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Organizator LIDER

Zlatni sponzor HEP KONČAR

Srebrni sponzor e·on HGK INA PPD

Brončani sponzori JANAF plinacro

Izv.prof.dr.sc. Goran Krajačić dipl.ing.
FSB - https://www.fsb.unizg.hr/
član HATZ - https://www.hatz.hr
Tajnik SDEWES - https://www.sdewes.org
Dopredsjednik ESEIA - https://eseia.eu/

Hrvatska energetska tranzicija zarobljena u prošlosti ili na pragu blistave budućnosti?

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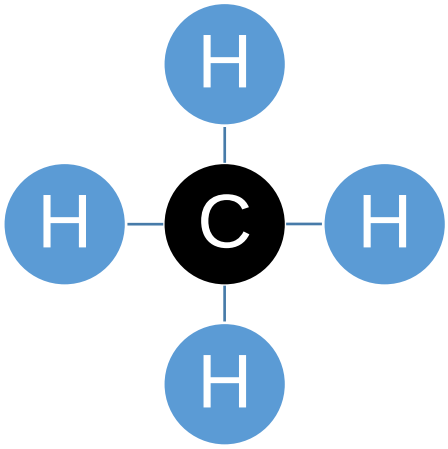

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PROSTORNI PLAN UREĐENJA OPĆINE LASTOVO
Dubrovnik, lipanj 2020.

Plinoopskrba. Općina Lastovo nema plinsku mrežu. Očekuje se da će realizacijom plinovoda Bosiljevo – Split Općina Lastovo spojiti na Državnu plinoopskrbnu mrežu.
Na području Općine Lastovo nema izgrađene plinske mreže (mrežni plin), kao ni centralnih toplifikacijskih sustava (CTS) s pripadajućom cijevnom mrežom.

Članak 99.

(6) Razvod plinoopskrbne mreže na području Otoka Lastovo planira se kao srednjetlačna mreža max. tlaka 4 bara.
(7) Do izgradnje plinoopskrbne mreže na zemni plin dozvoljava se izgradnja plinskih stanica i mreža sa miješanim plinom.
(8) Planirani kapaciteti redukcijskih stanica moraju osigurati pokrivanje ukupnih potreba domaćinstava (grijanje, topla voda, kuhanje) kao i opskrbu plinom građevina svih djelatnosti.
(9) Neposrednom provedbom ovoga Plana dozvoljena je izgradnja mjerno redukcijskih stanica (plinskih stanica na miješani plin) i plinoopskrbne mreže.

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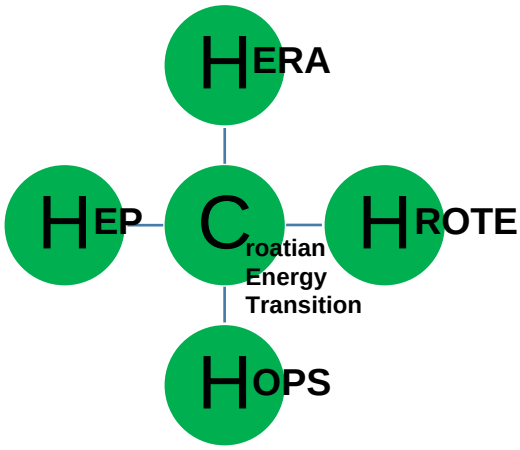

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Nekada smo radili drugačije? Krka Šibenik IEEE Milestone

Hidroelektrana Krka (kasnije nazvana Jaruga I) na slapovima rijeke Krke uvrštena je u popis povijesno važnih inženjerskih iskoraka u svijetu (*IEEE Milestone* program)

https://www.ieee.hr/ieeesection/sekcija/milestone

09:31

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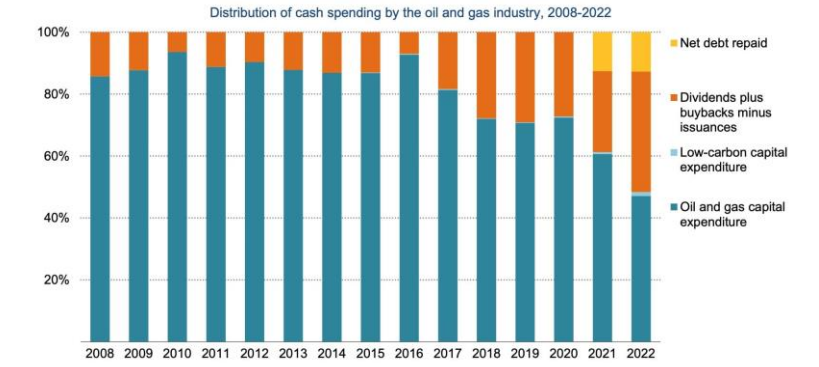
"Prljavi igraju prljavo"

Less than half of the oil and gas industry's unprecedented cash flow from the energy crisis is going back into traditional supply and only a small fraction to clean technologies



Source: IEA analysis based on data from S&P Capital IQ.

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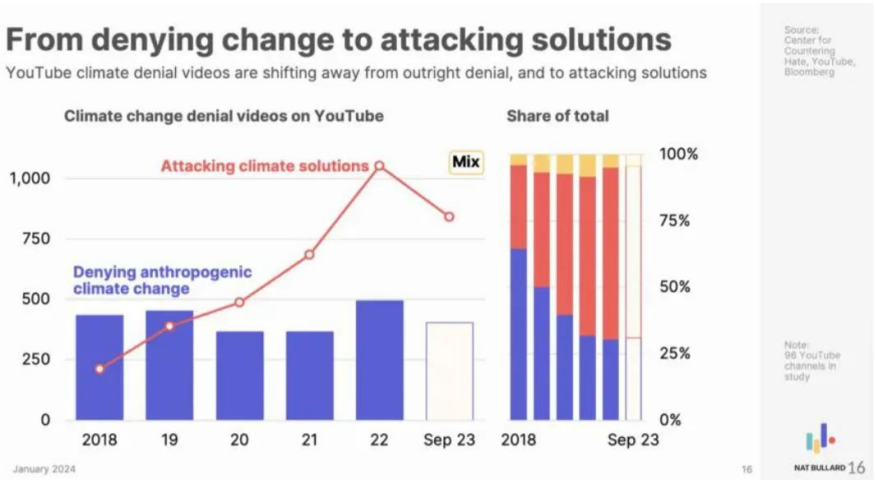
"Prljavi igraju prljavije - Australija"



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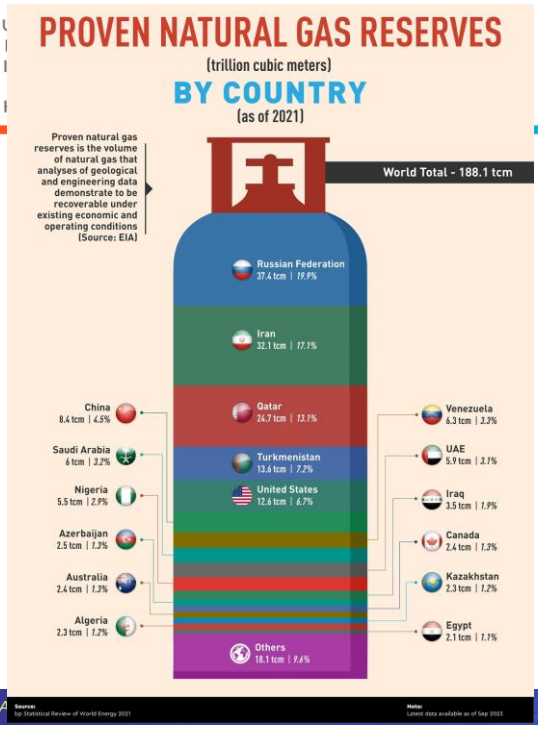

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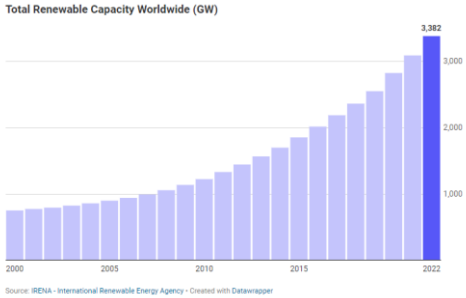
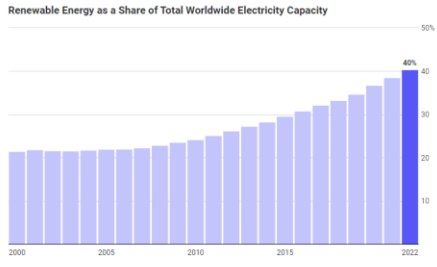
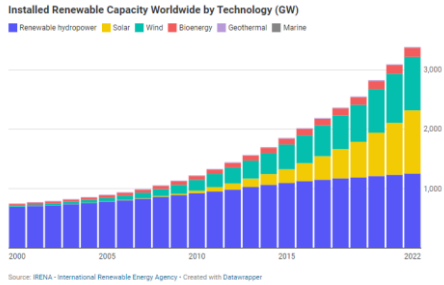
OIE u 2022.

hidroelektrane (1255 GW),
solarne elektrane (1062 GW)
vjetroelektrane (899 GW)







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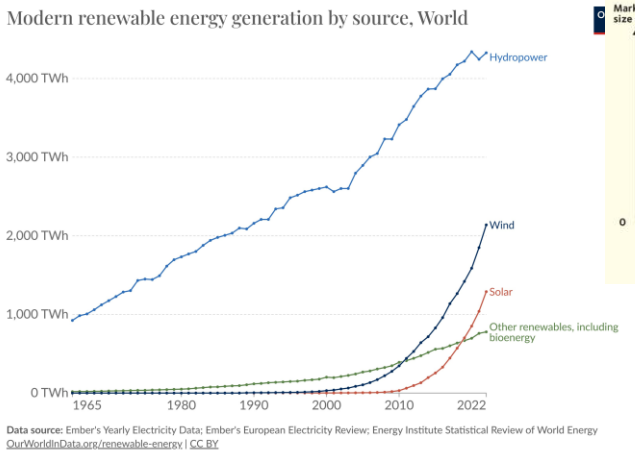
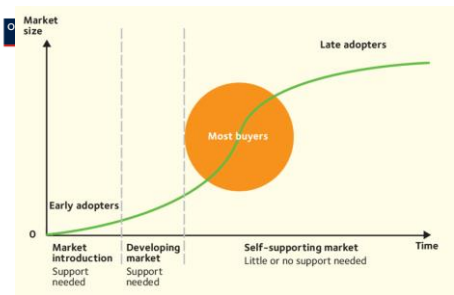
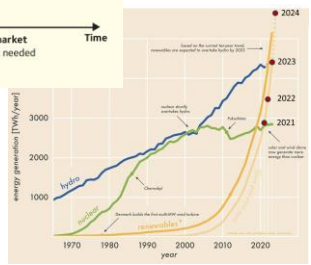
Proizvodnja energije iz OIE u svijetu

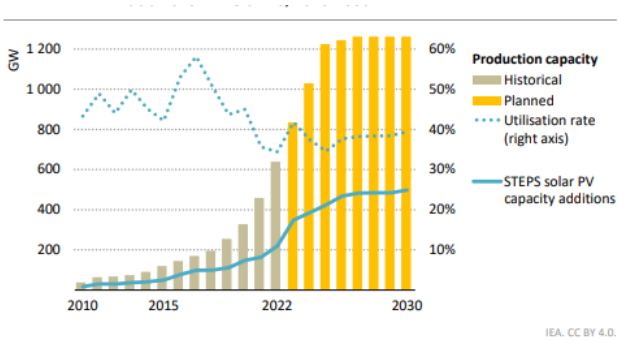




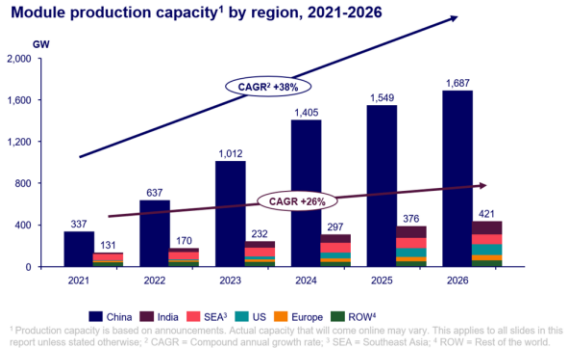


Kapacitet za proizvodnju PV

Global solar module manufacturing and solar PV capacity additions in the STEPS, 2010-2030



Wood Mackenzie: "How will China's expansion affect global solar module supply chains?



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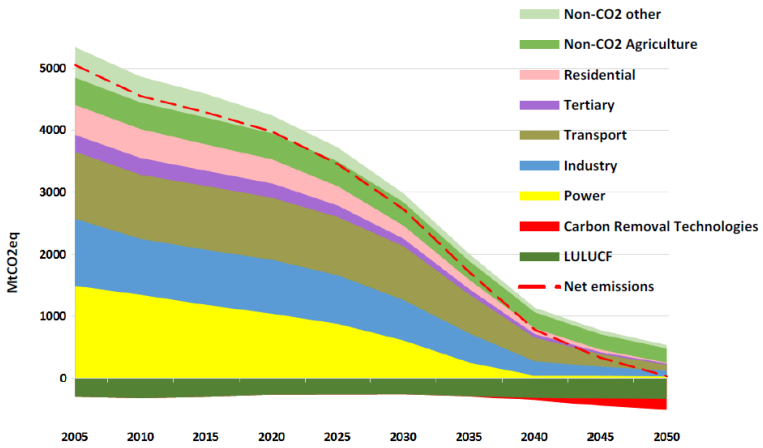
Klimatski neutralna Europa 2050.?



A Clean Planet for All, European Commission, 28 November 2018, COM(2018) 773 final.

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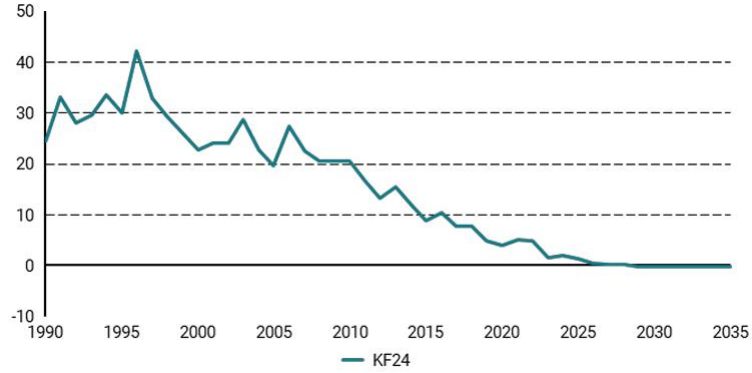
Greenhouse Gas Emissions from the Electricity and District Heating Sector, million tons CO2e - Denmark



Climate status and projection 2024;
https://www.kefm.dk/klima/klimastatus-og-fremskrivning/klimastatus-og-fremskrivning-2024

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Energetska tranzicija u Republici Hrvatskoj?

Godina	Udio OIE u BFPE	Pozicija u EU	Udio OIE u BFPE	Pozicija u EU	Udio OIE u BFPE	Pozicija u EU
2022.	27.92%	9.	42%	4.	33.75%	7.
2013.	28.04%	5.	27.17%	6.	32.66%	7.
2004.	23.40%	4.	14.83%	11.	22.55%	5.

Izvor: EIHP / Source: EIHP

Indikator / Indicator	2012.	2013.	2014.	2015.	2016.	2017.	2018.	2019.	2020.	2021.	2022.*
RES-E	37,98%	41,41%	44,71%	45,04%	46,42%	46,34%	48,14%	49,78%	53,82%	53,47%	55,52%
RES-T	0,65%	2,43%	2,37%	2,02%	0,80%	0,76%	2,20%	5,37%	5,93%	7,15%	2,42%
RES-H&C	36,55%	37,31%	36,22%	38,62%	37,64%	36,63%	36,65%	36,79%	36,98%	38,03%	37,21%
RES	26,66%	27,96%	27,76%	28,92%	28,15%	27,20%	28,09%	28,66%	31,30%	31,69%	29,44%

* preliminarni podaci / preliminary data

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EU politika →projekcije RH

	Instalirani kapacitet 2030. [GW]	Broj stanovnika [mil.]	kW/stanovniku	Broj stanovnika [mil.]	Instalirani kapacitet 2030. [GW]	Proizvodnja električne energije [TWh]
solar	600	448.4	1.338	3.8	5.08	5
vjetar	500	448.4	1.115	3.8	4.24	10
hidro						6.5
biomasa,bioplin						1
geotermalna					0.1	0.7
Ukupno OIE						23.2

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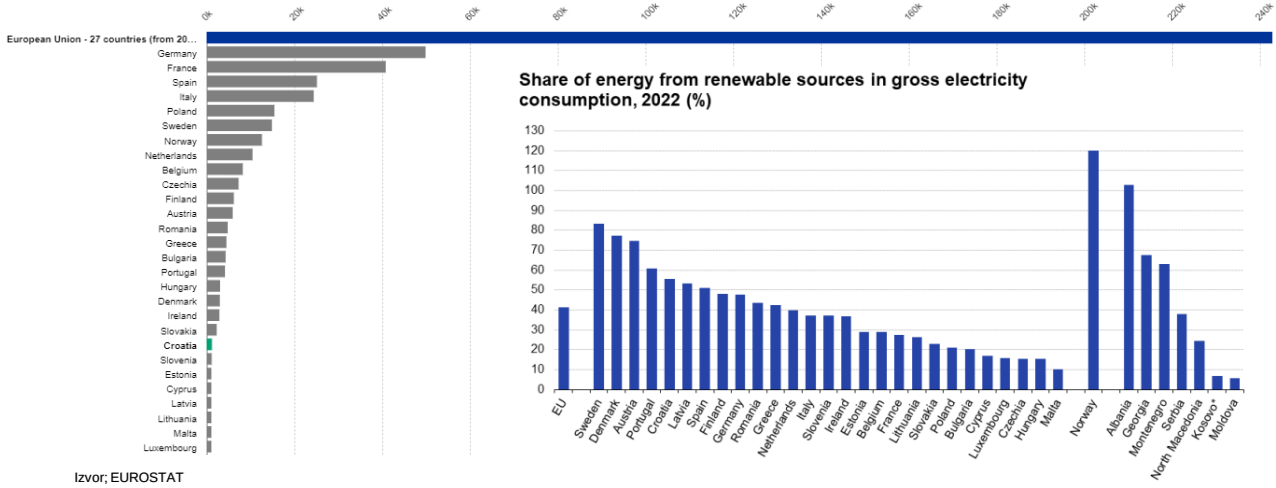
Proizvodnja električne energije u EU u 2022. [ktoe]



Izvor; EUROSTAT

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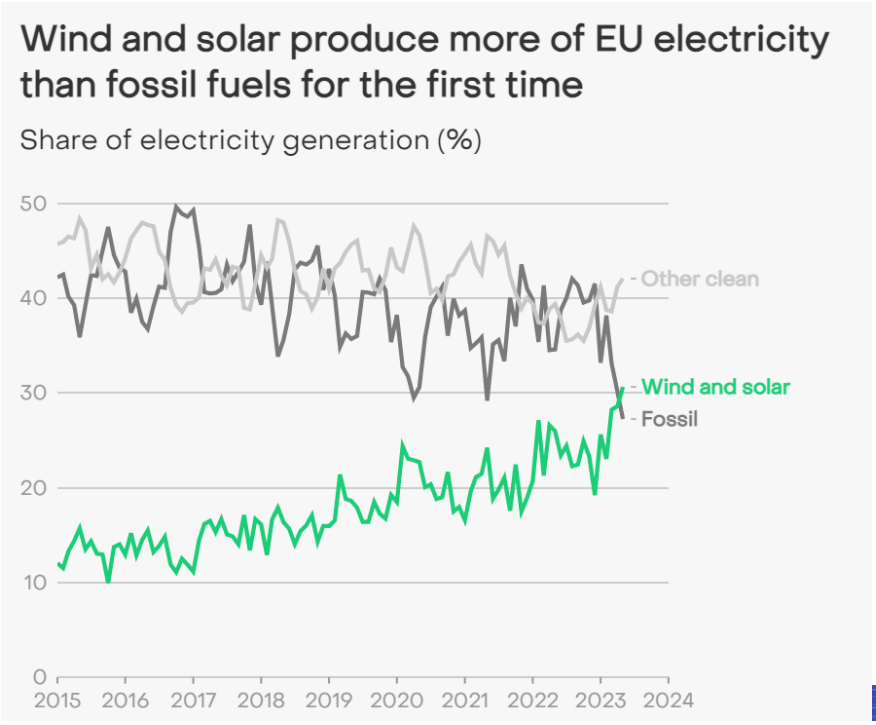
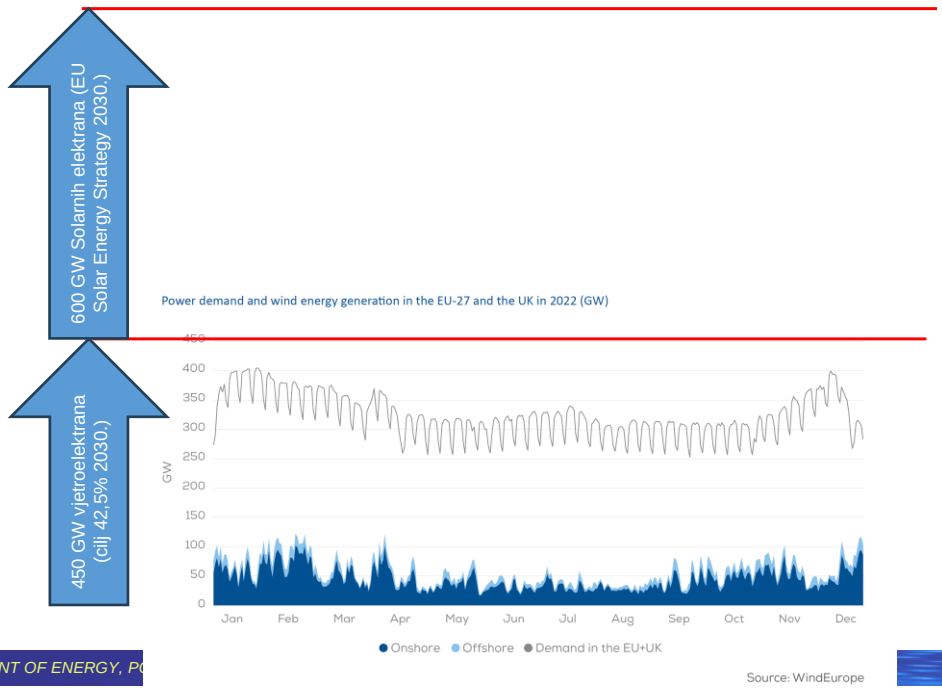


Svibanj 2023. vjetar i solar po prvi puta jači u EU od fosilnih izvora



California's „duck curve"

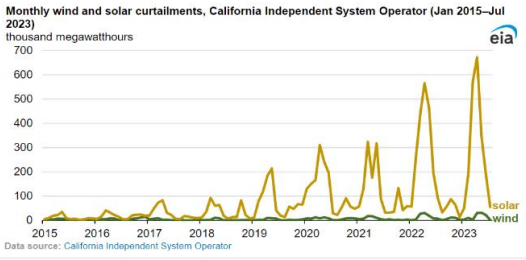


Image: Energy Information Administration

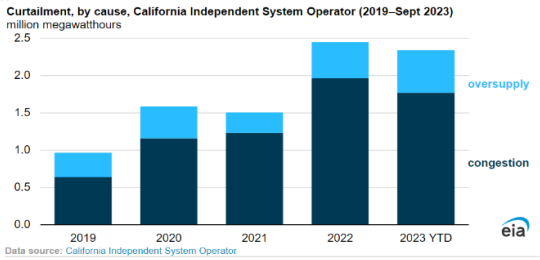


Image: EIA

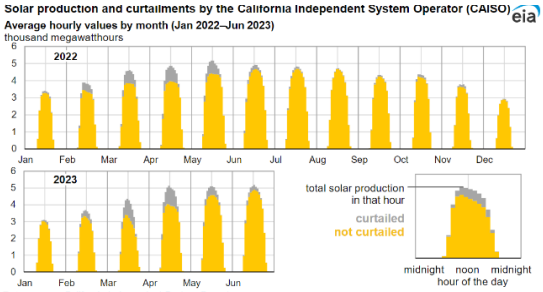


Image: EIA

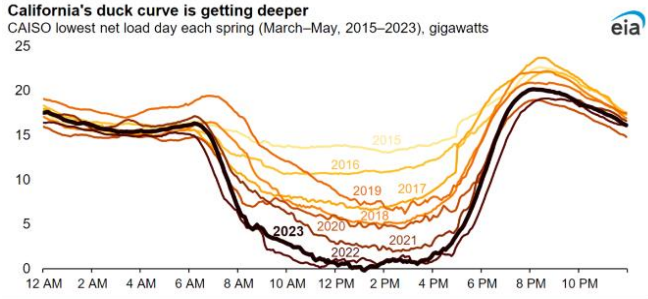
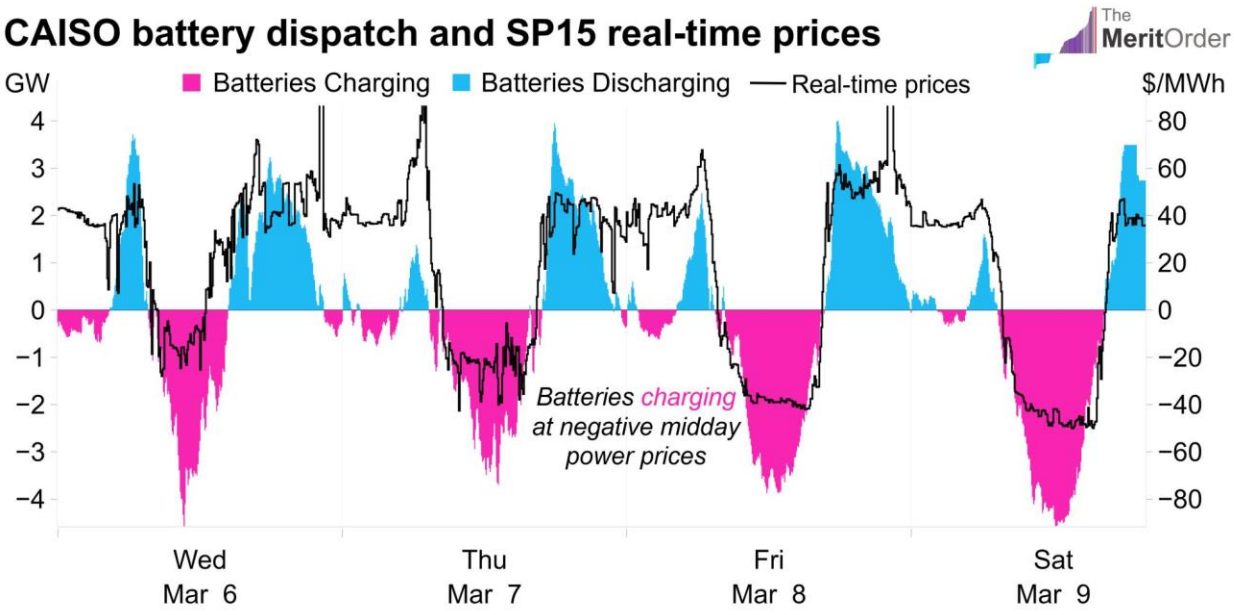
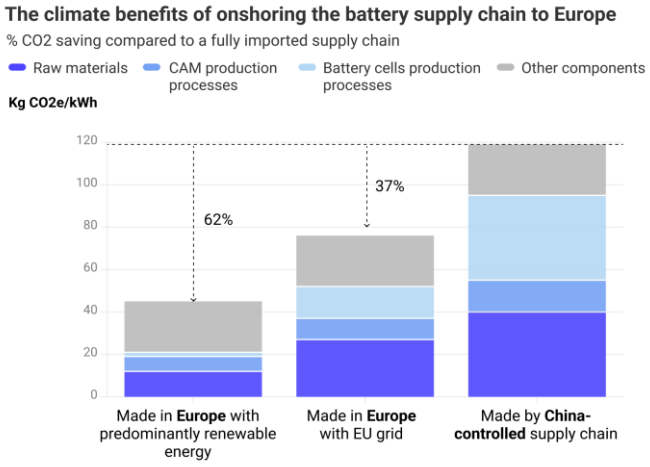


Image: EIA





https://www.transportenvironment.org/articles/european-made-batteries-could-be-60-less-carbon-intensive-than-chinese-analysis

Prepreke

- **Mreža – brzina širenja**
- **Elektrifikacija transporta**
- **Elektrifikacija grijanja**
- **Zeleni vodik, zeleni amonijak, zeleni metanol za industriju i goriva za interkontinentalni transport**

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Rješenje: Izgradnja pametnog energetskog sustava

Definicija pametnih energetskih sustava iz Strategije pametne specijalizacije usvojene za period do 2029.

- **Pametna energija podrazumijeva razvoj pametnih energetskih sustava koji kombinira i koordinira pametne električne, toplinske i plinske mreže kako bi se identificirale sinergije između njih te kako bi se postiglo optimalno rješenje za svaki pojedinačni sektor, kao i za cjelokupni energetski sustav.**

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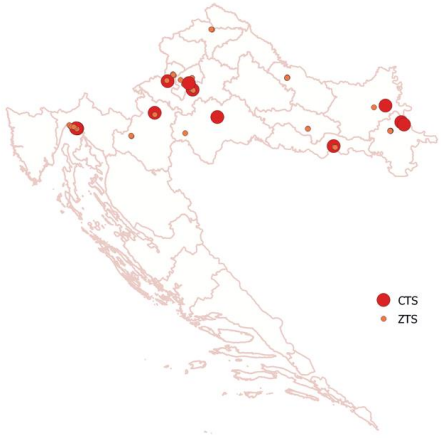
Toplinarstvo?



Tvrtka, grad / Company, Town		Ukupan broj potrošača / Total number of consumers	Grijana površina kućanstava / Heated area - households	Grijana površina ostalih potrošača / Heated area - other consumers	Ukupno isporučena toplinska energija / Total heat delivered	Ukupna duljina distribucijske mreže / Total network length	Gorivo** / Fuel**
		-	m²	m²	MWh	km	-
HEP - Toplinarstvo d.o.o.*	Sisak	4.008	n/p	n/p	133.404	30,00	PP; B
	Osijek	11.870	771.846	n/p	193.927	57,19	PP, B
	Zagreb***	116.028	6.029.675	n/p	1.504.649	304,17	PP, LUEL
Brod plin d.o.o.	Slavonski Brod	3.711	173.790	15.834	26.382	5,48	PP
Poslovni park Virovitica d.o.o.	Virovitica	444	21.988	6.323	3.033	0,90	PP
Energo d.o.o.	Rijeka	9.541	514.075	100.613	51.158	15,66	PP, LU, LUEL
Vartop d.o.o.	Varaždin	900	43.502	2.943	4.767	1,57	PP
Komunalac d.o.o.	Požega	417	19.839	-	1.939	0,61	PP
GTG Vinkovci d.o.o.	Vinkovci	1.676	85.431	2.748	7.585	1,60	PP, LU
Tehnostan d.o.o.	Vukovar	3.655	186.943	17.851	17.984	7,50	PP, LUEL, PEL, S
Gradska toplana d.o.o.	Karlovac	7.817	398.220	104.963	48.294	21,00	PP
Top-terme d.o.o.	Topusko	202	65.592	13.441	3.840	1,50	GEO
SKG d.o.o.	Ogulin	90	3.586	2.897	1.486	0,58	LUEL
Sveukupno / Total		160.359	8.314.487	267.613	1.998.447	448	

Source: EuH , EIHP 2023

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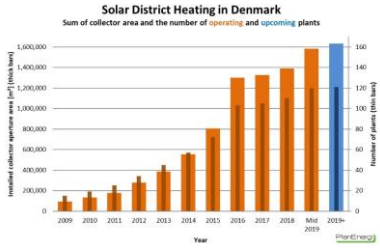
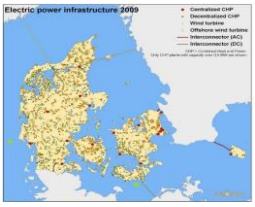
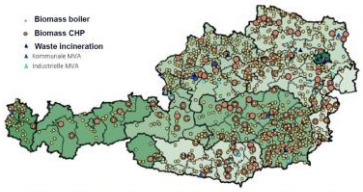
~ 1100 MW solar thermal ~ 1600000 m²
5,792,202 ppl → 0.276 m² per capita







In Austria, more that 2.400 heat networks are existing (among them a large number of small biomass networks). DH market share is about 24%. District cooling has only a minor role limited to some cities.

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Elektrifikacija transporta

Renewable and Sustainable Energy Reviews 82 (2018) 1823–1838

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

The future of transportation in sustainable energy systems: Opportunities and barriers in a clean energy transition

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[a] Department of Energy Conversion and Storage, Technical University of Denmark (DTU), Frederiksborgvej 399, Roskilde, Denmark
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Keywords:
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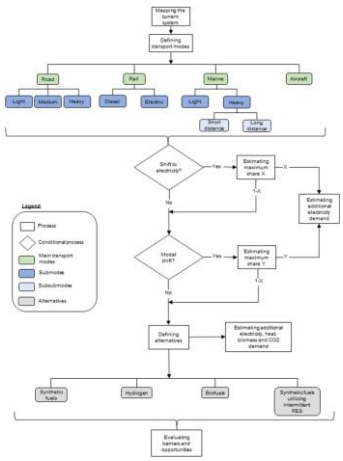
Electric vehicles
Biofuels, hydrogen
Electrofuels
Synthetic fuels

ABSTRACT

Energy demand of a transport sector has constantly been increasing in the recent years, consuming one third of the total final energy demand in the European Union (EU) over the last decade. A transition of this sector towards sustainable one is facing many challenges in terms of suitable technology and energy resources. Especially challenging transition is envisaged for heavy-weight, long-range vehicles and airplanes. A detailed literature review was carried out in order to detect the current state of the research on clean transport sector, as well as to point out the gaps in the research. In order to calculate the resources needed for the transition towards completely renewable transport sector, four main alternatives to the current fossil fuel systems were assessed and their potential was quantified, i.e. biofuels, hydrogen, synthetic fuels (electrofuels) and electricity. Results showed that electric modes of transport have the largest benefits and should be the main aim of the transport transition. It was calculated that 72.3% of the transport energy demand on the EU level could be directly electrified by the technology existing today. For the remaining part of the transport sector a significant demand for energy resources exists, i.e. 3069 TWh of additional biomass was needed in the case of biofuels utilization scenario while 2775 TWh of electricity and 925 TWh of heat were needed in the case of renewable electrofuels produced using solid oxide electrolysis scenario.



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Hrvatski pametni otoci?

- Pag
- Vis
- Krk
- Mljet
- Unije

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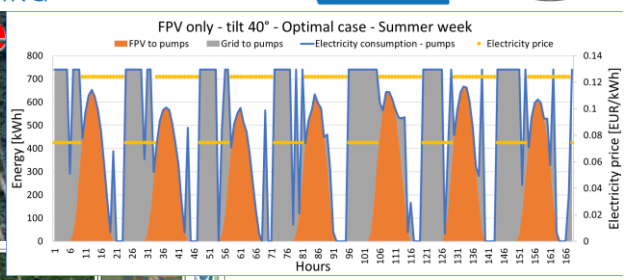
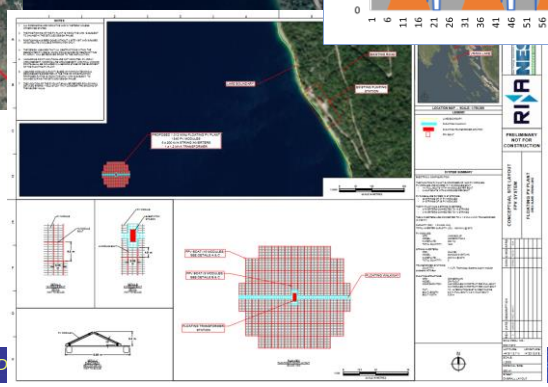
Plutajuće solarne elektrane otok Cres





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Maximizing the impact of innovative energy approaches in the EU islands

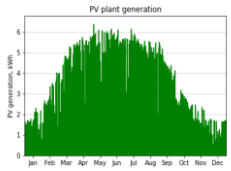
New Energy Solutions Optimised for Islands
NESOI
EUROPEAN ISLANDS FACILITY

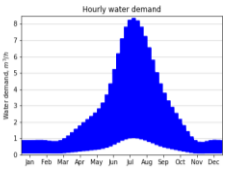
Integracija elektroenergetskog sustava i vodovoda, otok Unije

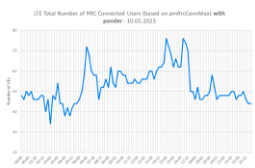
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824433

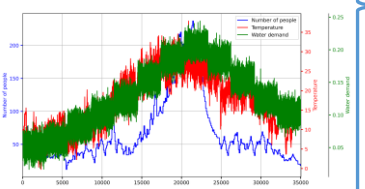
Povećana integracija OIE na otoku Unije povezivanjem vode i energije

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824433

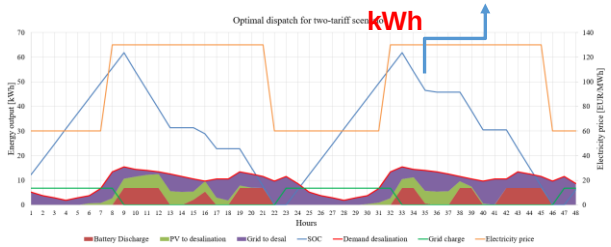




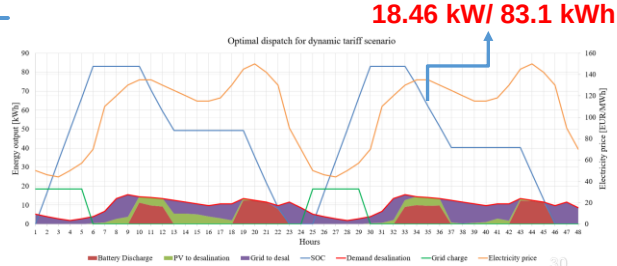




6.87 kW/ 61.84 kWh



18.46 kW/ 83.1 kWh



Ericsson Nikola Tesla Razvoj platforme za pametne otoke primjenom 5G i IoT

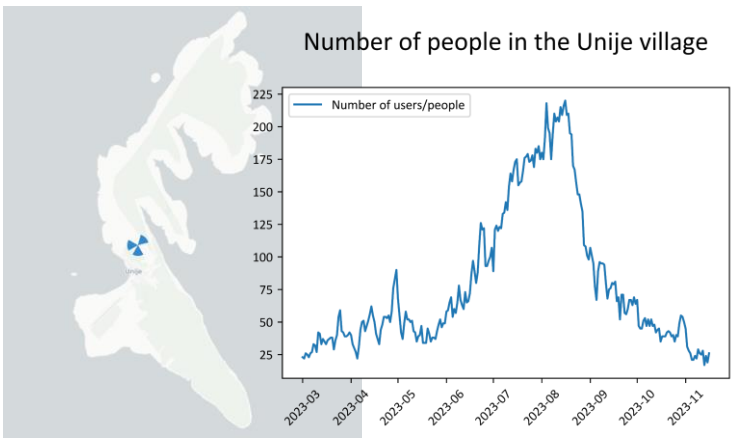
Smart Island Platform - Public Dashboard

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824433

Ericsson Nikola Tesla metode za prebrojavanje ljudi za pametne otoke primjenom 5G i IoT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824433

Island's population estimation through anonymized data from mobile telecom network



- Information on the island's population over time, obtained through anonymized data from mobile telecom networks
- Emphasized seasonality
- Vital input for successful resource demand prediction

Ericsson Nikola Tesla metode za prebrojavanje ljudi za pametne otoke primjenom 5G i IoT

Machine Learning algorithms in energy resources management - Datasets

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Maximizing the impact of innovative energy approaches in the EU islands
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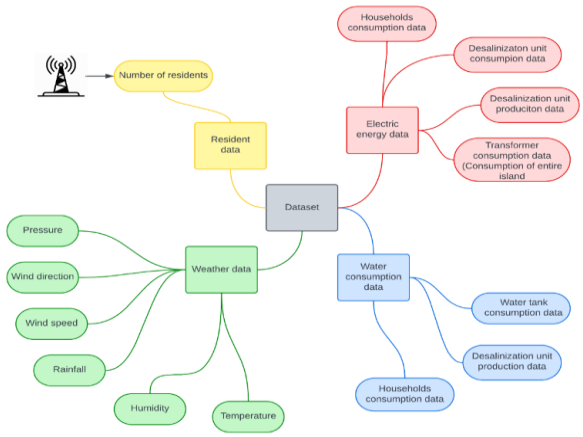
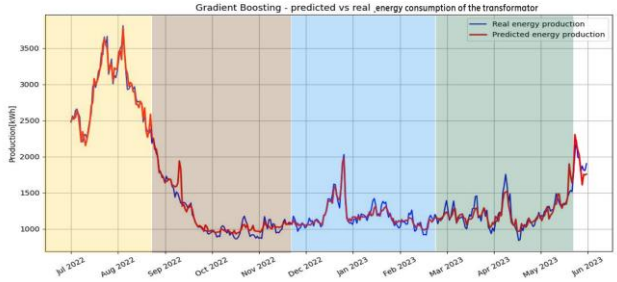


- **Energy Consumption Data**: historical records of electric energy usage on Unije Island,
- **Weather Data**: crucial for its influence on energy consumption,
- **Water Consumption Data**: historical records of water consumption on Unije Island,
- **Resident Data**: information on the island's population over time, obtained through anonymized data from mobile telecom networks

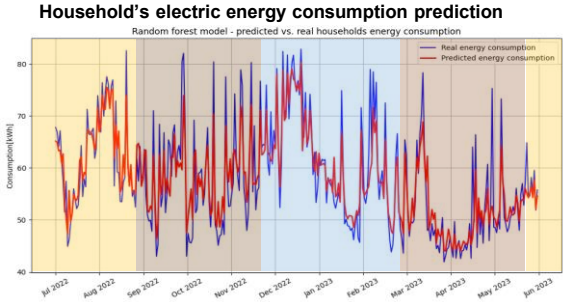
Ericsson Nikola Tesla metode za prebrojavanje ljudi za pametne otoke primjenom 5G i IoT

Water consumption prediction (island Unije)

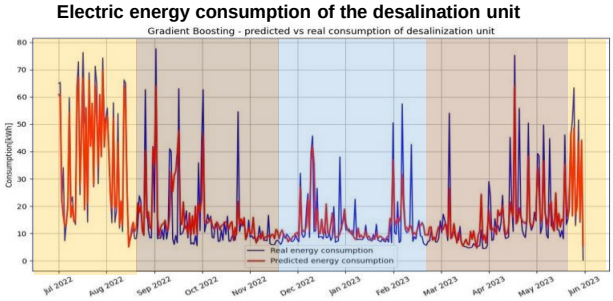
Electric energy consumption prediction (island Unije)



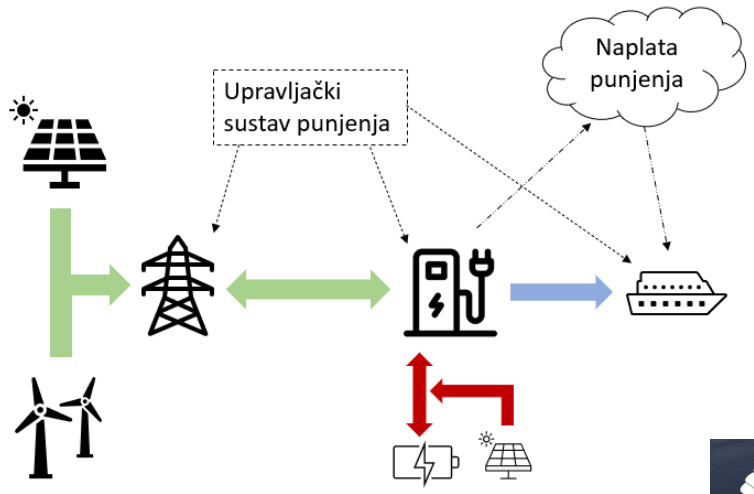
Household's electric energy consumption prediction



Electric energy consumption of the desalination unit



Shematski prikaz punjenja brodova



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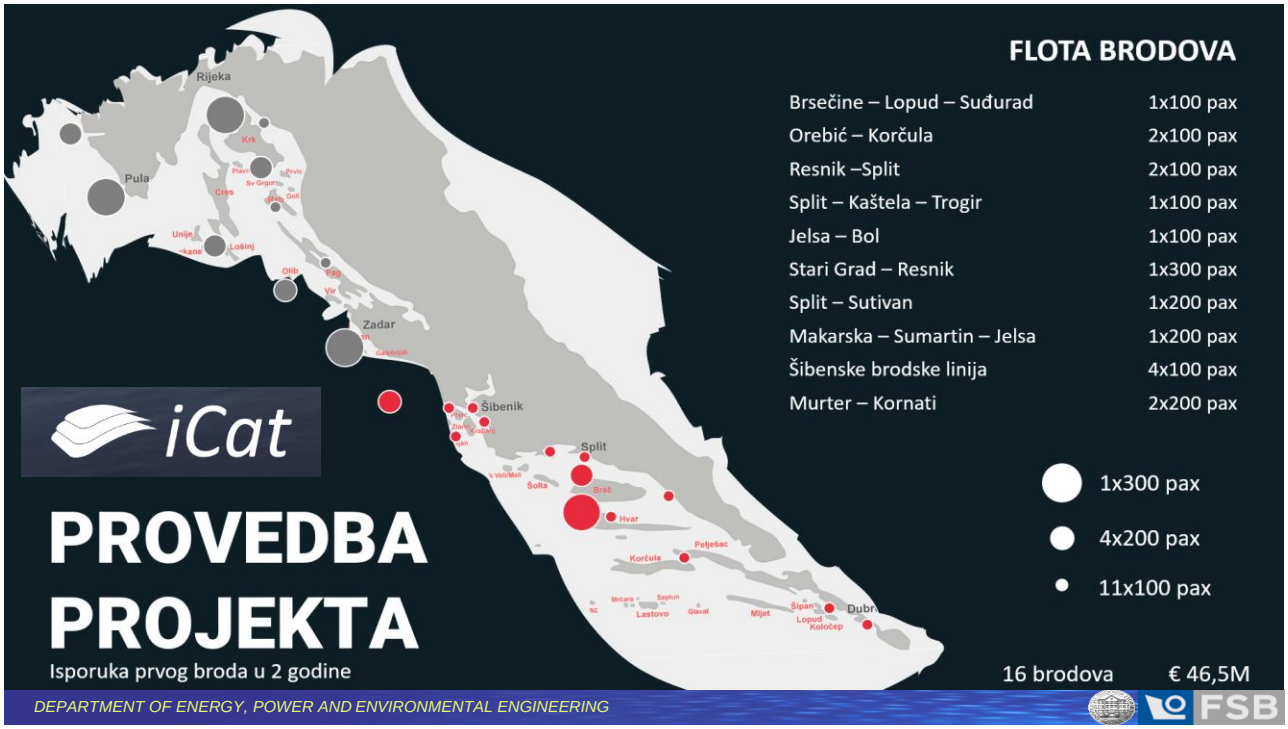
FLOTA BRODOVA
Brsečine – Lopud – Suđurad 1x100 pax
Orebić – Korčula 2x100 pax
Resnik –Split 2x100 pax
Split – Kaštela – Trogir 1x100 pax
Jelsa – Bol 1x100 pax
Stari Grad – Resnik 1x300 pax
Split – Sutivan 1x200 pax
Makarska – Sumartin – Jelsa 1x200 pax
Šibenske brodske linija 4x100 pax
Murter – Kornati 2x200 pax
1x300 pax
4x200 pax
11x100 pax
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Isporuka prvog broda u 2 godine
16 brodova
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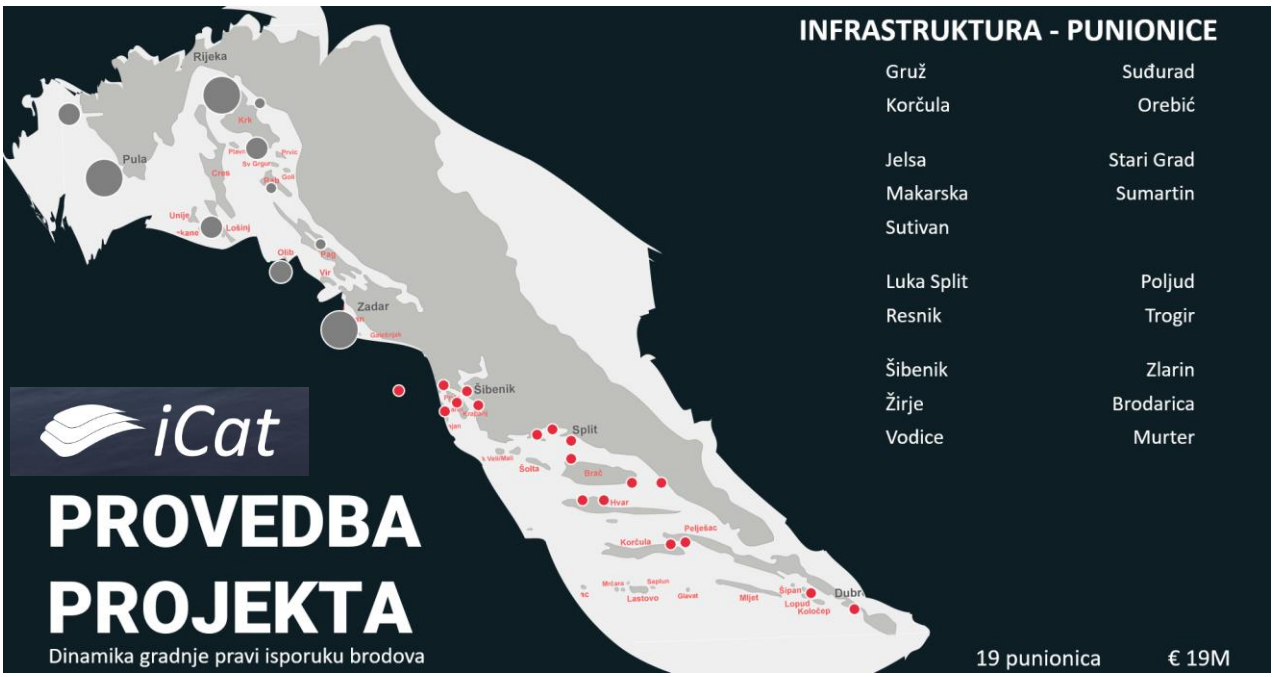
INFRASTRUKTURA - PUNIONICE
Gruž
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Korčula
Orebić
Jelsa
Stari Grad
Makarska
Sumartin
Sutivan
Luka Split
Poljud
Resnik
Trogir
Šibenik
Zlarin
Žirje
Brodarica
Vodice
Murter
iCat
PROVEDBA PROJEKTA
Dinamika gradnje pravi isporuku brodova
19 punionica
€ 19M
Rijeka
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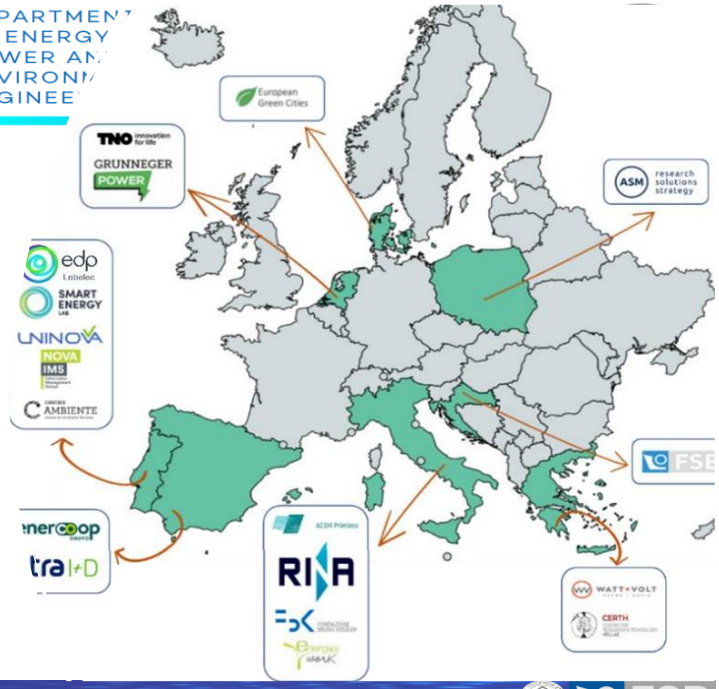
Energetske zajednice Građanska energija

COMMUNITAS

- 18 partners from 8 EU countries
- Budget: 7 M€ Grant: 6 M€
- January 2023 - June 2026
- Duration: 42 months



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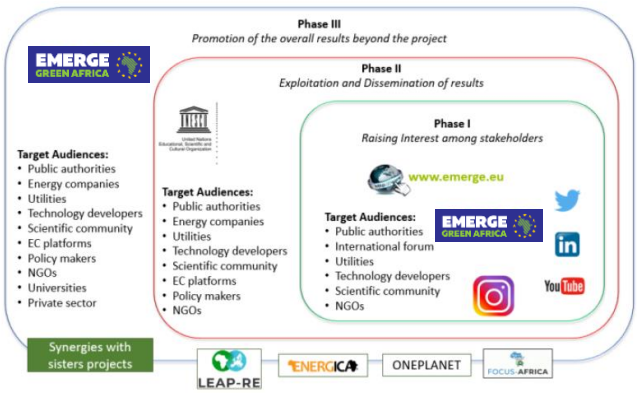
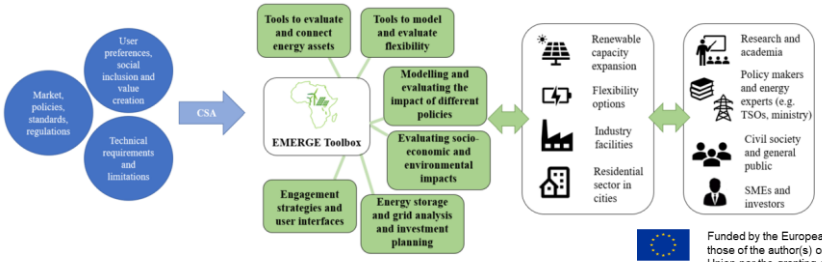
- Uspostaviti mrežu afričkih stručnjaka
- Povezati se s drugim aktivnostima suradnje AU-EU
- Demonstrirati inovativni EMERGE Toolbox temeljen na međusektorskoj analizi i planiranju energetskog sustava





EMERGE GREEN AFRICA

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STUDIJ ENERGETSKE UČINKOVITOSTI I OBNOVLJIVIH IZVORA
SVEUČILIŠTE U ZAGREBU - ŠIBENIK

Sveučilište u Zagrebu

Dislocirani preddiplomski sveučilišni

Studij energetske učinkovitosti i obnovljivih izvora u Šibeniku

180 ECTS bodova (3 godine)
Redovni preddiplomski sveučilišni studij

Studij organiziraju i nastavu izvode:

FER - Fakultet elektrotehnike i računarstva
FSB - Fakultet strojarstva i brodogradnje

Sveučilišni prvostupnik inženjer/ka energetskih tehnologija

Blistava budućnost Hrvatske

- **Bogata obnovljivim izvorima energije**
- **Renesansa brodogradnje, deseci GW pučinskog vjetra**
- **Može vrlo brzo postati 100% obnovljiva zemlja**
- **Razvoj pametnog energetskog sustava**
- **Može biti značajan izvoznik energije, električne energije, vodika, amonijaka i metonola**
- **Zašto bismo bili uvoznik, kad možemo biti izvoznik?**
- **Europa nema više fosilnih goriva, ali ima obnovljivih – na novoj energetici može izgraditi novu ekonomiju**

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