

A black and white photograph of four wind turbines in a field. The turbines are white with three blades each. They are situated in a grassy field with rolling hills in the background. The sky is cloudy. The image is used as a background for the slide.

EPRG Winter Seminar

*Session on renewables & infrastructure
investment*

8th of December 2023

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I. Our Business

GIRA
Strategic Finance

Overview

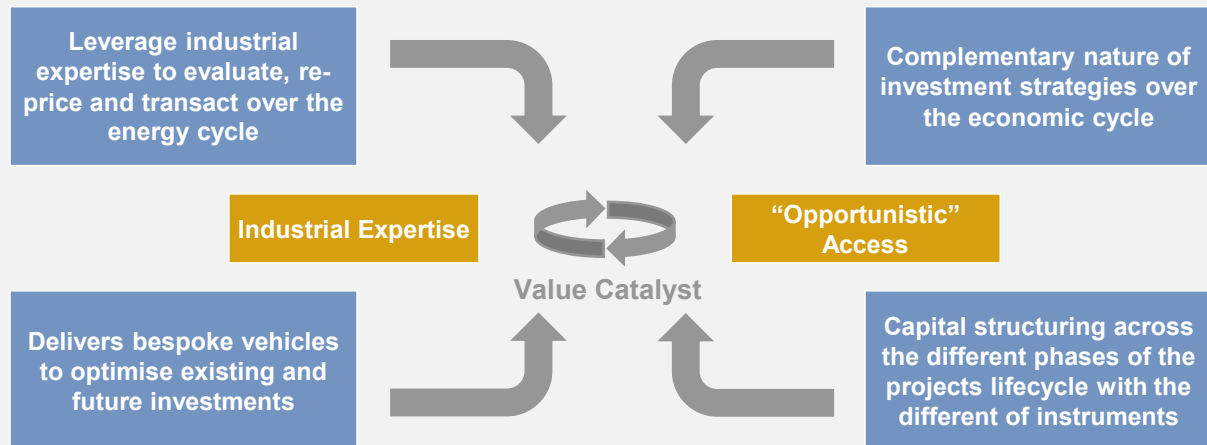
Mission

- GIRA is an independent industrial merchant bank geared to deliver value over the energy & real assets investment cycles

Proven Energy Infrastructure Experience

- Regulated bank by the **British Financial Conduct Authority**
- Our management team consists of investment professionals with a track record of successfully investing across numerous energy industry cycles
- Investment expertise in excess of 100 years spanning numerous cycles, across a mix of segments in the energy infrastructure space and changing market dynamics and identifying an appropriate cost of capital
- Successful investment in innovative value-add deals
- Proven asset management and technological innovation in the energy sector

4 Key Differentiators in GIRA's Offering

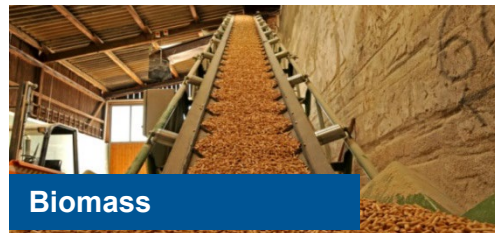


Our Expertise in Real Assets

GIRA is an industrial merchant bank geared to deliver value over the energy investment cycles



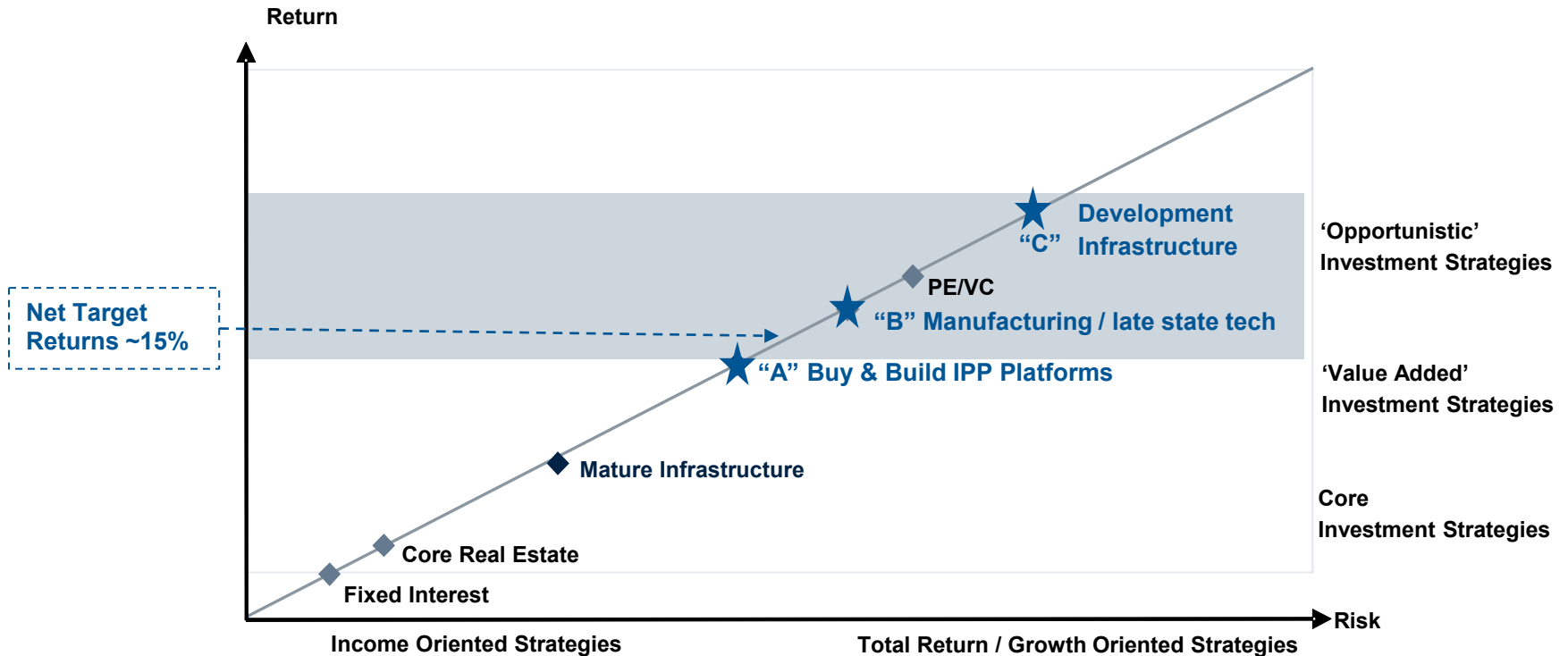
GIRA
Strategic Finance



Our Investment Strategy at the heart of the Energy Transition

Yield & Growth strategies in Real Assets

Risk/Return Profile of Infrastructure Investment



GIRA engages in opportunities across the value chain from Development Infrastructure and Buy & Build platforms to Manufacturing / late stage technology companies

For illustrative purposes Only: There can be no assurance that the above targets will be achieved

II. Renewable Energy Landscape

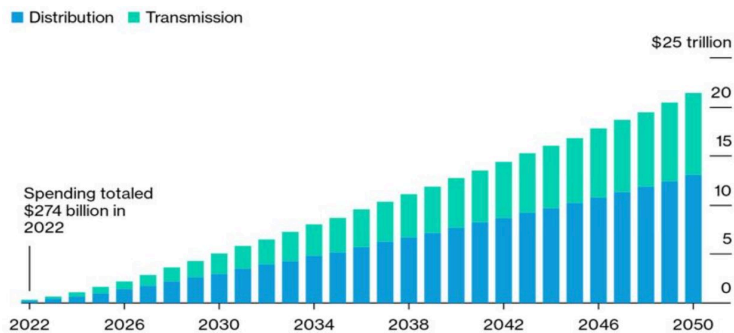
Global Renewable Energy Need: 3x by 2030!

The current global energy crisis and Climate Crisis has added new urgency to accelerate clean energy transitions and highlighted once again the key role of renewable energy

The grid is running out of capacity¹

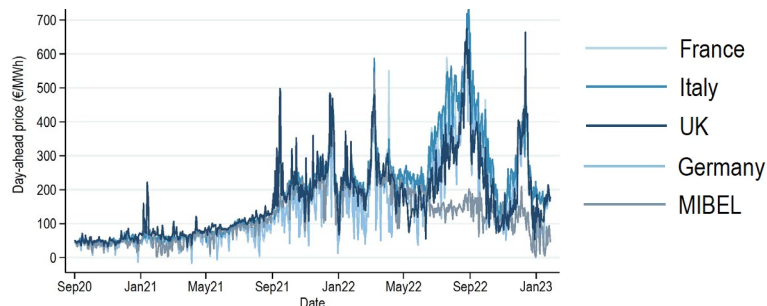
More than 1,500GW of wind and solar projects are waiting to be connected to the grid in the US and Europe

Global Grid Spending forecasts (2022-2050)



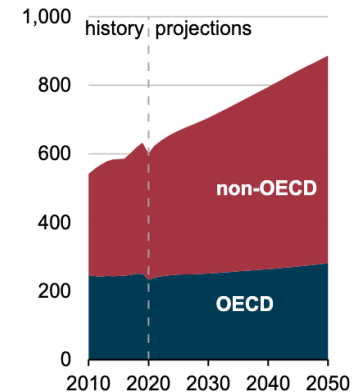
Energy prices spike³

Evolution of wholesale electricity prices in Europe – 2020-2023



The world needs more energy²

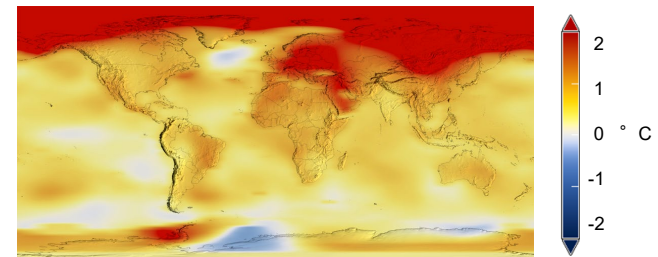
World energy consumption forecasts (2010-2050) in quadrillion British thermal units



Global climate change is accelerating⁴

The average temperature of the surface has risen 1.1° C as a result of CO₂ emissions from burning fossil fuels

Global Temperature Anomalies (2017-2021)



More renewable energy sources are crucial to fight climate change, reduce energy prices, decrease the world dependence on fossil fuels and ensure the security of supply

1. BloombergNEF

2. U.S. Energy Information Administration, International Energy Outlook 2021

(IEO2021) Reference case

3. Red Eléctrica; investing.com

4. NASA's Scientific Visualization Studio

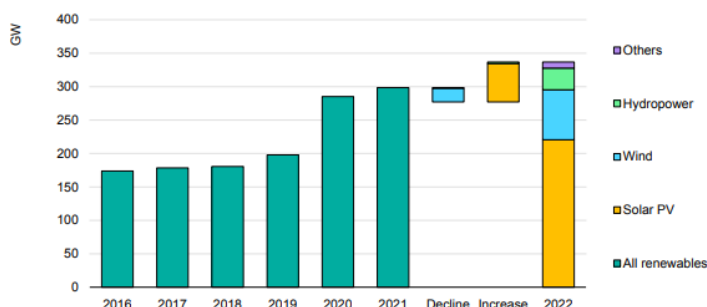
Global Renewable energy sector overview

The aftermath of the COVID-19 pandemic and the ripple effects of the Ukraine crisis have further compounded the challenges facing the transition

Annual deployment of some 1,000 GW of renewable power is needed to stay on a 1.5C pathway. In 2022, some 340 GW of renewables were added globally, accounting for 83% of new capacity compared to a 17% share combined for fossil fuel and nuclear

Annual renewable capacity additions broke a new record in 2021

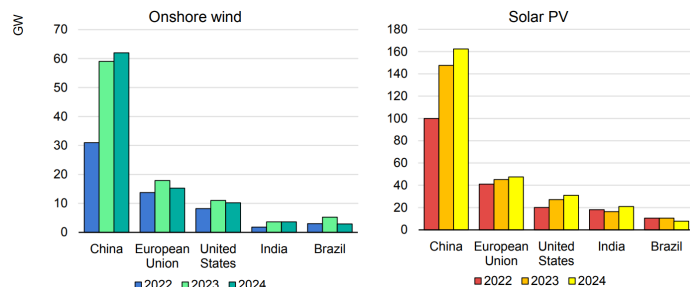
Overall renewable energy capacity additions rose by almost 13% to nearly 340 GW in 2022. However, solar PV was the only technology that broke a deployment record last year, with net additions of nearly 220 GW – a 35% increase from 2021



Renewable Energy net capacity additions, 2017-2022

China largely maintained its market share of deployment in 2022

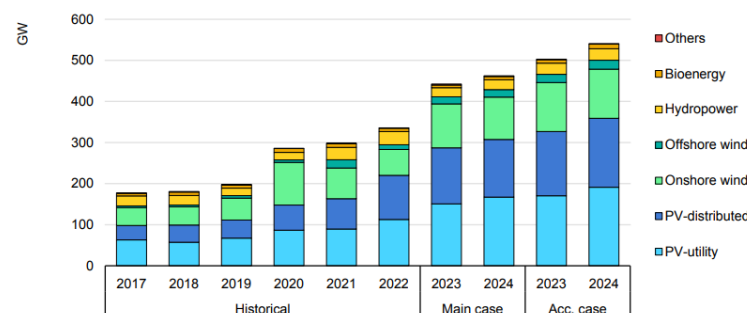
Annual PV growth rose in all major markets in 2022 while wind power capacity additions decreased for the past two consecutive years



Renewable net capacity additions by country and region, 2022-2024

2022-2023 forecasts for annual renewable capacity additions

- Solar PV will remain the main source of global renewable capacity expansion in 2023 accounting for 65% of growth with distributed applications
- Annual global onshore wind capacity additions are expected to jump 70% in 2023 to break the 2020 record. This surge is being fuelled mostly by the commissioning of projects in China that were delayed by Covid-related restrictions last year
- Offshore wind growth is also expected to recover from a major drop in annual additions last year resulting from a policy rush in China in 2021



Higher solar PV and wind costs are here to stay

- Expanding policy support, growing energy security concerns and improving competitiveness against fossil fuel alternatives will continue to support the development of renewable energy in the coming years. These factors are outweighing rising interest rates, higher investment costs and persistent supply chain challenges
- Annual solar PV market growth is expected to continue, reaching almost 310 GW in 2024, an increase of over 7% from 2023. Lower module prices, greater distributed PV system uptake and a policy push for large-scale deployment will trigger higher annual additions in all major markets including China, the European Union and the US
- However, permitting challenges and limited participation in competitive auctions might prevent faster growth of utility-scale wind and solar PV

III. Selection of projects

Example of a Hydrogen platform - H2SEL

A patented and cost-effective application to process waste and produce green hydrogen

Business Model

Vision: Establish a Pan European W2H platform



- H2SEL is one of the most advanced and cost-effective projects in the UK to convert a broad variety of waste streams into pure green hydrogen via plasma gasification
- The main partner in the project, owns a patented singaz process and has been running green hydrogen plants since 2011
- H2SEL business model will be to design, develop and produce plasma gasification plants. The first plant has already MoU's in place for feedstock supply, operational support and hydrogen off takers
- Permitting and planning are on-going with start of construction expected in 2025 for commissioning of the first plant in beginning of 2026

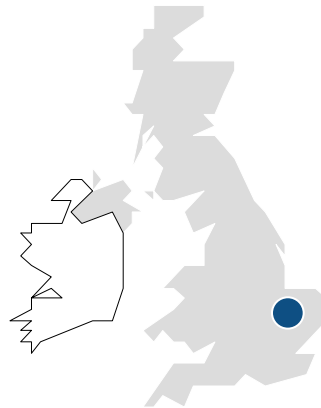
Business Highlights

Sector	Waste to Hydrogen Development/Prod.
Geography	Lincolnshire
Expected production	c. 13 tons of H2
Target Investment	c. £200m
Timing (end date)	
• Feasibility study	Q1 2024
• FEED	Q1 2025
• Construction	Q1 2026
Investment Time Horizon	5 years

Asset under development

c. 13 tons of H2

Yearly hydrogen production under development



● Plant location

Key Facts



- Patented & Innovative process
- Competitive H2 production cost
- Headquartered in Lincolnshire

Key Partnerships

*FEED = Front-End Engineering design

Example of Manufacturing - Ventum Dynamics

A patented and cost-effective horizontal wind turbine producer

Business Model

Vision: Disrupt the Distributed Generation market with a Horizontal Wind turbine manufacturer









- Ventum Dynamics is a Norwegian company offering an opportunity to invest in an innovative horizontal wind turbine solution
- Ventum Dynamics wind turbine is:
 - Omnidirectional and can capture wind in all directions while working non-stop 24/7
 - High efficiency with power yield efficiency in wind speeds ranging from 2 to 50 m/s
 - Available multiple sizes to fit many location from large-scale commercial and multi-unit development applications initially, and thereafter urban residential settings
 - Presents no threat to wildlife and biodiversity
 - Pleasing visual design and no auditory noise
- Ventum Dynamics wind turbine will convert any unused roof space into a new energy source that can operate in most weather conditions
- It is also produced sustainably using recycled materials and offers renewable power generation with a low carbon footprint
- Ventum Dynamics wind turbine could be used as a holistic energy system for commercial and residential buildings and can be adapted to urban areas and infrastructure, enabling energy to become mobile with no transportation of power and therefore minimal loss of energy

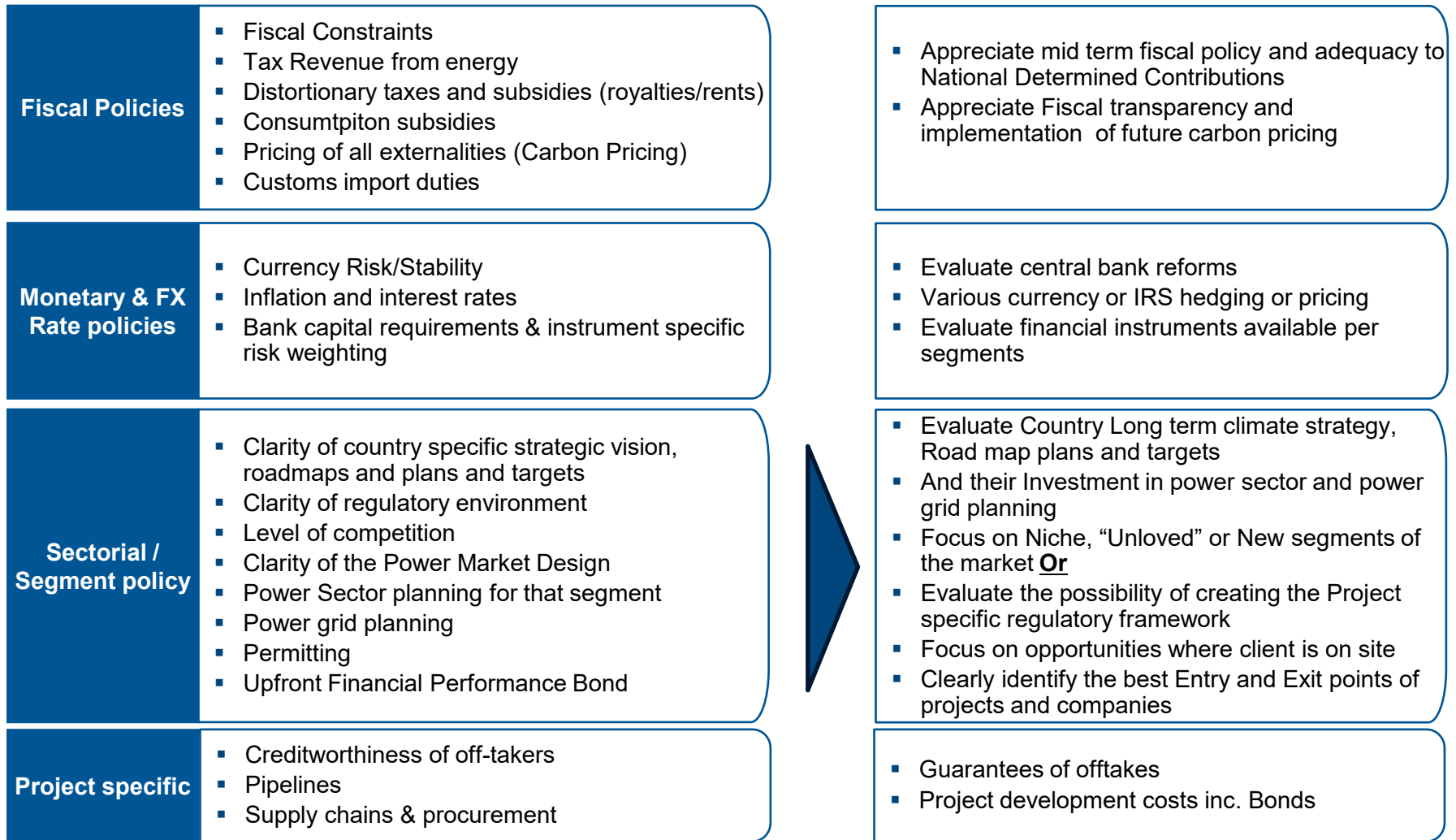
Business Highlights

Sector	Vertical axis wind turbine Manufacturing and IPP
Turbine Production start	Distributed generation
Addressable Market	Retail and C&I
Turbine Production start	Q1 2024

Key Facts

	Unique Technology with 11 patents
	Backlog of 30+k units
	Both urban and large-scale applications
	Strong underlying trends
	Seasoned management team
	Based in Stavanger, Norway

Economic policy challenges & mitigants



Active across all stages of energy and infrastructure projects

In Conclusion

COP 28 so far ...

- **Day 1:** Delegates from nearly 200 countries [agreed on details](#) for running the Loss and Damage fund, a facility designed to help vulnerable countries deal with more extreme weather stoked by global warming. It started with 260m\$ with contribution from the UAE, Germany and UK amongst others.
- **Day 2:** COP28 President Sultan Al Jaber announced the United Arab Emirates will put [\\$30 billion into a climate finance fund](#) called Alterra, which he dubbed a “vehicle like no other.”

Where we see the needs

- Simplify policies and schemes and processes on “bankable” utility scale renewables and projects
- Digitalize as much as possible all the processes
- Educate people on new behaviors to Facilitate / Promote distributed generation
- Push fully integrated solutions of C&I solar, ev and heat pumps as much as possible
- Create funding vehicles to Invest in new technologies to bridge the tech Risk gap.



Thank you!

Appendix 1 - **Ventum Dynamic** the case for decentralised wind energy

Revolutionizing Renewable Energy: Introducing Ventum, the Next Generation of Vertical Wind Turbine

Ventum's vision is to influence innovation in the renewable energy sector by creating a new platform that impacts equally on individuals as it does on commercial clients. Ventum wind turbine is a game-changing turbine system that can be installed on residential and commercial building rooftops, regardless of their location

The Problem

- ❑ The building sector faces the dual challenge of securing reliable and affordable energy to keep real estate and infrastructure running, whilst reaching net-zero emissions 2050
- ❑ Wind energy projects have a complex permitting process and the limitations of large-scale onshore wind turbine create a significant market opportunity for a decentralized wind turbine

Ventum's Answer

- ❑ Ventum Dynamics AS ("**Ventum**") is cleantech company founded in 2019 and headquartered in Stavanger, Norway
- ❑ The company has developed a revolutionary wind turbine using cutting-edge technology and design to maximize efficiency, sustainability and profitability in the small wind power industry
- ❑ Ventum offer a rooftop-friendly wind turbine for on-site power production and consumption.
- ❑ Pilot turbines have been deployed in Norway and multiple sites in the UK to test and verify the design
- ❑ Production version will be tested in Q4-23 and Ventum is aiming to going to market in the UK/EU in Q1 2024

Ventum's turbine presence



Ventum seeks to empower businesses to take control of energy costs, improve energy security, and cut carbon emissions to reach Net Zero faster all at once

Project Overview – The Ventum Turbine

The Next Generation of Vertical Wind Turbine

Ventum's turbine unique design greatly mitigates the limitation of large-scale wind turbines. While being small sized, it takes advantage of winds that are redirected suddenly and accelerated by building edges ("edge effect") to generate unique performance and contribute to energy efficiency

Unique Selling Proposition

- ❑ The Ventum turbine utilises a proprietary unique ducted rotor used in horizontal axis wind turbines mounted in a vertical axis arrangement aiming at harvesting wind energy in the most cost-efficient way
- ❑ **Patented unique shroud** – Omnidirectional, stationary, wind accelerating and turbulence reducing
- ❑ **Augmented Performance** – higher annual energy contribution with a design that allows to capture and concentrate wind from all directions reducing the turbulence and enhancing the wind
- ❑ **Low Noise** – Very minimal noise above ambient (40 dB @6m/s)
- ❑ **Installation** – No tall stands. Can be mounted close to the building tops
- ❑ **Low Maintenance** – reduced fatigue breakdown and vibration
- ❑ **Long Life** – Single moving component with no gyroscopic forces from chasing the wind. Ventum's turbine will be easy to decommission up to follow sustainable recycling pathways (circular based approach)
- ❑ **Aesthetics** – Visually pleasing, architecturally blends in with modern buildings in cities.
- ❑ **Safety** – Internal rotor removes all accident risk in city areas, no bird life loss

Turbine design¹

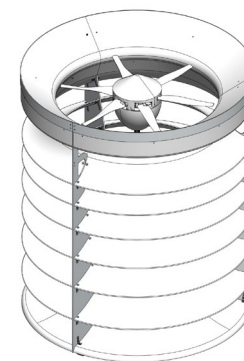
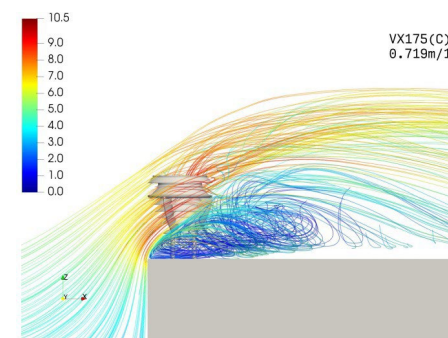


Illustration of the edge effect

Ventum turbine laminate the wind on the edge to generate more energy



Ventum turbine is a revolutionary tool to harness wind energy in an environmentally friendly, decentralised and disruptive way to help the world meet its Net Zero and tackling of GHG inventory by reduction of scope 2 emissions

1. Final production design not disclosed

Use Case – Example of a UK client-led energy solution

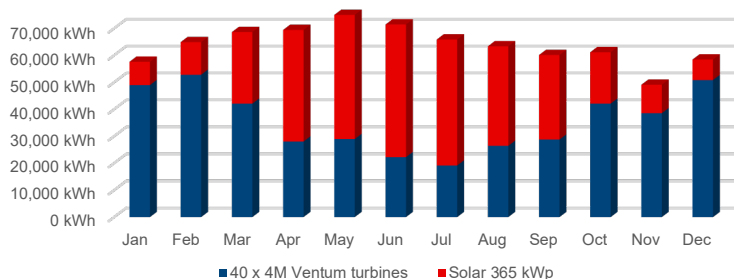
Ventum turbine can be used as a complement to solar PV or as a standalone

UK customers value proposition

- ❑ For thousands of UK businesses, limited access to an aging and underinvested grid network and low-yield solar resource constraint their efforts to decarbonise their energy consumption
- ❑ With large areas at average windspeed at 5m/s or above¹, the UK is particularly rich in wind resources, but onshore wind faces rising opposition and offshore projects take years to commission
- ❑ A decentralised energy solution like the Ventum turbine is highly advantageous to harness the UK wind power potential
- ❑ After realising an energy assessment of each UK customer energy consumption, demand profile and available wind resource, the Ventum team will come up with a customised energy solution and suggested setup

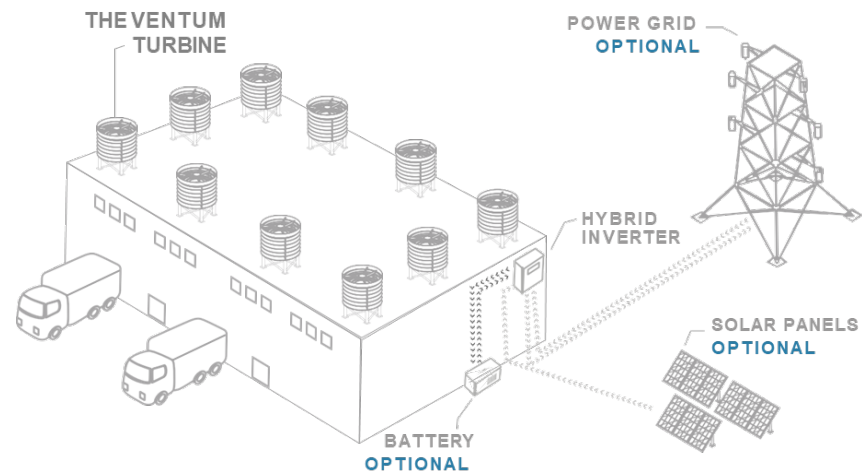
Energy Assessment for a potential UK customer¹

Yearly electricity generation proposal combining Ventum + solar for a UK-based potential customer



Example of a potential setup

- ❑ Ventum unique turbine design can be adapted to all locations, creating a massive commercial application potential
- ❑ The number of turbines is flexible depending on the customer's needs and consumption profile, can supplement existing solar solutions and can be connected to the grid or provide off-grid power or connected to optional battery storage



With its high average windspeed and difficult grid access, UK is an ideal country for Ventum initial launch. Ventum turbine are highly relevant in various locations, as a complement to solar PV or as a standalone depending on the location

1. Met Office, Mean wind speed annual average, 1981-2010

2. Indicative Energy Assessment performed by Ventum and based on data collected from a Ventum turbine's potential customer and preliminary results from CFD analysis of the 4m to be confirmed at the end of the calibration tests.

The graph shows the high complementarity of the solar PV + Ventum configuration to smooth the energy output around 60,000 kWh per month

Appendix 2 - **H2SEL**

how can Waste-to-Hydrogen can help decarbonise the
Heavy Good Transport sector

Decarbonising Heavy Good Transport

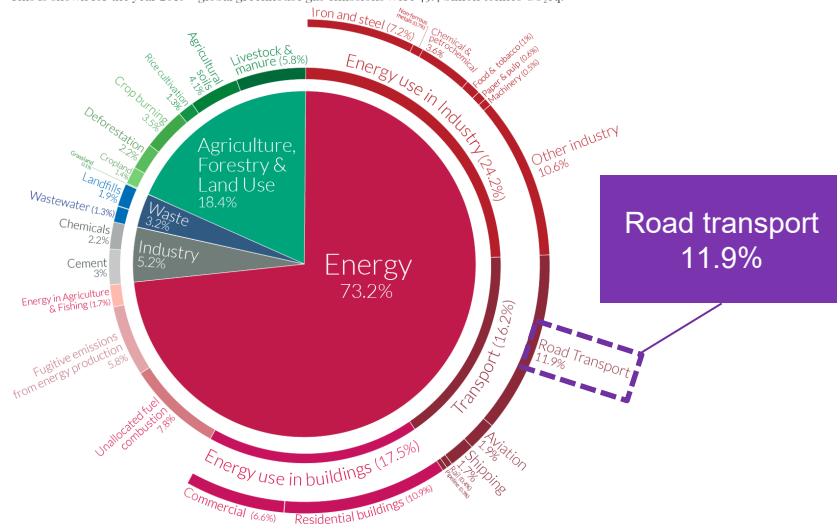
Road transport is a major and growing contributor to global warming. Cost effective hydrogen is needed to decarbonise urban and heavy goods transport, given the limitation of batteries

Road Transport is the main source of CO₂ emissions

- ❑ Global greenhouse gas emissions are the main cause of climate change
- ❑ Road Transport is a major contributor, on par with electricity generation in Europe, and the sector's emissions continue to rise
- ❑ Innovative technology, like Electric Vehicles ("EVs") and hydrogen-for-transport are emerging to help reduce road transport carbon footprint

Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.



OurWorldData.org – Research and data to make progress against the world's largest problems.
Source: Climate Watch, the World Resources Institute (2020).

Batteries are not optimal for Heavy Goods Transport

- ❑ Short range and long charge time **reduces utilisation rate**
- ❑ Battery size can **reduce capacity** by 9%-19%¹



Range	High	Low
Network	To be developed	Developing
Recharge time	Fast	Slow
Cargo reduction	None	Up to 20%
Pre-subsidy fuel cost	High	Low

Hydrogen from waste will reduce fuel cost

- ❑ Waste to hydrogen expected to deliver cost below £[5]/kg vs. £7/kg for Alkaline electrolyzers²
- ❑ Cost competitiveness vs alternative fuel can be secured through a Hydrogen Business Model contract with Government³
- ❑ Logistic centers serving main consumption centers can transition early as they are not reliant on national fueling network

Using waste to produce green hydrogen near logistic centers is ideal to help decarbonize transport - deployment should focus on areas with medium range transport as the H₂ fueling network is built

1 [Applied Sciences | Free Full-Text | Electrification of a Class 8 Heavy-Duty Truck Considering Battery Pack Sizing and Cargo Capacity \(mdpi.com\)](#)

2 For Alkaline Electrolyzers using grid electricity, source [Hydrogen production costs 2021 \(publishing.service.gov.uk\)](#)

3 Application window for Hydrogen Business Model opens Q4 2023

Market Overview – Focus on Greater Lincolnshire

Greater Lincolnshire is ‘Britain’s breadbasket’

Greater Lincolnshire has been an important region for UK food production for many decades, with its rich agricultural heritage and favorable climate contributing to its role as a significant provider of essential crops and livestock for the UK

Greater Lincolnshire stands as a cornerstone of UK food production

❑ GL's agriculture feeds the UK:

- GL grows 30% of the UK's crops
- 16% of English livestock production
- A major center of food processing

❑ UK's leading food logistics cluster:

- Supporting more than 150k jobs
- GL is underpinned by the **most significant food logistics sector in the UK**
- **30% of all national food freight distributed** through the district

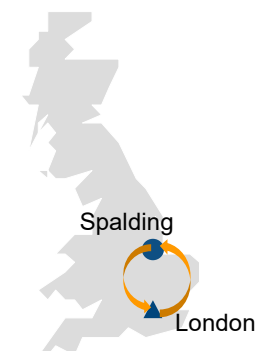
❑ Favorable market trends:

- GL is at the heart of the UK's £234 billion agrifood sector, UK's largest manufacturing sector
- Increases in food demand driven by
 - i) **UK government priority to increase national production** following Brexit and war in Ukraine
 - ii) ii) population growth and
 - iii) iii) changing diets

❑ Logistic companies seeking to cut emissions at competitive cost

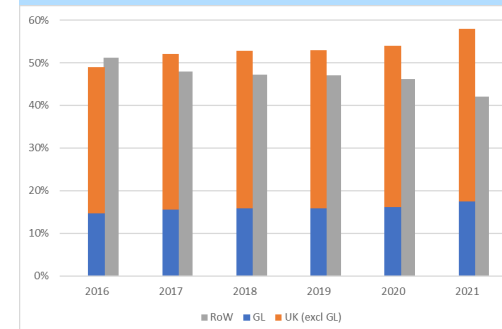
- 38% of all CO₂ emissions in GL are attributed to transportation
- Electric trucks are not seen as a viable solution by hauliers given batteries weight and size

GL logistics routes



● Plant location

Origin of UK food¹



The project addresses the waste, power and transportation challenges in GL, but also strategically importantly addresses the UK national food security

Project Overview - A flagship project for the UK

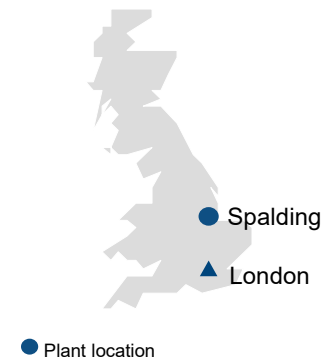
H2SEL is a pioneer project for the Waste-to-Hydrogen sector in the UK

H2SEL ambitions to address the needs of Greater Lincolnshire food sector of a cost-efficient and decarbonised source of energy to power the trucks of its logistics sector while processing difficult to treat waste

Project Overview

- ❑ H2SEL (incorporated under Lincoln Hydrogen Ltd) is a project to build and operate a WtH plant in Spalding, Lincolnshire while **using local waste to produce 13,200 tons p.a. of low-carbon H₂** through a plasma gasification process
- ❑ H₂ will be mainly **sold to transport companies delivering food to London**. Those companies will convert a significant share of their trucks to hydrogen and their fleets will be able to rely on a single refueling station that will be close to their depot
- ❑ Other key products include carbon dioxide and heat, that will be captured and sold locally, in a circular economy design. Access to local waste is already secured
- ❑ H2SEL has attracted strong support from local councils and businesses and fits well in GL local authorities plans to champion innovation in low carbon technologies for freight and logistics while achieving their Net Zero targets
- ❑ **The core technology** is based on the Plasma Enhanced Melter technology ("PEM"), **operational since 2011**. The key Technical Partner of H2SEL is the exclusive licensee for this tech worldwide and has combined it with established technologies for gas cooling, cleaning, and compression
- ❑ The technology delivers **high purity H₂ at a competitive cost**
- ❑ A 15 acres plot of **land is currently under exclusive negotiations** with the seller with land option agreement to be signed imminently

Plant Location

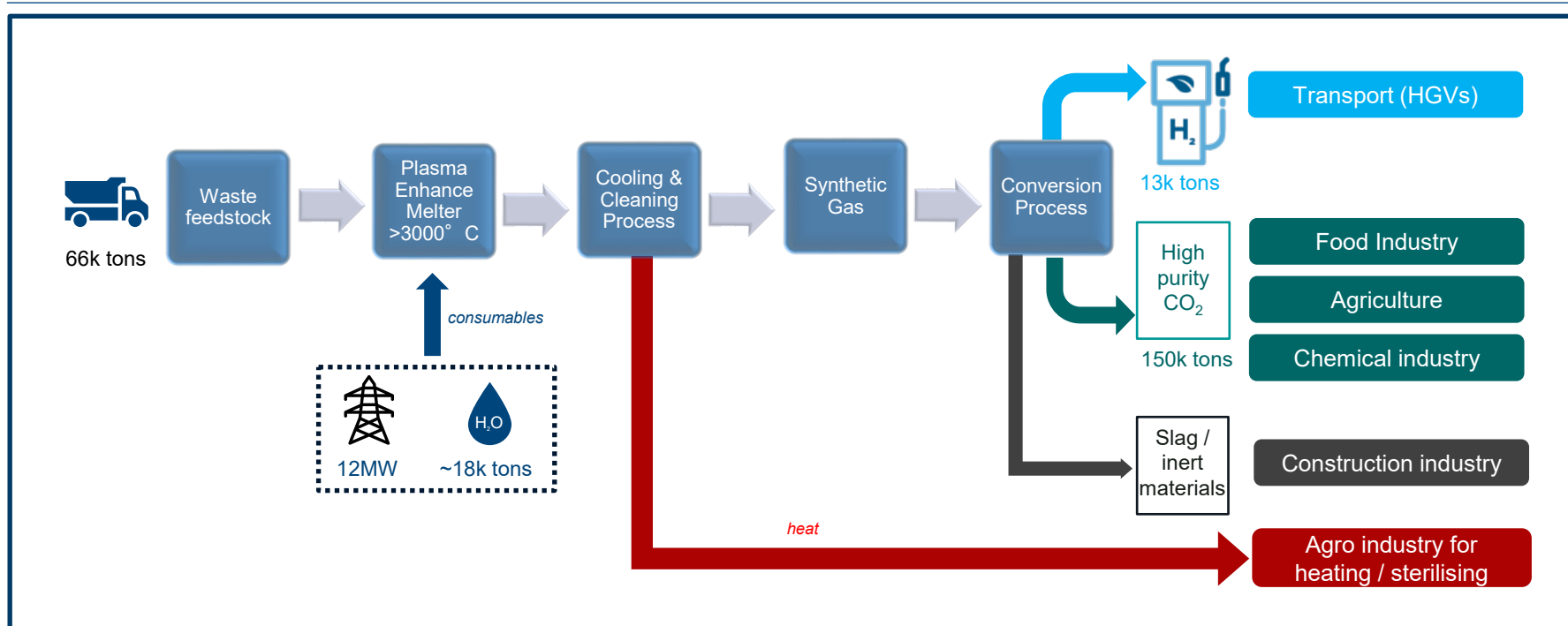


PEM Technology



H2SEL benefits from a tremendous support from GL business leaders, significant local politicians' engagement while the main technical aspects are being finalised (quality of the waste, environmental study and planning for the land...)

Waste-to-Hydrogen - Process overview



Key steps:

- ❑ Waste is **delivered pre-treated** to site
- ❑ **Waste decomposed** in simple molecules in the plasma reactor
- ❑ Gas is then cooled, and the heat recovered
- ❑ **Main output is syngas**, a mixture of H₂ and carbon monoxide (CO)
- ❑ Residual components are inert metals and vitrified slag
- ❑ The conversion process **maximises the H₂ output** and converts syngas to high-purity H₂ and CO₂

Main outputs:

- ❑ The H₂ is sold to local trucking companies
- ❑ The CO₂ is captured to reduce emissions and sold in liquid form to local offtakers
- ❑ The non-leachable vitrified slag has potential commercial applications, e.g. backfills and construction industry
- ❑ The residual heat from the process is sold locally to the agro industry / sterilising (i.e. abattoirs)