Energy storage: Amsterdam Arena shows data centers the way

The European EV-Energy project is working hard on mapping and promoting legislation and regulations of local and regional authorities that can accelerate the so-called 'decarbonisation of the energy and mobility sector'. This project also touches on the integration of data centres and smart grids. A project on battery storage at the Johan Cruyff Arena in Amsterdam shows how this can be achieved in practice and what benefits it has to offer.

Last summer, the Johan Cruyff Arena in Amsterdam officially commissioned a battery system for storing electrical energy. This opening followed an earlier project of the stadium in which a large part of the roof was covered with solar panels. Generating energy from solar panels is interesting - especially if this energy can be used immediately. In the case of the Arena, however, many of the activities that take place here are scheduled to take place in the evening hours. Storage of the energy generated by solar panels in batteries was therefore an important next step.

61 racks

It is therefore logical that the use of the room with 61 racks full of batteries already received the necessary attention last year. Now, more than half a year later, it is becoming increasingly clear how important this project is - especially for the data centre industry. As can be seen from the figure below, this project does not only focus on the storage of energy in batteries. Precisely in order to justify the relatively high costs of batteries, they needed to develop a business case that is as broadly defined as possible. In other words: the batteries should be used in as many ways as possible, so that the investments can be recouped. It is precisely this phenomenon that makes this project highly relevant to data centres, which are now also discussing the possibilities offered by integrating batteries and UPS systems with the energy networks of grid operators.

A subsidiary of the Johan Cruyff Arena - Amsterdam Energy Arena BV - has invested in a hall filled with 61 racks full of batteries. These come from Nissan's electric car - the Leaf. After a number of years, the capacity of the batteries of these cars will drop from 100% to 80%. This reduction means that the batteries are no longer suitable for use in an electric car, so they need to be replaced. What to do with so many batteries? However, it turns out that these batteries can still be used to store electrical energy in, for example, an energy storage system linked to solar panels. Meanwhile, the Arena has installed 61 rockets with 590 battery packs. Good for 3 MW of power capacity and 2.8 MWh of storage capacity.

Generation and use

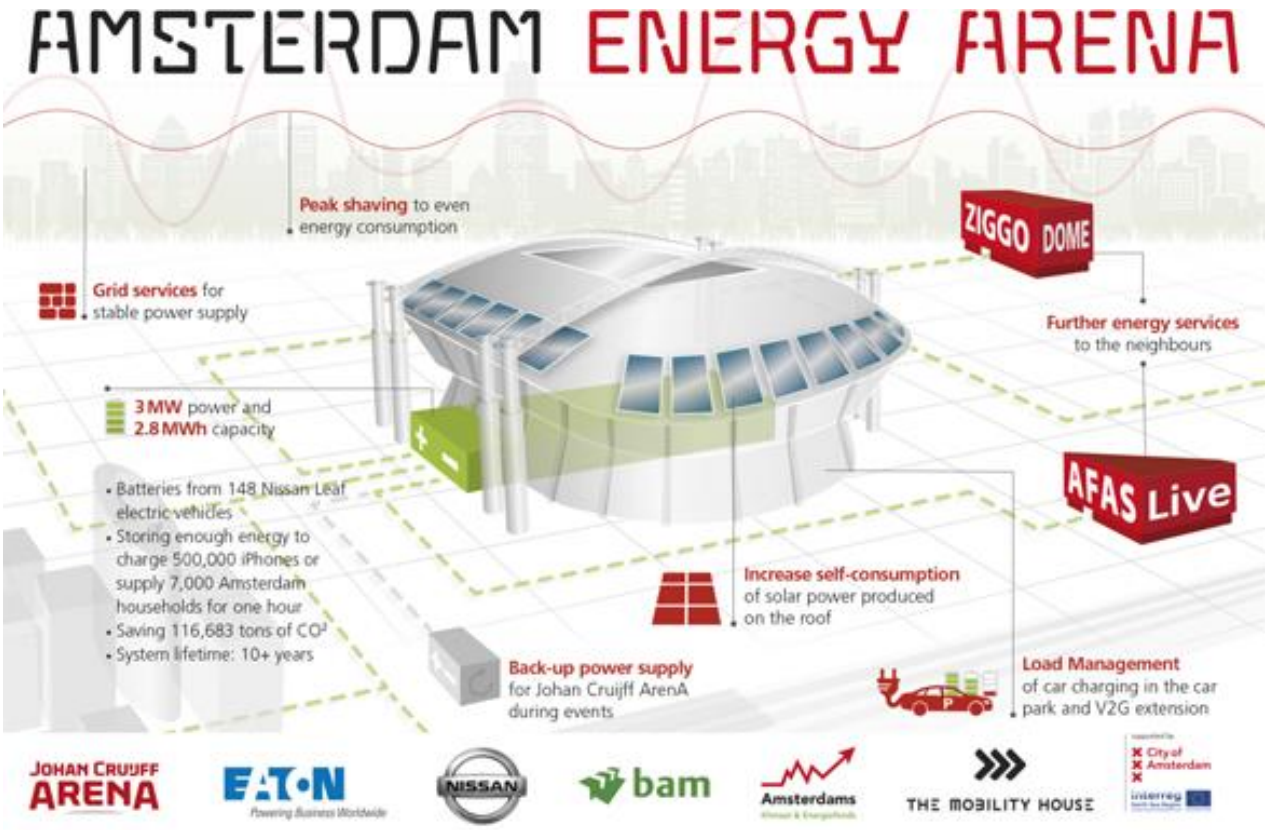
What exactly does the Arena use the stored energy for? This is first of all to compensate for the mismatch between the moment of generation and the moment of use. The 4,200 solar panels on the roof of the stadium generate electrical energy during the day, while many sports games and concerts, for example, require energy in the evening hours. These are serious amounts of energy. When the Arena is running at full speed in the evening, the energy stored in the batteries is sufficient to meet the energy demand for one hour. If not all systems are actually switched on, the Arena can extend this period to 3 hours. Outside this period, energy will have to be drawn from the grid. It is interesting to note that not every evening the maximum consumption of electrical energy from the batteries is required. At times like this, Amsterdam Energy Arena BV can use the storage capacity in other ways.. Think of energy

services that are supplied to the grid. In this way, the local grid operator has more and better opportunities at his disposal to keep the grid in balance. This can be done by temporarily storing energy from the grid in the batteries of the Arena or by sourcing energy from it.

Peak shaving

However, the Amsterdam Energy Arena also provides other services. For example, electric or hybrid cars can be charged via bi-directional charging stations in the stadium. But the reverse is also possible: temporary energy storage in the batteries of these cars. Peak shaving is also possible. Depending on supply and demand, peaks and troughs in energy consumption can be absorbed by using energy from the batteries.

Another remarkable application: backup power during events. Many major artists who give concerts in locations such as the Arena generally do not rely on the energy supply in the venues where they perform. In too many places there are problems with the quality and robustness of the network, is their experience. They prefer to bring their own diesel generators in order to ensure uninterrupted power supply during their events. With all the associated costs, of course. In the case of the Arena, this is no longer necessary and battery storage can be used.



Future for data centres

With this energy storage, the Johan Cruyff Arena in Amsterdam is an interesting example of what could well be the future of many data centres. European projects such as EV Energy and CATALYST are working hard to facilitate the integration of data centres and smart grids. Batteries and UPS systems

from the data centre are linked to the grid via smart management software. For grid operators, the advantages are of course clear. As with the Amsterdam Arena, they can then use the storage capacity of a data centre - the batteries installed there - to help keep the network stable. Because data centres are likely to invest more in the generation of renewable energy, they may also be able to supply energy to the network. In addition, it will allow for peak shaving and a more organised form of backup power.

Of course, this also creates interesting opportunities for data centres. Until now, they function on the basis of a business model that has only one financial pillar: selling space for processing data. Certainly, at many commercial data centres we see that the margins on these types of projects tend to decline: the projects are getting bigger but the margins are smaller. However, an integration of data centre and smart grid makes it possible - what we will call - to place 'grid services' as a second financial pillar under the business model of a data centre. Provided that this is done on the basis of sound agreements, new turnover will be generated. Initially, of course, modest in size, but with a relatively high margin.

Financial possibilities

The same applies, of course, to data centres that will supply residual heat to customers for a fee in the future. These transactions will also have a relatively high margin and can therefore make an interesting financial contribution to the operation of data centres.

It will be clear that the battery storage project in the Johan Cruyff Arena could well serve as an example to the data centre industry. Although the storage capacity in the stadium is not yet sufficient to supply external customers with energy, this project does show that the development and supply of energy services offers interesting opportunities for data centres. As a result, the energy transition that the data centre and ICT sectors are facing could offer unexpectedly great opportunities - also in the financial field.

Battery storage in figures

- Legal entity: Amsterdam Energy Arena BV
- Power generation: 4,200 solar panels (1 MWp)
- Power capacity: 3 MW
- Storage capacity: 2.8 MWh
- Number of battery racks: 61
- Number of battery packs: 590
- Number of modules per battery pack: 12
- Total number of batteries: 250 used Nissan Leaf battery modules + 340 new Nissan Leaf battery modules
- Number of bi-directional inverters: 4
- Partners: Johan Cruyff Arena, Eaton, Nissan, BAM, The Mobility House, municipality of Amsterdam, Amsterdam Climate & Energy Fund