aggreko

Greener Power in Construction

Sustainability insights from
field trials conducted by Aggreko
and Sir Robert McAlpine

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INTRODUCTION

Even the most ambitious businesses will struggle to deliver lasting changes without cooperating with partners and other supporting organisations across the supply chain.

Construction is no different. The industry will be central for creating a more sustainable built environment, featuring buildings and key infrastructure designed to run on low- and zero-carbon sources of energy.

But it's not just finished projects that will need to be designed with long-term climate goals in mind. The fuels, technologies and processes that are used during construction will also need to be reimagined to bring about necessary reductions in embodied carbon. As consultancy firm McKinsey points out, firms operating in energy- and resource-intensive sectors must now "work collaboratively with customers, supply networks, and industry groups…keeping stakeholders engaged in a complex, multi-year change effort".[1]

This is a huge challenge, not least because the UK's construction supply chain is itself responsible for a portion of the industry's total emissions.[2] Yet it also presents an opportunity for businesses to showcase how greener upgrades can be rolled out without causing delays or hitting the bottom line.

It's this idea that forms the basis of an in-depth study between Aggreko and Sir Robert McAlpine. Both companies have been reforming their approach by analysing how equipment performs on site and determining where real-life improvements can be made – not only to keep net zero ambitions on track but also to demonstrate this kind of strategic knowledge-sharing which holds the keys to real progress. In 2021, Aggreko was brought on board to conduct a range of field trials at Sir Robert McAlpine's Kettering plant. The aim was to understand which of Aggreko's generator set-ups was most efficient for providing tower crane power on site, in turn giving both organisations the practical knowledge needed to make more sustainable decisions at other projects across the country. The results of those trials are discussed in this report.

Net zero cannot be achieved in isolation

1. https://www.mckinsey.com/business-functions/operations/our-insights/making-supply-chain-decarbonization-happen
2. https://www.weforum.org/reports/net-zero-challenge-the-supply-chain-opportunity

Trial objectives

- A shared ambition to achieve net zero carbon emissions
- Identify real-life solutions to accelerate decarbonisation efforts

Trial highlights

- Generators that are oversized or poorly matched for their chosen application will lead to inefficiency and otherwise avoidable emissions
- Applying innovative thinking to how industry approaches existing technologies and giving companies a clear opportunity to make an impact today
- There is a need for greater collaboration between contractors and hire partners to effectively use data insights to reduce emissions across construction sites

The trials conducted by Aggreko and Sir Robert McAlpine are founded on an in-depth knowledge of UK construction and a shared aim to lead the sector's energy transition.

Aggreko

Aggreko has supplied temporary power, cooling, heating, and dehumidification to a wide range of different construction projects for over five decades. The company has several sustainability targets:

By 2030, Aggreko will:

- **Reduce the amount of diesel fuel used by at least 50%, offering customers cleaner technologies and fuels that guarantee the same or better level of reliability and competitiveness**
- **Reduce local air quality emissions from its equipment by 50%**

By 2050, Aggreko will:

- **Achieve net zero across all business operations**

Sir Robert McAlpine

Sir Robert McAlpine is synonymous with construction and engineering excellence. In 2021, the company joined the Science Based Targets initiative (SBTi), which helps align organisations' sustainability policies with recognised science-based initiatives.

This builds on the company's earlier goal:

By 2025, Sir Robert McAlpine will:

- **Become net zero carbon**

WHO LED THE PROJECT

Martin Mitchell

PLANT PROCUREMENT MANAGER

SIR ROBERT MCALPINE

Sir Robert McAlpine's Kettering site has been central to the field trials. From here, Martin developed the supplier relationships necessary to challenge conventional approaches to construction and drive savings through innovation.

Steve Wright

COMMERCIAL PLANT MANAGER

SIR ROBERT MCALPINE

Steve has overseen improvements across the business's plant throughout the last five years, looking for more efficient, low-impact equipment that can deliver on the company's ambitious sustainability targets.

Tom Adlington

SECTOR TEAM LEADER

AGGREKO

Tom oversaw Aggreko's contribution to the trials, providing the Sir Robert McAlpine team with Aggreko's Greener Upgrades needed to lower energy consumption, emissions, and fuel costs.

PROJECT BACKGROUND

Aggreko has provided power to Sir Robert McAlpine on major construction and engineering sites across the UK for a number of years. Landmark projects include White City Place, Woking Shopping Centre and Centenary Square in Birmingham.

Sir Robert McAlpine's membership of the SBTi means it must actively search for science-based methods to reduce its emissions when working on site. Part of this involves carbon 'hot spotting' – looking for energy intensive processes that can be made more efficient or areas where fossils fuels can be swapped out for greener sources – as well as the creation of reduction scenarios, which are then submitted to the SBTi for assessment and verification.[3]

Aggreko's own carbon reduction efforts and familiarity with Sir Robert McAlpine's work made it an ideal partner for this exercise. The businesses also had a pre-existing managed services agreement in place, so any insights generated during the research would be mutually beneficial.

Sir Robert McAlpine's team approached Aggreko in 2021, requesting a list of greener upgrades that could be tested ahead of roll-out on active projects. The nature of power consumption on typical construction sites means peaks and troughs are common, so areas where generators could be downsized or phased out in favour of better options was desirable.

Aggreko began the project knowing that construction companies tend to oversize their generators when specifying power for jobs on site. Both businesses were also aware of government plans to restrict the use of red diesel for heavy plant from April 2022, which further emphasised the need for viable alternatives that made better use of fuel whenever used.[4]

Sir Robert McAlpine engaged Aggreko for two key reasons:

- The company was due to replace its ageing fleet and was considering new purchases until it saw Aggreko's hired power as a leaner route to greener upgrades
- Aggreko's team match up generators with applications more accurately – important in an industry that tends to overspecify its power requirements

3. https://www.theconstructionindex.co.uk/news/view/sir-robert-mcalpine-commits-to-emissions-targets
4. https://www.theconstructionindex.co.uk/news/view/the-lowdown-on-red-diesel-rule-changes

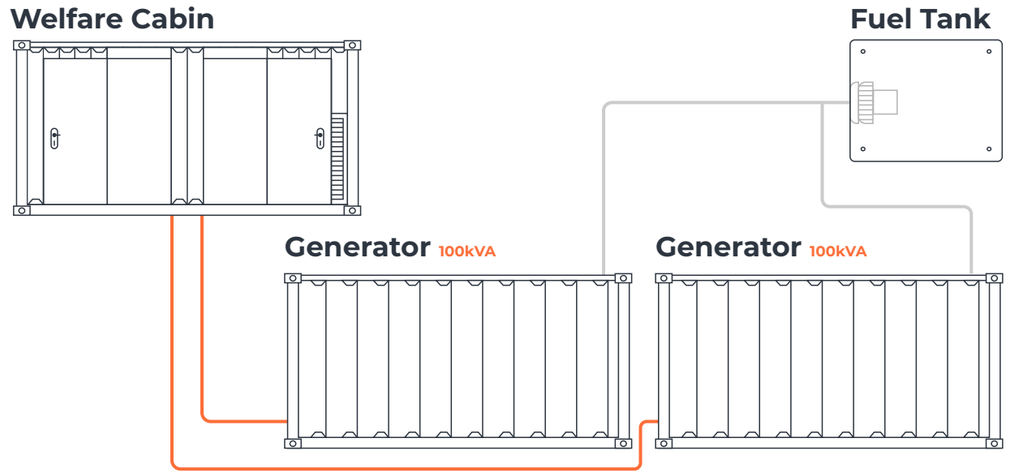
PROJECT BACKGROUND

Aggreko's Greener Upgrades in action

TESTING TIME

2 Weeks

The fleet of greener upgrades used for the trials included new forms of generation, such as hybrids using battery, as well as live data monitoring to improve asset performance.

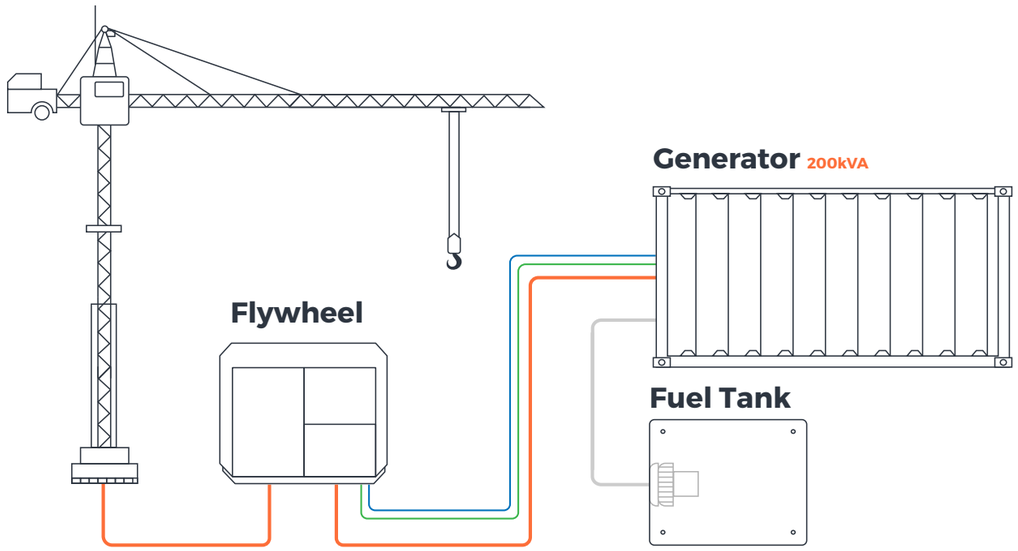


Load on Demand

A scalable, fully automated solution using several smaller kVA generators to power the same peak demand as one larger unit. However, when the site's demand falls, the surplus generators can be turned off.

Hybrid Generators

Models using battery storage to limit use of diesel fuel.



Flywheel Technology

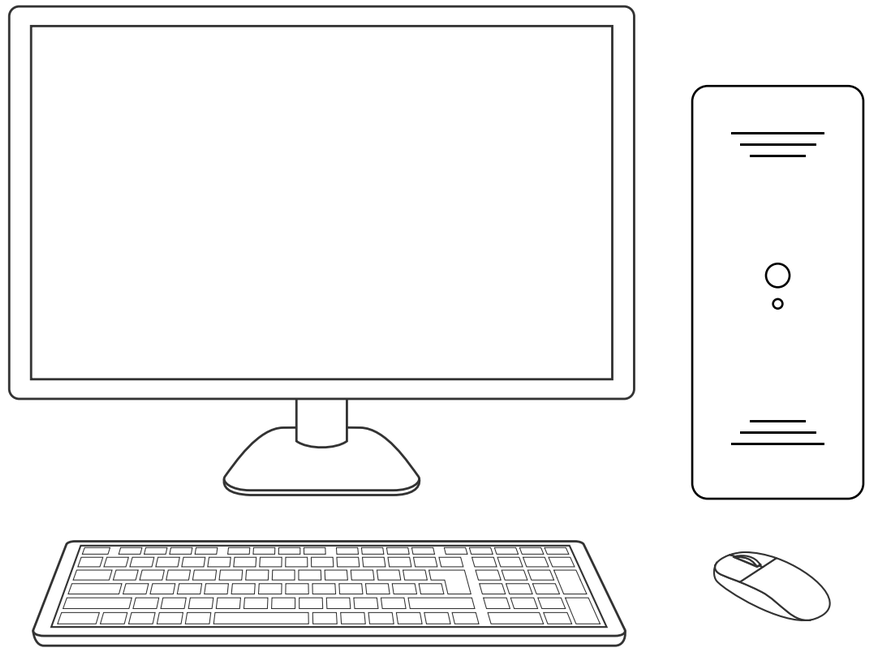
Flywheels operate by storing kinetic energy in a spinning rotor, which is then charged or discharged through a generator.

Hydrogenated Vegetable Oil (HVO)

Generators running on alternative ‘drop-in’ fuels that eliminate up to 90% net CO_2, NOx and carbon monoxide.

Aggreko Connect

A dedicated customer account delivering asset performance and providing access to live data.



ARM aggreko Remote Monitoring

PROJECT BACKGROUND

Field trials data

KEY NOTES

The fuel and emissions savings listed in this report are projections based on an average project window of 26 weeks.

EMISSIONS CALCULATIONS ARE ESTIMATIONSAND BASED ON THE ASSUMPTIONS BELOW

1000 litres

of diesel (based on EN16258 standard, ISO conditions and IPCC2006) would result in 3.26 tonnes of CO2e.

1000 litres

of HVO (based on NESTE 8g/MJ) would result in 275kg of CO2e.

Diesel burns at roughly the same rate as HVO

The field trials were based on lifting applications using two different types of tower crane at full working capacity (hoisting and slewing 12.5-ton weights). Both cranes are used in Sir Robert McAlpine's yard and in the field.

All tests were ran on HVO fuel.

TESTING OVERVIEW

SCENARIO 1

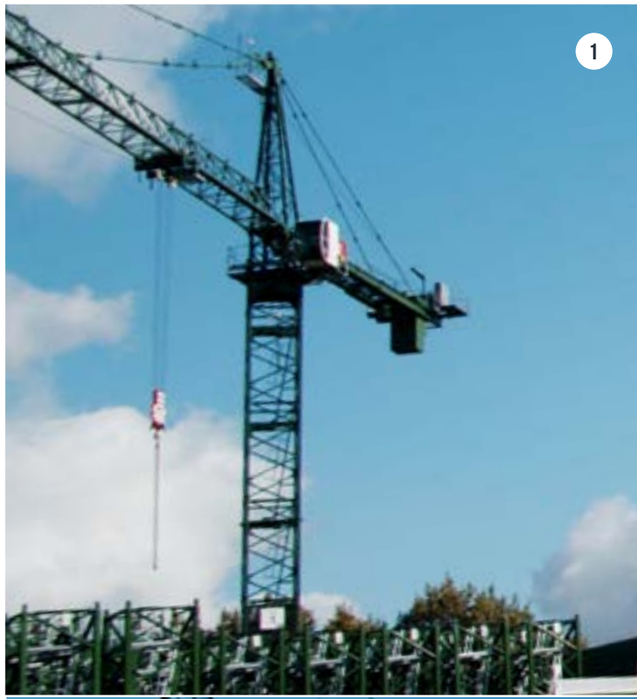
Standard crane

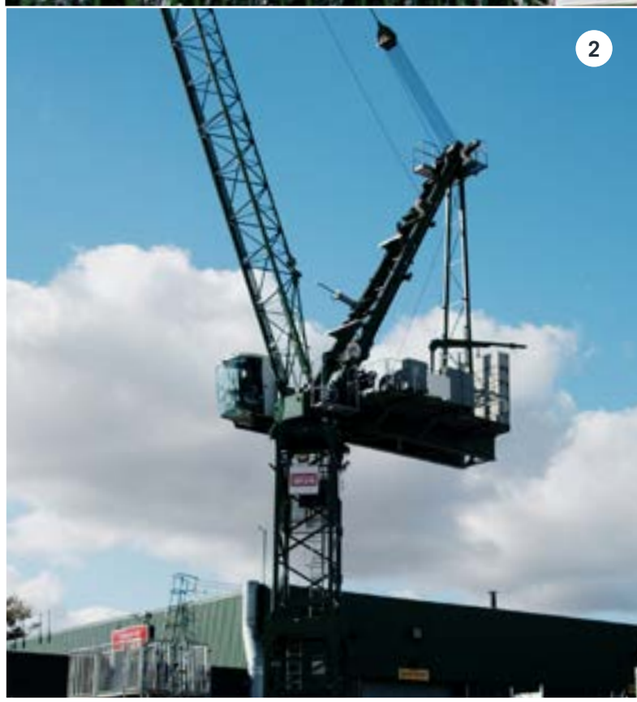
The first scenario involved a 200kVA generator, which already represented a downsizing from SRM's request for a 250kVA. This smaller model ran comfortably. Aggreko also applied a 100kVA model, which was also able to handle the job without any loss in performance, then introduced batteries to the generator's control mechanism to see if fuel consumption could be avoided entirely. This also met the crane's demands, with SRM able to load materials onto three lorries for over two hours without the generator firing up.

SCENARIO 2

Luffing crane

The second scenario used a bigger crane, at first running on a 320kVA generator to establish baseline data. Aggreko then introduced a 200kVA model, which could easily handle the crane's demands. A battery hybrid was again introduced afterwards, and able to support the job, though greater care was needed from operators to avoid spikes in demand.





SCENARIO 1 DATA

Data showed a maximum power of 94kW and an average fuel consumption of 37 litres per hour at this load.

The 200kVA had a max output of 160kW, so only ran at 58% of its total capacity, leaving 42% extra power unused.

Maximum readings from the generator never exceed 100kW, proving a smaller set up is better matched than the 250kVA generator originally specified.

HOW UPGRADES PERFORMED

GENERATOR SIZE	200kVA to 100kVA battery hybrid
APPLICATION	Tower crane hoisting and slewing 12.5-ton weights

SCENARIO 1 RESULTS

	200KVA (DIESEL) TO 100KVA BATTERY HYBRID (HVO)	200KVA TO 100KVA BATTERY HYBRID (BOTH RUNNING ON HVO)
FUEL SAVINGS	From 52,416 litres to 27,757 litres = ~ **47% decrease**	From 52,416 litres to 27,757 litres = ~ **47% decrease**
EMISSIONS SAVINGS	From 170,876kg of CO2e to 7,633kg of CO2e = ~ **95% decrease**	From 14,414kg of CO2e to 7,633kg of CO2e = ~ **47% decrease**

CONCLUSION

The 100kVA hybrid generator package offers the best solution when running the tower crane at the loads listed, delivering significant cost and emissions savings over an average hire period of 26 weeks. This demonstrates how specified power demands are often far beyond what's actually necessary, costing businesses more in fuel and hire costs, as well as increasing their emissions unnecessarily.

SCENARIO 2 DATA

Depot engineers operated the crane at full working capacity, lifting a 12.5-ton weight while luffing and hoisting, so accurate loading could be determined.

Data showed a maximum power of 121kW and an average fuel consumption of 18 litres per hour at this load.

The 320kVA model had a maximum output of 256kW, meaning 53% extra power was unused.

HOW UPGRADES PERFORMED

GENERATOR SIZE	320kVA to 200kVA battery hybrid
APPLICATION	Tower crane hoisting and slewing 12.5-ton weights

SCENARIO 2 RESULTS

	320KVA (DIESEL) TO 200KVA (HVO)	320KVA TO 200KVA HYBRID (BOTH RUNNING ON HVO)
FUEL SAVINGS	From 96,096 litres to 52,926 litres = ~ **45% decrease**	From 96,096 litres to 52,926 litres = ~ **45% decrease**
EMISSIONS SAVINGS	From 313,272kg of CO2e to 14,554kg of CO2e = ~ **96% decrease**	From 26,426kg of CO2e to 14,554kg of CO2e = ~ **45% decrease**

CONCLUSION

The 200kVA generator powered the crane adequately, meaning the 320kVA was again overspecified for its job. Sir Robert McAlpine saw significant savings even making this small swap. However, the biggest change was seen when incorporating a hybrid solution. This required greater care from operators to avoid power spikes but nevertheless shows that more sustainable options can meet base demands.

PROJECT BACKGROUND

What does this mean for other live projects?

What currently impedes greener upgrades being rolled out on site as standard and how fast could roll-out be?

Access to equipment will be a priority, as will technical support from engineers who can troubleshoot problems should they occur. Supplier engineers will also be vital to ensure equipment is matched according to the load, as this project has shown that plant is often overspecified and leads to inefficiencies. Providing support is in place, and the site lends itself to these jobs, roll-out could begin immediately.

Where could greener upgrades be incorporated first?

The results have shown that energy-intensive areas of construction can be adequately supported by Aggreko's Greener Upgrades. Major civil engineering works, such as tunnel boring, may currently struggle with power being supplied in this way. But standard on-site applications could be moved over without a noticeable drop in service levels.

Can batteries guarantee performance? How are they recharged?

Yes. Aggreko's software runs as a control system, automatically managing the variable loads on site. This means it can turn the generator off when there's a period of low energy consumption and switch it back on to recharge mode. Contingencies can also be added in to eliminate the threat of a drop in power when spikes occur.

What other options exist to accelerate the net zero agenda in UK construction?

Hydrogen fuel represents the next step in on-site power generation and, if successful, will pave the way for a wholesale move away from traditional fuels. Aggreko and Sir Robert McAlpine are currently in the process of trialling this technology using generators and fuel cells.

Asking operators to monitor the power load when operating a crane sounds time-consuming, can this be avoided?

The trials are an indication of what's possible with greener technologies and asking operators to limit the load is not an ideal approach given how tight deadlines are on most construction sites. Nevertheless, the results show that hybrids can tackle the demand from larger lifting jobs and, with some refinement, will eventually be able to maintain current service levels without the associated energy or emissions penalties.

CONCLUSION

This trial has offered a clear route for Sir Robert McAlpine to improve sustainability and keep its net zero ambitions firmly on track. The results show practical swaps can deliver a significant drop in emissions, while also reducing the amount of fuel used and money spent on plant.

Arguably the most telling finding relates to generator sizing. Businesses tend to overestimate the power they need at the beginning of a project, and this trial was no different. In both scenarios the generator that was first specified by Sir Robert McAlpine was too large. Working this way is not only expensive but also creates emissions that can be avoided with the introduction of greener upgrades that maintain the same level of performance. Aggreko's consultancy throughout this project has demonstrated the importance of correct sizing, showing how even minor changes of this kind can bring about profound improvements.

For more information on greener upgrades in construction, visit:

www.aggreko.com/en-gb/greener-upgrades-in-construction

It's clear that strategic partnerships of this kind will be central for bringing UK construction in line with a low-carbon economy. New or improved technology cannot be adequately tested in isolation and businesses need real-world test cases to demonstrate value to stakeholders. Trials offer a pragmatic, evidence-based way to move industry away from inefficient practices and support the kind of joined-up thinking needed to tackle complex challenges like climate change.

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For more information

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