NRG ISLAND

FLOATING PV SYSTEM

Technical features

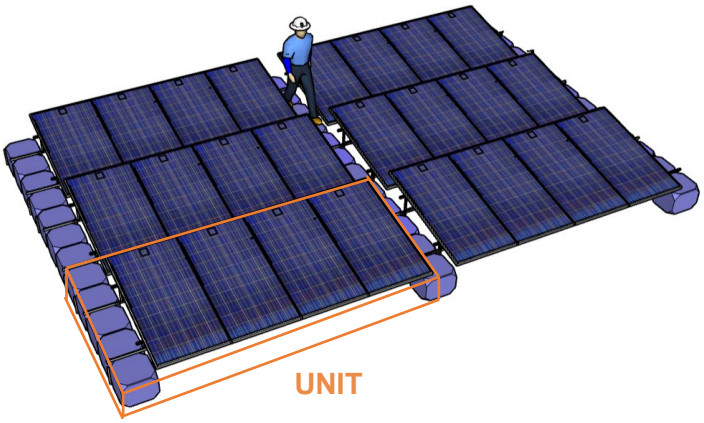
Rev 1 /2022

NRG ISLAND - NIAL_CDOCK - PATENTED FLOATING SYSTEM

SYSTEM DESCRIPTION

The NRG Island system is modular and consist of UNITS that are horizontally and vertically replicable so that you can obtain the desired total power output. Each UNIT is composed by one aluminium frame that supports up to 4 PV modules in portrait and by HDPE floats that support the frame at the side.

The type and the number of the lateral floats, and so the size of the floating UNIT, depends on the size of the panels to install.



SYSTEM MAIN COMPONENTS

Floats

Floats are made of virgin HDPE, a 100% recyclable material. The buoyancy capacity of the double and the single floats is 350 kg/sqm, the thickness of the HDPE is always between 7 - 9 mm. Floats are secured one to another with special connection pins in HDPE. These connection pins are inserted in the overlapped ears of two different floats. They can be tightened from above, without needs for divers.

HDPE FLOATS	*Weight*	*Used for*
Double float - size: 100 x 50 x 40 cm	11,5 kg	*- Frame support* *- Walkways* *- Spacer*
Double short float – size: 100 x 50 x 25 cm	9,3 kg	*- Walkways*
Single float - size: 100 x 50 x 40 cm	6 kg	*- Frame support* *- Walkways* *- Spacer*

Frames

The frame in the NRG Island system is the component that provide a stable support for the fixation of the PV modules. The frames are in ***ALUMINIUM*** that can be anodized if requested.

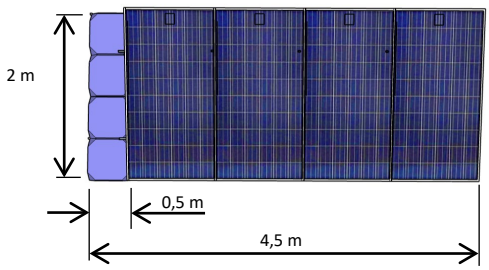
On the frame it is possible to install up to 4 panels, of whatever brand and size. Its tilted structure enable to optimize the energy producibility of the PV modules. The standard tilt value is 5°, but any inclination is possible and it can be decided by the Client.

The most suitable tilt value depends on the latitude of the installation site. However, since the cost of the system increases for increasing tilt values, we usually suggest to choose among 5°, 10° and 15°, in order to provide an optimized solution in terms of energy production and system cost.

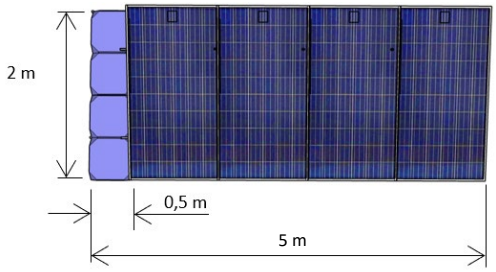
The system is supplied complete of all all the components needed to assemble the frames and connect the floats. Normally modules' clamps are not included but it is possible to supply them on request.

SYSTEM LAYOUT

For **60 or half cells** panels having a width that does not exceed 1002 mm, the standard UNIT has 2 lateral double floats and an overall size of **2 x 4,5 meters**. If the panels width is higher than 1002 mm, the aluminium frame is longer (XL version) and the overall size of the UNIT is **2 x 5 meters**.

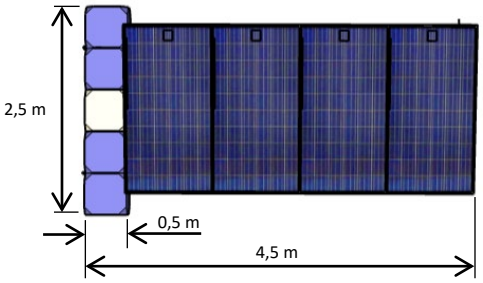


Panel length < 1900 mm
Panel width ≤ 1002 mm

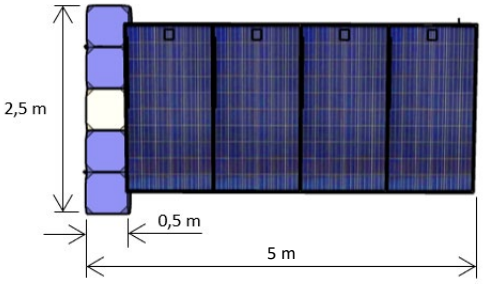


Panel length < 1900 mm
Panel width > 1002 mm

For **72 or half cells** panels having a width that does not exceed 1002 mm, the standard UNIT has 3 lateral floats (2 double and 1 single in between) and an overall size of **2,5 x 4,5 meters**. If the panels width is higher than 1002 mm, the aluminium frame is longer (XL version) and the overall size of the UNIT is **2,5 x 5 meters**.

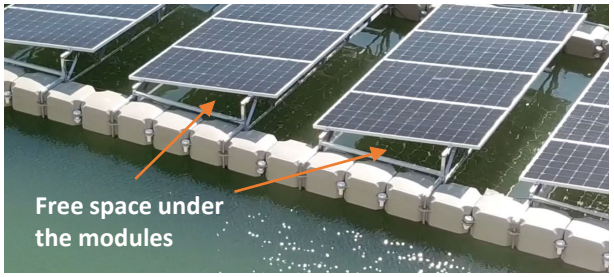


Panel length > 1900 mm
Panel width ≤ 1002 mm



Panel length > 1900 mm
Panel width > 1002 mm

The free space under the PV panels mounted on the floating unit, allows air to flow and to preserve an adequate oxygenation of the water. The air circulation and the mitigating effect of water protect the panels from high temperatures, guaranteeing, especially in summer, an improvement in the efficiency of the system. This design also allows the installation of bifacial photovoltaic modules.



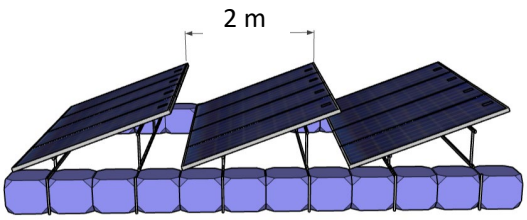
INTER-ROWS SPACEING: SHADING EFFECT PREVENCTION

To avoid the shading effect of the front rows of panels on the following ones, the NRG UNITS can be spaced with the addition of inter-row floats. To increase the distance, *double floats* and/or *single floats* can be used.

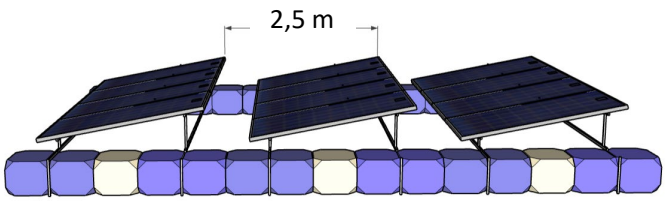
The need for an increased inter-row distance depends on the chosen panels' tilt and on the latitude of the project, but we usually suggest to consider this solution when tilt value exceed the 7°.

Below some scheme of the fpv plant with increasing inter-row space for both 60 cells and 72 cells in South oriented configuration.

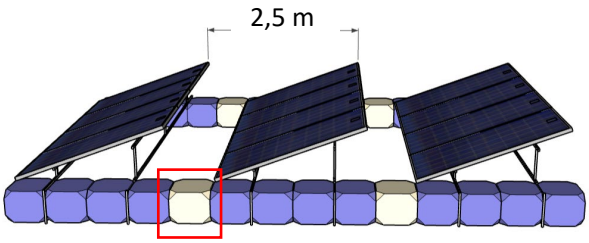
In the East-West panels configuration ("dome configuration"), unless specifically requested, inter-row floats are not provided.



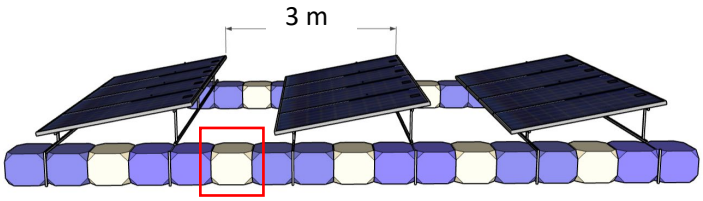
Side view scheme – 60 cells panels
No added floats: Pitch = 2 m



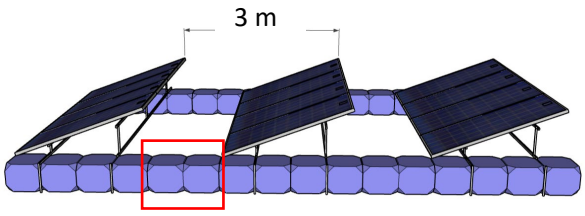
Side view scheme – 72 cells panels
No added floats: Pitch = 2,5 m



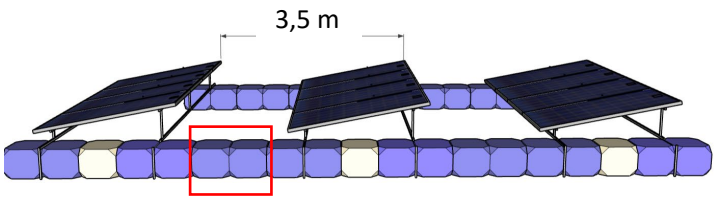
Side view scheme – 60 cells panels
Single floats inter-rows: Pitch = 2,5 m



Side view scheme – 72 cells panels
Single floats inter-rows : Pitch = 3 m



Side view scheme – 60 cells panels
Double floats inter-rows: Pitch = 2,5 m



Side view scheme – 72 cells panels
Double floats inter-rows : Pitch = 3 m

FLOATING PLANT WALKWAYS

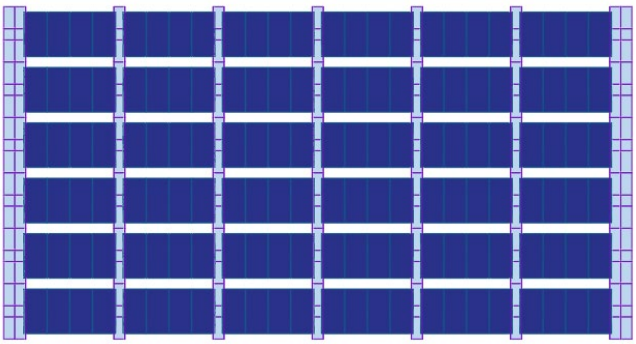
When more floating units are joined to create the PV plant, the floats that sustain the frames form continuous floating pathways in the direction of the panels orientation. These are called *structural walkways* and are about 0,5 m wide, enough to enable workers to reach every single panel for maintenance and to walk easily on the floating plant. Upon request, the width of structural walkways can be enlarged.

It is also possible to include additional walkways between the panel's rows or/and in the perimeter. Additional inter-rows or perimeter walkways can have whatever width needed, starting from 0,5 m minimum and increasing by step of 0,5 m at a time (width of 1m, of 1,5 m, of 2 m, etc).

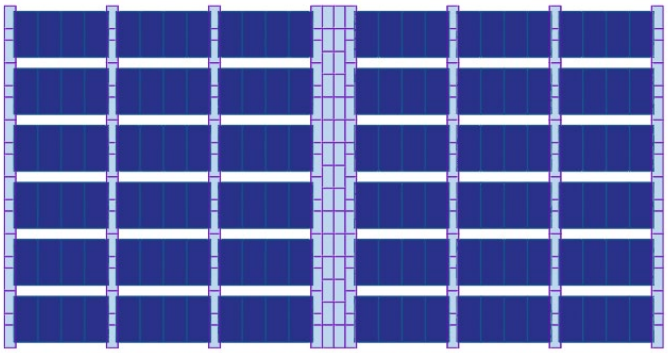
If requested, the FPV plant can be also equipped with a floating walkway that directly connects the plant with the land.

Of course, it is possible to combine different kind of walkways in the same layout.

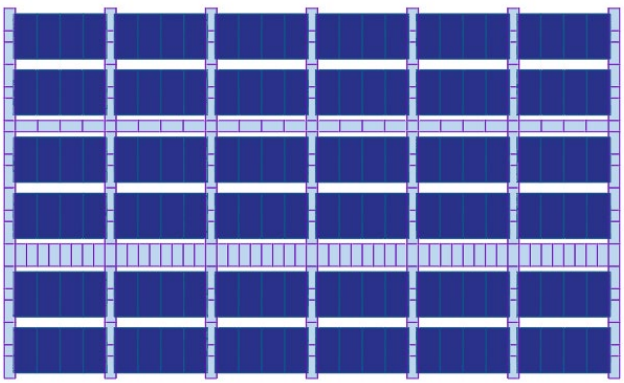
Some example images are shown below:



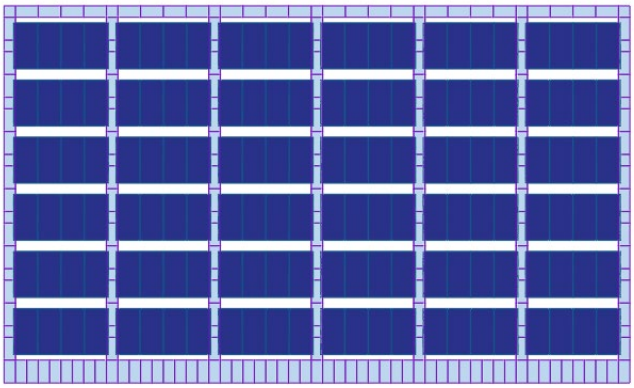
Enlarged perimetral walkways



Enlarged internal vertical walkway



Additional internal walkways



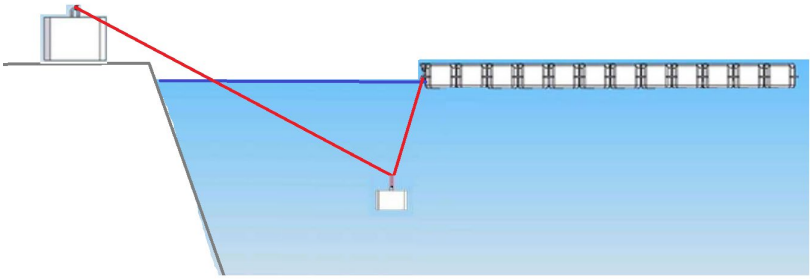
Additional perimetral walkways

ANCHORING SYSTEM

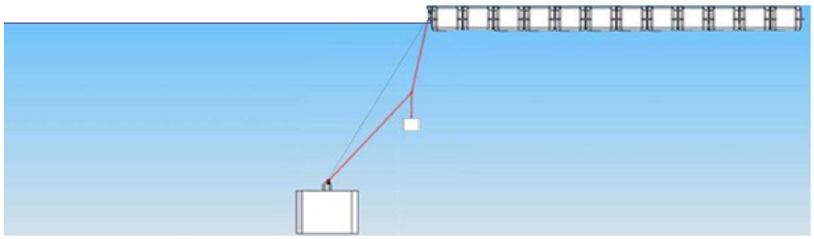
The anchoring system is design so that the island remains in position even when high variations of the water level occur. Depending on the site conditions, the system enables to anchor the floating plant to the shore or to the bottom of the reservoir by using ballasts of reinforced concrete and galvanized chains or high tenacity ropes.

The rope (or chain) is always kept in tension at any water level thanks to one or more counterweights positioned on its length.

For important water level variations, if necessary, more counterweights can be placed.



Example scheme of a bank anchoring



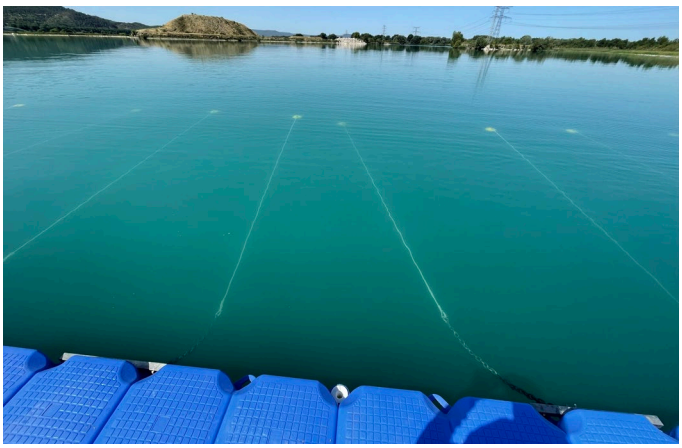
Example scheme of a bottom anchoring

Every anchor is composed by high tenacity ropes/chains in galvanized steel, reinforced concrete weights, and different accessories.

The main accessories are:

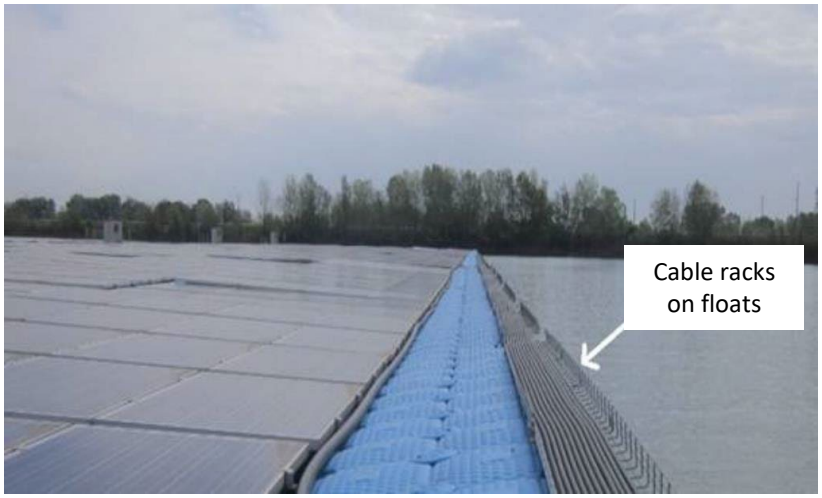
- Galvanized steel spring, a highly efficient shock absorber.
- Single or Double anchor kit: equipment that connect the floats with the mooring. The double one is used to divide the traction loads on two points (on two floats).
- Carabiners/shackles to connect the anchoring system's elements

The NRG team can evaluate the specific site conditions of the project and provide an anchoring system certified to resist to the environmental loads insisting on the floating system during its lifetime. The certified anchoring system is designed by performing an ad-hoc anchoring study that it is necessary to define the quantity, the position and the length of each mooring and to define the shape and size of the ballasts for the case of the project. The basic anchoring study has a separate cost that varies depending on the complexity of the project and it can be performed on the base of a plant definitive layout and detailed information about the site (like bathymetric information, wind conditions, ..). Upon request, we can also carry out a CFD study with an extra cost.



ELECTRICAL EQUIPMENT AND CABLE PATHS

Electrical cables on the plant can be fixed on the frames with cable ties and collected in cable racks fixed to the floats. The main electrical equipment can be placed on the shore or, if preferred, directly on the NRG Island plant. String inverters, junction boxes, and central inverters as well, can be fixed to the floats of the plant through special connectors.



INSTALLATION PROCESS

The NRG ISLAND system has been designed to allow an easy and fast installation procedure.

The aluminium frames and the cube-shaped floats are light -weighted and easy to move on the installation site. The assembly of the whole floating plant is a progressive operation that in most cases does not require lots of space or particular lifting machines: the first lines of floating units are assembled on the bank, then they are partially slid into the water to free the space needed to connect the following lines.

Depending on each case, the installation can be performed on the bank with or without the use of a ramp to slide the system into the water, or, where appropriate, directly on the empty reservoir's bottom.

More details about the installation procedure are described in the NRG Island Installation Manual.

For further information please contact us at: info@nrgisland.com