

Series-ER: Enabling  
zero emission zones

# Get to zero™

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**BAE SYSTEMS**



## Delivering on zero emission commitments

Cities everywhere are facing a massive challenge to improve air quality, and drive down carbon emissions. Achieving this in an affordable and sustainable manner will require a range of different technologies. Transport will be a key part of this, and we believe both low and zero emission vehicles are part of the solution.

One of the major challenges cities face when implementing zero emission transport solutions, whether battery electric or hydrogen fuel cell, is refueling. The infrastructure is both costly and time-consuming to implement. For cities struggling with this challenge, a zero emission-capable drive train solution is available and proven. Series-ER, our electric range hybrid technology, provides an extensive zero emission driving capability with a built-in ultra-low emission charger.

# Plug-in and increased electric range

With plug-in charging capability and the range available from more power-dense energy storage systems, Series-ER vehicles can complete entire routes in full zero emission electric mode. Series-ER based vehicles therefore provide an immediate zero emission solution without infrastructure and are future-proofed to be able to operate in full zero emission mode in an all-electric environment.

Since operators do not need to wait for charging infrastructure to be constructed before they can reduce emissions, the transition to Series-ER hybrid technology can begin immediately. Once operators are able to install charging infrastructure, these vehicles can take advantage of grid power in the same way as a battery-electric bus.

## Electric Range - theory of operation

- 1, 2, or 3 mile electric vehicle event setting options
- Daily electric vehicle mileage will depend on the number of electric vehicle events selected on a given route
- Electric vehicle events managed by the hybrid system controller
- Obtains GPS data through intelligent transportation system provider or an equivalent system



## Why Series-ER Electric Range Hybrid drivetrain?

Series-ER hybrid buses present a significant stepping stone in the transition to the long-term goal of full electric.



No charging infrastructure required



Proven and future-proof, quick and easy to scale



Fully driver-independent electric zero emission zone capability combined with no range restrictions



Ideal for residential neighbourhoods, schools, hospitals, city centres, etc.



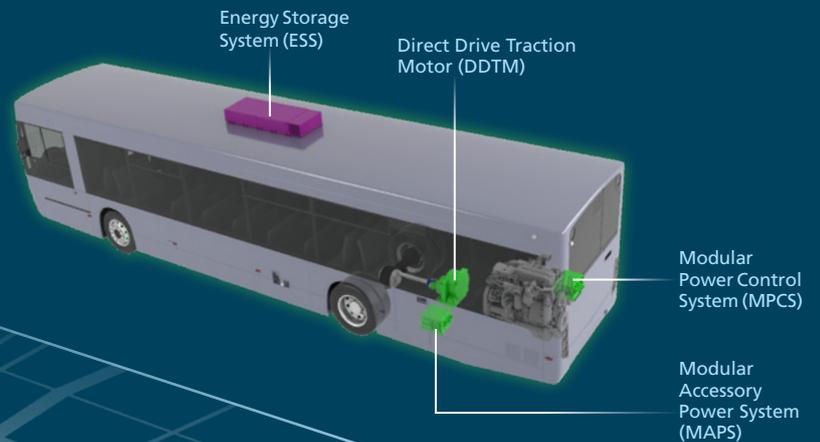
Retrofit at mid-life to increase energy storage capacity for more frequent zero emission zones

# Our solution is operationally proven

Series-ER technology is enabling vehicles to automatically switch to full electric operation when entering the zero emission zones.

This technology expands on the engine stop/start capability, with intelligent geo-fencing to operate in full electric mode throughout entire zero emission zones.

GPS geo-fencing automatically switches off zero emission operation when exiting the zero emission zone



GPS geo-fencing automatically switches on zero emission operation when entering the zero emission zone



## Ireland Series-ER Application Dublin and Galway, Ireland

Ireland's National Transport Authority (NTA) will be incorporating the technology into its new fleet of hybrid double deck urban buses to reduce emissions and fuel use. In January 2020, the NTA announced its intention to roll out up to 600 Series-ER enabled vehicles over the next five years.

- New buses will have plug-in capability
- Vehicles are classified as 'clean vehicles' under the European Union's Clean Vehicles Directive

# Case studies



## Brighton, UK

The seaside city of Brighton turned to Series-ER technology to reduce air pollution in one of its tourist areas. These buses are the first in the U.K. to switch automatically to zero-emission mode whenever they travel through controlled ultra low emission zones.

- 30 Alexander Dennis Limited Enviro400ER double deck buses with Series-ER technology in the fleet
- Equivalent to more than 133,000 emission-free miles per year

## San Francisco, USA

San Francisco was one of the first cities to adopt the technology, creating designated “green zones” to benefit communities with poor air quality as part of an environmental justice initiative. The city plans to upgrade more than 170 additional buses with the Series-ER technology in the next year.

- 68 Series-ER buses in fleet
- Around 131,000 emission free miles per year
- Reduced emissions in nine low income neighbourhoods with measured emission hot spots
- On board computer monitors battery life



## Boston, USA

Boston uses our Series-ER system on more than 400 buses to reduce emissions with idle reduction. This feature allows the bus engine to turn off at stops, eliminating fuel use, emissions and noise when the bus is not moving. Nearly half of Boston’s fleet is also using software to enable vehicles to switch to battery power at low speeds.

- 400 Series-ER buses in fleet
- Equivalent to an average of 14,000 emission-free miles per bus each year
- No grid charging required
- Massachusetts Bay Transportation Authority using Series-ER on 18m bus for a trial test in the ~3.8 km Silver Line transit tunnel and on surface roads





# We can help you get to zero emissions

Contact us at [gettozero.com](http://gettozero.com)

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