SOCIÉTÉ DE L'EAU AÉRIENNE SUISSE

ENERGY SOLUTION

March 2016

SWISS COMPANY

Catalogue

SEAS ENERGY SOLUTION

SCOPE OF THE WORK

SEAS Energy Solution has the scope to supply electrical alimentation, on and off grid, matching the supply of AWA MODULA, our air to water generator system.

As attachment, it is proposed four different solution type, based on a 2500 lt/day water production, denominated AWA MODULA 250 with a power of 60 kW and an average consumption of 0.28 kW/h for litre produced.

This module can be doubled for an AWA MODULA 500 system, tripled for an AWA MODULA 750 system and fourfold for an AWA MODULA 1000 system.

The proposed solutions are not the only ones, but allow for a modular engineering structure of fast realization and local installation, with a local environment impact equal to zero.

Our Energy Solutions are in addition transportable and can be moved and dismounted shortly, and then satisfy the transfer urgency and operate in more sites in case of construction sites, mines, motorway constructions, etc.

Our engineering is disposable to create dedicated solutions as ground plants, roof plants, Aeolian integrated plants, with pyro gasification structures, or others on request.

1. PV KIT EQUIPMENT SPECIFICATION

The SEAS Energy Solution will be installed using the best technology available on actual market, in order to supply the best performance and reliability.

The SEAS Energy Solution are made and think in order to be real independent power stations and allowing the customer to install them easily.

The SEAS Energy Solution can easily be expanded by increasing the energy produced, and may even be moved.

The SEAS Energy Solution comes as a container on the roof will be placed solar panels, while inside there are two rooms: one is dedicated to the battery's bank while the other will be used for the inverter, or other components.

The SEAS Energy Solution (PV power station) will be complete with all the necessary components and the container will be delivered with the all electrical parts comprehensive of inverters and batteries bank already mounted so the customer will just need to mount the solar panel on the roof top by following the instructions on the manual.

We will supply and lay for every SEAS Energy Solution:

- Photovoltaic polycrystalline modules, 280 Wp each;
- Roof-top steel/aluminium structures for PV modules support, complete with every accessory for installation of structures themselves and PV modules - clamps, screws, nuts, bolts;
- Inverters complete with every accessory;

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- String Combiner box complete with every accessory, fuses, surge protection device, disconnecting switch and cabling accessories;
- Battery Station complete with every accessory;
- Electrical cables;
- System Controller for the grid, power generation, battery and photovoltaic power;
- Complete manuals and documents;
- Shelter 40HQ with all the electrical equipment's;
- DT BC – G 200, Tank box container for 20,000 litres
- Diesel Generator CGM 250F

SEAS Energy Solution do not requires infrastructure and civil works, but only a plan land area with gravel or firm ground suitable to receive our shelters.

All the components will respect all the general requirement requested in the project.

By using the best available technology, we guarantee that the PV power station will ensure and provide high quality and excellent power availability.

The SEAS Energy Solution will guarantee also low maintenance requirement and low operating costs.

SEAS Energy Solution will provide the details in terms of drawings, documents, specifications, and list vendors in a more advanced state of the tender or final offer.

1.1. PV MODULES

We will supply photovoltaic polycrystalline modules, 280 kWp each.

This model is particularly well suited to the technical and electrical requirements and provides excellent performance.

The main specification of the modules are shown below:

- 10-years product warranty
- TUV certification
- Uoc 37,45 V
- Ump 31,09 V
- Isc 8,83 A
- Imp 8,05 A
- PV cells 60
- Efficiency 17%

The modules are guaranteed for 10 years against manufacturing defects.
It is guaranteed a loss of power, compared with the nominal, less than 10% in 10 years and less than 20% in 25 years.

The modules are compliant with Swiss and/or European standards, certified IEC 61215:2006-08, IEC 61730-2:2007-11, Class II insulation and IP65 protection to the junction box.
The PV modules manufacturer have obtained the following certifications:

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- ISO 9001:2008
- ISO 14001
- OHSAS 18001

1.2. INVERTER

We will supply and install inverter particularly well suited to the technical and electrical requirements providing excellent performance.

The main features of the items are shown below:

DC/AC inverters, each with:

- AC output nominal power (minimum) 10 kW
- AC output nominal frequency 50 ± 5 Hz
- AC output nominal voltage 400 ± 1% (3ph+N)
- AC output nominal current 16 A
- DC input maximum voltage (minimum) 1000 V
- MPPT nominal range 320-800 V
- DC input maximum current MPPT1 (minimum)22 A
- DC input maximum current MPPT2 (minimum)11 A

1.3. CONVERSION SYSTEM AND BACTERIES

We will provide a shelter building to accommodate the equipment indicated for the control room shelter. Such container will be painted by a special paint for naval use. The shelter, with inside electrical components, will have a special insulation system of polyurethane foam inside metal sheets. The insulation system will have a thickness of 40 mm for the lateral whole and 50 mm for the ceiling. Such solution guarantee a remarkable decreasing of the thermal transmittance (U-value) respect to a classic masonry building. A non-invasive anchor, without any bolts and holes, will fix the external unit of the air control and conditioning system, such solution guarantee the container integrity in the case they will need to be transferred from the site for instance.

The batteries use the **lead gel** technology. Each battery have the following characteristics:

- VRLA technology
  294 – 3919 Ah nominal capacity
- Single cell
- Maintenance free
- 3000+ cyces at 60% DoD C_{10}
- 100% recyclable;

Technical specification:

- Nominal capacity 294 – 3919 Ah C_{120} (20°C)
- Cycling performance at 20°C (with IU charging): 2400 cycles at 60% Depth of Discharge at 20°C
  For enhanced performance and for system ≥ 48V, It's recommend IUI charging, to reach 3000+ cycles at 20°C
- Designed in accordance with IEC 61427 and IEC 60896-21/22
- Long shelf life up to 2 years at 20°C without recharge due to the very low self discharge rate

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- Also available as flame-retardant version on request (V0)
- Manufactured in Europe in our ISO 9001 certified production plants
- Trouble-free transport of operational cells, no restrictions for rail, read, seas and air transportation (IATA, DGR, clause A67)
- Approval: UL (Underwriter Laboratories)

Battery protection is based on the T5V 400-4000 4p F FC Cu 1000V AC/DC circuit breaker (ABB SpA)
We will also supply and lay power electronics system to provide the right working of the entire hybrid system. We will provide a Hybrid System for a Smart Grid application, composed by photovoltaic inverters, DC/DC converters, Energy Storage inverters and one main central controller. The system is suitable for connecting to an eventual weak grid thanks to some specific features:

- Dynamic Power limiting
- Frequency drop controller LVRT Capability
- Management of reactive power
- Peak shaving and load leveling
- Power supply in case of grid failure
- Management of unbalanced loads

It is possible to use lithium battery with project and costs to be defined.

1.4. DIESEL GENERATOR

We will provide a diesel generator to accommodate the equipment of PV SEAS Energy Solution without grid.
Technical specification:

- Prime power 250 kVa / 200 kW
- Stand-by power 275 kVa / 220 kW
- Temperature 40°C
- Altitude 1000 mslm
- Humidity 60,00%
- dBa 69
- Rpm 1500
- Frequency 50
- Voltage 400+N
- Ampere rating 361

It's possible to provide a generator for other types of fuels, with project and costs to be defined.

1.5. TANK

The proposed containerized tank would accommodate the diesel generator in SEAS Energy Solution system. Thanks to a capacity of 25,000 litres, tank will guarantee a perfect stand-by system.
Technical specification:

- Corner blocks for lifting, positioning and anchoring;

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- Roof totally enclosed, complete with hinged hatch placed on the container roof, in anti-spark aluminum sheeting, assisted by gas piston, complete with handle and lock attachment;
- Corrugated metal walls;
- Open paving equipped with support cross-members and against the slide for fastening the containment basin;
- Double door container-head, with jealousies for ventilation anti-rain and anti-tampering, for a natural ventilation inside the compartment and a padlock locking rods;
- Total protection with acrylic paint, anti-corrosion of the structure.

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SEAS ENERGY SOLUTIONS

All the proposed solutions in annex will be dimensioned according to design parameters provided by customer; upon delivery of the equipment will be provided the following project documentation:

- Executive design and scheme
- Full operation and maintenance manuals in English, spare parts manual;
- Quality certification for every single items/component of the plant;
- Control Panel on monitoring system with automatic and manual regulation;
- The combined units will be covered by a warranty period of 12 months after the issuance of provisional acceptance certificate.

This solution is inclusive of all the accessory for installation. The present proposal is for a turnkey project.

Scope of Work:

- Preliminary Design
- Detail Design & As-Built Design
- PV Modules
- Supporting structure complete with all the accessories for the installation
- Inverter
- String Combiner Boxes complete with cabling accessories
- Conversion Container, with ancillary system, and reinforced concrete foundation
- Batteries complete with support shelves and electrical accessories and charger
- Electric Cables for a complete system
- DT BC – G 200, Tank box container for 20,000 litres
- Diesel Generator CGM 250F

The solution does not include:

- Tax and duties, customer cost, transportation, VAT, etc.
- Building permits, planning and practices or administrative costs;
- Work in war zones, or in presence of epidemics or other risks;
- Customs or import duties, or other unforeseen costs;
- Structures executive design and installation distances;
- Equipment or instrumentation not specified;
- Building works outside perimeter fencing;
- Lightning protection system;
- Check and eventual closure of existing ditches or underground pipes;
- Verification of property limits, geological surveys and land leveling;
- Construction work for water outflow or mitigation works;
- Equipment, building works and cables for connection to the public network;
- Data connection with hyper lan bridge;
- AWA MODULA Systems;
- Anything else that is not specified in the offer.

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Options:

All the proposed solutions can be realized with different operation voltages:

- 220 V – 50Hz
- 220 V – 60Hz
- 400 V – 50Hz
- 440 V – 60Hz
- Other to be defined.

SEAS ENERGY SOLUTIONS can study a dedicated and tailor-made project with the customer for the following technologies:

- Photovoltaic
- Aeolic
- Pyro Gasification

Riva San Vitale, March 22, 2016

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SOCIÉTÉ DE L'EAU AÉRIENNE SUISSE

STANDARD

TYPICAL AWA MODULA 250 CONNECTION

AWA MODULA 250

LOCAL POWER NET

220V - 60Hz

- On Grid connection
- Power net 200 KVA
- 3Ph/Voltage & Frequency on request

380V - 50Hz

- On Grid connection
- Power net 200 KVA
- 3Ph/Voltage & Frequency on request

220V - 50Hz

- On Grid connection
- Power net 200 KVA
- 3Ph/Voltage & Frequency on request

440V - 60Hz

- On Grid connection
- Power net 200 KVA
- 3Ph/Voltage & Frequency on request

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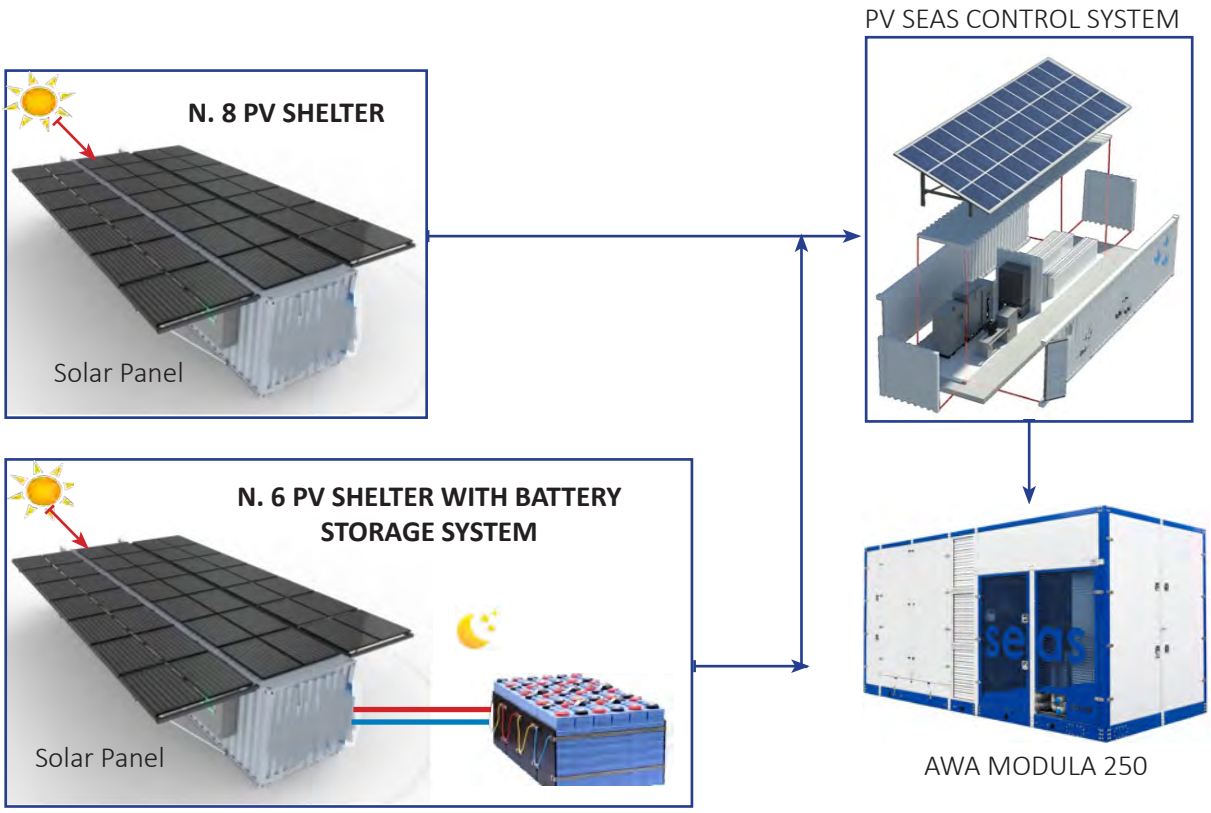
SOLUTION 1

SEAS PV 60 STORAGE OCG 400/50



- **OFF Grid solution with battery storage h24**
- **Plant about 250 kWp**
- **Avaiable load 60 kWp h24 at 400V/50Hz**
- **Occurred space 1800m2 (65m x 30m)**
- **Attached plants specification**

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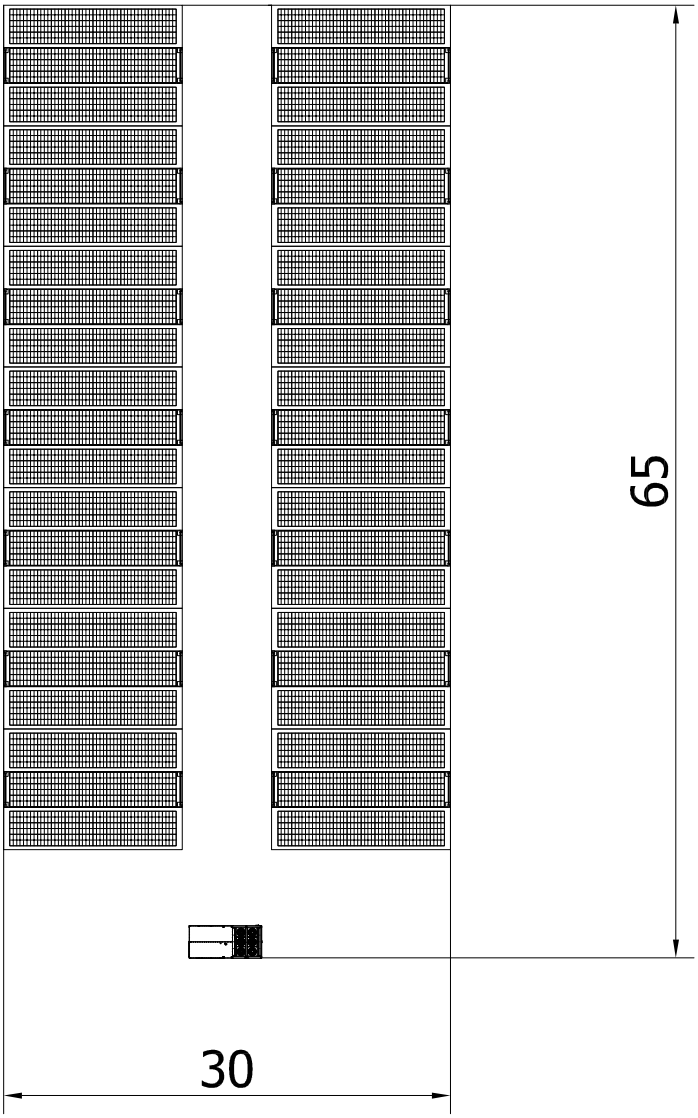

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SIGN							
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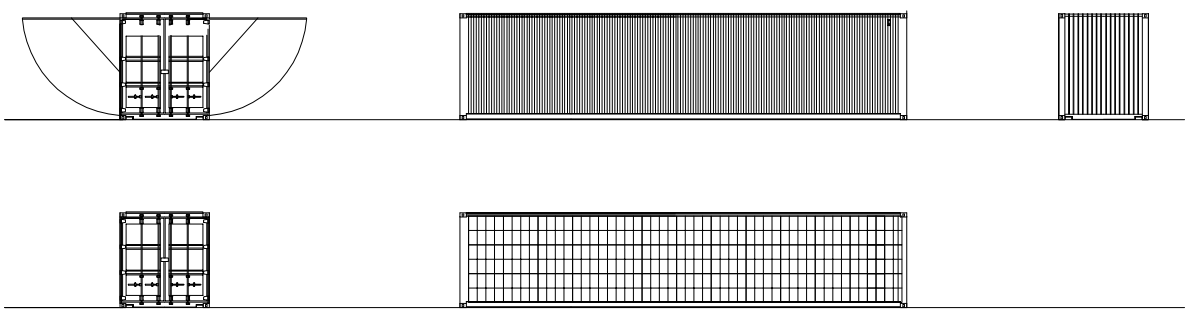
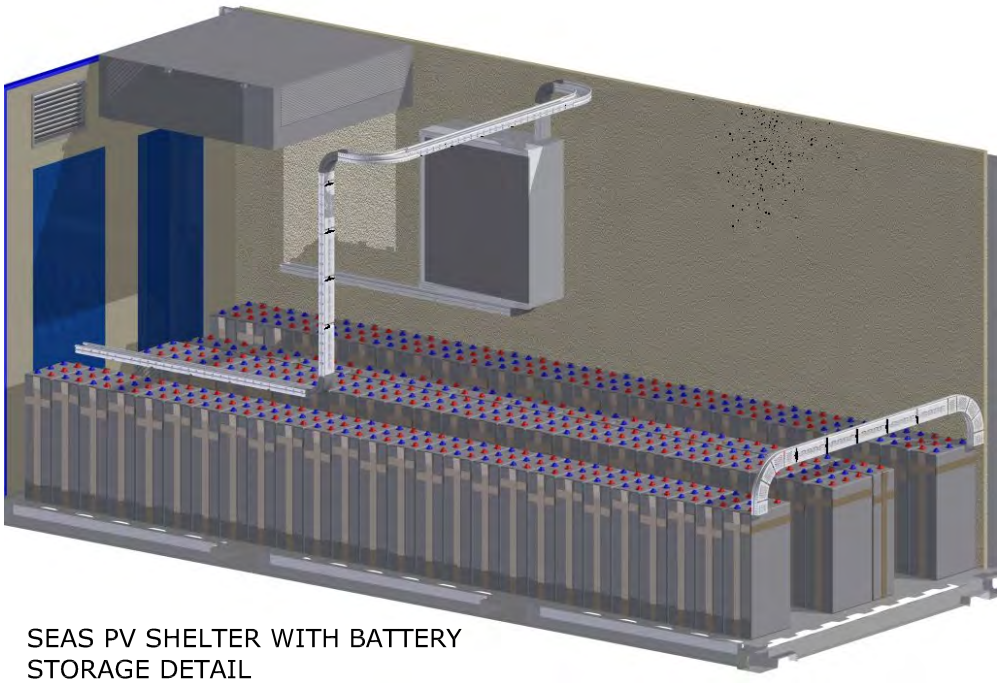
N° DRAWING

LAY-A250-PEP00-SSX00

REV 00



SEAS PV SHELTER DETAIL 40' HC lxpxh 12192x2438x2896 mm



SEAS PV SHELTER WITH BATTERY STORAGE DETAIL

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						1:200	AWA PV
	N° DRAWING LAY-A250-PEP00-SSX00					REV 00	

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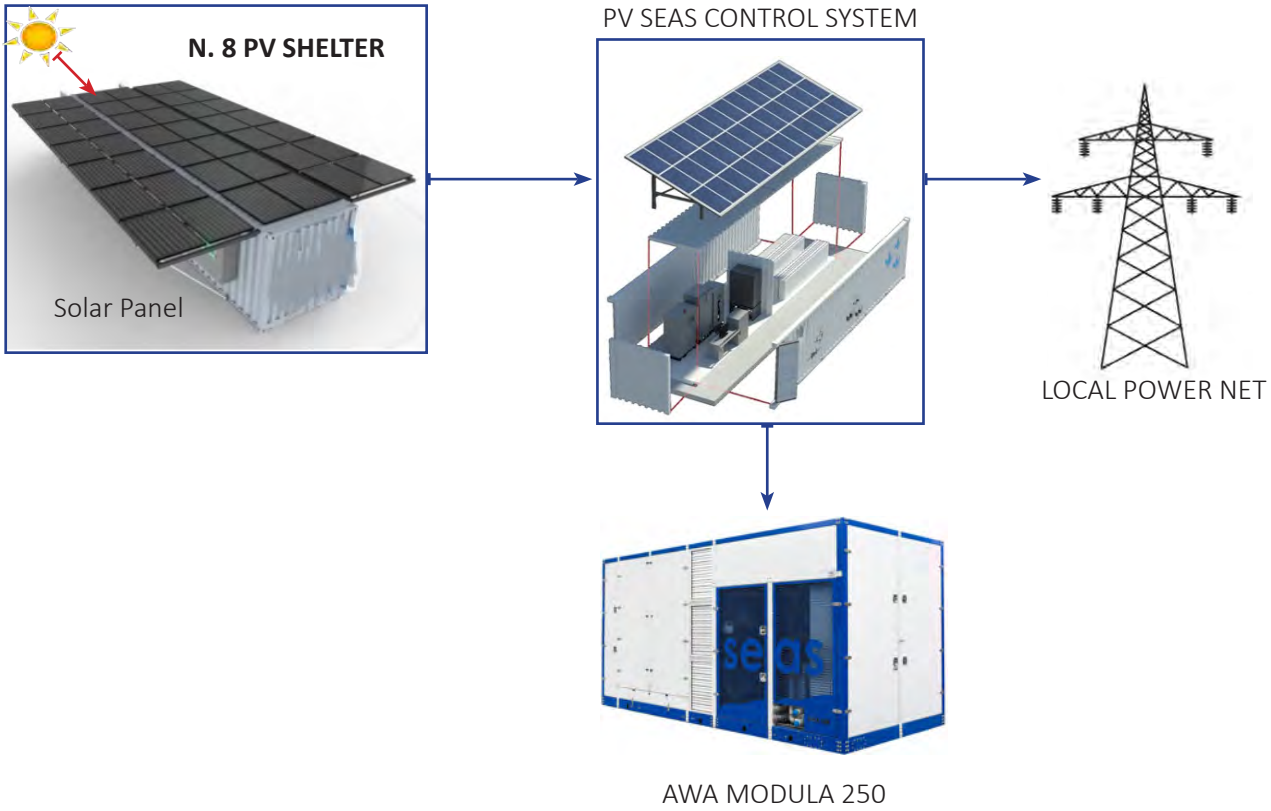
SOLUTION 2

SEAS PV 60 GRID GG - 400/50



- **ON Grid solution with only sunny days work**
- **Plant about 125 kWp**
- **Avaiable load, in realtion to sunny days (8-10h/day) 60 kWp at 400/50Hz**
- **Local power network necessary for a correct and continuous system functionality**
- **Occurred space 1200m2 (40m x 30m)**
- **Attached plants specification**

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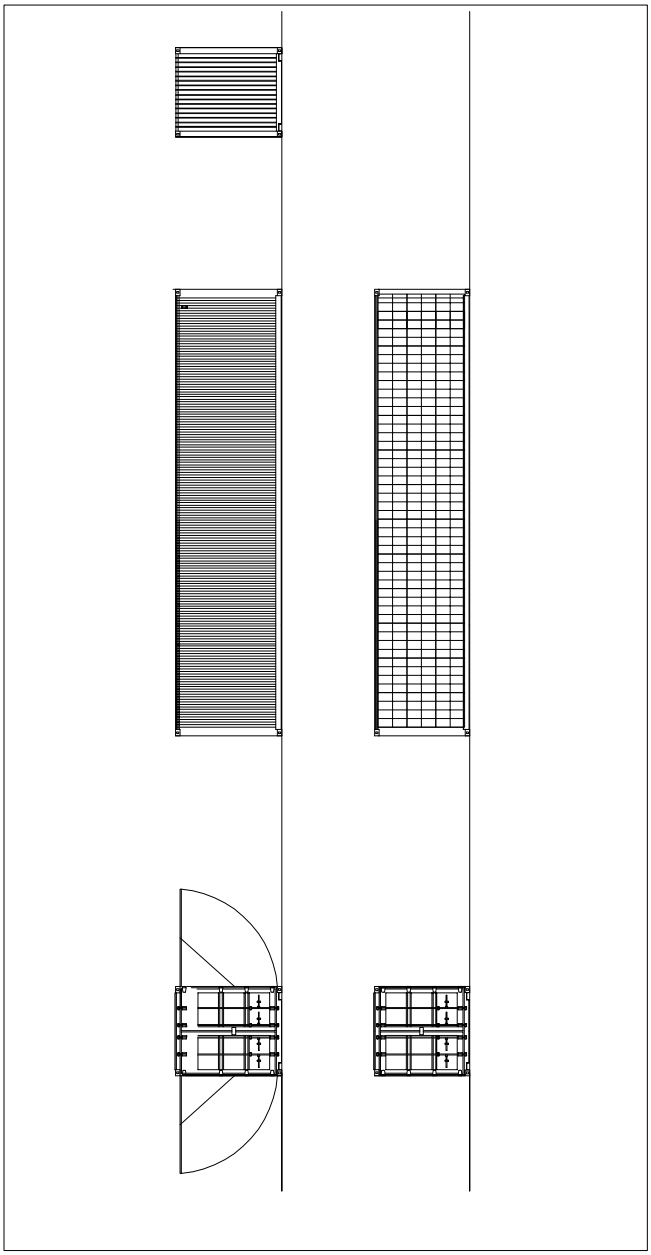

SEAS PV SHELTER DETAIL 40' HC lxpxh 12192x2438x2896 mm

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TREATMENT				S/N			
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SIGN							
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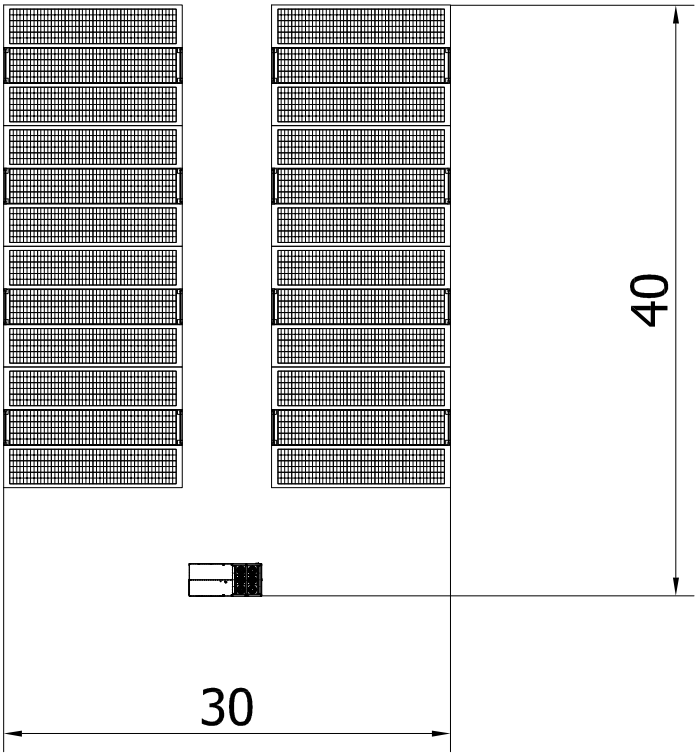

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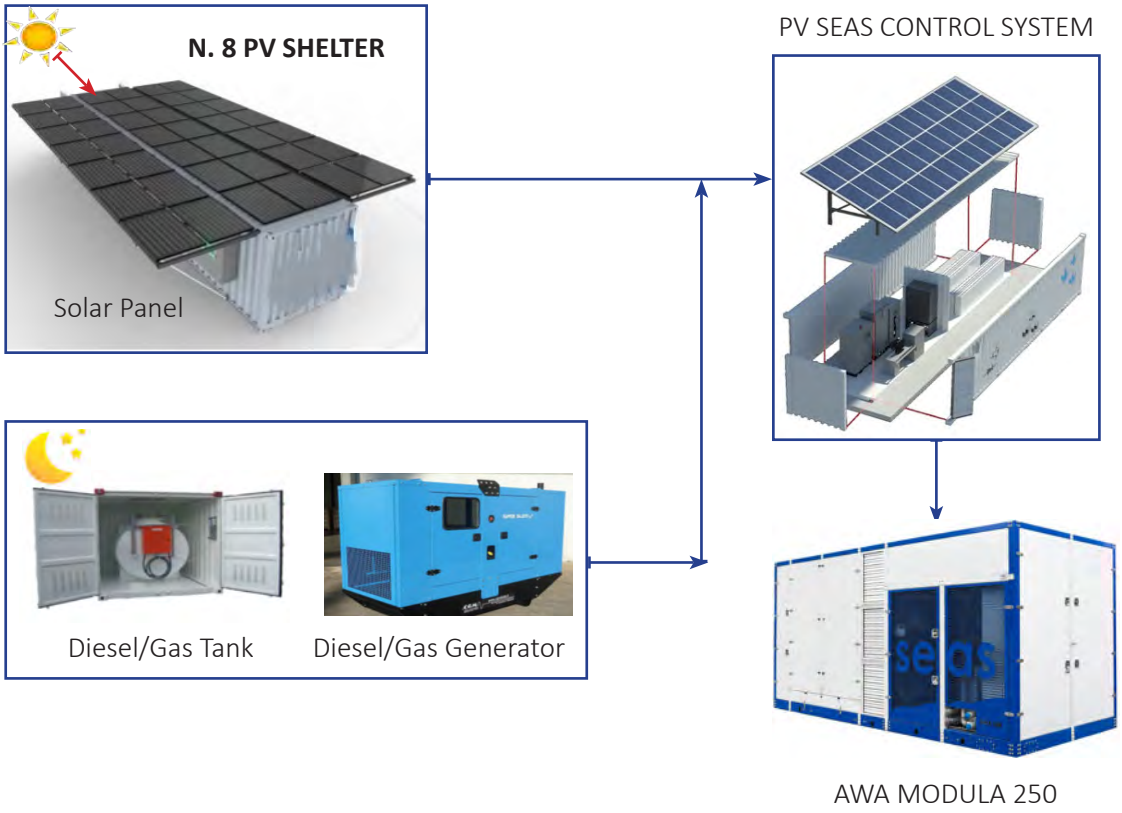
DATE	07.03.2016	11.03.2016	11.03.2016			A4	1/2
SIGN							
DESCRIPTION	SEAS PV 60 GRID GG SEAS PV 60 GRID GG					SCALE 1:500	JOB AWA PV
	N° DRAWING LAY-A250-PEP00-SSX01					REV 00	

SOCIÉTÉ DE L'EAU AÉRIENNE SUISSE

SOLUTION 3

SEAS PV 60 OGG 400/50



- **OFF Grid solution with generator storage h24**
- **Plants about 125 kWp/PV + 200 kWA generator**
- **Avaible load, 60 kWp h24 at 400V / 50Hz**
- **Occurred space 1200m2 (40m x 30m)**
- **Attached plants specification**

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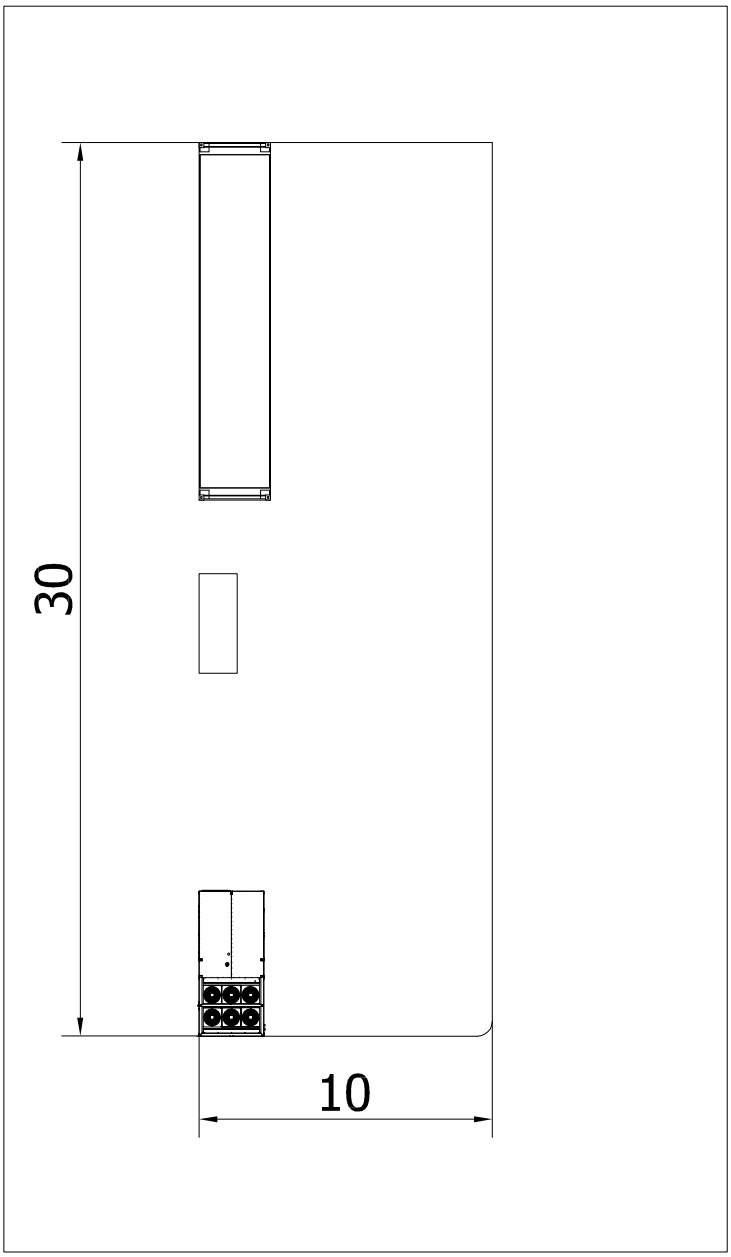

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SIGN							
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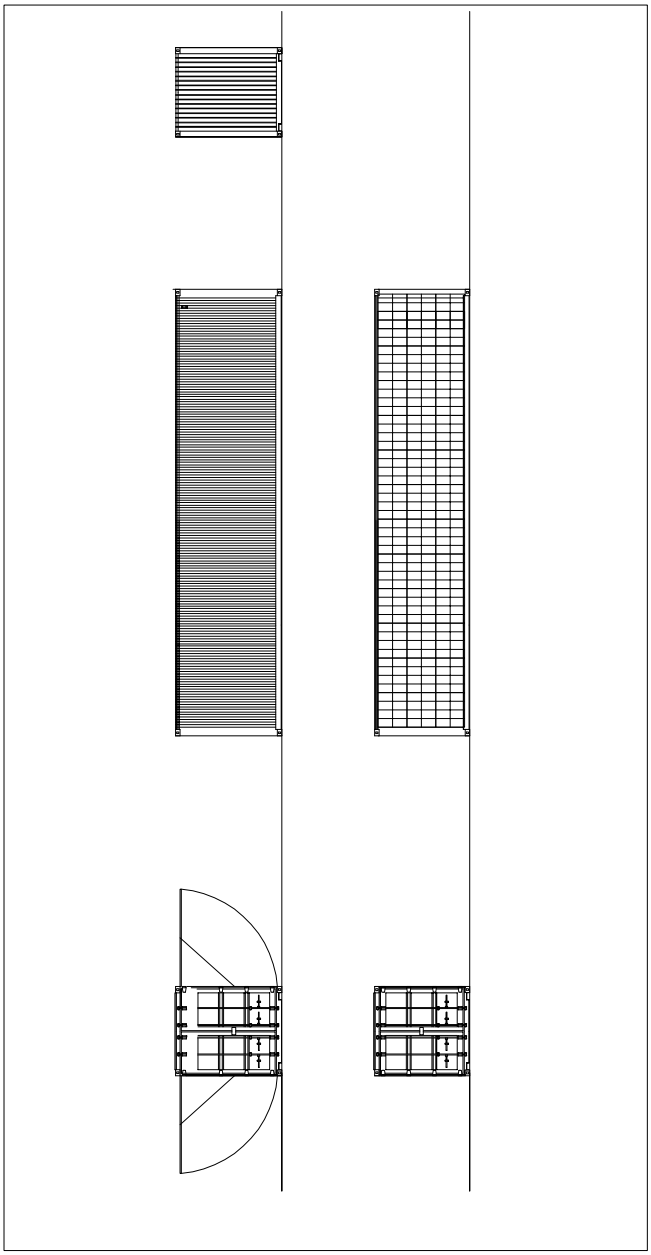
	N° DRAWING LAY-A250-PEP00-SSX03					REV 00	



SEAS PV SHELTER DETAIL 40' HC lxpxh 12192x2438x2896 mm

MATERIAL				PART CODE	LAY-A250-PEP00-SSX02		
TREATMENT				S/N			
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SIGN							
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	N° DRAWING LAY-A250-PEP00-SSX02					REV 00	

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SOLUTION 4

SEAS GEN 60 - 400/50

AWA MODULA 250

- **OFF Grid solution with generator storage h24**
- **Plant about 200 kWA generator**
- **Avaiable load, 200 kWa h24 at 400V / 50Hz**
- **Occurred space 300m2 (10m x 30m)**
- **Attached plants specification**

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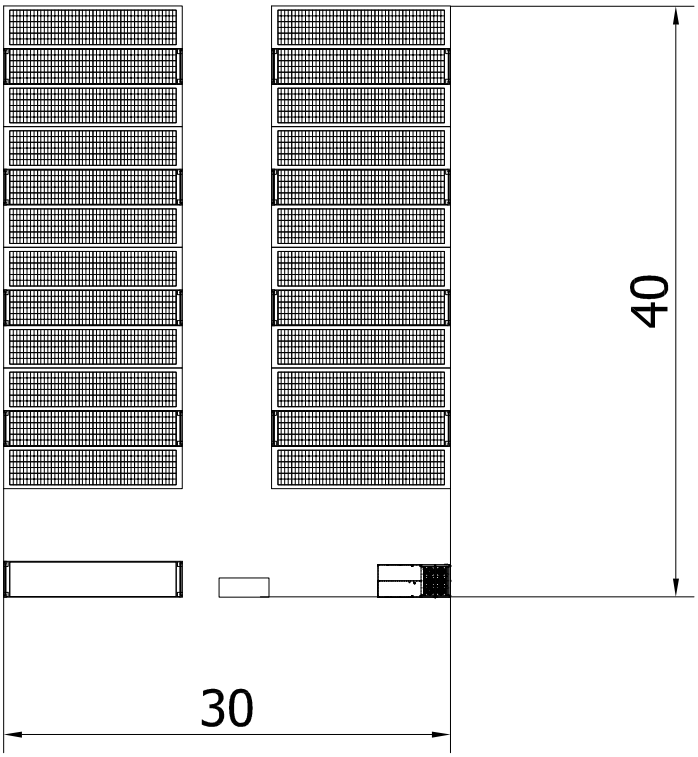

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