Offshore wind energy. Delivered.

In a nutshell

FARWIND ENERGY
1 rue de la Noë
44300 Nantes, France
www.farwind-energy.com

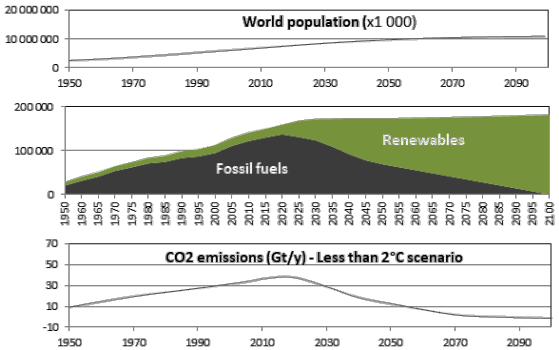
Creation date: July, 9th, 2020
Legal structure: SAS
Workforce: 5
Share capital: 59 090 €

We deliver dispatchable renewable energy which we produce from the far-offshore wind energy resource.

Key figures:

	2021	2024	2027	2030
Revenues (k€)	786	4 876	8 122	28 021
EBITDA (k€)	(242)	866	1 966	12 260
Equity (k€)	1 175	10 175	52 552	178 955
Workforce	12	40	60	160

Market: renewable energy



Team

Félix Gorintin, MSc.

Marine renewable energy business strategy (10 y.)
Co-founder OceanSwing (cleantech)

CCO

Arnaud Poitou, PhD.

Management & R&D funding (30 y.)
Intrapreneurship (10 y.)
Former CEO Centrale Nantes

Chairman

Aurélien Babarit, PhD.

Marine renewable and far-offshore wind energy expert (20 y.)
World top 5 researcher
On Google Scholar for MRE

CTO

Strategy board

Didier Pitot
Industrial strategy (30 y.)

Mohamad Atoui
Industrial company management (30 y.)

Technical & scientific board

Philippe Baclet
Battery & hydrogen storage (20 y.)

Jean-C. Gilloteaux
Offshore wind energy (20 y.)

Vincent Frémont
Autonomous vehicles (20 y.)

Mentorship

ATLANPOLE
Land of innovation

INCUBATEUR
CENTRALE NANTES · Audencia BUSINESS SCHOOL · nantes ensa architecture

FARWIND

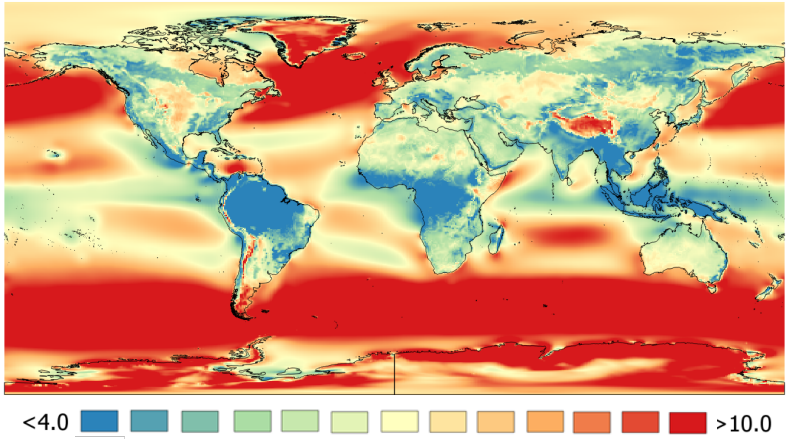
Problem & solution

Far-offshore wind energy: clean, renewable & available

✓ **Tremendous potential**
Can cover several times the global energy consumption

✓ **Best quality of wind on Earth**
Wind speed & consistency

✓ **Available**
Energy independence
No conflicts of uses



Mean wind speed at 100 m from MERRA analysis. Period 1979 – 2013.
Source: DTU Wind energy, Global Wind Atlas 1.0

x **Unexploitable with conventional offshore wind turbines**
Grid-connection cost, installation cost, maintenance cost

FARWIND

Key characteristics

Clean

Up to 6 000 t of avoided CO_2 emission per annum per ship

Affordable

Up to 80% capacity factor
Possible savings of grid access cost

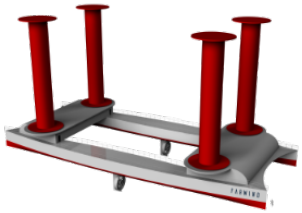
Reliable

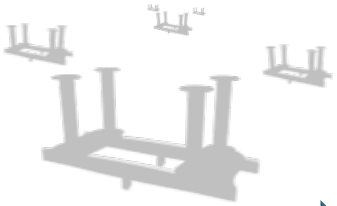
Dispatchable and forecastable energy
No fuel price volatility

Fast

Plug-and-play solution
No land and coastal space occupation (permits & acceptability)
Compatible with existing infrastructure (methanol)

Roadmap





2016

LHEEA CENTRALE NANTES — cnrs

2020

POC
- Energy production
- Remote operation

2022

FID prototype

2024

Prototype
- 2 MW
- Battery/storage
- H_2

2027

Prototype fleet
- 3 ships (2 MW)

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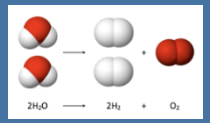
Markets

Markets

Short term *Long term*

	Electricity for islands and coastal communities	Green hydrogen	Liquid fuel
			
Key characteristics	- High cost: 150 – 500 €/MWh - High emissions: 700 – 1000 g_{CO2}/kWh - Over 200 TWh/y (30 B€/y)	- Cost: 6 €/kg - Over 8kt/y (48 M€) as of 2020	- Cost: 0.6 – 1.5 €/L - High emissions: 2.5 kgCO2/L - Over 4 500 Mt/y (2 000 B€/y)
Trends	- 3% growth rate - Switching to clean power generation sources	- EU: 63%/y growth rate up to 2030 - Cost : 3.5 €/kg by 2030 - From grey to green hydrogen in industry (e.g. steel, fertilizers) - Emerging market: mobility	- Growth : +10% by 2050 (value-based) - Transitioning to clean alternatives
Main players	- Government - Grid-operators - Power producers	Air Liquide, Air Products, Lhyfe, Linde, ENGIE	TOTAL, equinor, Shell, bp, Chevron, ExxonMobil
Constraints	- Grid connection authorization - Land availability - Acceptability	- Safety	- Drop-in (conversion cost) - Safety

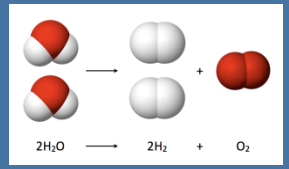
Business models

Electricity for islands and coastal communities

- Subsystem supplier(1)
- Energy ship supplier
- Energy producer
- *Energy supplier(2)*
- Consumers

(1) Of key subsystems, i.e. rotors and water turbines
(2) Preferred, but depends on market opportunities

Hydrogen



- Subsystem supplier(3)
- Energy ship supplier
- Energy producer
- Energy supplier
- Consumers

(3) of key subsystems, i.e. rotors and water turbines

Liquid fuel

- Subsystem supplier(4)
- Energy ship supplier
- *Energy producer(5)*
- Energy supplier
- Consumers

(4) of key subsystems, i.e. rotors, water turbines and power-to-methanol plant
(5) Depending on market opportunities

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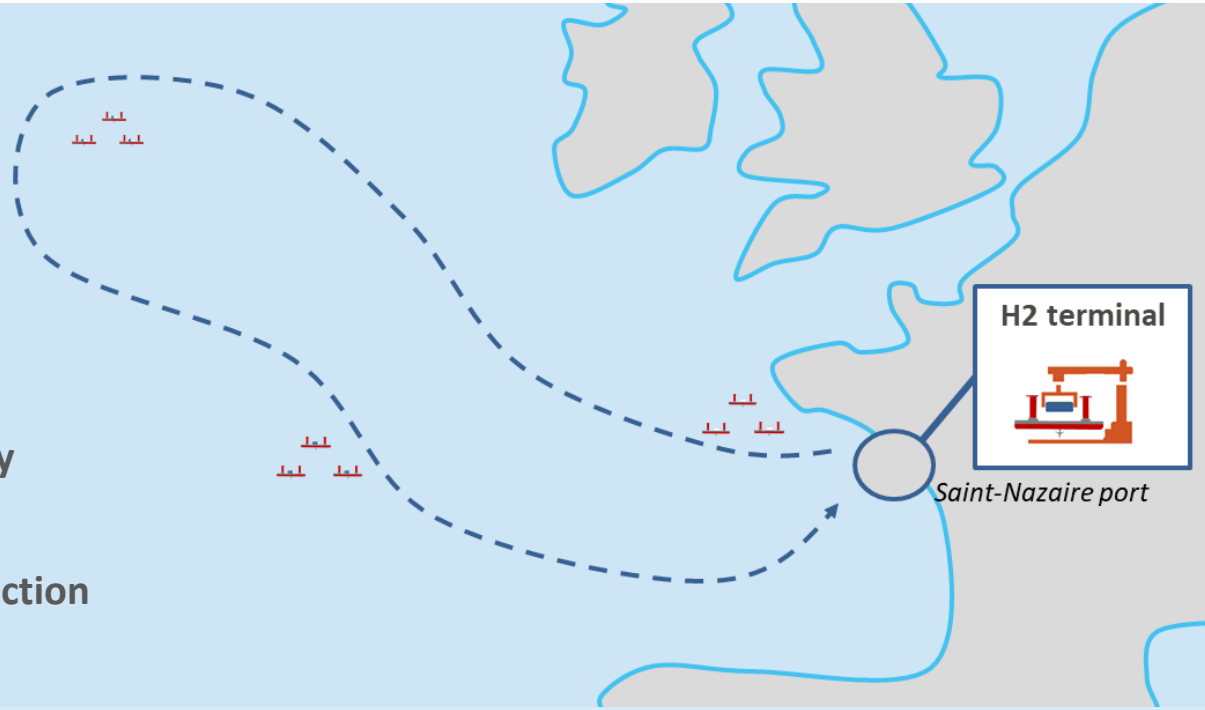
Green hydrogen: Région Pays de la Loire case study

Hydrogen : région Pays de la Loire case study

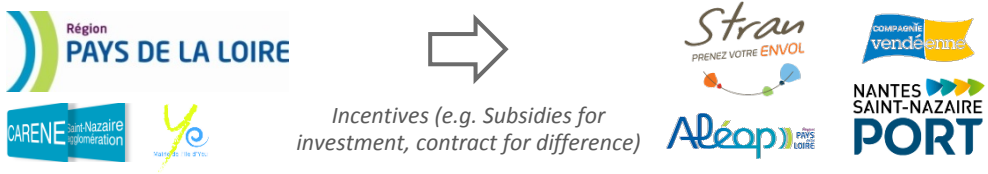
FARWIND-H2 solution

- ✓ **Production cost <5€/kg**
- ✓ **6 000 kg storage capacity**
- ✓ **7 days charging cycle**
- ✓ **Optimized energy production using weather-routing**
  70% average capacity factor



Hydrogen : région Pays de la Loire case study

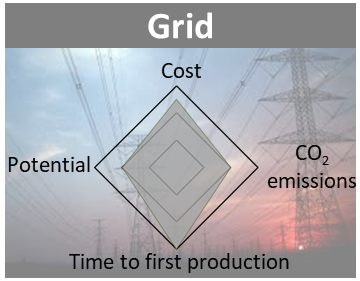
Sales

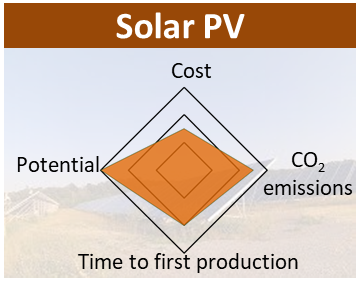


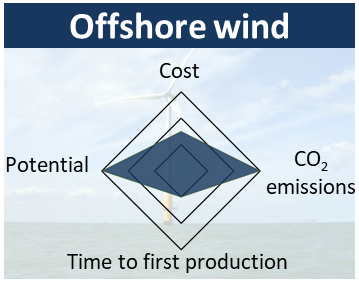
Role	**'Prescribers'** *Technology push*	**End users**
Needs	• To implement hydrogen strategy • Economic development & attractivity • Energy independence & acceptability	• Affordable, reliable and safe hydrogen supply • Image • Safety
Value proposition	✓ Clean, local & acceptable green hydrogen ✓ Innovation ✓ Jobs (unique opportunity to foster the development of an emerging market)	✓ Green hydrogen ✓ Affordable ✓ Reliable

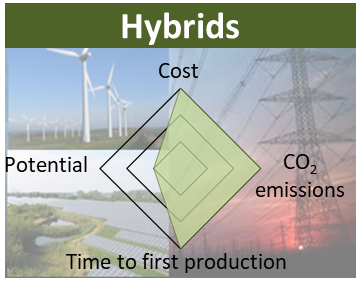
Hydrogen : région Pays de la Loire case study

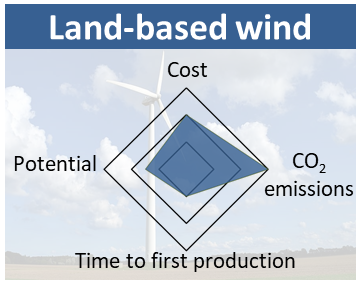
Competition: details

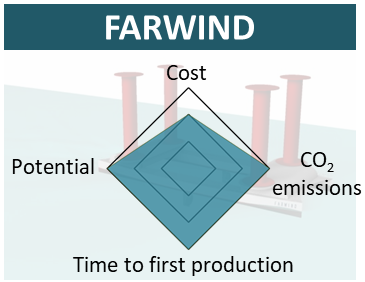












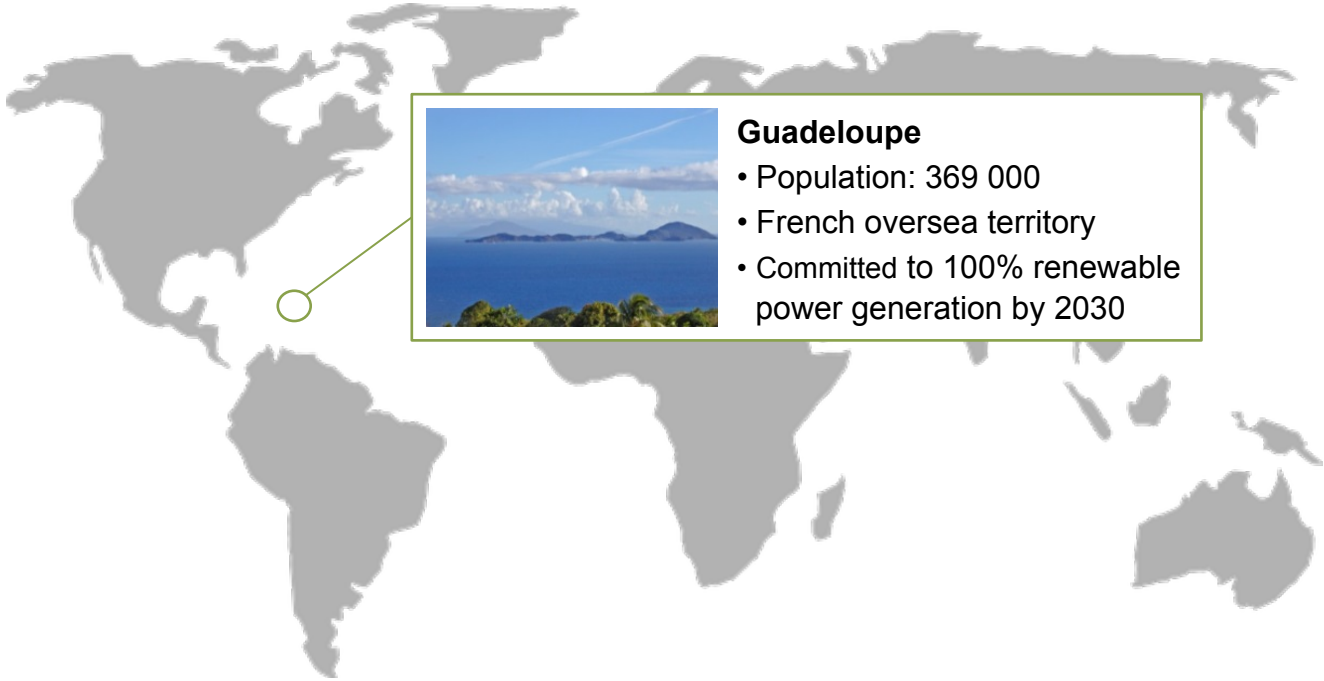
- ✓ ***Cost*** *of hydrogen production*
- ✓ ***Potential*** *: Share of the global demand which could be covered by the energy source if deployed wherever possible. It takes into account land availability.*
- ✓ ***Time to first power*** *: Factors influencing time to first production are the complexity of the authorizations process, infrastructure development requirements (e.g. Foundations, grid-connection works) and acceptability.*
- ✓ ***CO_2 emissions*** *is the climate impact of the energy source.11*

FARWIND's key advantages:

- ✓ **Affordable**
  Thanks to 70% capacity factor
- ✓ **Virtually unlimited potential**
  Land-use limited to logistics
- ✓ **Short time to first production**
  Authorizations & infrastructure limited to grid-connection
  High acceptability (no conflicts of uses, no visual impact)
- ✓ **Clean**
  Wind is the lowest CO_2 emission energy source among renewables

Power supply for islands: Guadeloupe case study

Power supply for islands: Guadeloupe case study



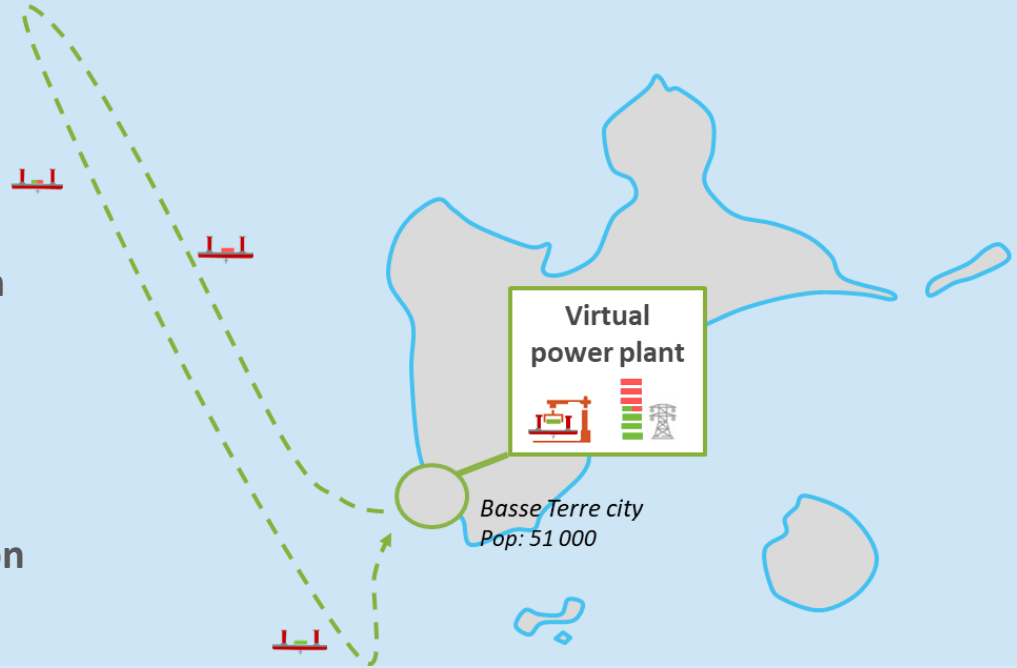
Guadeloupe

- Population: 369 000
- French oversea territory
- Committed to 100% renewable power generation by 2030

Power supply for islands: Guadeloupe case study

e-FARWIND solution

- ✓ **Production cost <65 €/MWh**
  150 €/MWh inc. Batt. storage
- ✓ **40 MWh battery capacity**
- ✓ **24h charging cycle**
  (including unloading time)
- ✓ **Optimized energy production using weather-routing**
  70% average capacity factor



Power supply for islands: Guadeloupe case study

Sales

Enforces the grid-operator to buy the energy at a minimum price

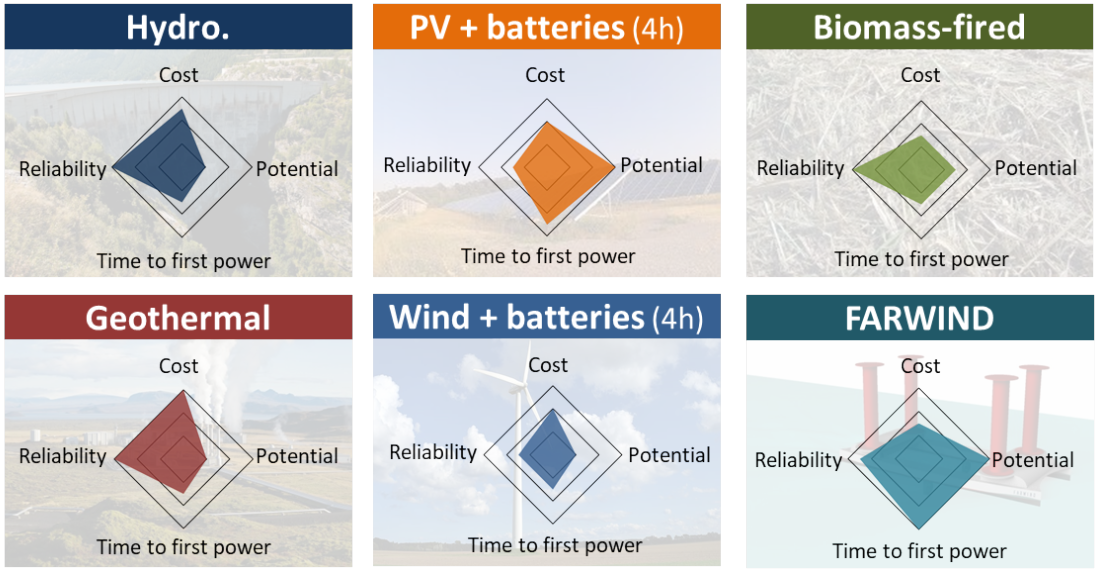
Provides technical information for defining the energy price

	'Client' *Decides on goals for new capacities deployment (Legal framework : « Programmation pluriannuelle de l'énergie »)*	**Grid operator** *Provides grid-connection*	**Energy regulator** *Decides the energy price*
Role			
Needs	• To achieve 100% clean electricity 2030 target • Economic development & attractivity • Energy independence & acceptability	• Controllable electricity source (grid-balance) *Dispachability & forecastability*	• As low as possible cost of production
Value proposition	✓ Clean, local & acceptable energy ✓ Innovation ✓ Jobs	✓ Forecastable energy production ✓ Dispatchable energy (battery storage)	✓ Affordable energy source

FARWIND

Power supply for islands: Guadeloupe case study

Competition



- ✓ ***Cost*** *of energy production. It does not include grid access cost.*
- ✓ ***Potential*** *: Share of the energy demand which could be covered by the energy source if deployed wherever possible. It takes into account land availability.*
- ✓ ***Time to first power*** *: Factors influencing time to first power are the complexity of the authorizations process, infrastructure development requirements (e.g. Foundations, grid-connection works) and acceptability.*
- ✓ ***Reliability*** *: It includes dispatchability and controllability.*

FARWIND's key advantages:

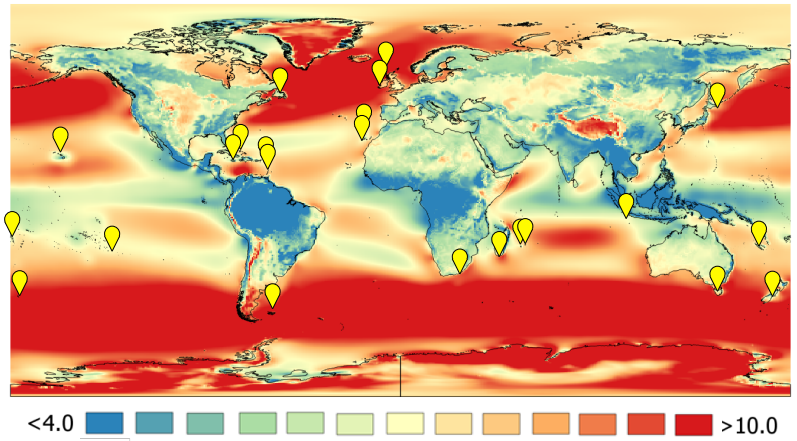
- ✓ **Affordable**
  Similar to biomass-fired power plants
- ✓ **Virtually unlimited potential**
  Land-use limited to logistics
- ✓ **Short time to first power**
  Authorizations & infrastructure limited to grid-connection
  High acceptability (no conflicts of uses, no visual impact)
- ✓ **Reliable**
  On-demand electricity

Power supply for islands: Guadeloupe case study

Replicability

Island	Population	Electricity price (€/MWh)
Puerto Rico (USA)	3 474 000	200
Jamaica	3 950 000	250
Mauritius	1 219 000	150
South Island (NZ)	1 187 000	200
Oahu (USA)	976 000	300
Tenerife (SP)	906 000	200
Gran Canaria (SP)	838 000	200
La réunion (FR)	854 000	200*
Viti Levu (FJ)	662 000	300
Tasmania (AU)	507 000	250
Martinique (FR)	390 000	200*
Santiago (CV)	290 000	250
Barbados	279 000	250
Madeira (PT)	262 000	200
...	...	...

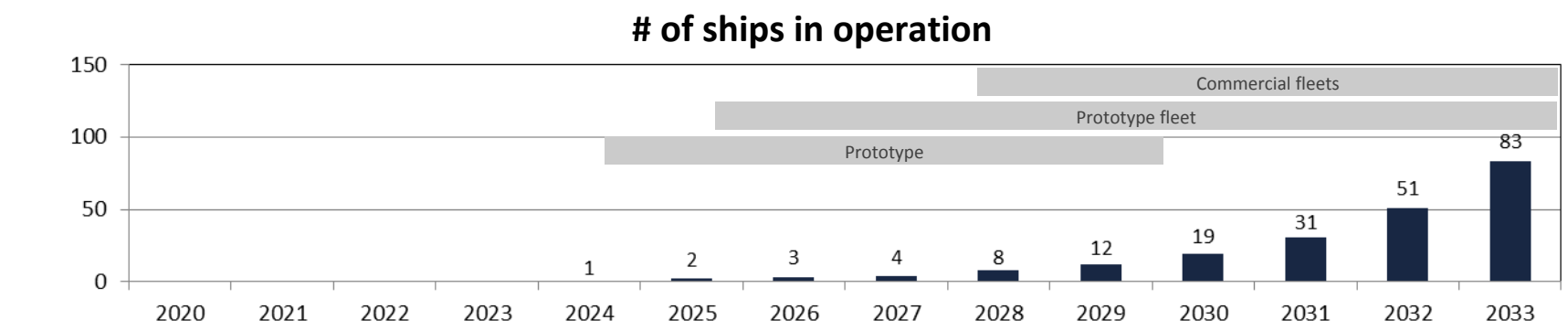
**Present power generation cost*

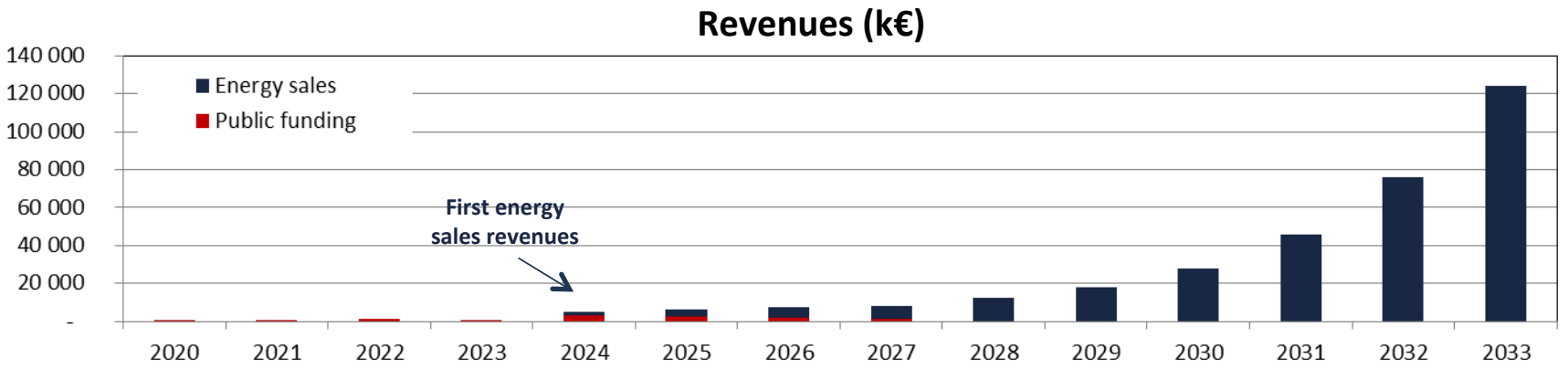


Mean wind speed at 100 m from MERRA analysis. Period 1979 – 2013.
Source: DTU Wind energy, Global Wind Atlas 1.0

Financials

Energy sales





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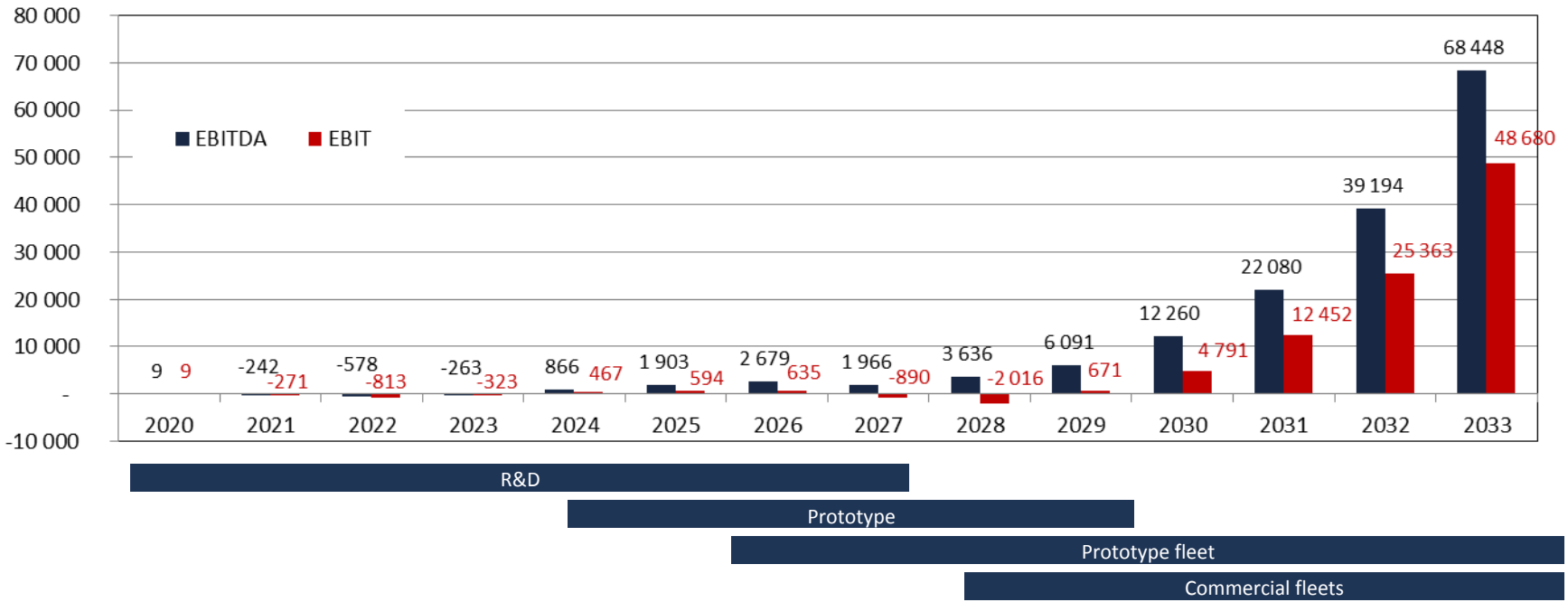
EBIT & EBITDA



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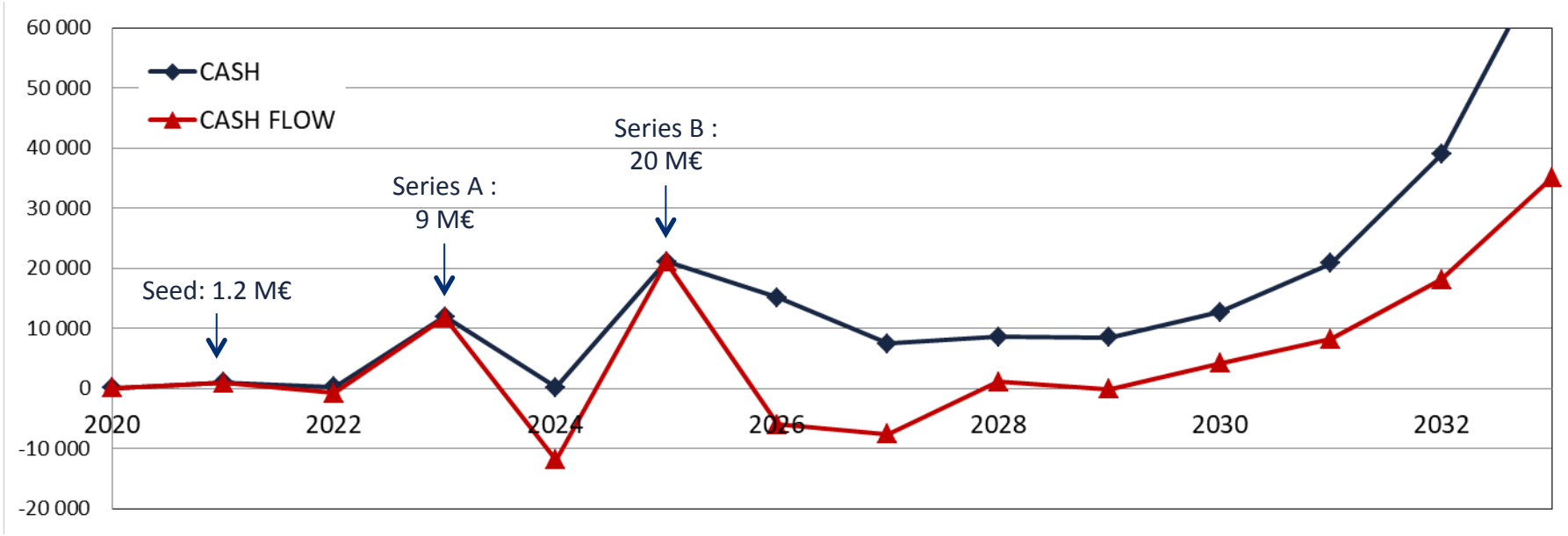
Cash


60 000
50 000
40 000
30 000
20 000
10 000
0
-10 000
-20 000
CASH
CASH FLOW
Seed: 1.2 M€
Series A :
9 M€
Series B :
20 M€
2020
2022
2024
2026
2028
2030
2032

IP

Patent search

Freedom to operate

Patent	Year	Inventors	Claims	Status	Area
US 4,335,093	1982	R.E. Salomon	Energy ship concept	Public domain	
WO 01/33076A1	2001	H. Schiller	Water turbines integrated in the ship hull	Abandoned	
US 7,146,918B2	2006	M. Meller	Fleet navigation	Abandoned	
US 2007/0046028A1	2007	A.R. Gizarra	Water turbines integrated in hydrofoils	Abandoned	
JP2014184935A	2014	H. Hayashi et al.	Energy ship with **redox-flow battery** energy storage	Pending	JP
US 2018/0148356A1	2018	C.A. Munoz et al.	Energy ships with foldable rigid sails	Abandoned	

Barriers to entry

KNOW-HOW

- We are the far-offshore wind energy pioneers

PATENTS

- Flettner rotors (application submitted)
- Energy unloading & quick connexion (to come)

DESIGN

- Ship architecture
- Rotor of water turbine

SOFTWARE

- Weather-routing solution for energy ships
- Online energy production maximization

Contact us

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Partners:

Support:

Awards:

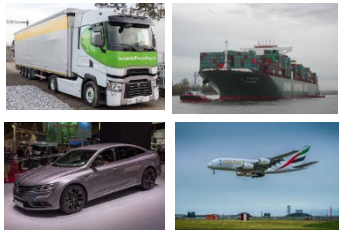
Appendix
Liquid fuel : EU transportation fuel market

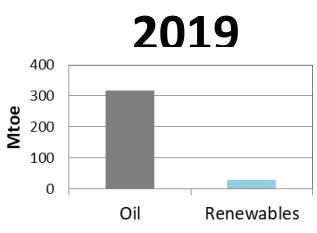
Liquid fuel : EU transportation fuel market

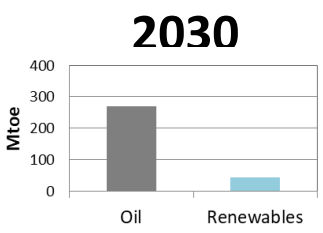
Market opportunity

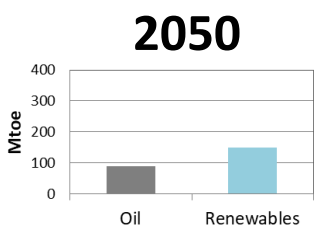
+ 26 Mtoe of renewable fuel *(4% CAGR)*

+ 106 Mtoe of renewable fuel *(6% CAGR)*









Population	447 000 000	449 000 000	+0.4%	441 000 000	-2%
Transportation fuel demand	345 Mtoe	315 Mtoe	9%	250 Mtoe	-21%
Oil-based	317 Mtoe	270 Mtoe	-15%	90 Mtoe	-67%
Renewables	28 Mtoe	44 Mtoe	+57%	150 Mtoe	+240%

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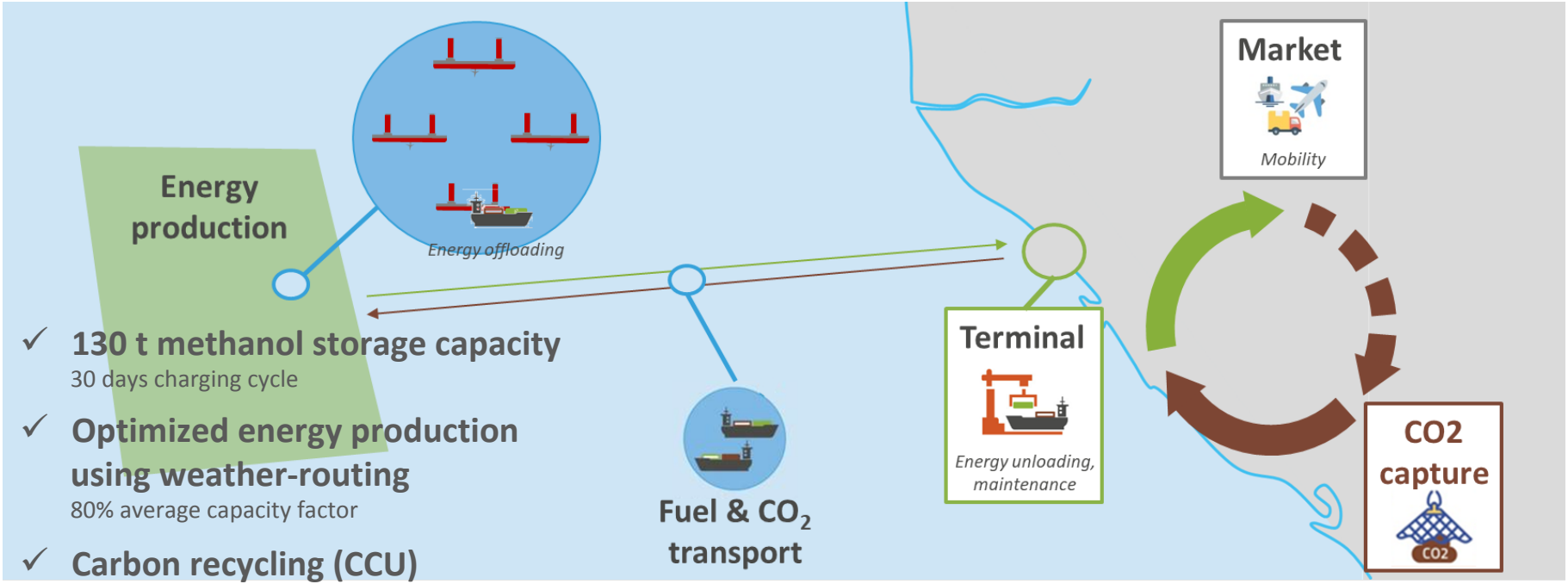
Liquid fuel : EU transportation fuel market

Solution



Liquid fuel : EU transportation fuel market

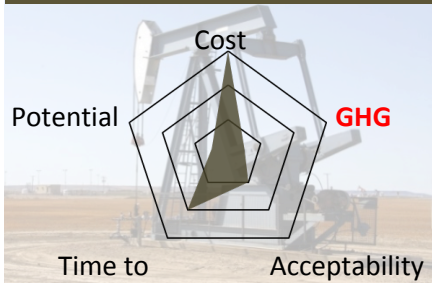
Sales

	Policy-maker	Vehicles manufacturers	Fuel suppliers
Role	*Decides on:* - *CO_2 emission targets for vehicles* - *Share of renewables in transportation fuel in the EU* - *Standards and regulations for commercial fuels*	*Develops, produces and sells vehicles*	*Develops and sells fuel blends*
Needs	• Carbon-neutral EU by 2050 • Economic development • Energy independence	• To comply with CO_2 emission targets • Improve image	• As low as possible cost of production • Improve image
Value proposition	✓ Clean & local energy ✓ Jobs	✓ Clean liquid fuel ✓ Drop-in liquid fuel	✓ Clean liquid fuel ✓ Drop-in liquid fuel ✓ Affordable

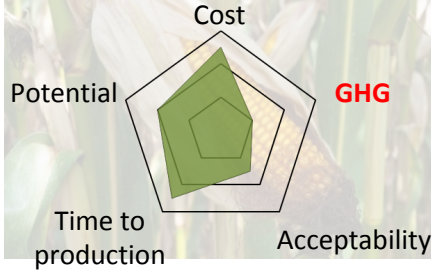
Liquid fuel : EU transportation fuel market

Competition

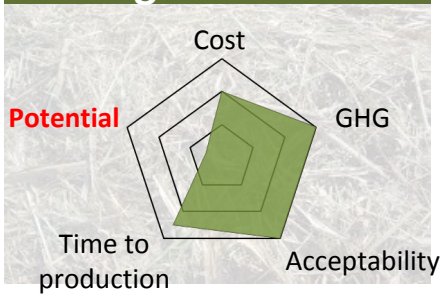
Oil



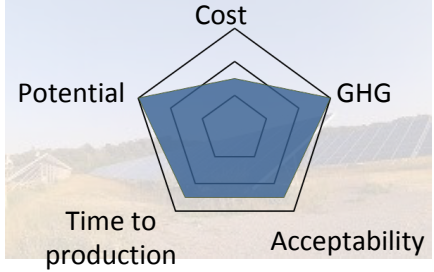
1st gen. biofuel



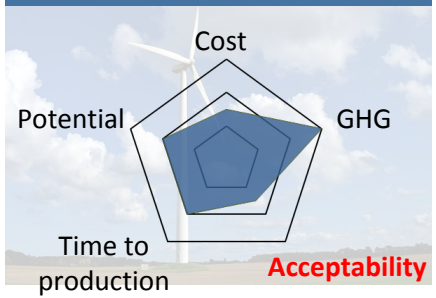
2nd gen. biofuel



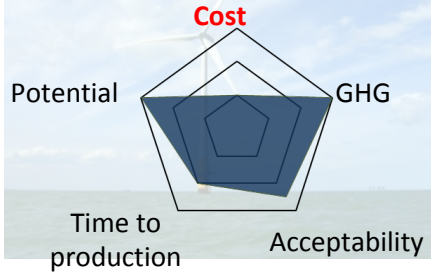
Solar PV



Land-based wind



Offshore wind



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