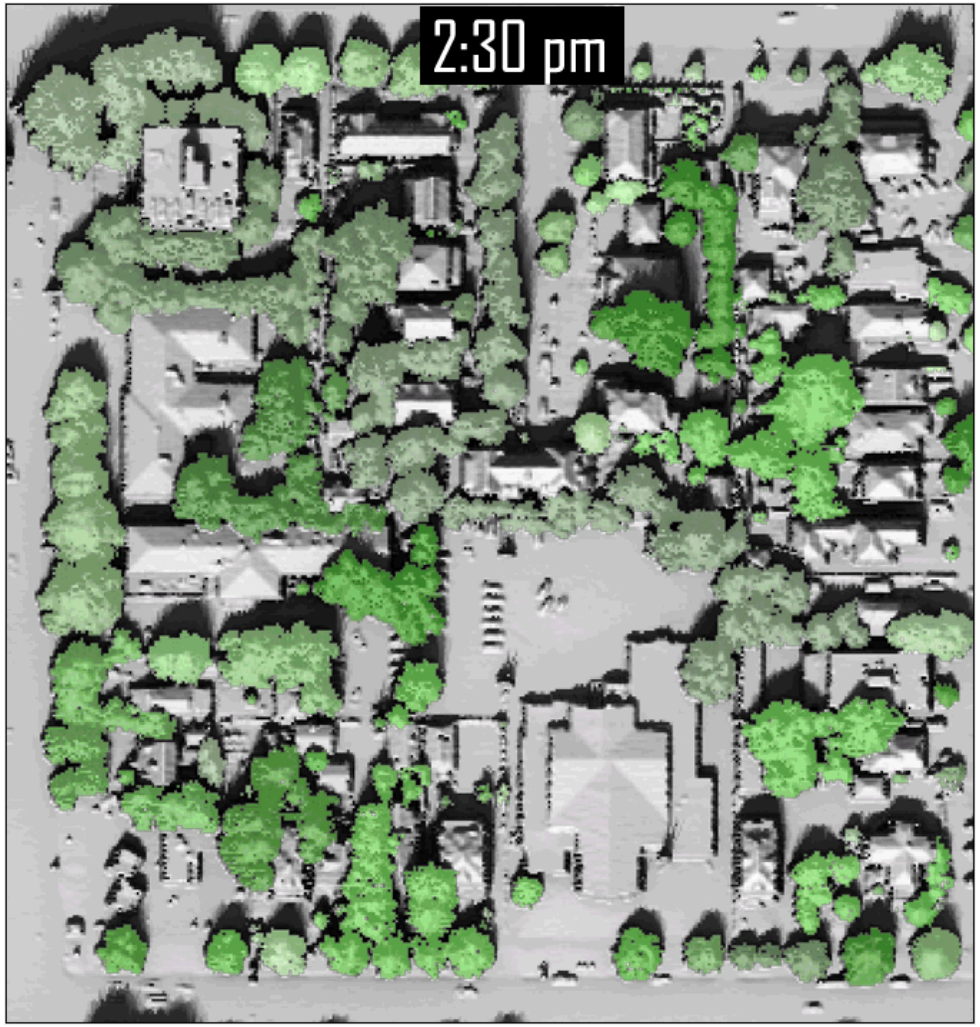


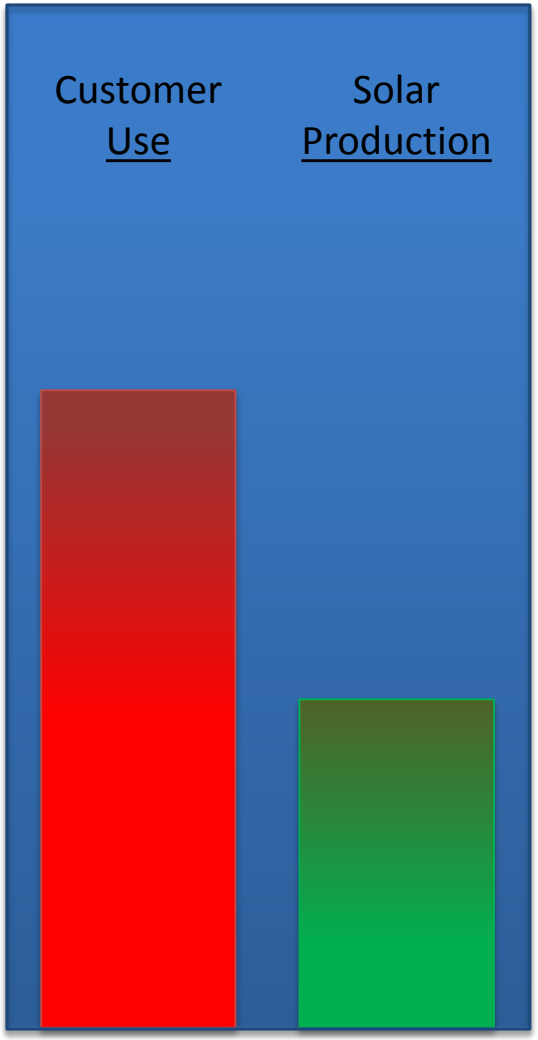
Here comes the sun



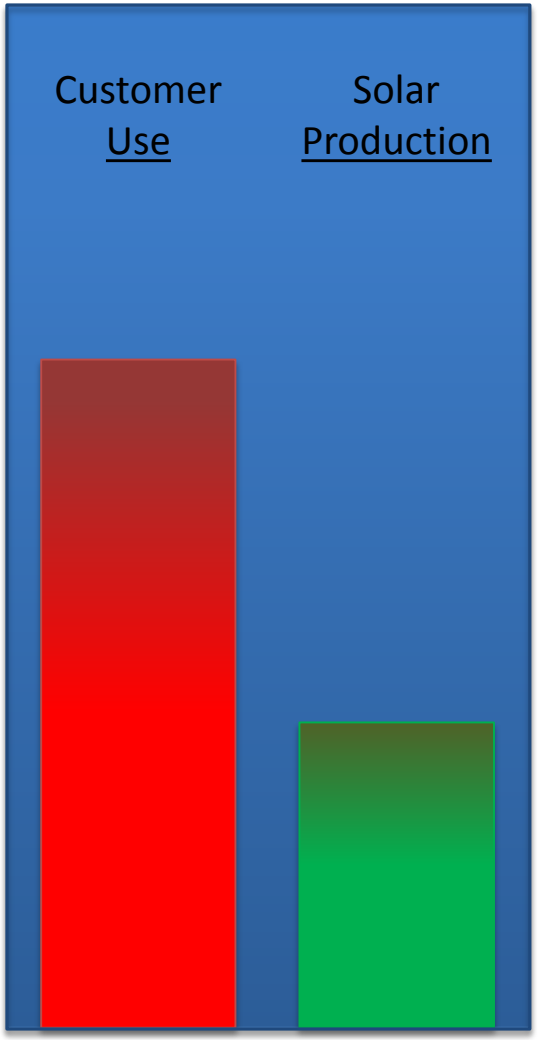


Here comes the sun

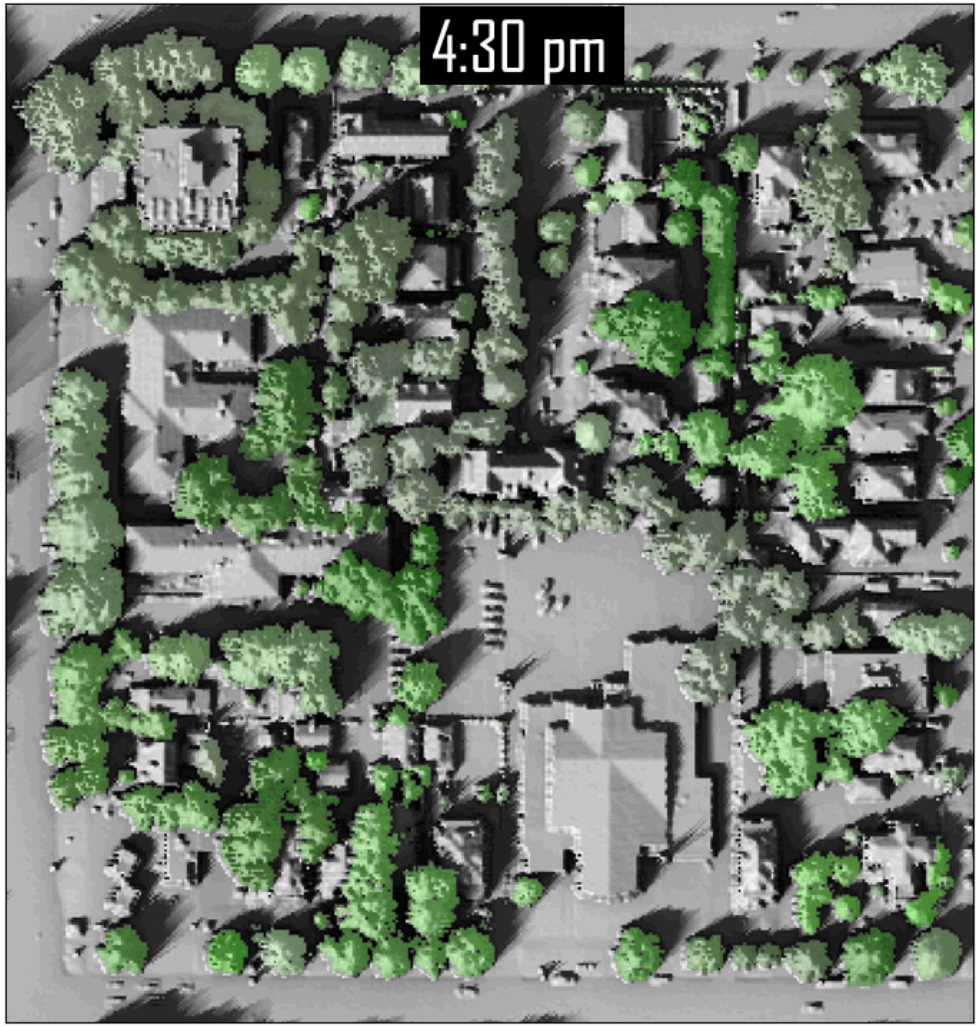


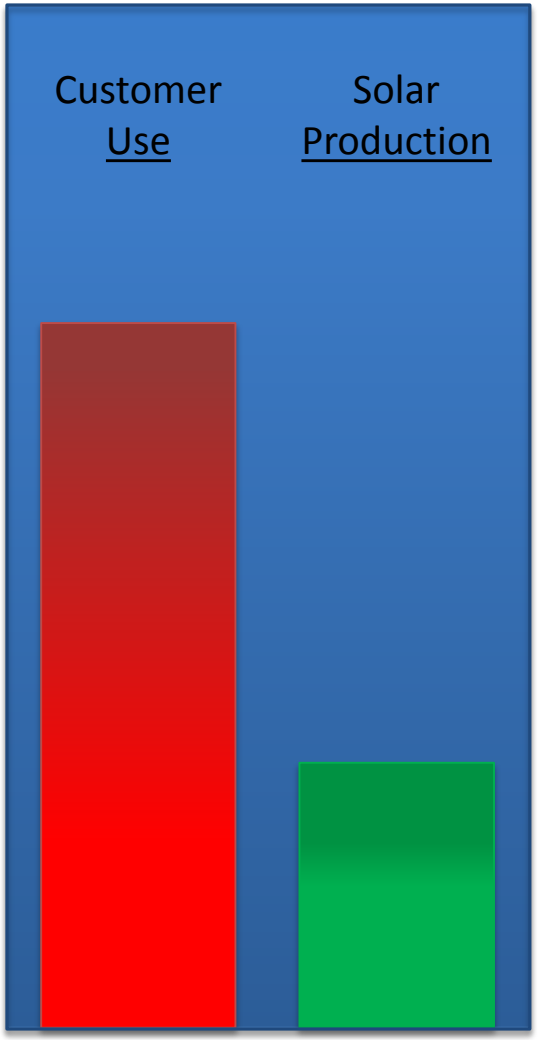


Here comes the sun

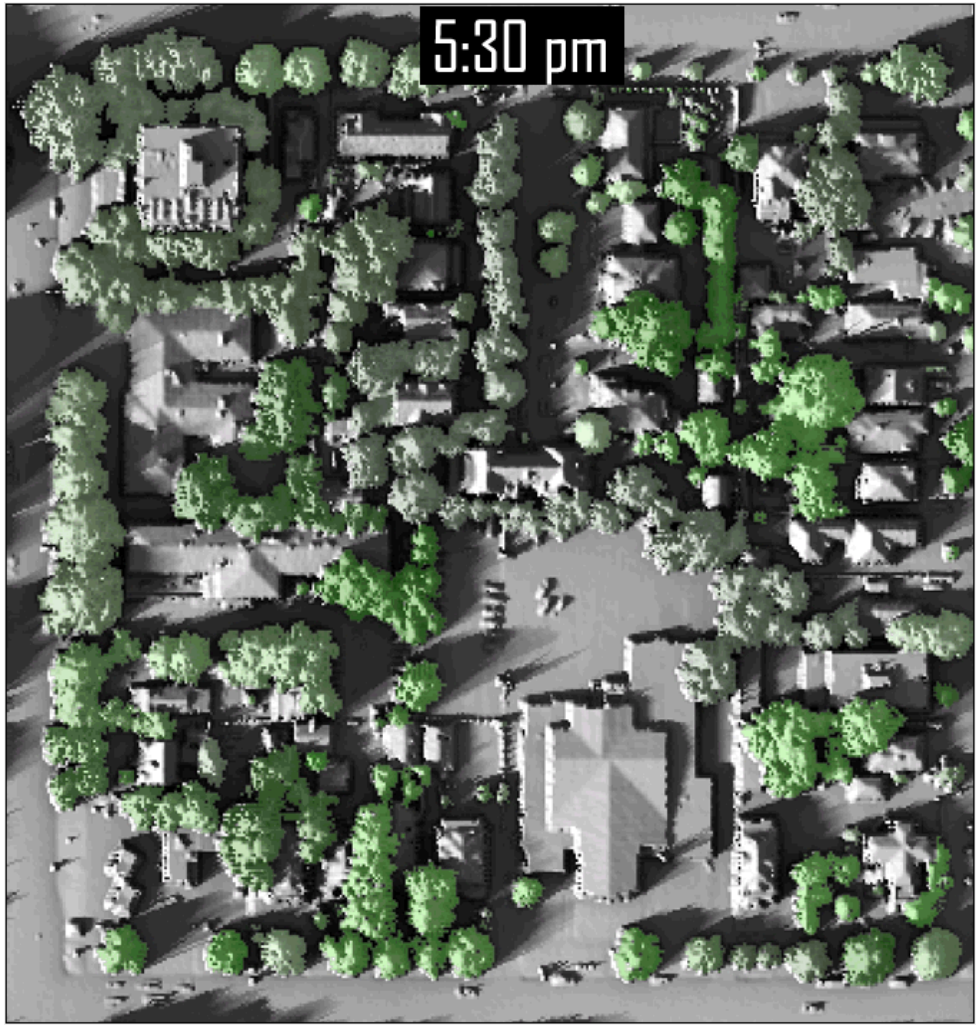


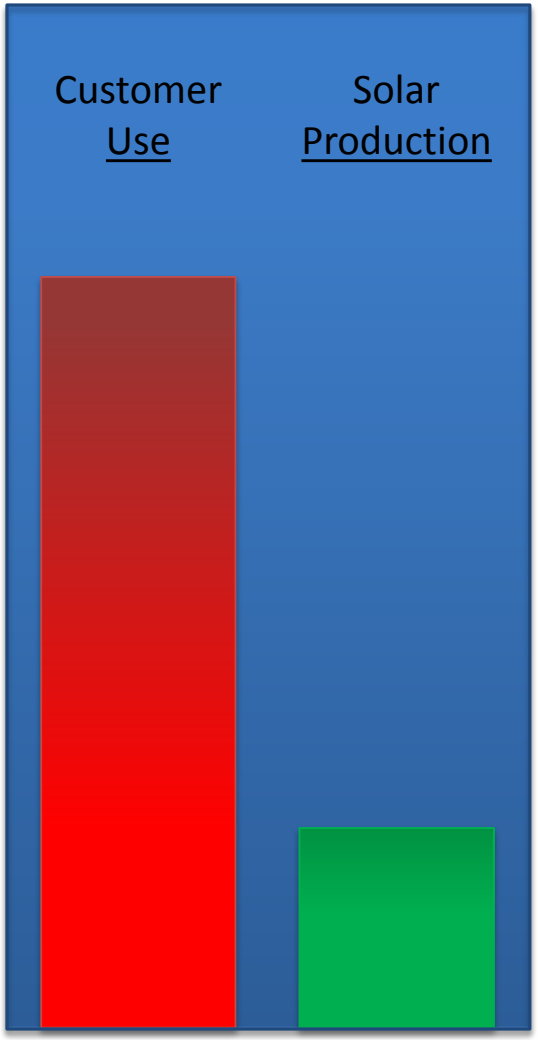
Here comes the sun



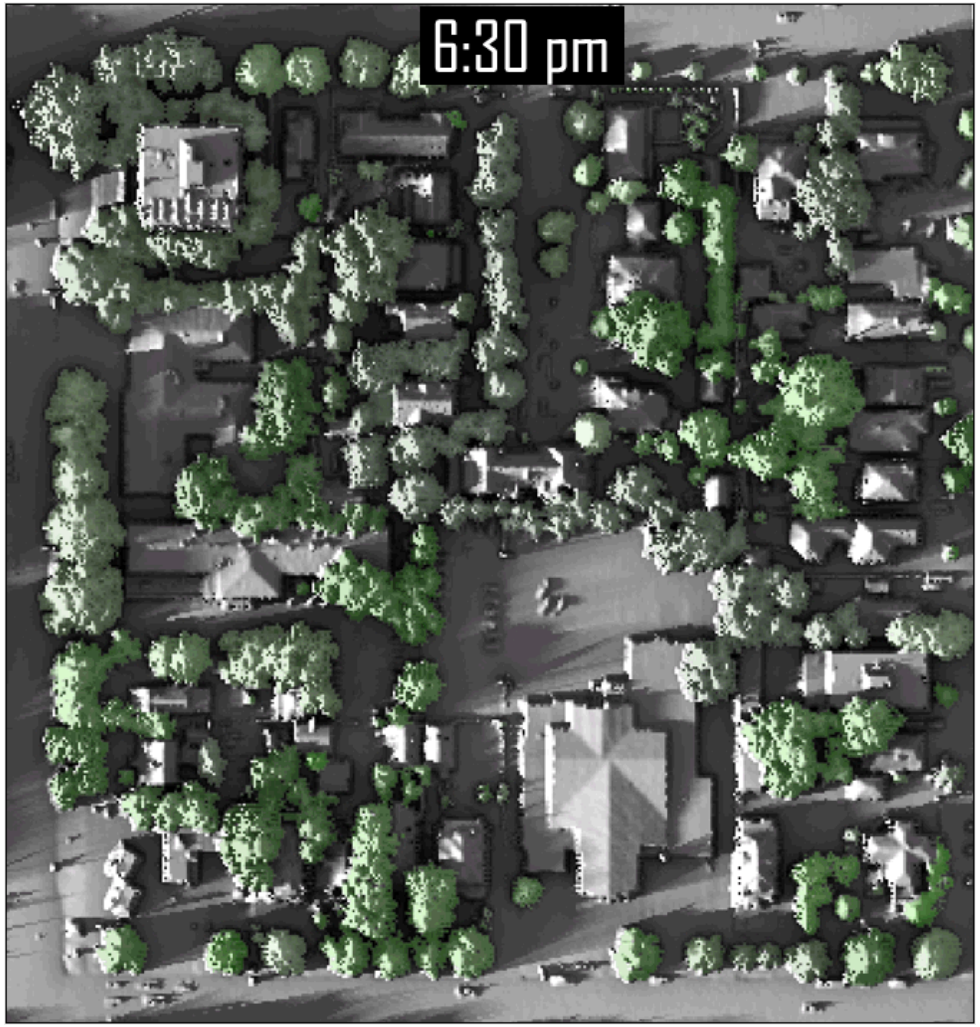


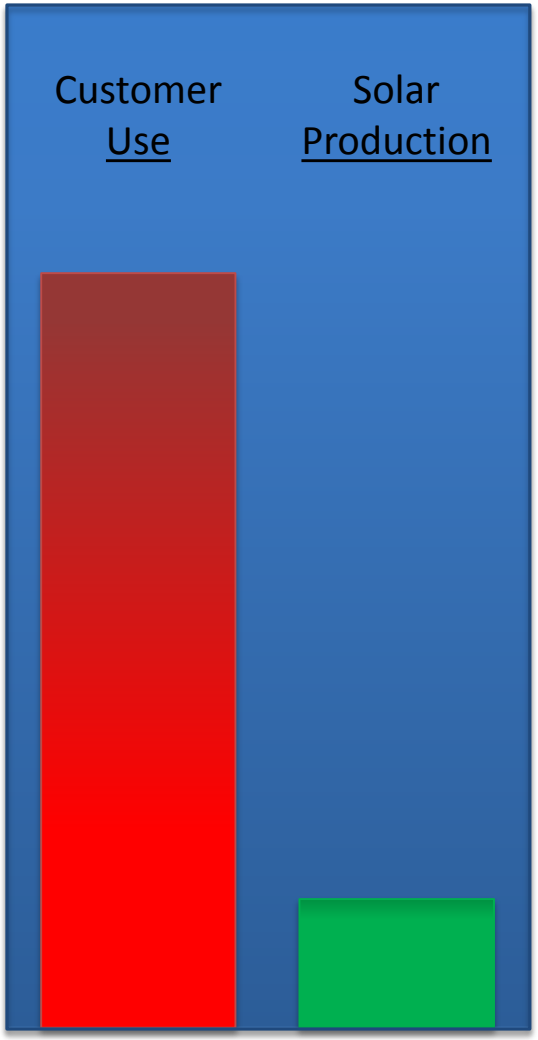
Here comes the sun



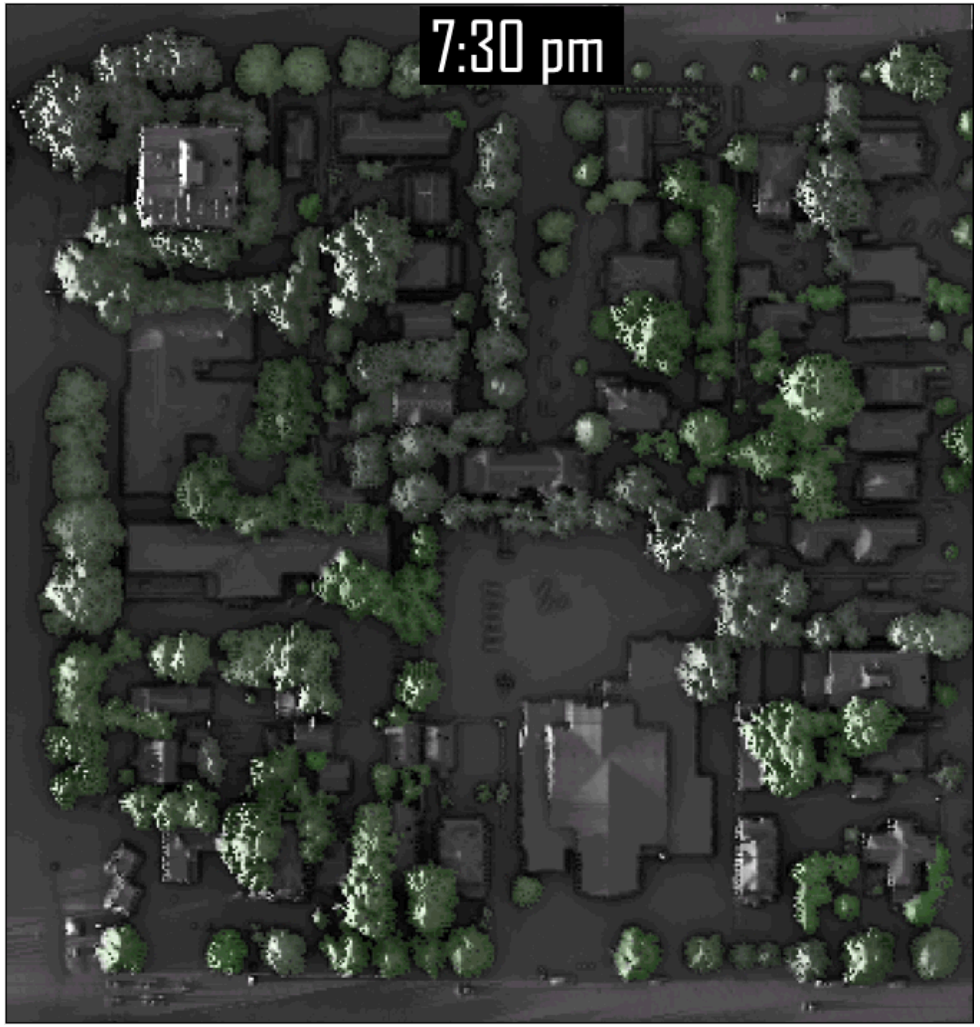


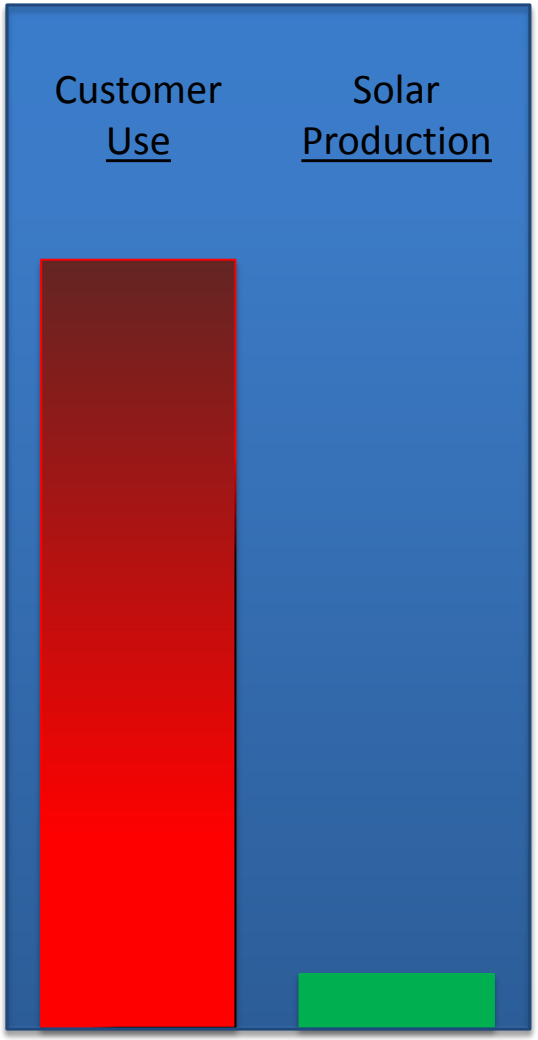
Here comes the sun





Here comes the sun





Estimated solar production

Solar Energy Conversion:

- ✓ 2,210 MWh annual energy production
  - 1,560 MWh during summer months (May-Sept.)

Maximum Solar Power Output – as calculated

- ✓ June 21 = 1.52 MW (summer solstice)
  - *Temperature Corrected = 1.45 MW at 76^{o} F*

Solar Output on Circuit Peak

- ✓ August 2 = 0.54 MW (2010 circuit peak)
  - *Temperature Corrected = 0.48 MW at 93^{o} F*

Projected 2011 Circuit Peak = 4.6 MVA

Solar contribution to peak