

WHAT IS A CATALYTIC GENERATOR?

The Cat Gen (Catalytic Generator) is a device we are developing, positioned to fill the sustainability gap between internal combustion and fully electric power for vehicles and portable power.

HOW DOES IT WORK?

The Cat Gen is a microturbine device that generates a hot, high-pressure air and fuel mix to drive a turbine. The turbine is attached to an electric machine generating electrical energy that can be used to charge batteries. Watch the video [here](#).

HOW MUCH DOES IT COST?

We are developing the Cat Gen to be produced cheaply in high quantities. Currently, we have calculated that the device has the potential to be manufactured at under £2000 per unit at a high volume (100,000+ units/year).

WHAT IS THE FUEL EFFICIENCY?

28% from fuel in, to DC power out. The fuel efficiency is fixed for all types of fuels by the thermodynamics of the system and the recuperated Brayton cycle. However, the fuel consumption will vary depending on the fuel.

COULD IT BE USED AS A RANGE EXTENDER TO MINIMISE THE NEED FOR ADDITIONAL BATTERY CAPACITY IN BEVS?

Yes, the Cat Gen enables battery capacity to be optimised to cover the average daily usage of the vehicle it is integrated with. The concept is to use the Cat Gen as a back-up generator for unexpected journeys or when there is no opportunity to recharge the battery, rather than to be used constantly to power the vehicle.

IS THE CAT GEN A POWER ADDER OR IS IT FOR REDUCING EMISSIONS OF EXISTING ICE VEHICLES?

No, the Cat Gen is a standalone power generation device with ultra-low emissions capabilities that does not require after-treatment. The Cat Gen is power dense and can run on multiple fuels.

DO YOU HAVE ANY EXAMPLES OF THE CAT GEN IN USE TODAY?

The Cat Gen has been integrated into multiple demonstrator vehicles across the propulsion industry. Two Ford Transits, a luxury cruiser from Baltic Yachts and the Ariel HiPerCaR. We are looking for partners to demonstrate the Cat Gen's fuel flexibility running on hydrogen

WHAT IS THE SPECIFIC FUEL CONSUMPTION AND FUEL USAGE RATE ON PETROL AT 35KW?

In charge sustain operation on WLTC (Worldwide harmonized Light vehicles Test Cycles) the Cat Gen equipped Ford Transit PHEV (Plug-in Hybrid Electric Vehicle) running at 35kW, uses 290g/kWh at 5.3L/h.

WHAT IS THE ELECTRIC MACHINE ARE YOU USING ON THE CAT GEN?

A high-speed permanent magnet unit designed by Delta Cosworth is located on the common turbine and compressor shaft. This unit is also used in reverse to spin the Cat Gen during the start-up phase.

WHAT TYPE OF CATALYST IS USED FOR THE REACTION PROCESS IN THE CAT GEN?

The catalyst is developed in conjunction with and supplied by Johnson Matthey.

WHAT ARE THE NOX EMISSION QUANTITIES?

Operational temperatures are below the threshold that NOx gasses are produced so, emissions are minimal even on petrol. We achieve around 3% of the Euro 6d limits with the Ford Transit PHEV at 35kW on petrol for a WLTC charge sustaining cycle.

WHY ARE YOU MAKING THE ELECTRIC CAR BURN FOSSIL FUEL?

The Cat Gen is compact, lightweight and low cost. Compared to a PHEV, the Cat Gen enables a large reduction in emissions with a weight saving potential. Having a smaller, lighter generator enables a larger battery to be used with similar costs, resulting in an overall increase in range on battery power alone.

When integrating the technology in a BEV (Battery Electric Vehicle), we can optimise the size of the battery for different applications. In many cases this reduces overall mass and costs. Reducing battery size also enables the implementation of battery technology into more vehicles, accelerating electrification and avoiding range anxiety issues. The Cat Gen had been developed to be a last resort device, only to be used on occasions where charging via a plug isn't an option or for use on longer journeys to recharge without stopping. The Cat Gen is extremely low emissions and capable to be run on carbon neutral fuels, removing the need for fossil fuels all together.

WHEN WILL THE CAT GEN GO INTO FULL SCALE PRODUCTION?

We are looking for funding and investment opportunities to enable production at high-volume for 2023.

IS THE CAT GEN RELIABLE?

The durability target is ~2000h. We are currently in the testing phase of the system to understand how long it can run for and what the actual durability is. ~1000h is enough for the lifetime of a passenger vehicle when used as a backup range extender, so our target of ~2000h adds in a strong reliability safety margin.

CAN THE CAT GEN BE RUN IN SERIES FOR MORE POWER?

Catalytic Generators can be connected in parallel to increase the power level. This enables multiple power outputs as well as redundancy for larger power demands and where the percentage change of failure needs to be as close to 0% as possible.

WHAT DOES THE CAT GEN SOUND LIKE?

In the Ford Transit PHEV, the sound is comparable to that of an electric vehicle during a drive-by test, with extremely low interior cabin NVH (Noise Vibration and Harshness). A small audible whistling noise can be heard, similar to that of a turbocharger.

ARE THERE OTHER POWER OUTPUT POSSIBILITIES OTHER THAN 35KW?

The Cat Gen can be scaled within the range of 1kW to 70kW within the same concept.

WHAT IS THE MASS OF THE CAT GEN?

In the region of 48kg for the core hardware.

WHAT ARE THE PACKAGING RESTRICTIONS?

The Cat Gen can be located in any position and orientation giving great package flexibility. The current Cat Gen layout can also be changed to suit a wider range of applications.

CAN YOU RUN SEVERAL TYPES OF FUEL WITHOUT CHANGING HARDWARE?

The Cat Gen is fuel agnostic, meaning it can run on multiple fuels without changing the core hardware. The fuel delivery system might have to change depending on the fuel choice.

WHAT IS THE RECUPERATED BRAYTON CYCLE?

In the recuperated Brayton cycle, we generate hot gas to spin a turbine thanks to air and fuel reacting in a catalyst (any kind of fuel (liquid/gaseous) can be used). The turbine is connected to a compressor and an electric machine so by spinning the turbine, the electric machine also spins and this is how we generate electricity.