

BAE SYSTEMS

Get to zeroTM

Getting cities to zero emissions, no matter where they are today.



Get to
zero today

The demand for low and zero emission vehicles continue to rise as air quality and global warming remain high on the global agenda. If you are looking to reduce emissions or fossil fuel consumption, we can help.



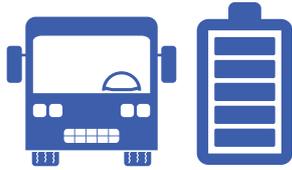
or
take
steps to
get there.

With an extensive portfolio of green power and propulsion solutions, we can help bus operators make an impact on the environment using incremental steps. We realize some operators are closer to zero emissions than others and we offer options designed to get bus operators to zero no matter where they are on their journey.

Zero emission solutions available today

The same components used in more than 10,000 BAE Systems' electric hybrid systems around the globe are used in today's battery electric and fuel cell electric systems. Our zero emission systems are in service helping municipalities reach their clean air goals.

Zero emissions solutions



Series-EV: Battery Electric System



Series-H: Hydrogen Fuel Cell System

Using the same components as our leading electric hybrid system, we deliver and integrate all-electric solutions that get transit to zero emissions.

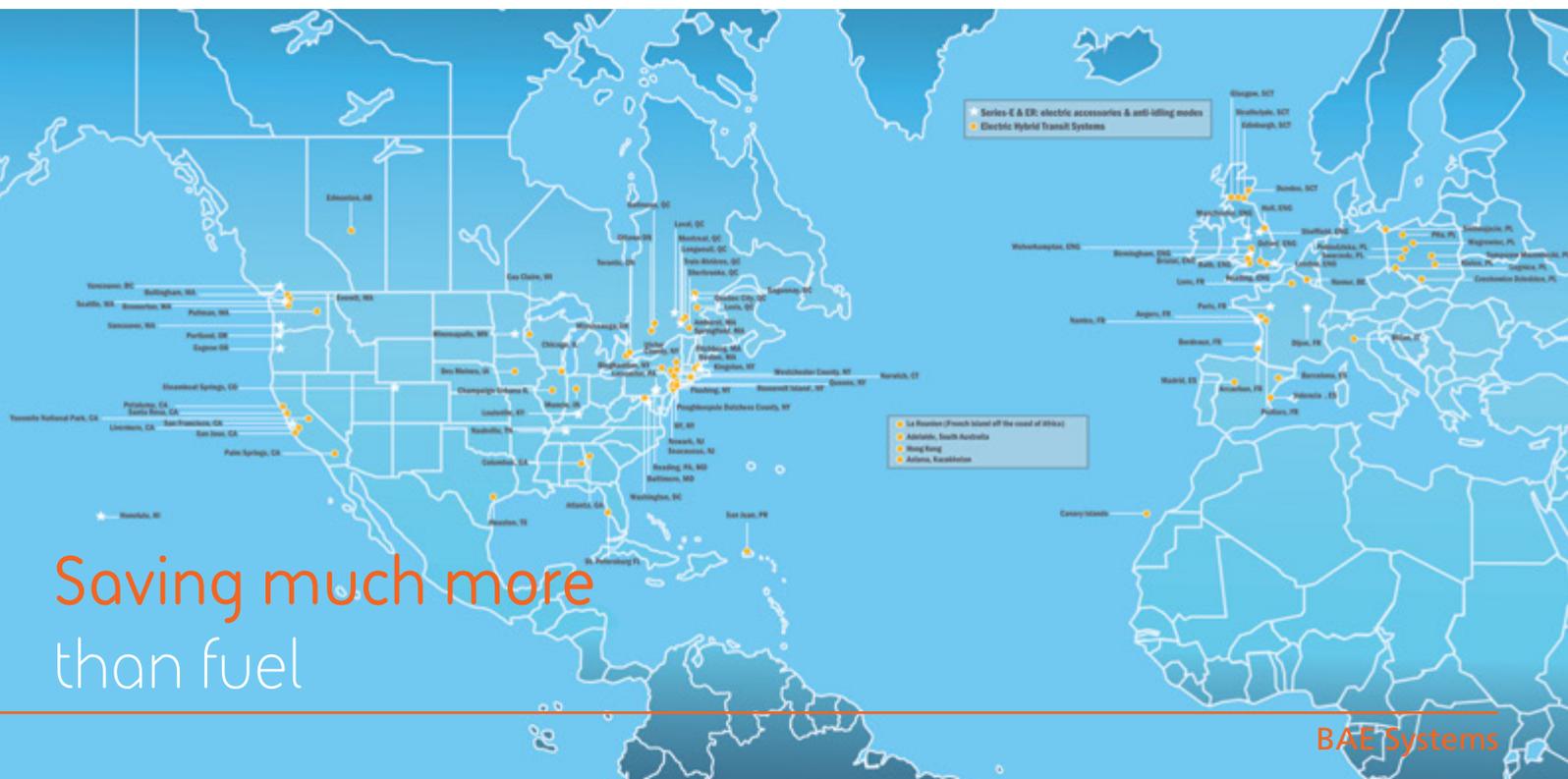
Low emission solutions



Series-ER: Electric Range Hybrid System

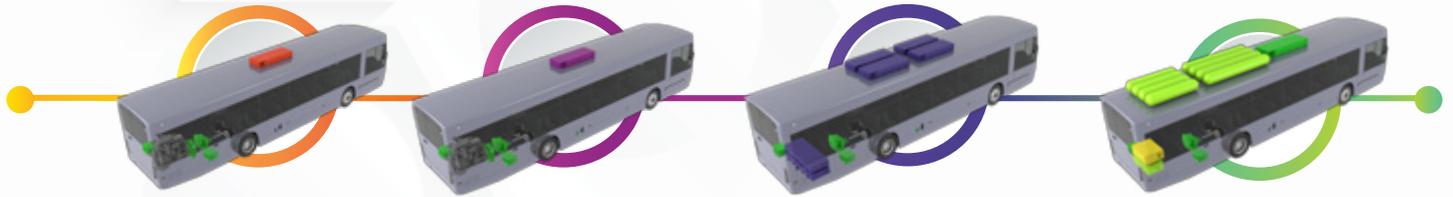


Series-E: Electric Hybrid System



Saving much more than fuel

Get to zero with a proven partner and systems integrator



Series-E: Electric Hybrid

Cost-effective first step to zero emissions:

- Electric drive today
- No mechanical link between the engine and the wheels
- Electric powered bus accessories
- Lowest TCO (total cost of ownership)

We're getting bus operators and cities to zero emissions, no matter where they are today. We know not everyone can or will want to take a leap to all electric systems so we provide incremental steps to get you there.

With more than 10,000 systems in operation, around the globe, our popular Series-E: Electric Hybrid system offers a proven, cost-effective first step on the road to zero emissions.

And with political drive for zero emissions growing, the market recognizes that challenges still exist for the large scale deployment of EV charging infrastructure.

Series-ER: Electric Range Hybrid

Low-risk path to full electric:

- Electric drive today
- No mechanical link between the engine and the wheels
- Zero emission zones created with electric range
- Optional plug-in capability

To address this, BAE Systems' Series-ER: Electric Range Hybrid solution provides a low-cost, low-risk path to full electric. Series-ER delivers low and zero emission operation wherever there is emerging demand for clean air zones, without the complication and expense of charging infrastructure. What's more, when ready, Series-ER has optional plug-in capability to put operators on a proven path to full battery electric.

For those ready for zero emission solutions today, we're announcing our next generation battery electric system including new light-weight, modular electronic systems for high efficiency

Series-EV: Battery Electric

High-efficiency, zero emission, battery electric:

- Adding more passengers and less battery to travel farther
- Modular scalable electronics
- Custom configured for less weight and higher efficiency

and our latest high torque, high reliability electric propulsion motor paired with our Modular Power Control System (MPCS) optimizing range and battery life.

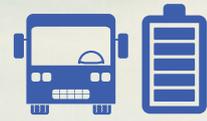
Series-H: Fuel Cell Electric

Zero emission solution:

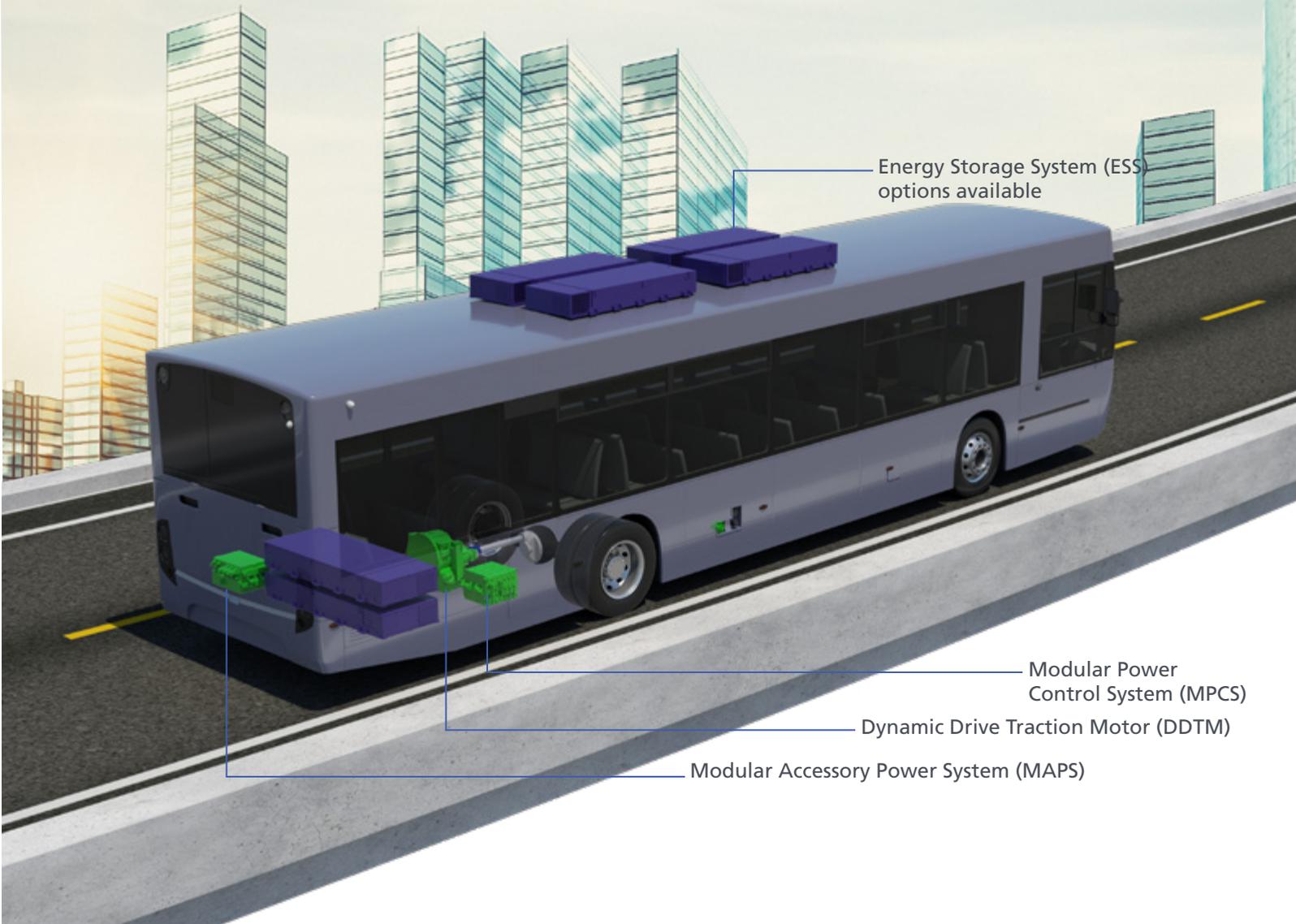
- Hydrogen is sole fuel source
- Produces only pure water in the exhaust
- 300+ mile range



Our proven battery-electric propulsion system delivers full zero emission travel and has recorded five million miles.



Series-EV: Battery Electric System
Zero emissions



Series-EV: Battery Electric Drive

Introducing our newest battery-electric system, with modular, scalable power electronics and robust traction motor technology helping bus operators go the distance.

- Zero emissions 100% of the time
- Full electric propulsion and electric powered accessories
- Systems available to power 12m, 18m bus bodies
- Compatible with all standard charging systems
- Opportunity charging, overnight, inductive, and conductive charge options available
- Power electronics include custom configuration to lower weight and size

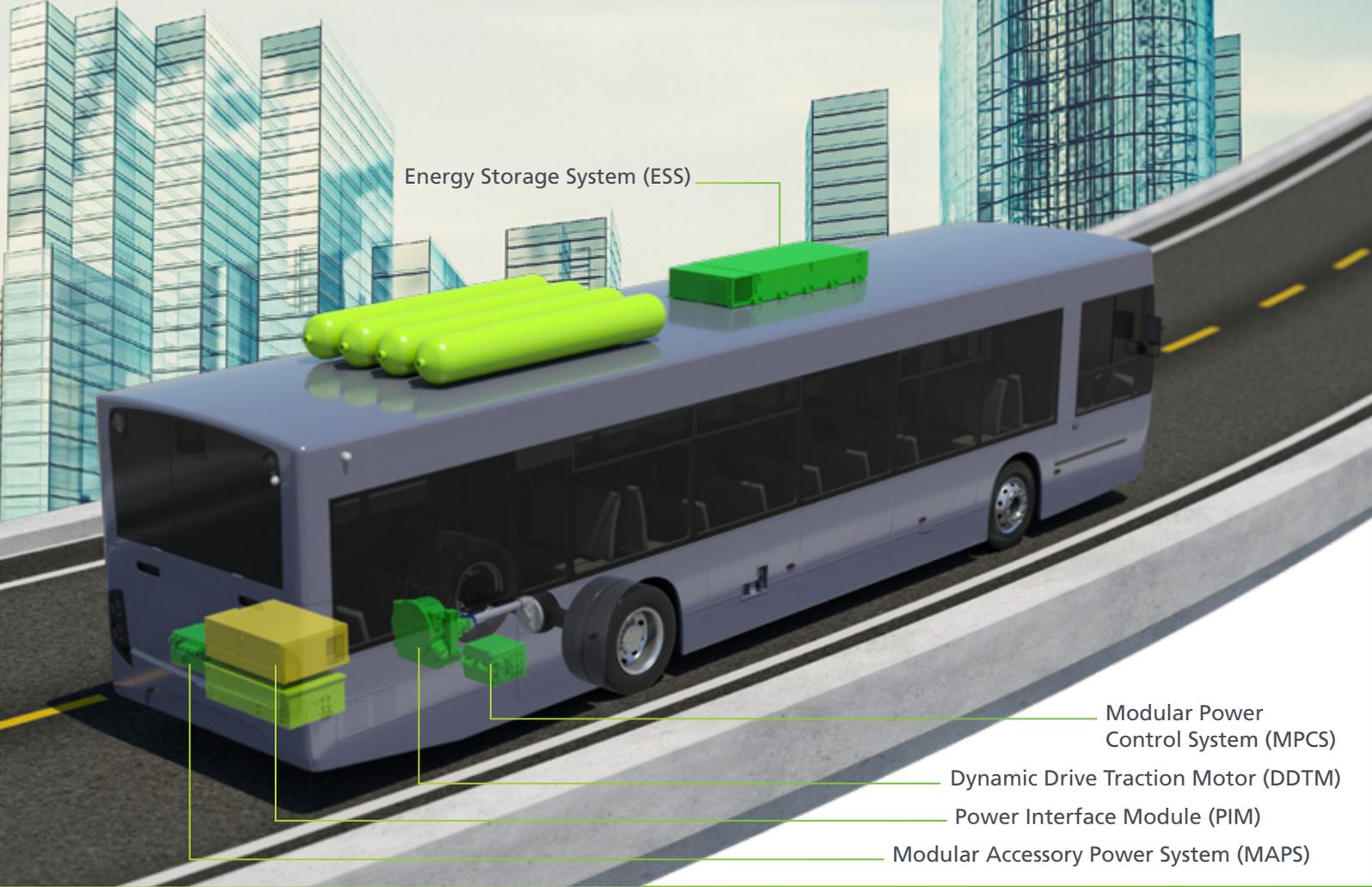
Next Generation Battery Electric:

Our products are proven and operating in the heavy-duty transit market, but we are not stopping there. We are continuing to innovate bringing the next generation of battery electric systems to market, introducing new cutting-edge technology and materials to improve both component and system efficiency and increase the range a bus travels before a charge.





Series-H: Hydrogen Fuel Cell System



Series-H: Hydrogen Fuel Cell Electric

Our Series-H fuel cell electric systems are also zero emission systems 100 percent of the time. The only exhaust is water providing an option to full battery electric systems.

Benefits

- Zero emissions 100 percent of the time
- All electric accessories
- Route independent
- Fuel cells and batteries can be added or removed based on customer requirements



How it works:

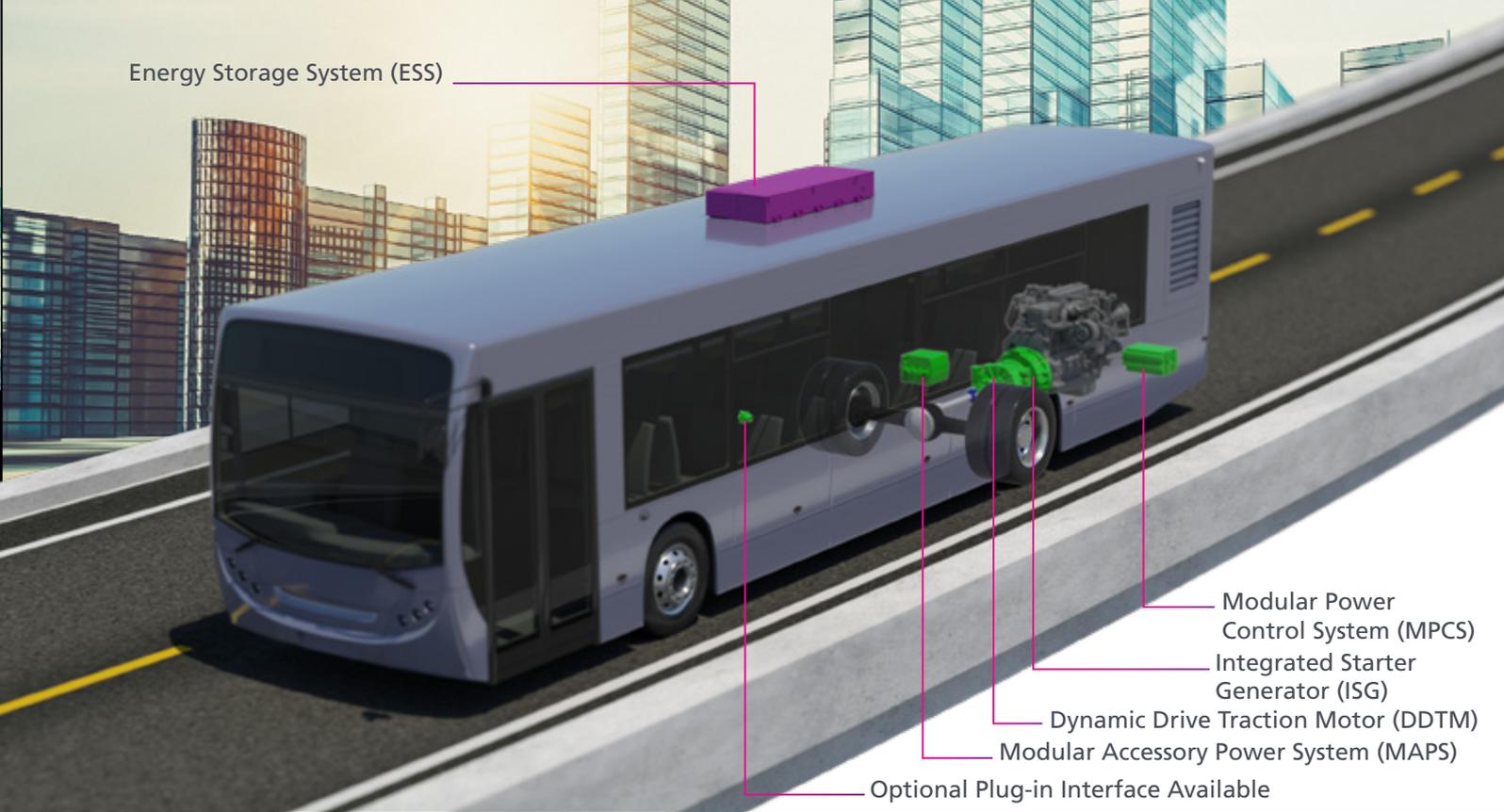
Using our propulsion control system (PCS), electric power from our battery and the hydrogen fuel cell engine is blended to provide power to the wheels and the electrified accessories. As with Series-EV: Battery Electric systems, regenerative braking maximizes vehicle efficiency. The fuel cell engine uses hydrogen to generate all of the electricity needed for the bus.

Low-cost, low-risk solution decreases emissions and create zero emission zones.



Electric Range Hybrid System

Energy Storage System (ESS)



Modular Power Control System (MPCS)
Integrated Starter Generator (ISG)

Dynamic Drive Traction Motor (DDTM)
Modular Accessory Power System (MAPS)

Optional Plug-in Interface Available

Series-ER: Electric-Range Hybrid

Like our Series-EV battery electric system, Series-E and Series-ER systems are electrically driven systems. The electric motor drives wheels, but instead of using an external charging system to recharge the batteries, Series-E and Series-ER have an on-board charger. Series-ER gives operators zero-emission travel where and when they need it. With our latest energy storage system, the ESS-3G-32K, operators can run in engine-off mode up to 35% of the time.

Benefits:

- Electric drive, no mechanical connection between the engine and the motor
- Creates zero emission zones
- Ideal for travelling through tunnels and low and no-emission areas

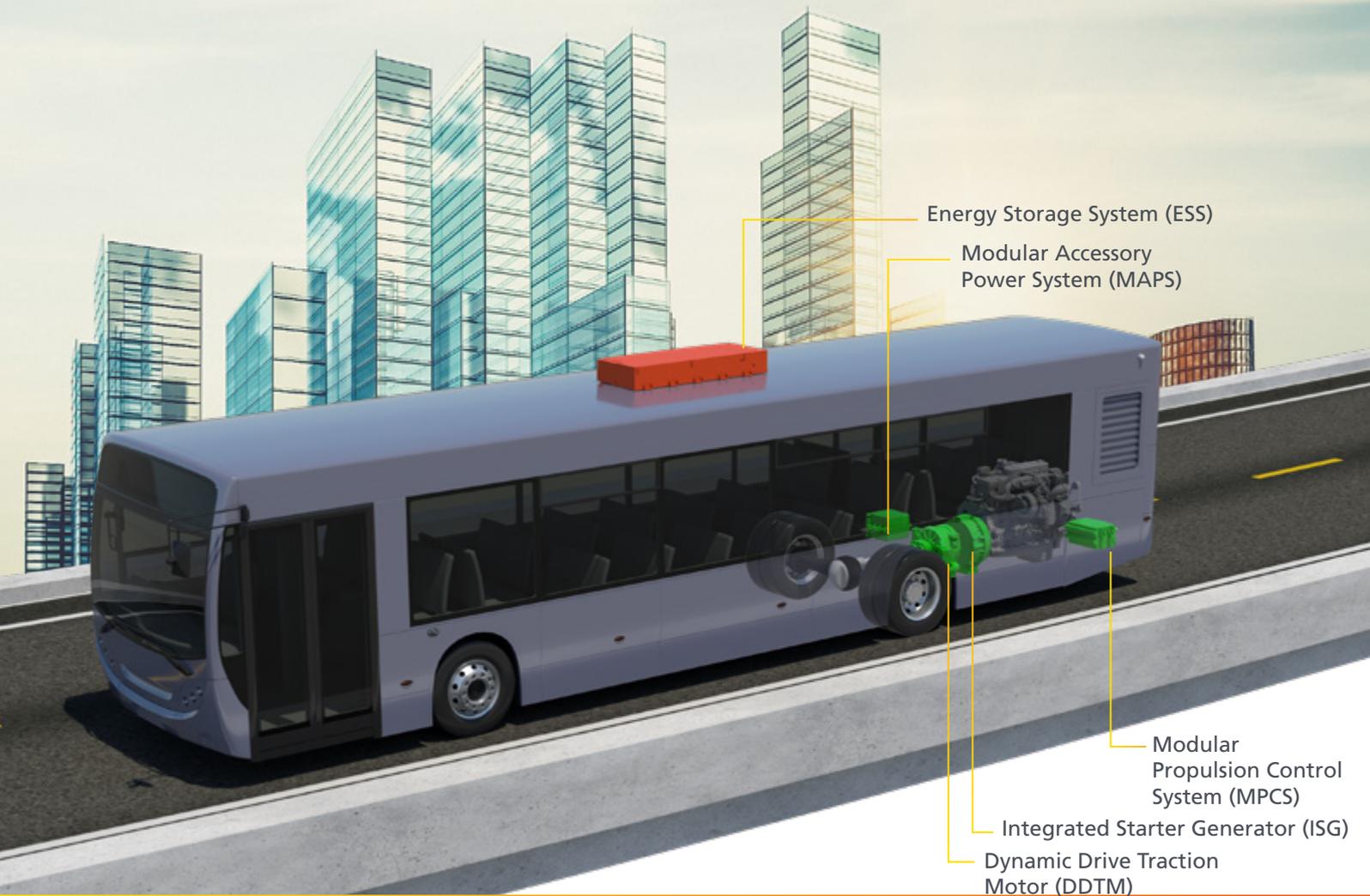
How it works:

Series-ER: Electric Range hybrid solution uses our energy dense energy storage system providing a longer range of engine-off driving. Series-ER delivers low and zero emission operation wherever there is emerging demand for clean air zones without the complication and expense of charging infrastructure. With Series-ER, our optional plug-in capability, and infrastructure in place, suppliers and operators will already be on a proven path to full electric solutions when they are ready.





Series-E: Electric Hybrid System



Series-E: Electric Hybrid

Series-E is an electric hybrid propulsion system capable of powering all bus accessories on electric power, allowing operators to take advantage of stop/start technology. With Series-E, the engine can shut off at stops and electric accessories (A/C, power steering, air compressors, etc.) will continue to operate. Our hybrid systems have energy storage options. With Series-E, our energy storage system does not require a mid-life replacement providing a low-cost, lower total cost of ownership.

Benefits:

- No mid-life energy storage replacement
- Lower total cost of ownership
- Increased fuel economy over other full hybrid systems



How it works:

With Series-E, the integrated starter generator (ISG) is the prime energy source. Once the generator is turned by the engine, the generator provides power to the energy storage system (batteries) which in turn powers the electric drive motor. A secondary source of energy is realized from vehicle braking. As the driver engages the brake, energy is reclaimed and stored for use in the energy storage system to drive the wheels.

Advancing electric solutions through global market leaders.

To offer transit operators maximum flexibility, BAE Systems delivers environmentally friendly solutions and superior systems integration with market leading bus manufacturers across the globe.

In North America the following buses are powered by our electric drive technology: Nova Bus, New Flyer, Gillig, and El Dorado. In Europe, Alexander Dennis Limited, Iveco, and Solaris offer our systems on their buses.

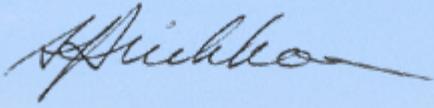


Our all-electric systems are built on the same **fundamental technology** as our **leading electric-hybrid systems**.

We're focused on efficiency so that we can **offer the range our customers and operators need**.



Transit is our mission,
we will continue to invest in new
technologies that make our systems
more reliable and provide the value
and flexibility our customers and
bus operators demand.



Steve Trichka

Vice President, Power and Propulsion Solutions

We build our systems on **proven technology**
that has led our industry for **nearly 20 years.**



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