



First certified hydrogen-powered shunting locomotive to be approved for the European market

PESA SM42-6Dn Shunting Locomotive

PESA, the largest manufacturer of rolling stock in Poland, has undertaken a groundbreaking fuel cell project to enhance the sustainability and efficiency of rolling stock vehicles. Primarily used for shunting operations in railway yards and industrial facilities, the SM42-6Dn hydrogen-powered shunting locomotive represents the first phase of the company's program to implement zero-emission technologies in rail vehicle drives.

Offering a commercially-ready vehicle with supporting mobile refueling infrastructure has been a key criteria in PESA's development approach. PESA has made zero- and low-emission rail transport the base assumption of its product strategy. The company has spent the last three years working on pioneering projects for shunting locomotives, with the SM42-6Dn being the first stage of PESA's program of incorporating hydrogen technologies into its product range.

“Ballard's customers understand the importance of embracing zero-emission energy to keep pace with the industry, as well as identifying the key collaborators to partner with to remain integral contributors in the alternative drivetrain conversation.”

Oben Uluc
EMEA Sales and Marketing Director
Ballard Power Systems Inc.

Ballard fuel cell in numbers

Manufacturer:	PESA
Type:	SM42-6Dn Fuel cell shunting locomotive
Powered:	2 x FCveloCity™-HD85, 170kW
Batteries:	Lithium titanate-oxide 167.6kw/h
Hydrogen:	175kg
Max. Speed:	90 km/h
Weight:	70t
Temperature:	-25°C to +35°C

Project Steps:

August 2022 Preliminary operational testing was started at PESA's facility in Bydgoszcz, Poland.

September 2022 the SM42-6Dn, including a mobile refueling station, was showcased at Innotrans, Berlin

December 2022 the Railway Institute completed certification tests

Mid-2023 the Railway Institute plans final approval

Together with PESA's fuel and energy collaborator PKN ORLEN, a special mobile hydrogen refueling station was constructed on an experimental track in Płock, Poland, with the partners signing a collaboration agreement that will offer the SM42-6Dn and the fueling station as a package.

Proven performance and reliability through exceptional availability and module lifetime - with more than 30,000 hours of fuel cell operation in the field without failure, PESA aims to use the shunting locomotive experience gained in this project to inform its construction of a hydrogen-powered passenger train.

“ Our ambition to accelerate industry-wide decarbonization is shared by Ballard, whose robust fuel cell platform provides a durable and high-performing power module for the SM42-6Dn heavy-duty application. ”

Maciej Grześkowiak
Director of Strategic Projects and Communications, PESA

PESA successfully integrated the PEM fuel cell system into the SM42-6Dn locomotive, resulting in significant advantages:

- › **Zero-emission** of the locomotive
- › **Reduced noise levels** during operation, leading to a quieter and more environmentally friendly locomotive
- › **Higher energy efficiency** by allowing for regenerative braking and reduced fuel consumption
- › **Flexible integration at low risk** for system integrators
- › **Resilience** by preventing degradation of the fuel cell power unit
- › **Decreased maintenance** due to the fuel cell system's simplified design, with fewer moving parts and lower operating temperatures

PESA's fuel cell project successfully introduced sustainable and efficient technology to the SM42-6Dn shunting locomotive. The integration of a PEM fuel cell system transformed the locomotive into an environmentally friendly and cost-effective solution for shunting operations. The project exemplifies PESA's commitment to innovation and the pursuit of greener solutions in the railway industry, providing a blueprint for future sustainable locomotive developments.

About Ballard Power Systems

Ballard is a world leader in the development, manufacture, sale, and servicing of PEM hydrogen fuel cells. With more than 44 years of experience, Ballard represent decades of innovation and engineering leadership in clean energy solutions. Our fuel cell technology powers buses, trucks, trains and ships, as well as stationary power systems.

To learn more about Ballard, please visit: www.ballard.com

Specifications and descriptions in this document were in effect at the time of publication. Ballard Power Systems, Inc. reserves the right to change specifications, product appearance or to discontinue products at any time. (05/2023). Ballard™, Powered by Ballard®, FCgen®, FCveloCity®, FCmove™ and Here for life are trademarks of Ballard Power Systems Inc.

Here for life™

Ballard Power Systems, Inc.
9000 Glenlyan Parkway
Burnaby, BC V5J 5J8
Canada

Contact us
(+1) 604.454.0900
marketing@ballard.com