

Measuring Solar Energy from Regional Metered Power Data

Caroline Fuller

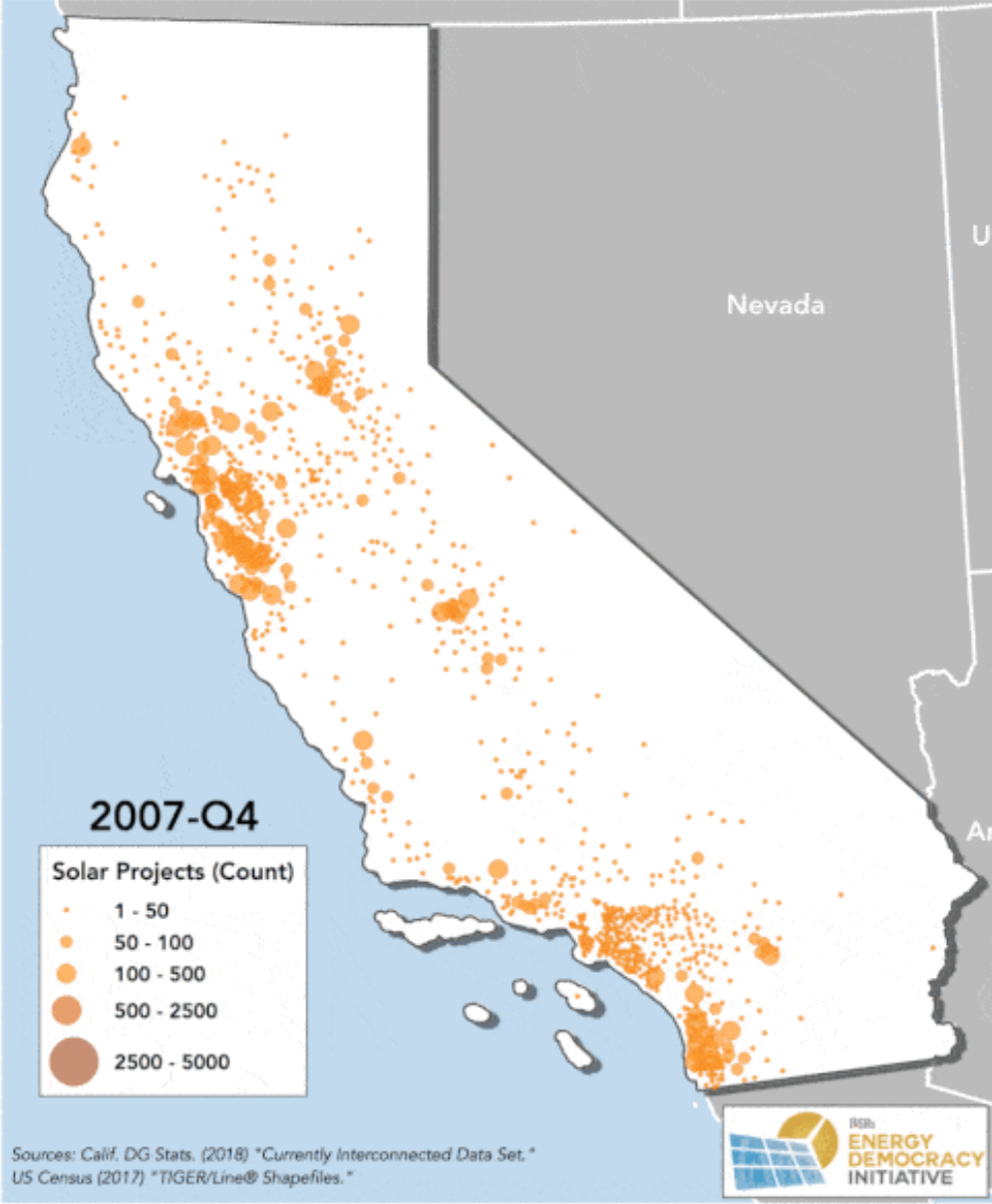
Dr. Snowden-Ifft

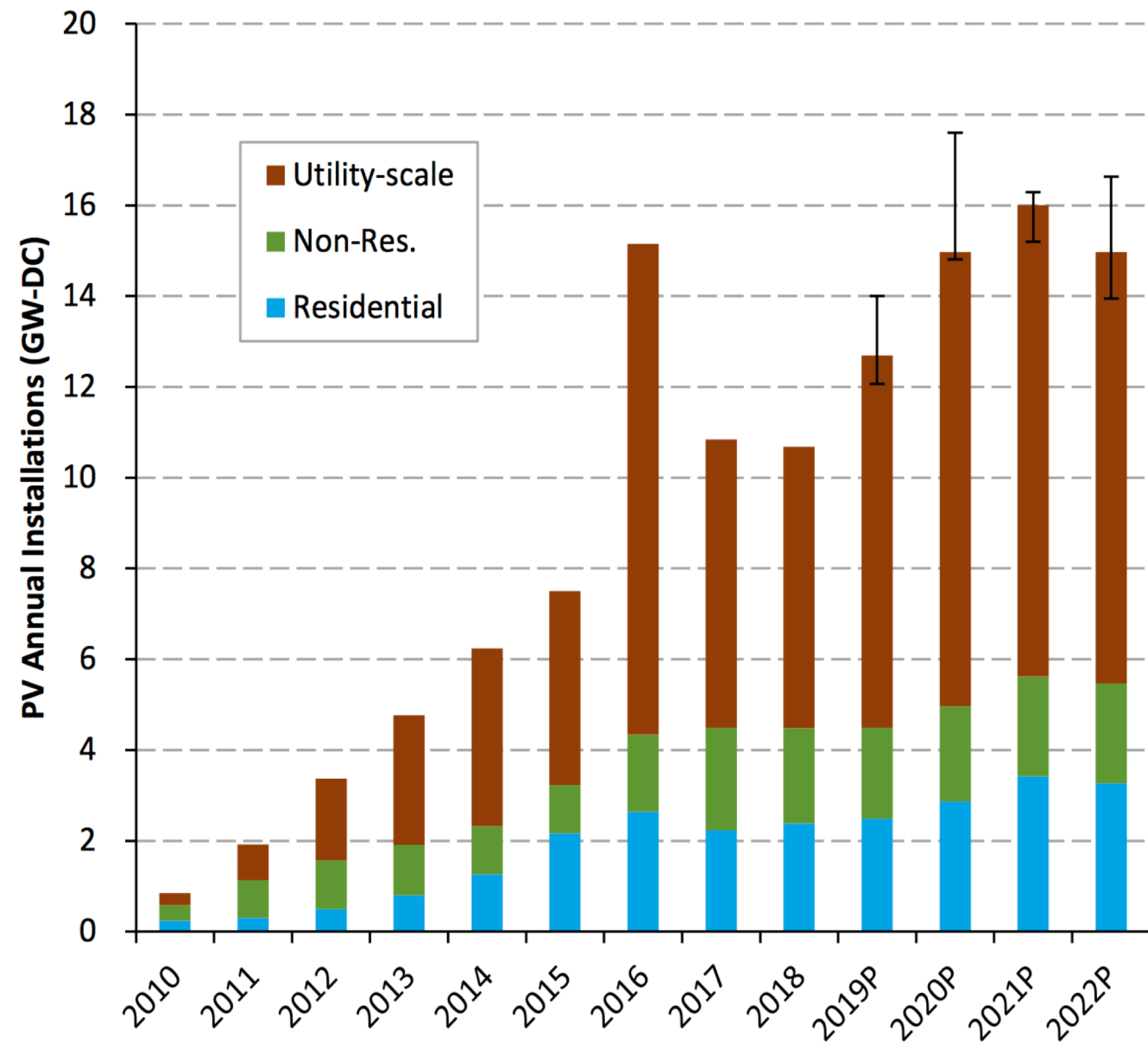
Occidental College, Physics



Growth in California's Solar Market

Quarterly by ZIP Code, 2007-Q4 to 2018-Q2

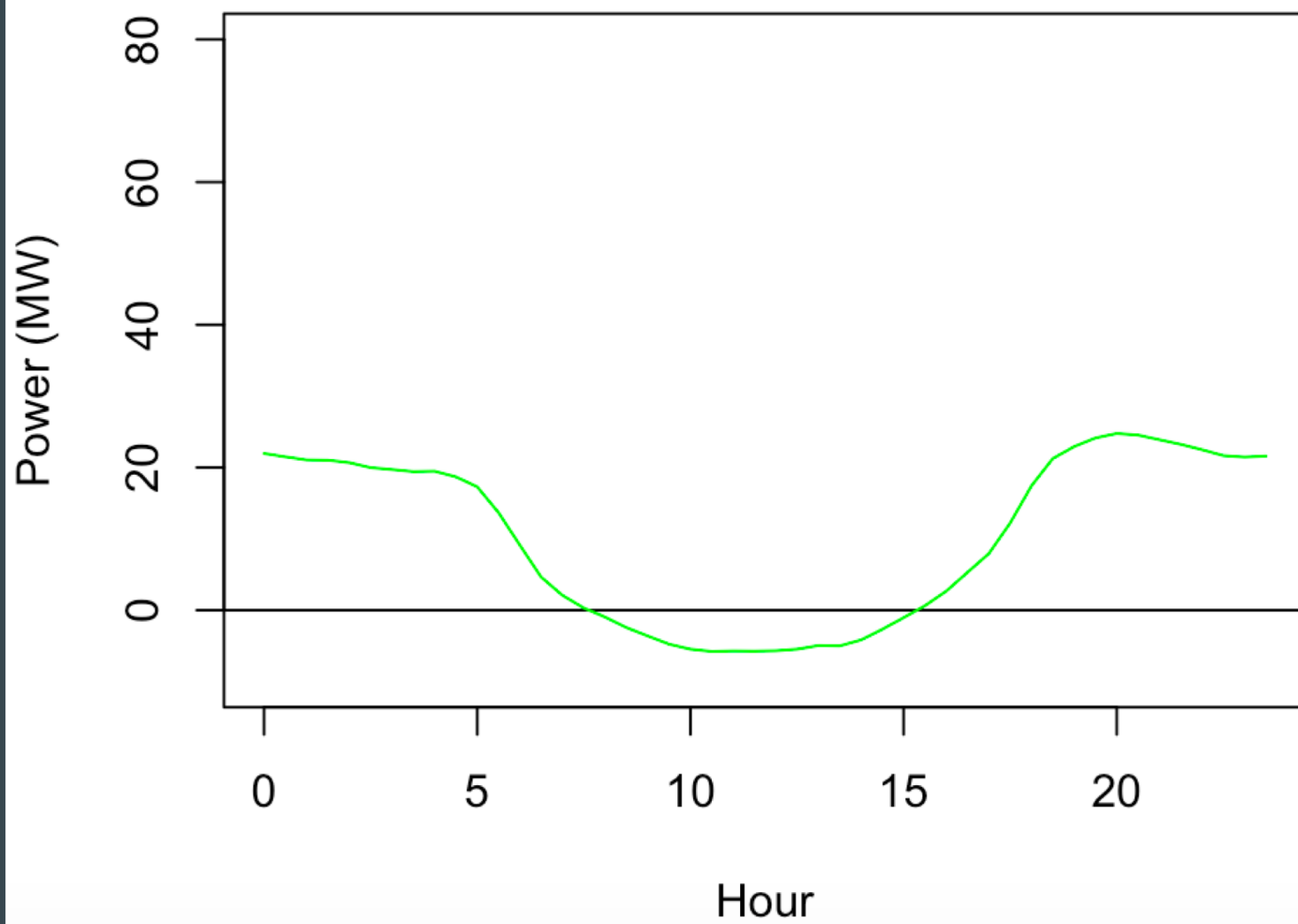




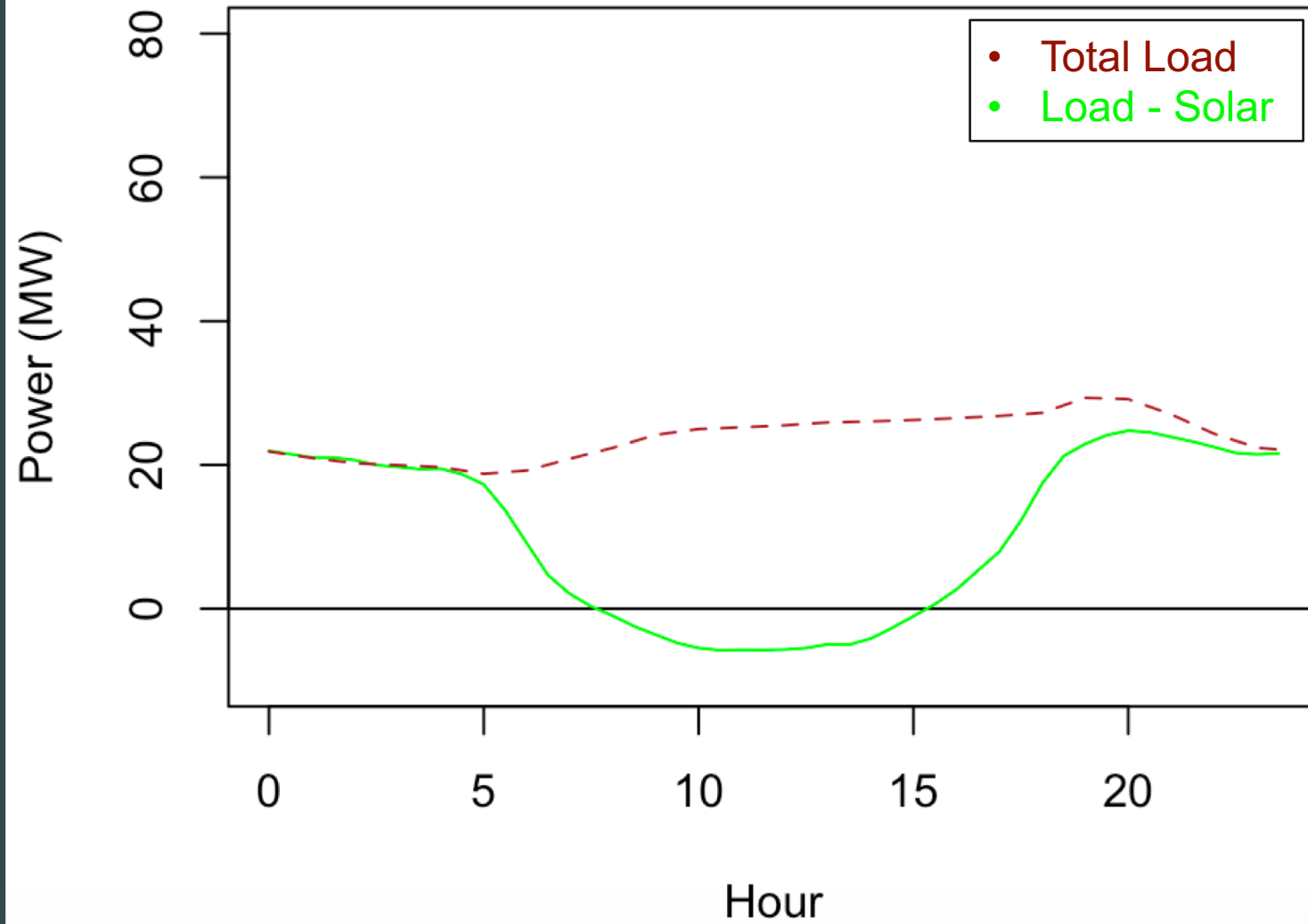
Annual US PV Demand.
Feldman, David and Robert Margolis. "Q4/2018 and Q1/2019 Solar Industry Update."
National Renewable Energy Lab, May 2019.

How do we get behind the meter?

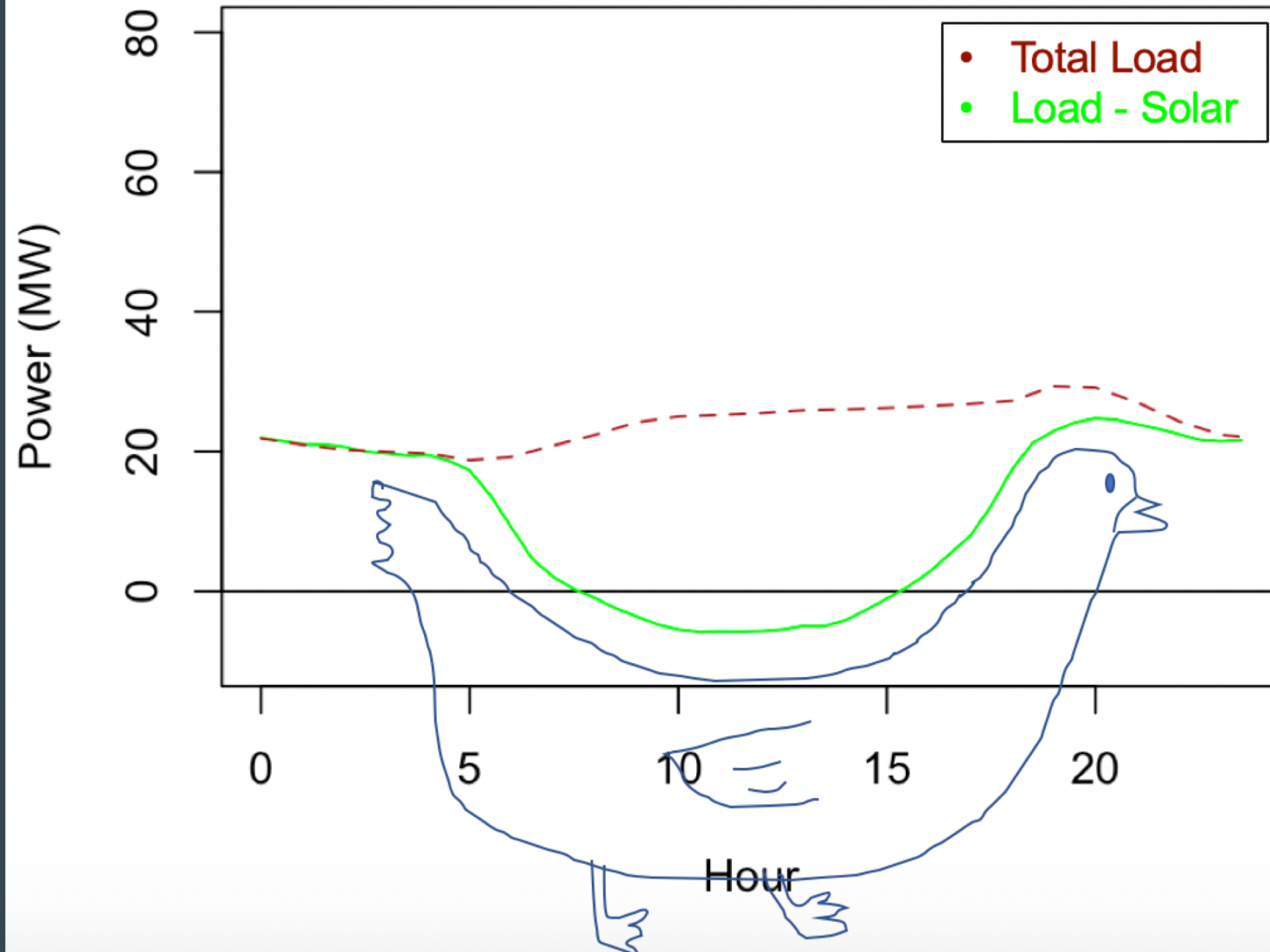
Location A, 2018-06-17



Location A, 2018-06-17



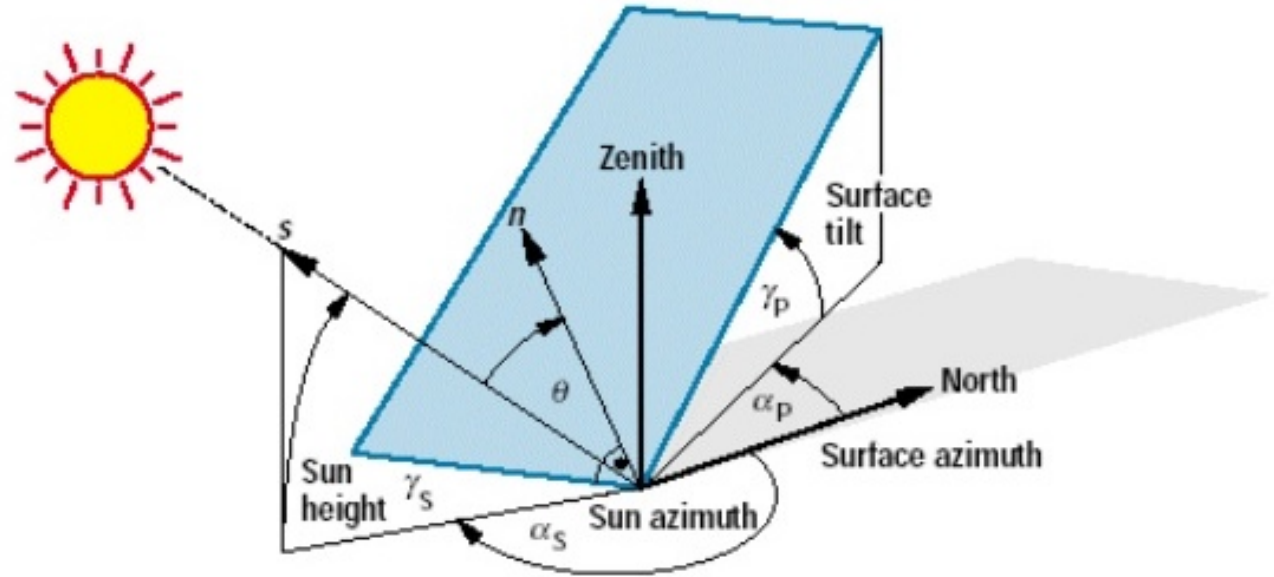
Location A, 2018-06-17



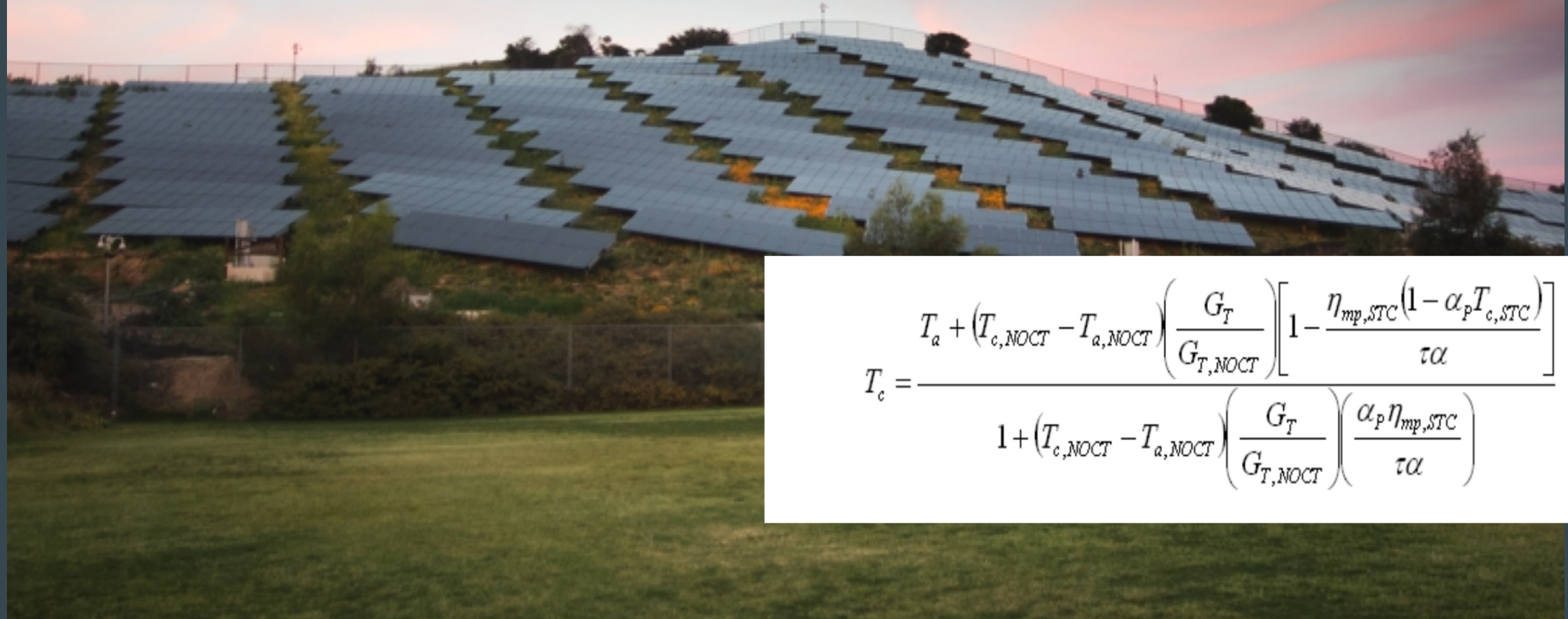
The Solar Output Curve

Variables

- Solar Position
- Panel Layout
- Solar Irradiance
- Cell Temperature

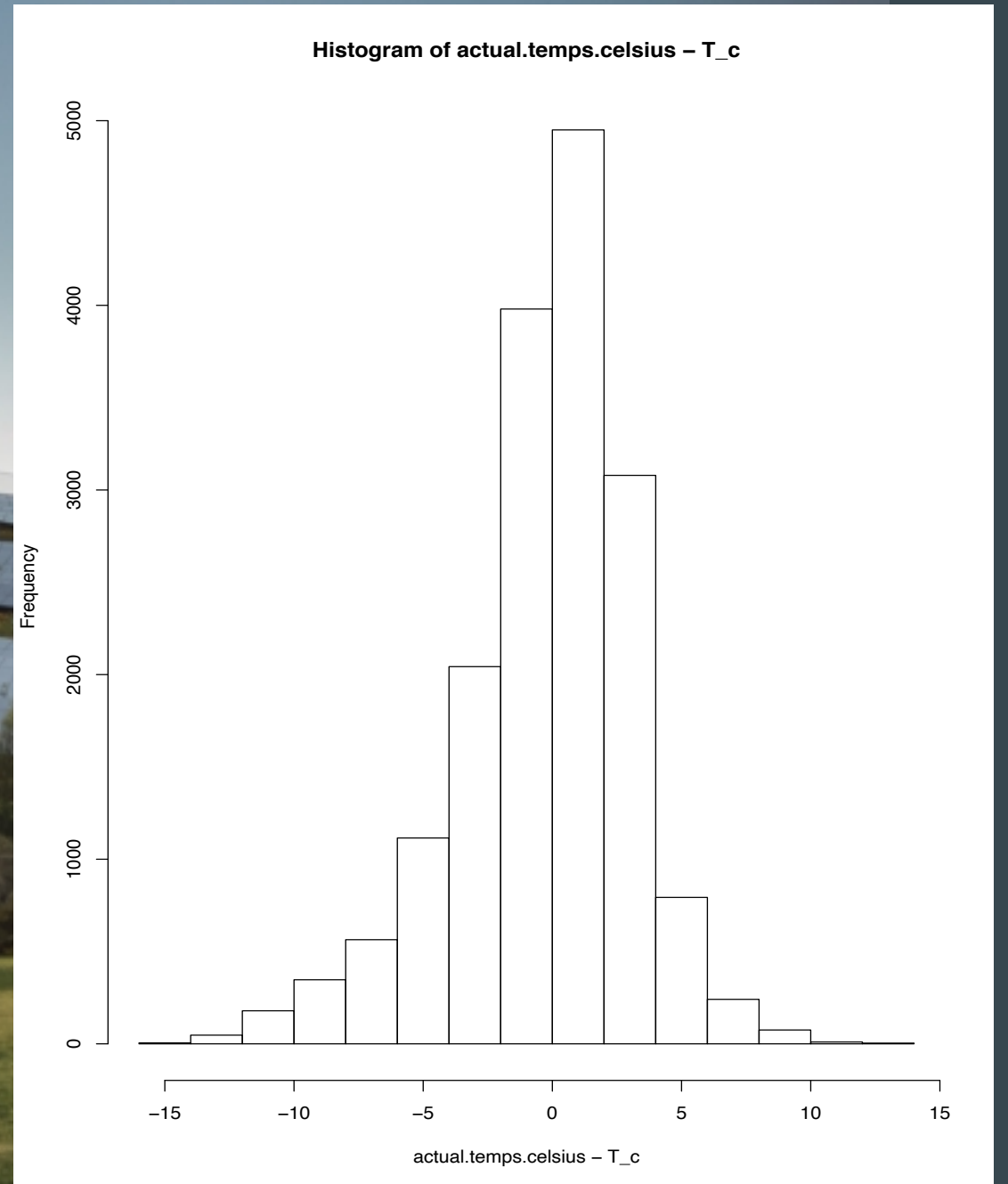


Cell Temperature

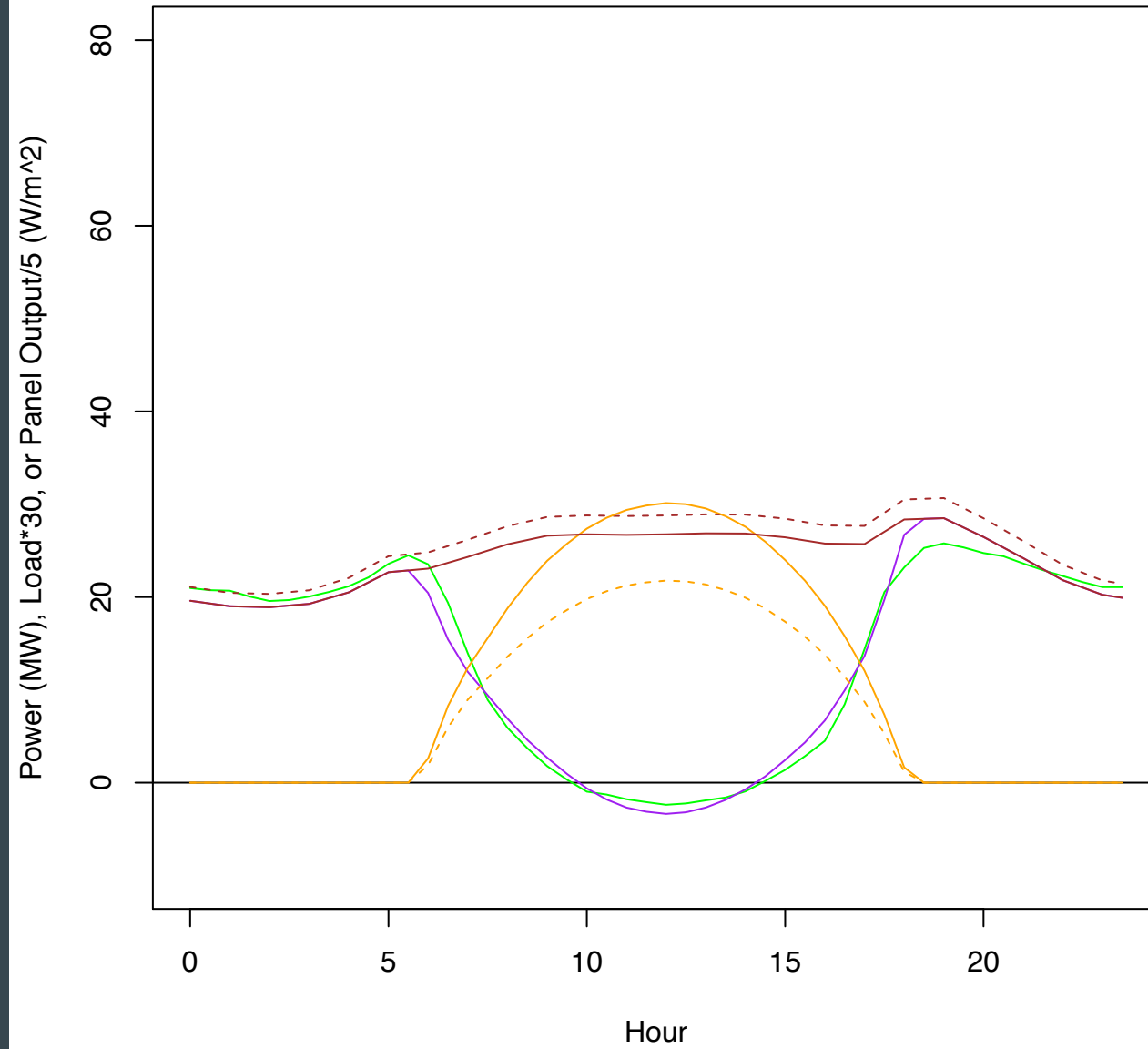


$$T_c = \frac{T_a + (T_{c,NOCT} - T_{a,NOCT}) \left(\frac{G_T}{G_{T,NOCT}} \right) \left[1 - \frac{\eta_{mp,STC}(1 - \alpha_p T_{c,STC})}{\tau \alpha} \right]}{1 + (T_{c,NOCT} - T_{a,NOCT}) \left(\frac{G_T}{G_{T,NOCT}} \right) \left(\frac{\alpha_p \eta_{mp,STC}}{\tau \alpha} \right)}$$

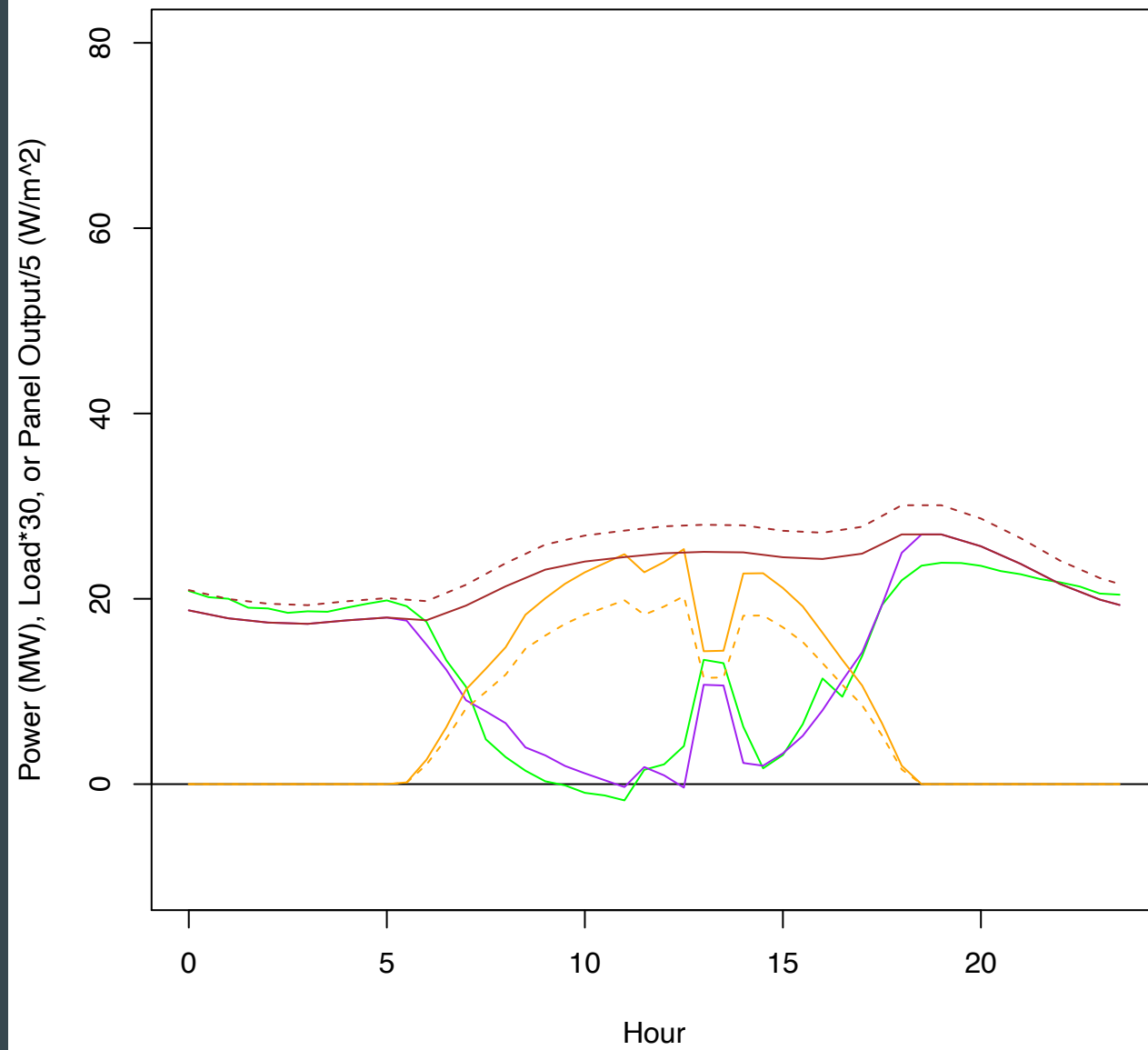
Cell Temperature



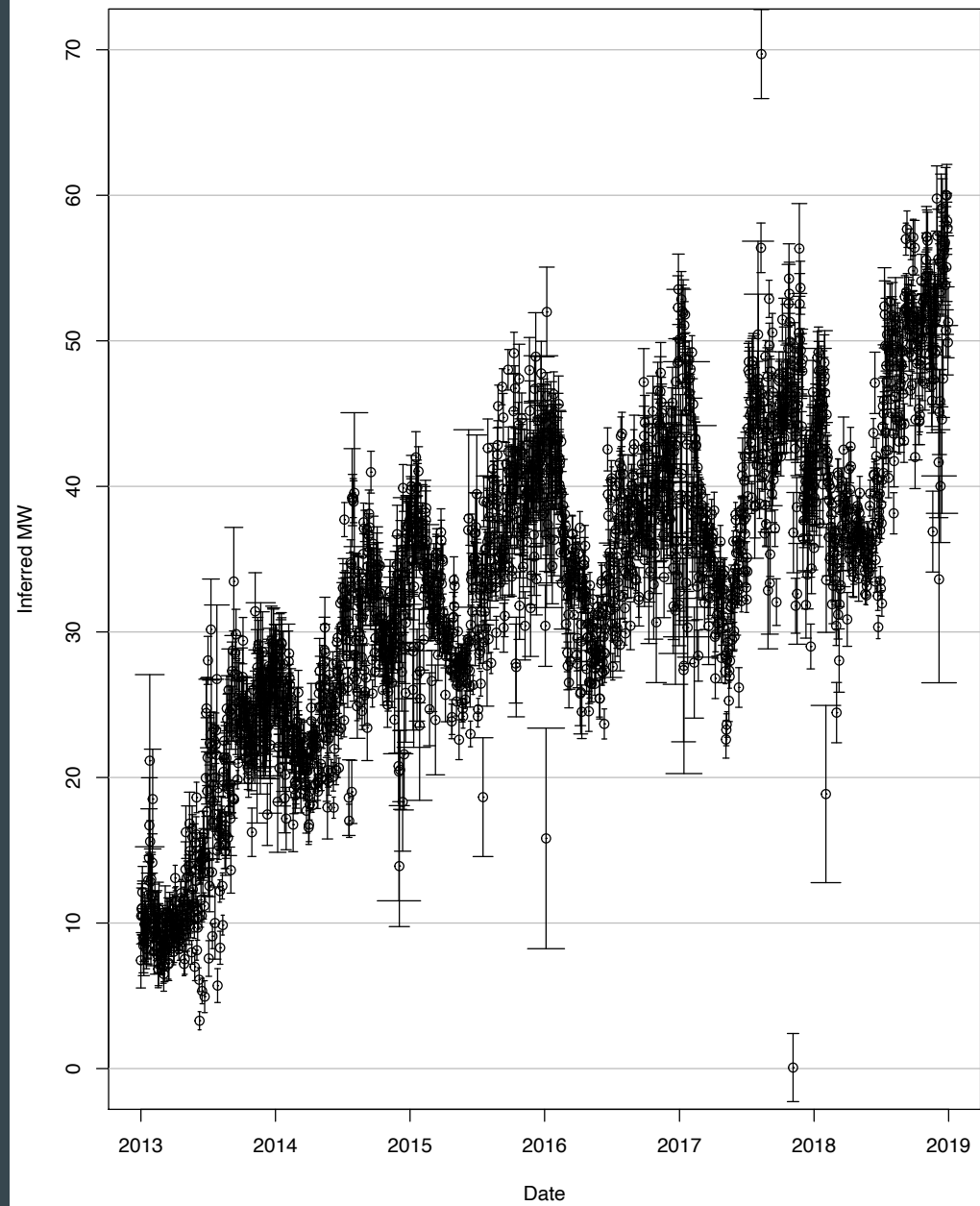
2018-03-27 - 2018-03-27 23:30:00
38.7 +/- 0.74 MW



2018-04-07 – 2018-04-07 23:30:00
35 +/- 1.2 MW



Location A, Total Inferred MW



What's Next?

- More comprehensive SCE data
- More extensive locations to show the overall growth of solar over time



Acknowledgements

- Professor Snowden-Ifft
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- URC at Oxy

