Hybrid Power Report – SLD Hussh Pod

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01. Introduction

As part of George Leslie's 'Beyond Net Zero' target and in-line with exploring innovative products within the construction industry, a trial of hybrid energy technology took place at various GL sites.

The technology involves a battery pack that allowed a standard site generator to "switch off," reducing the amount of fuel consumed and carbon emissions. The battery pack would power the welfare set up until such times the battery was drained. The generator would start back up and power the welfare set up and re-charge the battery pack.

In addition to this, an alternative set up is to set the Pod on a timer which is particularly effective at night in built up areas. When the Pod batteries have been drained, the generator will re-start. The

The battery pack is referred to as a Hussh Pod and available from SLD (Scottish Water framework supplier for site generated power).

The trial took place at Kilmarnock Road, Shawlands; Munnoch Reservoir, nr Dalry; Minishant WwTW; and Provost Driver Court, Renfrew.

02. Site Background

Kilmarnock Road, Shawlands

Due to the location of the works, the site compound was situated on a side street between tenement flats. To reduce the volume of noise coming from the generator at night, there were 2no Hussh Pod's on hire to help assist in providing power to the site compound during the night and not have the generator switched on, creating noise pollution.

Munnoch Reservoir, nr Dalry

Although the site is in a remote area, the noise at night can carry and disturb local landowners. The Hussh Pod was brought in to reduce the noise at night as well as reduce the fuel being delivered.

Minishant WwTW

This was an unmanned site, where the works involved were to pump the waters entering the wet well when it had reached a high level. Instead of using just a pump and generator set up which would have required the diesel generator running 24hrs a day as well as additional attendances to site, the Hussh Pod was brought in to reduce the number of visits required to the remote site, while again saving on fuel and carbon emissions.

Provost Driver Court, Renfrew

The site sits between housing estates, and to reduce noise levels the Hussh Pod was hired. This is a relatively new site, where there is insufficient data for analysis.

03. SHEW – Safety, Health, Environmental and Wellbeing

The major benefit in using the Hussh Pod is the carbon emission reduction, which has been one of the main drivers in using them on a number of sites. With the ability the Pod has in effectively switching off the generator, this will help reduce noise levels whether in urban areas with residential properties close by or in more remote rural areas where noise can travel longer distances.

With the generator switching off this also saves on fuel and reduces the number of on-site attendances required for checks and refueling. In turn, this reduces the risk for an incident to occur in travelling to or from the site, and on the site.

04. Commercial

The Hussh Pod is an additional charge on top of the hire of the generator, distribution board and fuel tank. The present hire cost for the Hussh Pod is £400 per week. However, this can be negated with the saving on fuel throughout the same hire period of the Pod.

Currently, SLD cannot provide a discount on the rate quoted due to the equipment being new technology and the cost they are being procured at.

The table below shows a comparison between the traditional welfare power set up and the hybrid energy solution, and the potential commercial saving made on fuel:

Project Length	Traditional Cost		Hybrid Cost		Potential Saving		Nett Gain
	Hire & Sales	*Fuel*	*Hire & Sales*	*Fuel*	*Hire & Sales*	*Fuel*	
1 Week	£1,137.92	£1,562.40	£1,756.44	£1,041.60	£618.52 LOSS	£520.80 GAIN	£97.72
1 Month	£1,596.68	£6,249.60	£3,437.76	£4,166.40	£1,841.08 LOSS	£2,083.20 GAIN	£242.12
3 Months	£2,972.96	£20,311.20	£8,481.72	£13,540.80	£5,508.76 LOSS	£6,770.40 GAIN	£1,261.64
6 Months	£4,960.92	£40,622.40	£15,767.44	£27,081.60	£10,806.52 LOSS	£13,540.80 GAIN	£2,734.28
9 Months	£6,948.88	£60,933.60	£23,053.16	£40,622.40	£16,104.28 LOSS	£20,311.20 GAIN	£4,206.92
12 Months	£8,936.84	£81,244.80	£30,338.88	£54,163.20	£21,402.04 LOSS	£27,081.60 GAIN	£5,679.56

The above is in relation to a 60kva generator with a minimum 4no cabin set up. Fuel has also been priced at £1.55/l. For other comparisons, see Table A.1 in the appendix.

For information, the 40kva generator with Hussh Pod would not be a suitable solution for the number of cabins set up in the example as the Hussh Pod requires a minimum 60kVA generator.

The above is all in theory, however the below is the real-world trial that took place at the sites mentioned earlier. It is worth noting the fuel price fluctuation on all sites, due to the trials taking place at various times throughout the period.

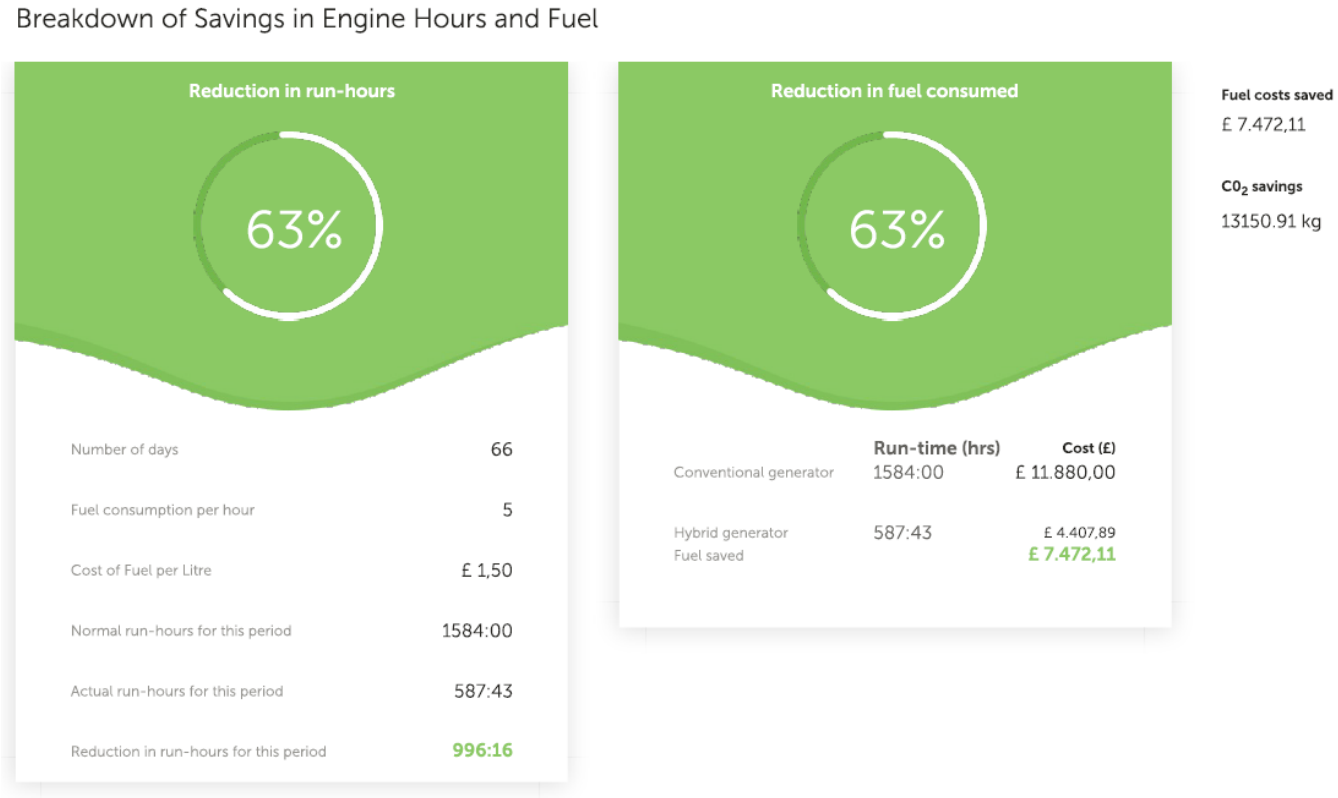
Kilmarnock Road, Shawlands

There were 2no pods used at the Kilmarnock Road site. Due to the site compound being located between tenement blocks and in a populated area, the generator was required to be off at night. The Hussh pods were used to assist with this.

In total, the pods were used for 66 days, giving a potential generator run time of 1,584 hours. Assuming the generator expels 5L/hr and diesel averaged £1.50 per litre, then the potential cost of fuel over 1,584 hours is £11,880.

During the trial, the site generator ran for just over 587 hours, meaning the pods were running for 996 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pods saved the site £7,472. This equates to approximately a saving of under £800 per week.

In total, the pods were running approximately 63% of the time while on site, and accumulated to saving over 13 tons of CO2, or 1.3 tons of CO2 per week.



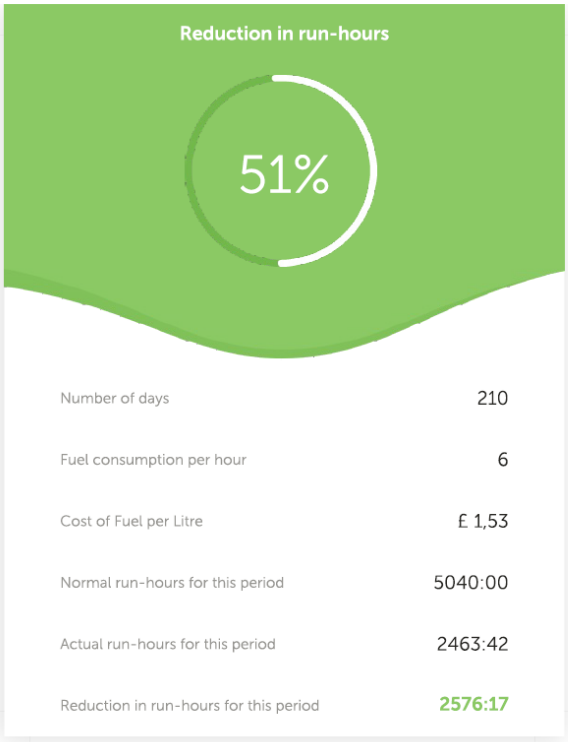
Munnoch Reservoir (currently a LIVE project)

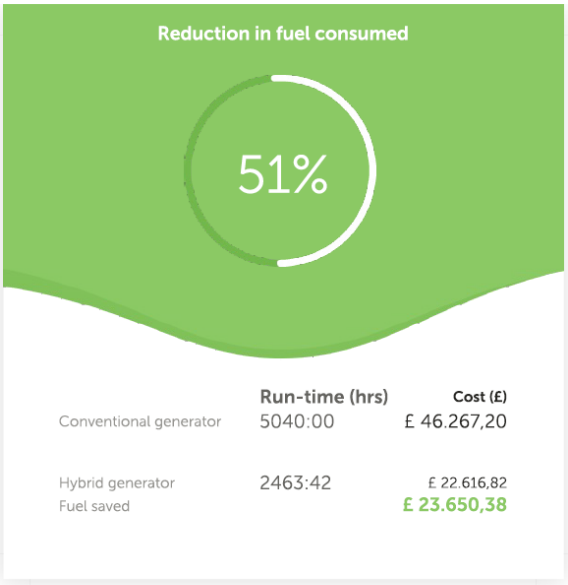
Munnoch Reservoir has one pod on site. To date, the pods have been used for 210 days, giving a potential generator run time of 5,040 hours. Assuming the generator expels 6L/hr and diesel averaged £1.53 per litre, then the potential cost of fuel over 5,040 hours is £46,267.20.

During the trial, the site generator has ran for just over 2,463 hours, meaning the pod has been running for over 2,576 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pods have saved the site £23,650.38 so far. This equates to approximately a saving of under £788 per week.

In total, the pods have been running apporximately 51% of the time while on site, and accumulated to saving almost 41 tons of CO2, or over 1.3 tons of CO2 per week.

Breakdown of Savings in Engine Hours and Fuel





Fuel costs saved
£ 23.650,38

CO_2 savings
40808.5 kg

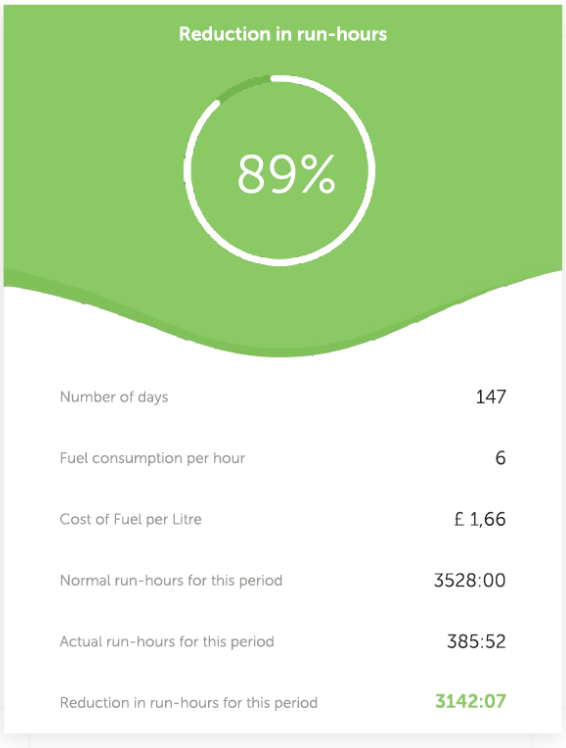
Minishant WwTW

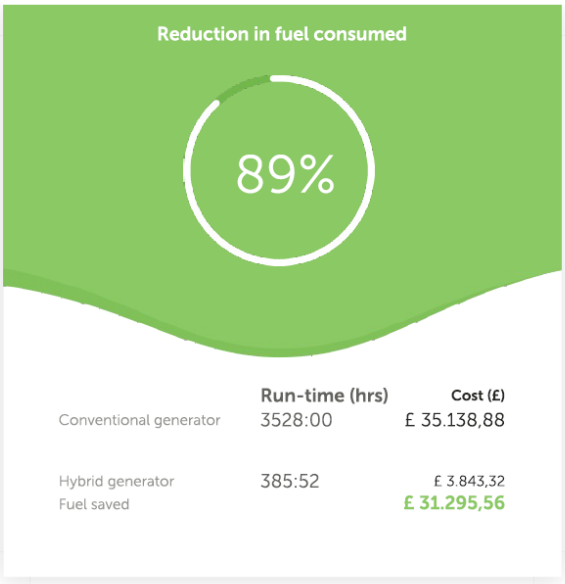
Minishant WwTW had one pod on site. The pod was used for 147 days, giving a generator run time of 3,528 hours. Assuming the generator expelled 6L/hr and diesel averaged £1.66 per litre, then the potential cost of fuel over 3,528 hours was £35,138.88.

During the trial, the site generator ran for just over 385 hours, meaning the pods were running for 3,142 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pods saved the site £31,295. This equates to approximately a saving of £1,490 per week.

In total, the pods have been running approximately 89% of the time while on site, and accumulated to saving over 49 tons of CO2, or 2.36 tons of CO2 per week.

Breakdown of Savings in Engine Hours and Fuel





Fuel costs saved
£ 31.295,56

CO_2 savings
49771.25 kg

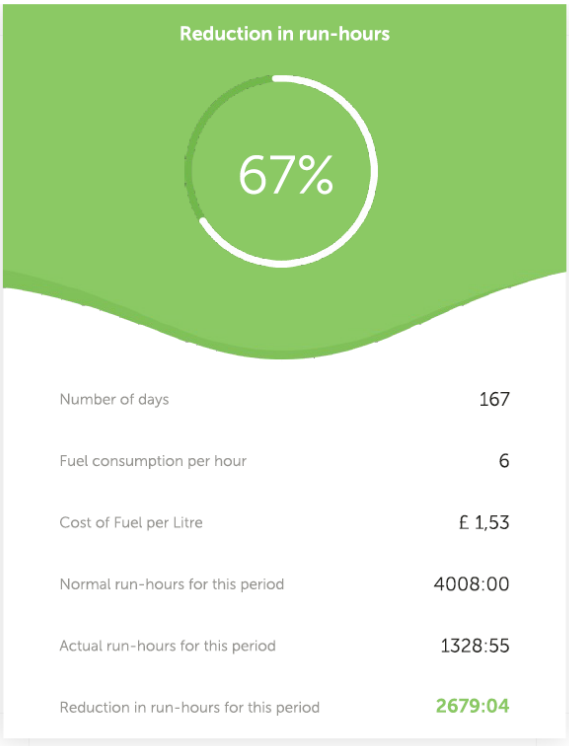
Provost Driver Court, Renfrew (currently a LIVE project)

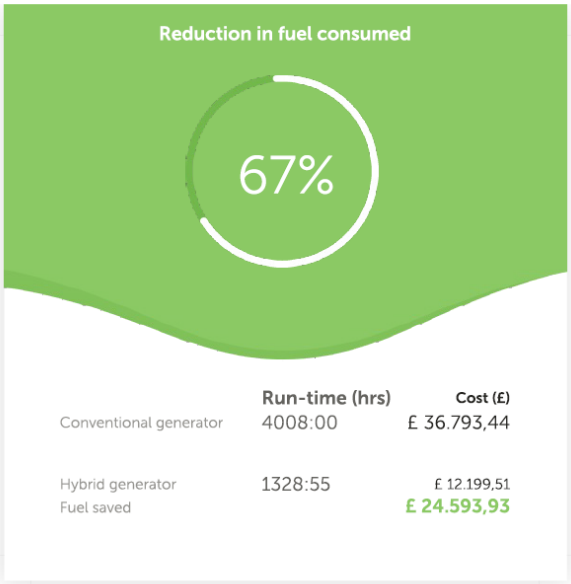
Provost Driver Court has one pod on site. To date, the pods have been used for 167 days, giving a potential generator run time of 4,008 hours. Assuming the generator expels 6L/hr and diesel averages £1.53 per litre, then the potential cost of fuel over 4,008 hours is £36,793.44.

During the trial, the site generator has ran for just over 1,328 hours, meaning the pod has been running for 2,679 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pod has saved the site £24,593.93 so far. This equates to approximately a saving of £1,033 per week.

In total, the pods have been running apporximately 67% of the time while on site, and accumulated to saving over 42 tons of CO2, or or 1.76 tons of CO2 per week.

Breakdown of Savings in Engine Hours and Fuel



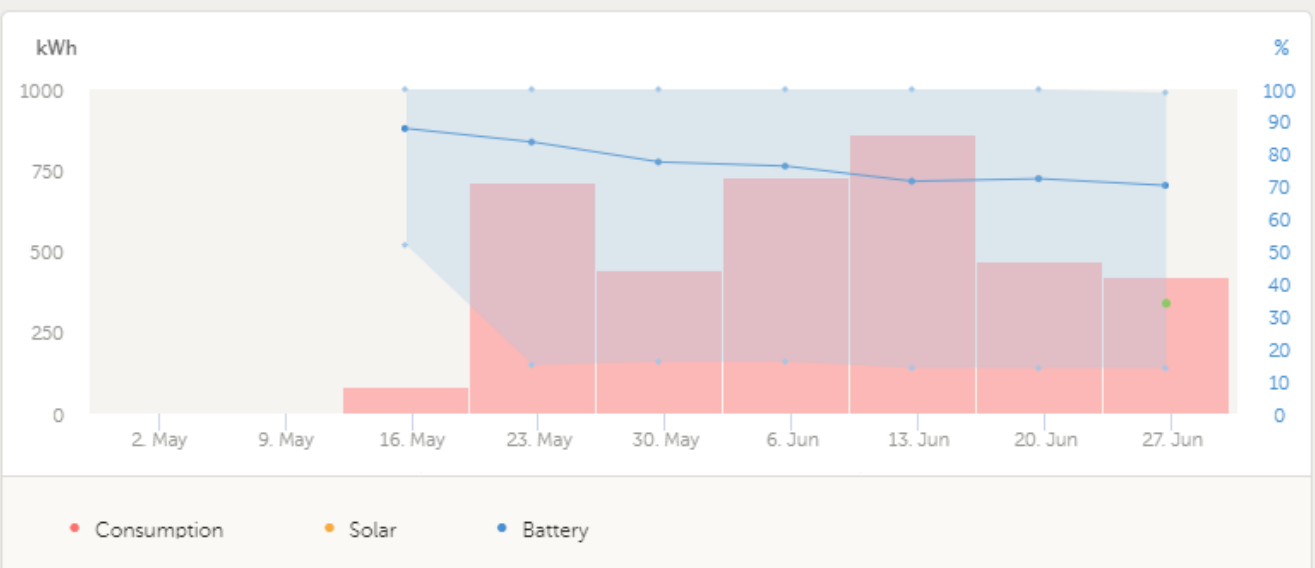


Fuel costs saved
£ 24.593,93

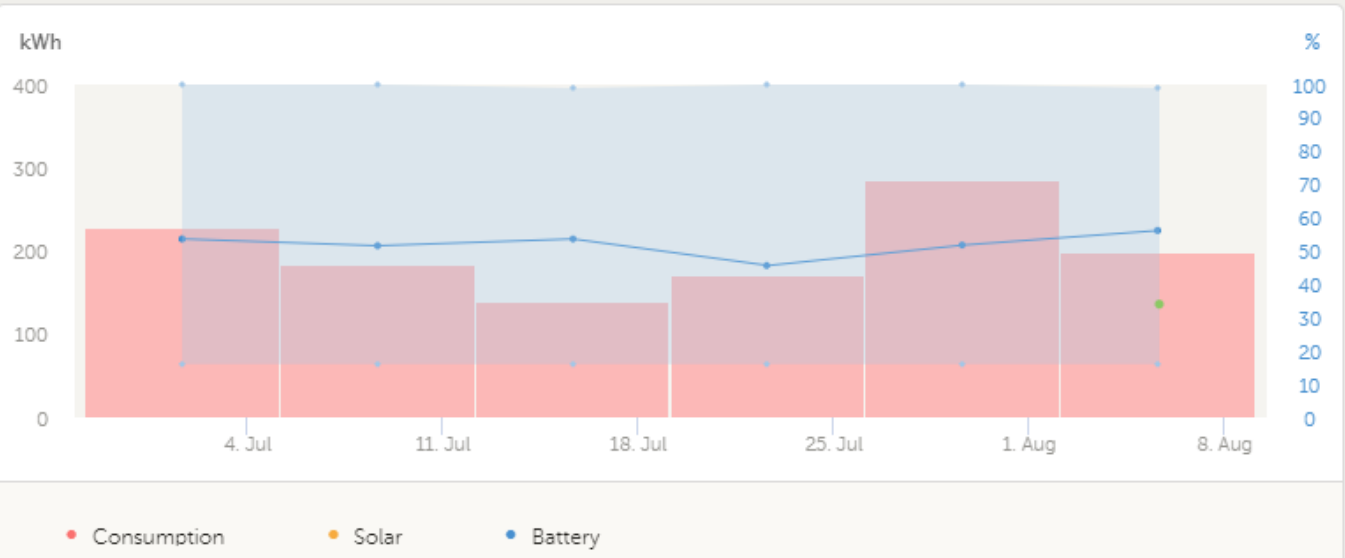
CO_2 savings
42436.59 kg

It should also be noted that, from the beginning of May till end of June, the pod was on a timer due to the site being in a built-up residential area. The aim of this was to reduce the noise pollution during the night with the generator being off and the pod supplying power.

However, through analysing the data on the portal, it was found that the generator was kicking in in the very early hours of the morning due to a spike in power output. This is shown in the image below.



The pink bars are the usage provided by the generator in kWh through the day, with the blue line the battery charge percentage from the battery. The power demanded on the generator was higher than anticipated, therefore the operation under timer was removed as well as the site team being made aware to minimise energy consumption during non-working hours, eg switching off lights, printers, radiators etc when not in use. In the graph below, this shows the difference made in reducing the peak usage from 800kwh to 300kwh.



Due to no customer complaints being raised in relation to the generator running during the night, the pod timer was not reinstated. This is subject to ongoing review with SLD and the site team.

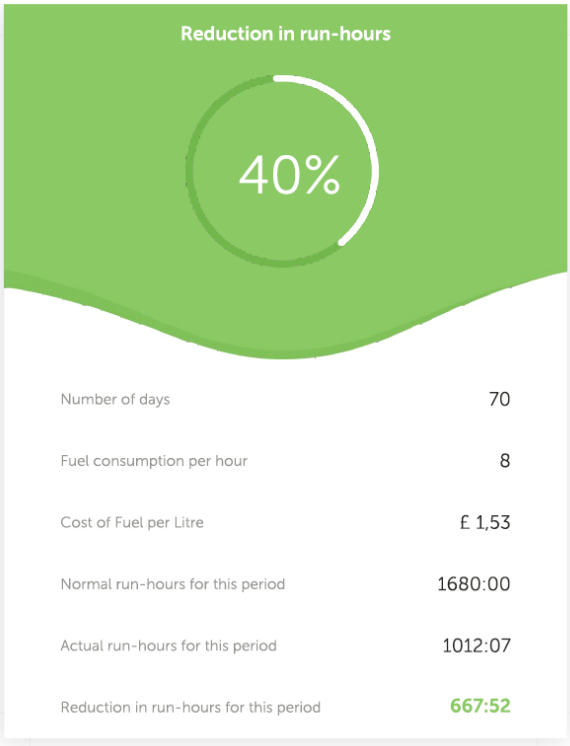
Braidholm Road, Giffnock (currently a LIVE project)

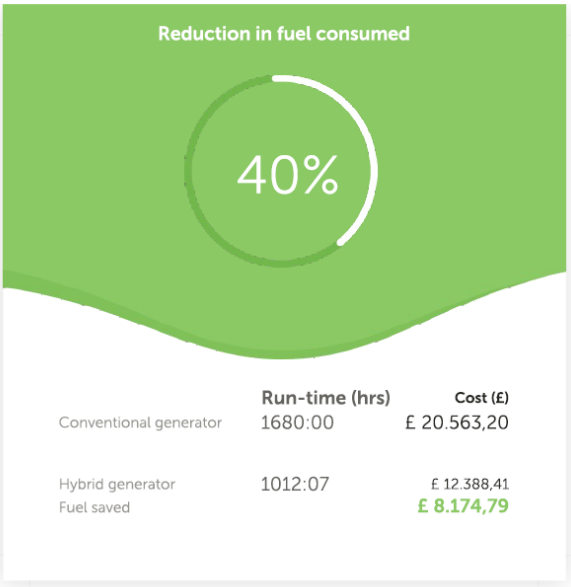
Braidholm Road has two pods on site. To date, the pods have been used for 70 days, giving a potential generator run time of 1,680 hours. Assuming the generator expels 8L/hr and diesel averaged £1.53 per litre, then the potential cost of fuel over 1,680 hours is £20,563.20.

During the trial, the site generator has ran for just over 1012 hours, meaning the pod has been running for over 667 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pods have saved the site £8,174 so far. This equates to approximately a saving of around £817 per week.

In total, the pods have been running apporximately 40% of the time while on site, and accumulated to saving almost 14 tons of CO2, or 1.4 tons of CO2 per week.

Breakdown of Savings in Engine Hours and Fuel





Fuel costs saved
£ 8.174,79

CO_2 savings
14105.53 kg

In addition to the above, the Hussh Pod at Braidholm Road is ONLY set to come on at 8pm every night, due to noise pollution in a built up area. Also, they are using a different welfare unit supplier from the other sites listed. With those two points in mind, this has contributed to a slight reduction in overall use of the Hussh Pod, although it is performing well for the its desired purpose.

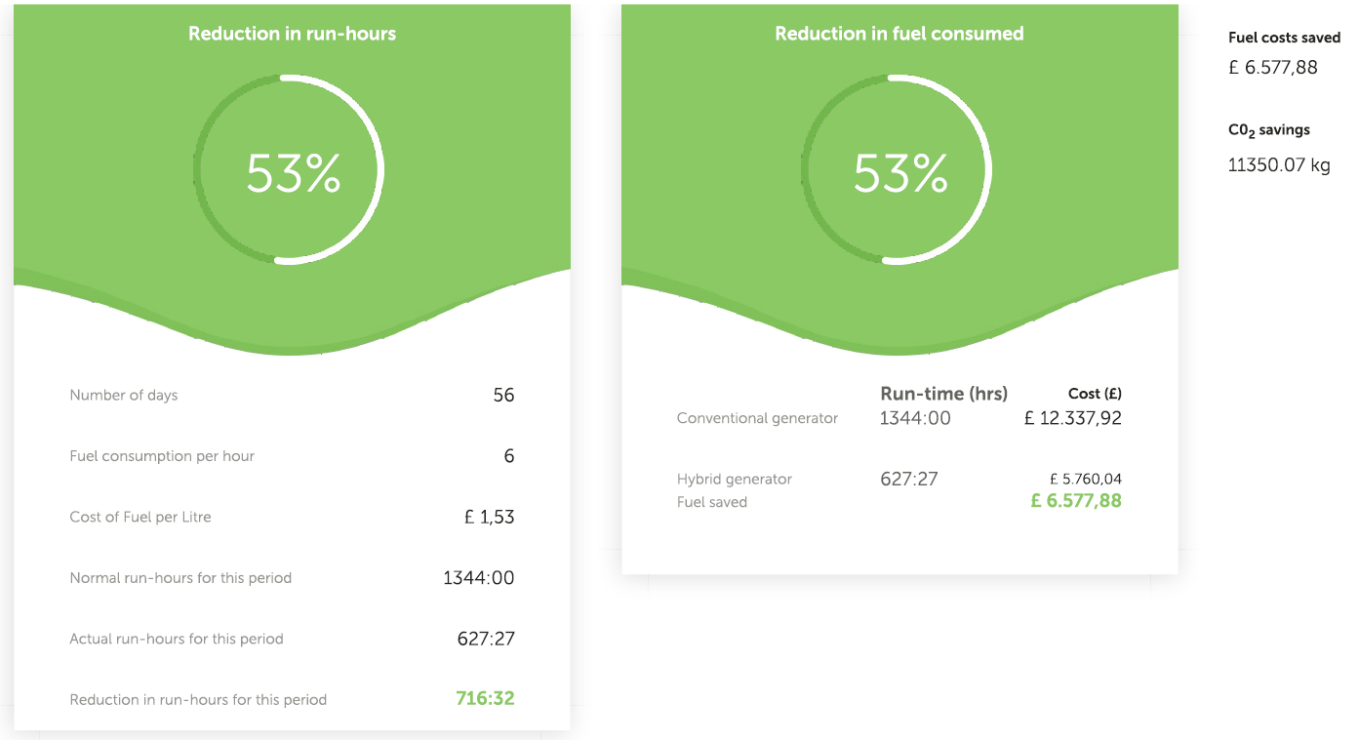
Daer Reservoir (currently a LIVE project)

Daer Reservoir has one pod on site. To date, the pods have been used for 56 days, giving a potential generator run time of 1,344 hours. Assuming the generator expels 6L/hr and diesel averaged £1.53 per litre, then the potential cost of fuel over 1,344 hours is £12,337.92.

During the trial, the site generator has ran for just over 627 hours, meaning the pod has been running for over 716 hours. Using the figures above in economy of the generator with fuel and price for fuel, the pods have saved the site £6,577.88 so far. This equates to approximately a saving of under £822 per week.

In total, the pods have been running apporximately 53% of the time while on site, and accumulated to saving almost 11.3 tons of CO2, or 1.4 tons of CO2 per week.

Breakdown of Savings in Engine Hours and Fuel



05. Use on Site

Five of the six sites that have used the pods to date have done so to power the welfare units. Minishant was powering a pump at an unmanned site.

Although the benefits for the pods are clear in relation to carbon reduction, this is one of a few. The pods can be set on timers to come on only at night when in built up areas, or noise sensitive areas. However, this is better effective when linked with two pods. Similarly, by doubling up on the pods on site, this will help reduce the amount of fuel and carbon emitted from the generator.

When running the pods on site, the site team should be vigilant in what electricity demands are being used by the welfare units, particularly when no/low numbers of personnel are on site (e.g., nighttime security). Any unnecessary equipment or devices, like heaters, water coolers, microwaves, lights etc., should be switched off when not in use for longer periods (e.g., nighttime) to leaving at the end of the day. This decreases the load being omitted by the pod but will increase the length of time the pod can run for.

06. Summary Conclusion

Pro's	Con's
Reduced fuel usage with accompanying cost saving (see Table A.1 in Appendix)	Additional cost on top of the hire of the existing generator set up (see Table A.1 in Appendix)
Significant reduction in carbon emissions by greater than 1ton of CO2 per week (see Table A.2 in Appendix)	Requires additional footprint within site compound for setting up
Alternative source of power when working in built-up residential areas (reduced noise)	
On remote sites where monitoring and infrequent inspection is required, this will save on fuel costs and travel by squads	

Support Services would recommend Hussh Pods are used on all our Scottish Water sites, both new generator installations as well as retrospectively added to existing operational sites. There are significant carbon savings when using Hussh Pods, as well as appearing to be a significant commercial benefit which grows in line with the project duration.

The benefits on carbon reduction and fuel saved are there to be realised, but these need to be managed with a diligent site team who can turn off appliances when not in use. The advances in welfare units using greener methods to insulate, light and heat the units will also assist in managing the benefits. Site teams should therefore request the greener unit option from their suppliers whenever possible.

Support Services have created a tool where the site teams can input their generator requirements to predict comparative cost and carbon savings with the use of Hussh Pods. Teams should contact Support Services for this.

Support Services will continue to monitor existing and new Hussh Pod installations to record carbon and cost savings, and are looking to trial Sunbelt Rentals equivalent BSU battery power on a GL non-Scottish Water site.

Report by: Gavin Pick

Date: 15th September 2022

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07. Appendix

Table A.1

40kva Generator

Project Length	Traditional Cost	Hybrid Cost	Potential Saving
1 Week	£2,427.92	£2,624.44	£196.52
1 Month	£6,756.68	£6,909.76	£153.08
3 Months	£19,742.96	£19,765.72	£22.76
6 Months	£38,500.92	£38,335.44	£165.48
9 Months	£57,258.88	£56,905.16	£353.72
12 Months	£76,016.84	£75,474.88	£541.96

60kva Generator

Project Length	Traditional Cost	Hybrid Cost	Potential Saving
1 Week	£2,700.32	£2,798.04	£97.72
1 Month	£7,846.28	£7,604.16	£242.12
3 Months	£23,284.16	£22,022.52	£1,261.64
6 Months	£45,583.32	£42,849.04	£2,734.28
9 Months	£67,882.48	£63,675.56	£4,206.92
12 Months	£90,181.64	£84,502.08	£5,679.56

80kva Generator

Project Length	Traditional Cost	Hybrid Cost	Potential Saving
1 Week	£2,975.72	£2,986.64	£10.92
1 Month	£8,947.88	£8,358.56	£589.32
3 Months	£26,864.36	£24,474.32	£2,390.04
6 Months	£52,743.72	£47,752.64	£4,991.08
9 Months	£78,623.08	£71,030.96	£7,592.12
12 Months	£104,502.44	£94,309.28	£10,193.16

100kva Generator

Project Length	Traditional Cost	Hybrid Cost	Potential Saving
1 Week	£3,246.12	£3,170.24	£75.88
1 Month	£10,029.48	£9,092.96	£936.52
3 Months	£30,379.56	£26,861.12	£3,518.44
6 Months	£59,774.12	£52,526.24	£7,247.88
9 Months	£89,168.68	£78,191.36	£10,977.32
12 Months	£118,563.24	£103,856.48	£14,706.76

Table A.2

CO2 Reduction

Site Name	Total Energy (hours)	Pod Use %	Total CO2 Savings	CO2 Savings Per Week
Kilmarnock Road, Shawlands	1,584	63	13tons	1.3tons
Munnoch Reservoir	5,040	51	41tons	1.3tons
Minishant WWTW	3,528	89	49tons	2.36tons
Provost Driver Court, Renfrew	4,008	67	42tons	1.76tons
Braidholm Road	1,680	40	14tons	1.4tons
Daer Reservoir	1,344	53	11.3tons	1.4tons