

# Arealansøgning I Det Åbne Land

Kommune Kujalleq nunaminertamik tunisinermi najoqqutassiaq malillugu matumuuna nunaminertamat qinnuteqaat una saqqummiunneqarpoq. Nunaminertamik tunineqarnissaq pillugu akerliliissutigiumasat aamma oqaaseqaatit nassiunneqassapput ataani allassimasumut:

I henhold til retningslinjer for arealtildeling i Kommune Kujalleq offentliggøres følgende ansøgning. Eventuelle indsigelser og bemærkninger til arealansøgningen skal fremsendes til:



**Kommune Kujalleq**  
**Teknik & Miljø**  
**Box 514**  
**3920 Qaqortoq**  
**Telefon: 70 41 00**

**E-mail:** [arealadmin@kujalleq.gl](mailto:arealadmin@kujalleq.gl)

Ulloq allartiffik: Startdato:	02.09.2020
<b>Oqaaseqaateqarfiginissaannut ulloq killigititaq:</b> <b>Indsigelsesfrist:</b>	<b>24.09.2020</b>

Sumiiffik / Sted:	Lokalnavn/adresse, Isortoq Reindeer Station		
Koordinat - UTM Zone 24N, WGS84:	X = : 42129.79	Y = 6791098.28	

Kommune Kujallermi Teknikkimut Avatangiisinullu Ingerlatsivik nunaannarmi erngup nukinganik nukissiorfiup allilernerqarnissaa pillugu qinnuteqaammik tigusaqarpoq, taanna Isortoq Reindeer Station-ip eqqaaniippoq Kommune Kujalliup Kommunemi pilersaarutaani 2017-2028-imi sumiiffik M9-mi illuni.

Qinnuteqartup Isortumi erngup nukinganik nukissiorfioreersup allilernissaa kissaatigaa. Alliliinissaq qinnuteqartup Isortoq Reindeer Station-imi toqoraavimmi qeqqussanik tunisassiorfissamik ilanngusserusunneranik tunngaveqarpoq.

Qinnuteqaat erngup nukinganik nukissiorfioreersup 11 kw-imiit 250 kw-imut allilernissaanik imaqarpoq. Alliliinissaq Isortup kuuani inissisimassaaq. Qinnuteqaat innaallagissiiutit kaavittuniit kallerup innerata kabelii Isortoq Reindeer Stationimut siaarnerqarnissaanik aamma imaqarpoq, nunap assinga ilanngussaq takuuk.

Erngup nukinganik nukissiorfimmi innaallagissiiutit kaavittut pinngortitamut aalisakkanullu innarliinngitsut pilersinneqassapput. Innaallagissiiutit kaavittut atortorissaarutaapput immikkut ittut pisariitsut, aalisakkallu ajoratik innaallagissiiutit kaavittut anigorsinnaasassavaat. Innaallagissiiutit kaavittut aalisakkanut innarliineq ajortut ikkunneqarnerisa ilassutaatut aalisakkat qaqisarfi innaallagissiiutinut kaavittunut tamanut ikkunneqassapput, taamaasillutik aalisakkat ajoratik innaallagissiiutit kaavittut akornisigoorsinnaasassapput. Innaallagissiiutit kaavittut aalisakkallu qaqisarfiisa nassuiarneqarneri tusarniummut uunga ilanngunneqarput (Tuluttut).

Kommune Kujallermi Teknikkimut Avatangiisinullu Ingerlatsiviup innersuussutigaa Pinngortitamik illersuineq pillugu Inatsisartut inatsisaat nr. 29, 18. december 2003-meersumi sinerissamat kuunnnullu ungasissusissanut piumasaqaat saneqqunneqarsinnaasoq, nukissiorfimmik pioreersumik alliliinissaq eqqartorneqarmat, kiisalu qinnuteqartoq sumiiffimmi pinngortitap pigisaanik illersuisussamik suliniutitut siunnersuusiorsimammat. Nunaminertamat akuersissuteqarnermi innaallagissiiutit kaavittut qinnuteqarnermi atornerqartut assingatut pilersinneqarnissaat piumasaqaataassaaq, (Innaallagissiiutit kaavittut pinngortitamut aalisakkanullu innarliinngitsut aalisakkanut qaqisarfillit).

Naammagittaalliortoqassappat nunaminertamat qinnuteqaatip suliarineqarnerani ilanngunneqarumaarput.

## Arealansøgning I Det Åbne Land

Teknisk Forvaltning i Kommune Kujalleq har modtaget en ansøgning til udvidelse af vandkraftværk i det åbne land, ved Isortoq Reindeer Station -beliggende i område M9 i Kommune Kujalleq Kommuneplan 2017-2028.

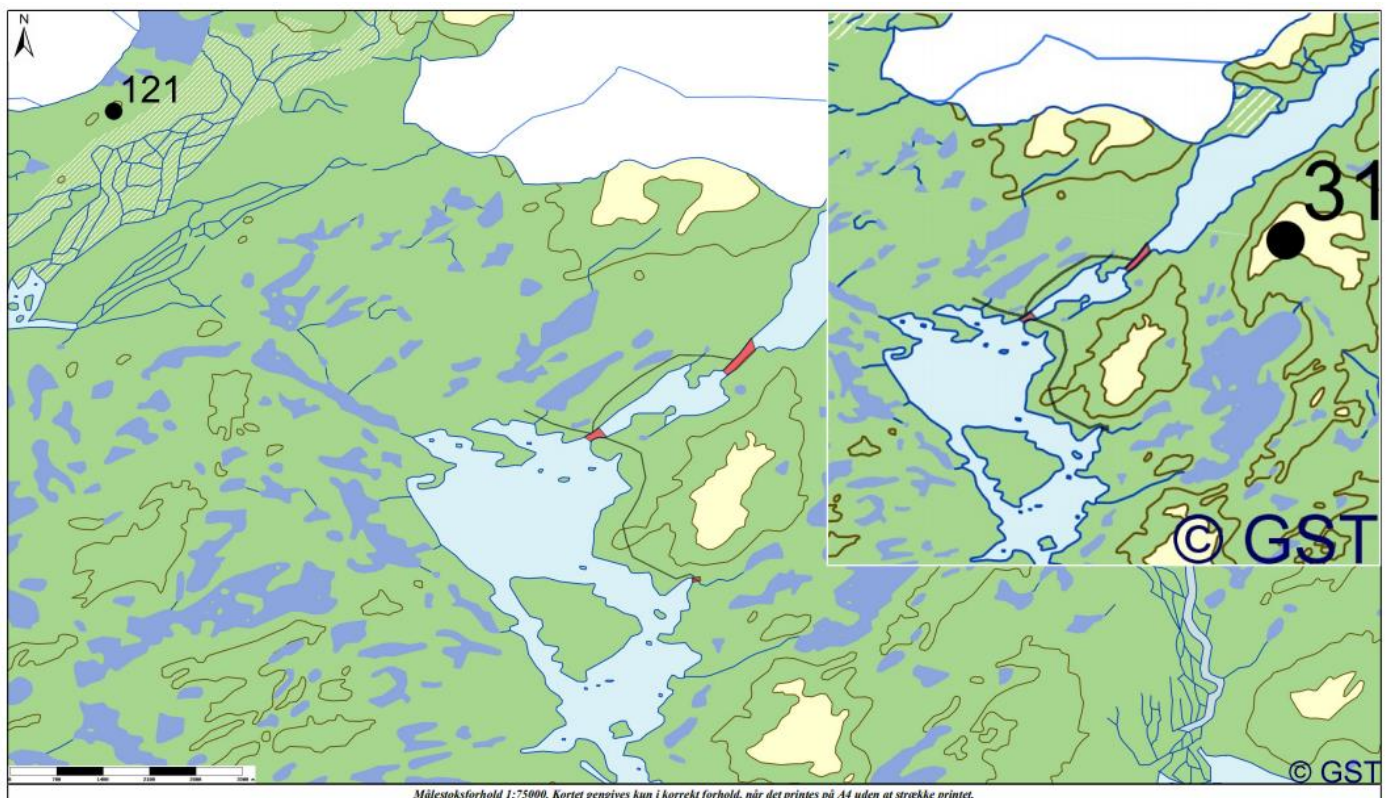
Ansøger ønsker at udvide det eksisterende vandkraftværk i Isortoq. Udvidelsen skyldes, at ansøger ønsker at tilføje tangproduktion til slagteriet i Isortoq Reindeer Station.

Ansøgningen omfatter udvidelse af det eksisterende vandkraftværk fra 11 kw til 250 kw. Den fysiske udvidelse placeres ved Isortoq-elven. Ansøgningen omfatter også elkabler fra turbinerne til Isortoq Raindeer Station, se det vedlagte kortbilag.

Vandkraftværket vil blive etableret som natur- og fiskevenlige turbiner. Turbinerne er en simpel specialteknologi der slipper fiskene levende og uskadte igennem turbinerne. I tillæg til de fiskevenlige turbiner anlægges fisketrapper til alle turbiner så fisk kan passere turbinerne uhindret. Beskrivelse af turbiner og fisketrappe er vedlagt denne høring som bilag 1 (På engelsk).

Teknisk Forvaltning i Kommune Kujalleq anbefaler at man dispensere fra afstandskravet til kyst og elv i Landstingslov nr. 29 af 18. december 2003 om naturbeskyttelse, da der er tale om udvidelse af et eksisterende anlæg, samt at ansøger har lavet et projektforslag der værner om områdets naturressourcer. Det vil blive et krav i arealtildelingen, at turbinerne kun må etableres som tilsvarende ansøgningsmaterialet (Som natur- og fiskevenlige turbiner med fisketrapper).

Eventuelle indkomne indsigelser, vil indgå i den videre sagsbehandling af arealansøgning





# TURBULENT

Decentralized hydropower,  
inspired by nature

Turbulent NV  
Florian Vallaeys  
Wijgmaalsesteenweg 6, 3012 Wilsele  
Belgium

Name Company:  
Name Contact:  
Contact details:

Isortuusua Raindeer Station  
Stefan Magnusson  
[stefanhrafnh@gmail.com](mailto:stefanhrafnh@gmail.com)  
+3548436735

Contact person:  
Contact details:

Florian Vallaeys  
[Florian@turbulent.be](mailto:Florian@turbulent.be)  
+32474236955

Proposal multiple  
50kW micro hydro  
vortex power plants  
05-06-2020

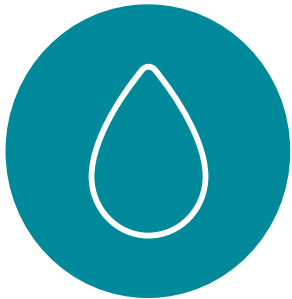
Our Reference: GL - 50IRS - 001  
Your Reference: Turbulent 4x50kW

# YOUR SITE CHARACTERISTICS



## Location

Country: Greenland  
Village: Isortuusua  
Location: Raindeer farm  
Site: 1km East



## Flow

Design Flow: 4 m<sup>3</sup>/s  
Total flow: 12 m<sup>3</sup>/s

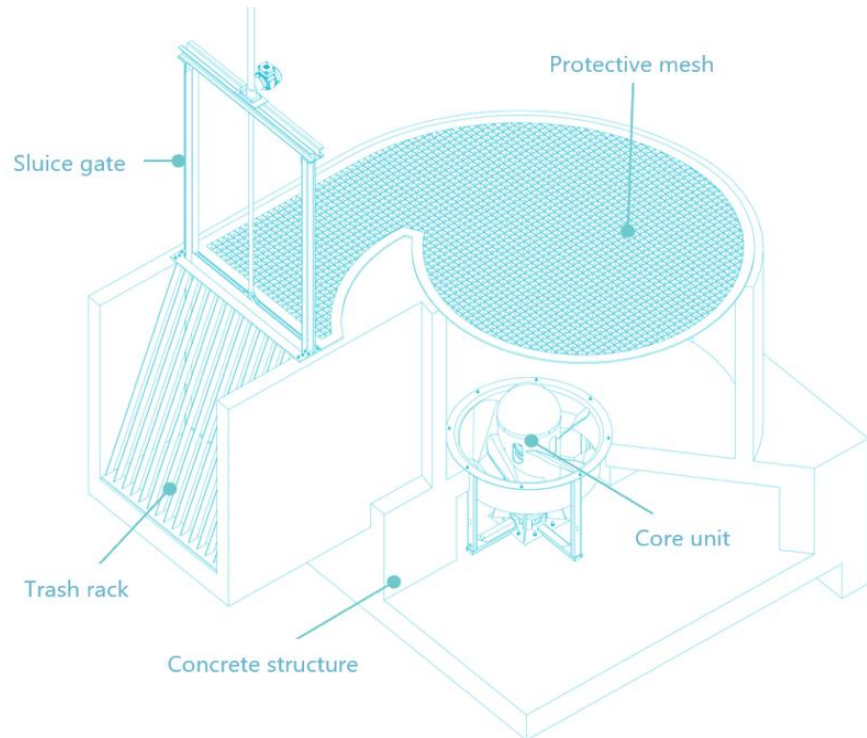
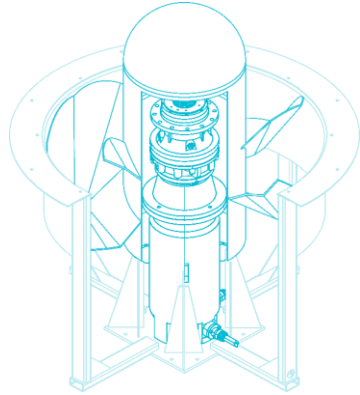


## Head

Design Head: 2,4 m  
Available Head: +-2 m



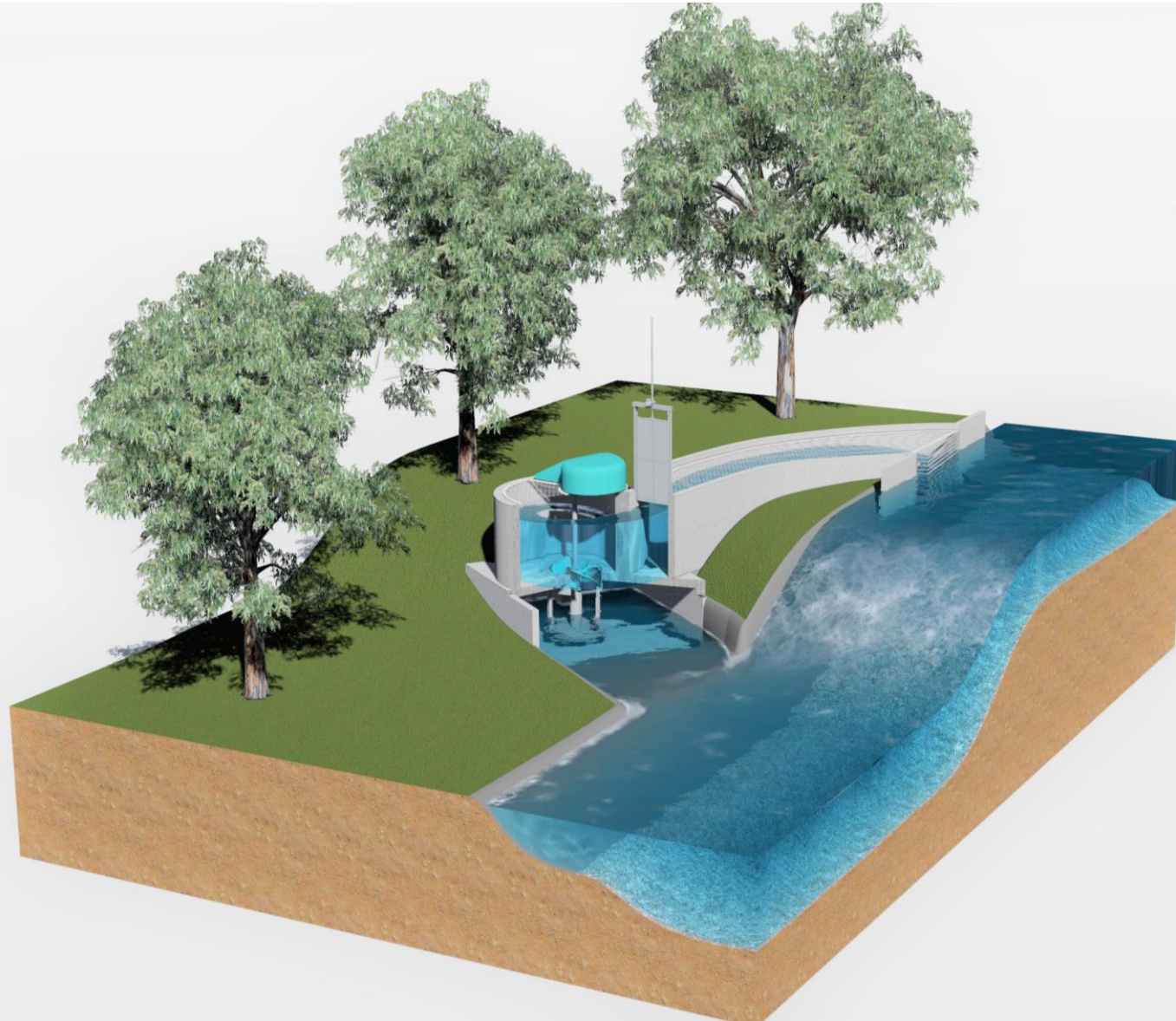
# Optimal Solution



Silent.  
Discrete.  
Fish friendly.  
Low maintenance.  
In harmony with nature.

- Silent underwater turbine, ensuring quiet operation
- Thanks to the underwater design, the turbine blends with nature and is very discrete
- Slow turning speed, letting fish pass through the turbine unharmed
- Debris resistant model, trash rack will not need a lot of cleaning and can have a wider spacing between the bars (70mm)
- Mud, sand and stone resistant. Bedload can pass through and remove chance of future inlet dredging
- INOX316 for corrosion resistance
- Biodegradable oils resisting extreme temperatures

# Your first Turbulent TURBINES



## A) 1 turbine of 50 kW

- Design **flow of 4 m<sup>3</sup>/s** and **head of 2,4m**
  - Estimated plant factor: **90%**
  - Estimated yearly **generation: 400.000 kWh**
- Diesel has an energetic value of 9kWh per liter
- Hence, this turbine generates the same amount of energy as 44.500 liter of diesel
  - Diesel costs about 1 Euro per liter
- Hence, you are **saving 44.500 Euro per year!** (and the environment!)

## B) 3 turbines of 50kW

- **Total Power 150 kW**
  - Design **flow of 12 m<sup>3</sup>/s** and **head of 2,4m**
  - Estimated yearly **generation: 1.200.000 kWh**
- In this situation, you are **saving 133.000 Euro** per year!

## Always included

- Off-grid turbine
- Base load for your Station
- Constant, reliable energy
- Energy 24/7
- No more logistical cost for diesel
- 3-Phasic AC, direct usable energy
- Limited impact on environment
- No harm to aquatic fauna and flora
- Resistant to brackish water

# THE BENEFITS

*Project in Doñihue, Chile:*



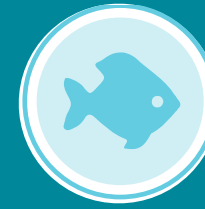
## EASY AND FAST INSTALLATION

Our turbine is the smallest for the amount of energy it produces, within its category. It is pre-manufactured in **our factories in Europe** in accordance with **ISO 9001 standards**. Therefore, **very little civil work** is necessary for its installation. Our presence **with local partners** confirms our support in your projects



## CONFIGURE AND FORGET

**Quality** elements to ensure the least amount of maintenance. The **simple** rotor design makes it as well **resistant to abrasion/fouling** by sediments in the water. In addition, it has a control system that allows **monitoring** and collecting operating data at any time or place.



## NO ENVIRONMENTAL IMPACT

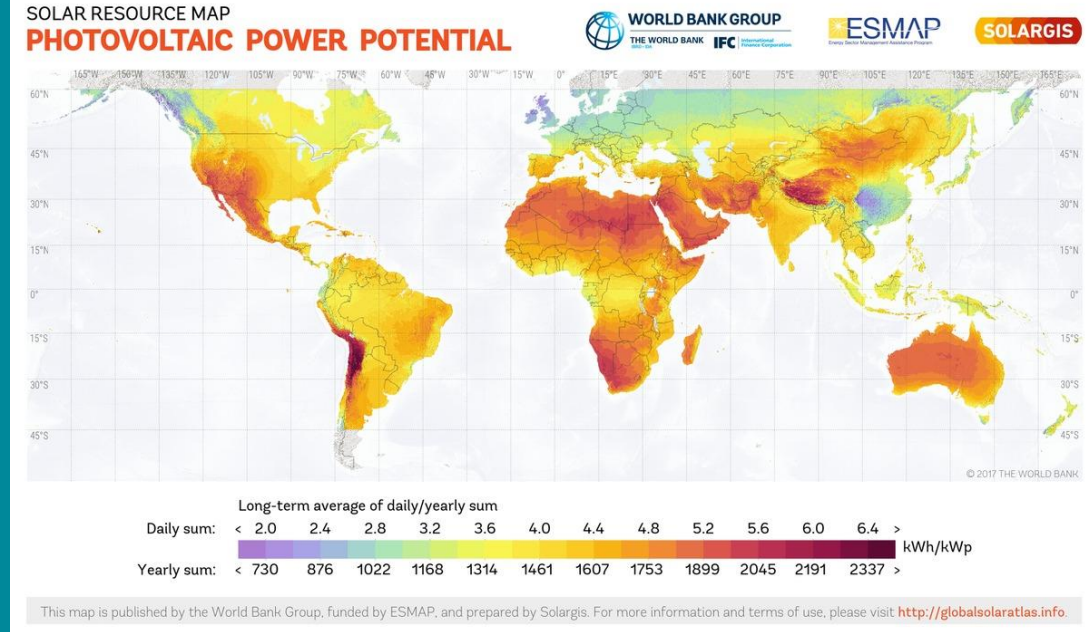
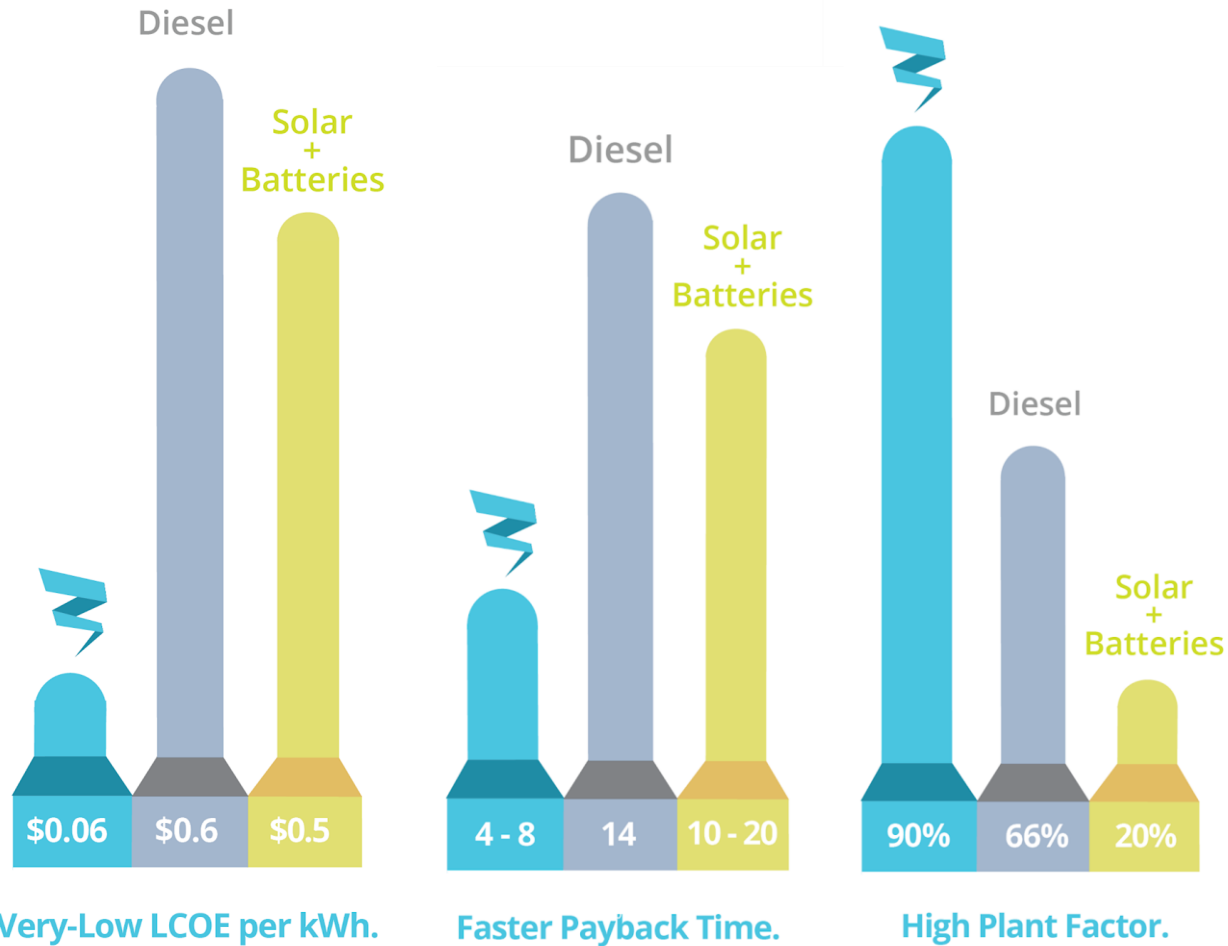
Thanks to its **compact design**, our plant can be installed in a channel **without damaging the local ecosystem** or the canal, thus generating really clean energy, while improving your water quality. The turbine does not impact your water flow, it only extracts excess energy, and thus even reduces the maintenance cost.



## LARGE LIFE TIME FOR SMALL PRICE

Its robust design allows us to guarantee a minimum of 10 - 15 years of **continuous generation** without major repairs with correct maintenance. In addition, our **cost effective** design give a return of investment of between two and six years (in most countries).

# Renewable Energy Comparison



- Greenland is a location with a **extremely low solar radiation**
- 500 kWh** are produced for each **kW** installed (if there is no obstruction from leaves,...)
- This means an **50kW** solar plant will **only generate 25.000 kWh/year compared to 400,000 kWh with our solution.**
- To generate the **same amount** of energy as what **our solution** can offer you, you would have to install **800 kWp** of solar power! (**16x more!**)

→ Turbulent provides 24h, 365 days energy at a lower cost



# PROJECT STANDARD PACK



## Engineering

**Detailed engineering** of all the aspects of the turbine. This includes the dimensioning of **electronics** and **mechanics** and development of **civil work plans** of the turbine. This also includes remote **guidance** and follow up during the project installation and commissioning.



## Turbulent Core Unit

**Core Unit** of Vortex Turbines which includes the **Hub** and **Blades** (5x) made from Stainless Steel following DIN1693 and ISO1083, the **Metal base frame, Couplings** and **Bearings** for support. A high efficient **Generator, Gearbox** and the **casing support** complete the setup of each unit.



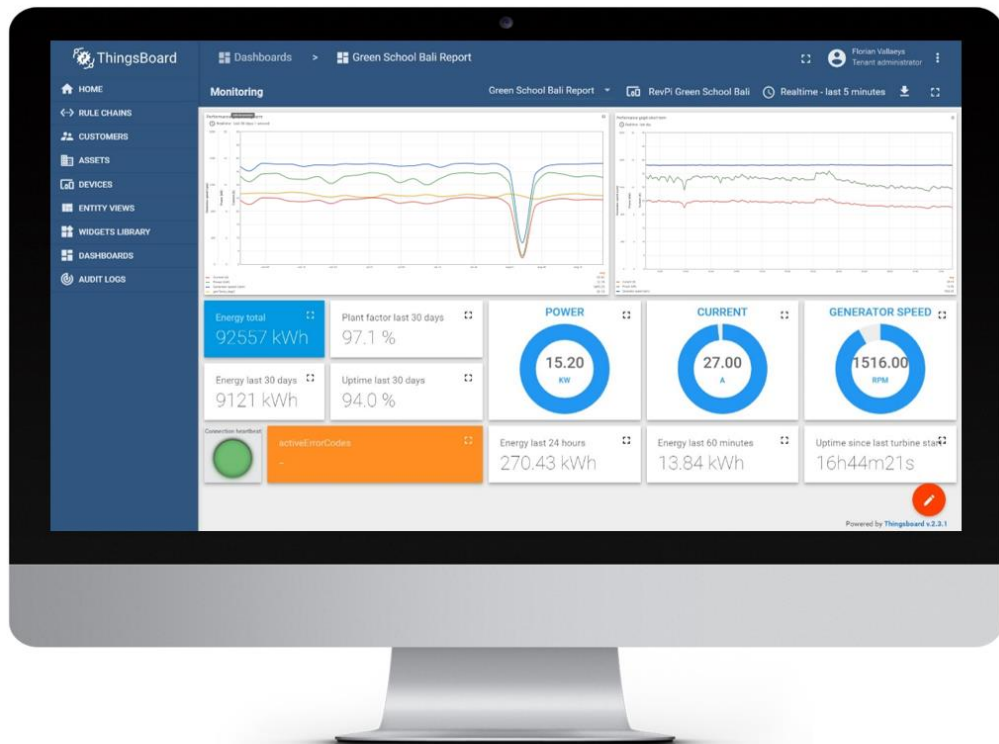
## Electrical cabinet

**Controls** for **operationalization** of the powerplant. This contains the **Switchboard, Power electronics** and **Electric cabling** (excl. canalization). This system is meant for off-grid operation.



## Basic Off-grid energy management

**System** for the management and **adaptation** of injected **energy** based on **demand**, with dissipation of any excess energy into dumploads.



## These items are NOT included in the standard package.

If desired, each respective option can be chosen and indicated at the FINANCIAL ANALYSIS section (page 9). For more information on the packages, please contact us.



**Automatization, remote control and monitoring – Software and control electronics for automatization of power plant and automatic control of sluice gate.** Including **mobile application** that lets you monitor and **control** the **turbine** from anywhere in the **world**.



**Smart off-grid system – Energy management system (EMS)** which allows the **addition** of different other power sources, like solar panels, diesel generators or **batteries**. The system will control the different sources and always look for optimal use of each, while the turbine(s) will ensure the base load.

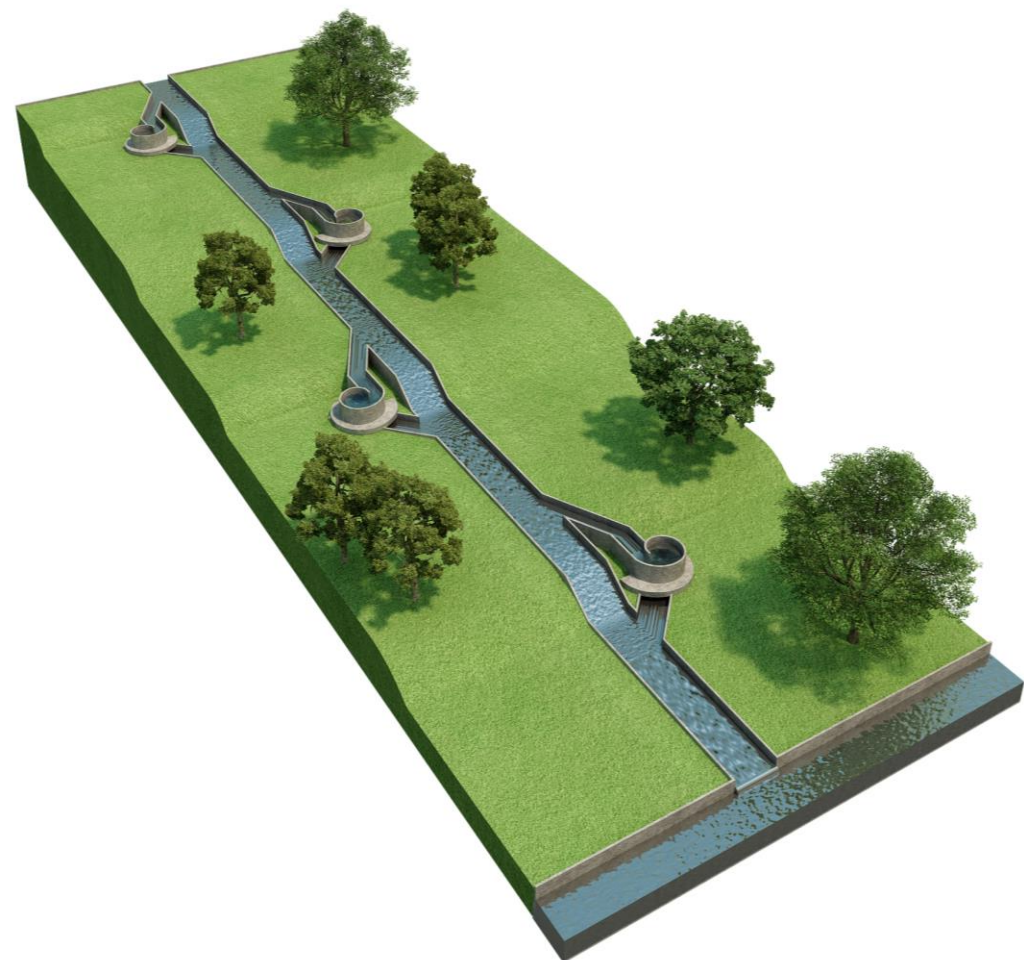


**Sluice gate and trash rack – Steel frame** to cut off the water inlet into the turbine. Both the metallic parts as the **electric drive system**. A sluice gate is necessary for **automated turbine** operation.



**On site engineering support – Turbulent can send engineers on site** during the installation, connection and commissioning of the turbine, to **support** the local installation. This is **excluding** costs for **flights, accommodation** and local transportation.

# FINANCIAL ANALYSIS



## Included in pricing

Engineering & Manhours for production  
 Electrical cabinet  
 Turbulent Core Unit  
 Power Take Off

<input type="checkbox"/> 1 turbine of 50kW → 400.000 kWh/year TOTAL Cost / Kw → Estimated Project <b>payback</b> of 4-5 years	<b>130.000</b> <b>2.600</b>	<b>Euro Ex-Works</b> <b>Euro/kW</b>
<input type="checkbox"/> 3 turbines of 50kW → 1.200.000 kWh/year TOTAL Cost / Kw → Estimated Project <b>payback</b> of 3-4 years	<b>330.000</b> <b>2.300</b>	<b>Euro Ex-Works</b> <b>Euro/kW</b>

## Additional Packages

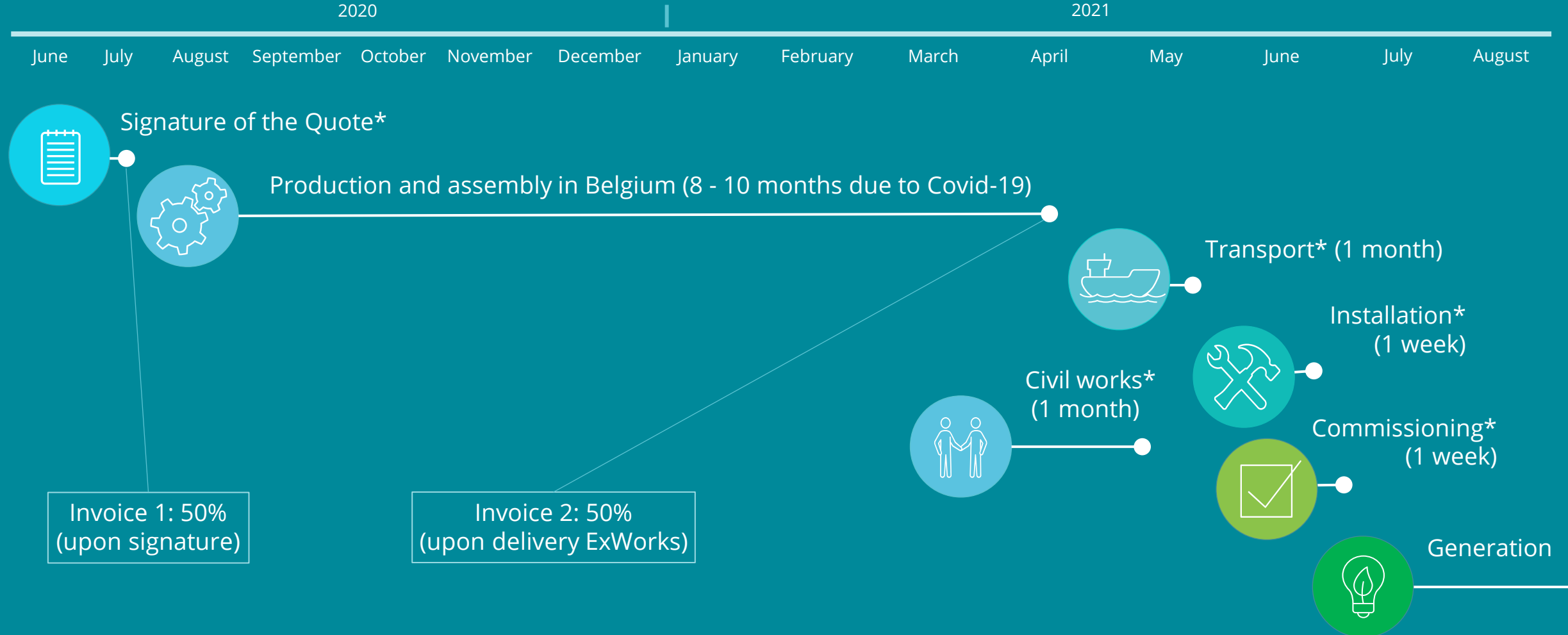
<input type="checkbox"/> Smart off-grid system	8.250	Euro
<input type="checkbox"/> Remote control and monitoring	3.840	Euro/turbine
<input type="checkbox"/> Sluice gate and trash rack	14.450	Euro/turbine
<input type="checkbox"/> On-site support	500	Euro/day
<input checked="" type="checkbox"/> Free selection of Belgian beers	0	Euro

## NOT supplied by **TURBULENT**

- Civil works & installation
- Cabling canalization
- Cabling until the grid
- Transport and Importation (we deliver ExWorks)
- Any other local permits
- Anything not specifically mentioned in this document

\*All prices in this document are excluding VAT and any other taxes applicable. Offer valid till 25/06/2020.

# TIMELINE OF PROJECT



\*Turbulent will not be responsible for delays in the project caused by these steps because of reliance on the customer. Since Turbulent will not do an engineering study, we will not be held responsible if provided flow parameters are wrong. The same goes for incorrect installation or civil works.



# TURBULENT

Decentralized hydropower,  
inspired by nature

Reliable,  
Constant,  
Renewable,  
100% green

We hope that this proposal will fully meet all your expectations and, of course, we remain at your disposal should you need any additional information. Please call us if you need further clarification.

Turbulent wants to give you full support during the different stages of the project.

For approval of the project and the general terms and conditions, sign here:

Company: .....  
Person: .....

Company: Turbulent NV  
Person: Florian Vallaey

.....

.....