NER

Nafici Environmental Research

Investment opportunity in NER's EcoPulping technology - converting agricultural residues into paper pulp for the packaging and tissue industry, as an alternative to wood pulp

June 2024

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Our Mission :

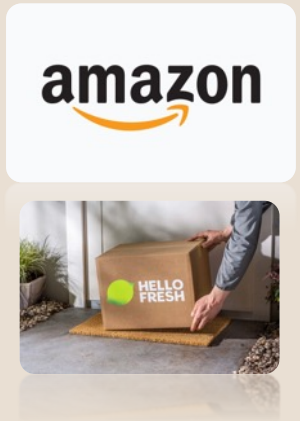
To meet the paper and packaging industry’s demand for non-wood pulp by installing NER’s EcoPulping patented technology in local markets, saving 4.2 million trees and 126,000 tonnes of carbon dioxide per annum.

Vision

- 350,000 tonnes of capacity installed (12 trees per tonne of virgin wood saved)
- 500 miles maximum from the market it serves
- By 2035

The Macro Problem: Growth in demand for packaged goods is increasing but shifting packaging materials from plastic to wood fibre is not the silver bullet

25% Global Population Growth forecasted by 2080 increases demand for packaged goods



E-Commerce growth increasing demand for fibrous packaging

Online sales accounted for 19.5% of all retail sales worldwide in 2023 (Statista)

Online shopping is expected to make up 41% of all retail purchases by 2027 (Boston Consulting Group)

EU Directive 2019/904 Single use packaging Laws for plastic packaging driving a shift towards use of fibrous materials

Increasing use of wood pulp leads to further deforestation (from the 3 billion trees felled every year) and is not the solution.

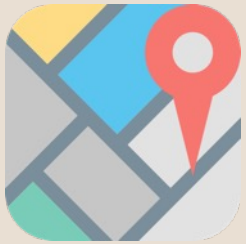
The Paper & Packaging Industry Challenge :

1. Re-Use - Recycle as many fibres as possible to minimize the use of virgin materials.
2. Recycled Fibres have limitations - There is a limit to the number of times you can recycle fibre; it loses its strength properties over time. x7 is often deemed the limit.
3. Fresh virgin wood fibre (and/or starch) is required to give the paper/ package the desired strength properties.
4. Traditional kraft process used for making pulp for the paper and packaging require significant use of energy and water with production concentrated thousands of miles away from the market they serve.

The NER EcoPulping Process Solution:

Up to 50% less energy

95% less water



Creates pulp capacity local to the market it serves

Has the pulp strength required as an alternative to virgin wood and starch

Global Paper Packaging market 265 mio annual tonnes & European virgin pulp market (18 mio annual tonnes)

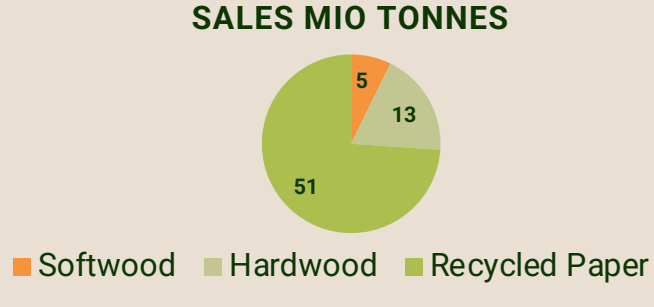
Packaging & Paper Manufacturers and Brand Owners are looking for local non-wood materials as a long term sustainable alternative to wood fibre

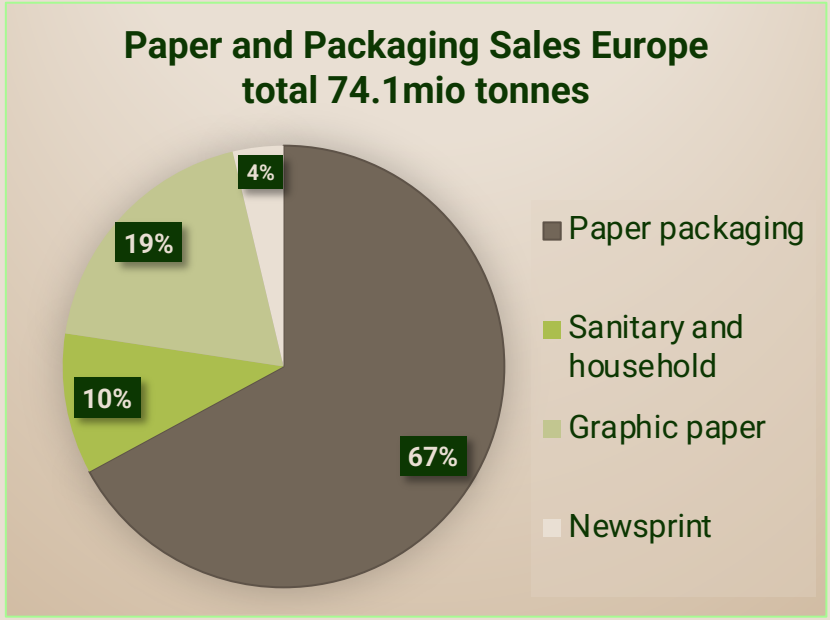
Global Paper Packaging market dynamics

- The global paper packaging market size reached US$ 428.1 Billion in 2022. **This is a total production of 265 mio metric tons per year. Europe sales represent about 50 mio.**
- Looking forward, IMARC Group expects the market to reach US$ 535.6 Billion by 2032, exhibiting a growth rate (CAGR) of 2.4% during 2024-2032.
- The global market is primarily driven by the rise in e-commerce sector, increasing consumer demand for sustainable packaging, regulatory pressures for environmental compliance, continual technological innovations, and global sustainability initiatives pushing for eco-friendly alternatives to traditional packaging materials.

Recycled paper and wood pulp market in Europe

- Recycled paper consumes 51 mio tonnes per annum in Europe alone. *
- Hardwood & Softwoods are used extensively in the production of packaging and tissue applications across Europe. Annual consumption 18 mio tonnes.
- Estimated import volumes from outside of Europe +90%.

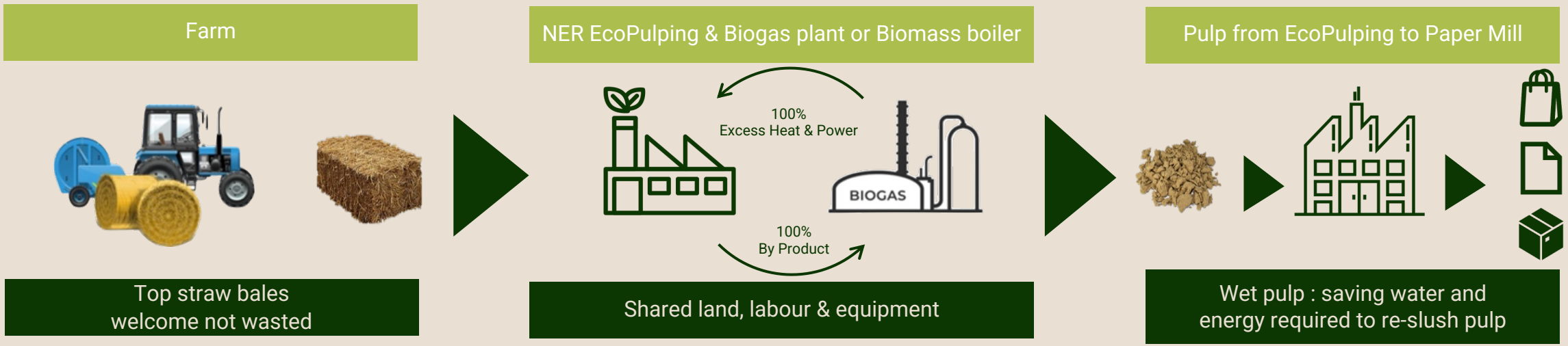




*Limitations in the # of times paper can be recycled means that paper companies are forced to add strength to their packaging through additives such as starch or virgin fibre.

NER's EcoPulping operating model is focused on providing local supply solutions, maximising the use of valuable resources!

1. The process will take wet (top bale) straw that cannot be used for cases such as energy for power plants , increasing farmers' straw yield and income.
2. The operating model focuses on co-locating with biogas plants using available resources such as space, heat, equipment and labour that are not utilised today. Moreover, the by-product produced by NER's process can be used to fuel the BioGas plant (or biomass boilers) - a circular solution.
3. The close proximity from the production site to the customer means less road miles with no requirement to dry the pulp, dramatically impacting the carbon footprint. Delivering an unrivalled solution compared to virgin wood fibre (circa 90% hardwood pulp supplied from outside Europe).

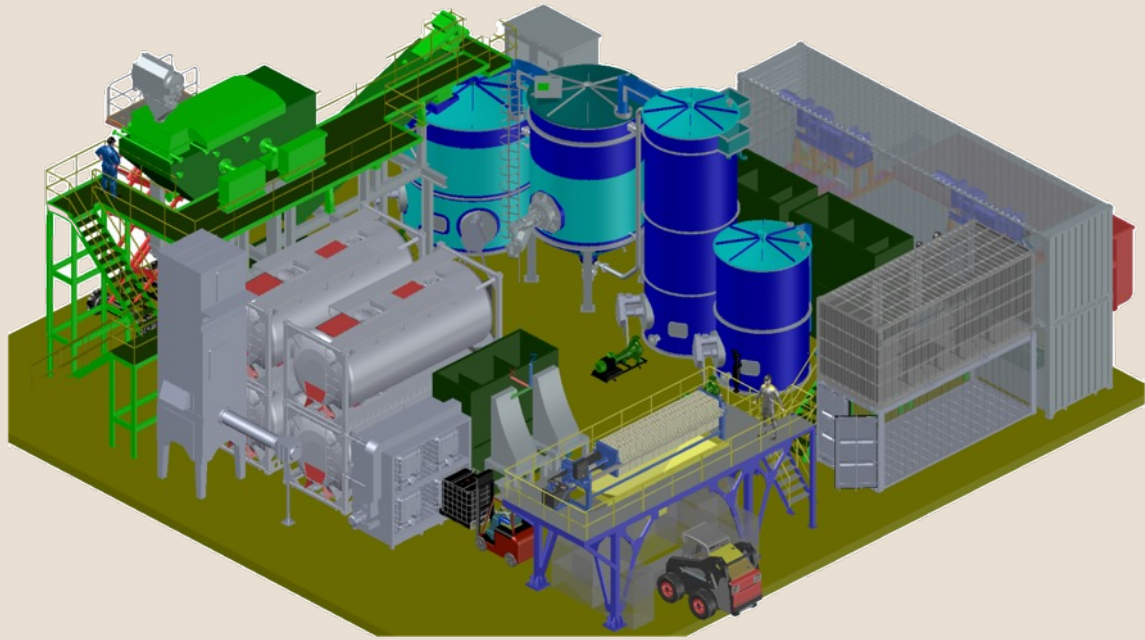


NER's EcoPulping process

Nafici Environmental Research Ltd ("NER") Patented EcoPulping technology is a **low carbon process** that transforms crop residues such as wheat straw into pulp used for paper and packaging products **as an alternative to wood pulp.**

Sustainable technology

- **The IP-** At the heart of the process is the bespoke 'Biotank' which uses low heat, no pressure and **NER's trade secret catalyst** to extract the fibres and produce high quality, strong fibre EcoPulp.
- **Feedstock Flexibility** - At our pilot facility in the UK we have successfully tested a large variety of agricultural residues (wheat straw, rice straw, maize stover and others) ensuring supply chain flexibility should crop availability and/or price fluctuation become an issue.
- **Scalable Output -** from **12TPD to 400TPD capacity.**
- **Small & Modular** - The design is small (from 576m2), standardised and modular, which allows us to build and install units quickly.
- **Tested** – Our Pilot facility and the first commercial production plant (China) have given us valuable data to support the design of the latest solution and for customers to validate pulp quality.



NER's Initial Scale Up Plan

Short term : showcase the technology and commercial model in Europe by NER owning and operating the plants. We plan to build two sites based in the UK.

Site 1 - 12 tonnes per day. Production - May 2025.

Site 2 - 36 tonnes per day. Production - May 2026.

Long term business model: we plan to license our technology (see slide 12 & 13)

Site 1 based in the UK, will be our European Commercial Demonstrator

Project site 1

- Option on site under process to be finalized by 31st May 2024.
- +100% feedstock for Site 1 and 2 availability within a 50 miles radius of site.
- Environmental permit – Low impact submission 1st June - Subject to EA confirmation (6-12 months). Working with SLR Consulting.
- Planning application for NER EcoPulping activity - exact timescale will be advised within 13 weeks following submission.
- Pulp offtake status – LOIs in place represent 100% of production for site 1 and 2

	Site 1
Annual output (340 days)	4,080 Bone dry tonnes of EcoPulp (12TPD)
Annual input	8,160 tonnes of wheat straw (24TPD with 18% moisture)
Project start date	1st November 2024
Commercial Operations	May 2025

Location 1 details, biogas plant in Suffolk

Strong offtake interest from leaders in the paper packaging industry

- Adding 5 to 10% EcoPulp has been proven to increase packaging strength by 33%
- EcoPulp has been proven through industrial paper tests as a credible solution for paper and tissue products.
- We are now proposing the installation of 4,080t and 12,240t annualised capacity into the UK (sites 1 & 2) for use in the packaging & paper products as an alternative to wood pulp & starch.

- **Letter of Interest in place with DS Smith . Estimated UK annual volume demand is 9-18k tonnes per annum. This final volume will depend on the results of an industrial trial due to take place in July 2024.**

DS Smith Business Services
Level 3
1 Paddington Square
London W2 1DL
United Kingdom

15th March 2023

To whom it may concern – expression of interest

Before considering whether to enter into a formal trading relationship, DS Smith would need to determine key parameters, including:

- Technical performance: additional strength, fibre quality, and performance in recycling process
- Economics: cost for initial trial pilot and at scale
- Supply volumes: ability to acquire straw waste supply at sufficient scale in relevant geographies

In two DS Smith geographies where the initial business cases have been targeted, we could estimate 1-2% inclusion rate on average across the portfolio. Subject to the key parameters above, this could give a requirement for 9-18kTs in the UK and 6-12kTs in the Balkans for DS Smith only.

PACKAGING EUROPE
A SUSTAINABLE FUTURE FOR PACKAGING

HOME TOPICS SECTIONS EVENTS SUSTAINABLE PACKAGING SUMMIT TICKETS

NEWS

DS Smith and Nafici explore conversion of straw and grain into packaging

10 JANUARY 2024

Customer testimonial, DS Smith

"Laboratory pulp testing shows that NER's straw pulp fibre offers improved performance at already low levels of pulp addition. The test carried out confirmed that NER wheat straw pulp does deliver increased strength in the pulp mix." Nick Thompson – Materials Development Director (Group R&D)

Link to DS Smith website page mentioning its work with NER

- DS Smith Plc is a leader in the paper packaging Industry. It's a UK-based provider of sustainable fibre-based packaging. It delivers fully fibre-based corrugated products across Europe and North America for consumer products, e-commerce, promotion, transit and industrial packaging.

Annual Turnover	£7.44bn
Employees	30,000

NER Business Model – Long term license model

1. **We Create Demand** for EcoPulp (hence EcoPulping plants) through Business Development/R&D activity with packaging, paper and tissue producers (as we have done with DS Smith).
2. **Licence Technology, Install & Commission EcoPulping Plant for an operator**. Potential examples of operators could be:

   - → Bio-Gas Operators who have space, excess heat and labour, that can be used to operate the plant efficiently.
   - → End users of pulp who are looking for an integrated or wholly owned production facility e.g DS Smith.
   - → Existing Pulp producers looking for an extension to their portfolio.
   - → Independent operators who want to take advantage of local pulp demand opportunities

3. **Supply Catalyst** on an ongoing basis to ensure pulp quality and efficiency.

4. **Service Organisation focusing on:**
   - → Pulp Demand Creation
   - → EcoPulping Project Installation & Commissioning
   - → Feedstock Management
   - → Training

   - → Maintenance
   - → Spare part
   - → Continuous Improvement
5. **R&D Centre of Excellence** that ensures that NER drives continuous improvement of pulp quality and plant performance.

Long term – License Model

Location: Biogas/Farm

- Land &/or buildings
- Straw Supply
- Energy – heat
- Energy – Electricity
- Water
- Site Management
- By Product Demand

- Customer Supply Agreement/Relationship
- Material Sourcing – Straw/Chemicals
- Plant Labour Sourcing & Management
- Pulp & By Product Production
- Supply Chain Management
- Order to payment
- Storage of pulp

NER

- Equipment inc license bio tank
- Project Services
  - Site Feasibility Study
  - Project Installation & Commissioning
  - Feedstock Supply
- Production Services
  - Service
  - Spare Parts
  - Training
- Catalyst Supply/tonne
- Royalty/tonne

Developing NER's Market – 5-year plan

1. Drive penetration in the packaging industry

DS Smith demand in Europe can represent up to 200tpd therefore 6 projects similar to project 2 (£9.6m license fee + royalties).

- Other paper packaging customers currently testing pulp

Customer	Annual Turnover	Annual Output (tonnes)	NER volume demand (tonnes)	Commercial status
1. DS Smith: packaging (UK and Romania)	€8bio	1,000,000 +	18,000	LOI in place
2. A European moulded packaging manufacturer	€23mio	20,000	12,000	LOI in place
3. A European tissue manufact urer	€2.8bio	900,000	3,000	Pulp Tests ongoing
4. A European tissue producer	€175mio	100,000	25,000	Pulp Tests ongoing
Total	~€10bio	2,020,000	58,000	

2. Creating demand for EcoPulp through new applications : tissue and moulded packaging

Several tissue producers interested in non-wood pulp addition in their tissue products with mills all across Europe.

Moulded packaging producers are increasing their use of fibre to replace plastic.

3. Creating partnerships with paper industry equipment suppliers to deliver projects for paper packaging, tissue and moulded packaging industry.

4. Selecting areas with Wheat straw surplus

5. Selecting biogas plant sites or other sites to develop 36 Tonnes per day EcoPulping plants using renewable energy 1) from the Anaerobic Digestion facilities that produce biogas from agricultural or food waste or 2) from biomass boilers using our by-products and other agricultural wastes

COUNTRIES	STRAW	PACKAGING	TISSUE	BIOGAS
	6.2mio tonnes	**1.87** mio tonnes*	**684,000** tonnes	**750** Sites
	21 mio tonnes	**23.1** mio tonnes	Up to **2 mio** tonnes	**10,000** Sites
	3 mio tonnes	**9.6** mio tonnes	Up to **800k** tonnes	**1,500** Sites
	32 mio tonnes	**7.3** mio tonnes	Up to **660k tonnes**	**700** Sites
Europe (CEPI)		**51** mio Tonnes	**7.98** mio tonnes	

Competitive position

NER's EcoPulp provides a competitive and functionally superior product when compared with wood pulp and non-wood pulp competitors.

Competitors in non-wood technology

Sustainable Fiber Technologies Inc	SFT developed a competing wheat straw to pulp technology, originally licensed to Columbia Pulp (WA, USA). The CP plant never achieved maximum capacity (140,000 tonnes per annum) and has now closed. European licence granted to Essity, which has built a non-wood pulp plant in Mannheim, Germany.
Red Leaf Pulp Ltd	Based in ON, Canada, RLP has announced a 182,000 tonnes per annum straw pulping plant, but construction has been delayed – the full scale plant is now due for completion "Q1 2026" but equity finance only raised in Q4 23.
Fibres365 GmbH	Small (farm) scale steam explosion technology producing cellulose products for paper and clothing industries. 15,000 tonnes per annum project announced in Ukraine in 2021, now war disrupted.

What makes NER EcoPulping different

Patented	UK, Europe, USA, Canada, Australia, India.
Low carbon	Low heat and no pressure.
Catalyst	Use of trade secret catalyst.
Pulp quality	Fibre strength superior to other similar non-wood produced using other processes.
Small scale	EcoPulping economic at small or large scale capacity.
Flexibility in pulp quality	Strong R&D and product development expertise – pulp grades adapted to customer requirement.
Variety of raw material	R&D and pilot facility trialed a large variety of agricultural residues or plants – enables adaptability.

The Team

Highly capable management team with combined experience of over 200 years in pulp and packaging industries.

Management team

Dr. Shahriar Nafici Co-founder, Inventor
Biotechnologist (Cranfield University), Industrial designer, 35 years experience agri-waste conversion.

Florence Miremadi Co-Founder and CEO
Engineering MSc, >10 years prior experience in International Business development and 12 years in the non-wood pulp industry.

Steve Gibbons Sales and Marketing Director
25 years experience in fibre packaging, customer management and business development project execution.

Kate Lowes Project and Supply Chain Director
40 years of experience defining, designing, architecting, managing, and building teams and highly scalable software and technology-based systems.

Catherine Gilmour Financial Director
Over 20 years of experience in finance, accounting and supply chain, delivering value-added solutions that enhance business performance.

Technical team

Antony Marshall Engineering Director
>35 years of project engineering experience, specialising in the design and project management of paper and pulping industry projects.

Keith Harsham Product Manager
> 30 years of experience as a chartered chemical and biochemical engineer. Expert in the paper making, focusing on water usage optimisation & treatment, fibre recovery, paper manufacture.

Tony Eley Process Engineer
>30 years experience in Technical, Process, Supplier Quality and Management roles within the Pulp & Paper and FMCG industries.

Joseph Bryant Process Technician
BSc with First Class Honours in Mathematics from the University of Kent, responsible for supporting the day to day running of the Pilot Plant.

Marcia Goncalves, Program Manager
Her role consists of assisting the management and technical team in various duties.

Our partner: Hive Energy Ltd

In February 2022, Hive Energy Ltd partnered with NER to support NER's business development activities.

Hive Energy is a global leader in green energy and the circular economy. Hive's expert team have developed an international pipeline of solar (photovoltaics), green hydrogen, wind, and green ammonia projects, with over £1.3 bio of capital deployed and 2,036 MW constructed or sold to date.

Hive employs over 300 full-time members of staff around the world, and have offices in Romsey, London, and Liverpool (UK), as well as Alicante, Spain.

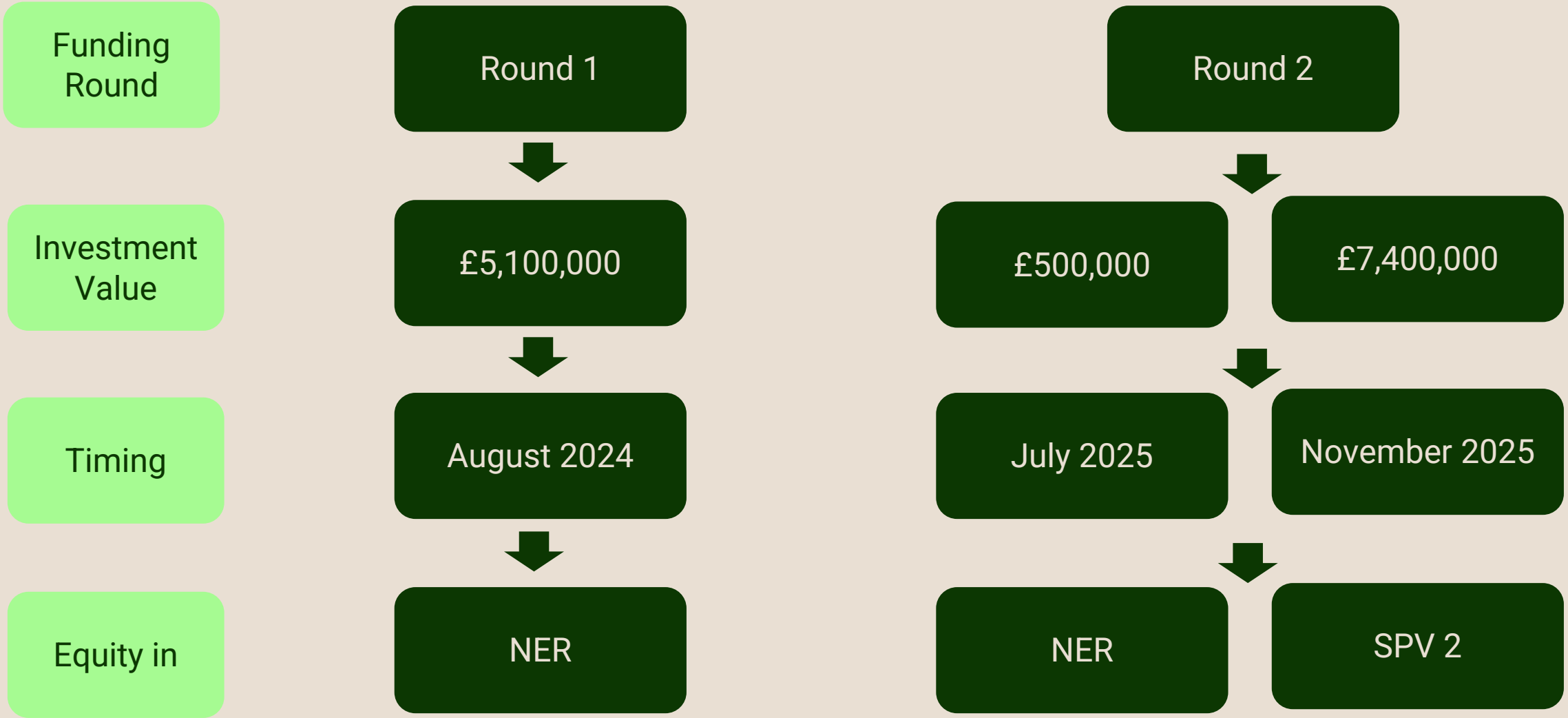
Hive support NER with their expertise in the renewable energy sector but also significant know-how in project development and financing.

Giles Redpath
CEO Hive Energy

Ross Champion
Head of Investment Finance

Investment Opportunity in Site 1 & 2 to drive NER expansion

	NER	Commercial Scale 1			SPV 2		
		Raise	Design & Build	Operate	Raise	Design & Build	Operate
Timeline		Aug 24	Aug 24 – Apr 25	May 25	Nov 25	Nov 25 – Apr 26	May 26
Investment – A Round	**£5.1m** →	**£3.6m**					
Investment – B Round	**£0.5m**				**£7.4m**		
CAPEX		£3.6m			£7.4m		
Annual Revenue at Full Capacity	£13.9m			£2.9m			£8.7m
IRR	21.3% (Investor 1)			6.8%			16.3%
Payback Breakeven	FY30			FY36			FY33


Funding Round
Round 1
Round 2
Investment Value
£5,100,000
£500,000
£7,400,000
Timing
August 2024
July 2025
November 2025
Equity in
NER
NER
SPV 2

NER

Financial Assumptions

General

- Each site is modelled up to FY46
- Useful life of each site is 20 years

Sites 1 and 2

- Designed, built and run by NER
- At modelled full capacity (achieved during FY27) sites 1 and 2 will be producing pulp and by product sales of just over £9.5m p.a.
- Direct costs include site employee's, straw feedstock and Energy (some of it derived from the anaerobic digester units on site). By products are sold back to the AD plant, achieving almost complete product circularity on a single farm site.
- Depreciation assumes total capex is £10.9m and is written off over 10 years, straight line.
- Capital allowance claims on Site 1 defer payment of corporation tax until FY34 and Site 2 until FY28.
- Dividends start to be paid when SPV has positive retained earnings, and sufficient cash.

Sites 3 to 12

- Designed and built by NER under a licence model generating MRR for NER via Royalties and Catalyst sales and one-off project fees via License Fees, Equipment Sales, and Project Management Fees.

Site Delivery Plan

	FY25	FY26	FY27	FY28	FY29	FY30
Sites per Year	1 x 12 TPD	1 x 36 TPD	2 x 36 TPD	2 x 36 TPD	3 x 36 TPD	3 x 36 TPD
Capacity in tonnes	4,080	12,240	24,480	24,480	36,720	36,720
Cumulated capacity	4,080	16,720	41,200	65,680	102,400	139,120
EBITDA NER (£000's)	(1,163)	(563)	3,916	6,148	9,781	11,175

Nafici Environmental Research Ltd – Profit and Loss Account – Year 6 (FY30)	£000s
Sites 1 to 12 in Full Operation	
Licence Fees	4,421
Project Management Fees	103
Royalties	6,034
Catalyst	2,448
Dividends – SPV 1 -12	852
Total sales	**13,858**
Direct costs	1,224
Gross profit	**12,634**
Gross profit %	91%
Overheads	1,459
EBITDA	11,175
Depreciation	62
Profit before interest and tax	11,113

Initial Process Considerations

All dialogue from interested partners will be with the NER representatives below and appropriate management team members.

Interested parties will be required to sign an NDA, after which further information will be made available. Data room in development, available June 2024.

Contact

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