"Cleaning" Solar Energy at GT

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Project Inspiration

Solar Panels are low maintenance, "free" energy

BUT efficiency decreases over time with dirt build-up

Dirt on panel

"Clean" Energy?

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CNES Lab

- ~200 kW of installed rooftop capacity
- Built in 2011, the 460 panels have not been cleaned since then and grime has accumulated.
- We want to know: How could cleaning the panels improve performance?

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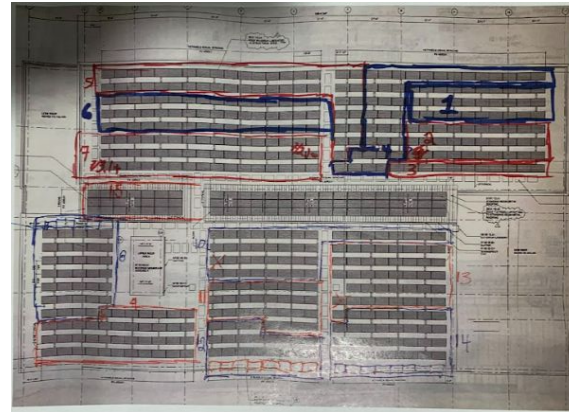
Project Statement

Our project seeks to **record electrical energy production** of solar panels and compare the performance **before and after cleaning** to **find optimal frequency of cleaning and financial benefits.**

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Qualitative Methods (Cleaning)

Scrubbing down individual solar panels with sponges, microfiber cloths, and rough brushes while using a mixture of the following common cleaning liquids for glass:

- Kitchen Detergent

- Power wash hose

- Windex

We first sprayed on the cleaning products on the bottom part of the solar panels, let it soak, and then scrubbed with hard and rough brushes until the dust came off.
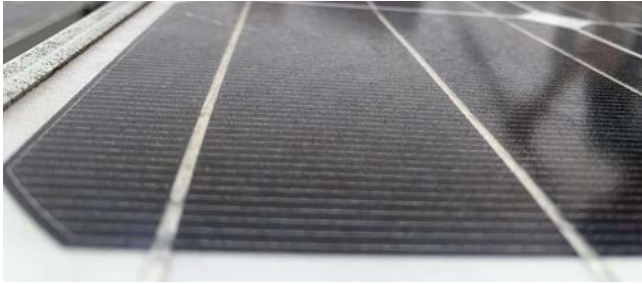
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Before

After

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Preliminary Results (Qualitative)

The panels have accumulated a lot of sediment with

Dirt on panel

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Quantitative Methods

Percent Increase of the panel bank A

$$\%\Delta\eta_A = \frac{E_{A,2} * E_{B,1}}{E_{A,1} * E_{B,2}} - 1$$

*equipment bought using grant

Variable Symbol	Description
$\%\Delta\eta_A$	Percent change of efficiency
$E_{A,1}$	Energy produced by array A in period 1 (Not cleaned)
$E_{A,2}$	Energy produced by array A in period 2 (Cleaned)
$E_{B,1}$	Energy produced by array B in period 1 (Control)
$E_{B,2}$	Energy produced by array B in period 2 (Control)

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Solar Panel Efficiency

Average increase in solar panel efficiency:

11.7%

Financial Benefit

$$\$10.30$$

Money Saved

$$M_{S,2} = E_{A,2}\left(1 - \frac{1}{1 + \Delta\eta_A}\right)R$$

Sustainable Impact

Enhancing solar energy is key to several UN Sustainable Development Goals, including clean energy (7), sustainable cities (11), and climate action (13). We wish to increase the longevity of existing PV infrastructure to help us enhance solar energy through community involvement in the Energy Club.

Future Work

- Explore different cleaning methodologies that consider variables such as time, labor, cost, and water.

- Continue monitoring solar arrays to observe the longevity of our efforts.

- Potentially extrapolate data to guide decisions regarding PV management and installations around campus.

- Continue encouraging community involvement in sustainable projects through the GT Energy Club.

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Thank you!

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