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University  
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**AMRC**  
**North West**

AMRC North West

# Achieving Net Zero in Industry

Ben Smith

Low Carbon Smart Factory Specialist



# What is the problem statement

Manufacturing has a challenging journey ahead to achieve Net Zero. The following aspects are the problems that need solving;

Scope 1 :- What does the facility use in its day to day operations?

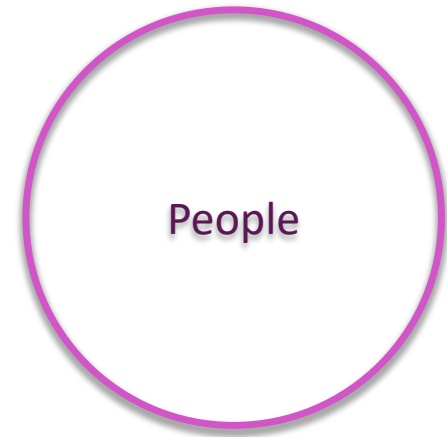
Scope 2 :- What utilities are consumed within normal operations?

Scope 3 :- What is the impact of all the required inputs for your operations to take place and what are the knock on effects of your business and the products it produces?

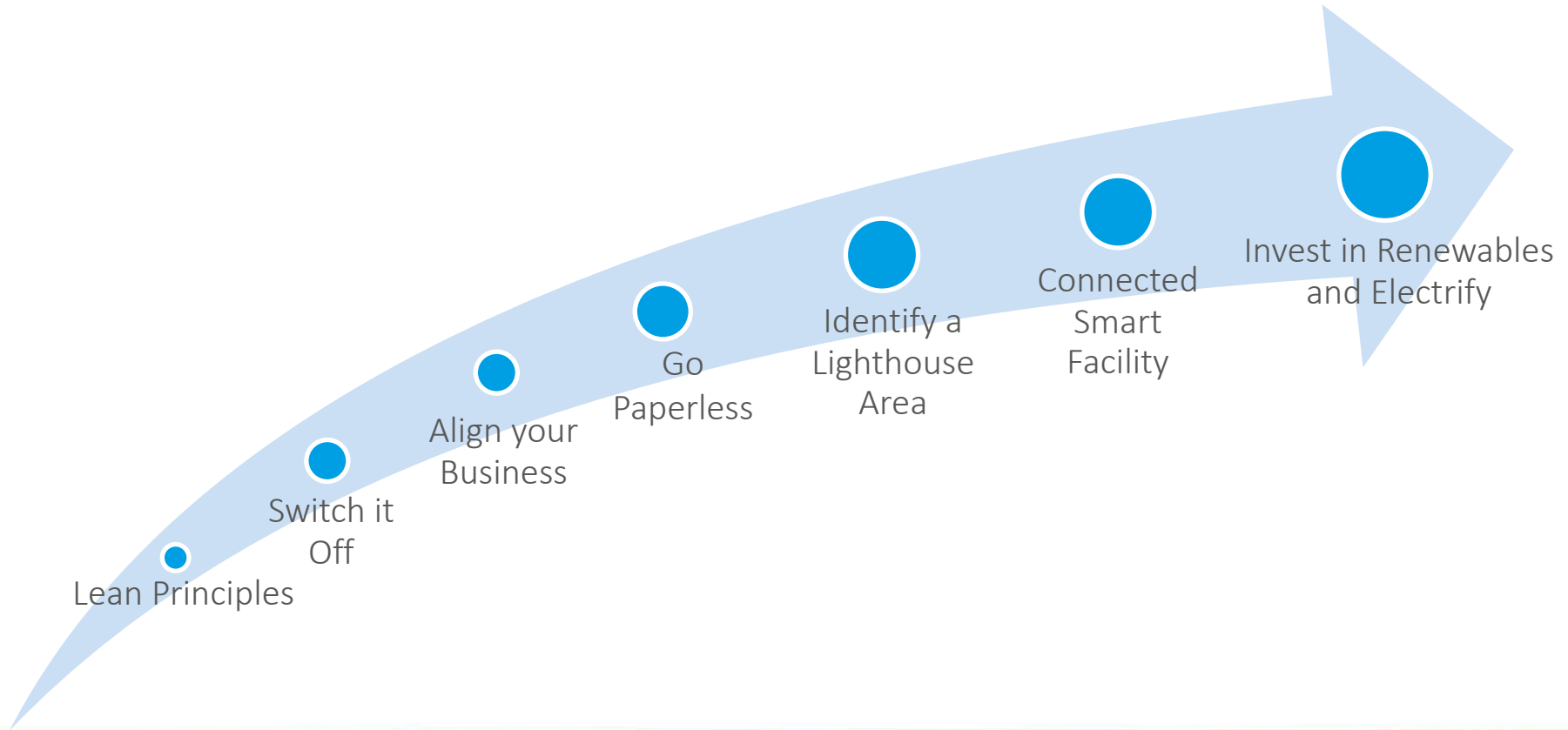
Manufacturing consistently solves challenging problems, with the methodology stemming from Lean Principles. So the question is, can it be utilised for Net Zero?

# What are the hazards

Net Zero is the objective, but sustainability is the approach.



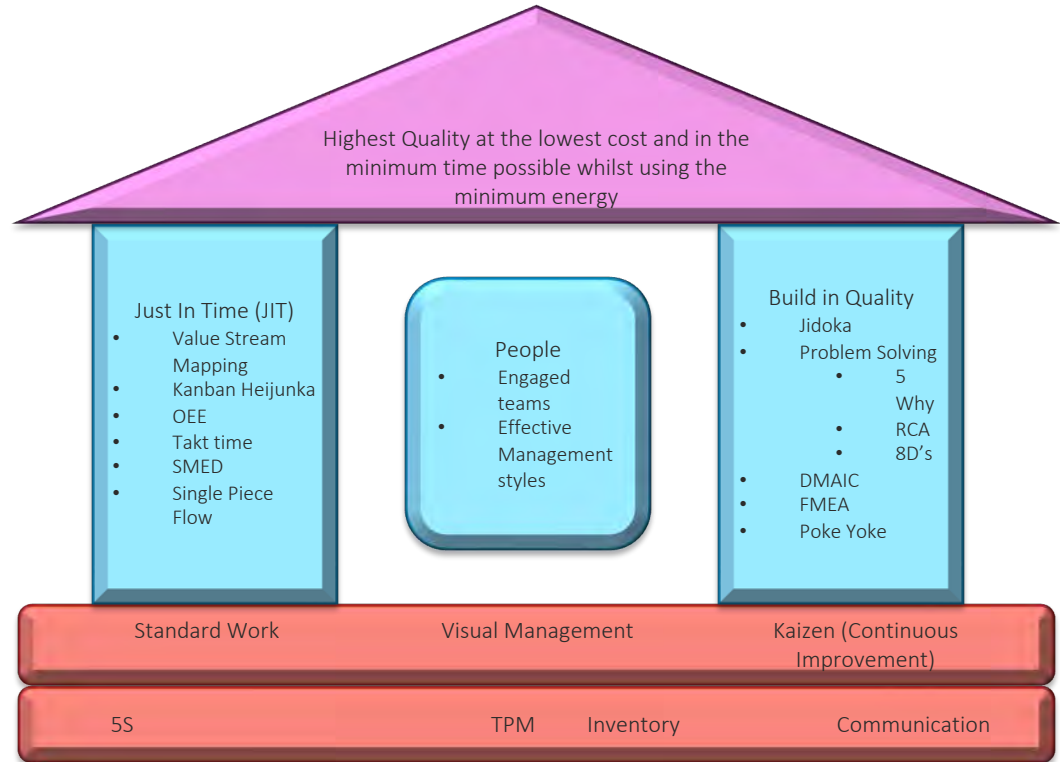
# AMRC NW's roadmap to Sustainability



# Why Lean?

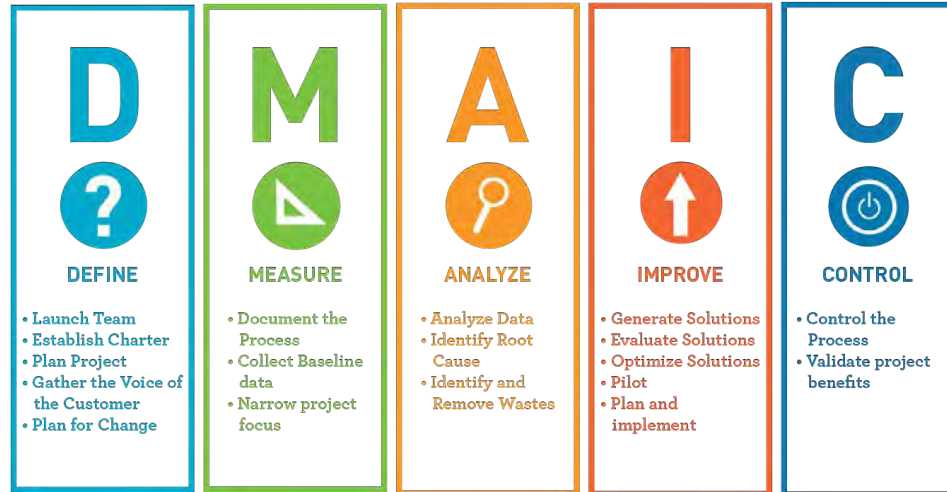
In the simplest terms it means expanding your KPI's to include your environmental performance.

SQCDP becomes SQCEDP.



# Is that all?

As per any operational KPI when a business is challenged to improve the performance of any of their metrics Lean tools offer the solutions, often using techniques such as DMAIC and Kaizen events. This is where the power of lean can drive the Net Zero approach.



# Net Zero Pareto

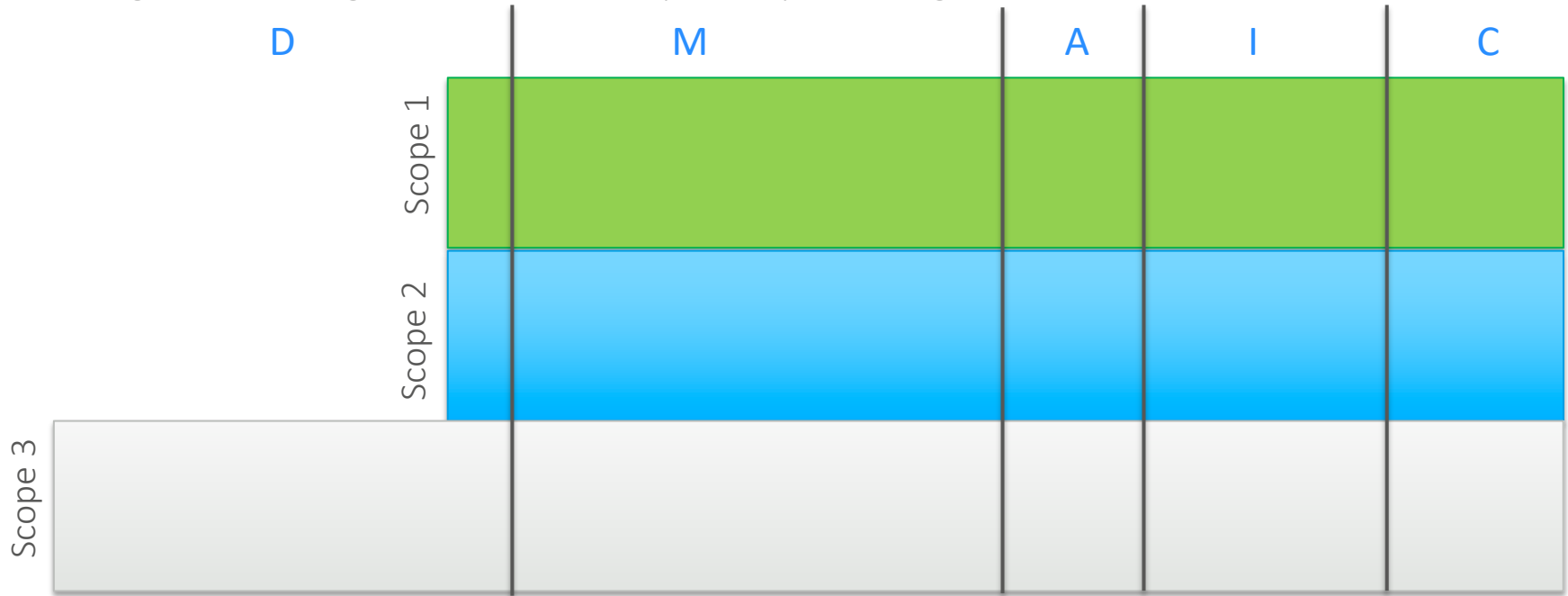
For manufacturing business the Net Zero Pareto will show that Scope 3 is the biggest opportunity for reducing your Carbon Footprint.

Nevertheless Scope 1 & Scope 2 are the opportunities that can be influenced immediately, whereas Scope 3 requires a more significant change to a businesses structure. So it is worth assessing them separately.

Carry out a Carbon Audit as a starting point.

# Lean and the Scopes

Below represents that maturity that each of the Scopes are currently at with respect to problem solving and a visual guide to the time required by each stage.





# Where does a Smart Factory come in?

As W. Edwards Deming put it...

“Without data you are just another person with an opinion”

So where to start? The AMRC is developing an open access Low Carbon Smart Building Demonstrator, so you can see a Sustainable smart factory in action.

# What is a Low Carbon Smart Factory Demonstrator?

The Low Carbon Smart Factory Demonstrator is the first, important step on pioneering the route to a carbon neutral manufacturing industry.

## Phase 1

The purchase and implementation of IIoT (Industrial Internet of Things), Smart technology, and carbon footprint reducing technologies with the specific usage case to understand, identify opportunities and reduce the carbon footprint of the AMRC North West facility at Samlesbury.



# What is a Low Carbon Smart Factory Demonstrator?

## Phase 2

The creation of a community of practice and engagement forums, conferences and workshops, with the intention of;

- Showcasing how IIoT, Smart technology, and carbon footprint reducing technologies can be retrofitted to existing manufacturing environments.
- Creating collaboration between our partners, tier 1, 2 & 3 companies and SME's.
- Producing guidance to support the industry in understanding the challenges of retrofitting these technologies, based upon our experiences.



# Digital Dashboards

## Purpose

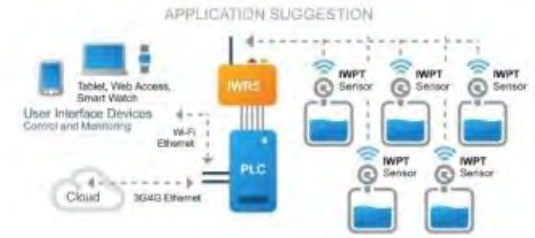
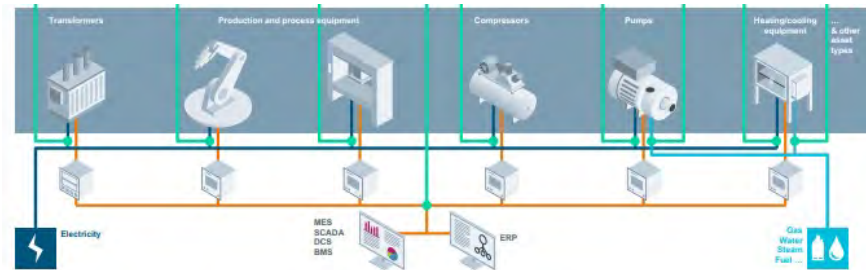
An agnostic dashboard to visualize the data from the Smart and IoT sensors to guide and propose improvements.



# BMS Monitoring

## Purpose

- Using the latest IoT technology interfacing with;
  - Gas
  - Electricity
  - Water
  - PV system monitoring
  - HVAC system monitoring
- Identify the blind spots you wouldn't otherwise see





# Occupancy / Asset Monitoring

## Purpose

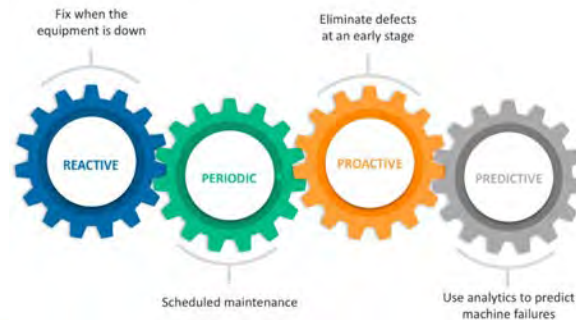
- 100% Coverage of facility for occupancy monitoring, including floor level, desk, meeting rooms and communal spaces.
- Track visitors, contractors and staff around the building, in real-time.
- Real time tracking of people and assets. Find people and assets in the building quickly, improving productivity, and preventing asset loss / theft.



# Equipment Monitoring

## Purpose

- Monitor the operating status of machinery and equipment.
- Monitor vibration and temperature of motors e.g. pumps on CNC machines. Alert based system (when outside of normal parameters) / software dashboard of asset health for predictive maintenance.
- Track energy consumption at the individual circuit breaker level to understand operational patterns within device energy profiles and pinpoint inefficiencies.
- Cognitive analytics that predict equipment malfunction / maintenance requirements.
- Ability to connect with / create preventative maintenance plans.

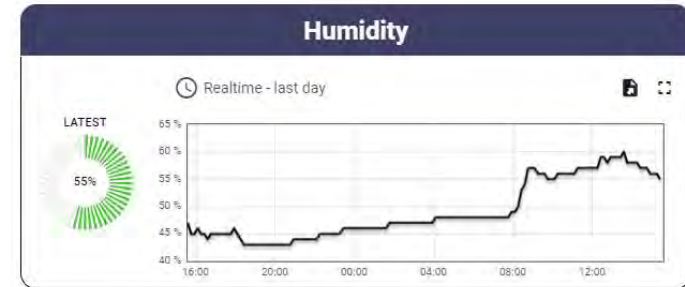
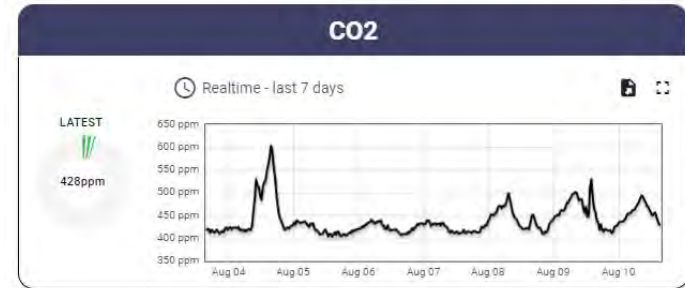
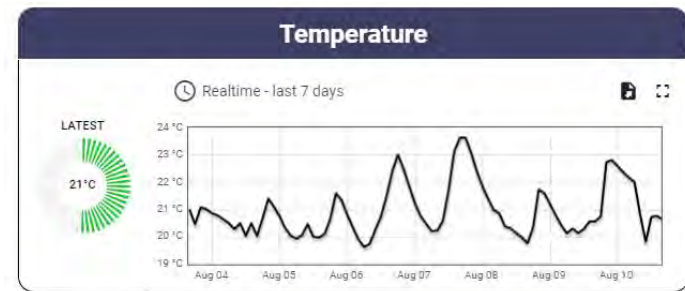


# Environmental Monitoring

## Purpose

Monitor, data log and forecast the external and internal environmental conditions such as;

- Carbon Dioxide
- TVOC's
- Particulates
- Rainfall
- UV Monitoring
- Wind Monitoring
- Temperature
- Humidity
- Sound and Light levels





# Digital Twin

## Purpose

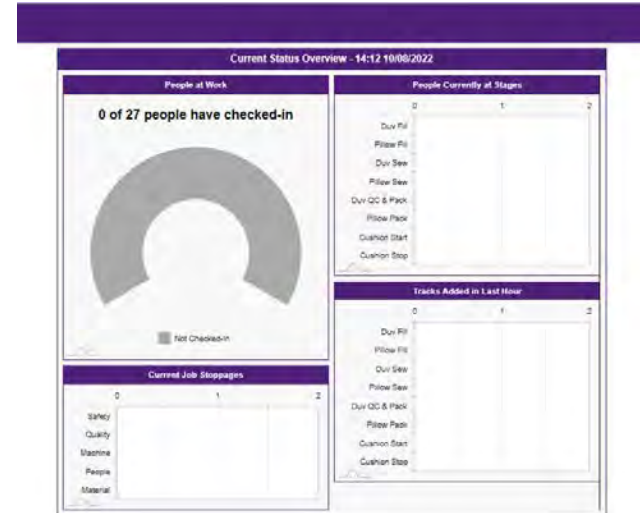
- Create a digital version of your facility, connected to all the data sources to bring the data to life.



# Paperless Manufacturing

## Purpose

- Demonstrate shop floor environment and showcase innovative MES systems with live OEE tracking and reporting.
- Track, manage, visualise and improve production.
- Improve transparency and traceability
- Improve quality and consistency
- Improve data collection
- End to end supply chain visibility

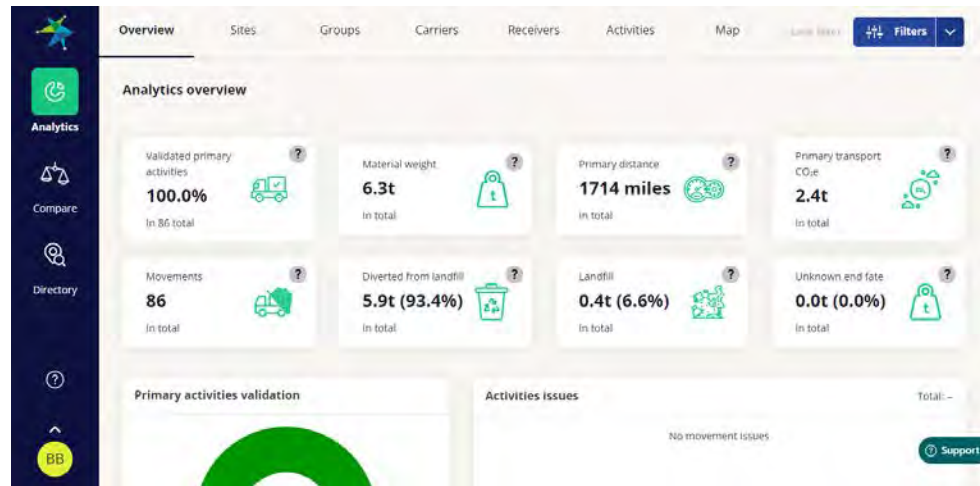


# Waste Mapping

## Purpose

Demonstrate waste mapping technologies to provide real time data on waste production. Using this information decisions can be made to;

- Reduce waste to landfill
- Identify reuse and recycle opportunities
- Develop towards a circular economy business model



# Autonomous Technology

## Purpose

Demonstrate autonomous technologies

- Reducing the underutilisation of personnel.
- Lights out cleaning, minimising business impact.
- Greater consistency of cleaning to reduce transmission of pathogens.
- Optimised cleaning efficiency.
- Solution is able to recycle it's water supply minimising water wastage and reducing manned interaction.
- Automated smart charging to minimise electrical usage.



# Renewable Energy

## Purpose

Demonstrate renewable energy sources such as PV and Static Battery Technology.

Implementation of Generating Assets - For example retrofit of Solar Photo Voltaic (PV) panels and battery storage. Local energy production, plus storage system, thus reducing external energy requirements and enabling grid balancing. (Subject to planning restrictions and review of emerging technologies).

- Includes full installation and set-up
- Provides warranty and service contract
- Ability to work concurrently with current BMS systems
- Ability to support retrofitted sensors





# Renewable Energy

Novel technologies such as SmartFlower and Static Battery technology to support the facility but also help our network visualise renewables in a new way.





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Of Sheffield.

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Thank you. For further information please contact or visit:

Email: [b.smith@amrc.co.uk](mailto:b.smith@amrc.co.uk)

Tel: 07896368378

Web: [amrc.co.uk](http://amrc.co.uk)



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