Case: ClubFloat – Offshore Wind Farm (OWF)

The ClubFloat OWF is an upcoming floating wind farm project located on the Norwegian Continental Shelf.

A joint venture between **Norwegian Offshore Renewable Energy Transition Union Reaching Netzero** (NORETURN – 60% ownership) and the **Bergen Rotation Environmental Energy Zea Endeavour** (BREEZE – 40%), the ClubFloat project has been granted an area large enough for a 540MW wind park. The allocated area is located 75km off the municipality of Solund on the Norwegian coast, with an average water depth of 265m. The area lays between two active oil and gas fields: North of the Troll field and South of the Gjøa field. Seabed conditions over the area are mixed, ranging from soft clay to hard sand.

The ClubFloat project will include all offshore assets including the Offshore Substation, and Export Cable (offshore and onshore) up-to-and-including the onshore substation.

The floating farm will consist of 30 wind turbines – each with a capacity of 18MW – one offshore substation and one onshore substation, inter-array cables, as well as an export cable. The construction period will run from 01.01.2024 to 30.09.2028, with the first year of operation expected to commence from 01.10.2028. The project has a projected lifespan of 25 years. The turbines will gradually become operational and produce electricity as IAC's are commissioned from June till the end of September 2028.

Vendors from across the world are being utilized to procure the best quality equipment:

- **Bestas** will provide the WTGs with various components, manufactured at different sites in Europe, before being transported to the assembly site in Norway;
- **REKA** will, under an EPCI contract, be responsible for the semi-submersible floating foundations, with manufacturing taking place in Poland and Norway, before being transported to the assembly site in Norway;
- As a subcontractor to the REKA, **KNOF Subsea** will provide all Marine and Transport & Installation operations in connection with in-shore handling of the foundations, as well as pre-installation of SKS and tow-to-field and hook-up;
- In a direct contract with the ClubFloat Project, KNOF Subsea will also install the inter-array cables. These cables will be free-issued by the company to KNOF Subsea after being manufactured in the UK by **FTW Cables**. They will be stored there until ready for transportation to the site in Norway for installation;
- **RELAXANS** will manufacture the on-and-offshore export cables in Norway, as well as install said cables;
- A JV of **CAIBEL** and **LEPPEK** will deliver the HVAC floating substation. The platform will be built in Singapore before being dry transported around the Cape of Good Hope to Norway. The transportation contractor will be **Socksmart;**
- The CAIBEL and LEPPEK JV has contracted with the following subcontractors for their scope; **Bitachi** will supply the complete HVAC electrical power system. KNOF Subsea will procure and pre-install a Station Keeping System (SKS) consisting of 12 mooring lines in the installation season prior to substation tow-to field. KNOF Subsea will then be responsible for the tow-to-field and hook up of the offshore substation;
- CAIBEL will build the onshore substation.
- **VND** will conduct project certification and **Universal Maritime** will cover MWS.

With decades of joint experience between all stakeholders, the ClubFloat windfarm will be on the cutting edge of technology, providing green renewable energy to further Norway's quest to become carbon neutral.

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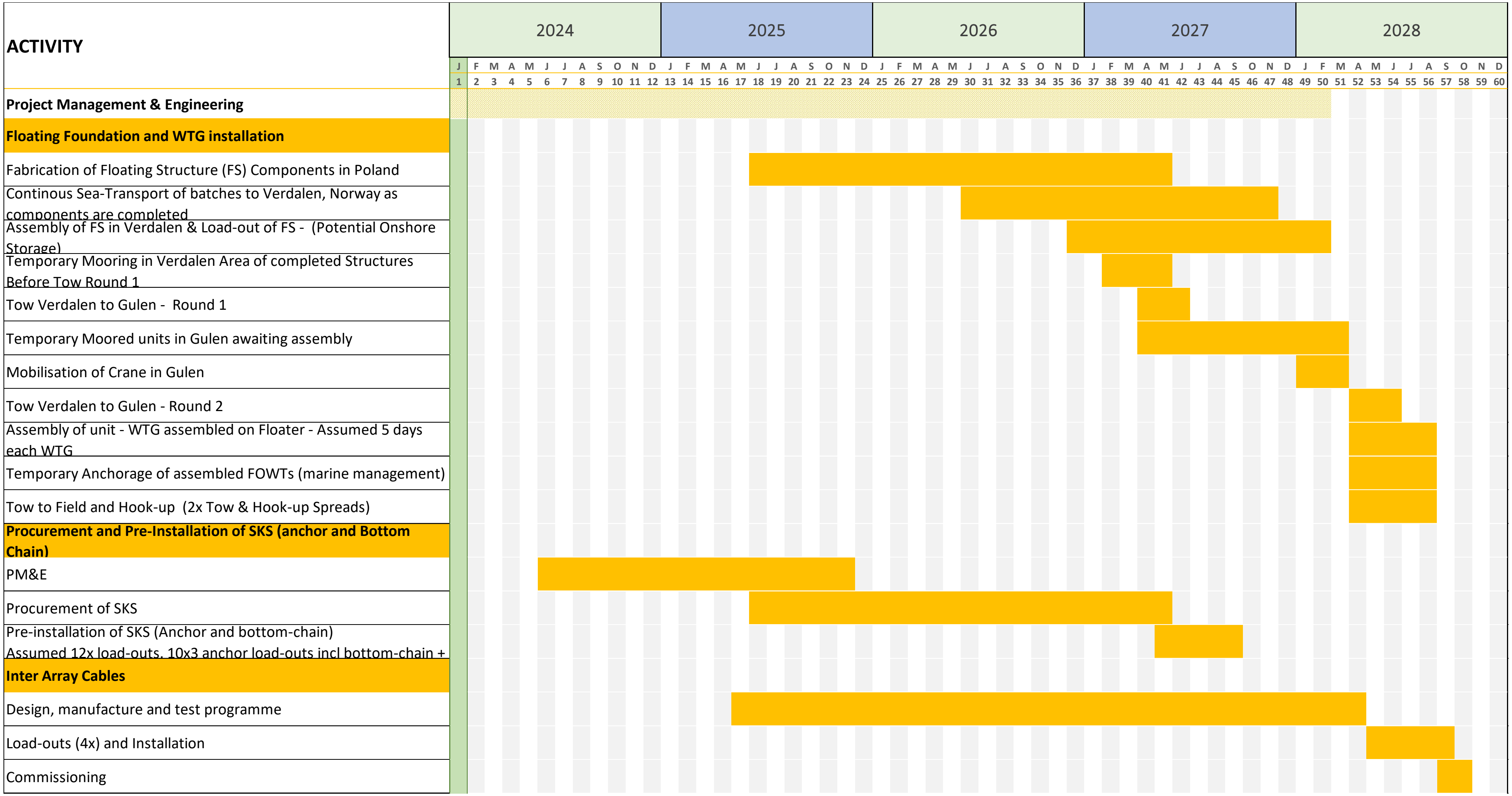
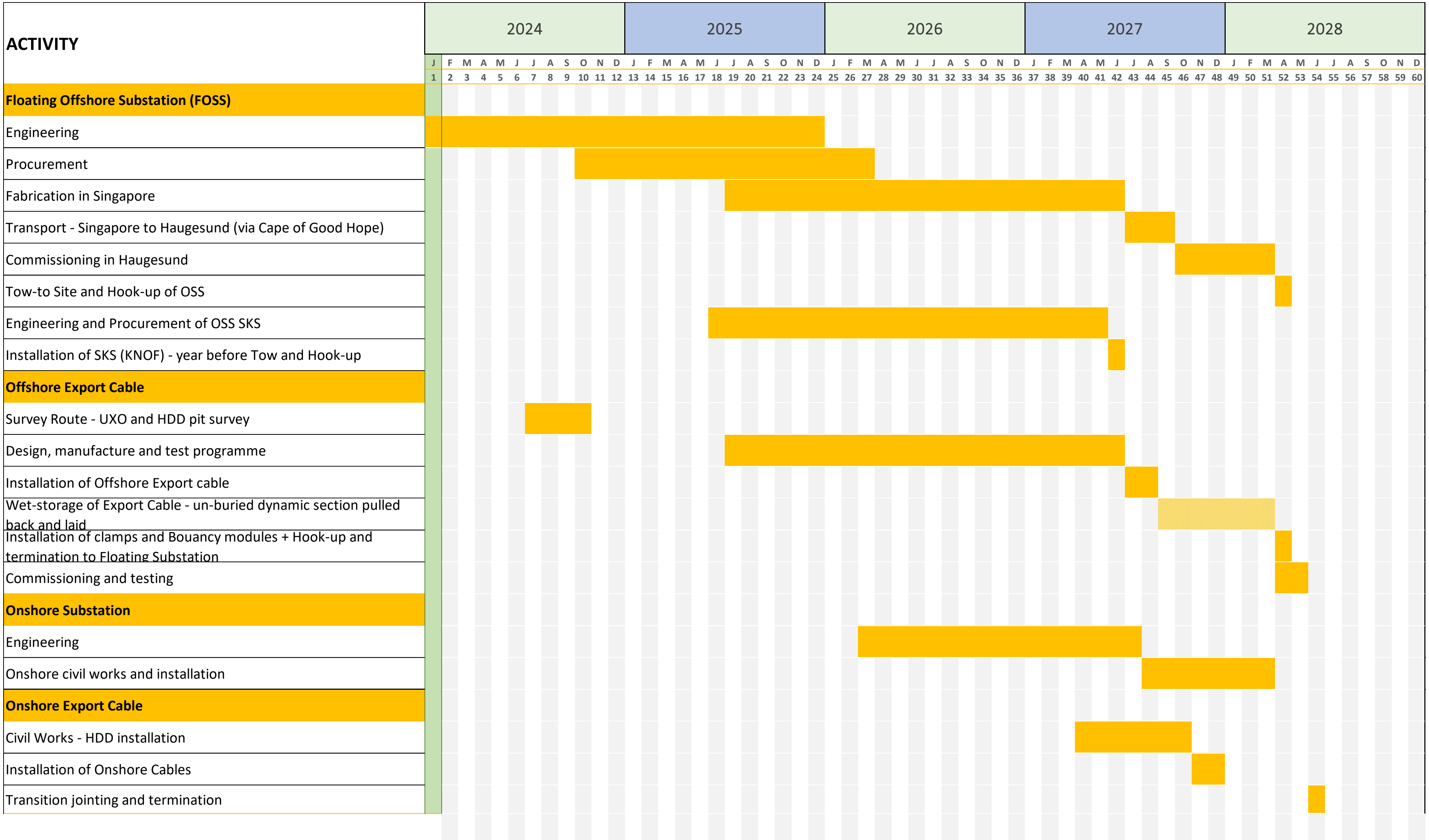
1. Indicative Schedule





ACTIVITY
2024
2025
2026
2027
2028
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Floating Offshore Substation (FOSS)
Engineering
Procurement
Fabrication in Singapore
Transport - Singapore to Haugesund (via Cape of Good Hope)
Commissioning in Haugesund
Tow-to Site and Hook-up of OSS
Engineering and Procurement of OSS SKS
Installation of SKS (KNOF) - year before Tow and Hook-up
Offshore Export Cable
Survey Route - UXO and HDD pit survey
Design, manufacture and test programme
Installation of Offshore Export cable
Wet-storage of Export Cable - un-buried dynamic section pulled back and laid
Installation of clamps and Bouancy modules + Hook-up and termination to Floating Substation
Commissioning and testing
Onshore Substation
Engineering
Onshore civil works and installation
Onshore Export Cable
Civil Works - HDD installation
Installation of Onshore Cables
Transition jointing and termination

2. Budget

Below is the preliminary budget of the project:

Asset	Total Supply Cost (EUR):	Quantity:	Cost/WTG # (EUR)
Wind Turbine Generator (WTG) - Turbine Supply Agreement (TSA):	600 000 000	30	20 000 000
Foundation (incl Station Keeping System (SKS))	930 000 000	30	31 000 000
Inter-Array Cables (IAC) (incl T&I)	78 000 000	65	1 200 000
Offshore Substation Incl SKS with T&I	525 000 000		
Offshore Export Cable (incl T&I): 2 x 220kV HVAC - 2x75km Incl 1x 220kv HVAC submarine cable (spare) - 2.5km (Dynamic section) Incl 1x 220kv HVAC submarine cable (spare) - 2.5km (static section)	231 000 000	150	1 540 000
Onshore Export Cable (incl installation)	10 000 000	10	1 000 000
Onshore Substation	125 000 000		
Other	50 000 000		
Total:	**2 549 000 000**	30	**84 966 667**

The contracts which are the basis of these budgets were negotiated largely without the impact of price inflation in recent years. Some contracts have lump-sum (LS) components in them but many also have provisional sum (PS) components. These are often to cover costs that the contractors perhaps cannot control themselves, such as Waiting on Weather, Price of Steel, Price of Fuel, etc.

Provisional Sum (PS) components are approximately 30% of the budget of this project. The project team is somewhat concerned about the current pressure on supply-chain as well as general inflation currently experienced. Additionally, the project has initiated studies into replacement of units currently purchased in a high volume. Previously, some have used 15% increase in prices when unitising bulk-procured items.

There is some scepticism in the project if this may hold up.

3. Wind Turbine Generators (WTGs)

The ClubFloat project has entered into a Turbine Supply Agreement (TSA) with the leading wind-turbine manufacturer Bestas, one of the three leading offshore turbine manufacturers outside of China. Bestas will be responsible for providing the towers, the nacelles, blades and relevant electrical components.

Bestas will deliver 30 of their recently marketed B260 turbines. The B260 has a prototype installed at the Østerild National test centre in Denmark where it is currently being tested. The turbines will have 128-metre-blades with a 66,000m^2 sweep area, and a rotor diameter of 260m, each with the effect of 18MW.

Bestas will be responsible for the coordination and assembly of the Wind Turbine Generators (WTGs) onto the floating foundation. Crane, marine logistics and base-support services will be free-issued by ClubFloat to Bestas.

The B260 turbine is not yet in serial production. Nor has it achieved a Type Certificate. Bestas is responsible for achieving a Rotor Nacelle Assembly (RNA) Type Certificate in the six months prior to first load-out of components.

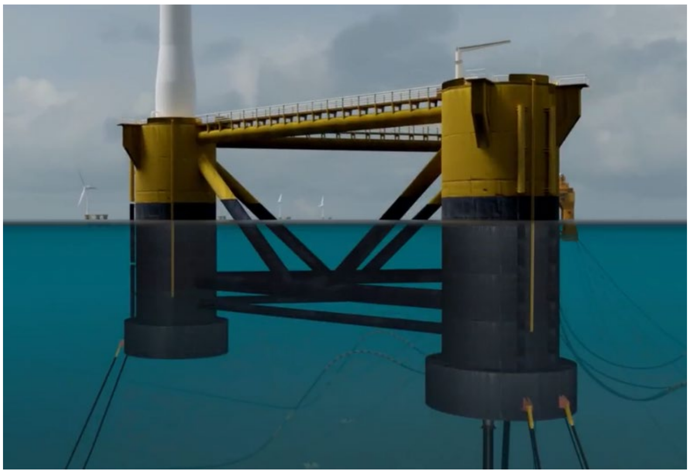
The blades will be produced in Italy, the nacelle in Poland, while the towers will be manufactured in Denmark and Spain. All of these units will be transported by geared (self-unloading) vessels to the assembly site in Bergen, Norway. Bestas is delivering the components on a Delivery Place Unloaded (DPU) basis to the assembly site. They will arrange insurance for the transportation themselves.

Bestas will provide a warranty with a five-year Defects Notification Period (DNP) after last WTG take-over date (warranty max. seven years after defects remediation; if repairs are conducted under warranty). The warranty does not include vessel cost related to offshore installation and/or tow to/from port, but does include logistics of getting components to/from load-out base.

ClubFloat and Bestas have also entered into a five-year Service and Maintenance Agreement (SMA) for maintenance of the components supplied under the Turbine Supply Agreement (TSA).

4. Foundation

ClubFloat has entered into an Engineering, Procurement, Construction and Installation (EPCI) agreement with REKA Predicament, a very well respected Norwegian EPCI contractor for the Offshore Oil and Gas industry with more than 40 years' experience designing, delivering and servicing semi-submersible drilling and production platforms.



REKA will be responsible for delivery of 30 floating foundations to the assembly site; they will thereafter be responsible for all marine operations in association with the assembly site operations. REKA will also be responsible for provision of a Station Keeping System (SKS), meaning anchors and bottom chain. Additionally, REKA's scope of work includes the pre-installation of a Station Keeping System (SKS), meaning anchors and bottom chain, as well as the tow-out to field and hook-up. REKA has a contractual warranty to the project to remedy defects notified during the Defect Notification Period (DNP) of five years. The warranty is capped at 200mEUR.

The basis of the foundation will be a semi-submersible floater. The floater will be made of steel. Each floater will have an approximate mass of 4,000-to-4,500 tons. It is composed of three vertical columns arranged in a triangle with a height of 25m. The columns will be connected by tubular structure element; the triangle width is 95m*85m sides.

Columns and Water Entrapment Plates (WEP) will be prefabricated in Poland at a renowned Polish steel construction company. All truss and pontoon pre-fabrication will also be done in Poland at another respected steel construction firm. The finished components will be transported by sea to Verdalen, Norway. The pre-fabrication company is responsible for arranging both transportation and insurance of the components until off-loaded at foundation final assembly yard, from which point they are in REKA's control.

It is planned that the foundations are fabricated and assembled from the major components in Verdalen, Norway; this being the foundation final assembly yard. Verdalen is REKA Predicaments strategic area for offshore wind assembly, with access to massive onshore areas as well as several areas of temporary mooring locations, in addition to an abundance of quay-side. REKA will arrange for a suitable Self-Propelled Modular Transporter (SPMT) and semisubmersible barge for load-out of assembled foundations. Verdalen will not be limited by a number of temporary mooring locations for the foundations.

The foundations will be towed from Verdalen to Yellowish Base for integration with the towers, nacelles and blades to become a fully integrated Floating Offshore Wind Turbines (FOWTs). Yellowish Base is thus the integration site. The integration site will have 1x crane for assembly of the WTG onto the foundation. It will have also 10 other temporary mooring locations in sheltered waters for foundations and fully assembled Floating Offshore Wind Turbines (FOWTs). The tow route from Verdalen to Gulen is about 325 nautical miles (nm). 2x 80t Booby tugs are planned for towage of the foundations from Verdalen to the Yellowish base; the project is, however, considering use of 1x 80t Booby tugs to save money.

Ten foundations will be towed from Verdalen to Gulen as they are completed from start of production in

2027. These will be arriving at Yellowish base during 2027 and be temporarily moored there until the integration harbour is operational upon mobilization of the crane. The remaining foundations will be towed during the start of 2028 season as they are completed. There will not be any towing of foundations between 15th of April and 30th of September.

The project initially wanted to conduct both major component assembly as well as integration (foundation integrated with WTG) at the same location; either Yellowish base or Verdalen. However, the spread of locations was encouraged by the government so as to be advantageous for "local content" considerations during the lot-award process. The project has signalled that it may wish to gather the operations in one location, thereby avoiding the transport/tow of the non-integrated units from Verdalen to Yellowish base. They are, however, uncertain as to what would be the political consequences if they suggested this.

REKA has contracted with KNOF Subsea for all Marine and Transport & Installation (T&I) operations in connection with in-shore handling of the foundations, as well as pre-installation of Station Keeping System (SKS), tow-to field and hook-up. The SKS system will be a six-line mooring system. A three-line system is evaluated by the project due to some expected cost savings. However, for a three-line system, if a mooring line fails it is likely that the Inter-Array Cables (IAC's) connected would fail. It is not decided whether the anchors will be shared or individual.

KNOF will pre-install the anchors and bottom chains in the installation season before assembly and tow-out commences. KNOF will use two tow and hook-up spreads working in parallel to tow-out and hook-up the turbines. KNOF has a contractual warranty to REKA for faulty workmanship, and must execute all work required to remedy defects notified during the Defect Notification
Period (DNP) of 5 years. However, the KNOF warranty is capped at 100% of contract value. The contract value is 55m EUR.

The plan is to conduct the tow-out and hook-up of all 30 assembled units in one season. The season is set from 15th April 2028 to 15th September 2028. This period is 153 days, meaning that an average of 5.1 days are available for tow-out and hook-up per unit.

It is estimated that the integration of one Floating Offshore Wind Turbine (FOWT) will take five days each. Tow-out and Hook-up will take five-to-seven days. As there are two tow-out and hook-up spreads, there is some redundancy. Some voices say the schedule is far too conservative, claiming that less time should be achieved for both assembly and tow-out & hook-up, while others say it is far too optimistic already.

In case of delays or a lot of Waiting on Weather (WoW), the plan will be to delay installation of potential remaining Floating Offshore Wind Turbines (FOWTs) to after 15.04.2029. Arrangements have been made for such an outcome in the contracts considering tow-out and hook-up, Inter-Array Cables (IAC) Transport & Installation (T&I), as well as temporary mooring inshore.

REKA has a separate contract in-place for procurement of mooring lines and anchors. Suction Anchors have been chosen due to seabed conditions. These are to be delivered via geared vessel on a Cost Insurance Freight (CIF) basis to a logistics base and free-issued to KNOF.

5. Inter-Array Cables (IAC)

The inter-array cables will connect the Floating Offshore Wind Turbines (FOWTs) with the offshore substation. The current plan is for the inter-array cables to connect from the Offshore Substation through six strings of five Floating Offshore Wind Turbines (FOWTs) in a daisy-chain. This is with 66kV cables, a floating version of the current conventional design for Inter-Array Cables (IAC) for bottom-fixed wind. Such 66kV cables have been confirmed by FTW cables to be adequate for 5x 18MW Floating Offshore Wind Turbines (FOWTs). The project is also considering using 132kV cables for inter-array, which would enable an increase of how many Floating Offshore Wind Turbines (FOWTs) could be in each string.

The cables would have a dynamic section in a 'reverse pliant' or 'lazy wave' configuration with a hold-down anchor. This is subject to final engineering.

During the feed stage, the project considered an alternative design for Inter Array Cables (IAC). In this alternative design there would be a main cable for each string with subsea connectors connecting each Floating Offshore Wind Turbine (FOWT) with a separate Inter Array Cable (IAC) extending from this main cable. This instead of each Floating Offshore Wind Turbines); having two Inter-Array Cables (IAC's) connected to it.

This would remove the risk of an Inter-Array Cable (IAC) failing at the point nearest the Substation and taking out one sixth of the farms production. Additionally, it could reduce the challenges in replacing Inter-Array Cables (IAC's). However, the technology is not tested before and as such the project is uncertain on which avenue to proceed on.

ClubFloat has entered into a two separate contracts for the manufacture and installation of the inter-array cables. FTW Cables will manufacture the cables whilst KNOF Subsea will install them. The contracts include an option for a revised design with subsea connectors.

FTW Cables has produced the dynamic cables for most floating wind projects to date. KNOF Subsea has not installed much dynamic cable, however, has a significant track-record of installation of flexible products from the oil and gas industry.

FTW will manufacture the Inter-Array Cables (IACs) at their facility in Hartlepool, UK. The Inter-Array Cables (IAC) will be stored on the manufacture facility of FTW for 5 months until KNOF Subsea completes load-out of the Inter Array Cables (IACs) and transit direct to site for installation.

The contract also includes provision of buoyancy, vertical clamps, various tether anchors and other appurtenances as may be required. Bend stiffeners and Cable Protection systems (including protection sleeves) is purchased separately by the ClubFloat project and free issued to the installation contractor, KNOF. The ClubFloat project has made an agreement with the supplier LHIH (Lets Hope It Holds). This supplier has very competitive prices but has had serial defects issues with their products in the past. The engineering team at ClubFloat is somewhat concerned about the CPS interaction area with the seabed. It is also product that is considered challenging to assemble and install.

The average distance between the Floating Offshore Wind Turbines (FOWT) locations is approximately 1.1km. The average Inter-Array Cables (IAC) length is 1100m + 350m*2(for some routing, buoyant section and overlength) = 1800m.

The contract also includes a requirement for 3x spare Inter-Array Cables (IAC) lengths. Total estimated distance is then 36(30+3spare +3 loop-connectors) *1800m = ~65km Inter-Array Cables (IAC).

A cable installation vessel will be used to install the Inter-Array Cables (IAC's). The Inter-Array Cables

(IAC’s) will be delivered by FTW in pre-cut lengths with bendstiffeners/ pullheads pre-mounted in both ends. It is expected that nine IAC’s can be installed on each load-out. Thus, there will be four loadouts, with the last trip having six IAC’s. The daily rate for the vessel for variation work is EUR 275,000. However, the contract limits required variation work under the contract to 90 days maximum. The vessel is fully scheduled for subsequent installation season, giving some uncertainty as to which vessel would conduct the transport and Installation (T&I) in the event the installation is delayed into next installation season.

FTW will also be responsible for the pull-in and termination of the Inter-Array Cables (IAC). FTW will use a suitable subcontractor for the commissioning scope.

KNOF gives a warranty to ClubFloat for faulty workmanship and must execute all work required to remedy defects notified during the Defect Notification Period (DNP) of two years. However, the KNOF warranty is capped at 20% of contract value. The contract value is EUR35m. However, although KNOF’s warranty includes provision of vessel services to remedy faulty workmanship, it does not include replacement cable.

FTW gives a warranty to ClubFloat for faulty design, material and workmanship and must execute all work required to remedy defects notified during the Defect Notification Period (DNP) of two years. However, the warranty is limited to provision of replacement cable at their facility. It does not cover vessel to install such cable.

6. Export Cables

The export cables will go from Onshore Substation to the Offshore Substation.

The offshore section will consist of 2x 220kV HVAC cables of 75km, so 150km of Offshore Cables in total. 70km of these cables will be static whilst the full last 5 KM will be specified as dynamic.

The static section of the cables will be buried in similarly to how they would be for bottom-fixed wind. 1-1.5m Depth of Burial (DoB) for most of the route. There will be increased Depth of Burial (DoB) of the last KP’s before entering the HDD duct. There will be a transition from static to dynamic section. The cable will be buried well into the dynamic section. The dynamic section will be held-down by a hold-down anchor thatclamps onto the cable. There will be buoyancy modules holding the cables in a lazy-wave configuration before the two dynamic cables enter the floating substation.

Onshore the two High-Voltage Alternating Current (HVAC) cables will connect with the offshore cables at the beach-pit junction boxes. The export cables will be laid within a 1,200m corridor with approximately 200m between them. There are no expected crossings, however all normal surveys will be done plus a Pre-Lay Grapnel Run (PLGR).

The onshore cables are laid 5km, before reaching the onshore substation and the grid connection point.

The contract will also include provision of all required appurtenances as well as 1x 2.5km spare cable with dynamic qualities and one 2.5km spare for the offshore static section.

ClubFloat has awarded an Engineering, Procurement, Construction, and Installation (EPCI) contract with RELAXANS for the on and offshore Export cables. RELAXANS has given the Warranty that they must execute all work required to remedy defects notified during the Defect Notification Period (DNP) of five years.

The Export Cables will be produced in Halden and thereafter loaded directly onto RELAXANS own owned Cable Lay Vessel (CLV) RELAXANS Australis. The vessel has a massive cable capacity of 10,000 tons and one load-out of cables is expected. Thus, the vessel would be, at one time, loaded with 2x export cables. The export cables will be installed in the 2027 season and wet-stored for pull-in after Floating Offshore SubStation (FOSS) tow-out and hook-up. This to ensure that Floating Offshore SubStation (FOSS) can be commissioned early in the 2028 season and subsequently electricity production from Floating Offshore Wind Turbines (FOWTs) can be exported as they are gradually installed and commissioned through the 2028 installation season.

The contract also includes provision of buoyancy, vertical clamps, various tether anchors and other appurtenances.

7. Floating Offshore Substation (FOSS)

The Offshore substation is to hold high voltage (HV) transformation and switching equipment and various other auxiliary facilities. The Inter Array cables will deliver power to the offshore substation which will transform this to 220kV. Thereafter the power will be transmitted via the export cables to the onshore substation which is the grid connection point. The offshore substation will normally be unmanned but will have helideck and basic living facilities for shorter periods of maintenance. Normal operations will be carried out from the onshore control centre.

During the feed-stage the project considered using a subsea substation. This would remove the need for a lot of dynamic cables but would change the installation methodology as well as maintenance. The project was optimistic but concluded that the technology was not yet ready and decided to go for a floating substation instead.

The substation will weigh approximately 9,500tons and have a foot-print of approximately 75*80m.

ClubFloat has entered a EPCI agreement with a Joint Venture (JV) of CAIBEL and LEPPEK for the delivery of the High-Voltage Alternating Current (HVAC) floating substation; ClubFloat Den Heilage. The contract includes commissioning, transport and installation of the complete converter platform offshore. The Joint Venture (JV) has given the warranty that they must execute all work required to remedy defects notified during the Defect Notification Period (DNP) of five years. The value of such warranty is capped at 25% of contract value this as per NTK-15 (Norwegian Total Contract 2015). All subcontractors to the Joint Venture (JV) has given the same warranty.

The platform will be built in Singapore at the Leppek yard before being dry-transported around the Cape of Good Hope to Haugesund, Norway. The transportation contractor will be Socksmart, a global market leader in heavy marine transport with more than 30 years' experience.

Bitachi as a subcontractor will supply the complete HVAC electrical power system. The floating substation will be outfitted by CAIBEL in Haugesund. The JV has subcontracted the tow to field and hook-up to KNOF Subsea.

KNOF Subsea will procure and pre-install a Station Keeping System (SKS) consisting of 12 mooring lines in the installation season prior to Substation tow-to field. Thereafter KNOF will also be responsible for tow-to-site and hook-up.

The project is in dialogue with experienced UK transmission asset operators for the potential sale of export infrastructure, including offshore and onshore substations as well as export cables. This could be a possibility after the first year of operation of the farm.

8. Onshore Substation

The onshore substation transforms and potentially converts the power to correspond with grid requirements as agreed with the government.

CAIBEL was awarded the Engineering, Procurement, Construction and Installation (EPCI) contract for the Onshore Substation. The Onshore substation is relatively remotely located in a suitably sheltered area.

9. Harbour Logistics & Port Services

ClubFloat has entered into an agreement with port and logistics services at the Yellowish Offshore Base.

The agreement includes services such as accommodation services for workers, provision of Self-Propelled Modular Transporters (SPMTs), forklifts, storage sites, guard services and other as may and will be required.

ClubFloat has also entered into an agreement with Woolly Elephant for the provision of a suitable crane for the assembly operations, lifting the components onto the floating foundation during its installation.

For the operational phase, the project has included a framework for use of Yellowish base as a site for their maintenance team, including storage of spares. It also includes an arrangement for general quay-side services if there is a need to tow any of the floaters back to shore. However, the crane from Wolly Elephant will be demobilised following the completion of the assembly site operations. Yellowish base will not have a permanently installed crane.

Although, due to the Oil and Gas industry; the Norwegian west-coast does also offer a few quay-side locations with suitable water depth, unhindered tow-routes and quayside to accommodate units towed to shore, none of these have a suitable crane permanently installed.

Thus, The Club Float Project does not have a fully elaborated plan for conducting major component exchange (MCE).

Additionally, there has been reports about Russian fishing vessels acting suspiciously in the vicinity of some of the quay-side locations of installations facilitating oil and gas, as well as the renewables industry, on the west coast.

10. Revenue

The project has won a CFD with the government at 110EUR/MWh. The project expects its P90 Capacity factor to be 45%, while its P50 Capacity factor is estimated at 50%. For the first year of operation the following calculation is made:

Description:	Unit
MW:	540
100% Capacity Factor MWh (100%*365days*24hrs)	4 730 400
P90 Capacity factor:	**45,0 %**
P90 Production MWH = Capacity factor* 100% production (avg Annual):	2 128 680
P50 Capacity factor:	**50,0 %**
P50 Production MWh = Capacity factor* 100% production (avg Annual): (avg Annual):	2 365 200
EUR/MWh - CFD	110
P90 Annual Revenue (MWh Produced * EUR/MWh):	234 154 800
P50 Annual Revenue (MWh Produced * EUR/MWh):	260 172 000
Annual Revenue basis for DSU/BI:	247 000 000

11. Certification

VND will conduct Project Certification according to their standards VND-SE-0422 and VND-ST-0119.

The Project Certification will cover the floating wind turbine foundations, towers and the associated Station Keeping System (SKS). There is currently no planned governmental requirement to have project certification. The initial FOW projects in Norway had a split scope for third party verification.

The floating offshore substation will be certified to design stage as per VND-SE-0073 Certifications of offshore windfarms and VND-ST-0145 Offshore substations

Bestas will also use VND for the Type Certification of the B260.

12. Marine Warranty Survey - MWS

ClubFloat has awarded the MWS scope to Universal Maritime. Universal Maritime is one of the leading MWS companies globally, boasting extensive experience from oil and gas. They have also been MWS for about half of the floating wind projects to date.

MWS guidelines and SoW will be according to JNRC 2023-029. The JNRC 2021-028A Renewables Warranty Endorsement will be in-place.

13. List of Abbreviations, definition and explanations

Term:	Description:
EPCI	Engineering, Procurement, Construction and Installation
WTG	Wind Turbine Generator, includes RNA And tower.
RNA	Rotor Nacelle Assembly is the nacelle and the rotor. The nacelle normally contains the generator, bearing, gearbox, yaw bearing and yaw system. A gearbox is not always used in offshore wind turbines. The rotor consists of three blades, a hub casting, blade system, bearings, and pitch system.
HDD	Horizontal Directional Drilling – Drilling of tunnel from onshore just after beach-landing to a suitable (few hundred meters to ~1km) distance from shore. The tunnel then has pipes pulled through it (HDD Ducts). The cable will then be pulled through these plastic pipes when being laid.
DPU	Delivery at Place Unloaded, the seller is responsible for costs and risks until the goods are unloaded at the agreed named place at destination. Thereafter the buyer is responsible. The buyer is responsible for import duties and arrangements.
DoB	Depth of Burial of a cable. How long the cable is buried during or following its installation. The depth of burial depends on the seabed, current and vessel activity in the area as well as the cable properties itself.
SKS	Station Keeping System; a term covering both the mooring lines and the anchors. Sometimes referred to as the mooring system. The system to keep the floater within its location parameters.
WoW	Waiting on Weather; usually used as a term for when operations are delayed for weather sensitive operations. For our project operations such as towages and hook-ups, Load-Outs, WTG integration, cable installation and several other are weather sensitive.
FOWT	Floating Offshore Wind Turbine this is all of the components required to generate electricity from wind energy offshore, including the floating structure, the tower, the nacelle, the rotor blades, and any other necessary equipment. The foundation is an integral part of the floating structure and is included in this term.
(TSA)	Turbine Supply Agreement , this is the contract between turbine manufacturer and the developer. Includes the design, fabrication and manufacture of the WTGs. In bottom-fixed wind it usually also includes the erection of the WTGs at site on foundations installed by others. In floating wind, it is expected that the TSA will include erection on the floating foundations whilst at quayside, but that the required craneage is provided by the developer under another contract. This contract includes the warranties for the WTGs.
SMA	Service and Maintenance Agreement, describes the responsibilities by a party for maintaining and repairing the property in question.
LCOE	Levelized Cost Of Electricity; this is summing up the net present value of total estimated cost of building and operating the wind farm over its life-time and then dividing this number by the electricity which the farm is expected to generate.