PROJECT NAME: Quantifying and Valuing Fundamental Characteristics and Benefits of Floating Photovoltaic (FPV) Systems

Last 5 digits of project number: 08746
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BACKGROUND and OVERVIEW

- No studies have been done so far to identify common characteristics among the FPVs, study the impact of FPVs on hydro-biological life, and vice-versa.
- This is a first project assessing the performance capabilities of FPV technologies, potential environmental impacts of the technologies, and collect data for use in the subsequent development of research protocols.

METHODS

- Time-series data collection, monitoring of PV modules temperature and field surveys would be performed at four existing FPV sites, and four existing land-based photovoltaics (LPV) control sites located in Florida, and California.
- Field surveys involve the assessment of FPVs impact on water bodies, biological life, and wildlife interaction.
- Data analysis goal is identifying the common characteristics, patterns and performance improvement metrics.

KEY MILESTONES

- Completed – Hydro-Biological field surveys (animal interaction with FPVs, water quality tests), temperature sensors setup and data collection at four sites.
- The field surveys revealed that FPVs do impact the hydro-biological life, but the severity of impact depends on the type of water resource (retention pond, water treatment reservoir, irrigation pond, fishponds, etc.).
- The time-series data analysis revealed an unusual and high temperature difference among the FPV modules compared to the LPV modules.
- Ongoing – Project findings dissemination through webinars, a dedicated website, conference and journal publications, and open-access data.

CONCLUSION

- Hydro-biological results could lead to the development of new statutes and guidelines safeguarding animal life in vicinity of FPVs. Further, performing the water quality tests (presently not done) could become part of the FPVs approval or installation.
- Temperature analysis results could lead to the development of new orientation and connection configurations in FPVs to reduce temperature differences and produce optimal performance.

STRATEGIC ANALYSIS AND INSTITUTIONAL SUPPORT TRACK

Floating PVs attract more birds, **bird droppings** and the Floating PV modules **exhibit unusual** and **high temperature** differences compared to **Land PV modules**.

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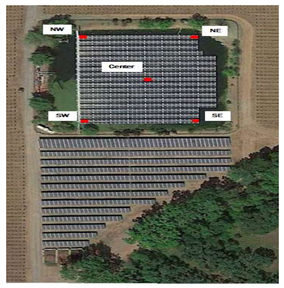
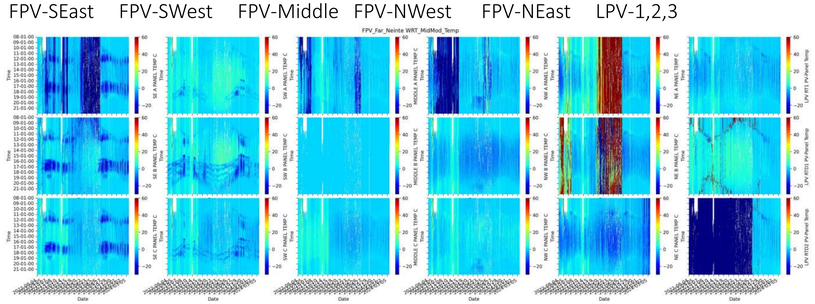
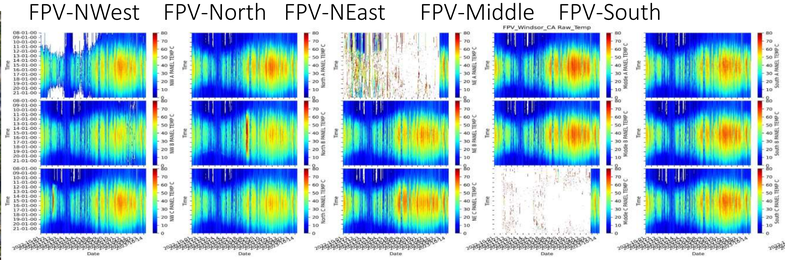


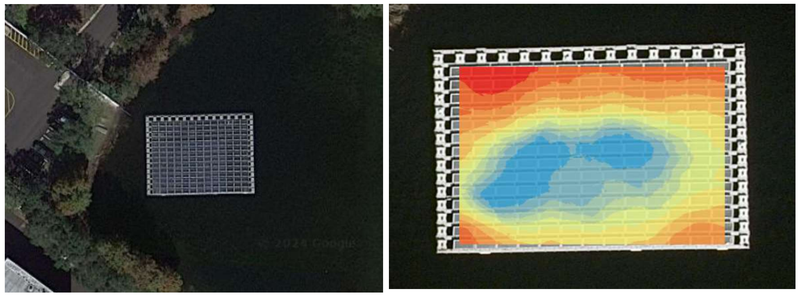


First picture: Floating and Land PV systems located at a Farm in CA. Second picture: Normalized data heatmaps of 5 FPV modules (three sensors per module) and 3 LPV modules (all subtracted by middle FPV module temperature). The five FPV modules were located at five extreme corners of the PV array as annotated in the first picture. Note: all maps scaled to one scale color bar.



First picture: Floating PV system located on a water treatment facility at Windsor, CA. Second picture: Raw data heatmaps of the five PV modules temperature (three temperature sensors per module) located at five corners of the PV array as annotated in the first picture. Note: all maps scaled to one scale color bar.

First six pictures: Bird droppings on a FPV located on a water treatment facility at Windsor, CA (Pic courtesy: Donard Metzger, Dave Chasar, FSEC, UCF); Seventh picture with bird: Great Egret utilizing the FPV platforms at a FPV, Orlando, FL. (Pic courtesy: UC Davis)



Example of interpolated soiling surface (bird dropping, dust, etc.) on a FPV located at Orlando, FL. Blue represents 'cold spots,' or areas predicted to have low levels of soiling, while red represents 'hot spots,' or areas predicted to have high levels of soiling.

Additional project contributors: FSEC, WildEnergy UCDAVIS, NREL Transforming ENERGY