

Energy Storage System (ESS) Launch Event Fact Sheet

Key statement to illustrate the innovativeness of the ESS project:

- The ESS is the largest European energy storage system using new and second-life batteries in a commercial building

Key facts about the ESS:

- Nominal power: 3 MW, nominal capacity: 2.8 MWh
- The ESS consists of 7 rows of battery racks and 4 bi-directional Eaton inverters
- The total number of battery racks is 61
- Each rack houses up to 10 ESS battery packs
- The total number of ESS battery packs is 590 (250 2nd life (= Gen1), 340 1st life (=Gen4))
- Each ESS battery pack contains 12 battery modules
- Four ESS battery packs are equivalent to one Nissan Leaf EV battery pack
- Each battery rack contains the equivalent of 2.5 Nissan Leaf EV batteries
- The total ESS comprises 590 ESS battery packs, equivalent to 148 Nissan Leaf batteries
- CO2 savings over lifetime: 117,000 tons (Sources: Spring Associates for AKEF)

Key facts about the ESS in operation:

- Storing enough energy to provide full power to the ArenA for 1 hour during a major event with maximum energy intake
- Storing enough energy to provide full power to the ArenA for up to 3 hours during an event if dispensable consumers (e.g. kitchen) is disconnected
- Storing enough power to fully charge 500,000 iPhones or supply 7,000 Amsterdam households with electricity for one hour

Key facts about the JC ArenA:

- Photovoltaic rooftop system comprising 4,200 PV modules with a total capacity of 1.1 MWp
- Peak consumption during events: 3 MW
- Current backup power source: 2 diesel generators with total power of 640 kVA (21% of ESS power)
- E-mobility roadmap:
 - short term: equip 18 parking places with smart EV charging stations and integrate bidirectional chargers to realize various Vehicle 2 Grid - V2G use cases
 - long term: equip 200 parking places with smart EV charging stations and further bidirectional chargers

Who is involved in the ESS project and what do they do?

Eaton is dedicated to helping utilities, municipalities, businesses and everyday homeowners re-think the impact they have on the environment. Whether it's using more energy-efficient products — or harnessing low carbon and renewable resources like solar, wind and hydroelectric power. Around the world, we're helping major industries lower emissions and use less fuel.



For the ESS, Eaton is bringing an expertise in power management that is globally recognized. Eaton has designed the energy storage system specifically to meet the Johan Crujff ArenA and The Mobility House requirements and use cases. This includes designing and adapting power electronics such as the bidirectional inverters and also integrating the Nissan battery modules (2nd life and new ones) into the battery packs. Eaton as a supplier of high quality products also took care of the certification and standard compliance of the energy storage system. Finally Eaton ensured that the energy storage system is not only sustainable but also safe and reliable.

The Mobility House promotes the energy transition and facilitates an emissions-free future. With our innovative charging and energy storage solutions, we help electric mobility achieve a breakthrough. Our technologies allow us to integrate electric vehicles into the power grid as aggregated swarm storage of batteries as well as a stationary storage device from vehicle batteries. The Mobility House was founded in 2009 and supports all leading car manufacturers in over 10 countries worldwide from its locations in Munich, Zurich and Sunnyvale (California).

For the ESS project, The Mobility House has provided an intelligent hard- and software solution that manages the battery in multiple use cases. During events, the software controls the overall power intake of the stadium, secures them with backup power and will perform peak shaving to reduce the ArenA's grid costs. Outside of the events, the storage is managed to maximize local consumption of PV power and provide grid services, such as frequency control (FCR). The required interfaces to the ArenA's energy management system and to grid operator TenneT have been designed and operated by The Mobility House. As next step up to 200 electric vehicle chargers (uni-/bi-directional) will be incorporated to provide a holistic charging management system at the Johan Crujff ArenA.

Nissan made the strategic decision to invest in electric vehicle (EV) technology because it is committed to zero emissions and more sustainable societies. Being the first OEM to bring the 100% EV to the mass market with the Nissan LEAF which nowadays is the best-selling EV globally. Since 2010 we have been also working to go beyond the car, to create a fully electric ecosystem including the vehicle and the battery technology, with a clear vision to redefine our role in the lives of our customers by developing sustainable and innovative energy solutions while reinforcing our position as EV leaders and inspire the masses for a more sustainable future.

Nissan has worked jointly with Eaton on developing energy storage solutions (xStorage) for houses, buildings, commercial facilities that have the capacity to store energy saving money to the customer and bettering the entire energy system. Users can contribute to the de-carbonization of the energy supply, by storing, consuming or feeding renewable energy back to the grid. Also, the product further its commitment to sustainability by providing a second life for Nissan's electric vehicle batteries after their first life in cars is over (circular economy). Nissan has contributed to the project with the Nissan LEAF batteries (new and second life) and the battery expertise.

BAM

By collaborating with our supply chain, encouraging innovative and digital thinking through our products, and realizing the benefits of circular business models, BAM aims to have a net positive impact in the long term (towards 2050). Our sustainability strategy emphasizes both climate change (climate positive strand) and resource constraints (resource positive strand).

BAM acknowledges that the company needs to prepare for a low-carbon economy and needs to reduce its own emissions as well as supply chain emissions. Our company has a large impact on reductions in lifecycle carbon impact of buildings and infrastructure (through material selection, design or asset management), deploying renewable energy systems or energy reduction measures for our clients or communities.

The company works towards a circular economy and believes the industry will be able to leave a positive legacy to the environment if they are able to work from reversible designs that are regenerative. BAM has made progress on reducing construction waste by becoming more efficient, utilizing off-site manufacturing and by working with its supply chain to eliminate waste throughout the lifecycle of its projects.

BAM is involved as a technology partner, constructed the battery room and integrated the ESS into the existing energy grid of the Johan Cruijff ArenA.

Johan Cruijff ArenA

Johan Cruijff ArenA is an important player in the top league of international, multi-purpose stadiums. It is the home of AFC Ajax and the stage for the Dutch national team, big concerts, dance events and business meetings. Johan Cruijff ArenA welcomes more than two million visitors annually. Johan Cruijff ArenA makes it all about the audience experience. Together with its partners, Johan Cruijff ArenA offers top-level services and facilities, and is constantly working on creating an optimal fan experience in and around the stadium.

Amsterdam Innovation Arena

The stadium's new energy storage system and related company, Amsterdam Energy ArenA BV, are concrete results of the innovation program managed by Amsterdam Innovation Arena, in which knowledge institutions, governments and companies such as BAM, Nissan, Eaton and The Mobility House are working on the stadium of the future.

The stadium and neighboring area function as a Living Lab; a hotspot for testing innovations in practice. Innovative concepts and ideas as well as proven solutions in the field of stadium construction, management and exploitation will find their way to stadiums, sports and recreational areas throughout the world via Johan Cruijff ArenA International. The partners in Amsterdam Innovation Arena are: Johan Cruijff ArenA, Amsterdam City Council, Amsterdam Smart City, TNO, KPN, KPMG, Huawei, Microsoft, Signify, Nissan, Eaton, Honeywell and BAM.

What is the role of AKEF in this project?

AKEF is a financing partner and co-investor.

What is the role of Interreg in this project?

Interreg Europe helps regional and local governments across Europe to develop and deliver better policy. They subsidize part of this innovative project increasing sustainability in the north sea region.



JOHAN CRUIJFF
ARENA



What is the role of City of Amsterdam?

City of Amsterdam has been fully supportive of the innovative projects being run at Johan Cruijff ArenA.