Construction:

Go Digital, Improve Productivity & Strive to Net-Zero

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Melanie Dawson

Board Member, Invest NI

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WELCOME

Go Digital, Improve Productivity & Strive for Net Zero

Melanie Dawson
Origin7
Moderator & INI Board Member

Introductions, Agenda and Objectives

- Challenges
- Opportunities
- Support & Solutions

Challenges

1. Productivity

- Single source of truth and digital data
- Technology and automation
- Training and developing people

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2. Sustainability

- Climate Change Act
- Net Zero 2050
- 40% of carbon emissions linked to the built environment.

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3. Regulation

- Building Safety bill
- Green agenda
- Social value

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2. Sustainability

- Climate Change Act
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3. Regulation

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4. Assistance

- Financial support
- Knowledge
- Social value

Agenda

Digital and Innovation

09:45 – 10:05 Innovate UK KTN – Chris Bagley, Head of Infrastructure

10:05 – 10:30 McAvoy - Lorraine McMorrow, Head of Digital

10:30 – 10:50 Q&A

10:50 – 11:20 Break

Productivity & Net-Zero

11:20 – 11:40 Mannok Build – Kevin Lunney, Operations Director

11:40 – 12:00 Sustain IQ – Liam McEvoy, Co-Founder

12:00 – 12:20 Q&A

Invest NI Solutions & Support (panel session)

12:20 – 12:50 Daniel Purdy, Energy and Resource Efficiency Manager
John McClune, Operational Excellence Manager
Richard Pelan, R&D - Innovation Manager

12:50 – 13:10 Q&A

13:10 – 13:20 Wrap up / Close – Gina Lyttle, Client Manager Construction, Invest NI

Lorraine McMorrow

Head of Digital, McAvoy

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Merstham Park School – Low Carbon Pathfinder

mcavoy

We Create Inspiring Spaces

About us

- Award winning offsite construction specialists celebrating 50 years in business
- Volumetric modular turnkey permanent and semi-permanent space solutions
- Greater certainty of quality, programme and cost using innovative processes and technology
- Manufacture and deliver high quality buildings for education, healthcare, commercial and infrastructure sectors

Our Values

Precise
Responsible
Inspiring

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McAvoy Operations

State-of-the-art manufacturing facility in Lisburn, Northern Ireland with the present capacity to manufacture up to 45,000 sqm annually underpinned by best-in-class workforce and quality management practices

Manufacturing Capability

Purpose built offsite facility

3 hectare site

Significant Manufacturing Capacity

1,500 modules/up to 45,000 sqm annually

People

250+ people in workforce

Integrated Management Systems

- Accredited to international standards
- Performance outcomes measured against industry and company KPIs

Business Divisions

mcavoy

Modular Rental & Sales

- Rental & sale options
- Standardised structure / envelope allowing freedom of internal design
- Repeatable products (SmartSpace & QSpace)
- Compliant & tested solutions
- Rapid delivery
- Inhouse design

Permanent Offsite

- Principal contractor role
- Full McAvoy led design from Stage 0 to completion
- UK BIM Framework compliant
- Platform based approach of standardised repeatable components
- Flexible, highly configurable system using offsite manufacture led designs
- Open BIM approach means - not limited to any one software or design company

Recent McAvoy projects

Project Overview

Client: **Department for Education / GLF Schools**
Facility: **900-place secondary school**
Location: **Redhill, Surrey**
Building Size: **6,850m2 - 178 modules installed in 6 weeks**
Project Duration: **66 weeks**

Project Challenge

- Achieve the **best possible low carbon outcomes** with a view to **sharing the learning** with all project stakeholders, so best practice could be employed in future school building projects.

In summary - **Reduce as far as reasonably practical the operational carbon of the building.**

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4 Point plan

Team

McAvoy - in-house team

Ramboll UK - Net Zero Carbon specialists

Natural Dimensions - Biophilic specialists

Arkilab_ - Architect

Focus

Due to project having **already progressed through concept design** and **client engagement** at the time the carbon pathfinder was introduced it was agreed to focus on **'operational' carbon** only.

Targets

Agreed through series of workshops between McAvoy, DfE and Mace

4 Point Plan - Agreed Targets

We adopted the 'Be Lean, Be Clean, Be Green' energy hierarchy which focuses on **reducing the demand** for energy at source through passive measures before considering **efficient systems and renewable technology**.

1. OS19 with MMC SSB

- Meet the requirements of MMC SSB

2. Wastewater Management

- Reduce new water demand by 25%

3. Robust renewable energy position

- Reduce energy demand by 50%
- Reduce carbon emissions by 55%
- 40% of energy achieved through onsite renewables
- De-gas the site and decarbonise the grid

4. A biophilic approach to landscape

- Adopt a biophilic approach to improve the health and wellbeing of the building users and assist with the reduction of carbon

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4 Point Plan - Results

OS19 with MMC SSB

Passive Supervision	Inclusion of a defibrillator	Improved splashback wall protection	Improved floor construction	School built to be safer and more robust requirements
Higher balustrading (1250mm)	Enhanced access to roof areas	Safer cubicle design		

Rainwater harvesting

toilet flushing & irrigation	XX%	XX%	Saved and stores over 1,100m3 of water / annum	Equates to saving of approx. £2750 / annum

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4 Point Plan – Results

Robust Renewable energy position

- Up to 50% improvement on U'values
- Improved airtightness

- All electric strategy / de-carbonise the grid

- All electric cooking
- Lighting controls
- Peak loop cooling
- Point of use water heaters
- 650m2 PVs
- ASHPs
- Metering /monitoring

- 650m2 of Photovoltaics

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44% of energy achieved through onsite renewables

59.3% reduction in carbon omissions

73.2% reduction in energy consumption equates to energy utility bills being reduced by three quarters

The PVs will generate approx. 92.7MWh per annum which would be approx. £13,000 saving per annum (@ £0.14 per KWH)

97% reduction in gas utility bill (gas only required for science labs)

School produces 3 times less carbon than other typical buildings of its type. (Significantly improved carbon footprint)

4 point plan – results

A biophilic approach to landscape

Benefits on enhanced biophilic design

1. **Planting scheme absorbs 16% of annual CO2 emissions from this building**
   - This building produces 54tons / annum (based on Part L regs)
   - Original design produced 133tons / annum (based on Part L regs)
2. **Significant psychological effects on well being, concentration, relaxation and focus with reductions in stress and anxiety**
3. **Improved pedagogic opportunities**
4. Significant improvement to biodiversity.
5. Improved aesthetic values and sensory qualities
6. Improved quality of social and recreational spaces around school
7. Trees adjacent to **buildings improve passive solar gain during winter and reduced solar gain during summer to control ambient heat temperatures** and reduce energy consumption
8. Evapotranspiration from trees adjacent to buildings **reduces adjacent air temperature and improves air quality**
9. **Improved flood regulation**
10. Strong integration of green belt into school environment
11. Natural bridge and natural connections between extensive landscape and school grounds

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Plant type:	Plant Qty:	Estimated CO2 absorbed over 25 year period:
Trees	85	27.85 Tonne
Whips	168	36.48 Tonne
Feathered Transplants	1,110	157 Tonne
	Total =	**221.33 Tonnes**

*A typical tree can absorb around 21 kilograms of carbon dioxide (CO2) per year, however this figure is only achieved when the tree is fully grown - saplings will absorb significantly less than this. Over a lifetime of 100 years, one tree could absorb around a tonne of CO2. "https://www.viessmann.co.uk/heating-advice/howmuchco2doestreeabsorb#:~:text=A%20typical%20tree%20can%20absorb,around%20a%20tonne%20of%20CO2.

How do the Low Carbon Pathfinder targets align with the 2030 Net Zero Operational Carbon Targets

(as documented in the LETI Climate Emergency Design Guide)

Merstham

Wall = 0.18 = 81% progress towards LETI 2030 target*
Floor = 0.13 = 86% progress towards LETI 2030 target*
Roof = 0.13 = 86% progress towards LETI 2030 target*

**where a range has been given by LETI – average has been assumed*

Merstham

Regulated Energy Use = **30.6** kWh/m2/yr***

Total Energy Consumption = **61.2** kWh/m2/yr***

(Using an approximation from LETI and allowing for regulated making up 50%)

Merstham

Approx. **30%** of roof area
Significant area for further PVs

Merstham

Space heating demand = **14.9kWh/m2/yr*****

**** The LETI targets are based on 'operational energy' and 'space heating demand' so it's important to highlight that our comparison uses Part L estimates which can give an unrealistic expectation of performance in use as shown in the graph below.*
It must be understood that this is used as a sanity checking benchmark and an indication of performance, we must be wary of the risk of drawing direct comparisons between the two. The uncertainty of the unregulated energy adds to this risk and for the most part is outside our control.

Design

Actual

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Questions?

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info@mcavoygroup.com

0330 107 0799

mcavoygroup.com

Chris Bagley

Head of Infrastructure, Innovate UK KTN

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Innovate UK KTN

About Us

UK Construction

www.ktn-uk.org

Innovate UK
KTN

About Us

Innovate UK KTN (IUK KTN) exists to connect innovators with new partners and new opportunities beyond their existing thinking – accelerating ambitious ideas into real-world solutions.

UKRI Innovate UK KTN

UK Construction

2023 Innovation Trends and Priorities

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KTN

Discussion points

- Carbon
- Site power
- MMC
- Digital
- Reuse

HS2 Euston site

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Low Carbon material

- Performance
- Longevity
- Sourcing/cost
- Codes
- Is it:Isn't it??

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Site Power & fuels

Electric?
Bio Based Fuels?
Hydrogen?

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Modern Methods of Construction MMC

- Skilled Labor Shortages
- Carbon Reduction
- Quality
- Repeatability
- Speed
- Can Cost more
- Not universal Solution

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Digital Revolution & AI

Massive change across society
Massive change to construction
- Speed of change
- Control/trust
- Security

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Site Progress Management

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Connected Digital Sites

VR meets:

- Design
- Deployment/logistics
- Build
- Compliance
- Through-life

But

New Skills
Connectivity
Cost?

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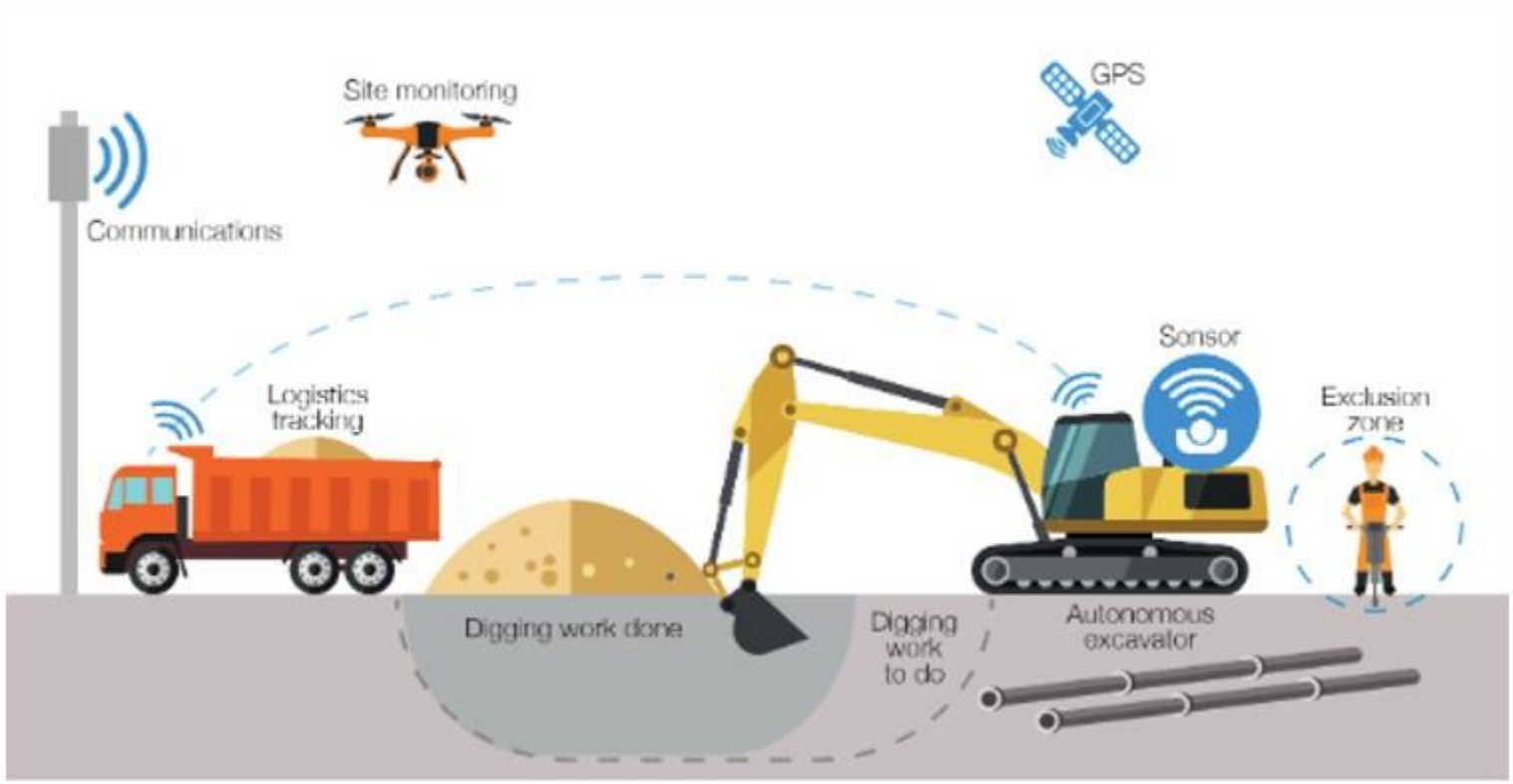
Autonomous Plant



Innovate UK KTN

Transforming what we have

Innovate UK
KTN

Reuse and refurbish – not demolish

BBC Midlands Today

The Old Tea factory

Innovate UK
KTN

Find out more

@KTNUK

www.ktn-uk.org

Innovate UK
KTN

Kevin Lunney

Operations Director, Mannok Build

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MANUFACTURING FACILITIES

818
Employees 2022

€318m
Turnover 2022

€90m
Investment 2015-2022

DISTRIBUTION ROUTES

LOGISTICS & EXPORTS

Circa. 90 artic load of building materials dispatched to Great Britain each day - Mixed Load delivery

Main ferry routes include:

- Larne to Cairnryan
- Larne to Liverpool
- Dublin to Holyhead
- Rosslare to Fishguard
- Rosslare to Pembroke Dock

Bulk Cement (by ship) from Warrenpoint to Rochester – 4,000t/week

MANNOK STANDARDS

bsi.

bsi. ISO 14001 Environmental Management

bsi. ISO 9001 Quality Management

NFRC
LEADING ROOFING EXCELLENCE

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION
Agrément Certificate 07/4444

NSAI
HEALTH & SAFETY ISO 45001:2018 NSAI Certified

CE

NSAI Agrément
Mannok EPS
Mannok EPS and Mannok EPS Pearl Under Floor Insulation

SYSTEM CERTIFICATION ISO/IEC 27001 SGS

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 11/4869

ISO 50001 CERTIFICATION EUROPE

BREEAM CODE FOR A SUSTAINABLE BUILT ENVIRONMENT
Cert. ENP 481

LPCB LOSS PREVENTION CERTIFICATION BOARD
Factory Production Control Assessed to PN111

QUALITY
I.S. EN ISO 9001:2015
NSAI Certified

UK CA

ISO 14001 CERTIFICATION EUROPE

BES 6001
Responsible Sourcing

ISO 9001 CERTIFICATION EUROPE

CHAS
Accredited Contractor CHAS.co.uk

Constructionline
A UK GOVERNMENT CERTIFICATION SERVICE

BUILDER'S PROFILE

mpa British Precast

MANNOK LEAN SIX-SIGMA FRAMEWORK

LEADING EXCELLENCE

LEAN

Focusing on maximising our efficiencies, while reducing our waste

SKILLS & DEVELOPMENT

Providing targeted training and development support to all employees

SUSTAINABILITY

Becoming resource efficient, reducing our energy consumption and carbon intensities

CONTINUOUS IMPROVEMENT

Sustaining our initiatives and continuing progress through constant review and incremental change


CLEANING STATION

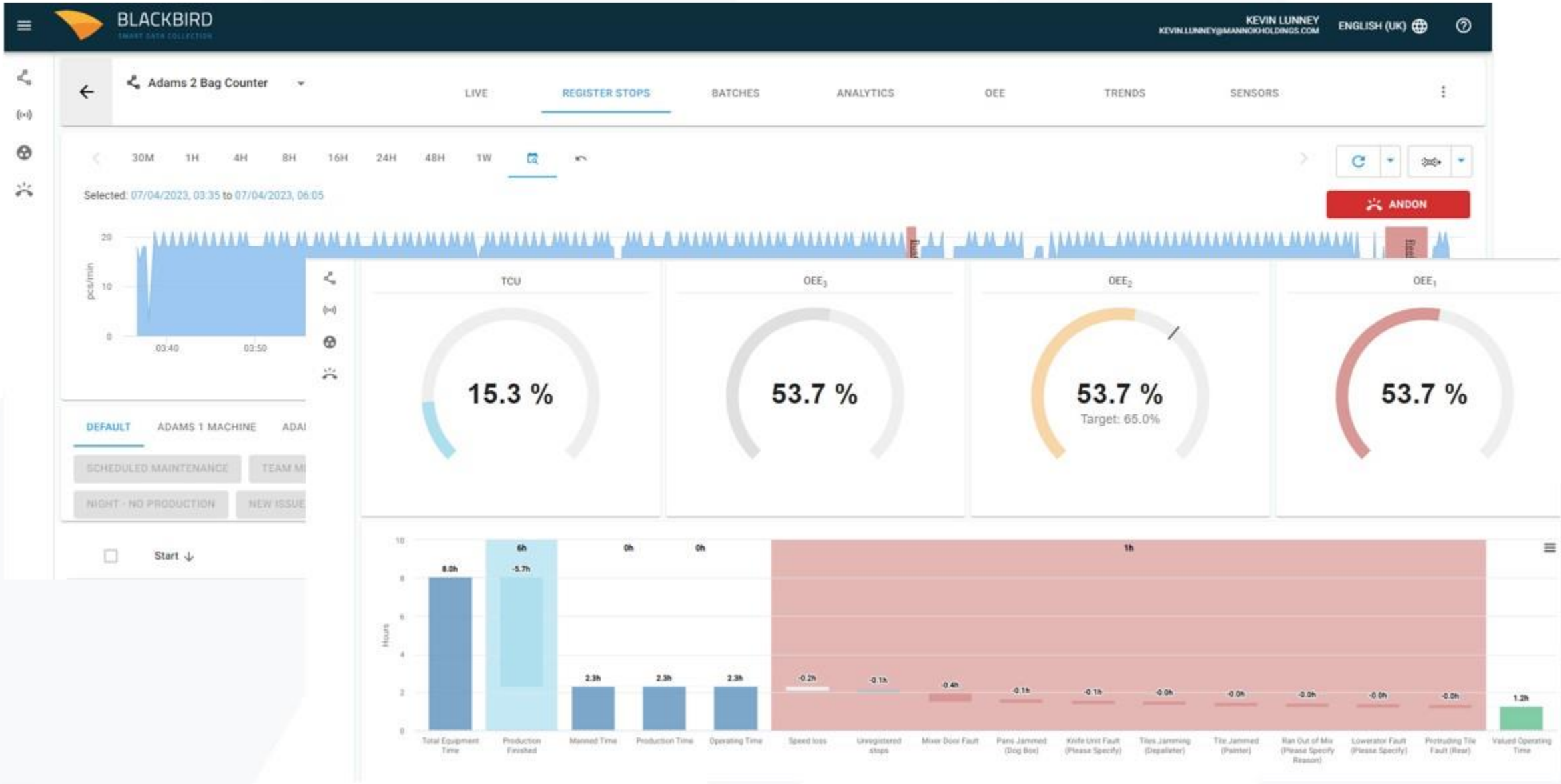

84%
K5
51%
51%
K6
76%
MANNOK
Accident Information
YTD Number of Accidents - 2021
0 days off work (Minor/First Aid)
Shift C
Shift D
Shift A
Day Staff
Shift B
Total
MANNOK

MANNOK DIGITIZATION

Digitization programmes in place in the following areas:

- Production & Process Optimisation (expert systems)
- Maintenance
- Transport & Customs
- EH&S Management
- Skills & Training
- Energy Management
- Product Information including LCAs and EPDs

DIGITISATION PRODUCTION



DIGITISATION MAINTENANCE

MAINTENANCE KPIs
Mannok

Refine by

Departments: Kiln
Categories: Select Categories
From: Feb 15, 2023 24:00
To: Apr 7, 2023 11:45
Apply Reset

DURATION : FEB 15, 2023 00:00 - APR 7, 2023 11:45

RUN FACTOR

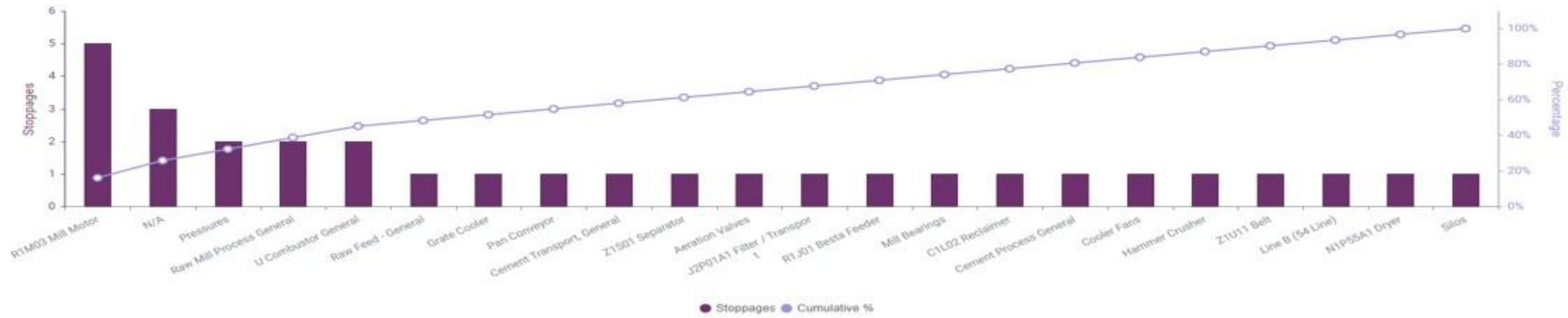
AVAILABILITY FACTOR

RELIABILITY FACTOR

MEAN TIME BETWEEN FAILURES

32.97
HOURS

STOPPAGES BY EQUIPMENT



DIGITISATION TRANSPORT & CUSTOMS

MANNOK

UK | Insights | Current Orders | Loads Planning | Status | Archive | 6804 | Kevin Lunney

Current Stats:

CURRENT ORDERS	LOADS PLANNIG	LOADING	CONFIRM PICK	OUT FOR DELIVERY	DELIVERED TODAY
31	68	63	0	123	3

Haulier Status:

PENDING	ACCEPTED	REJECTED	DELIVERY	DELIVERED	EXCEPTIONS	ETA UPDATES	INVOICE
7	19	0	123	3	3	0	0

Mannok Driver Status:

DELIVERY	DELIVERED	EXCEPTIONS
0	0	0

Latest deliveries:

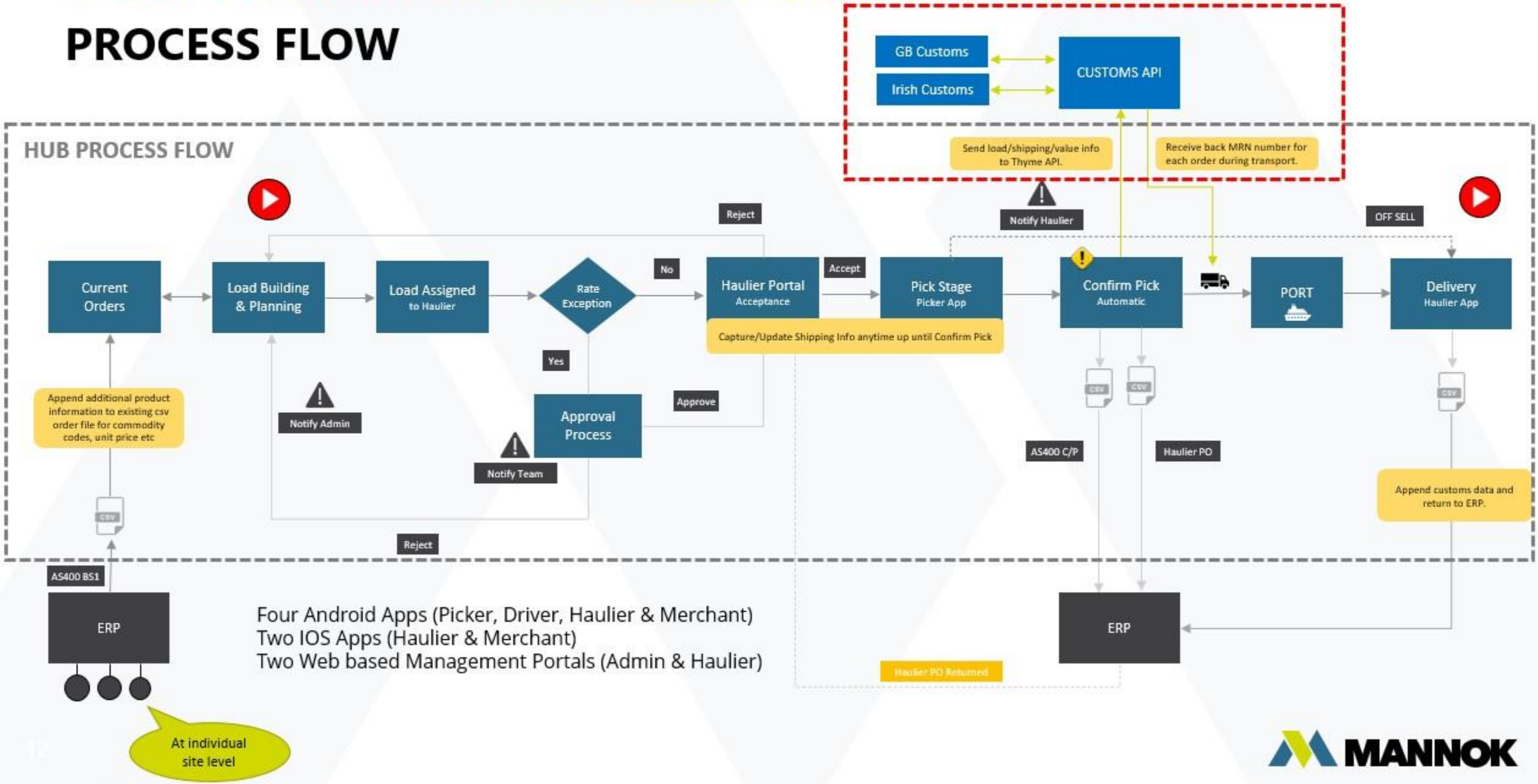
Customer	ADDRESS	LOAD ID	DATE/TIME	DELIVERED BY	SIGNED BY	REJECTED
BEATSONS BUILDING SUPPLIES LTD	GLENCRYAN ROAD	ML68359	07.04.2023 | 10:38 AM	Loane Transport	Jake glen	-
BEATSONS BUILDING SUPPLIES LTD	GLENCRYAN ROAD	ML68359	07.04.2023 | 10:38 AM	Loane Transport	Jake glen	-
BEATSONS BUILDING SUPPLIES LTD	GLENCRYAN ROAD	ML68359	07.04.2023 | 10:38 AM	Loane Transport	Jake glen	
MCNAIRS (BM) LTD	OLD MILL PARK	ML68359	07.04.2023 | 09:32 AM	Loane Transport	John wad	
D.W. NYE LTD	DOLKING ROAD	ML68242	07.04.2023 | 08:44 AM	BM Transport	David nye	
PGR BUILDER & TIMBER MERCHANTS	10 12 & 14 HANBURY ROAD	ML68493	07.04.2023 | 08:10 AM	BM Transport	Dan myat	
PGR BUILDER & TIMBER MERCHANTS	10 12 & 14 HANBURY ROAD	ML68493	07.04.2023 | 08:10 AM	BM Transport	Dan myat	
PGR BUILDER & TIMBER MERCHANTS	10 12 & 14 HANBURY ROAD	ML68493	07.04.2023 | 08:10 AM	BM Transport	Dan myat	
PGR BUILDER & TIMBER MERCHANTS	10 12 & 14 HANBURY ROAD	ML68493	07.04.2023 | 08:10 AM	BM Transport	Dan myat	

Haulier Acceptance:

HAULIER	LOAD ID	AREAS	EXPIRY
Surefreight	ML68865	Devon	ACCEPTED
Perennial Freight	ML68844	Devon	ACCEPTED

DIGITISATION TRANSPORT & CUSTOMS

PROCESS FLOW



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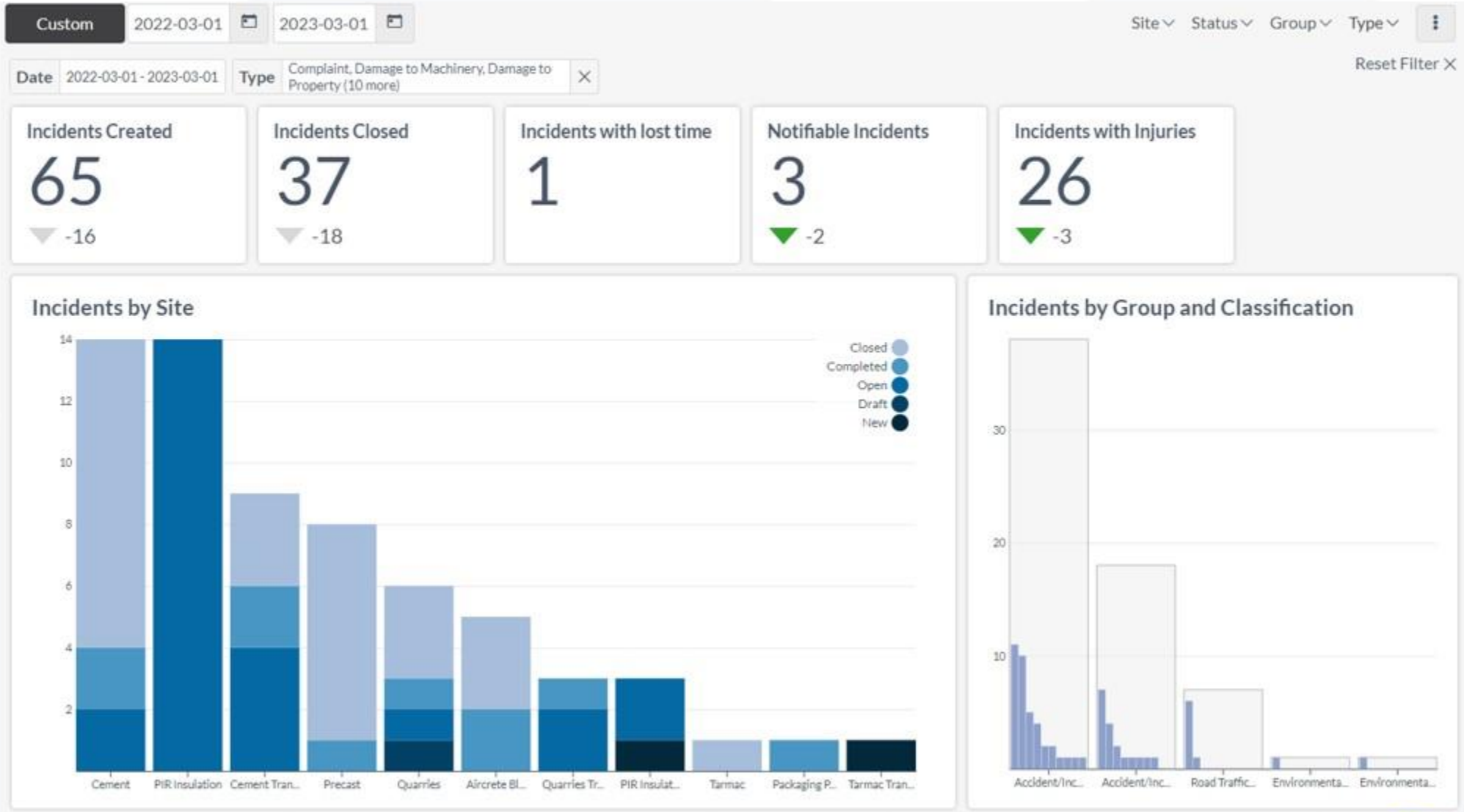
DIGITISATION EH&S MANAGEMENT



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DIGITISATION SKILLS & TRAINING

Course Contents

Operating the Granulator - KMD6

1. KMDOP9.3 - Feeding Sheet into Granulator KMD 6
2. KMDJC10.1 - Cleaning Granulator KMD 6

KMDOP9.3 - Feeding Sheet into Granulator KMD 6

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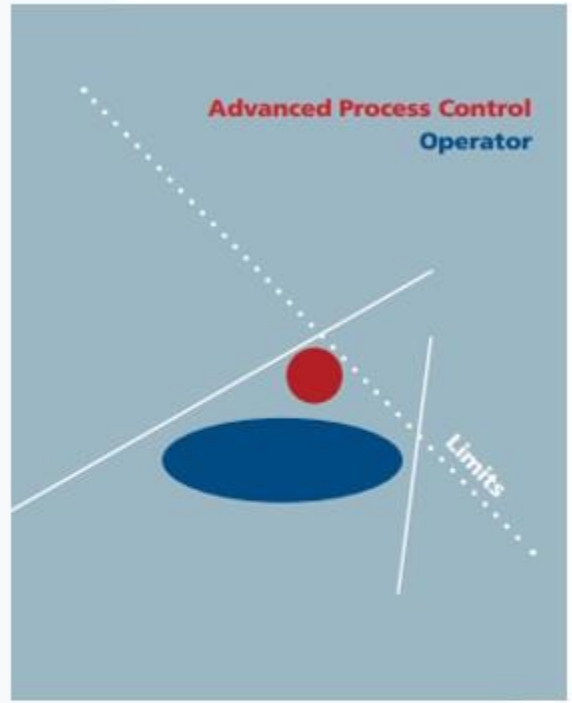
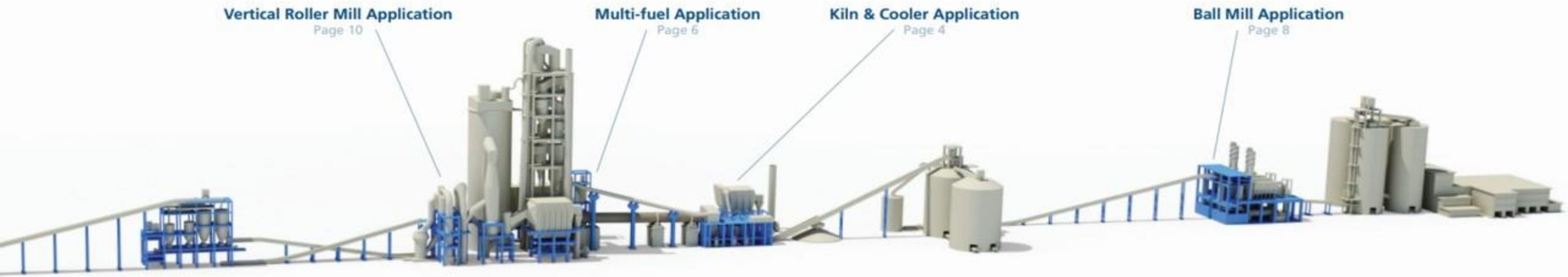
DIGITISATION ENERGY

PROCESS EXPERT SYSTEMS



Advanced Process Control currently being implemented in cement plant

- FLSmidth: ECS® PXP
- Up to 8% higher production
- Up to 6% lower fuel/energy consumption
- Up to 30% lower standard deviation of quality
- Payback of investment in less than a year (depending on specific applications)
- Long-term stability
- Reduced equipment wear
- Minimized downtime
- Reduced maintenance costs



DIGITISATION PRODUCT DETAILS / BIM

BIM Object

A single Mannok product BIM Object such as insulation, aircrete blocks, precast elements, etc.

VIEW ALL

BIM Object Assembly

A group of BIM Objects which form a BIM Assembly for wall, roof and floor solutions.

VIEW ALL

BIM Object System

A complete BIM construction system which includes a wall, roof and floor solution.

VIEW ALL

BIM Object System – Sill

BIM Object System – Jamb

BIM Object System – Lintel

BIM Object System – Pitched Roof

BIM Object System – Gable

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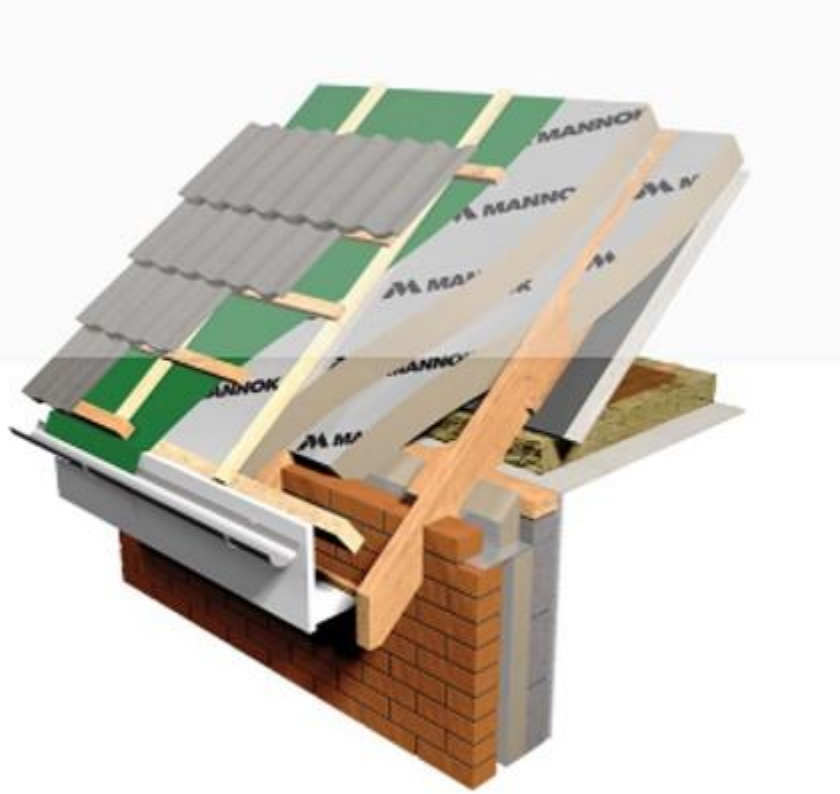
PRODUCT PERFORMANCE MEASUREMENT

LCA - Life Cycle Assessment

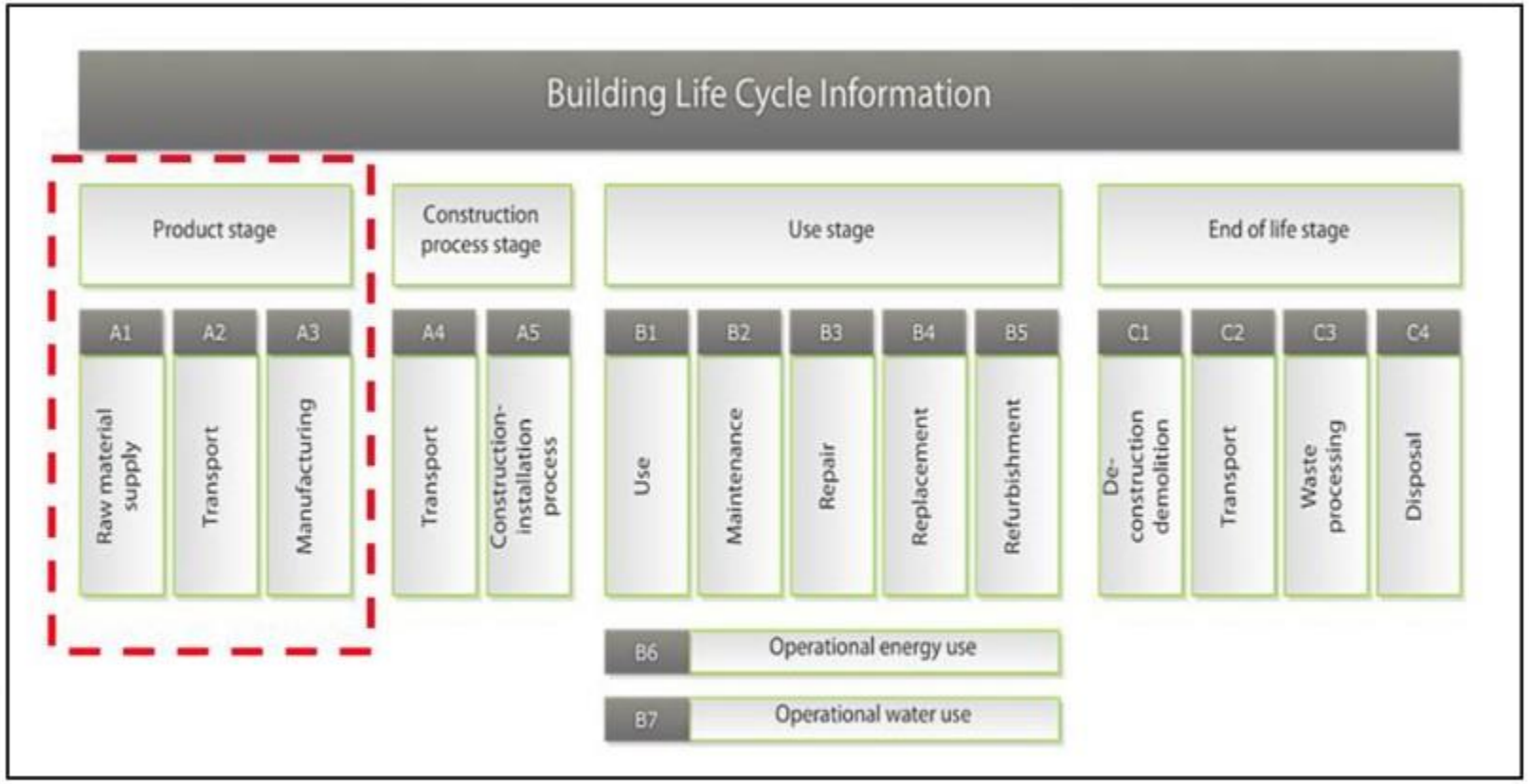
- Provides quantitative information on products and resources for market information and environmental optimization.
- Allows for better understanding of 'hot spots' in the material supply chain and production process.
- Helps management make informed decisions.



EPD – Environmental Performance Declaration

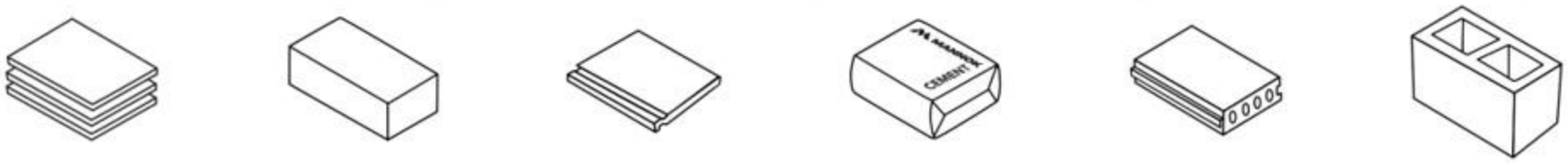
- Third party certified that is officially registered to show the environmental impact of a product or service.
- Producing an EPD is a 3-stage process
  1. Produce LCA
  2. Independent verification of LCA
  3. Convert LCA to EPD

LCA's & EPD's



Mannok:

- ✓ LCA's developed by Irish Consultants EcoReview and include modules A1, A2 and A3 *"Cradle to Gate"*
- ✓ EPD's hosted by EPD Ireland



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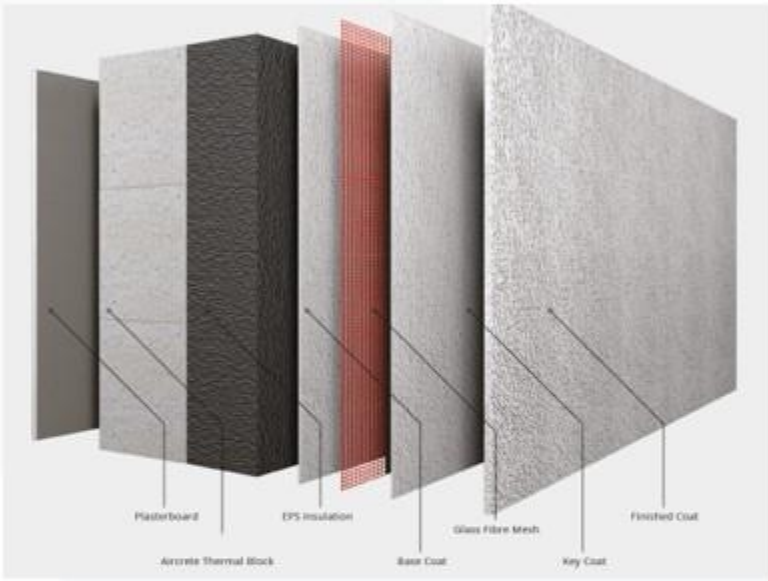
FABRIC FIRST: MANNOK SIMS

A ‘fabric first’ approach to building design involves maximising the performance of the building fabric before considering bolt-on such as renewable technologies. - *Reduce the energy demand and the energy source becomes less important.*



Fabric first approach : Key Elements	Benefits
▪ High Quality Insulation, ▪ Increased Airtightness, ▪ Minimise Thermal Bridging	▪ Reduces operational costs, ▪ Improves energy efficiency, ▪ Reduces carbon emissions, ▪ Reduces maintenance costs, ▪ Bridges the performance gap

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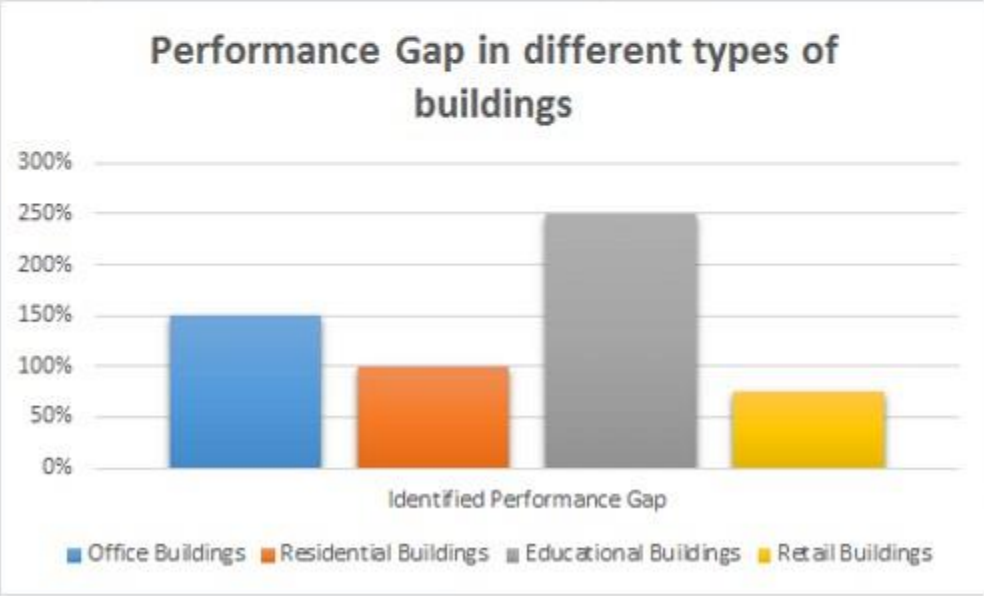
BRIDGE THE PERFORMANCE GAP

- The “Performance Gap” is the difference between the target energy performance of a building and the actual as-build performance of a building.
- The gap between ‘as-designed’ and ‘as-build’ has been identified to be as much as 250%, with Educational Building performing worst.
- The correct choice of construction method, a skilled workforce and digitising construction, all help to bridge the performance gap.



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BRIDGE THE PERFORMANCE GAP

Typical example: Poorly installed cavity wall insulation leads to thermal looping, the natural movement of air within a cavity, which draws cold air up the inside of the insulation, reducing its performance.

Thermal Looping and its Effect on U Value

- Desk U Value of 100mm Cavity Wall = 0.34W/m^{2}K

- With 3mm gap: 0.54W/m^{2}K

- With 10mm gap: 0.65W/m^{2}K

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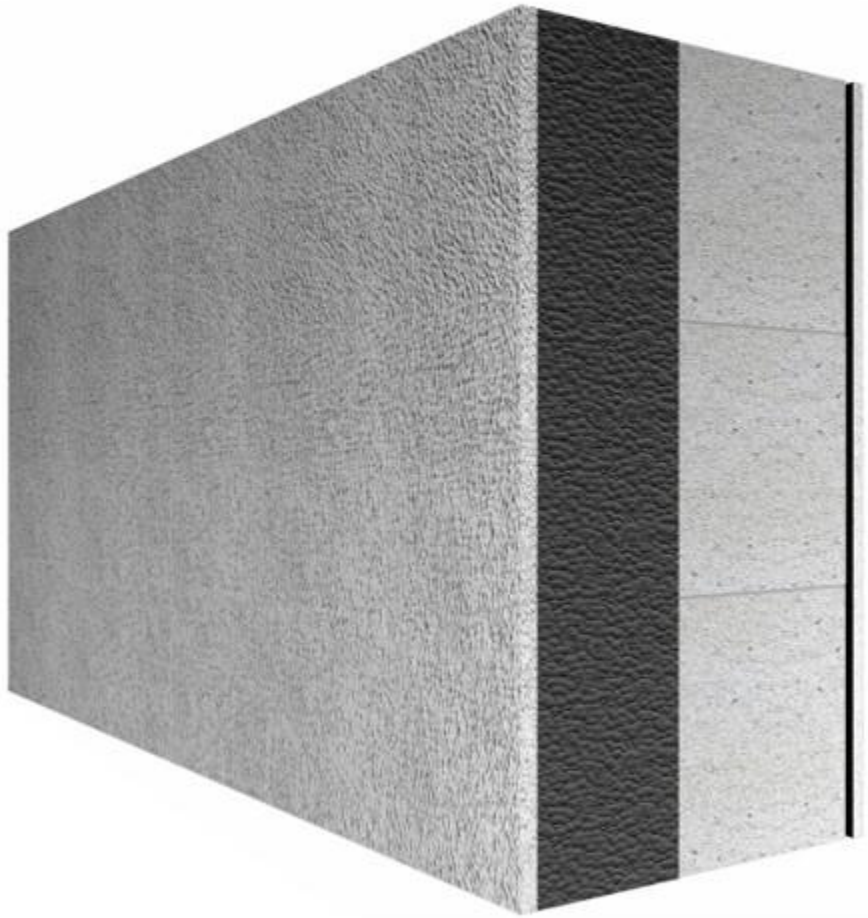
BRIDGE THE PERFORMANCE GAP



SIMS by Mannok

- No reliance on block-layers to install insulation – installed by trained applicator
- No wall ties or DPC's to obstruct insulation
- Adhesively bonding the insulation to blockwork eliminates risk of thermal looping
- Insulation thickness not limited to cavity width
- Thermal bridging addressed by default

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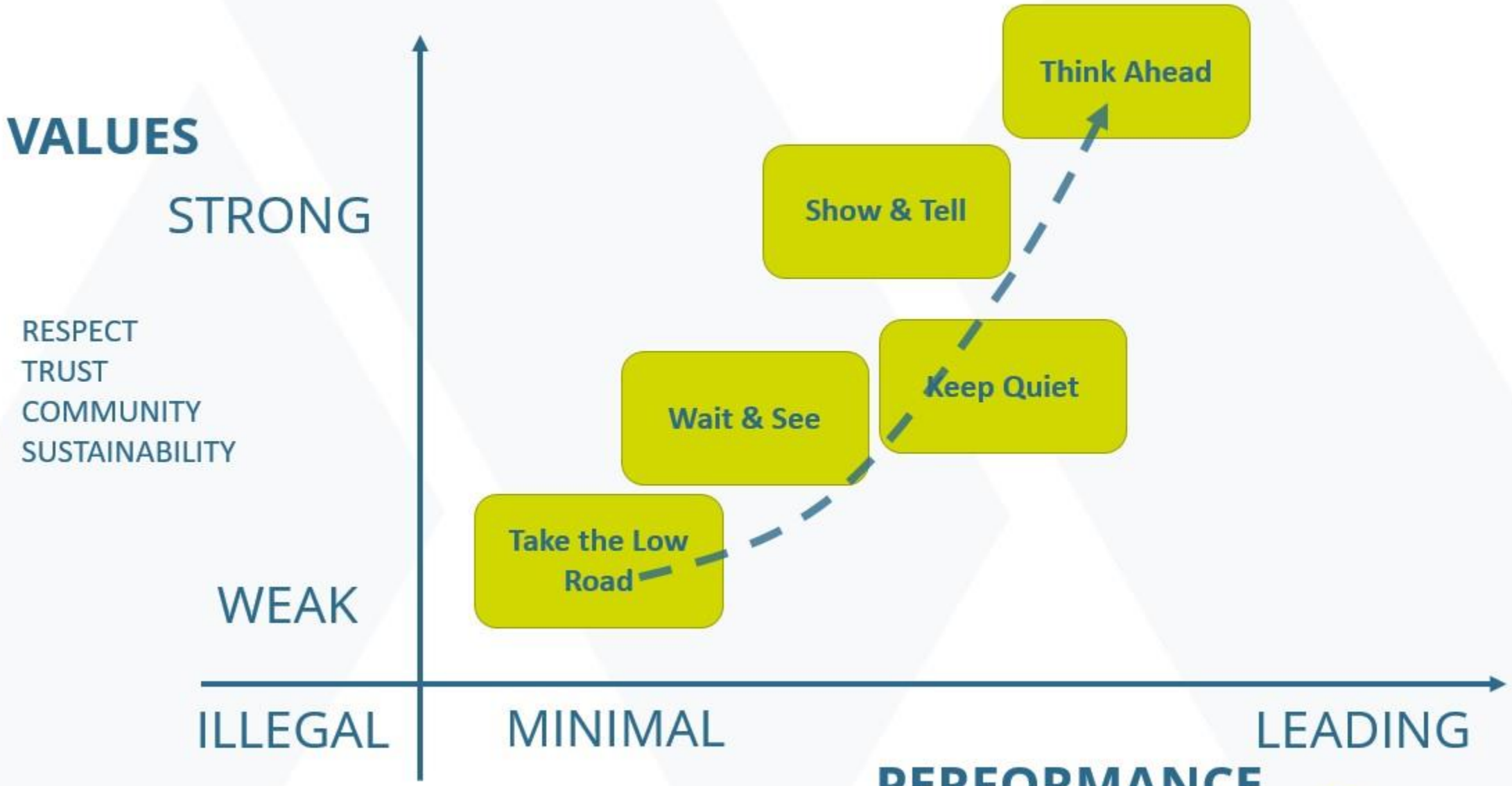
SUSTAINABILITY: EVOLUTION IN THINKING



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"We have a moral and ethical obligation to do everything in our power and sphere of influence to off-set the worst effects of the three of the global crisis we are all facing – climate change, biodiversity loss and the pollution of our environment"

2030 VISION ROADMAP

PEOPLE PLANET PARTNERS

2022
- ISO 45001 Safety Management System across all sites
- Employee sustainability engagement programme
- Water conservation programme
- Energy efficiency action plan
- Leading Excellence Programme to includelean circular economy system
- Annual schools' environmental initiative
- BITC CORE - Standard Award
- Scope 3 emissions action plan

2023
- Occupational Health Programme
- Business in the Community Inclusive Workplace Pledge
- Sustainability Leadership Training Programme
- Residual emissions action plan
- Increase land carbon sequestration rate by 12.5% v 2021
- BITC CORE - Silver Award
- Sustainable procurement policy
- Sustainability product innovation programme
- Voluntary emissions disclosure through Carbon Disclosure Project (CDP)

2024
- Subsidised employee membership to local physical education centre
- BITC Business & Biodiversity Charter Platinum Standard
- Increase land carbon sequestration rate by 25% v 2021
- BITC CORE - Gold Award
- Customer service and training centre of excellence

2025
- Employees complete Safer by Competence training
- Skills Development Programme to core manufacturing facilities
- 100% green electricity across all sites
- Decarbonise all cars and vans to zero emission vehicles
- ISO 50001 Energy Management accreditation to all sites
- Zero waste to landfill
- 3 new schools' partnerships

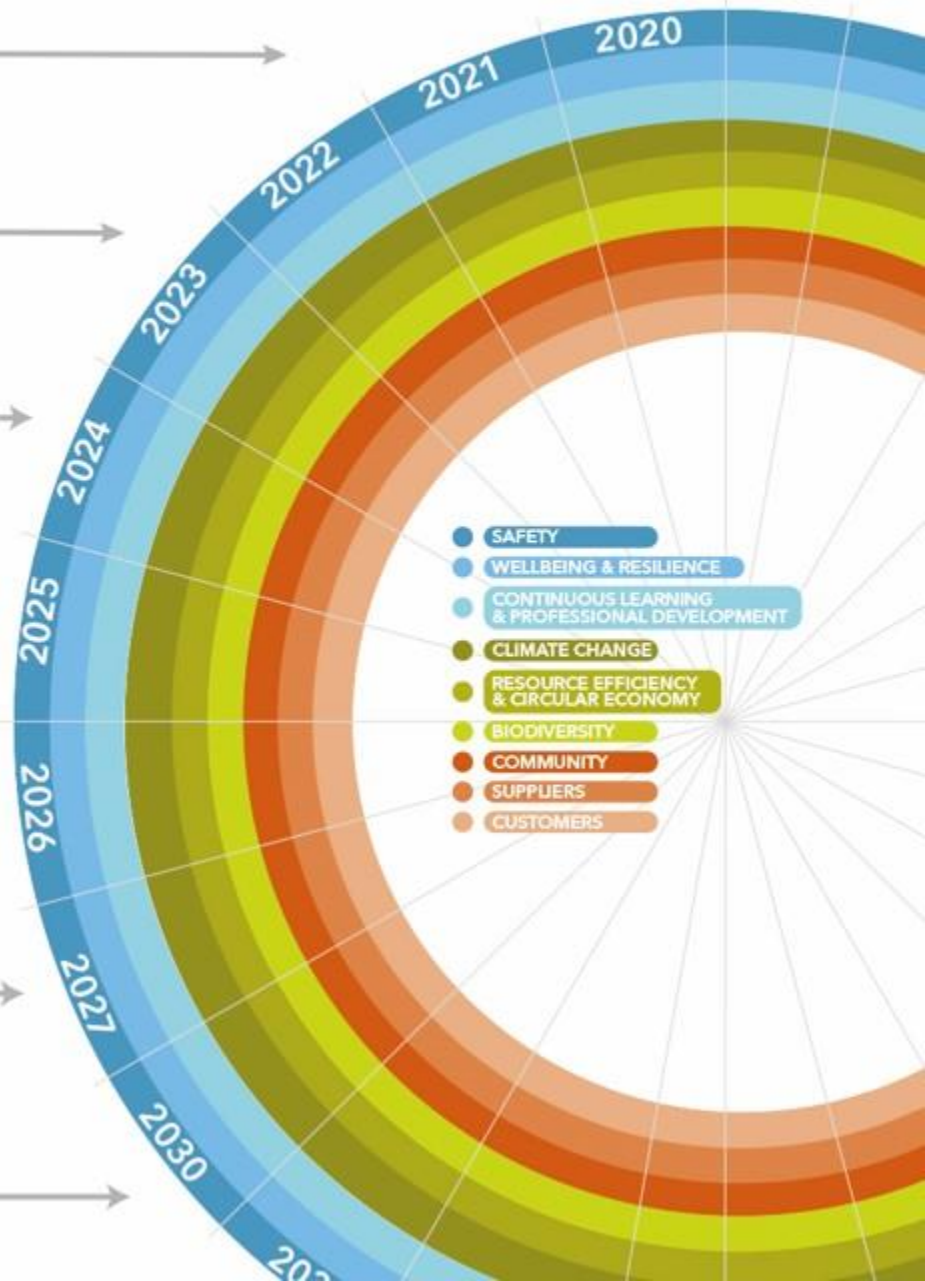
2026
- Implement priority projects aligned with NAAP
- Increase land carbon sequestration rate by 50% v 2021
- BITC CORE - Platinum Award
- Direct/tier 1 suppliers to achieve BES 6001 or industry equivalent
- Achieve all relevant ISO standards in the areas of climate action, nature-based solutions (biodiversity), financial and non-financial reporting

2027
- Skills Development Programme to support functions
- Competency-based framework for Operational Excellence at all levels of the organisation
- Slieve Rushen House development

2030
- Zero lost time accidents
- Reduce scope 1 and 2 emissions by 50%
- Reduce the carbon intensity of cement products by 32%
- Reduce the carbon intensity of insulation and concrete products by 25%
- Decarbonise 50% of fleet
- Increase land carbon sequestration rate by 100% v 2021
- Zero (residual) process waste

2035
- Decarbonise 75% of fleet

2040
- Decarbonise 100% of fleet



MANNOK FUTURES

EDUCATIONAL PARTNERSHIP OVERVIEW

SCHOOLS

PARTNERSHIPS
- St. Michael's College (Technical)
- St. Aidan's (Business)
- Mount Lourdes Grammar (Sustainability)
- St Kevin's College (Constuction BTEC)

WORK PLACEMENTS
- Chemical | Polymer
- Mechanical | Electrical
- Marketing | Business Change | IT
- H&S | Environmental

OTHER SUPPORT
- Careers Days
- Bursaries / Academic Awards
- Factory Tours

EDUCATIONAL INITIATIVES
- 4C Ur Future
- Department of Education Innovation Conference
- MEGA (Manufacturing & Engineering Growth & Advancement)

APPRENTICES

ENGINEERING
- Electrical & Mechanical Engineering
- Heavy Vehicle Repair
- Degree Apprenticeship in Manufacturing & Engineering

WORK PLACEMENTS
- Polymer Processing & Technology

HIGHER LEVEL APPRENTICESHIPS
- IT
- Degree +Programme BSc (Hons) Business Technology

GRADUATES

UNDERGRADUATE PAID INTERNSHIP
- Engineering Projects
- Business & IT Projects

GRADUATE PROGRAMMES
- Accounting & Finance
- Electrical & Mechanical Engineering
- Polymer & Chemical Engineering
- Project Management
- EHS Management
- IT
- Advanced Materials Science

EXPERIENCED (INTERNAL & EXTERNAL)

CHARTERSHIPS
- Chartered Institute of Marketing
- Engineers Ireland
- Chartered Accountants Ireland
- Institution of Occupational Safety & Health
- Chartered Institute of Personnel & Development

ENGINEERING (ELECTRICAL | MECHANICAL | CHEMICAL)
- Siemens PLC Level 6
- Multi skilled Technician

MANAGEMENT
- Site Supervision

BUSINESS & IT
- Advanced Leadership
- Lean Manufacturing Principles
- Business Analysis
- Polymer Engineering
- TOGAF (Ent. Architecture)

MANNOK SUSTAINABILITY IN ACTION

MOUNT LOURDES PARTNERSHIP IN SUSTAINABILITY




"Mannok and everyone here at Mount Lourdes clearly recognise the importance of the relationship between education providers, the community and successful local industry. This partnership demonstrates a shared interest in and shared responsibility for the young people of this area.

I'd also like to commend the management and staff of Mannok. It's encouraging to see an established local employer interacting with its local community, sharing its knowledge and expertise, building relationships with the school and most importantly valuing young people."

- Michelle McIlveen, Northern Ireland Education Minister








New NI Education Minister Launches Mannok's New Sustainability Partnership with Local School, Mount Lourdes

"The first-hand access to the expertise and facilities at Mannok will be invaluable for both our students and teaching staff. This type of blended learning will bring a new dimension to the educational framework for the students and staff involved which will enrich the learning experience for the girls and bring real-life experiences which just can't be achieved through classroom learning alone."

- Sinead Cullen, Mount Lourdes Principal








MANNOK AND MOUNT LOURDES PARTNERSHIP IN SUSTAINABILITY HELPS LAUNCH MAJOR RECYCLING INITIATIVE

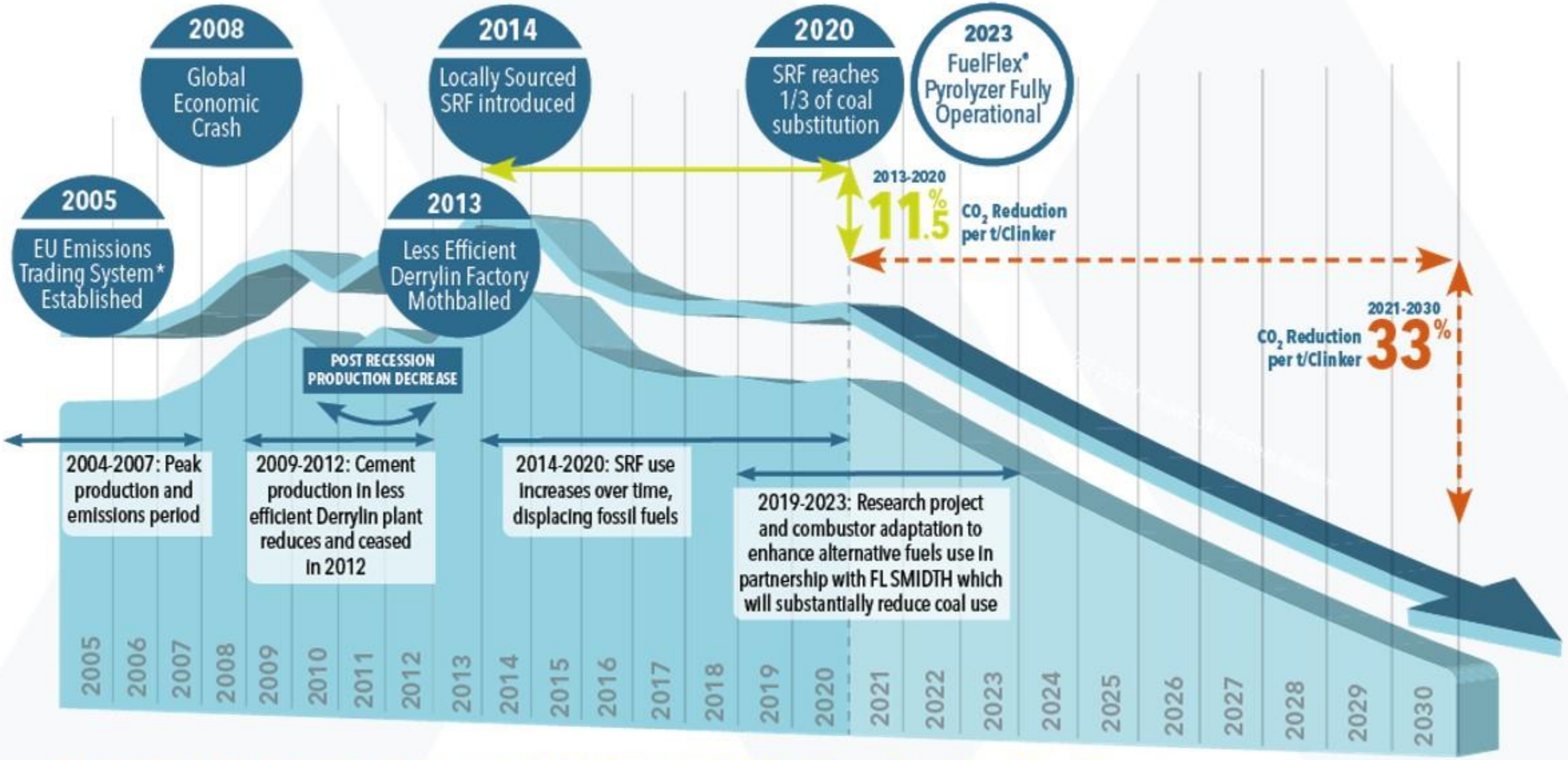




Mannok launch a five year partnership with school

"I think that Mannok as a company are giving us an angle here that you wouldn't normally get in education. Sustainability is a theme that's built into so many of our courses and to return to school life after lockdown to such a positive, innovative project has given the whole school a very welcome lift"

- Gerard Quinn, Mount Lourdes Head of Geography



STRIVING FOR NET ZERO →→→→ *Challenges for Cement*

MANNOK

CEMENT CO_2 /CLINKER

EU-ETS Submission	2020 t CO_2e	%	2021 t CO_2e	%	2022 t CO_2e	%
Calcination	465,003	62.62	536,966	63.23	463,153	64.20
Coal	226,749	30.55	267,388	31.49	200,690	27.82
SRF	34,552	4.65	27,133	3.20	34,198	4.74
NCC*	14,233	1.92	16,902	1.99	21,533	2.98
FDPC	1,114	0.15	93	0.01	760	0.10
Other (Gas/Oil Kerosene, etc)	846	0.11	749	0.09	1,057	0.15
Total	**747,598**	**100.00**	**849,233**	**100.00**	**722,828**	**100.00**
Clinker Production (t)	**875,196**		**1,013,246**		**869,977**	
kg CO_2e/ kg Clinker	**0.854**		**0.838**		**0.832**	

**NCC - Non Carbonate Carbon (ratio of Raw Meal to Clinker)*

- 33% Reduction (on 2020) is 0.572kg CO_2-e/kg Clinker or **reduction of 0.282kg CO_2-e/kg Clinker**
- Competitors are promoting <0.500kg CO_2-e/kg Clinker by 2030

ACTIVE CEMENT CO_2 PROJECTS

Project	Aim	Est. CO_2e reduction based on 2022 production	Status	Timeframe	Target Intensity kg CO_2e/kg clinker
Fuel Flex®	World-First RD&I Maximise Coal Displacement in Calcination Stage of cement production	34kt	Complete FLS	Oct 2022	0.793
Kiln SRF	Introduce SRF in Kiln Stage of cement production	45kt	Planned	Q2 2024	0.741
The above two projects represent approx. one-third of the 33% objective in Mannok 2030 Vision					
Kiln SRF & Oxyfuel	Introduce Jetflex® SRF Burner to kiln	16kt	Design	Q1 2025	0.722
H_2 in Kiln	Remove coal fully from Kiln, replace with Hydrogen and introduce oxyfuel	48kt	Research & Innovation	2026	0.640
EU-ETS Benchmark 2021-2025 (Phase 4)					0.693

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CO_2 INTENSITY CALCS /CLINKER

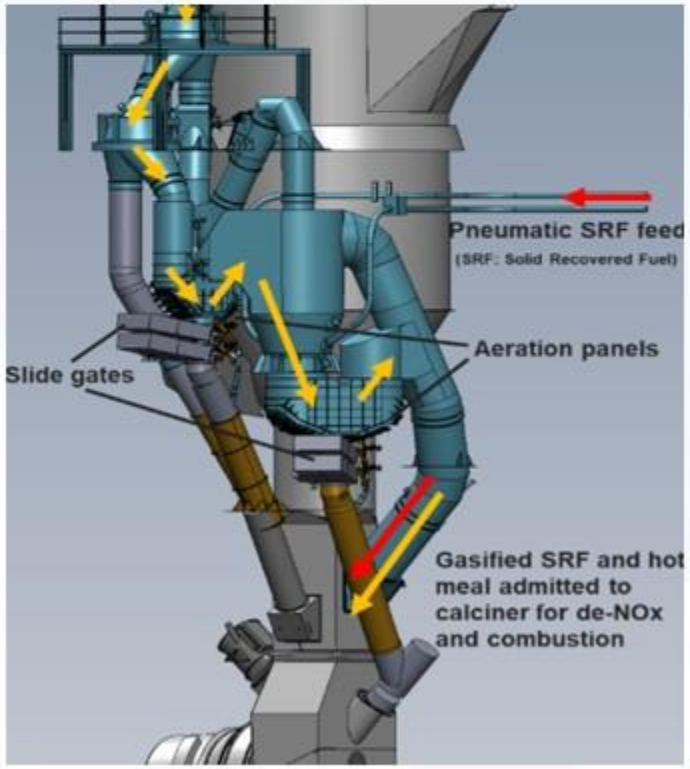
2022 CO_2 Fuel Intensity Analysis	t CO_2e/ t Clinker	%
Process (Limestone) CO_2 Intensity	0.559	67
Fuel (Coal & SRF) CO_2 Intensity	0.273	33
Combined Clinker CO_2 Intensity	**0.832**	

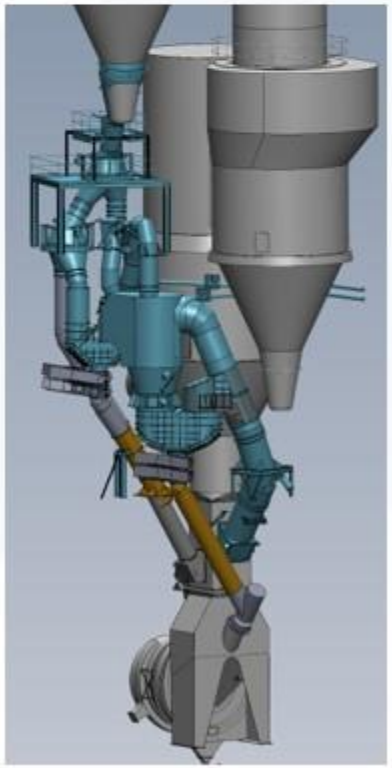
Cement decarbonisation projects cumulative reductions	% Intensity Reduction on 2022	
	Fuel CO_2	Total CO_2
With FuelFlex® (at 16t/h) – Mid 23 (WIP)	14.2	4.6
With Satellite SRF in Kiln (40%) – Q1 24	32.9	10.9
With JetFlex® SRF/Satellite in Kiln (55%) – Q3 25	40.3	13.2
Replace remaining Coal (20,000t) with H_2 – 2026	62.6	23.0

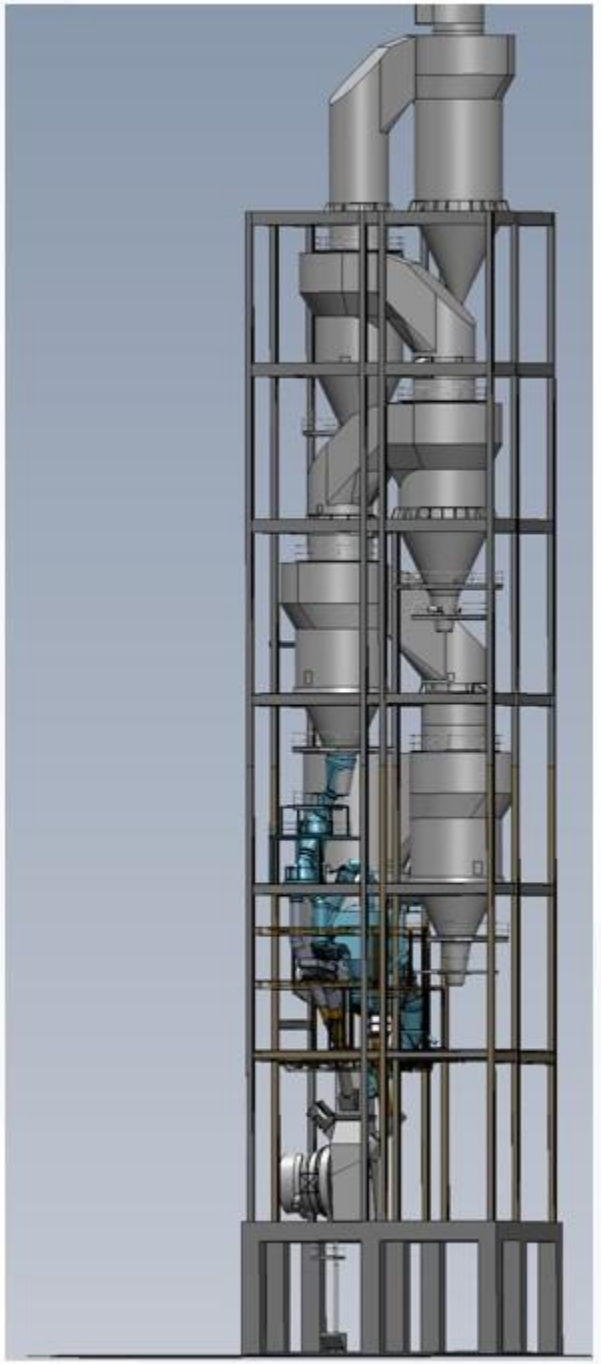
FUELFLEX® Pyrolizer

- RD&I Project now commissioned (Oct 22) in conjunction with FLSmidth
- Allows greater level of SRF burn in calciner, negating the need for calciner replacement
- Seeking to maximise in 2023

- Significant NOx reduction from 500 (licence limit) to 350 mg/Nm3 of gas released to atmosphere
- An extra 240 tonnes of CO_2 emissions saved per day through coal displacement
- 48,000L of ammonia water saved per week
- More even temperature distribution in riser leading to fewer build-ups and smoother operating conditions





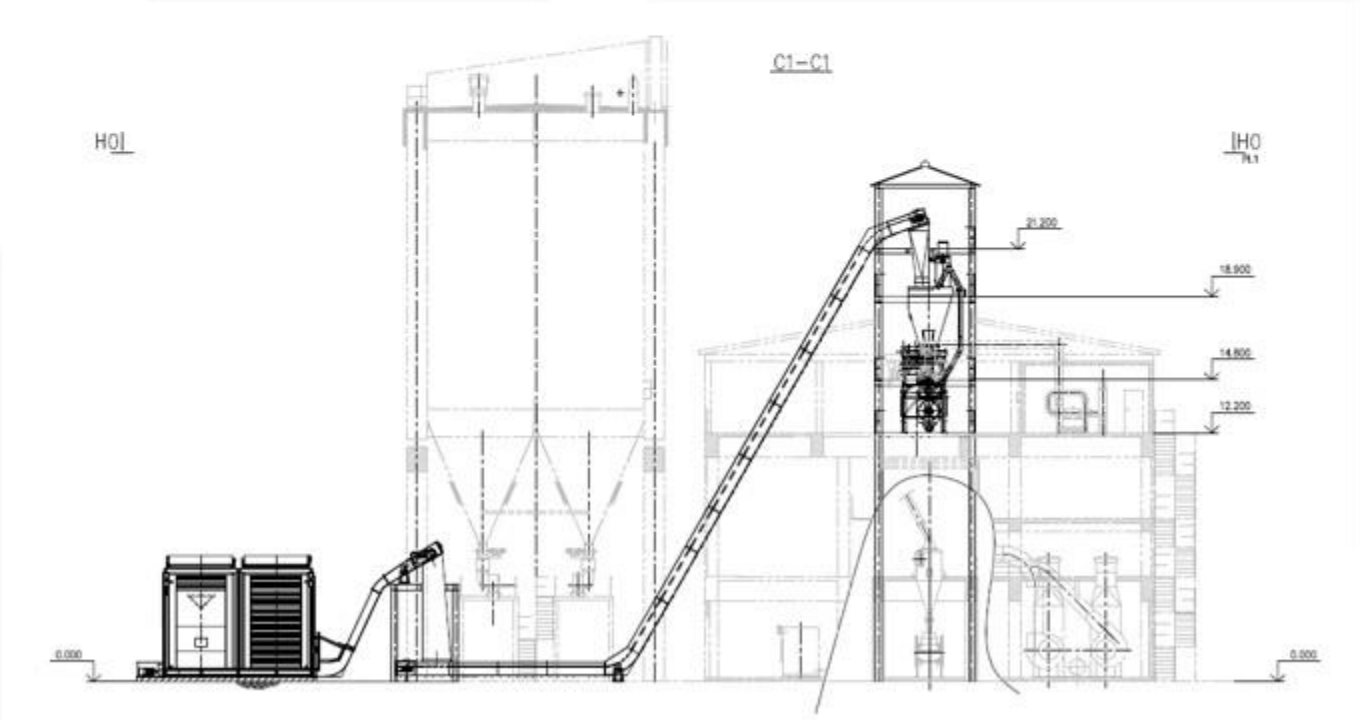


Site visit by South Korean delegation – November 2022

SATELLITE BURNER & JETFLEX® DESIGN

Two-stage retrofit to kiln to allow increasing levels of Coal Displacement with SRF

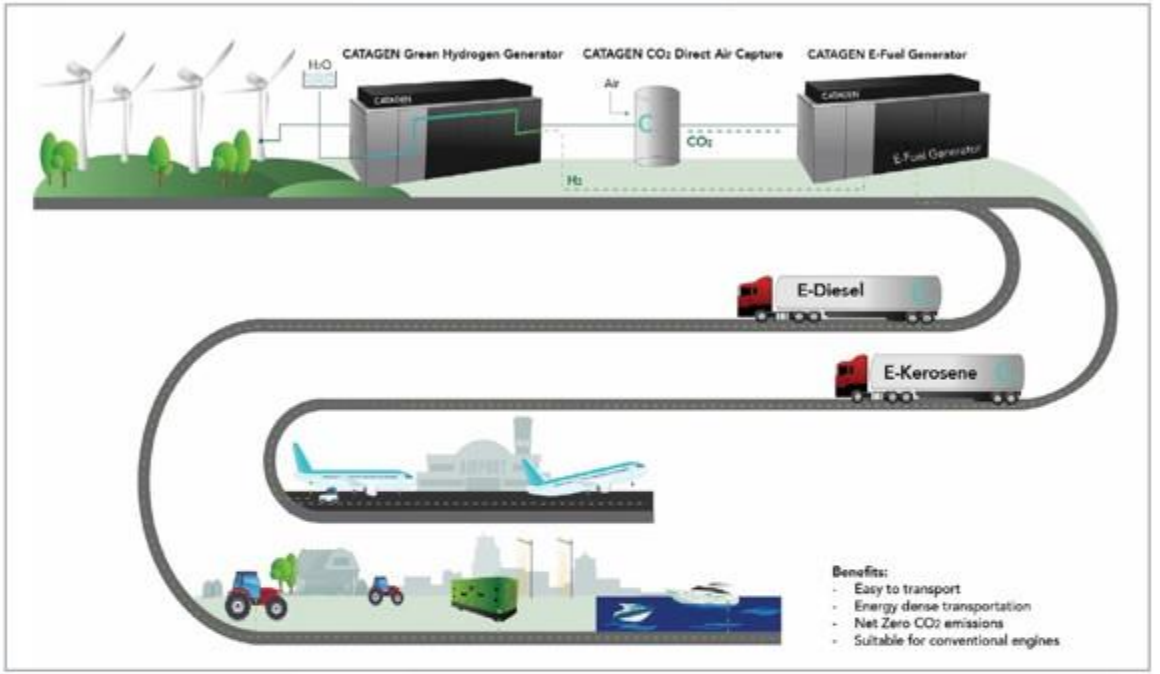
- Satellite Burner works in conjunction with existing main kiln burner
- Jetflex® replaces main kiln burner will allow future H_2 and Oxy-fuelling
- Site reference visit in Jan 23 Rohožník (CRH – Slovakia)



CEMHGEN: MANNOK & CATAGEN

PROJECT CEMHGEN

The first industrial-scale thermochemical generation and direct use of hydrogen in a cement kiln using recycled waste process heat.



MANNOK

A leading manufacturer of premium building materials. Key strategic areas of focus are improving plant operational efficiencies, enhancing product competitiveness and making a significant contribution to a circular economy. Lead project partner and responsible for all project outputs and results.

FLSmidth

FLSmidth provides innovative engineering, equipment and service solutions to the global mining and cement industry. Providing specialist knowledge and experience in engineering and innovative advanced technology that will integrate with the existing infrastructure

CATAGEN

Catagen is a pioneering facility delivering industry leading environmental and hydrogen production solutions and technology. Lead where their innovative technology integrates with Mannok cement operations from a process and physical perspective.

DTU Technical University of Denmark

Recognized internationally as a leading university in the areas of the technical and the natural sciences, renowned for their focus on sustainability, and environmental research. A key advisory international partner in the development and delivery of the project.

ATU

One of Irelands leading environmental and sustainability research-intensive universities, leading cutting-edge research into the problems of, and solutions to, environmental change. A key advisory partner and an important stakeholder in the delivery of the knowledge sharing plan.

RELATED DECARBONISATION WORK

Project/ Research	Benefits
Limestone Filler/ Additives Research	Reduce carbon intensive clinker content in cement range by adding setting additives to cement blend while increasing less intensive filler.
Calcined Clay (SCM)	InvestNI/ BEIS-Funded research into possible manufacture of SCM form local deposits Calcined Clay in Northern Ireland now complete
DETOCS	Data Enabling Transformation and Optimisation towards Concrete Sustainability. EU Horizon-funded collaboration to study the production of high quality SCMs from various sources
PXP Upgrade	FLS ECS/ProcessExpert® (PXP) advanced process control software upgrade provides advanced process control and optimization for the plant. Being implemented on the Pyro and Milling processes within the plant. Will be completed in Q2 2023.
Carbon 8	Planned work with Carbon8 to treat FDPC (by-product from burning SRF) with CO_2 from stack to produce a reformed aggregate.
CATAGEN	Feasibility study of producing Thermochemical Hydrogen (different method to Electrolysis) from waste heat or renewable energy for use in plant with modular compression and e-fuel production. This new technology could be more efficient overall and more suitable to cement sector
Carbon Cure	Are in the process of installing a pilot carbon cure plant at Ready-mix to see how CO_2 can be used to reduce cement content and reduce carbon intensity of Ready-mix.
Rooftop Solar	Currently installing solar panels on PIR (1.3MW). Awaiting final proposals on larger system for Packaging plant and related large buildings throughout manufacturing complex

Cavan
Comhairle Contae an Chabháin
Cavan County Council

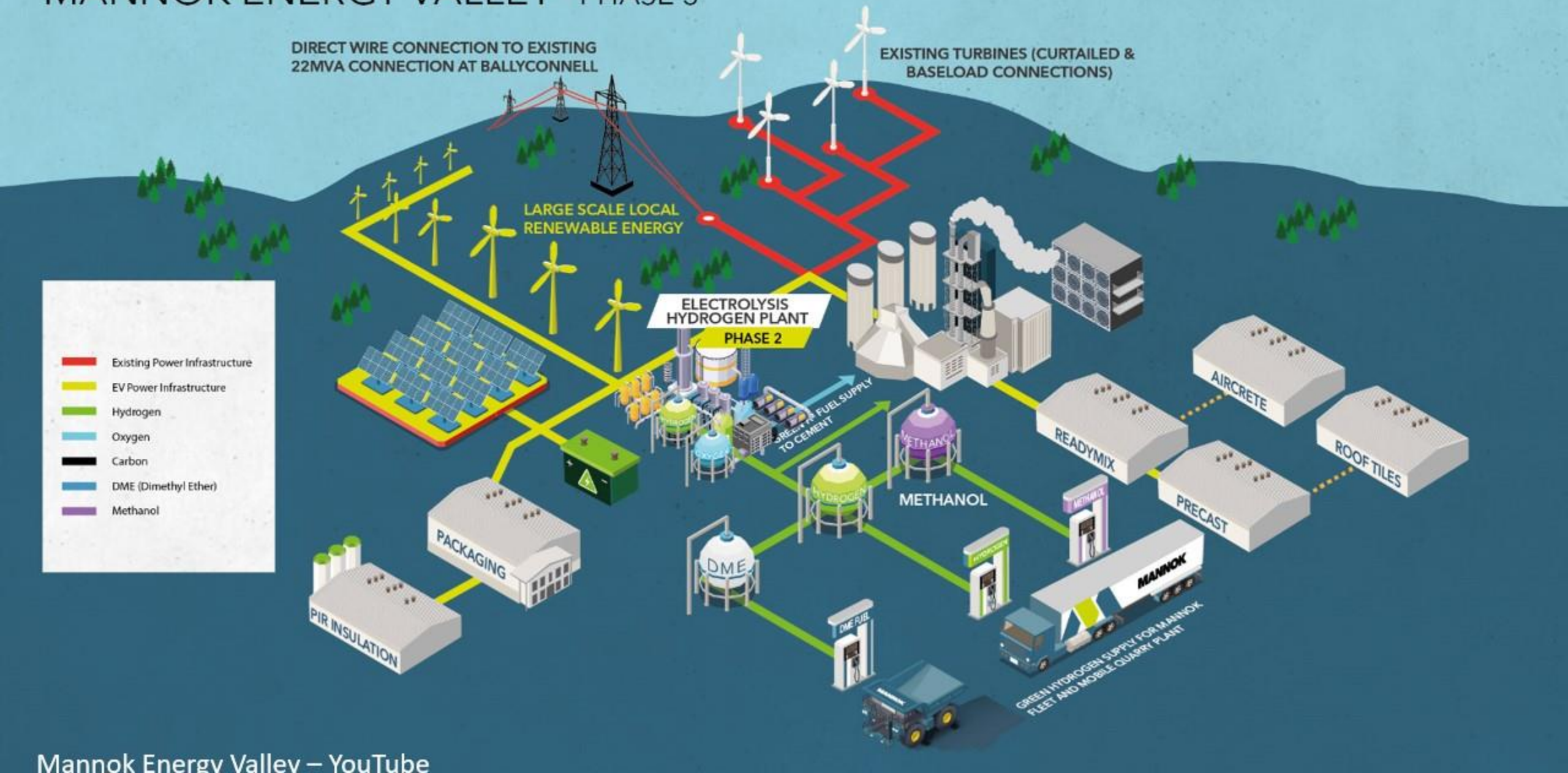
Leitrim
County Council
Comhairle Chontae Liatroma

Fermanagh & Omagh
District Council
Comhairle Ceantair
Fhear Manach agus na hÓmaí

CREATING
A DECARBONISED ECONOMY FOR THE REGION

MANNOK

MANNOK ENERGY VALLEY - PHASE 3

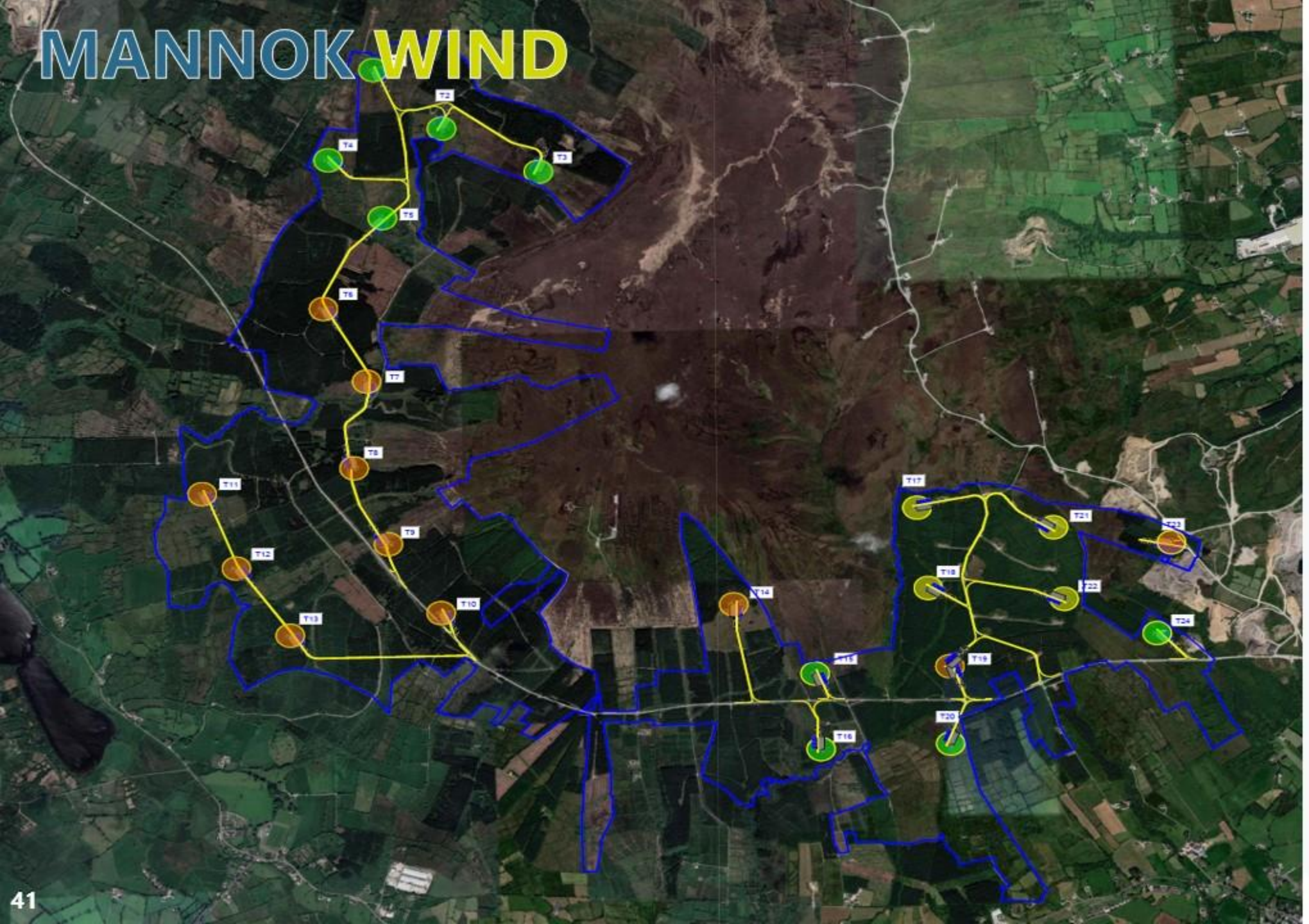


Mannok Energy Valley – YouTube

ENERGY VALLEY PHASING

Phase	Project	Objective	Collaboration
Phase 1	Produce Green H_2 and O from curtailed wind at Slieve Rushen wind farm	Replace 70% of 4m litres of Diesel with Hydrogen or derivative	FEED Study InvestNI BEIS/InnovateUK
Phase 2	Create new c50MW Renewable project close to Mannok operations	Grid Power displacement of c150GWh/ annum	Enterprise Ireland FuturEnergy Ireland
Phase 3	Increase renewable generation capacity combined with WHR	Use excess power to generate Hydrogen and Oxygen replacing remaining coal in cement plant	CATAGEN FLSmidth FuturEnergy Ireland
Phase 4	Further Wind and Solar generation combined with CCU at cement plant to produce Syngas	Become a generator of Syngas for own use and local distribution in North West	Various

MANNOK


MANNOK WIND
T2
T4
T3
T5
T6
T7
T8
T11
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T12
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T21
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T24
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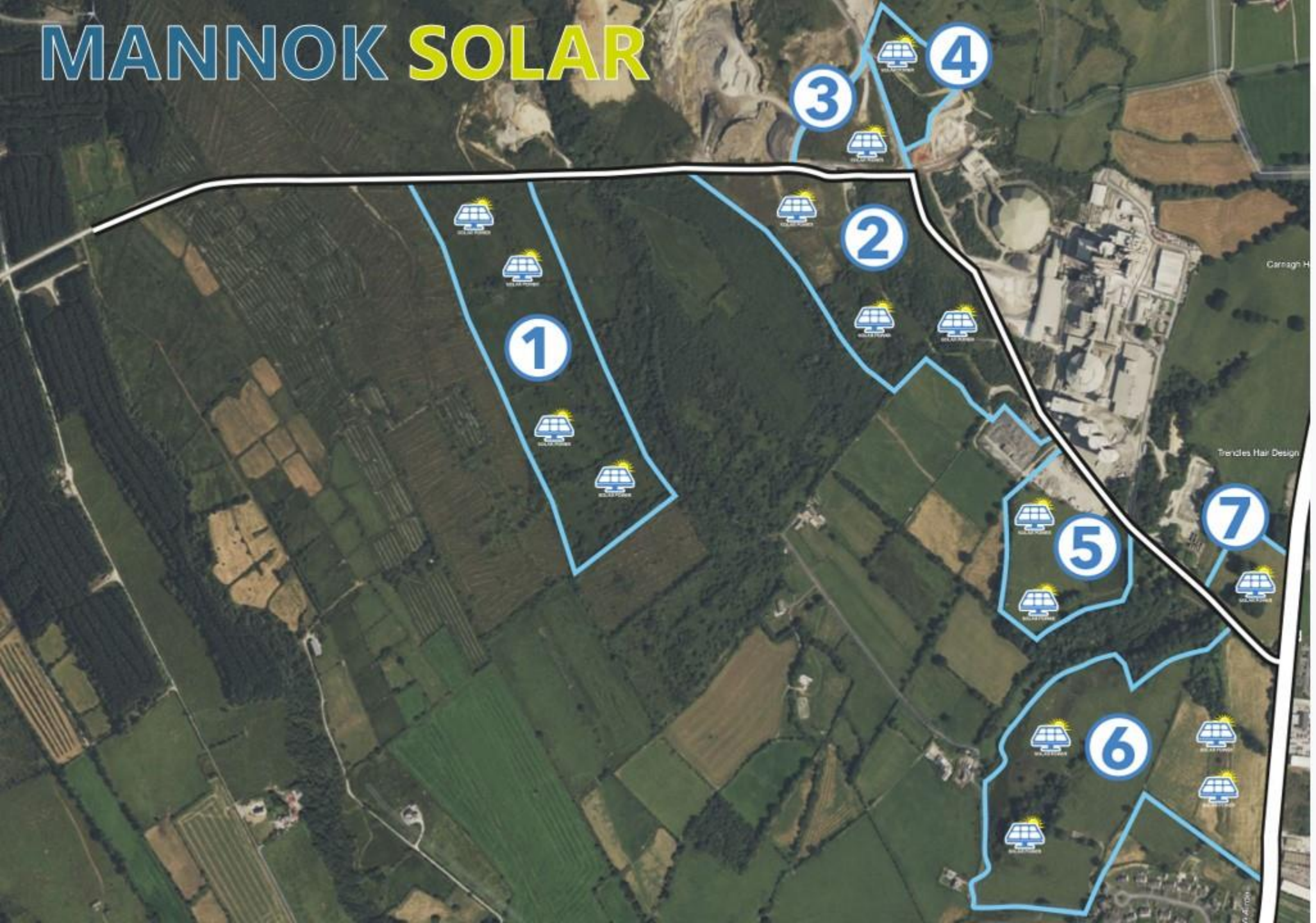
T20
T16

MANNOK



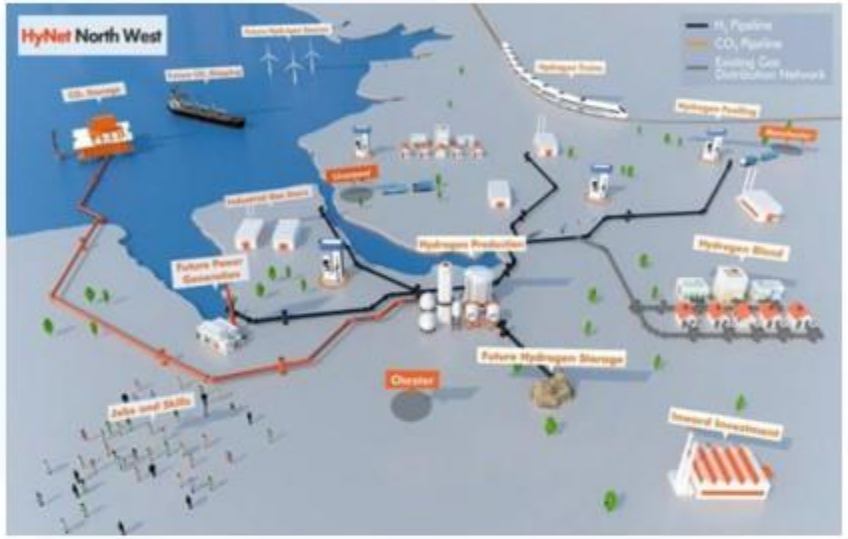
MANNOK

KEY POLICY CHALLENGES

No.	Topic	ROI	NI/UK	Challenges
1.	Renewable Energy Policy	• Emission reduction target 51% by 2030 • 80% electricity from renewables by 2030 (100g CO_2/kWh - Grid)	• NI – 48% • UK - 68%	• Business Case-Adequate sources of funding (Fragmented – EI/DECC/SEAI & Capped) • Lengthy Planning & Licensing Processes
2.	Green Hydrogen Deployment	• 2GW by 2030 (Preliminary)	• UK – 10GW	• No Hydrogen policy • Technology maturity & Lead times (Electrolyser & HGV's)
3.	Framework for Green Transport Fuels	• RTFO – Consultation stage (Draft buy out rate €0.05/MJ)	• UK – RFNBO attract dRTFC @ higher value; CfD; Additionality criteria • US - $3/kg !	• Availability & Value of supports • Complexity ! • Cross border transport of fuels & By-products
4.	Existing Infrastructure in the gas network deployed to benefit a green hydrogen rollout	• Network H2 ready - ≤20% blend • No CCS policy or targets • CAP 2023 - DECC: Advance policy position on CCS depending on feasibility assessments (2024)	• NI – Network H2 Ready • UK – Decarb Industrial clusters Inc Cement (Blue H2 + CCS) e.g. HyNet • **Invest £20B/20yrs** • **CCS Target: 20-30MT CO2 by 2030**	• No gas infrastructure in Ballyconnell • No CCS Policy or Infrastructure • Will Cement Industry be at a competitive disadvantage vs UK Carbon Clusters?

POLICY CHALLANGES

- Significant gaps in Renewable Energy Policy in N.Ireland and Republic of Ireland
- Green Transport transition plan is not yet defined
- Lack of a clear framework for Green Hydrogen deployment
- Hydrogen distribution network only partially available to the region
- Components necessary in large-scale hydrogen deployment in short supply with long lead-times
- Support for captured fossil-fuel CO_2 used in e-fuels will likely be phased out under EU-ETS and UK-ETS schemes
- This would make any investment in projects to create fuels from cement off-gas uneconomical, unless captured downstream
- A compatible CCUS strategy in Ireland and N.Ireland is essential including how dispersed sites will be handled
- Current position pushes the research towards mineralisation or other forms of sequestration.

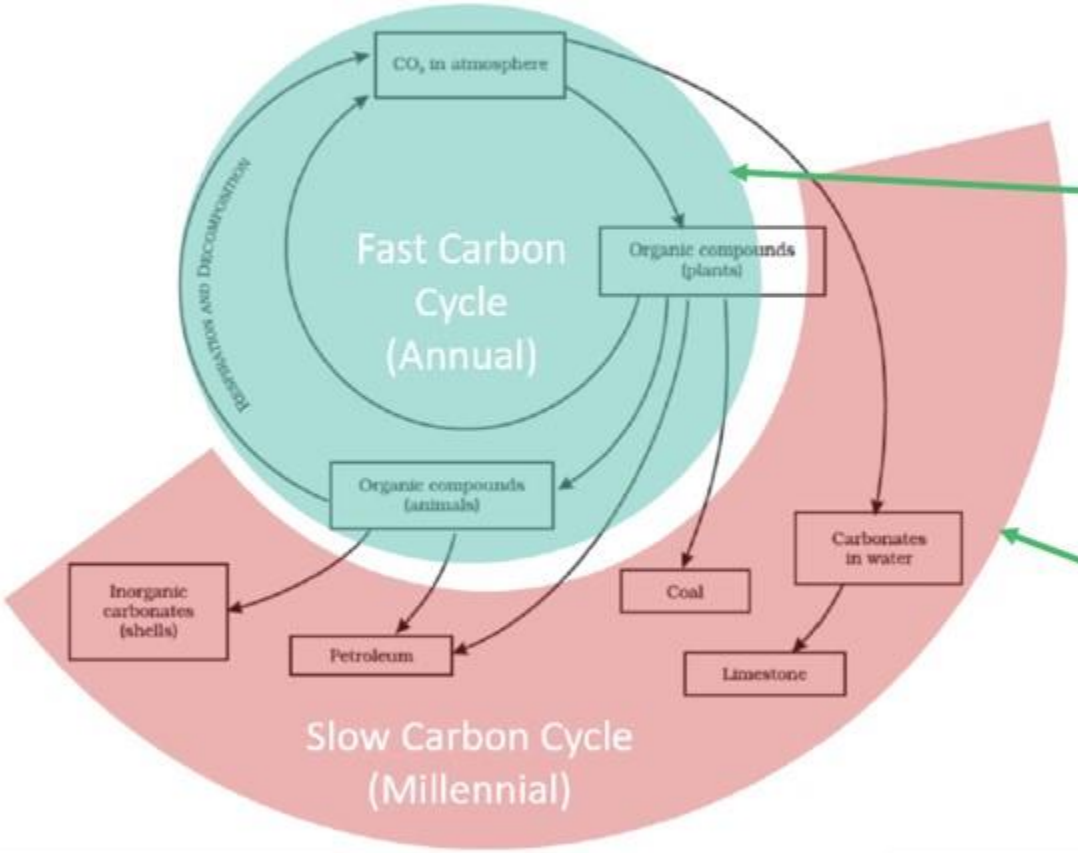


UK Government: Industrial Decarbonisation Strategy March 21

- "support deployment of CCUS on industrial sites in clusters to capture and store around 3 MtCO2 per year by 2030"

Industrial Decarbonisation Strategy (publishing.service.gov.uk)

CARBON CYCLES: FAST & SLOW



Bio-CO_2 is from the Fast Carbon Cycle

CO_2 is captured from air by biomass and then returned to air when biomass decays/is processed

Fossil CO_2 is from the Slow Carbon Cycle

CO_2 is mineralised and trapped in the ground

INNOVATIVE TECHNOLOGIES

Technology Provider	Description
CemAI	Provides predictive real-time prescriptive cement solutions to increase the productivity and lifetime value of industrial assets. Using a holistic approach and monitors performance and efficiency of entire cement manufacturing plant.- curates data from sensors (industry 4.0, it's more monitoring equipment then the cement mixture)
Concrete.ai (Recommended Carbon Built)	Cloud based software service that integrates with industry leading mix design and batching software. Optimize mix design to reduce costs and carbon. Carbon avoidance and cost savings are tracked on a user dashboard designed to comply with climate disclosure reporting criteria. Predicted properties include strength, lab curves, shrinkage, slump and set time
CarbonBuilt	CarbonBuilt helps replace cement with waste materials, which react with CO_2 during curing. The CO_2 then mineralizes into CaCO3, increasing the concrete's compressive strength. CarbonBuilt's process is the first solution that marries substantial improvements in concrete's carbon footprint with increased profitability for producers and 'no compromise' performance. All three are required in order to deliver on the carbon utilization potential of concrete
CarbonRE	Use reinforced learning AI to simulate chemical and physical processes and optimise combustion performance. The initial results, applied at a JK cement plant in India, gave 8% fuel savings and even larger carbon savings through optimising AF usage. Given the more sophisticated control systems that Mannok have we would expect somewhat lower savings (ISO 50001 Certified)
Carbon Upcycling	Upgrade SCMs by grinding in the presence of CO_2 and catalyst. This produces SCMs with better strength that can replace more cement. Permanently store CO_2 in SCM and reduces cement in concrete mix

MANNOK esg

The Responsible Business Network Northern Ireland

Mannok

ENGAGING WITH BIODIVERSITY

Silver

This organisation has met the requirements of the

BUSINESS & BIODIVERSITY CHARTER

This certificate is valid from

17 September 2021 – 16 September 2024

Kieran Harding
Managing Director
Business in the Community NI

IN PARTNERSHIP WITH

Ulster Wildlife

COMMITTED TO ENVIRONMENTAL RESPONSIBILITY

This is to certify that

MANNOK BUILD LIMITED

successfully achieved Silver Level in the 2022

NI ENVIRONMENTAL BENCHMARKING SURVEY

Kieran Harding
Managing Director
Business in the Community

Chris Conway
Chair
Business in the Community

NI Environmental Benchmarking Survey 2022
Silver

SPONSORED BY:

Moy park

SUPPORTED BY:

Department of Agriculture, Environment and Rural Affairs

Climate Action Pledge NI

WE'RE COMMITTED TO CREATING A MORE SUSTAINABLE FUTURE

www.bitcni.org.uk/climate

Mannok Build Ltd (Mannok Holdings DAC) has signed the Climate Action Pledge and is working in collaboration with others across Northern Ireland to address the climate emergency.

Mannok Build Ltd (Mannok Holdings DAC) has committed to:

- **Reduce scope 1 and scope 2 GHG emissions by 30% by 2030**
- **Measure and reduce scope 3 GHG emissons**
- **Report company-wide GHG emissions on an annual basis**

19 August 2022

Liam McCaffrey
CEO
Mannok Build Ltd (Mannok Holdings DAC)

Kieran Harding
Managing Director
Business in the Community

Jennifer Fulton
Chief Executive
Ulster Wildlife

Pledge Witness

Signatory
Climate Action Pledge NI

MANNOK

TREE PLANTING & BIODIVERSITY

Ulster Wildlife

- St Michael's School Partnership
- 11,000+ Trees planted since 2021

MANNOK ASPIRATIONS

Task Force on Climate Related Financial Disclosure

Corporate Sustainability Reporting Directive

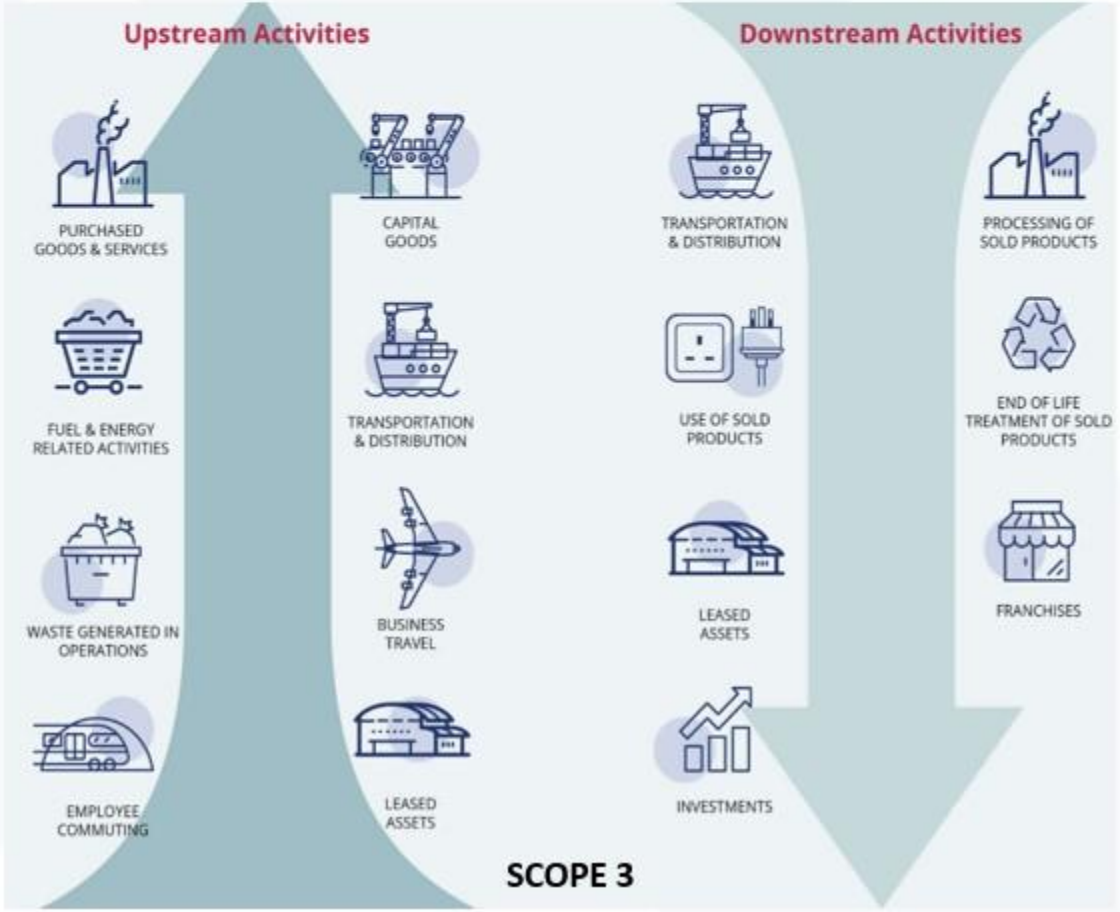
DISCLOSURE INSIGHT ACTION

Carbon Disclosure Project

Global Reporting Initiative

SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION



THANK YOU!

QUESTIONS & DISCUSSION

LINKS

- Mannok 2030 Vision - Mannok (mannokbuild.com)
- Mannok Energy Valley – YouTube
- Mannok & FLSmidth Successfully Making Cement Production More Sustainable with World First Tech – YouTube

Liam McEvoy

Co-Founder, Sustain IQ

Share your comments:
#constructionDPNZ2023

@Invest Northern Ireland

@investni

@Invest Northern Ireland

sustainIQ

DATA DRIVEN APPROACH TO NET ZERO

Agenda

- Understanding Net Zero
- Drivers
- Understanding GHG Emissions data
- Using GHG Emissions data
- Getting Started
- Examples of Best Practice

sustainIQ

Introduction

Liam McEvoy

CO-FOUNDER

SustainIQ is the all-in-one ESG & sustainability reporting software

Help businesses measure, monitor & report on their social, environmental & economic performance

sustainIQ

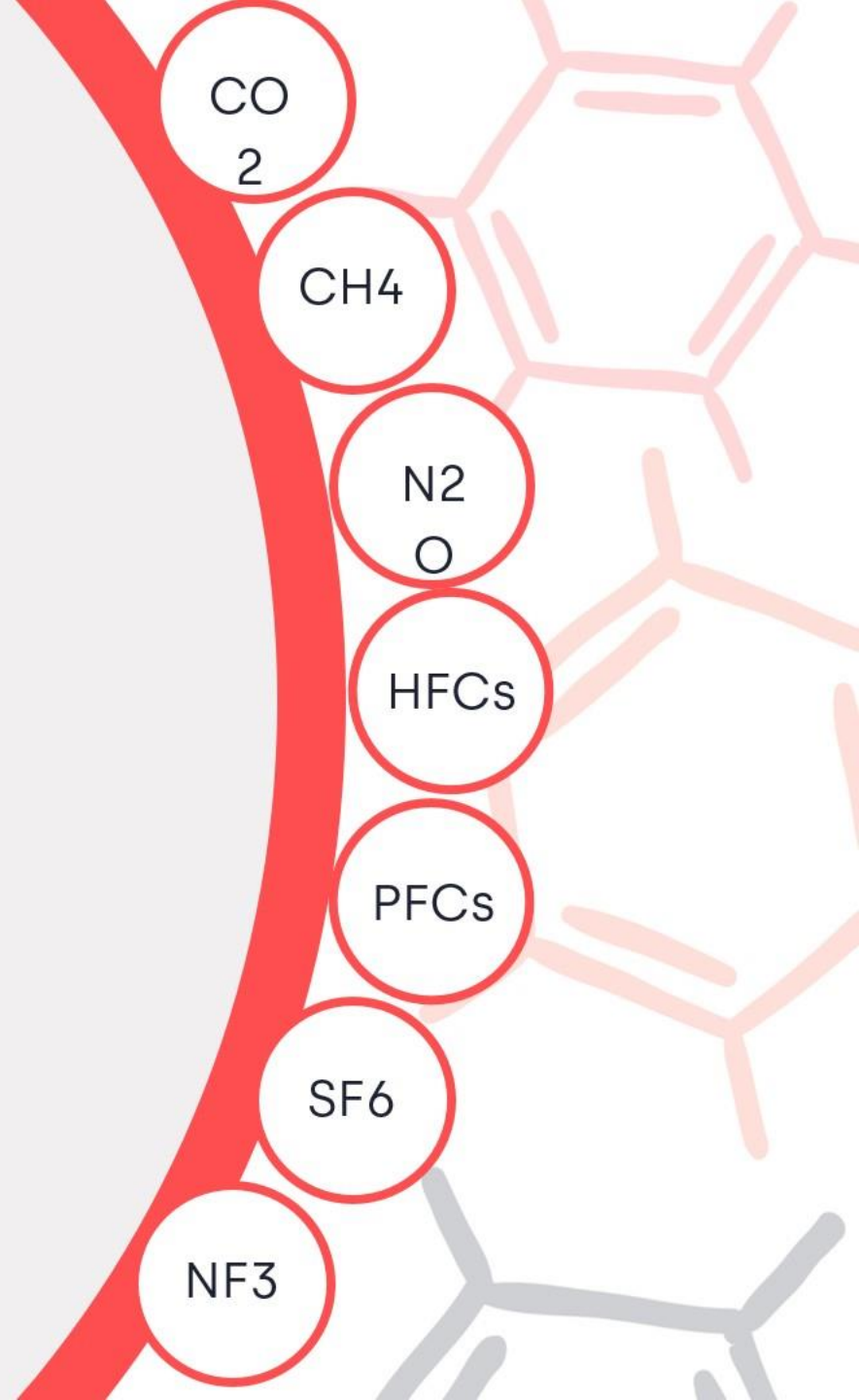
UNDERSTANDING NET ZERO

What is Net Zero?

- Net Zero means achieving a balance between greenhouse gases put into the atmosphere and those taken out.
- Think of it like a bath.
- Reaching net zero requires us to balance the amount we emit with the amount removed.

What does it mean for you?

- Companies setting targets commit to reducing GHG emissions aligned with pathway that limit global warming to 1.5C above pre-industrial levels
- Carbon removal or offsetting is used to achieve zero
- Applies to all seven GHGs, not just carbon.



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Why is Net Zero important?

- Net Zero is an internationally agreed goal to mitigating further global warming.
- What we do in the next decade to limit emissions is critical to the future of business.
- Every country, sector and industry must find ways to cut GHG emissions.

sustainIQ

KEY DRIVERS

Net Zero Drivers

INTERNATIONAL

NATIONAL

COMMERCIAL

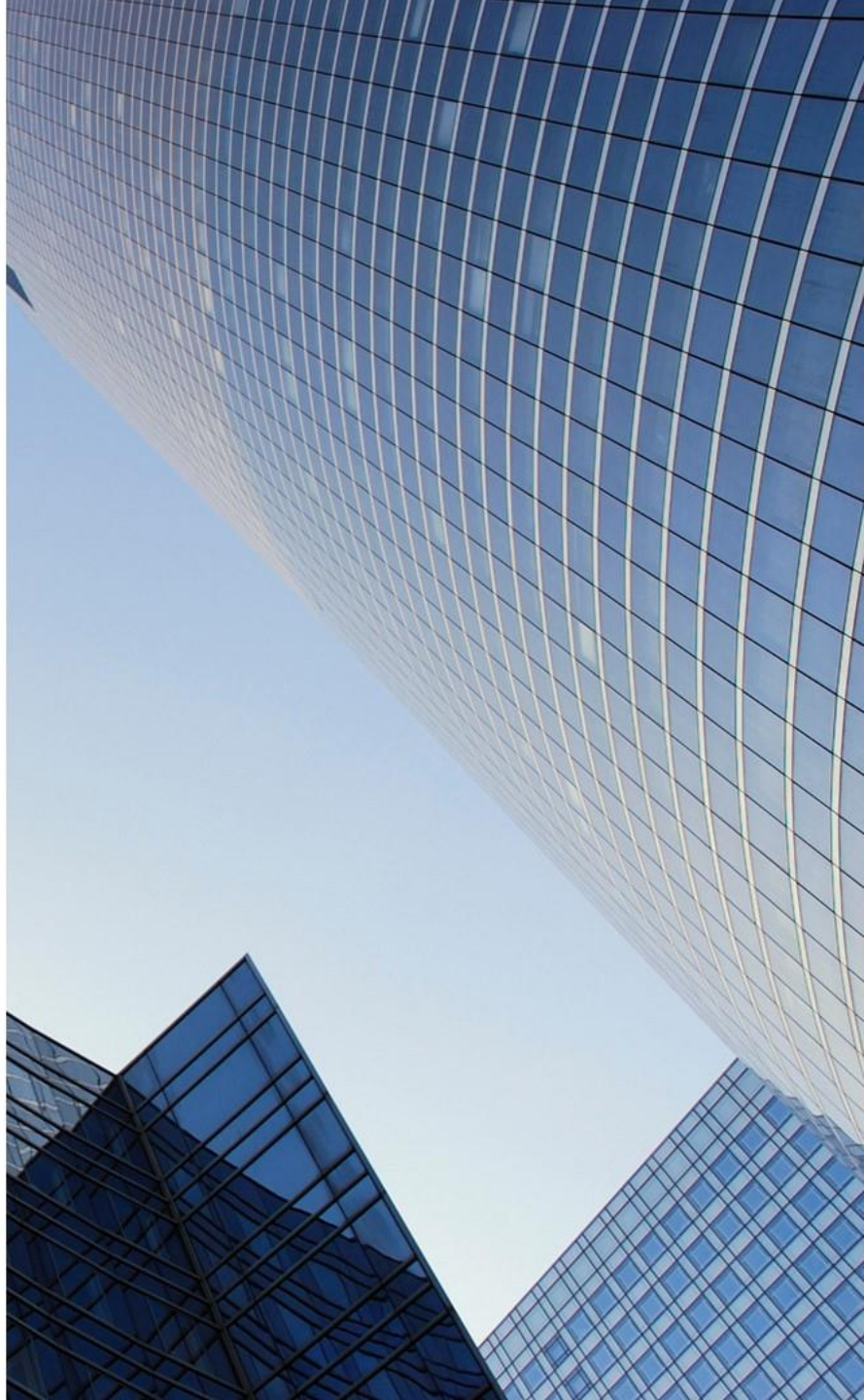
BUSINESS

International, national & commercial drivers:

- International:
  - The Paris Agreement
  - UN SDGs
- National:
  - Streamlined Energy Carbon Reporting (SECR) Regulations
  - Energy Saving Opportunities Scheme (ESOS)
  - CSRD
  - GPP
- Commercial:
  - PQQs / Tenders
  - Client expectations (Carbon Reduction Plans)
  - Cost savings

Net Zero Drivers

- Carbon has been monetised
  - Emissions directly related to commercial performance
  - Helps to build a business case for reducing GHG emissions
- Focus must be on reduction - you cannot offset your way to net zero
  - Carbon Neutral vs Net Zero



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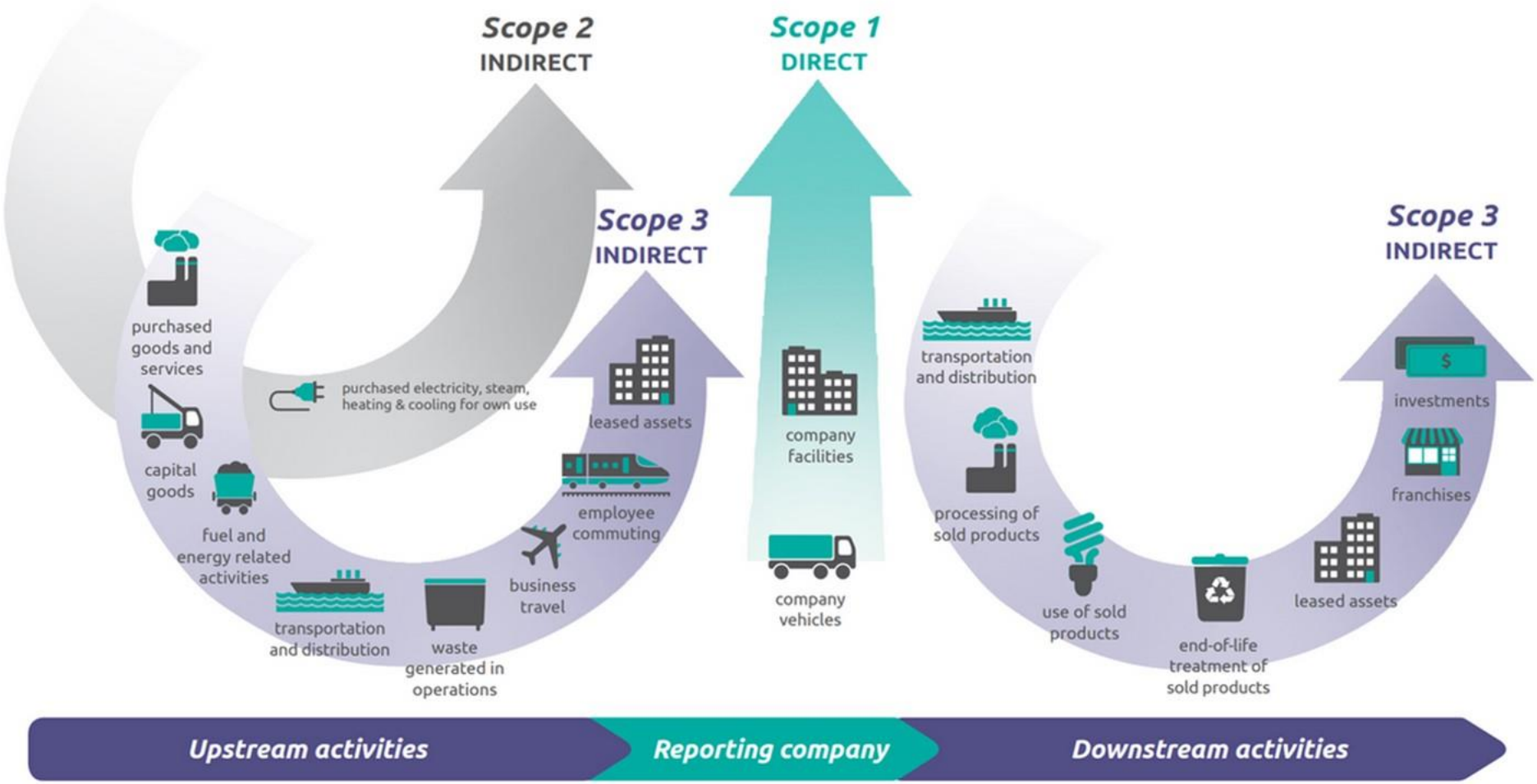
UNDERSTANDING YOUR EMISSIONS DATA

GHG Protocol - Setting the scope

- The GHG protocol has broken emissions into 3 scopes
  - Scope 1 – Direct emissions – company owned facilities, assets and vehicles
  - Scope 2 – Indirect emissions through the energy you purchase such as electricity
  - Scope 3 – Indirect emission relating to the transport or production of raw/core materials as well as the production or transport of goods and services beyond your premises, transport of your staff also.

GHG Protocol - Setting the scope



Source: Figure 1.1 of *Scope 3 Standard*.

Understanding your emissions

sustainIQ

What emissions does your business produce?

Where and when are they produced?

Are they direct or indirect?

Who is responsible for them?

How many tonnes of CO2e do they produce?

Use this information to build a carbon inventory

Emissions data gathered from all of these questions, then used to track reduction overtime

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Tackling Scope 3

UPSTREAM

- Purchased goods and services
- Capital goods
- Fuel and energy-related activities
- Upstream transportation and distribution
- Waste generated in operations
- Business travel
- Employee commuting
- Upstream leased assets

DOWNSTREAM

- Downstream transportation and distribution
- Processing of sold products
- Use of sold products
- End-of-life treatment of sold products
- Downstream leased assets
- Franchises
- Investments

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USING EMISSIONS DATA

Using emissions data

- Understand what your data is telling you
  - Interrogate the data
  - Identify trends
- Establish baselines
  - Opportunities to eliminate/reduce
  - Start with scopes 1 & 2
- Set Targets
  - Agree targets and KPIs
  - Measure, monitor & report impact of investments and progress

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GETTING STARTED

Education & Carbon Literacy

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Direct

Scope 1 emissions

Indirect

Scope 2 emissions

Scope 3 emissions

CO2 Equivalent

Methane, Nitrous Oxide

Net Zero

Carbon Neutrality

Climate Risk

Averting Climate Risks

Science Based Targets and SBTI

Emissions baselines

Carbon Reduction Planning

Intensity Ratios

Offsetting & sequestration

Adaptation vs. Mitigation

Resilience

Using performance data to improve

5 Steps to Getting Started

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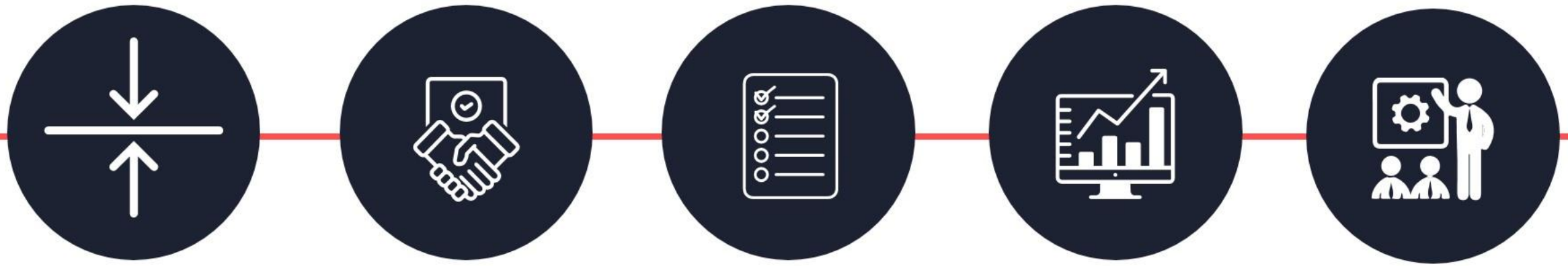

1. Understand where you are – measure your baseline
2. Make a commitment and set targets
3. Create a plan to get there
4. Implement and monitor progress
5. Report, verify and constantly improve

BITCNI Climate Action Pledge

- BITC NI Climate Action pledge can be a useful platform for organisations to begin implementing a data-driven approach.
- Signatory organisations commit to reduce their absolute scope 1 and scope 2 greenhouse gas emissions by either 30% or 50% by 2030, and work toward reporting on scope 3 GHG emissions.
- Provides annual opportunities for organisations to review and compare performance.

BUSINESS IN THE COMMUNITY

Signatory
Climate Action Pledge NI

Getting started

- 6 Step Guide to ESG & Sustainability Reporting
  - 6 Steps of how to move from limited to no reporting in place toward a full reporting strategy that's aligned with frameworks.
  - Will send on to Invest NI to distribute to attendees today.

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BEST PRACTICE EXAMPLES

SustainIQ - Our Solution

We cover all aspects of ESG using four customisable pillars:

Responsible Procurement

Environmental Management

People, Health & Diversity

Community Engagement & Partnerning

Gilbert-Ash

CUSTOMER PROFILE

Gilbert-Ash Limited is an innovative company with 70+ years' experience in construction, fit-out and refurbishment. Work with private and public sector clients.

CASE STUDY

Premier Inn, Whitbread

SustainIQ used throughout project to capture ESG data including:

- 99% construction waste diverted from landfill
- 21% scope 1 emissions
- 4% scope 2 emissions
- 75% scope 3 emissions

FELIX O'HARE
& CO LTD

CUSTOMER PROFILE

Felix O'Hare are an established building & construction contractor with over 100 years experience working in both Ireland & Northern Ireland. Deliver both public and private sector projects.

CASE STUDY

St Paul's School Navan

SustainIQ used throughout project to capture ESG data including:

- 98% of construction stage waste diverted from landfill
- 64% emissions from scope 3, with all emissions tracked through SustainIQ
- 72% of suppliers within 30 miles, having a significantly positive socio-economic impact

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Daniel Purdy

ERE Manager, Invest NI

Share your comments:
#constructionDPNZ2023

@Invest Northern Ireland

@investni

@Invest Northern Ireland

Daniel Purdy, Energy and Resource Efficiency Manager, ERE

Role:

Helping businesses reduce costs and carbon by finding solutions to use energy and materials more efficiently, therefore making the business more environmentally sustainable.

Support:

- Advice
- Free Technical Consultancy
- Resource Matching Service
- Resource Efficiency Grant

Contact:

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Invest Northern Ireland

John McClune

Operational Excellence Manager, Invest NI

Share your comments:
#constructionDPNZ2023

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@investni

@Invest Northern Ireland

John McClune, Operational Excellence Manager

Role:

To develop NI businesses competitive advantage by improving their productivity and profitability, through building capability to deliver quantifiable and sustainable improvement.

Support:

Training On-site mentoring Coaching Promotion of best practice

Contact:

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Invest Northern Ireland

Richard Pelan

Innovation Manager, Invest NI

Share your comments:
#constructionDPNZ2023

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Richard Pelan, Innovation Advisor, Advanced Manufacturing, R&D team

Role:

Sign posting to best R&D&I funding mechanism either within Invest NI or externally through IUK, Horizon EU etc

Support:

- Advice
- Connections
- Project Definition
- Grant for R&D

Contact:

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