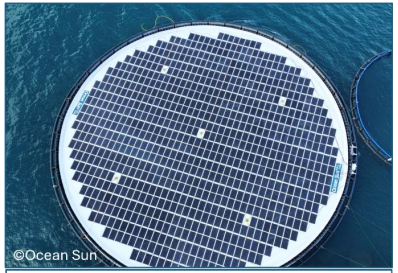
Pure-Floats (examples: CTI, Sungrow)

Metal or FRP + floats/pipes (examples: Zim Float, Scotra)



Membrane (example: Ocean Sun)

Closed or Semi-closed (examples: SolarFloat)

IEA PVPS

Subtask 2.1 Performance and Reliability of FPV

Josefine Selj, Head, Floating PV research group, IFE

EUPVSEC Parallel Session 2024

Agenda for the Introduction

- FPV at a glance
- Scope and overview of the report
  - What is *not* scope
  - What *is* scope - content and contributors
  - For each of the included topics:
    - Why is it included
    - What is the status today
    - What is the intention with the report - how do we aim to contribute on this topic


Photo credit: BayWa r.e. (Nij Beets)

PVPS

Session Schedule

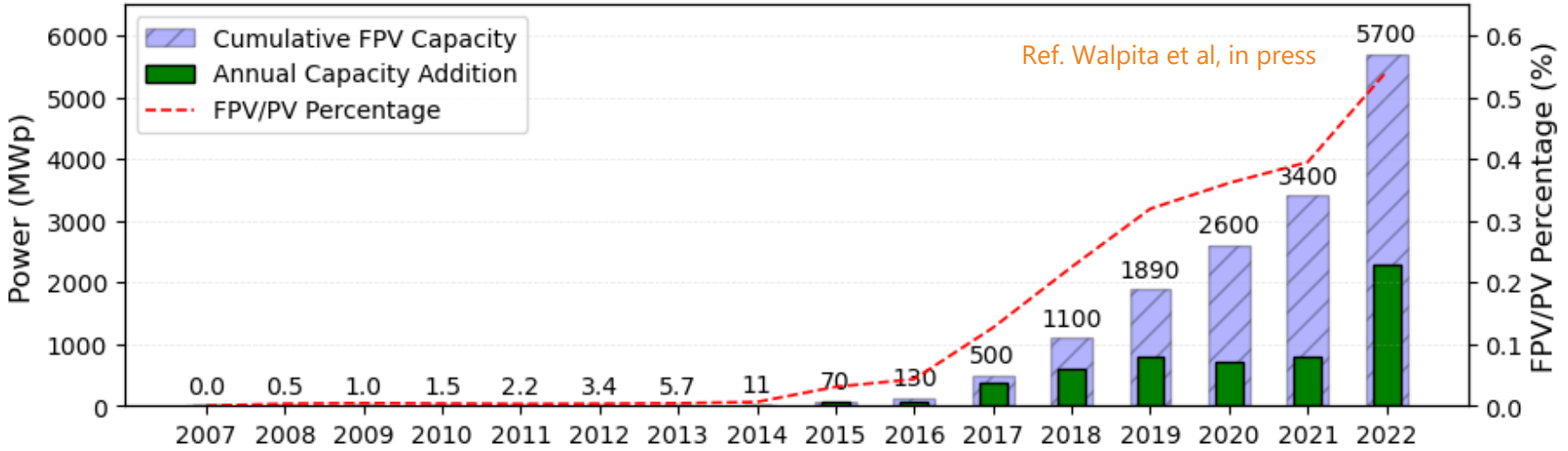
- *15.15 – 15.18: Introduction to the IEA PVPS Task 13, Ulrike Jahn IEA PVPS Task 13 Manager*
- *15.18 – 15.30: Introduction to the IEA PVPS Task 13 Report on FPV, Josefine Selj IFE, Norway*
- *15.30 – 15.45: Challenges and Opportunities in the FPV industry, Michele Tagliapietra*
- *15.45 – 16.00: Yield Assessment of FPV Systems, Torunn Kjeldstad, IFE, Norway*
- *16.00 – 16.15: Degradation of FPV Systems, Stefan Wieland, ISE, Germany*
- *16.15 – 16.30: O&M for FPV Systems, Ioannis Tsanakas, CEA-INES, France*
- *16.30 – 16.45: Discussion & Wrap-up, Josefine Selj, IFE & Wilfried van Sark, UU, The Netherlands*

Introduction - FPV at a glance

- FPV has many potential benefits, but dual land use is core
- Land availability for PV is restricted in many areas
- Largest markets currently in Asia, but also significant potential to support the EU's climate neutrality targets

Photo credit: BayWa r.e. (Kloosterhaar/Overijssel, NL)

Introduction – Global FPV installations



- ~ 7 GW by end of 2023
- Predictions for further growth vary substantially (15-60 GW by 2030)
- Sensitive to regulatory frameworks & the impact of technology development on cost and sea state applicability
- Michele/BayWa will talk more about both the benefits and challenges of FPV in the next presentation.

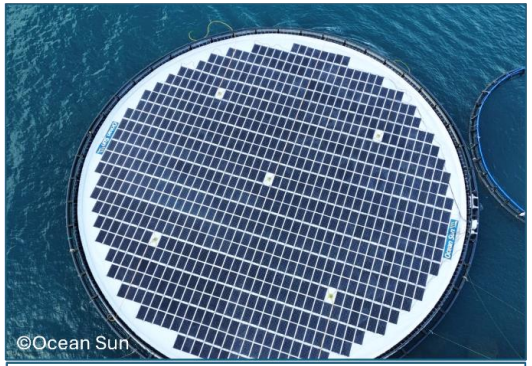
Figure ref: Walpita, Roosloot, Otnes, Aarseth, Selj, Nysted and Marstein (in press).
Based on data from Solar Power Europe, IEA, and World bank/SERIS – Where Sun meets water.

FPV - a (very) broad set of technologies

- FPV is modules that are mounted on a floating structure
- Surprisingly many ways to do this☺
- We use a «classical» categorization of the FPV technologies.
  - Not perfect, still useful

Pure-Floats (examples: CTI, Sungrow)

Metal or FRP + floats/pipes (examples: Zim Float, Scotra)



Membrane (example: Ocean Sun)

Closed or Semi-closed (examples: SolarFloat)

PVPS

Agenda for the Introduction

- FPV at a glance
- **Scope and overview of the report**
  - ➢What is *not* scope
  - ➢What *is* scope - content and contributors
- For each of the included topics

Why is the topic important?

What is the status today?

How do we intend to contribute?

What is *not* the Scope

- FPV is a highly multidisciplinary field – we do not wish to cover *all* aspects in *one* report.
  - ➢The scope of the report is FPV systems for relatively calm water, excluding offshore.
  - ➢The scope does not include any aspects of sustainability or recycling
  - ➢The scope does not include assessment of potential or market
  - ➢The BoS is mainly discussed in light of how it impacts the yield, lifetime and O&M of the PV panels.

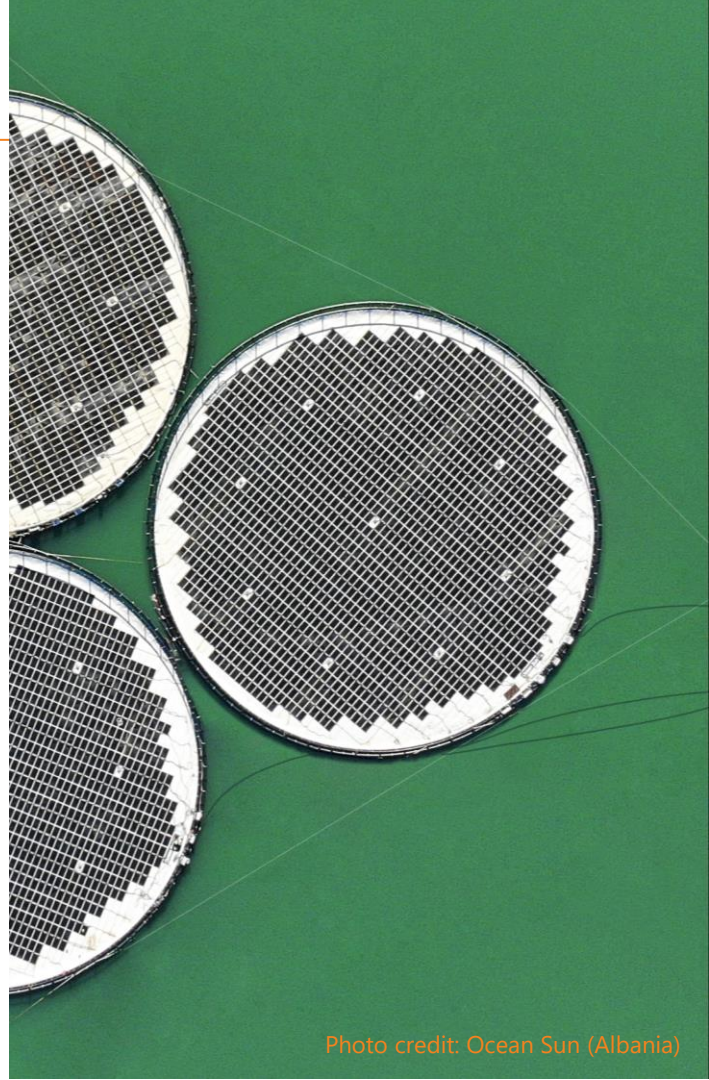


Photo credit: Ocean Sun (Albania)

What *is* the scope

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Scope of the Report - EYA

Why is EYA important?

- ✓ Energy yield is essential to understand the expected energy production and performance
- ✓ Energy yield is crucial for determining LCOE and profitability of a project
- ✓ Uncertainty in EYA assessments increase real and perceived risk and can hinder investment in new FPV projects

Status on EYA for FPV today

- ✓ No validated (or bankable) modelling tool developed to handle FPV-specific losses
- ✓ Significant research on operating temperature and U-values for FPV systems. Lack of validation and generalization of the results.
- ✓ No tested and validated complete model for mismatch losses available.
- ✓ Very little (quantitative) knowledge on soiling losses for FPV.
- ✓ No published report so far provide *values* for FPV specific losses

How do we intend to contribute?

- ✓ Summary of existing values for FPV specific losses
- ✓ Clear statements of knowledge gaps
- ✓ Technology specific values provided whenever possible

PVPS

Photo credit: Sunlit Sea

Scope of the Report - Reliability

Why is reliability important?

- The economic success depend on the ***lifetime*** energy yield
- Reduce chances of catastrophic failures
- FPV has very different reliability concerns from GPV
- Climatic factors play a major role in degradation and are by nature location specific.

Status on reliability for FPV today

- Most FPV systems are installed in the last few years
  - ➢ Little long-term data
- Data on FPV reliability is highly sensitive
  - ➢ Little open data
- Difficult to build “on campus”
  - ➢ Little data from research sites
- ➢ Very few publications with performance loss rates (PLR) for FPV
- ➢ Many reliability issues must be expected to be FPV technology specific, climate specific and depend heavily on O&M routines
- ➢ Significantly more data and analysis is needed

How do we intend to contribute?

- Review and systemize the information that do exist on FPV reliability
- Highlight work to map the climatic stressors - a precondition for the creation of meaningful service life prediction or degradation data

Photo credit: BayWa r.e.

Scope of the Report – O&M

Why is O&M important?

- Maturing technology & growing assets volume
  - ➢ focus shifts from design to operations and maintenance
- Huge differences in local climate and FPV technology
  - ➢ best-practice guidelines will be diverse
  - ➢ development of experience and guidelines will take time.

Status on O&M for FPV today

- O&M practice based on:
  - ➢ Company experience & know-how
  - ➢ International standards for GPV (like IEC 62446, IEC TS 63049 +)
  - ➢ Comprehensive GPV O&M guidelines from IEA and Solar Power Europe
  - ➢ In recent years: new best practice documents specifically for FPV

How do we intend to contribute?

- Review of FPV specific O&M actions
- Practical and concrete («actionable») information
- Failure Modes & Effects Analysis – valuable tool to harvest from previous experience
- Challenges or innovation opportunities within the field of O&M for FPV

PVPS

Photo credit: Ocean Sun

Thank you!

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