

BayWa r.e. Floating-PV: A part of the Hybrid Toolbox for Site Constrained Islands

5th Hybrid Power Systems Workshop





The integrated BayWa r.e. Floating Solution based on ZimFloat



1

Overview of BayWa r.e.
and Floating-PV in general

2

The BayWa r.e.
Floating-PV Solution

3

BayWa r.e. Floating-PV
References

4

Summary



1

Overview of BayWa r.e. and Floating-PV in general



BayWa r.e. – The entire value chain from one single source



Planning and technical consulting



Financing



Reporting and Analysis



Direct marketing



Project Development



Power Purchase Agreements



Procurement and turnkey construction



Operational Management

BayWa r.e.

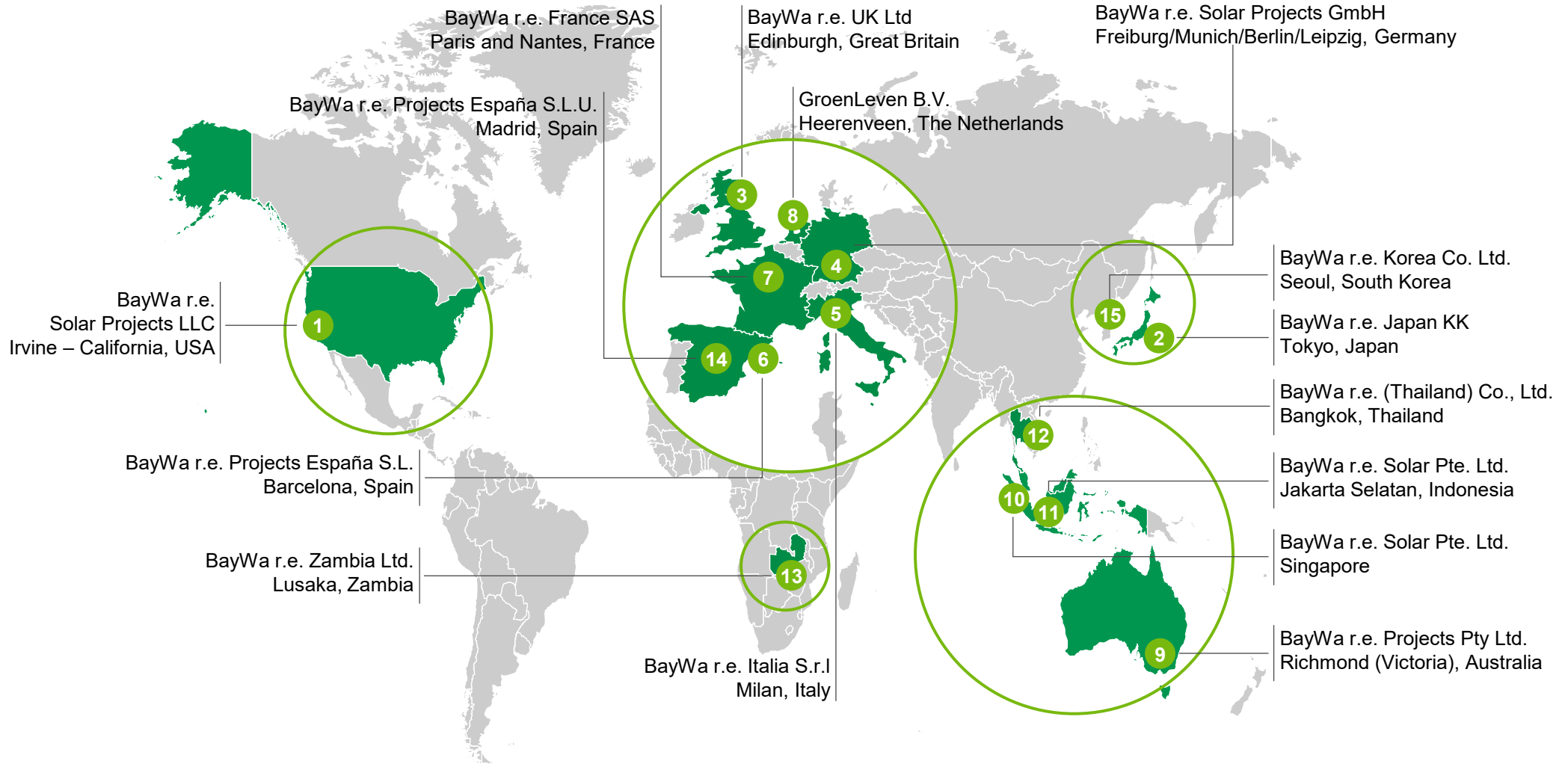
- Founded **2009**: In only 10 years we have grown to be an established global player
- PV Track record: **> 1,200 MWp realized in over 110 large scale projects** worldwide
- PV Pipeline: **> 6,000 MWp**
- **Market leader in Floating-PV**

“Our long-standing experience in operational management combined with our engineering expertise enable an innovative approach regarding maintenance on Floating-PV systems and ensure optimized yield and high availability.”

Felix Jetter
Head of PV at BayWa r.e. Operation Services GmbH



BayWa r.e. Agencies with Solar Activities Worldwide





Comparison: BayWa r.e. ground-mounted systems versus Floating-PV

Similarities

- Electrical components like modules, inverters, transformers are the same as in BayWa r.e. ground-mounted systems
- Multi MW plants are feasible
- Project development including building permit
- Same standard contracts, documentation and certifications
- Same lifetime of the PV plant of 25 – 35 years
- Everything out of one hand, including operational management

Differences

- No use of agricultural land, avoidance of land use conflict
- Additional revenue from existing water surfaces (mineral extraction lakes, or hydro dams and reservoirs)
- Foundation of durable high-density plastic floaters instead of steel piles
- More compact system, more power per area and less losses
- Faster construction of the plant



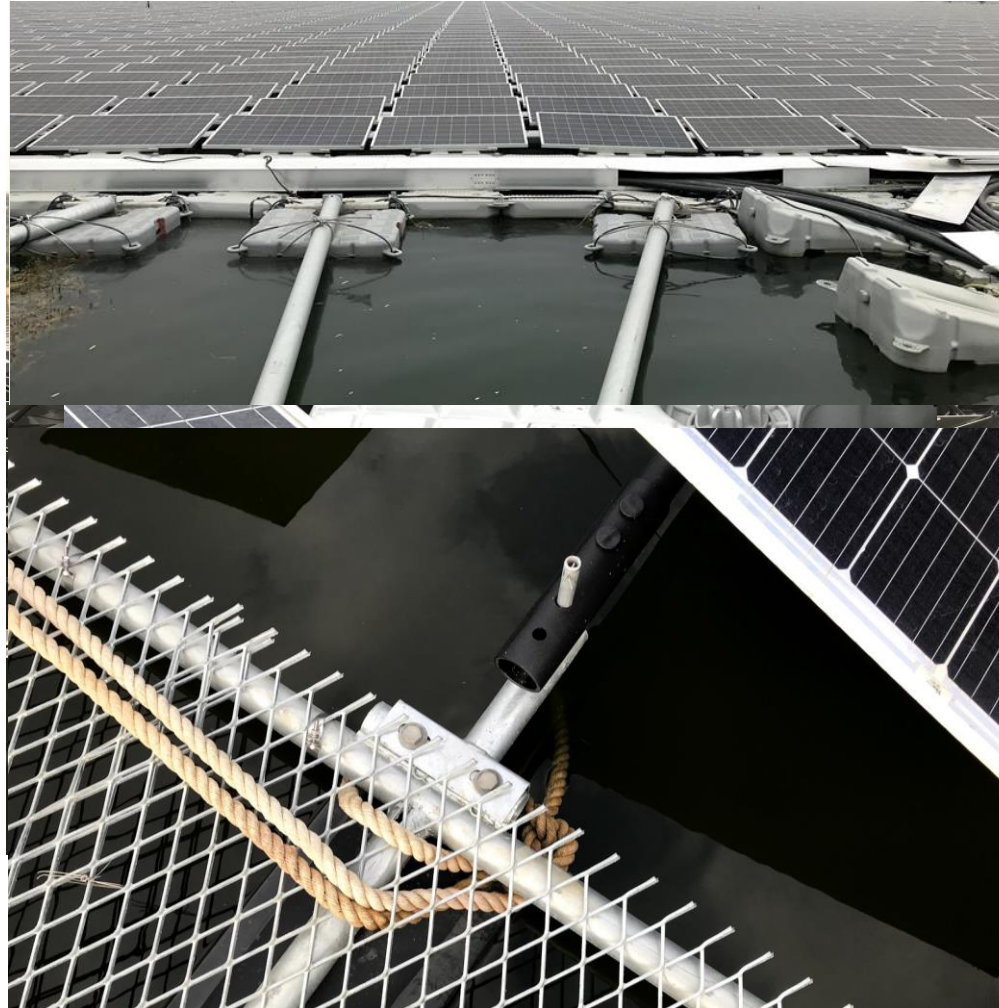
**Floating-PV
is not a new
technology,
but just a
new application.**



Substructure for Floating-PV

Available Floating-PV structures from competitors in 2018

- Systems with one floater for each PV module
Circulation of water impeded
- Pipe structures as floating body
No paths for maintenance and cleaning
- Metal structures on larger floating pontoons
Cables not conducted and hanging in water
- Anchoring was solved in several improvisational ways
No reliable static calculation possible



The Floating-PV systems available on the market did not meet the BayWa r.e. standards.

So we had to develop our own system, which is modular, stable and bankable.



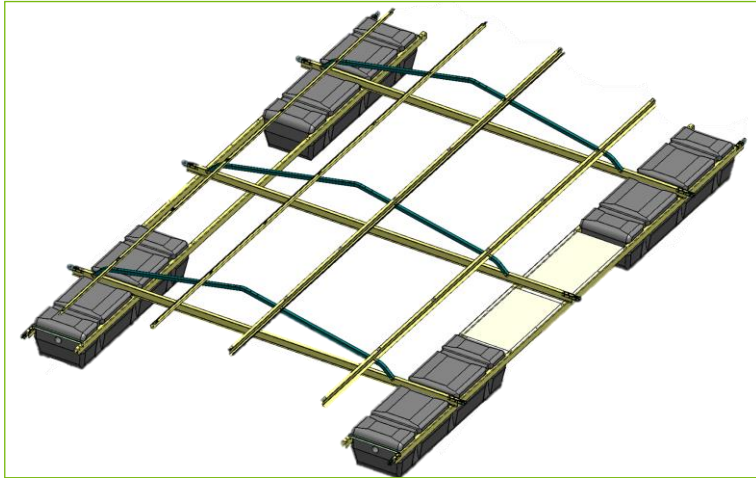
2

The BayWa r.e. Floating-PV System

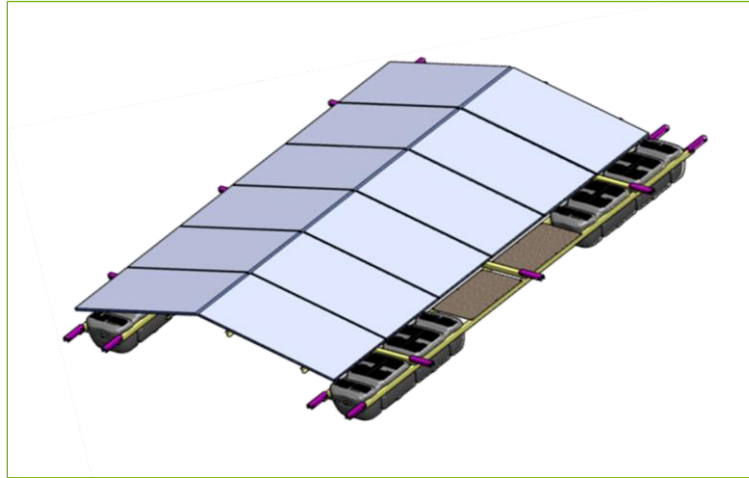


Basis of the BayWa r.e. Floating-PV solution

Modular Solar-Boot structure based on ZimFloat



- Stable, durable and scalable system long-lasting materials for all components for min. 25 years
- Combination of high quality-multilayer hard plastic (HDPE) floats and steel construction
- Integrated DC cable concept for fixed and protected cabling



- Maintenance paths integrated through the floats
- Inverter boat on the same structural basis
- Cables certified for in water installation
- Electrical concept VDE certified
- Static design based on Eurocode



Properties of a boat

Dimensions

5 × 9,5 m

Modules per boat

16 (8 east/8 west-oriented)

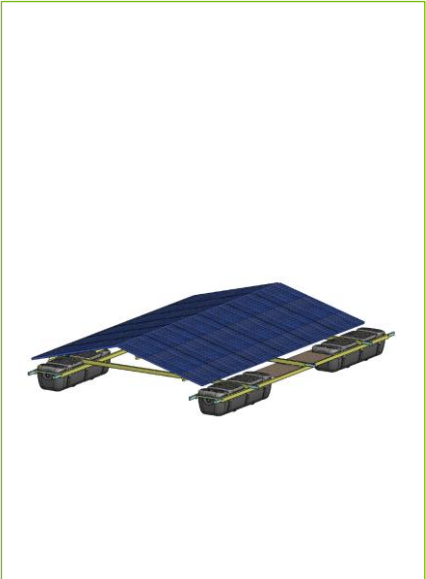
Capacity

8,5 kWp



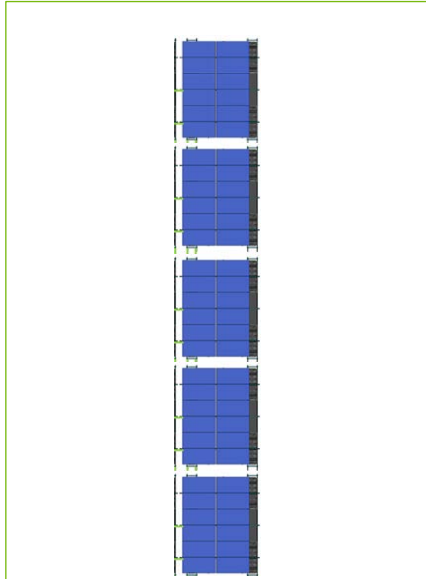
From a Solar Boat to a Floating-PV Park

Modular Block structure for Multi-MW-Parks



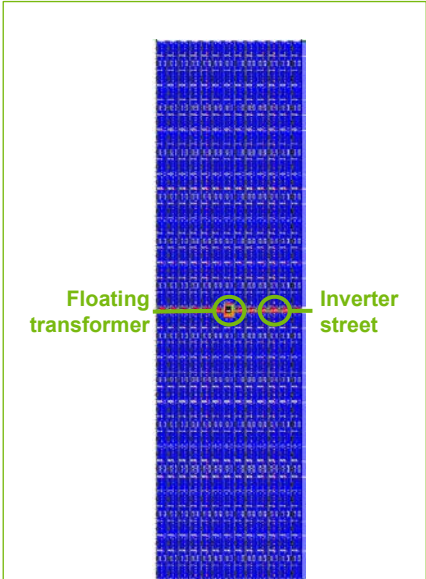
Solar Boat

Number of PV modules matching the boat dimensions



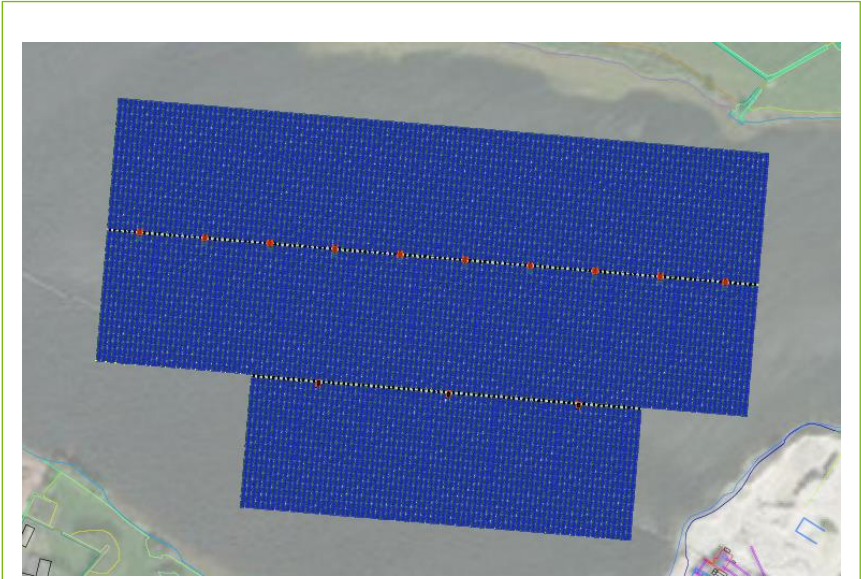
Solar Row

Number of boats matching the inverter capacity



Solar Block

Number of rows matching the transformer capacity



Solar Park

(here with 27 MWp)

Number of blocks matching the lake size



Robust, modular Floating-PV System, which is easily scalable. !



BayWa r.e. Floating Transformer Station

Special BayWa r.e. development

- Electrical standard concept with certified floating transformer station brought on the water
- Through the compact integration cable losses & costs are reduced significantly
- Special aluminum floater with integrated cable ducts and water sensors
- Integration into the Floating-PV system with protected cables under the walkways
- Transformation to MV on the water allows to have only one MV-cable connection to the shore
- System and its execution certified by VDE



ID. 40051479
04/2020

VDE certified system execution

- ✓ electrical safety & energy yield
- ✓ installation quality
- ✓ planning compliance

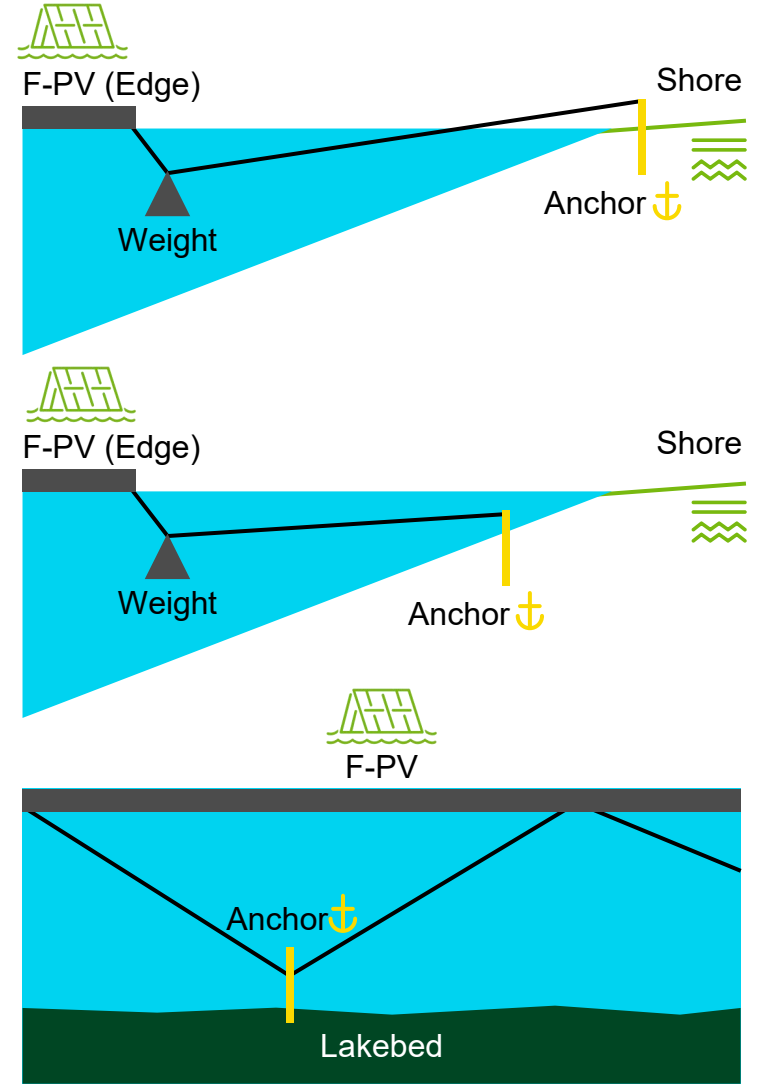
Standardized PV Power Plant

VDEinfo.com

Anchoring planned and executed by BayWa r.e.

Anchoring is a key expertise of BayWa r.e.

- Concept depends on the lake properties: surroundings, soil quality, lake requirements, water height deviation, etc.
- Different BayWa r.e. anchoring concepts
 - ① On-shore anchoring around the system
 - ② Near shore anchoring around the system
 - ③ Bottom anchoring below the system
- BayWa r.e. is constantly improving those concepts
- Planning, design and implementation certified by VDE





Stable walk-way for O&M

- Reliable system ensured through safe walkways enabling easy maintenance
- No mismatch losses because of misaligned modules (competitors up to 5% energy losses)



Competitor's System

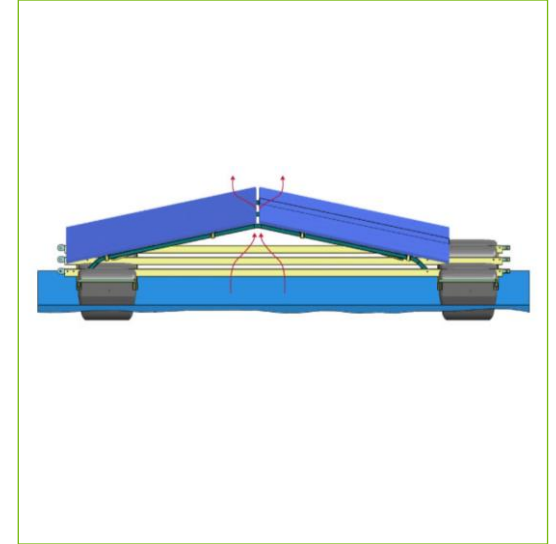
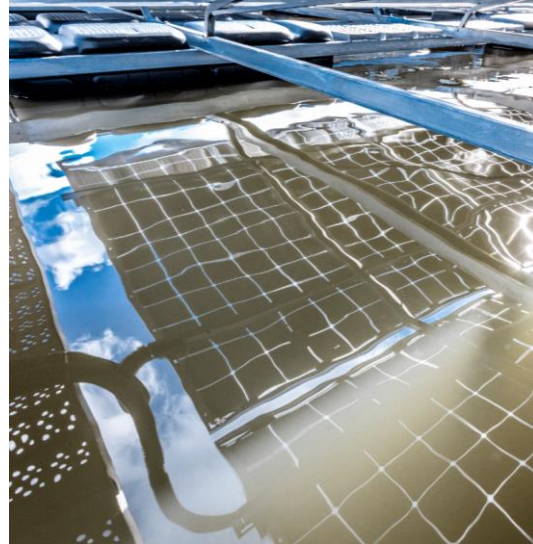
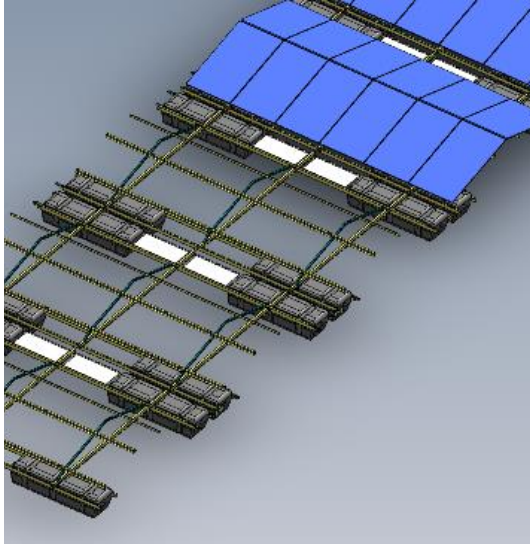


BayWa r.e. System





Low environmental impact



- Low direct occupancy in water by floating bodies
- Water contact footprint for a 2.3 MWp standard block is only 0,2 ha (15% of its covered surface)
- No stagnant water but free water movement

- High light transmission with glass-glass modules and distances between the boats result in minimal effect to the environment
- Moderate shade but no complete darkness

- Aesthetic integration into the landscape
- Almost no visibility on the water

- No heat accumulation under the PV modules
- The water body below is cooling the PV modules and accumulated heat is taken away through the chimney effect



3

BayWa r.e. Reference Systems



Weperpolder 2.1 MWp

Key Facts

Location	Oosterwolde, Netherlands
PV-Modules	5,752 (365Wp)
Inverter	40 Huawei 36KTL
Transformer	1,600 kVA
DC-power	2.10 MWp
AC-power	1.60 MVA
Size	1.45 ha/90 m × 160 m
Construction start	11/2018
Completion	12/2018
Construction time	3 weeks

Floating Structure

Solar boats	480
Inverter boats	19
Floating transformers	1





Tynaarlo 8.4 MWp

Key Facts

Location	Tynaarlo, Netherlands
PV-Modules	23,008 (365Wp)
Inverter	160 Huawei 36KTL
Transformer	4 × 1,600 kVA
DC-power	8.40 MWp
AC-power	6.40 MVA
Size	5.79 ha/360 m × 160 m
Construction start	04/2019
Completion	07/2019
Construction time	12 weeks

Floating Structure

Solar boats	1,920
Inverter boats	78
Floating transformers	4





Sekdoorn 14.5 MWp

Key Facts

Location	Zwolle, Netherlands
PV-Modules	39,712 (365Wp/370Wp)
Inverter	80 Huawei 36KTL; 130 60KTL M0
Transformer	7 × 1,600 kVA
DC-power	14.52 MWp
AC-power	11.78 MVA
Size	9.89 ha
Construction start	08/2019
Completion	10/2019
Construction time	8 weeks

Floating Structure

Solar boats	3,300
Inverter boats	98
Floating transformers	7





Bomhofspas 27.4 MWp

Key Facts

Location	Zwolle, Netherlands
PV-Modules	72,898 (370Wp/375/380Wp)
Inverter	338 Huawei 60KTL M0
Transformer	13 × 1,600 kVA
DC-power	27.33 MWp
AC-power	22.31 MVA
Size	18.25 ha
Construction start	01/2020
Completion	03/2020
Construction time	7 weeks

Floating Structure

Solar boats	6,084
Inverter boats	192
Floating transformers	13



Largest Floating PV system with 27.4 MWp outside of Asia





5

Summary



Summary

The BayWa r.e. system is the **best Floating-PV Solution** to successfully accomplish energy transition.



Unique characteristics of the Floating-PV System from BayWa r.e.



- **Scalable system with transformers on the water** for efficient multi MWp PV Parks
- Strong anchoring and high stability for **high security and easy maintenance**
- **Small footprint** on the water and high transparency for **minimal environmental impact**
- **Proven very fast installation**

As a **market leader** in Europe, BayWa re. is the most reliable partner to develop, build and operate big solar parks.



For further information
please visit our Website:
[https://www.baywa-re.de/
en/floating-pv/](https://www.baywa-re.de/en/floating-pv/)





Thank you

Charles Gilmour
Project Manager
Charles.Gilmour@baywa-re.com



Copyright

© Copyright BayWa r.e. renewable energy GmbH, 2019

The content of this presentation (including text, graphics, photos, tables, logos, etc.) and the presentation itself are protected by copyright.
They were created by BayWa r.e. renewable energy GmbH independently.

Any dissemination of the presentation and/or content or parts thereof is only permitted with written permission by BayWa r.e. Without written permission of BayWa r.e., this document and/or parts of it must not be passed on, modified, published, translated or reproduced, either by photocopies, or by others – in particular by electronic procedures. This reservation also extends to inclusion in or evaluation by databases. Infringements will be prosecuted.