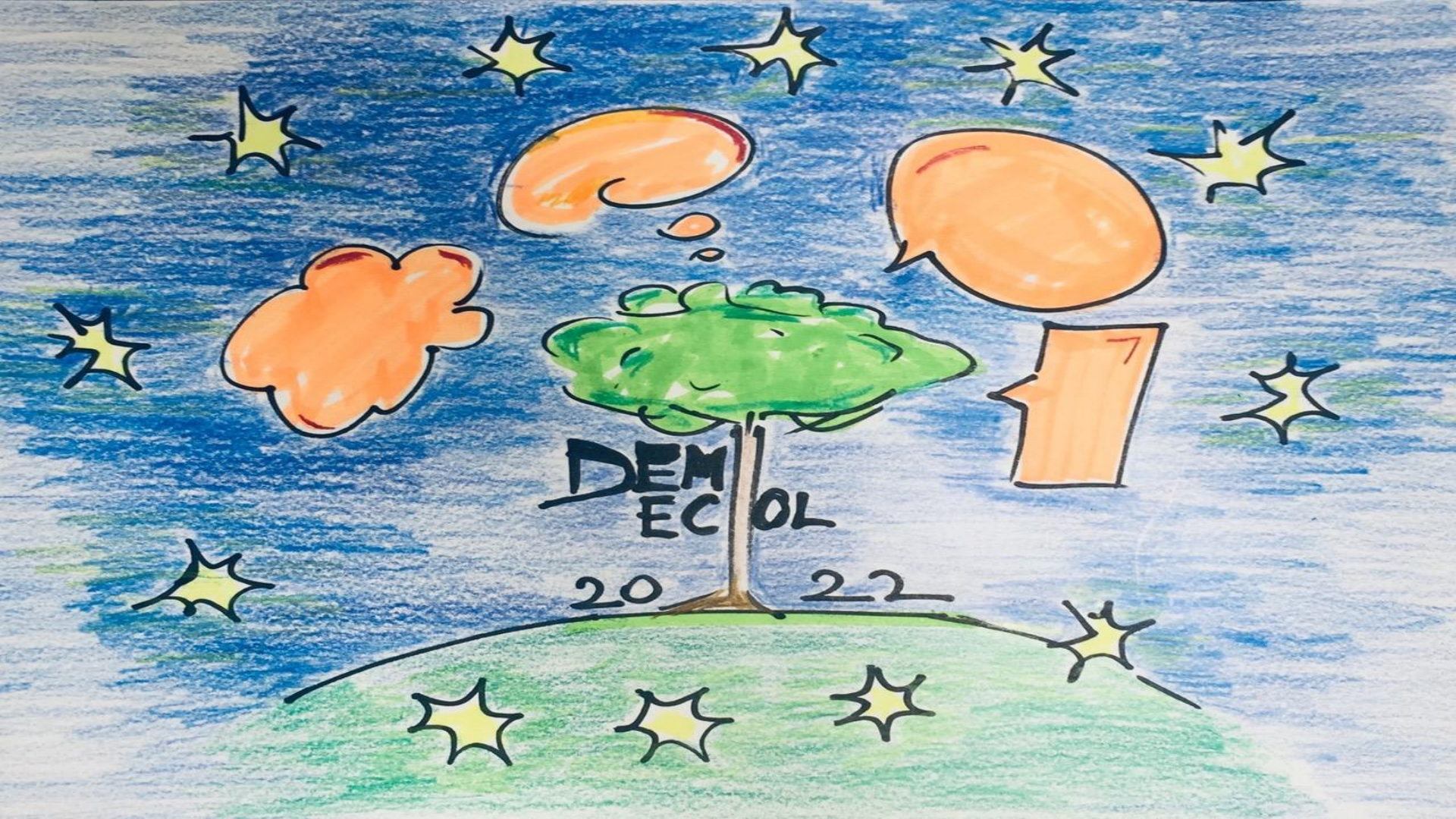
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SZILÁGYI GIMNÁZIUM BUDAPEST


BAfEP
KENYONGASSE
Mater Salvatoris


BBS
Donnersbergkreis


Cité scolaire
Béhal


Erasmus+

WINDMILLS

Made in Spain

Minerva Astrain - Josune Cabriada - Irene García
Paula Hernández - Álvaro Remacha - Laura Vicente

Irene

INDEX

EL INGENIOSO
HIDALGO DON QVI-
XOTE DE LA MANCHA,

Compuesto por Miguel de Cervantes Saauedra.

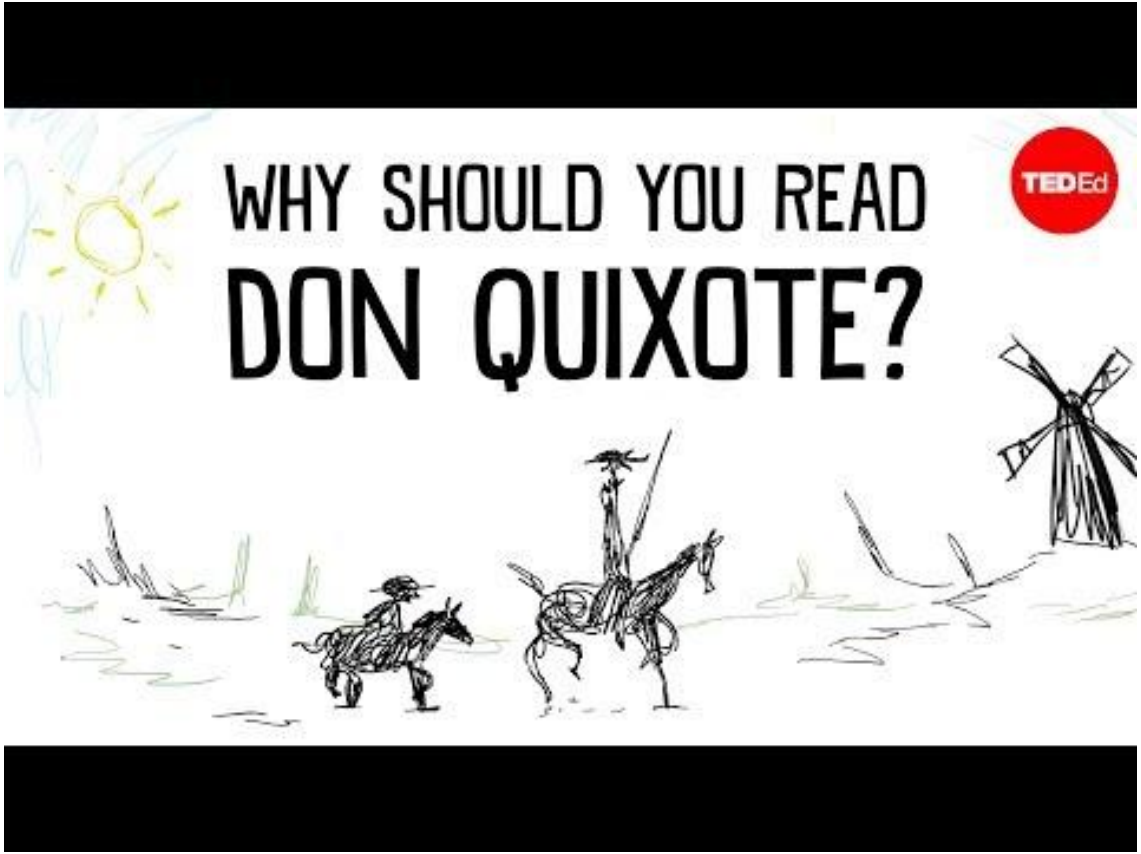
DIRIGIDO AL DVQVE DE BEIAR,
Marques de Gibraleon, Conde de Benalcaçar, y Bañares, Vizconde de la Puebla de Alcozer, Señor de las villas de Capilla, Curiel, y Burguillos.

Año, 1605.

CON PRIVILEGIO,
EN MADRID Por Iuan de la Cuesta.

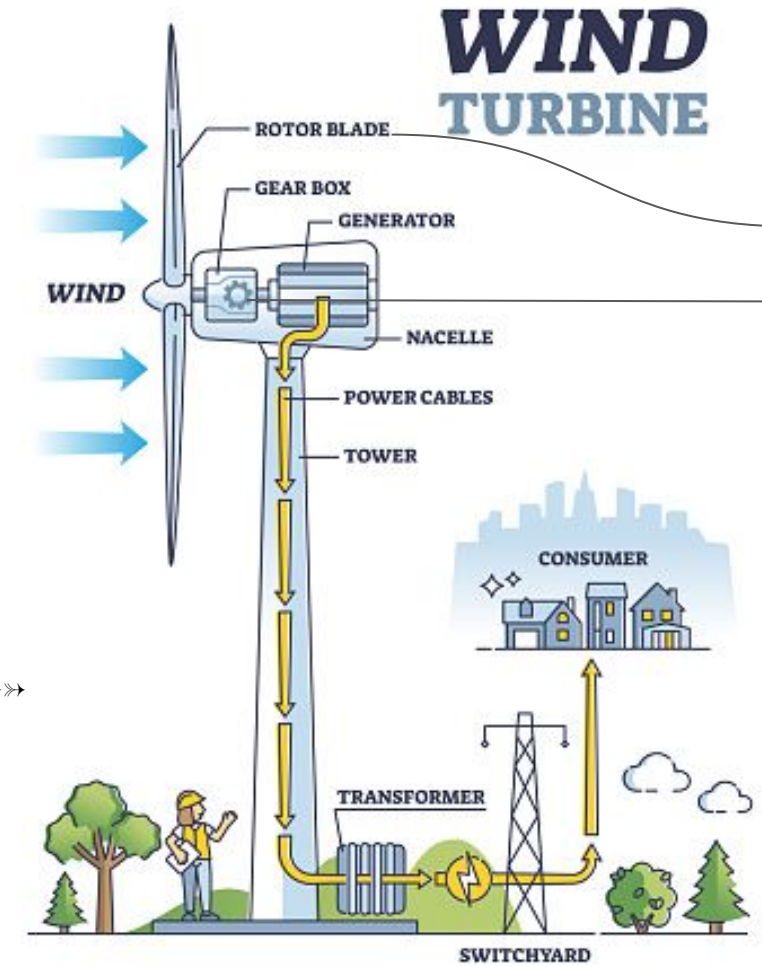
Vendese en casa de Francisco de Robles, librero del Rey nro señor.

EL QUIJOTE – 1:08



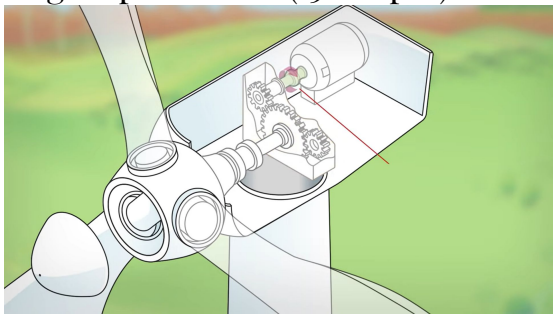
Irene

WHAT IS A WINDMILL?



13-20 rpm

high-speed shaft (1500 rpm)



Kinetic energy➳➳➳➳

→→→Electrical energy

Álvaro

HISTORY AND EVOLUTION OF WINDMILLS

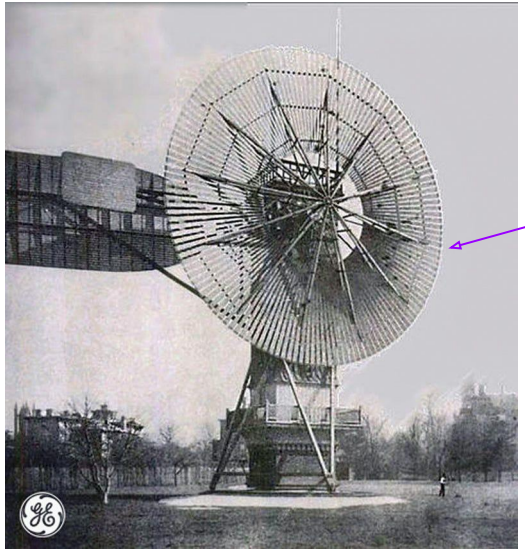
History

Spain: 1450 Guadalajara, first windmill

He found that with turbines with fewer rotor blades, energy production was more efficient, and speed increased

First wind turbine for electricity generation

(in Cleveland, Ohio)



Josune

HISTORY AND EVOLUTION OF WINDMILLS

Nowadays

More efficiency, lower costs

Rotor blades 75 m long (each)/100m marines

More than 1000 kW produced

Josune

ENERGY GENERATED BY WINDMILLS

- Normal wind turbine: 300 -750 kW.
- Max and min wind speed : 11-90 km/h
- Eolic energy: 3% of the global electricity consumption
- High expectations

Irene

NUMBER OF WINDMILLS WORLDWIDE

#	País	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	China	2599	5912	12 210	25 104	44 733	62 733	75 564	91 412	114 763	145 104	168 690	188 232	211 392	236 320	281 993
2	Estados Unidos	11 603	16 819	25 170	35 159	40 200	46 919	60 007	61 110	65 879	74 472	82 183	89 077	96 665	105 466	117 744
3	Alemania	20 622	22 247	23 903	25 777	27 214	31 060	34 332	39 250	39 165	44 947	50 019	56 132	59 311	61 357	62 184
4	India	6270	7850	9587	10 925	13 064	16 084	18 421	20 150	22 465	27 151	28 665	32 848	35 129	37 506	38 559
5	España						21 529	22 789	22 958	22 925	22 943	22 990	23 124	23 405	25 583	27 089
6	Reino Unido	1 963	2 389	3 288	4 070	5 203	6 540	8 445	10 711	12 440	13 603	15 030	18 872	20 970	23 515	24 665
7	Francia	1 589	2 477	3 426	4 410	5 660	6 800	7 196	8 243	9 285	10 358	12 065	13 759	15 309	16 643	17 382
8	Brasil	237	247	339	606	932	1 509	2 508	3 466	5 939	8 715	10 740	12 763	14 707	15 452	17 198
9	Canadá	1 460	1 846	2 369	3 319	4 008	5 265	6 200	7 823	9 694	11 205	11 898	12 239	12 816	13 413	13 577
10	Italia	2 123	2 726	3 537	4 850	5 797	6 747	8 144	8 558	8 663	8 958	9 257	9 479	9 958	10 512	10 839
11	Suecia	571	831	1067	1560	2163	2970	3745	4382	5425	6025	6519	6691	7407	8804	9688
12	Australia	651	824	1306	1712	1991	2176	2584	3239	3806	4187	4327	4557	5362	6199	9457
13	Turquía	65	207	433	801	1329	1799	2312	2958	3763	4718	6101	6516	7369	8056	8832
14	México	84	85	85	520	733	873	1370	1859	2551	3073	3527	4005	4935	6215	8128
15	Países Bajos	1571	1759	2237	2223	2237	2328	2391	2671	2805	3431	4328	4341	4471	4600	6600

Laura

ECOLOGICAL FOOTPRINT

WIND FARMS:

- Inflexibility → example: solar panels
- Limited → renewable energy.

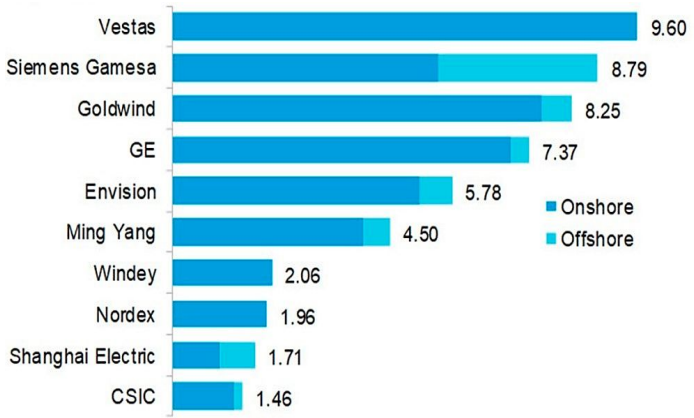
Effects on the food chain

Environmental impacts → luminic pollution

air pollution subtype

Environmental alteration in the installation process because of remotion of lands and loss of vegetation.

Laura



WINDMILLS IN SPAIN DATA

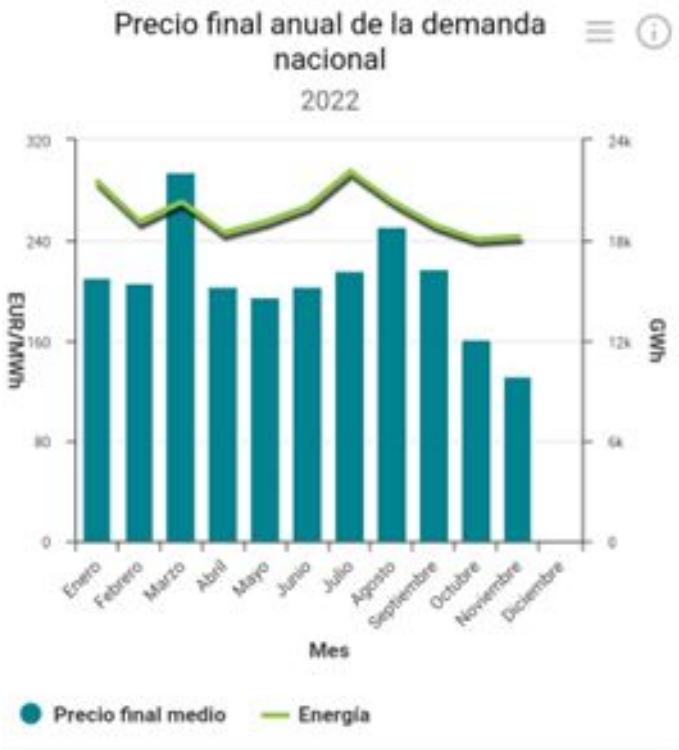
-1,298 wind farms

- 21,574 wind turbines installed.

- More than 250 manufacturing 16/17 CCAA

1. Iberdrola (Spain)
2. CIP (Denmark)
3. Arjun Investment Partners (British)
4. EDPR (Spain)
5. Enel Green Power (Italy)

SPANISH CONSUMPTION/ ENERGY EXPENDITURE DATA



Daily consumption in a Spanish home is 9 kWh = 1.35 euros/day.

Electricity cost of 270 kWh per month and about 3,272 kWh per year.

€200/Mwh could be considered the average cost.

DATA TO TAKE INTO ACCOUNT

- The mills do not produce constantly since they are a function of the wind (25%)
- It is for this reason that we need various sources of energy.
- The windmills work when the wind blows between 4 m/s and 25 m/s approximately.
- We have mills installed for many years, so they are not as efficient and the new advances have not been implemented (for this we will take 2MW as the average value)

According to estimates by the World Wind Association, 10,000 7MW mills would be needed.

MARINE WINDMILLS

OFFSHORE WIND FARM ↠clean and renewable source of energy

wind: speeds, higher and constant

natural barriers

CONDITIONS:

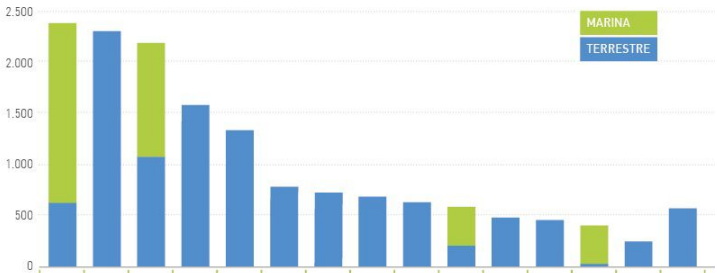
- 60 meters deep
- far from the coast or areas with maritime traffic routes
- protected natural areas

Advantage ↠ the wind carries a more constant velocity, thus providing a greater amount of energy

inconvenients ↠ destroy aquatic ecosystems

↠ lack of fish

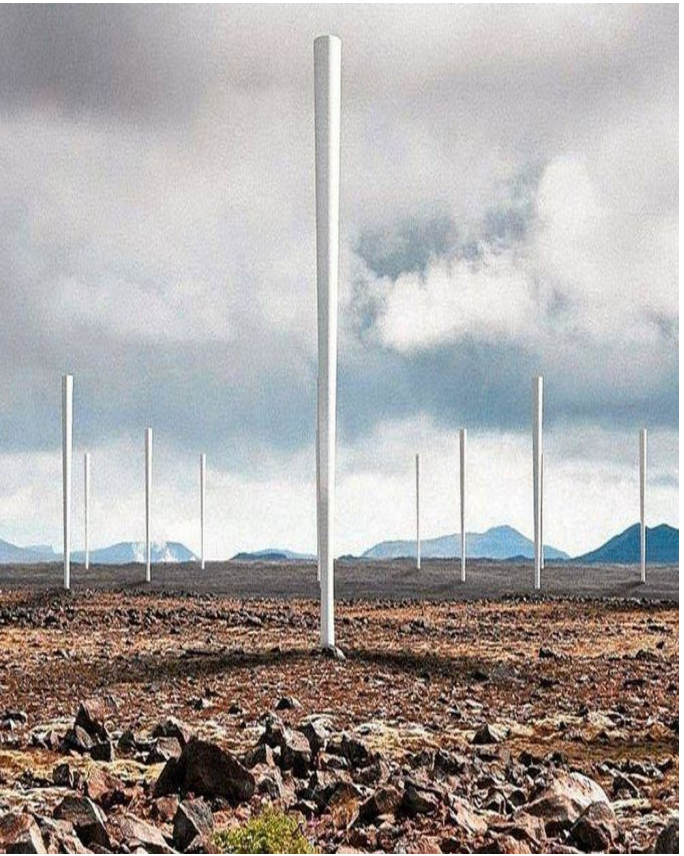
Nueva potencia terrestre y marina instalada en Europa en 2019 (unidades expresadas en megavatios, MW)



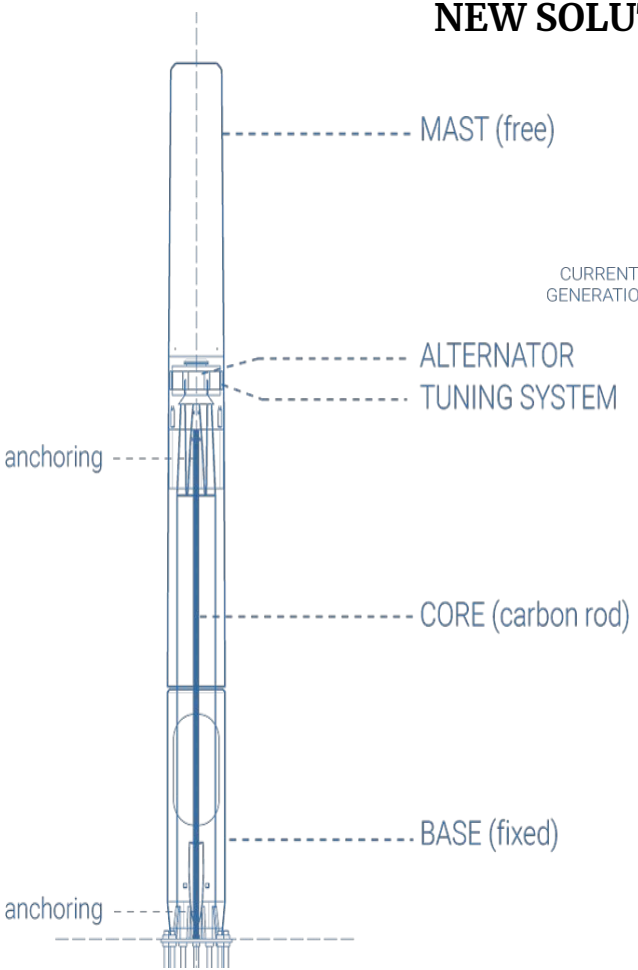
	Reino Unido	España	Alemania	Suecia	Francia	Noruega	Grecia	Turquía	Ucrania	Bélgica	Irlanda	Italia	Dinamarca	Finlandia	Otros
	1764	0	1111	0	0	0	0	0	0	370	0	0	374	0	8
	629	2319	1078	1588	1336	780	727	686	637	207	463	456	28	243	563
Total	2393	2319	2189	1588	1336	780	727	686	637	577	463	456	402	243	571

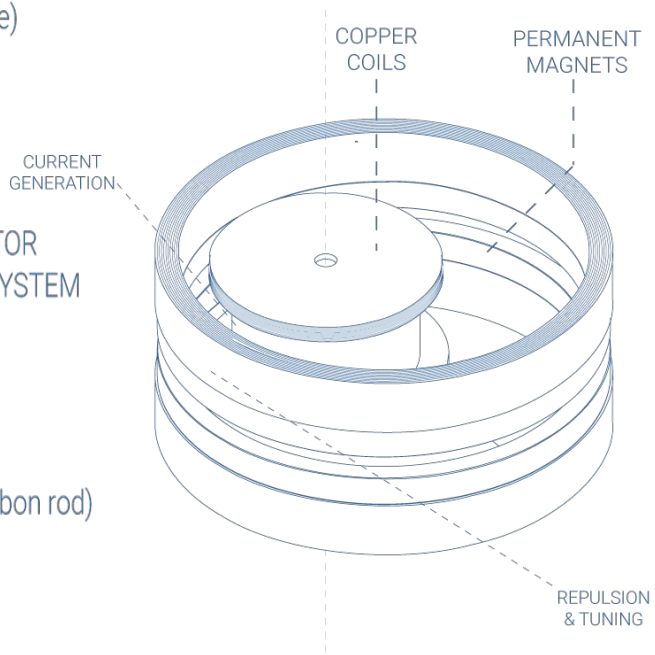
Paula

Vortex wind turbines



NEW SOLUTIONS





Álvaro

CONCLUSIONS

1. Windmills are one of the best sources of energy we have so far.
2. They do not provide energy constantly since their operation depends on various factors such as air speed.
3. For this last reason we need to have other sources of energy such as solar, oil, nuclear energy.

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THANK YOU