World leader in electric power and propulsion

Together we can save much more than fuel.

gettozero.com

BAE SYSTEMS

BAE Systems Power & Propulsion Solutions

Our Mission

- Deliver propulsion and power management performance
- Provide market and customers with innovative electrification products & solutions
- Advance vehicle mobility, efficiency and capability in the transit, military, marine and rail markets.

Who are we:

- Leading provider of power & propulsion solutions
- Over 10,000 systems operating worldwide
- Significant IP portfolio; 300+ patents world-wide; $500M invested in products & capabilities
- 24/7 product support

Leading provider of power and propulsion systems for commercial and military applications

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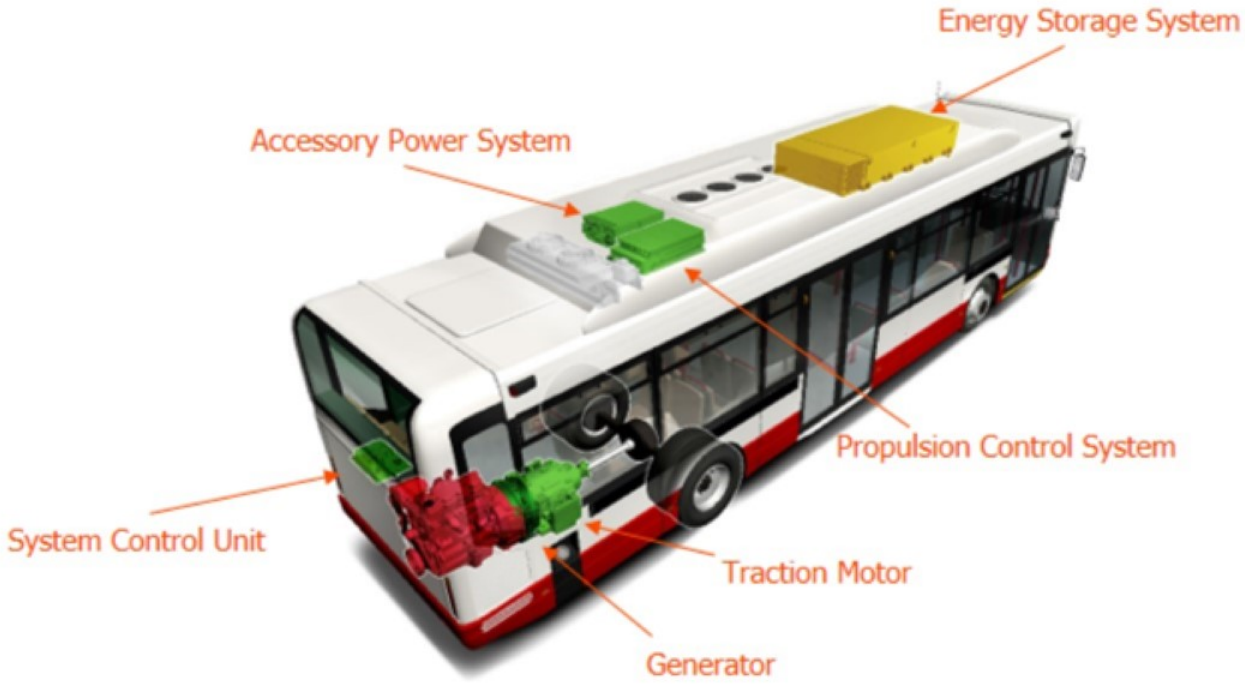
What do we provide?

- We use the same proven technology that has been installed in over 10,000 buses and trucks operating worldwide.
- Leverage what has been done and build on what is successful.



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American Fuel Cell Electric Bus Commercialization

American Fuel Cell Bus Partners:
El Dorado National – Bus Manufacturer
BAE Systems – Power & Propulsion, Lead Integrator
Ballard Power Systems – Fuel Cell

Mass Transportation Authority (MTA)
Flint, Michigan
1 Vehicle in service

Massachuesetts Bay Transit Authority
Boston, MA
1 vehicle delivered & demonstrated

Orange Country Transit Authority
Orange County, CA
1 Vehicle in service

SunLine Transit
Thousand Palms, California
10 Vehicles in service

Stark Area Regional Transit
Stark County, Ohio
7 Vehicles in service
5 More in plan

University of Calif., Irvine
Irvine, California
1 Vehicle in service

- Altoona tested
- HVIP eligible

MADE IN USA

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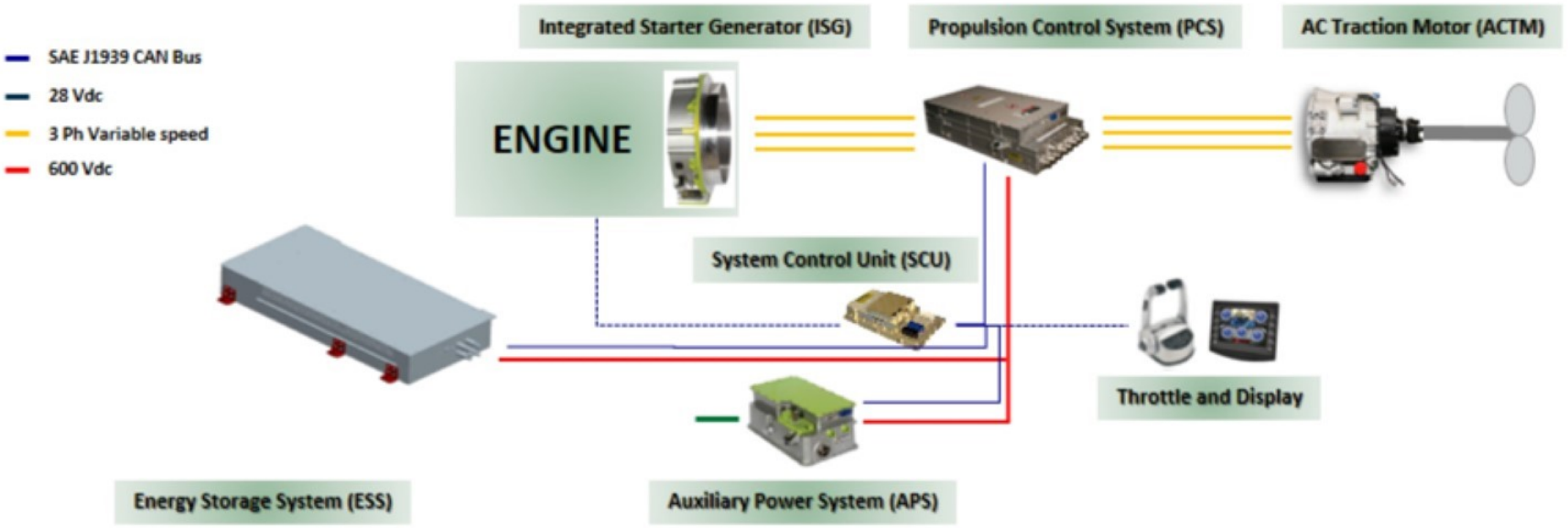
One common solution: Electric-Hybrid

BAE Systems' patented HybriGen® power and propulsion system



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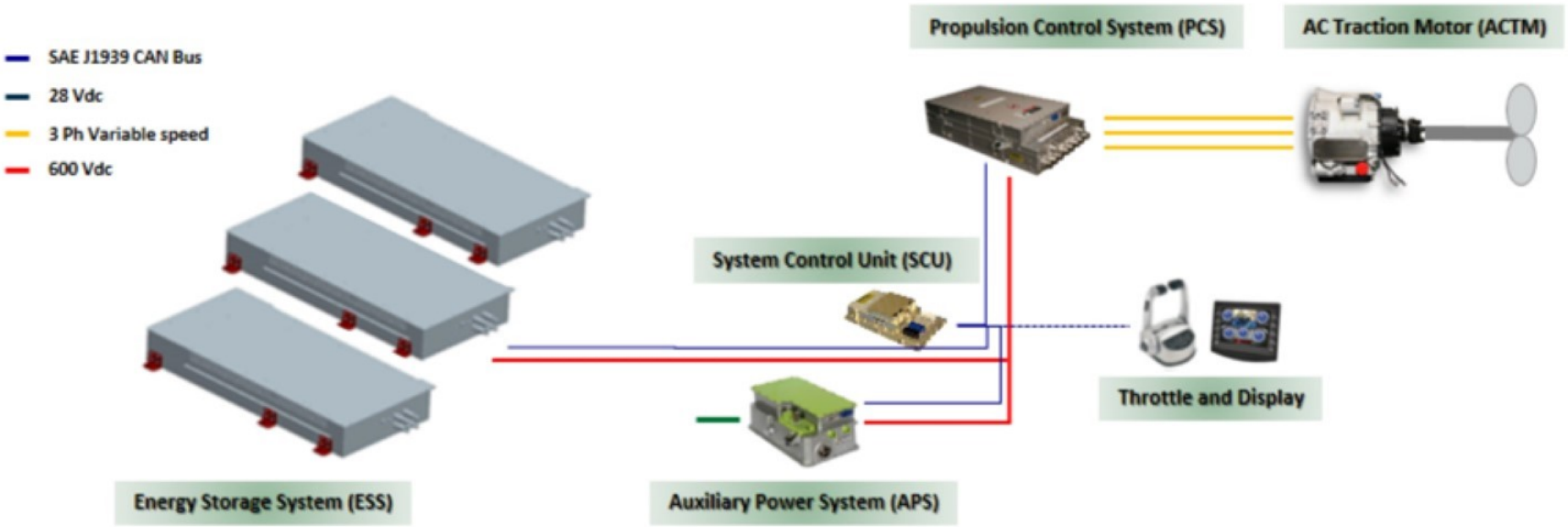
One common solution: Battery Electric

BAE Systems' patented HybriGen® power and propulsion system



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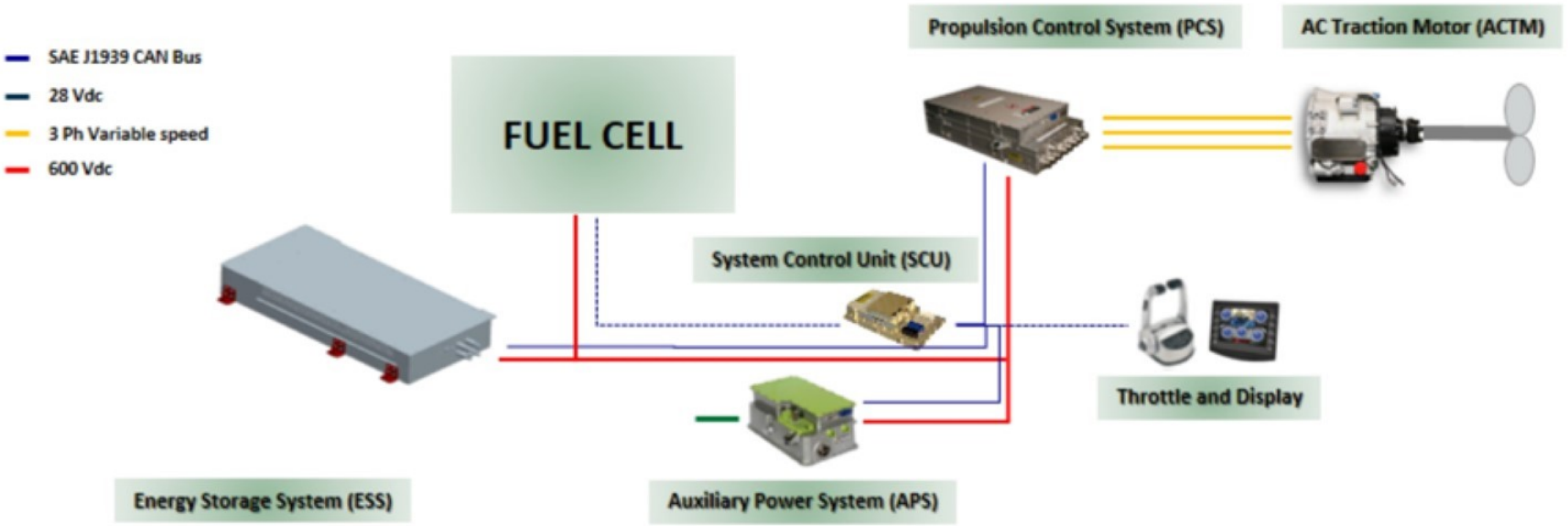
One common solution: Fuel Cell

BAE Systems' patented HybriGen® power and propulsion system



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The Water-Go-Round

- Aluminum catamaran
- 70’ / 21m LOA
- 84 passenger (reconfigurable)
- 22 knot top speed
- 2 x 300 kW electric motors
- 360 kW PEM fuel cell
- 100 kWh Li-ion energy storage
- H_2: 242 kg @ 250 bar / 3,600psi

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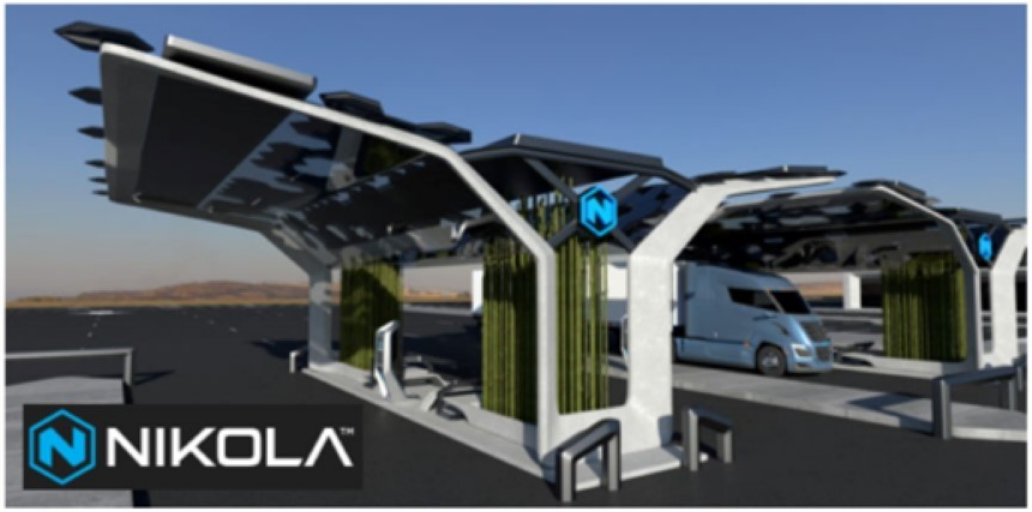
Challenge #1
Hydrogen availability

- Hydrogen production at point of consumption is key. On demand.
- Potential to take H_2 fuel production completely off grid.
- Cost effective electrolysis technology will help scale H_2 use.



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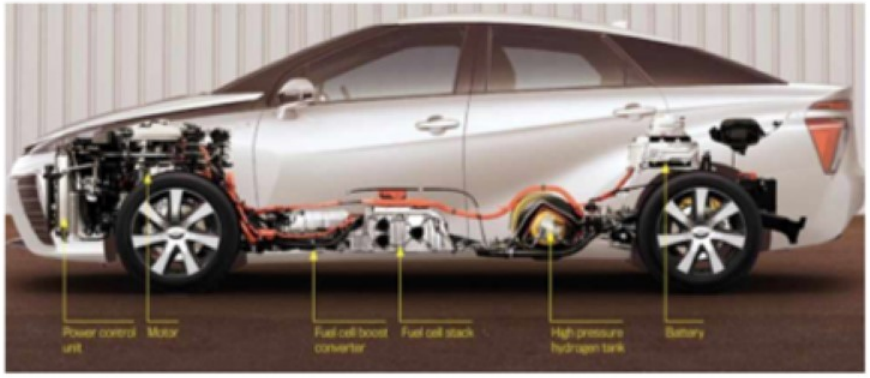
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Challenge #2
Hydrogen storage

1kg H_2~1.1 USG Diesel~30kWhr ESS
Source: Alternative Fuels Data Center
https://afdc.energy.gov/fuels/fuel_comparison_chart.pdf

Water-Go-Round
- 16 x H_2 tanks
- 242 kg @ 250 bar / 3,600 psi
- Equiv. to 7.2MWhr of Energy Storage

Fuel Cell bus
- 8 X H_2 tanks
- 60 kg @ 350 bar / 5,000 psi
- Equiv. to 1.8MWhr of Energy Storage



Toyota Mirai
- 2 x H_2 tanks
- 5 kg @ 700 bar / 10,000 psi
- Equiv. to 150kWhr of Energy Storage

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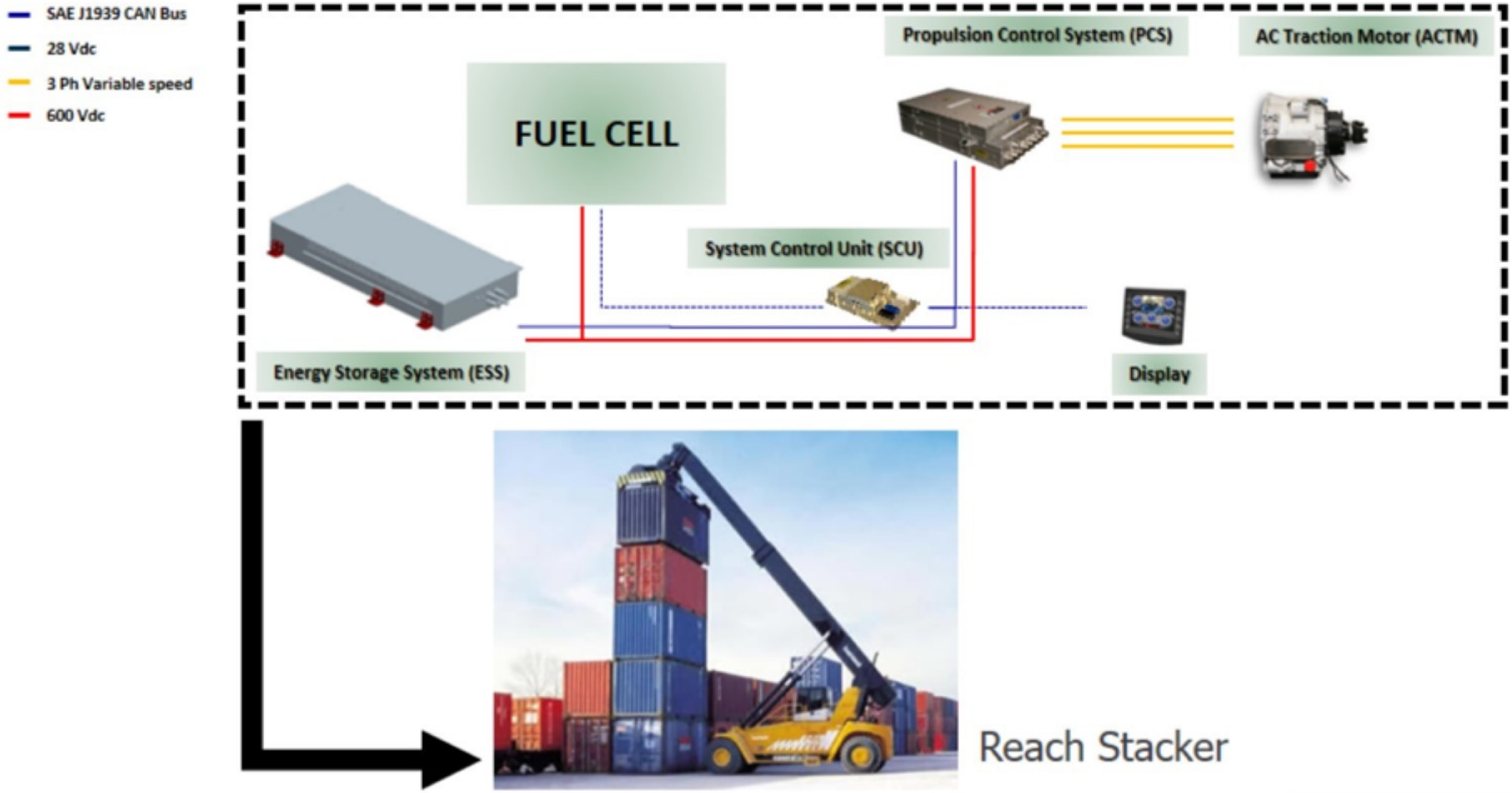
One common solution: Fuel Cell

BAE Systems' patented HybriGen® power and propulsion system



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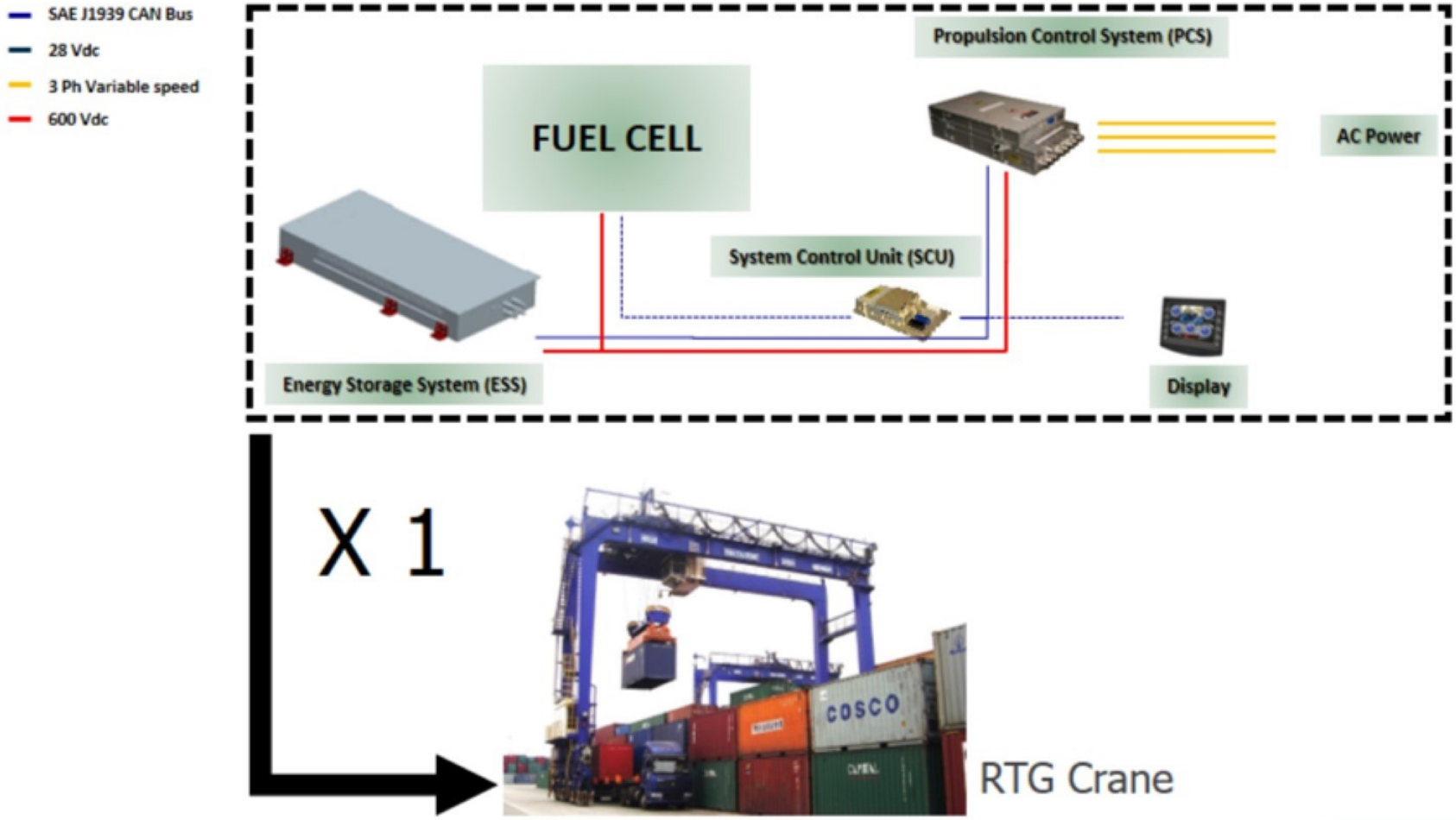
One common solution: Fuel Cell Energy Module

BAE Systems' patented HybriGen® power and propulsion system



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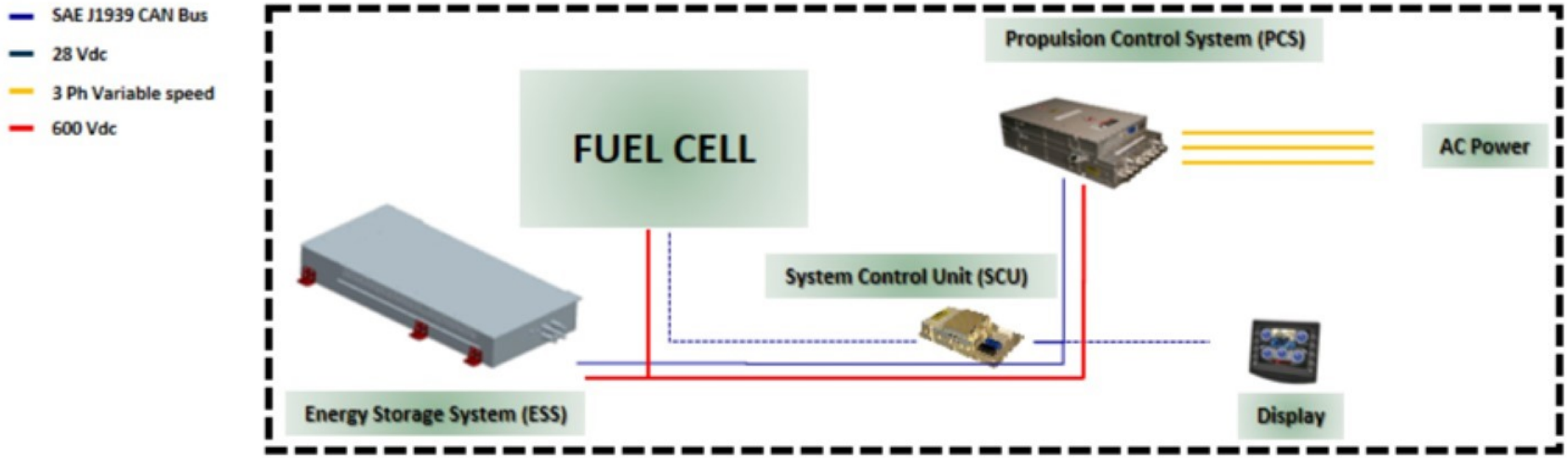
One common solution: Fuel Cell Energy Module

BAE Systems' patented HybriGen® power and propulsion system



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Switcher Loco

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Final thought

As we move towards a zero emission future, the first step is to select a technology provider capable of wide scale application adoption, electric hybrid, battery electric or H_2 fuel cell.

It's a journey, we'll get to zero together.

Thank you

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