Project for the strengthening and the development of initiatives in the RES field.

Albania renewable energy

Executive Summary
B0B3 - G

Supercapital

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Detailed materials will be available on the data-room.

Contents

Stakeholder

Stakeholder

“Supercapital is the firm specialist in the creation of valuable assets.”

Supercapital is sponsoring the new venture for the development of projects deploying investments in the renewable energy sector in Albania, being ready to approach the next market opening.

The investments are studied to secure a long-term value through the exploitation of the 3 main renewable energy source: Hydro, Solar and Wind.

The value will be reached with the operation of an infrastructure that gives its contribution to the economic improvement of a nation in constant growth as Albania is.

The team established by Supercapital is capable to implement and manage the infrastructure for the duration of its entire timelife, and to guarantee the creation and consolidation of the valuable assets.

The low investment risk is closely related to the technical capacity of the team, the duration of exploitation of the sources and the knowledge in the field of action.

The purpose is to give life to a New Energy Company to implement RES investment and to operate in the next Energy Open Market in Albania benefiting of the proficiency by Italy experience.

Hydro+Solar+Wind → Superpower

Superpower

Mission

Our aim is to contribute on creating a sustainable world. We are passionate about contributing to a world, which does not depend on power from fossil fuels.

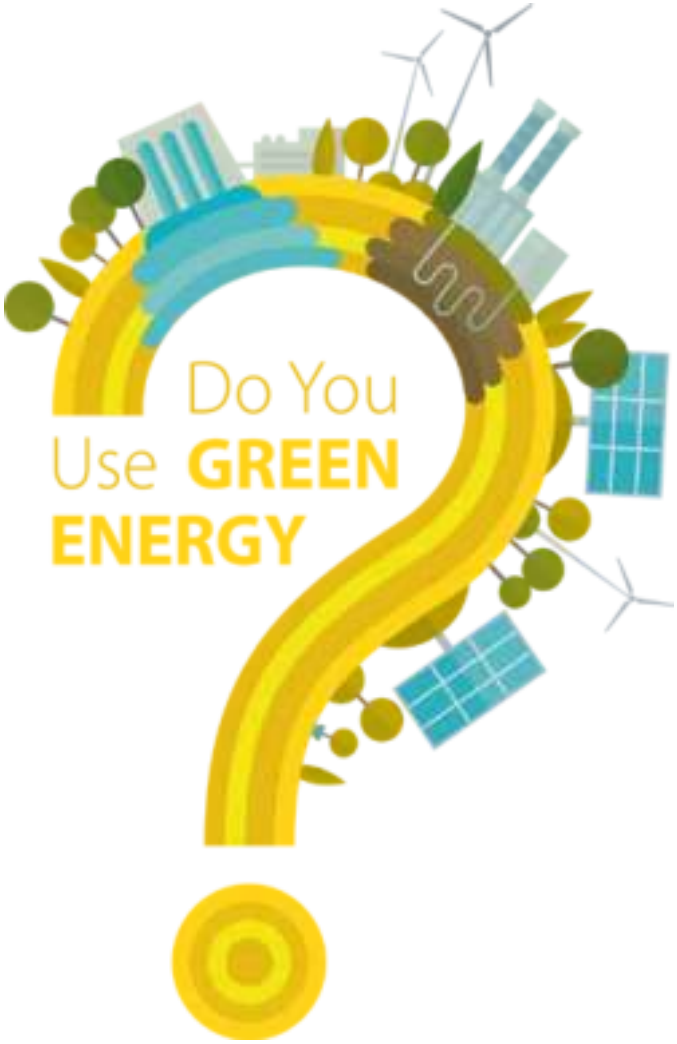
Our mission is to promote the adoption of renewable technology to preserve our environment and provide an environmentally friendly, sustainable power supply.

We remain focused on innovation driving with high efficiency the production plants, continually improving the quality and environmental friendliness of our production facilities.

The risk of breaks in supply chain ask the companies to rethink the entire methodology of production; energy is an important part of that.

We are committed to make available different kind of solutions that overcome these risks.

We are committed to comply with international safety, environment and quality standards at all times.



Management

An effective workgroup, able to handle complex tasks by treating processes in detail.

Competence, rapidity and efficiency are the characteristics that distinguish the working group.

A team structured to track workflows from the conception, design, construction to the management, people conscious that team makes the difference.

Stefano CAMPOCCIA
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Banking & Finance
Investment Funds

Massimiliano RUBIN
Vice President
Marketing
External Relations

Pasquale PESCE
CEO
Corporate, Project Finance
Private Equity, Real Estate

Nicola BARBIERO
CFO
Risk Management
Investment Funds

Enrico VIVIANI
COO
Engineering
Projects Assessment

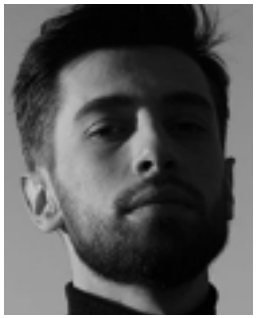
Paolo RUBIN
Head of Business

Irene PIRELLI MARTI
Head of Legal

Adnand MAHMUTI
Head of Partnership

Behaudin DOBI
Head of Land Acquisition

Arjola KRASNIQI
Head of Achitecture



Anius KOTORRI
Head of Technology

Country


KOSOVO
Shkoder
Lezhë
Peshkopi
Laç
Burrel
Krujë
Durrës
TIRANË
Kavajë
Petrele
Librazhd
Elbasan
ALBANIA
Fier
Gjiri i Drinit
Kepi i Rodonit
Rrogozhinë
Lushnjë
Tetovo
Vratnica
SKOPJE
Gostivar
Debar
Kičevo
Brod
E65
Bitola

Country

Albania shares a border with Greece to the south/southeast, Macedonia to the east, Kosovo to the northeast, and Montenegro to the northwest.

Western Albania lies along the Adriatic and Ionian Sea coastlines. Albania's primary seaport is Durres, which handles 90% of its maritime cargo.

Situated in the southwestern region of the Balkan Peninsula, Albania is characterized by a distinct mountainous landscape (the average altitude of Albania is 700 meters above the sea), but flat along its coastline with the Adriatic Sea. Climate is mild, temperate; cool, wet winters; dry, hot summers. Area is 28,748 sq. km. Major cities are: capital Tirana (858,262), Durres (201,519), Vlore (141,513), Elbasan (126,703) Shkoder (102,075). Population (2019 est.) is 2,938,938, population growth rate (2019 est.) is 0.14% and the median age is 36.4 years.

Based on the structure, composition and shape of the landscape, four physical-geographic zones are distinguished: Alps, Central Mountainous Region, Southern Mountainous Region and Western Lowland. The highest peaks are those in the Alps and the Eastern Mountains (Korabi 2751 m) and the lowest peaks are located in the western coast area. The landscape is intersected by the valleys of Vjosa, Devoll, Osum, Shkumbin, Erzen, Mat and Drin rivers, eastward and westward, which enable the connection of Adriatic Sea with the internal part of the country and the Balkans.

The country is linked with the rest of the world via land, sea and air routes.

Government

Type: Parliamentary democracy.

Branches: Executive--President (chief of state), Prime Minister (head of government), Council of Ministers (cabinet). Legislative--140-seat unicameral People's Assembly or Kuvendi Popullor elected by regional proportional vote; all members serve 4-year terms.

Judicial--Constitutional Court, High Court, multiple district and appeals courts.

Suffrage: Universal at age 18.

Economy

Real GDP growth: 4.32%, Inflation rate 2.1% (Albanian Institute of Statistics), Unemployment rate (Albanian Institute of Statistics) is 12.4% (as of September 2018). Natural resources: oil, gas, coal, iron, copper and chrome ores.

Renewable energy

- The Government in its National Economic development plan 2013- 2020 has set Renewable Energy as the key priority, for developing a "Green Energy" driven economy.
- Incentives, governmental support and facilitation of investments.
- High quality experienced engineering and technical workforce, particularly in the hydropower sector. Albania graduates students on 2017 was 35,173, number increased by 11% compared with 2016.
- Proven record of successful foreign investments in the sector - AYEN AS Energy, ENSO Hydro Energy, ETEA, Schneider Electric Sas, Amadeus Group, CNR (Compagnie Nationale du Rhone), VERBUND AG, Essegei S.p.A, San Leon Energy, IDROENERGIA ALBANIA SHPK.

HYDRO

Represent the only significant exploited renewable energy resource in the country, achieving the 95% of the total installed capacity of electricity production with around 2,100 MW (actually the 48% of the estimated hydro potential).

SOLAR

The country has the high number of sunshine hours per year in Europe, with an energy irradiation at 1,461 KWh/m^2, and some areas at the highest range of 1,753 KWh/m^2.

The expected capacity is up to 2,378 MW. Actually the country has the first 10 MW installed with a target of about 490 MW within the 2030.

WIND

Albania wind capacity is estimated in about 7,400 MW. The averange annual speed measurement in the windy areas is between 5.8 and 7 m/s with a load factor up to 25%. Power is not exploited at the moment; the target within the 2030 is up to 150 MW.

References

Albania Energy Association (AEA):
www.aea-al.org

Energy Community Ministerial Council adopts Renewable Energy 2020 targets:
www.energy-community.org

Enti Rregulatori I Energjise (ERE):
www.ere.gov.al

National Agency of Natural Resources:
www.akbn.gov.al

Electricity Data - Total Electricity Installed Capacity:
www.eia.gov

Institute of Energy for South Est Europe:
www.iene.eu

Ministry of Energy and Industry, Albania:
http://www.energjia.gov.al/en

The World Bank in Albania:
www.worldbank.org/albania

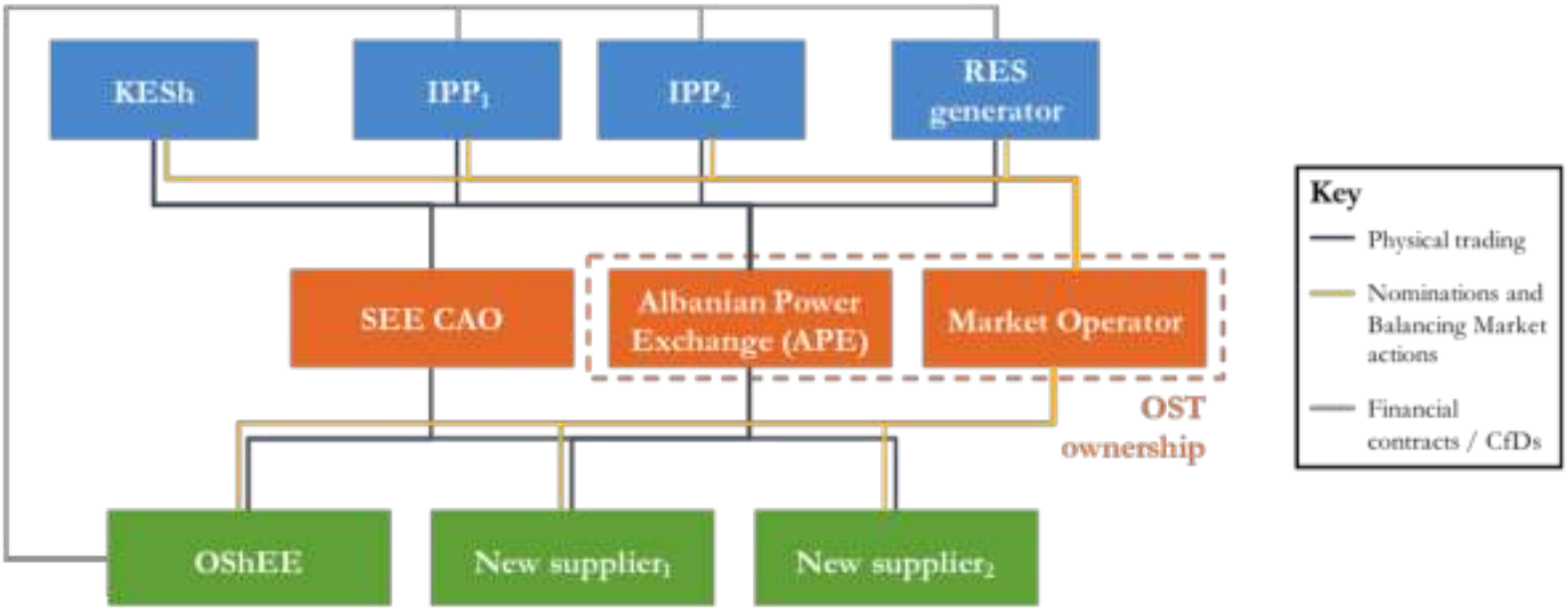
Operating plan

Operating plan

Market coupling and open market activities in the energy sector are in progress by the regional integration and the new strategic framework based on two main topics:

1 - market liberalisation and regional integration with the european energy market;

2 - development of the national energy and climate plan, foreseen by the european union accordingly with the Paris agreement.



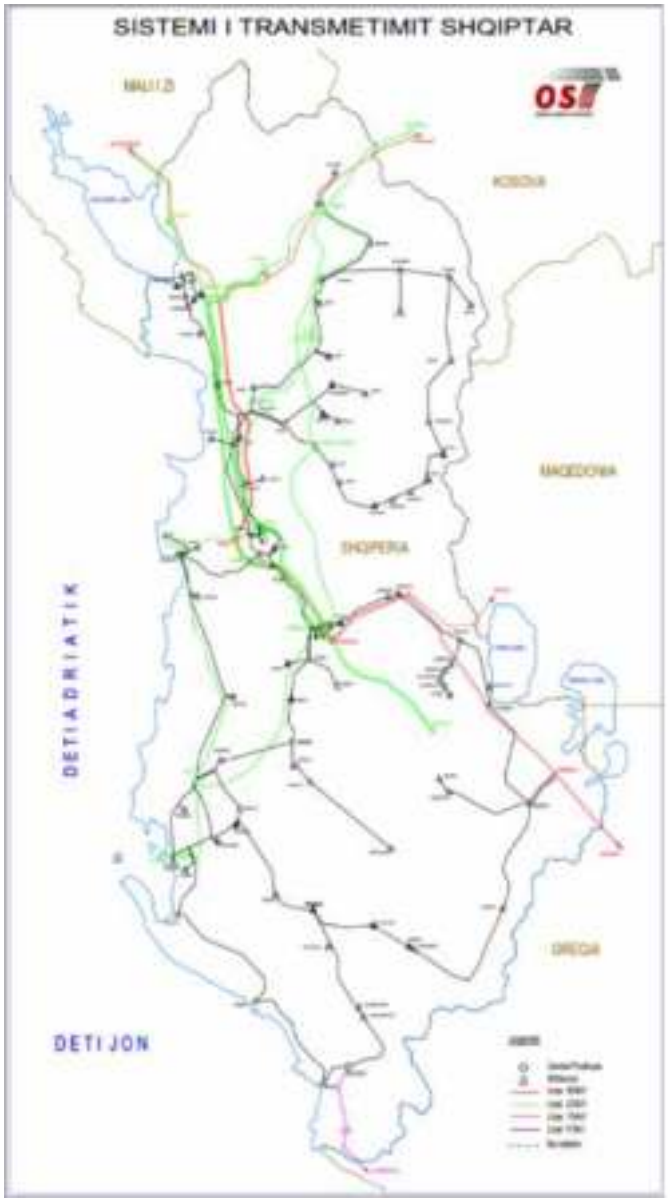
Market structure, by national energy strategy for Albania 2030

Operating plan

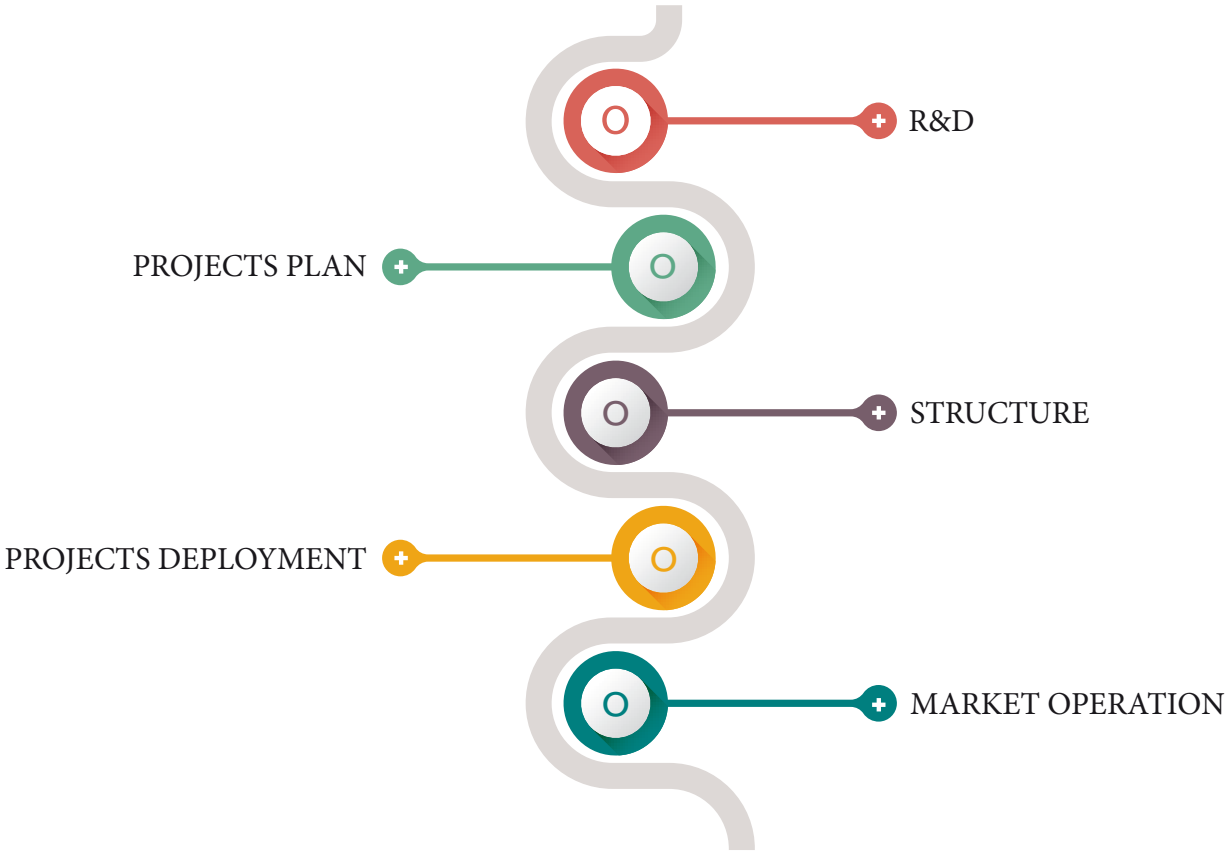
TRANSMISSION LINE NETWORK

Albania cross border interconnection established with Kosovo, Montenegro, Greece and under development with the Republic of Macedonia.

Is under study the possible Albanian interconnection with Italy by TERNA MON.ITA PROJECT, the undersee cable between Montenegro and Italy.



Operating plan



Operating plan

HYDRO

PAMBAD PROJECT 1,145 MW
BENCE TEPELENE PROJECT 8,527 MW
PROJECTS LICENCED READY TO BUILD

SOLAR

FIER (40 HA OF NO PRODUCTIVE LAND) SECURED TO DEVELOP UP TO 22 MW.
THE MINISTRY OF INFRASTRUCTURE & ENERGY IS UNDERLINING THE NEW LICENSING PROCESS.

XHAFZOTAJ (100 HA OF NO PRODUCTIVE LAND) UNDER REQUEST.

WIND SOLAR HYBRID SYSTEM

EAGLE 1, STUDYING THE SITE – PUKE REGION, FOR A 30 MW WIND FARM.
THE MINISTRY OF INFRASTRUCTURE & ENERGY ANNOUNCED A FUTURE WIND AUCTION ONGOING PROCESS.

GREEN HYDROGEN R&D

TECHNOLOGIES COUPLING R&D AND HYDROGEN BACKUP SYSTEMS.

SOLAR

FIER

DATA

SITE

40°43’15”, 19°25’57”

PV System: ground-mounted large scale

Azimuth of PV panels: Optimum (180°)

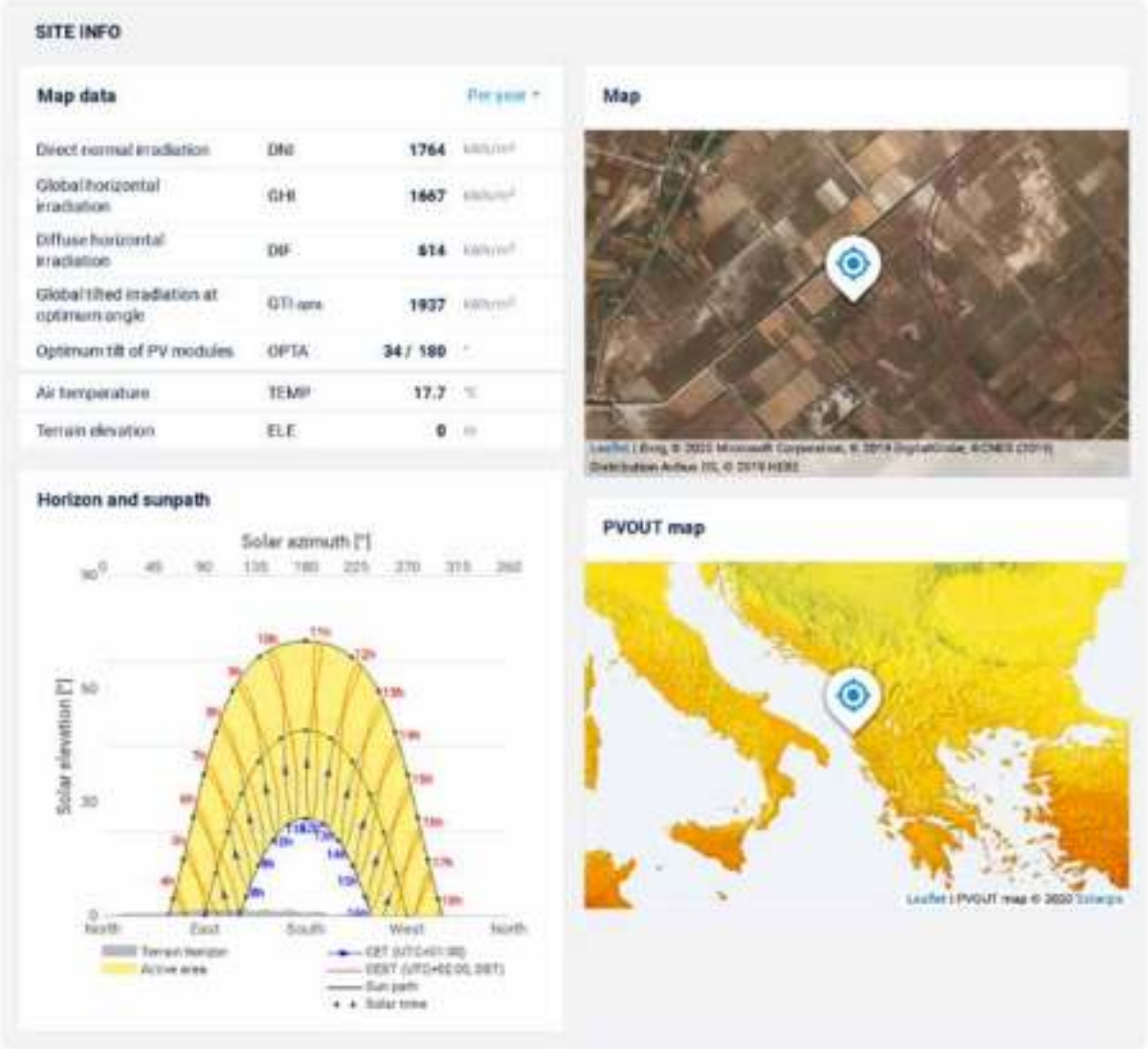
Tilt of PV panels: Optimum (34°)

Installed capacity: 1000 kW

Annual averages:

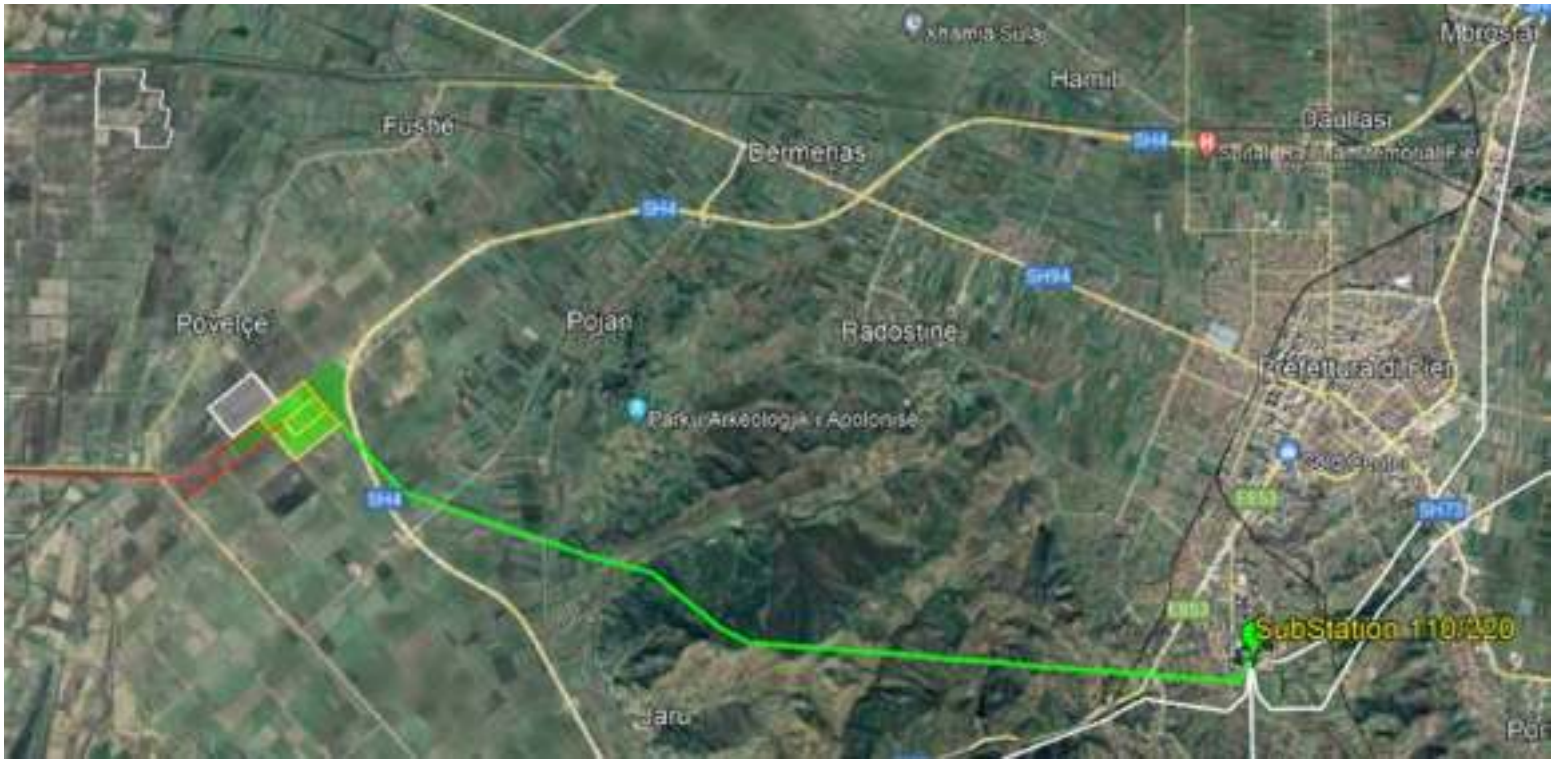
Total fotovoltaic power output

1571 GWh per year



FIER

AREA

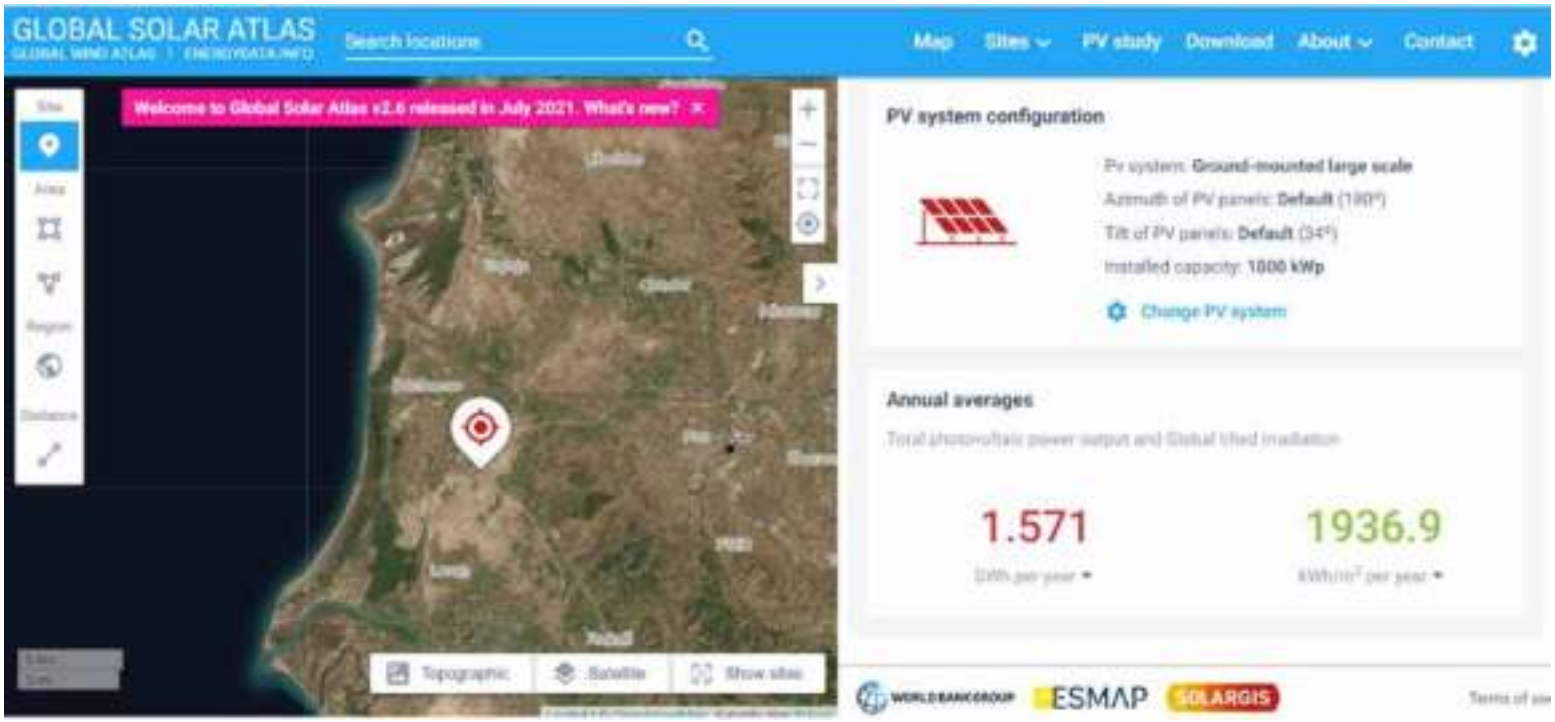


Area 60 ha

Distance from Fier 110/220 sub station: 10.3 Km

FIER

EXPLOITATION PERFORMANCE



XHAFZOTAJ

DATA

41°21’48”, 19°30’36”

PV System: ground-mounted large scale

Azimuth of PV panels: Optimum (180°)

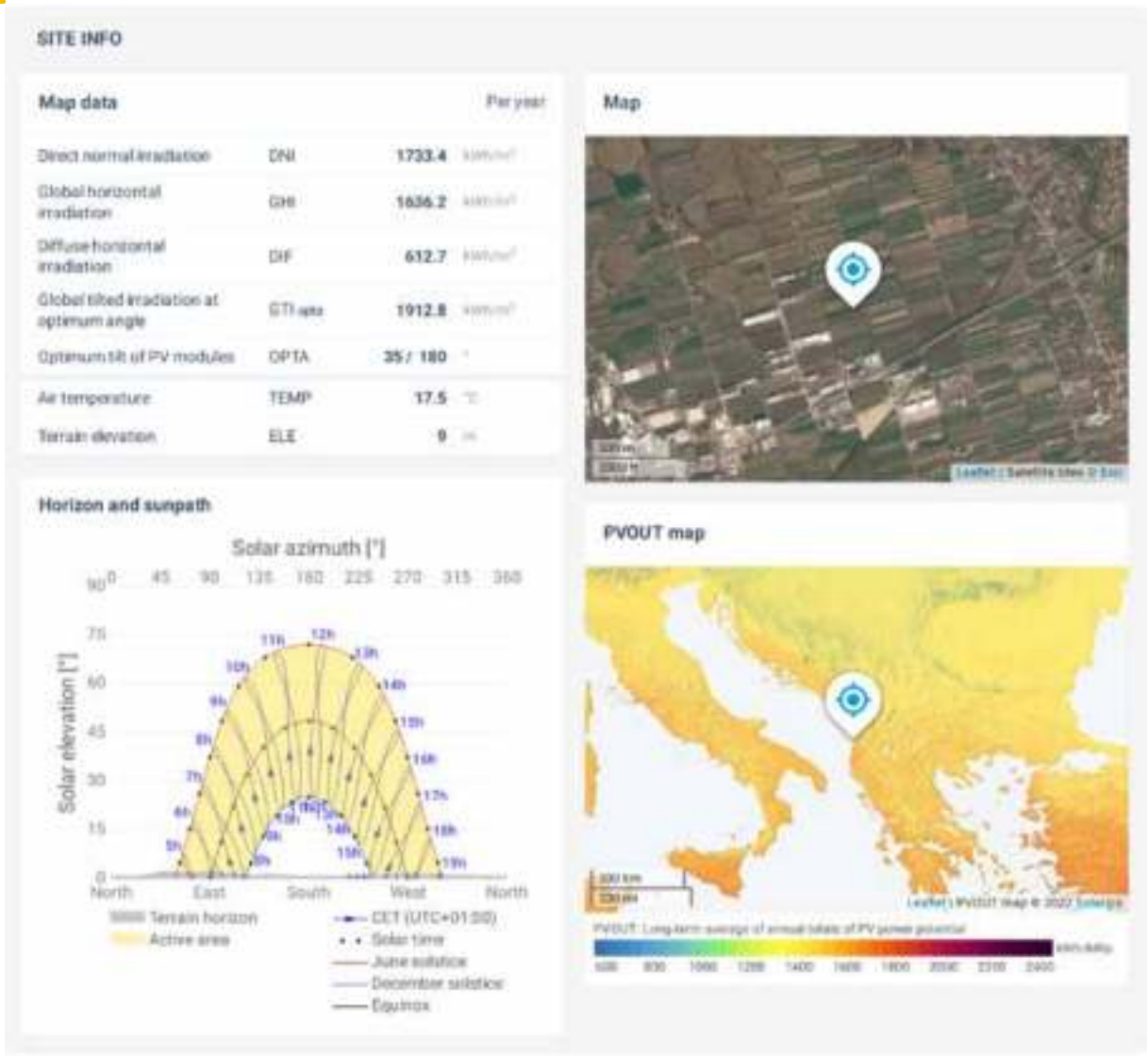
Tilt of PV panels: Optimum (34°)

Installed capacity: 1000 kW

Annual averages:

Total fotovoltaic power output

1555 GWh per year

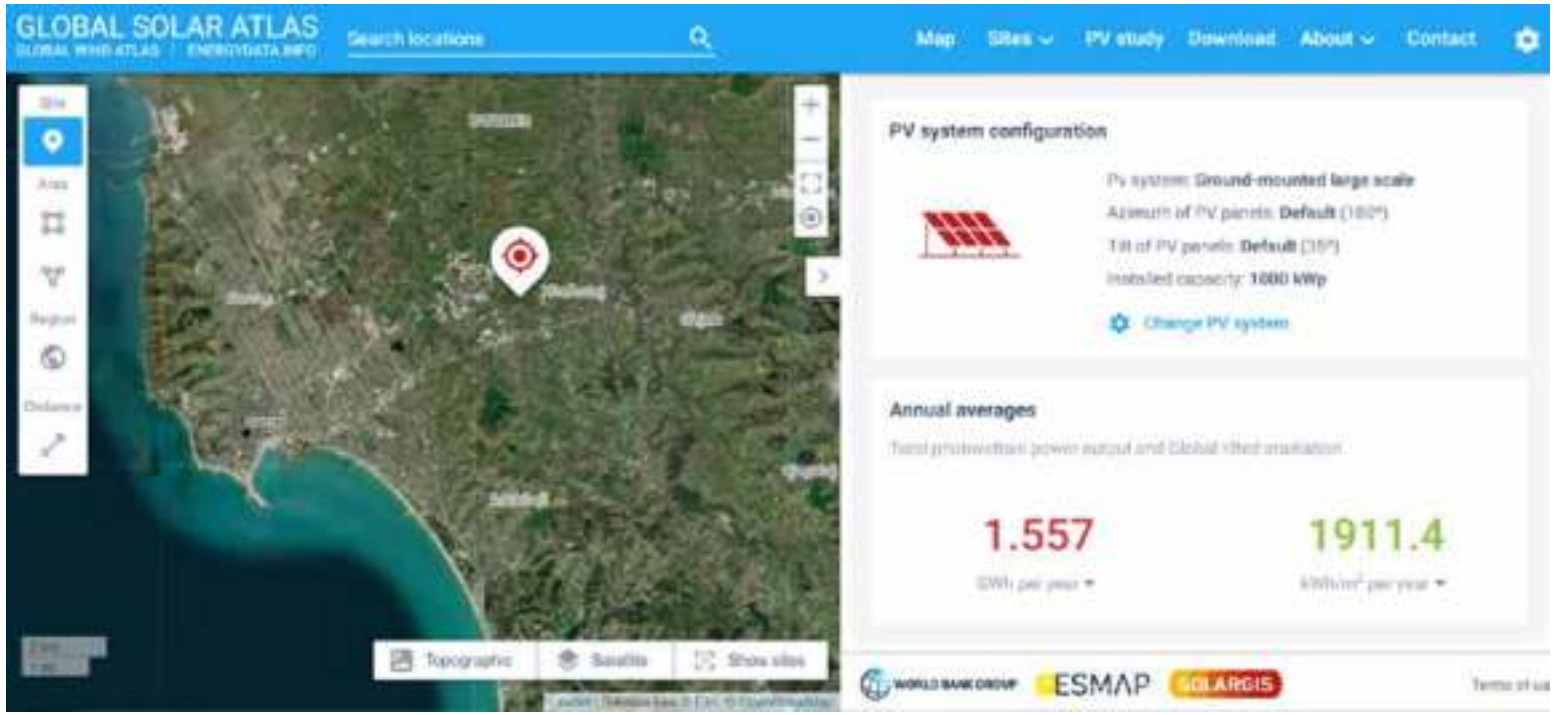


XHAFZOTAJ

AREA

XHAFZOTAJ

EXPLOITATION PERFORMANCE



WIND SOLAR HYBRID SYSTEM

EAGLE ①

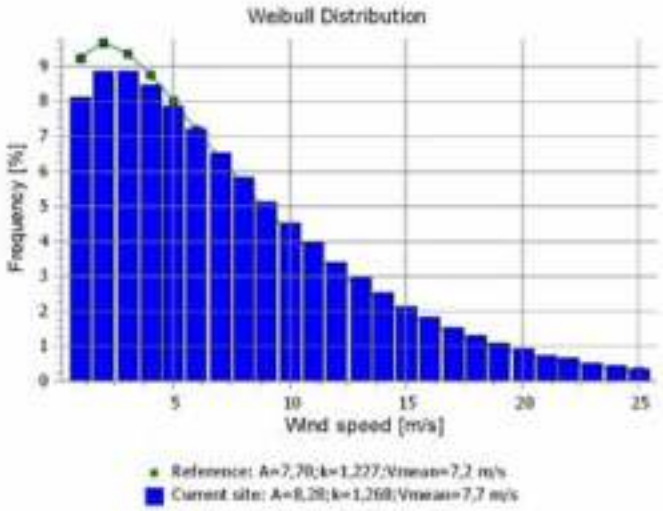
SITE VIEW

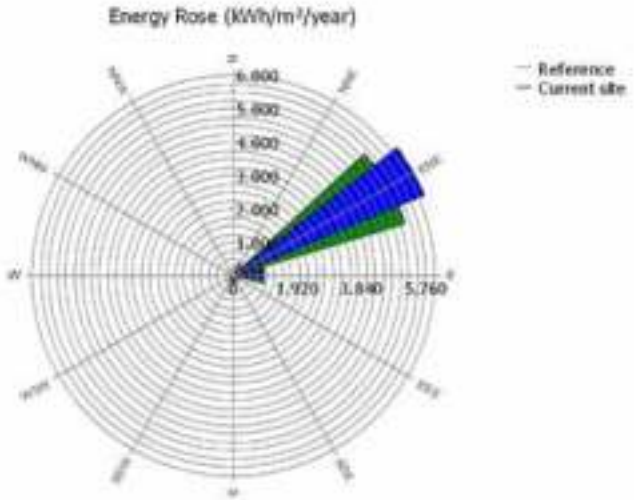
EAGLE ①

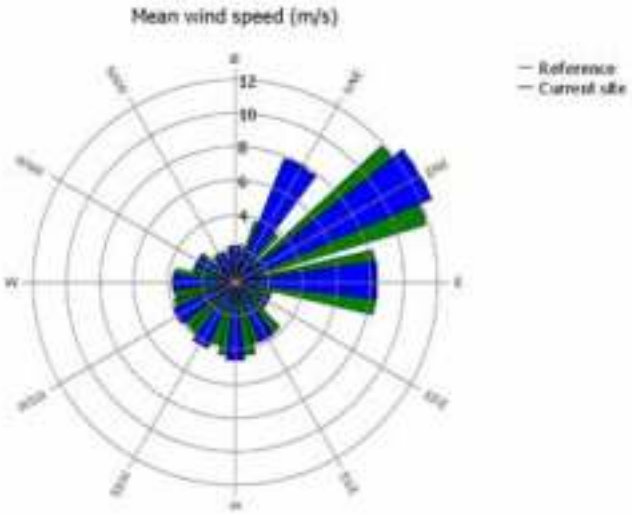
PROJECT PROFILE

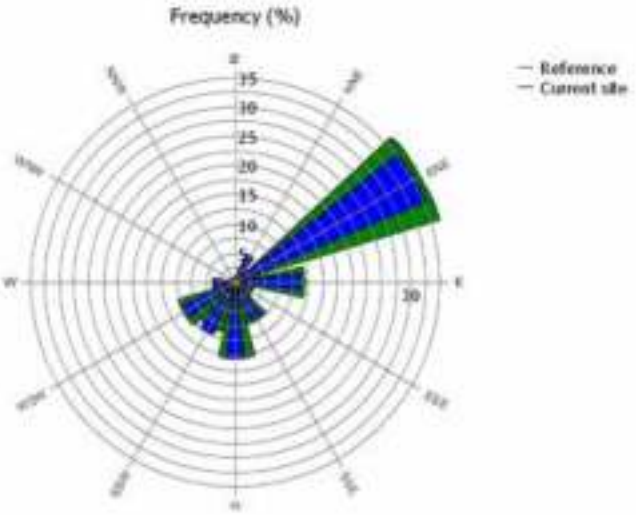
EAGLE ①

WIND


Weibull Distribution
Frequency [%]
Wind speed [m/s]
Reference: A=7,70;k=1,227;Vmean=7,2 m/s
Current site: A=8,28;k=1,268;Vmean=7,7 m/s


Energy Rose (kWh/m²/year)
Reference
Current site
1.920
3.840
5.760


Mean wind speed (m/s)
Reference
Current site


Frequency (%)
Reference
Current site

EAGLE ①

WIND

PARK - Main Result

Calculation: Puke Large Area Largest Layout

Wake Model N.O. Jensen (RISØ/EMD)

Calculation performed in UTM (north)-WGS84 Zone: 34
At the site centre the difference between grid north and true north is: -0,8°

Power curve correction method
New windPRO method (adjusted IEC method, improved to match turbine control) <RECOMMENDED>
Air density calculation method
Height dependent, temperature from climate station
Station: SHKODRA V3 2014
Base temperature: 16,1 °C at 44,0 m
Base pressure: 1013,3 hPa at 0,0 m
Air density for Site center in key hub height: 553,1 m + 80,0 m = 1,147 kg/m³ -> 93,6 % of Std
Relative humidity: 0,0 %

Wake Model Parameters
Wake decay constant 0,075 DTU default onshore

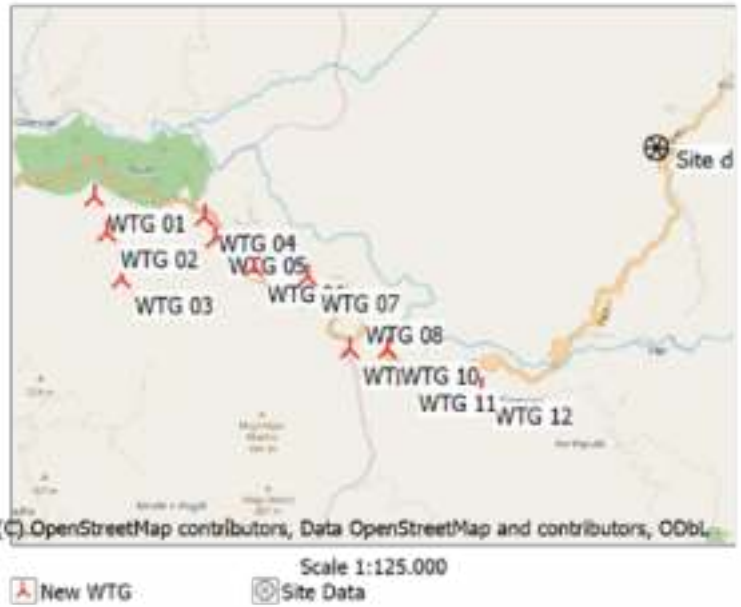
Omnidirectional displacement height from objects

Wake calculation settings

Angle [°]			Wind speed [m/s]		
start	end	step	start	end	step
0,5	360,0	1,0	0,5	30,5	1,0

Wind statistics AL Puke MCP - MCP session (1) - [Matrix].mws

WAsP version WAsP 12 Version 12.07.0048



Key results for height 80,0 m above ground level

Terrain UTM (north)-WGS84 Zone: 34

	Easting	Northing	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A	401.803	4.651.591	Site data: StatGen	WAsP (WAsP 12 Version 12.07.0048)	5.156	7,2	0,4

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK [MWh/y]	Result-10,0% [MWh/y]	GROSS (no loss) Free WTGs [MWh/y]	Wake loss [%]	Specific results*) Capacity factor [%]	Mean WTG result [MWh/y]	Full load hours [Hours/year]	Mean wind speed @hub height [m/s]
Wind farm	242.852,2	218.567,0	246.563,9	1,5	34,6	18.213,9	3.036	9,3

*) Based on Result-10,0%

EAGLE ①

SOLAR

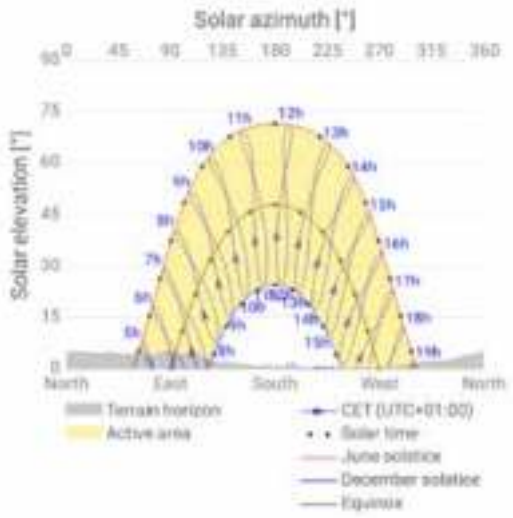
SITE INFO

Map data — Per year

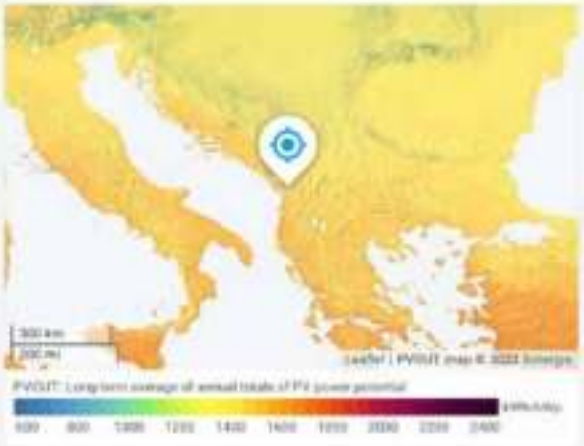
Direct normal irradiation	DNI	1633.0
Global horizontal irradiation	GHI	1553.2
Diffuse horizontal irradiation	DIF	599.9
Global tilted irradiation at optimum angle	GTI opta	1816.2
Optimum tilt of PV modules	OPTA	34 / 180
Air temperature	TEMP	14.6
Terrain elevation	ELE	456

Map

Horizon and sunpath



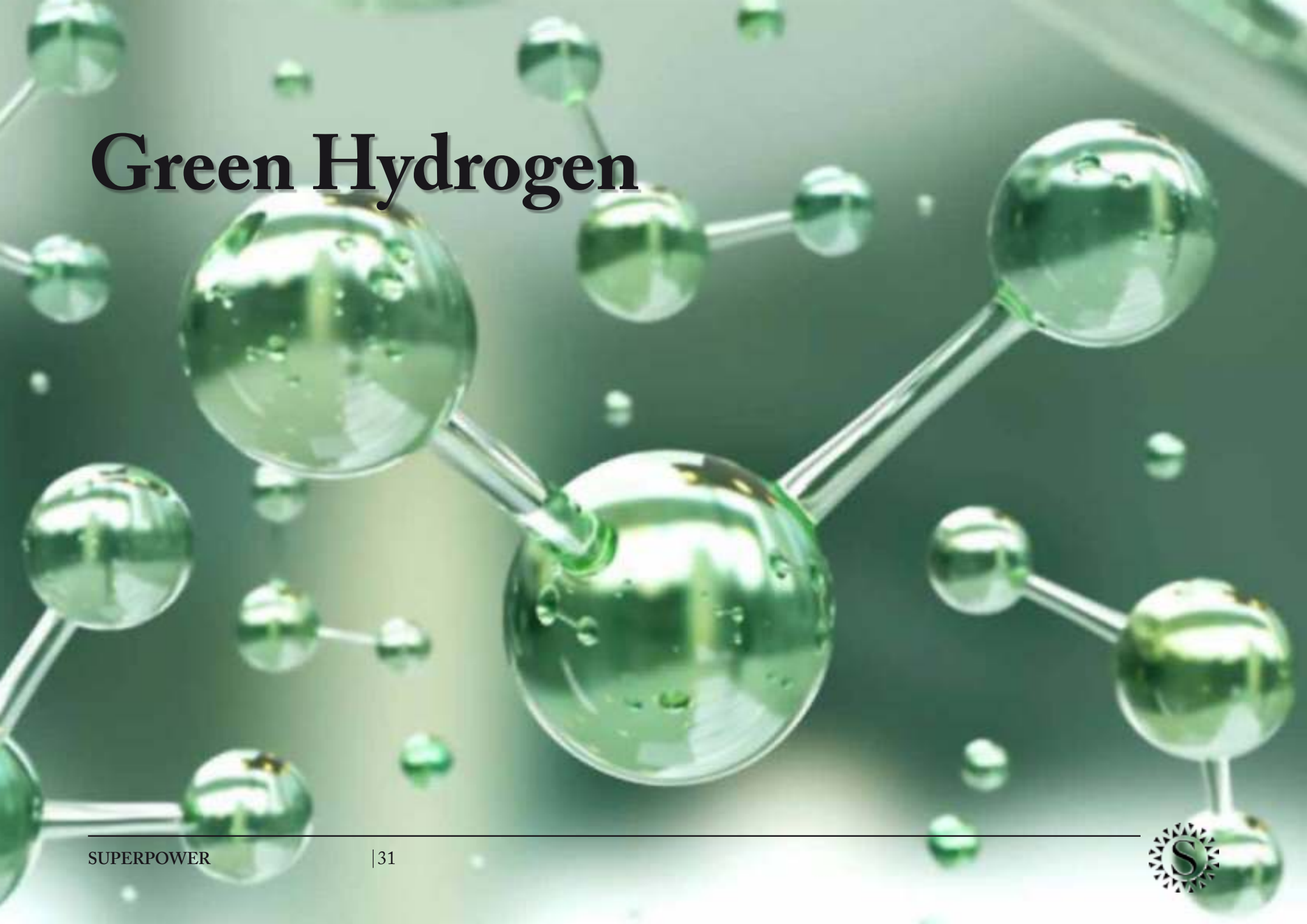
PVOUT map



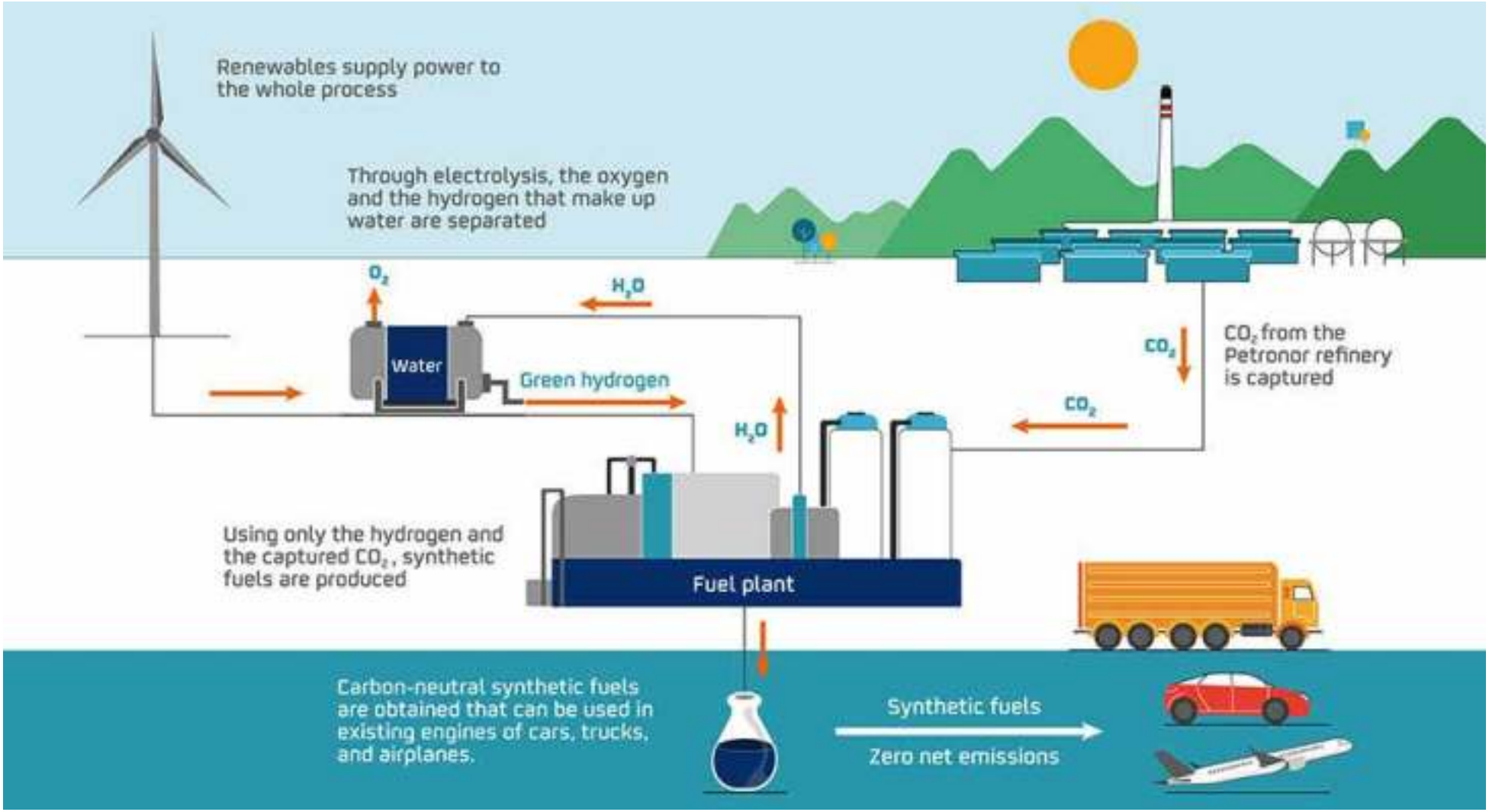
EAGLE ①

SOLAR

Green Hydrogen



R&D


Renewables supply power to the whole process
Through electrolysis, the oxygen and the hydrogen that make up water are separated
O_2
H_2O
Water
Green hydrogen
H_2O
CO_2
CO_2 from the Petronor refinery is captured
CO_2
Using only the hydrogen and the captured CO_2, synthetic fuels are produced
Fuel plant
Carbon-neutral synthetic fuels are obtained that can be used in existing engines of cars, trucks, and airplanes.
Synthetic fuels
Zero net emissions

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