Louisiana Solar Energy Laboratory

Summer Research Internship

UNIVERSITY of LOUISIANA LAFAYETTE

Training in Research Methods and
Modern Laboratory Equipment through

Floating Solar Plant Design and Technology Analysis

Presented by:

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Supervised by:

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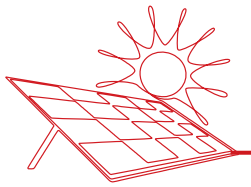
University of Louisiana at Lafayette



Objectives

of the Internship

- Get hands-on experience with software tools for simulation and design
- Using laboratory equipment
- Analyzing Floating Solar Plant Designs and Technologies

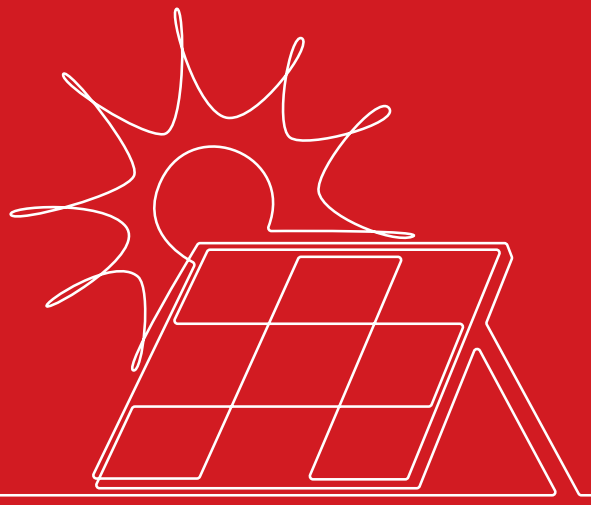
Purpose

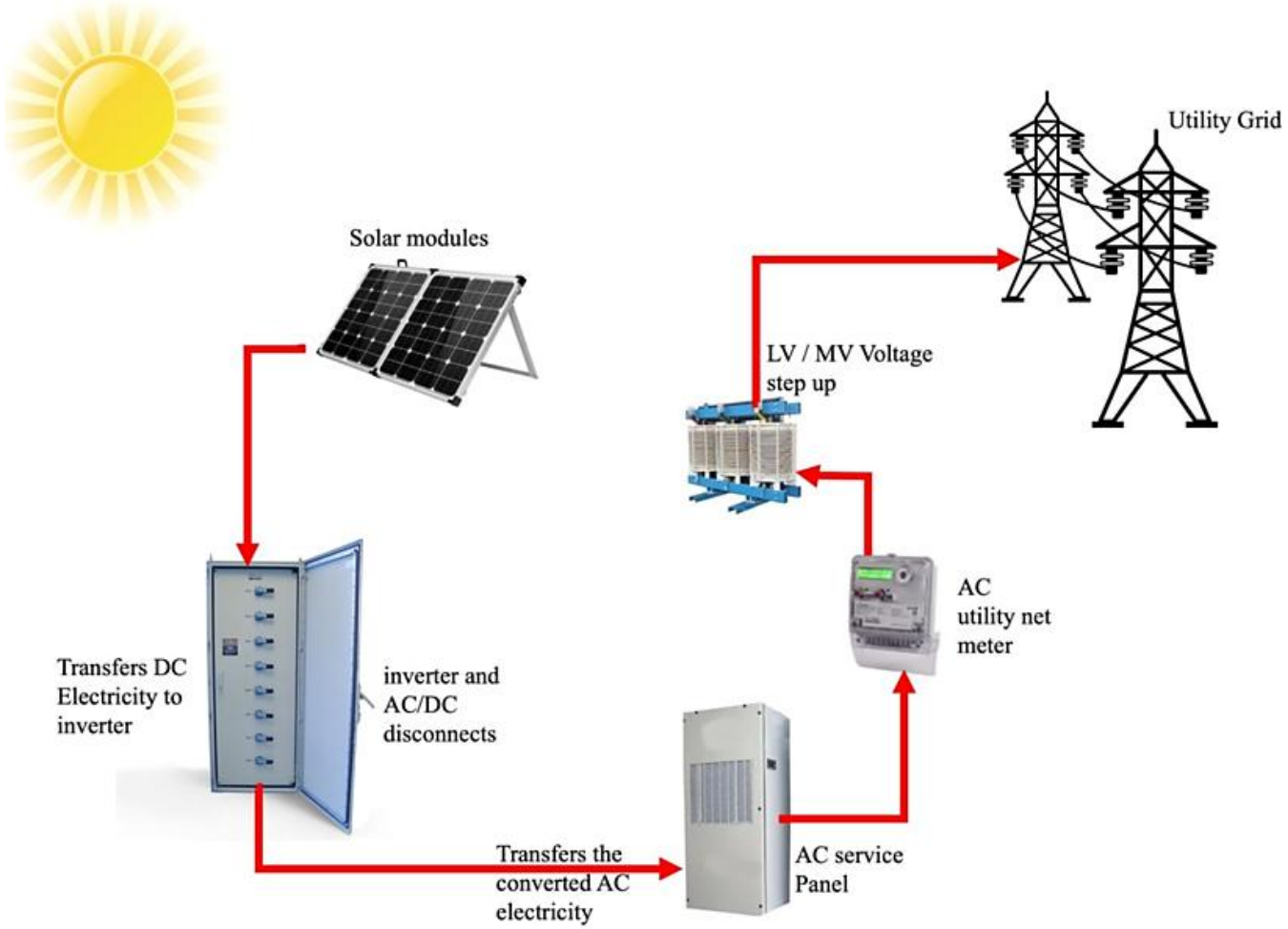
- Master Fundamentals of Solar Power Plants
- Learn and Apply Design Software
- Energy Analysis of Floating Solar

Renewable Energy

- Definition
- Type
  - Solar
  - Wind
  - Hydropower
  - Geothermal
  - Biomass

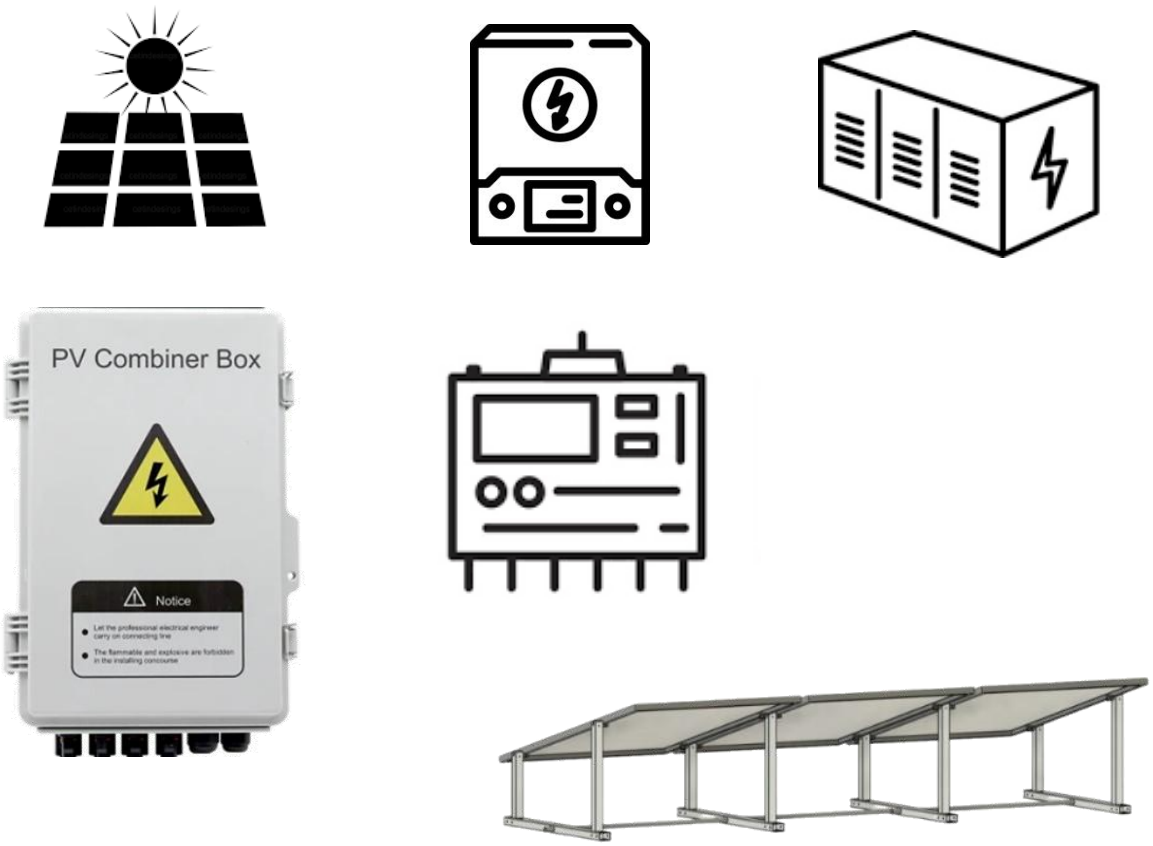
Solar PV and Solar Power Plant





Type of Solar Energy System

- Residential Solar
- Commercial Solar
- Utility Solar



Component of a PV plant

Solar Safety

- Installation Safety
- Site and mechanical Hazards
- Electrical Hazards

Floating Solar

Overview:

- Definition
- Efficiency Boost

Key Design Elements:

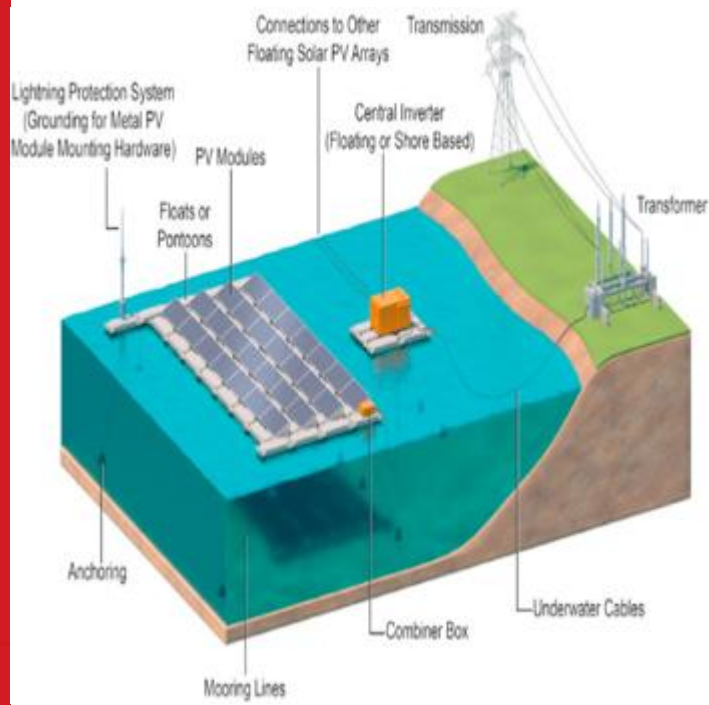
- Floating Structures
- Anchoring
- Durability

Benefits:

- Land Savings
- Water Conservation
- Energy Efficiency

Challenges:

- Maintenance Costs
- Environmental Impact



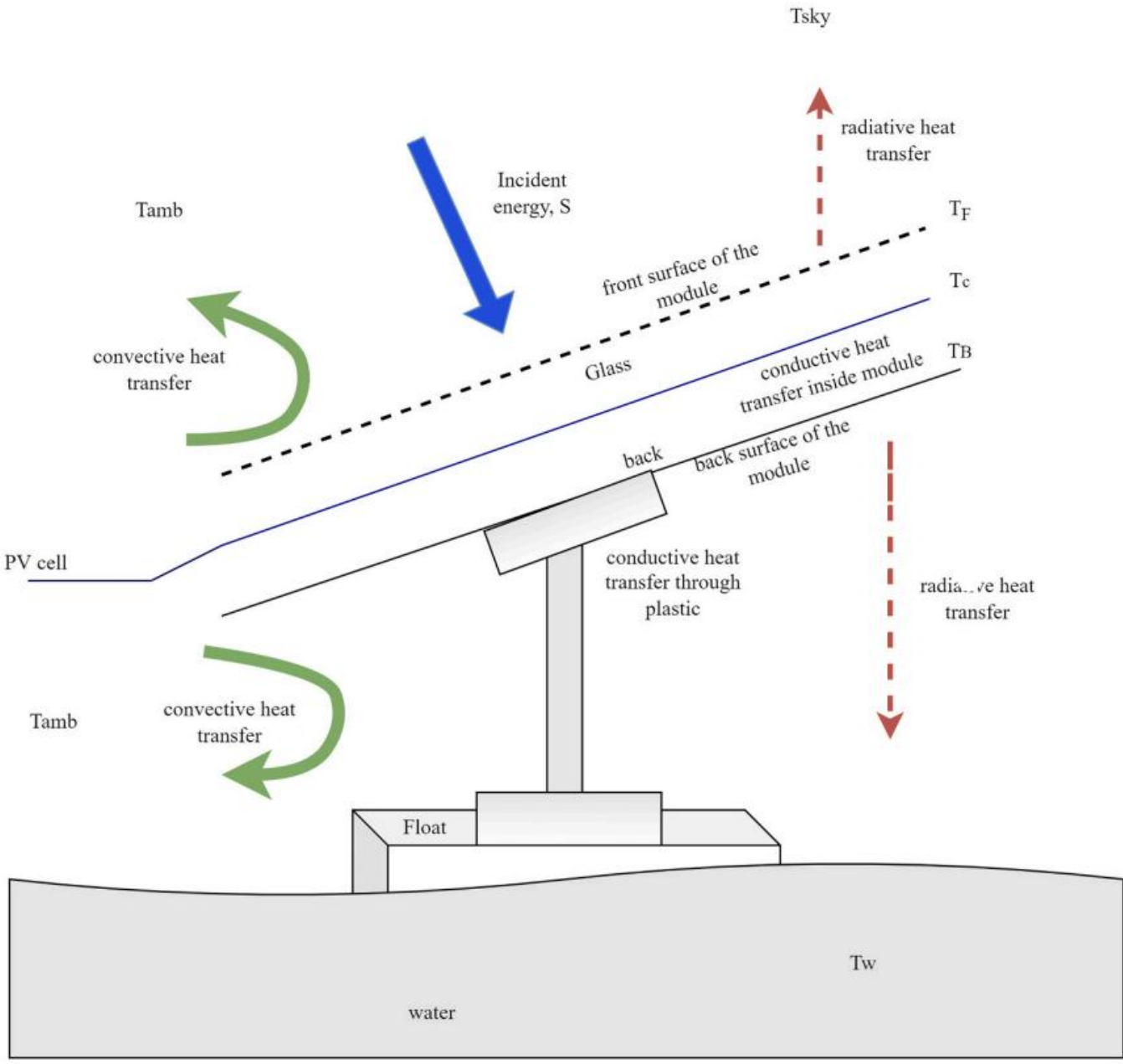
Heat Transfer in FPV

- Cooling Effect of Water:

  Convection and Evaporation
- Conduction:

  Heat Transfer from Panels to Water
- Radiation:

  Heat Release from Panels

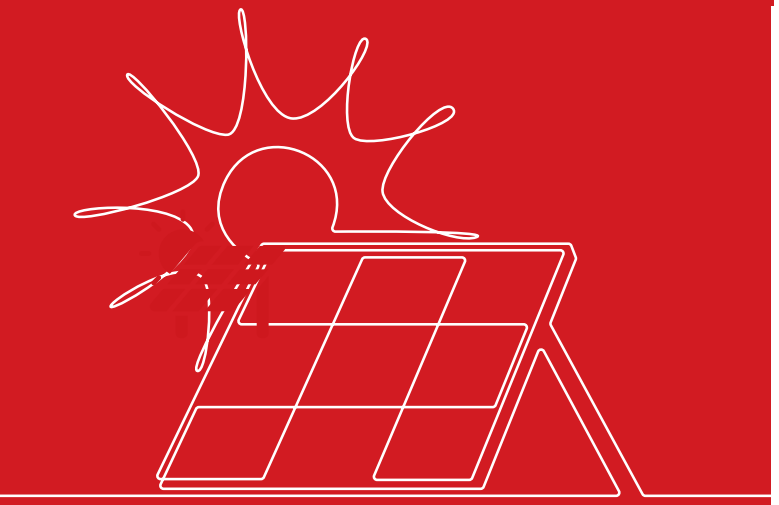


1 MW Ground Solar and Floating Solar

Parameter for design	GPV 1 MW	FPV 1 MW
Tilte angle	25	15
Ground coverage ratio	0.55	0.7
soiling loss	5%	1%
soiling loss	5%	1%
Heat transfer coefficients	a= -3.62 b= -0.075	a= -3.483 b= -0.105

Capital cost $/kW	1912	2380
Fixed operating cost	18	15.5
Analysis period	30	30
Inflation rate	2.50%	2.50%
Internal rate if return	5.10%	5.10%
Project Intern debt	71.80%	71.80%
Nominal debt interest rate	5%	5%
Effective tax rate	25.74%	25.74%

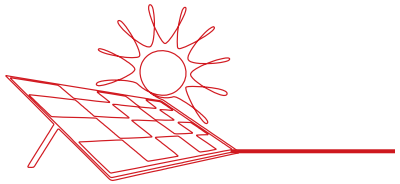
Software



System Advisor Model

PVSYST

PHOTOVOLTAIC SOFTWARE



System Advisor Model

NREL Transforming ENERGY

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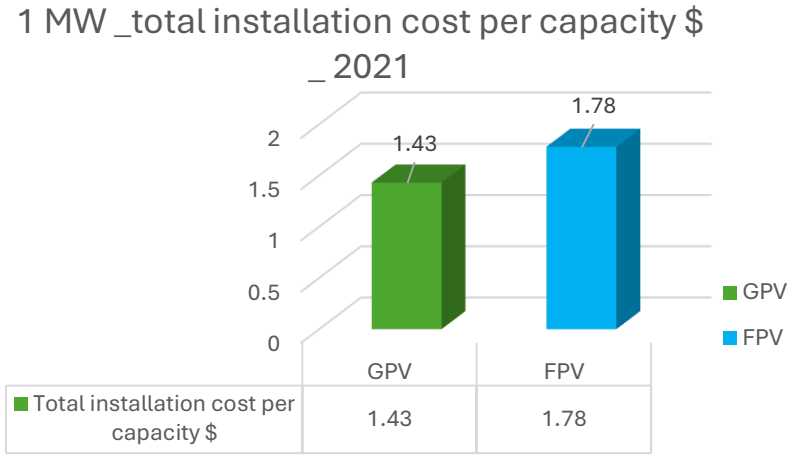
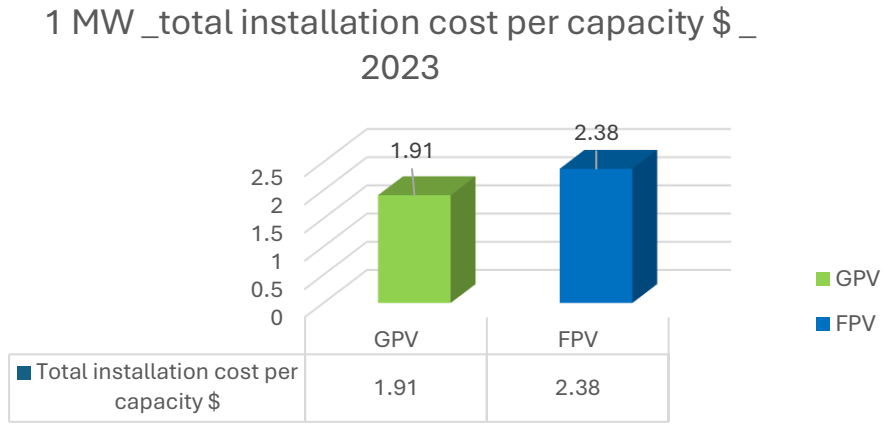
System Advisor Model

Result Analysis

Energy & Economic



Benchmark cost of GPV & FPV system



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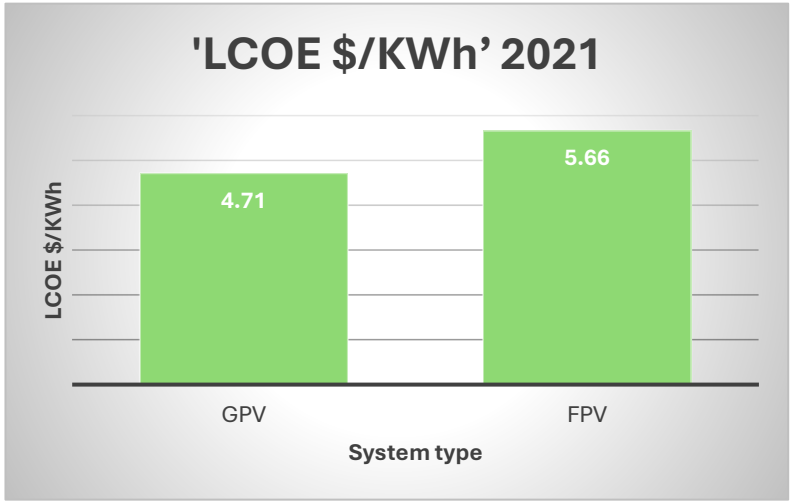
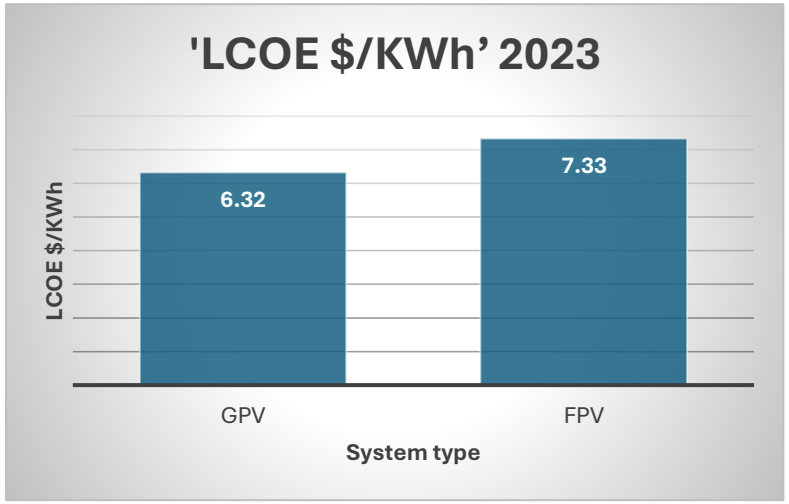
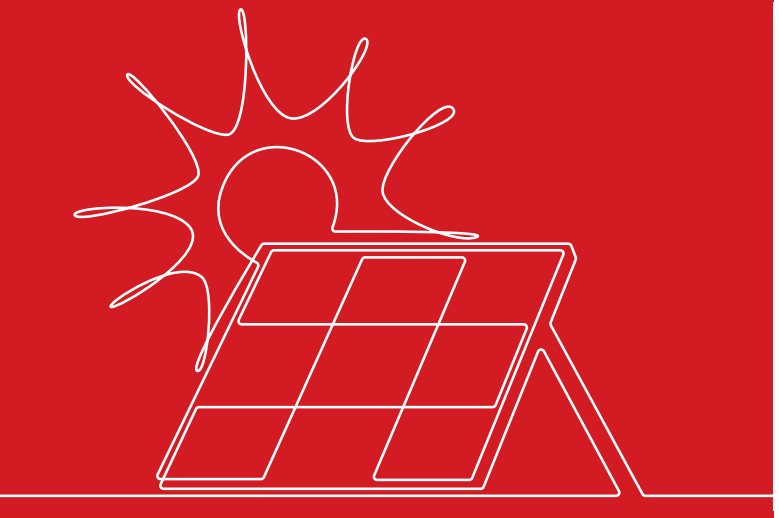




Result Analysis



Environmental

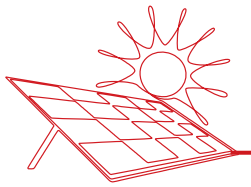
- Water Conservation
- Improved Water Quality
- Land Preservation
- Reduced Heat Island Effect
- Biodiversity Protection:
- Sustainable Development
- Potential for Synergy

Limitations of the analysis

- No specific software yet to design Floating PV
- The rule of lease varies in different place

Conclusion

- Higher Efficiency & Carbon Savings
- Water Conservation & Quality Improvement
- Land Preservation & Dual-Use Opportunities
- Environmental Protection & Sustainability



Thank You

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