E4F: IO.1 MODULE 3 - Renewables Energy Market

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Objectives

a. Have a clear idea of the European renewable energy context

b. Have a good knowledge of the market that regulates renewable energy sector

c. Have a good knowledge the different sources of renewable energy

d. Know the funding opportunities and policies

e. Be aware of the European best practices and success stories of this sector

Contents

The chapter about the EU context includes a focus on the geographical and economic context about renewable energy and the legislation under which they are used to produce electricity and promote their business model. A last paragraph shows the future opportunities for this sector.

This second chapter dealing with the different types of Renewable Energy includes 4 different types of renewable energy from the oldest one (the Hydropower) to the new frontier of the Wave Power and the Agri-voltaic.

Renewable energy is the joint name for power generated using renewable resources, like wind, water resources, sun, heat from the planet surface.

The share of renewable power in energy consumption has increased from 9.6% in 2004 to 18.9% in 2018. The five EU countries with the largest percentage of their power generated from renewable energy sources (based on 2018 data from Eurostat) are Austria, Latvia, Finland, Sweden and Denmark. Moreover, according to the EU's latest energy statistical datasheets, renewables are currently the leading electricity generation source in the EU.

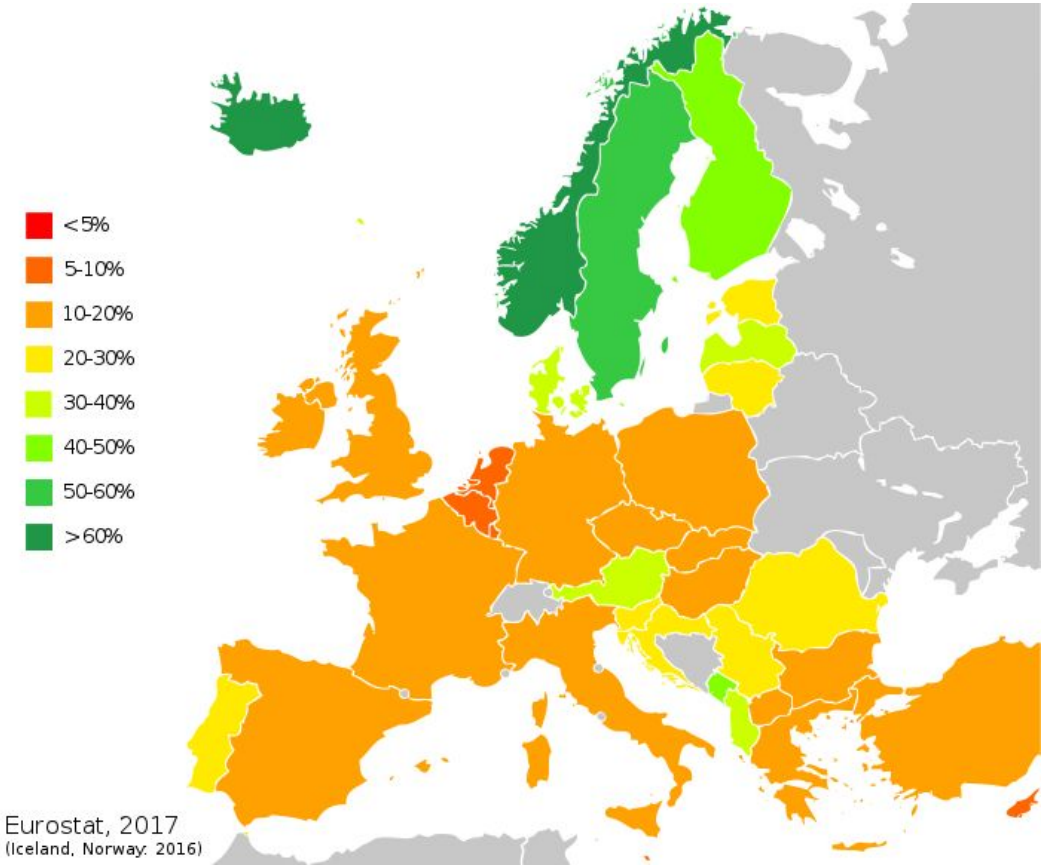


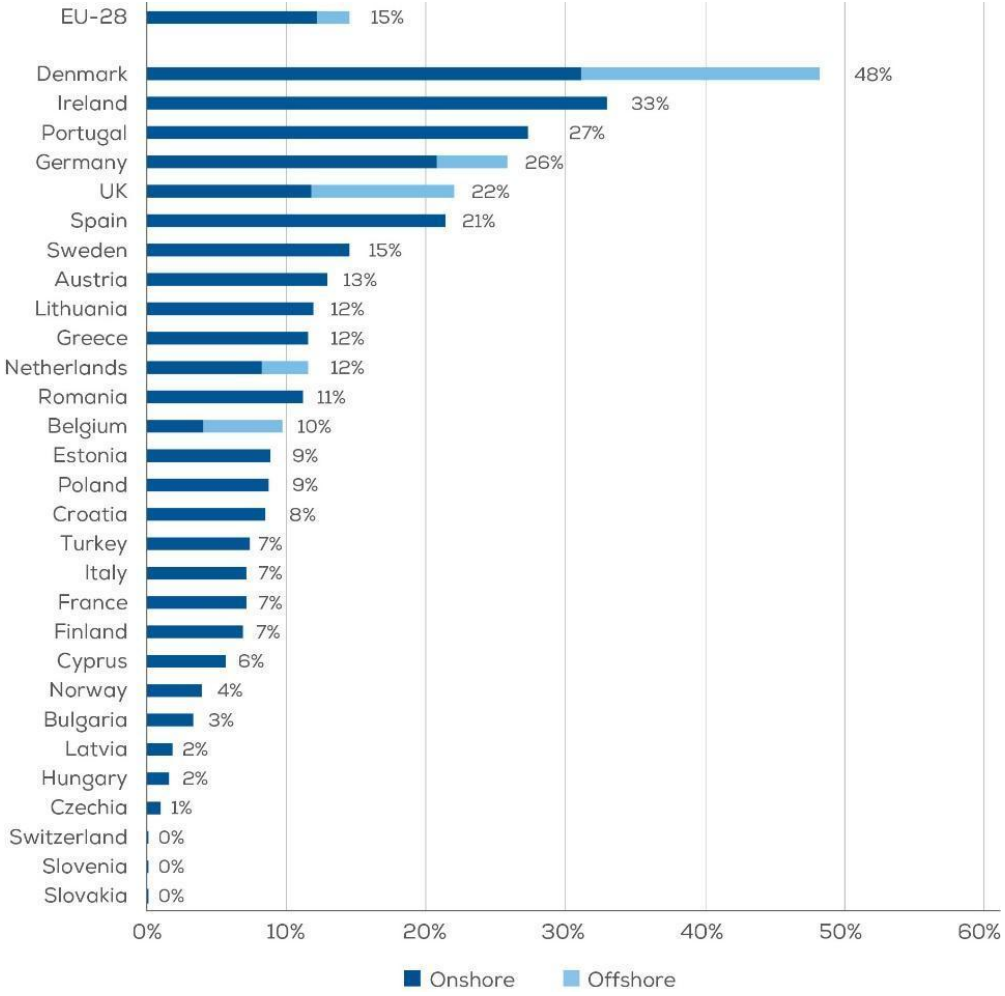
Figure 1 - Share of renewable energies in gross final energy consumption in selected European countries (2017)

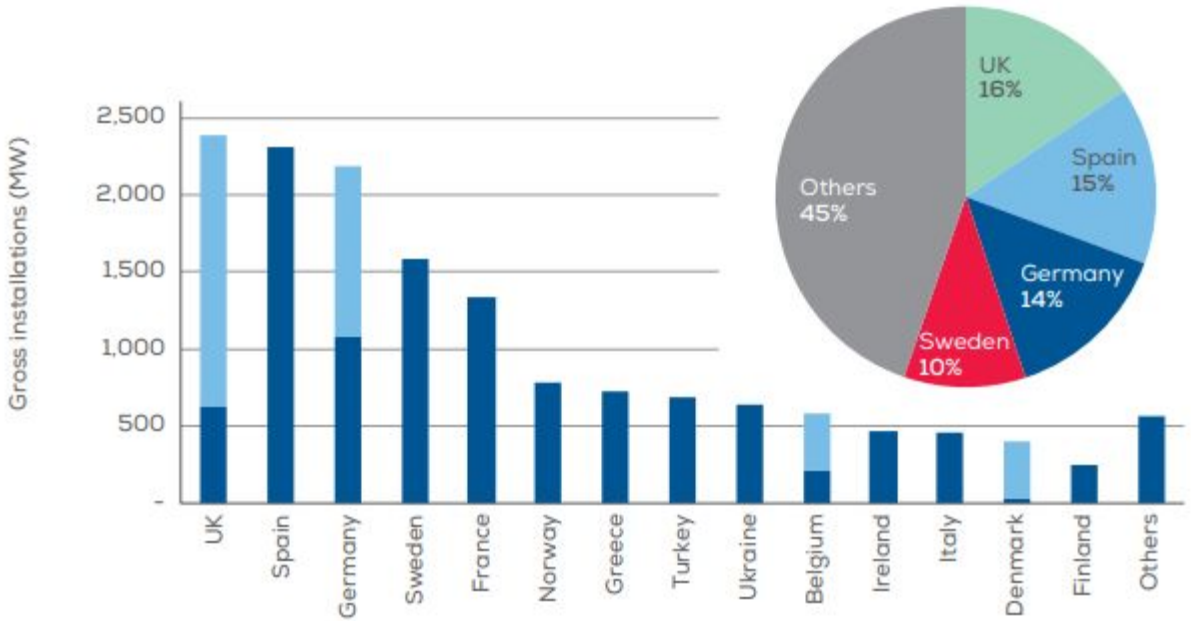
The share of renewable sources in the final consumption of energy has increased in all EU countries since 2004. The first country was Sweden with over half (54.6%) of its electricity provided by renewable sources in 2018 in terms of gross energy consumption, followed by Finland (41.2%), Latvia (40.3%), Denmark (36.1%) and Austria (33.4%). The lowest percentage of renewables in 2018 was registered in the Netherlands (7.4%), Malta (8.0%), Luxembourg (9.1%) and Belgium (9.4%).

To see the growth of renewable power use on farms, we would need to carry them more effectively in their transition to clean energy. In addition to monetary support, such as grants, subsidies and feed-in tariffs, capacity building efforts are crucial enabling factors. Also, information about RE use and production's successful practices should be shared to show farmers the concrete benefits of renewable energy.

WIND POWER

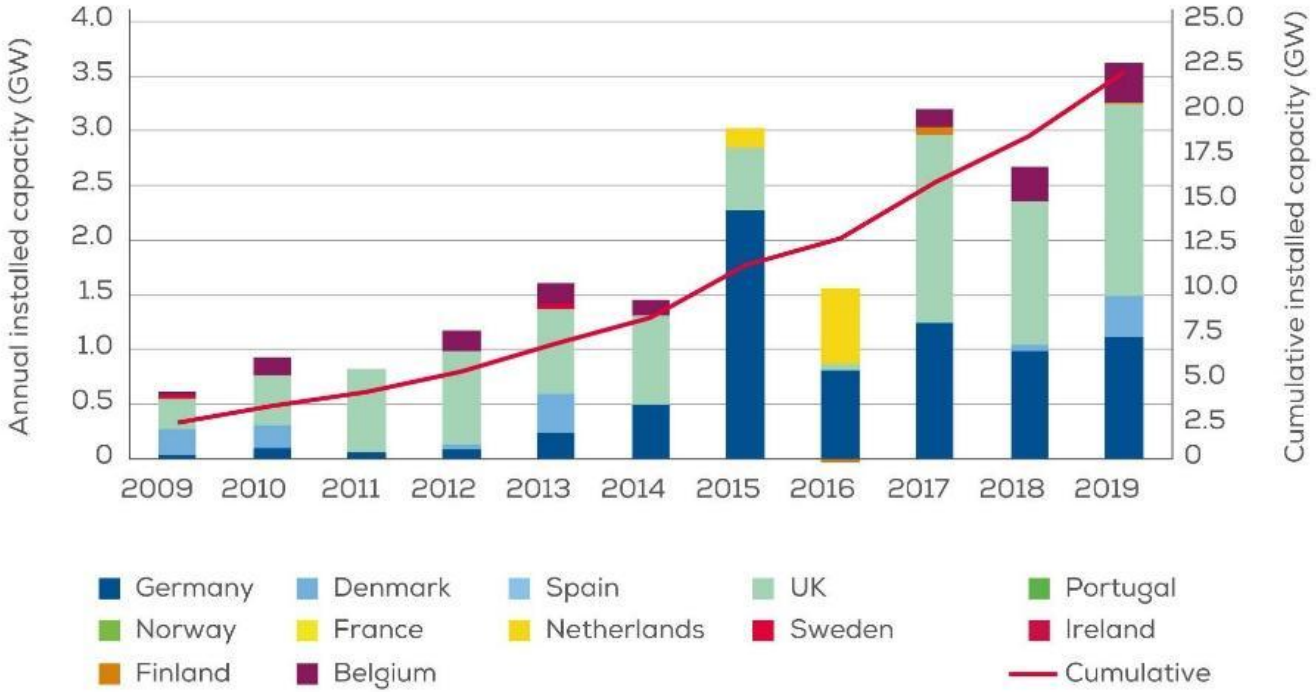
> 40%
20-30%
10-20%
< 10%


EU-28 15%
Denmark 48%
Ireland 33%
Portugal 27%
Germany 26%
UK 22%
Spain 21%
Sweden 15%
Austria 13%
Lithuania 12%
Greece 12%
Netherlands 12%
Romania 11%
Belgium 10%
Estonia 9%
Poland 9%
Croatia 8%
Turkey 7%
Italy 7%
France 7%
Finland 7%
Cyprus 6%
Norway 4%
Bulgaria 3%
Latvia 2%
Hungary 2%
Czechia 1%
Switzerland 0%
Slovenia 0%
Slovakia 0%
0% 10% 20% 30% 40% 50% 60%
Onshore
Offshore

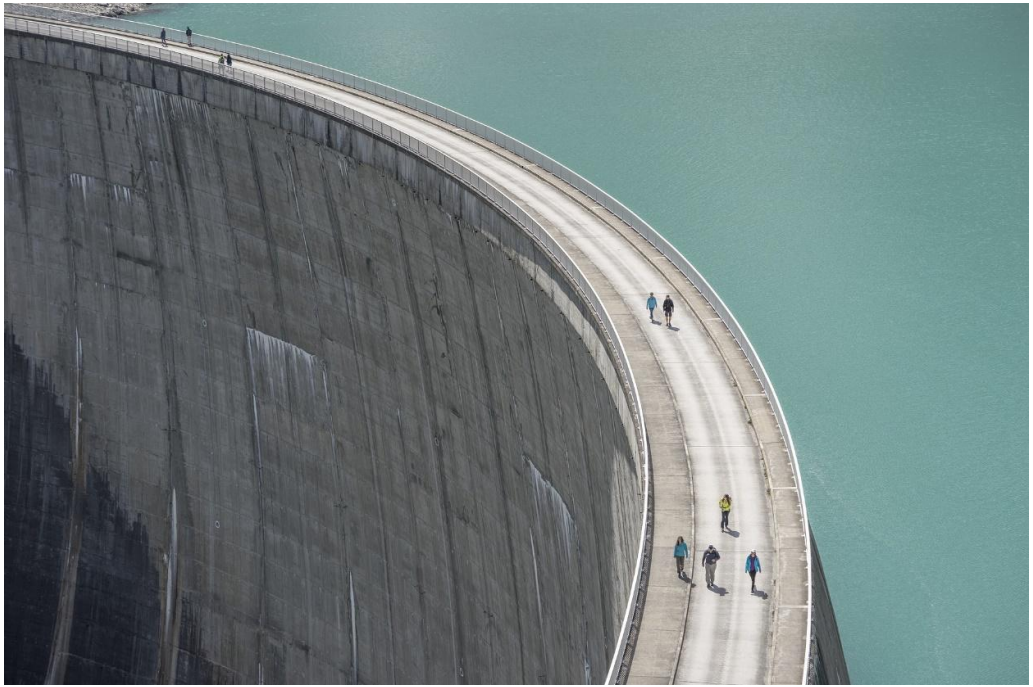


MW																
	Offshore	1,764	-	1,111	-	-	-	-	-	-	370	-	-	374	-	8
	Onshore	629	2,319	1,078	1,588	1,336	780	727	686	637	207	463	456	28	243	563
	Total	**2,393**	**2,319**	**2,189**	**1,588**	**1,336**	**780**	**727**	**686**	**637**	**577**	**463**	**456**	**402**	**243**	**571**

Source: WindEurope


Annual installed capacity (GW)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
Cumulative installed capacity (GW)
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Germany
Denmark
Spain
UK
Portugal
Norway
France
Netherlands
Sweden
Ireland
Finland
Belgium
Cumulative

HYDROPOWER



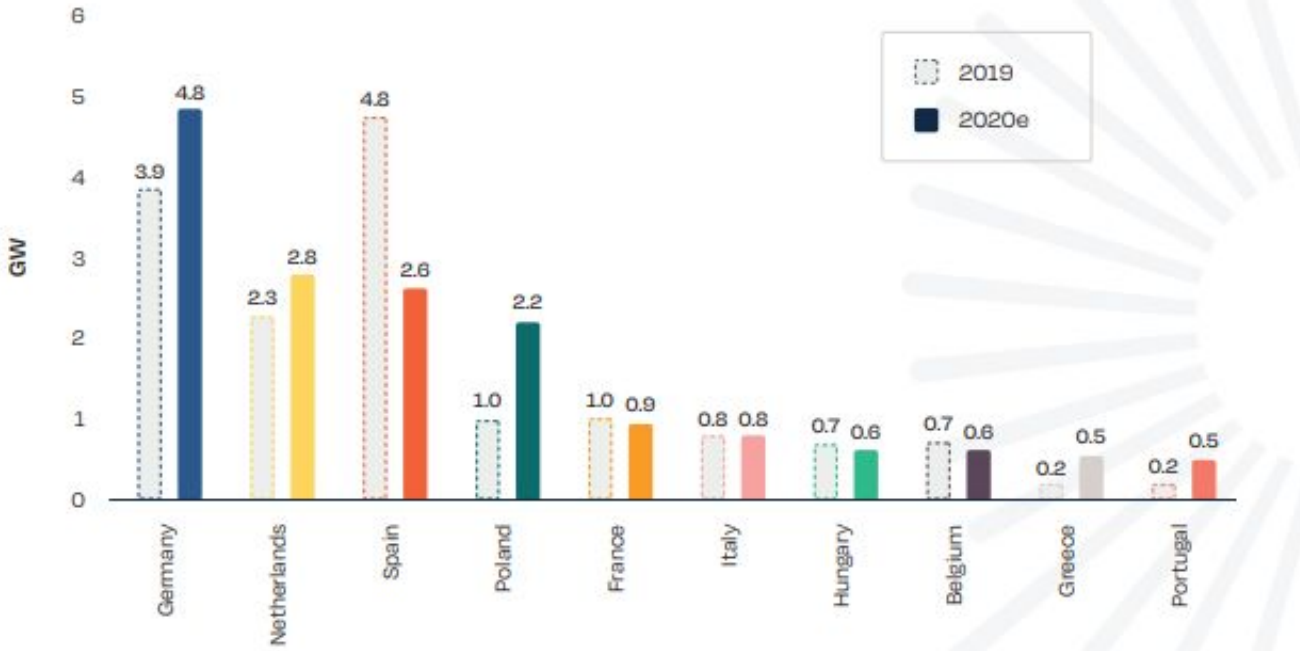
Almost 60% of Europe's whole installed hydropower capability is more than 40 years old and now needs to adapt to evolving grid and environmental laws, as well as new operational requirements. Modernization and uprating are necessary for existing hydropower plants to improve their efficiency and safety, hold their lifetime and provide the necessary grid services. Reduced investment because of very tough environmental stipulations, low electricity prices, and doubtful and inconsistent climate and energy policies, has been countered in European territories where there is a strong interest in boosting the economy and securing better water and electricity supplies.

Hydropower for Agriculture

Hydropower is one of the most constant energy sources among renewables. In various sizes, hydropower plants can be low cost and still produce enough energy for farming purposes. Power is produced from water streams or rivers that run through a turbine which rotates and turns tools or a generator for electricity production. The opportunity of using a "zero-head" or "in-stream" turbine allows applying kinetic and not potential energy, providing a maximum amount of electrical power without building dams or height differences, reducing investment costs for infrastructure and making it a low-cost, convenient solution for powering agriculture

SOLAR POWER

FIGURE 3 EU27 TOP 10 SOLAR PV MARKETS, 2019-2020



Solar Power for Agriculture

Solar energy is the power the Earth receives from the sun, principally as visible light and other electromagnetic radiation forms. Solar energy is among the easily achievable renewable energy sources on the planet, but its availability and features vary enormously from one region to another.

The solar energy potential is higher in regions near the equator, which overlap with many global South countries. Particularly in off-grid areas, solar energy in agriculture can considerably improve livelihoods, enabling access to irrigation, cooling, drying and other agri-food processing methods. Despite the suitability of these regions for solar power and the potential to improve living standards, many obstacles still prevent end-users from adopting this clean energy, including the lack of information and access to finances.

Depending on the solar source potential and its quality, solar energy can serve different purposes, leading to a wide diversity of solar technologies. They can be either passive or active, depending on how daylight is captured, saved and shared. Active solar technologies include solar photovoltaic and solar thermal systems; which turn sunlight into valuable energy. Passive solar techniques involve designing buildings, materials and spaces, allowing the optimization of the use of solar power, such as orienting a building towards the sun or choosing materials with favourable thermal conductivity, or insulation properties.

- Solar Powered Technologies for Irrigation

Among renewable energy, solar power is the most engaging alternative for irrigation. As costs for solar modules have fallen considerably in recent years, solar-powered irrigation systems (SPIS) have become more attractive from a financial perspective.

- Agrophotovoltaics: growing under solar panels

Agrophotovoltaics aims to combine electricity production with agricultural activity in the same area. Without certain precautions, it is imp
to cultivate land with photovoltaic panels, which, if placed close to the ground, makes cultivation impossible.

Like the panels, planning aspects must be placed at a height and distance that is adequate for the passage of mechanical means. The climatic conditions of the area concerned must also be taken into account. The panels must be sufficiently stable for safety reasons, as gusts of wind could cause them to fall, which could put farmworkers at risk; crop optimisation. According to the needs of the crops, it is necessary to evaluate the microclimatic conditions created by the panels' presence.

From a construction point of view, two solutions are possible:

- The static configuration, in which the inclination of the panels is predetermined and cannot be changed. This is the simplest, most economical and most reliable type of construction. The critical points are related to the fact that there is no flexibility on the shadow zones created, with possible consequences on the crops;
- The dynamic configuration allows the orientation of the panels to be changed, varying any areas of shade. Therefore, it is possible to place the panels in a vertical position, if you want to avoid or limit damage, or in a horizontal position, for more excellent crop protection in the event of frost and hail.

The solar tracking systems allow increasing the panels' efficiency, since they can tilt according to the sun's position, for more significant light capture and consequent energy production.

A success story, in this case, comes from the Netherlands. The dutch company Kusters Zachtfruit, in fact, has started growing small fruit under solar panels. The solar panel test installation, placed in 2020 above the crops in collaboration will now be extended to full coverage. The installation will generate green energy, but will also act as protection against extreme weather events, enabling crops to have a more favourable climate and better protection. The company believes that the quality of the fruit has improved thanks to the solar panels

WAVE POWER

Waves are actually a concentrated form of wind energy, capable of travelling considerable distances with minimal losses. Estimates of potential production from wave energy vary from 4000TWh/yr up to 29500TWh/yr. Europe's electricity consumption stands at around 3,300TWh/year. Europe's Atlantic coast offers some of the world's best wave energy sites, with giant swells travelling across the ocean and landing on the UK, Ireland, France, Portugal and Spain.

Some tips for creating a startup in the Green Labour Market

Startups are more and more involved in new green technologies, innovation processes, and new eco-products creation. The market for green jobs is certainly on the rise, and will be even more so as a result of the Green New Deal and NextGenerationEU funding. Employment in this sector has grown by 20 % since 2000 and now provides 4.2 million jobs.

Success stories from startups

Following EU-STARTUPS.COM, these are the 10 best cleantech startups in 2019

Solar Foods is producing a new kind of nutrient-rich protein using air, water, and electricity. Solar Foods is changing food production, as its product is not conditioned by agriculture, weather, or climate, and the technology has huge potential in terms of protecting land and water resources. The company plans to start industrial production of its protein by 2020, which it presumes will be cheaper than other sources such as soy protein. Founded in 2017, Solar Foods has already raised €2 million.

DEPsys is paving the way towards a future of smart grids and microgrids. Its versatile control platform lets power grid operators manage distribution grids safely, reliably and optimally – making it possible to feed huge quantities of renewable energies into their grids from decentralised sources.

Otovo has created a platform that sells solar panels, comparing the costs of dozens of local installers in a very short time. Otovo's solar panels generate clean energy for 25 years, and the startup will buy back any extra energy generated by people. Otovo won the Oslo Innovation Award 2018, raised €10.5 million and acquired the French solar panel startup In Sun We Trust.

The Ocean Cleanup has taken on the massive goal of cleansing the oceans of 90% of their plastic waste by 2040. In September 2018, the startup presented its solution: tube barriers that act as an artificial coastline, collecting ocean debris in the Great Pacific Garbage Patch discovered between California and Hawaii. The startup is now working to fix the device. The Ocean Cleanup has raised $35.4 million to date, and Time Magazine placed it on its 25 Best Inventions of 2015 list.

Orbital Systems collaborated initially with NASA to develop the technology for their shower system, called OAS, which the company claims decreases water waste from showers by 90%. OAS reuses the same batch of water with a built-in purification system, utilising two gallons per shower – versus 20 gallons of a typical shower. This company intends to take this technology developed for space and put it in people's homes, which would save water and save families a lot of money.

Phytoponics has developed a business-scale hydroponic growing system called Hydrosac, cheaper than traditional hydroponic systems. Hydroponics implements an innovative solution that can address world hunger and sustainability. According to the startup's CEO, Adam Dixon, using hydroponic solutions like Hydrosac, we will only have to utilize 10% of land for agriculture by 2050.

Ducky is tackling climate change with innovative devices to measure, teach, and mobilise citizens to take action on carbon sustainability. Ducky's platform suggests a range of products based on climate and environmental research data. You can monitor your footprint in their climate calculator and reduce your carbon emissions through team games. The startup produces tools for businesses, associations, and schools to mitigate their impact on the climate.

Lilium Aviation is developing a VTOL (Vertical Take Off and Landing) electric jet, which it intends to expand commercially as an air taxi that can be scheduled easily within an app by 2025. The plane will be emission-free, with energy performance comparable to an electric car. Moreover, it has an expected range of 300 km and estimated top speed of up to 300km/hr. Avoiding road congestion, customers will be able to travel from Munich to Frankfurt in over an hour.

Tibber has designed an app that works as an energy business and advisor for homeowners. The app operates as a smart assistant that can buy, control, and conserve energy. You can buy electricity directly through the app, which also monitors your home, using smart analyses to find ways to save you energy.

Wind Mobility is one of the more innovative startups to join the crowd. Like other e-scooter startups, wind's scooters are electric and emissions-free, and clients can open, park, and pay for its dockless scooters through an app, with prices starting from €1 per user.

Other E+ Projects

https://manual.newagronet.com/

Thank you!

See you in Bologna!