

# FIAMM- SoNick batteries, applications and advantages of environmentally-friendly and efficient technology

23. March 2015

Overview of the battery versions with sodium-nickel technology in sustainable mobility, in backup and energy storage systems

FIAMM's sodium-nickel technology battery (salt batteries), are proving to be the most flexible ecological solution for numerous applications which range from electric mobility to energy storage in support of renewable sources and even backup systems to guarantee uninterrupted power in data centres or telephone switchboards.

There are more and more projects in Italy and around the world using this technology that provides significant advantages in terms of being environmentally-friendly (extremely low environmental impact, no emissions, entirely recyclable parts) and being efficient (extremely long life, high number of cycles, maximum resistance to thermal stress, high specific energy, low cost of raw materials).

In recent years FIAMM has been a key player in the revolution taking place in energy storage systems from renewable sources with an extremely promising market with an estimated value of €6.5 billion in 2017 for the energy storage sector alone.

FIAMM Energy Storage Solutions (FIAMM ESS), the Business Unit started in 2011, specialised in providing electrical solutions where storage is the core business, has launched extremely flexible supply projects with "tailor made" solutions dedicated to normed grids such as the orders completed for Terna in Sardinia and Sicily.

For the Codrongianos power station in northern Sardinia, the system designed by FIAMM ESS will serve to stabilize the grid by storing the energy generated by the power station and making it available at peak demand times and during voltage drops. The 1.2 MW project dedicated to sodium nickel chloride technology, falls within the scope of the large safety, network protection and national power grid modernization plan organized by Terna - the world's first high voltage transmission grid manager to include Storage systems within its development plans. A system with the same characteristics was also installed in Ciminna in Sicily, also with Terna.

Another relevant project is the recently concluded Toucan Project for EDF in French Guyana. This project, on the other hand, has to do with the Independent Power Producer area with FIAMM supplying 5 FIAMM SPRING 164 BESS units for a total of 288 FIAMM ST523 accumulators, which are capable of providing 4500 kWh of storage capacity and a maximum power release of 1500kW x 3.5 hours to the distribution grid.

## Elcos (Italy): Hybrid genset power station



- Able to be adapt at any Value of Load
- Capex reduction
- Opex reduction
- Double output
- AC power single phase
- DC power 48VDC
- Constant performance up to 60°C
- Battery cycle Sodium Nickel Chloride with more than 5000 cycles at 40% DOD
- 48V batteries cycle 100% recyclable
- Compart design, all parts integrated in all in one unit.

The 5 20-foot standard containers prepared by the multinational corporation from Vicenza are connected to the photovoltaic panels in the plant set up in the area near Montsinery, in the French Guyana inland, whose energy is stored by them during the day to be released during the night hours.

## MALDIVES project

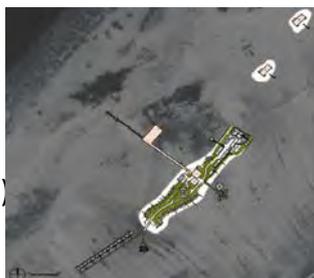
Location: Gasfinolhu Island Resort

– Maldives Islands

**UNIT:** 1 BESS (64 ST523 620V 23,5kWh)

**ENERGY:** 1.2 MWh (400 KW x 3h)

**POWER:** 600 KW – 800 kVA



On the other hand, the order for the accumulation system destined for a luxury resort in the Maldives falls under non-normed microgrids / systems FIAMM's Microgrid Hybrid Energy Solution is an innovative project capable of providing perfect hybridization of the system, allowing full exploitation of the Resort's photovoltaic system thanks to the storage provided by the 64 ST523 sodium batteries and the use of two diesel generators as backup or for distribution modulation.

This exclusive solution, enclosed in a single container, is capable of powering all the structures on the island, accumulating the energy produced by the photovoltaic system (1MW peak) and releasing it as required by the hotel structure. The

hybridization of the system also makes it entirely autonomous in the event of insufficient photovoltaic production due to poor weather or other factors.

The importance of being able to store energy and release it when necessary, and above all being able to regulate its delivery, thus preventing dips and spikes, is a priority for high-tech structures like the Polytechnic University of Bari or the University of Cagliari.

In these cases as well, FIAMM Energy Storage Solution provided a plug & play BESS (Battery Energy Storage System) capable of managing energy accumulations that range from 100 to 600 kWh. The electronic component of the FIAMM BESS system allows for the definition of the local automatic operating logics, as well as for the power set-points exchanged with the power grid to be received from the microgrid control system.

In the rail transportation sector FIAMM solutions were selected by Bombardier, a German multinational leading company in the aeronautical and transportation sectors, which chose the FIAMM sodium batteries technology for the “Innovia Monorail 300” platform. The batteries were used in the first two projects completed in Brazil and Saudi Arabia and the provide backup energy to all the on board emergency services.

One of the monorails already completed that uses FIAMM sodium batteries is the one built for the new “espresso Tiradentes” line in Sao Paulo, Brazil. The second is the monorail for the “King Abdullah Financial District” in Riyadh, Saudi Arabia. These means of transportation move up to 48,000 passengers every hour at a top speed of 80 kph.

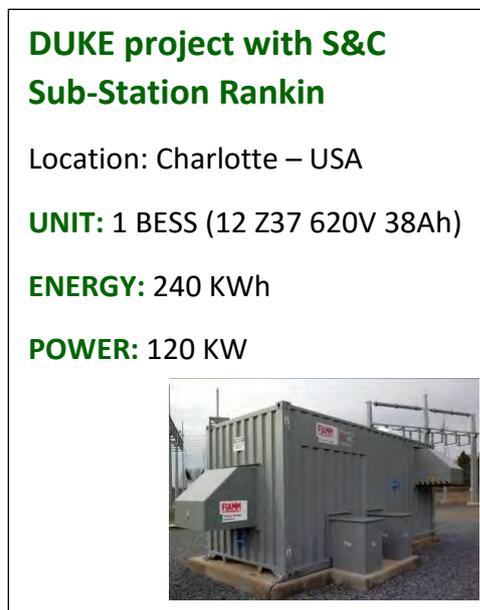
## DUKE project with S&C Sub-Station Rankin

Location: Charlotte – USA

**UNIT:** 1 BESS (12 Z37 620V 38Ah)

**ENERGY:** 240 KWh

**POWER:** 120 KW



FIAMM Sodium Chloride batteries have proven to be the winning choice for Bombardier thanks to the numerous advantages that they offer such as the insensitivity to external temperatures, remote monitoring, a significant space savings (the battery is 70% lighter and 30% smaller than conventional batteries), the low management costs (when compared with those batteries made with other technologies) and the long maintenance-free storage period, as well as the important ecological aspect since sodium chloride batteries have zero emissions.

The national South African rail operator, Prasa (Passenger Rail Agency of South Africa) tasked Siemens with managing the technical upgrade programme for the rail network in the country and in this area FIAMM sodium batteries were immediately proposed for the entire backup part.

## Bombardier Transportation

### Innovia 300 Monorail

**BOMBARDIER**  
the evolution of mobility

- 110V 80Ah per unit
- Powering auxiliaries off- catenary
- Projects in Saudi Arabia, Brazil
- Turn key battery and mounting designed by FIAMM



In the telephone area, in addition to other projects already described recently, FIAMM participates in the American telephone provider CenturyLink's project. The exponential growth of data traffic in the telecommunications world forces operators to revamp the architecture of their telephone switchboards in order to take the best possible advantage of the space available without having to purchase or rent new buildings. Their higher energy density, lower weight and ease of installation have allowed sodium batteries to revamp the architecture of these switchboards, increasing the spaces available for communication equipment without compromising the backup performance demanded in this market segment.

Applications in the 'zero emissions' electric mobility segment are also very promising, where after years of the market being limited to test applications, small fleets or demo vehicles, it is now beginning to open up to the first system. Proof of this is the great success of the 'jack-of-all-trades' DAILY van made by IVECO which mounts FIAMM Sonick batteries in the electric version. This is the first OE (original equipment) project for completely electric commercial vehicles with sodium-nickel batteries. IVECO, after years of studying and development, chose FIAMM as their supply partner for the EV version of the Daily, a model which has also achieved great success: In fact, the IVECO MY 2014 was presented with the prestigious 'Van of the Year 2015' award.

### CESS: Excel project

Location: Denver – USA

**UNIT: 1 CABINET**  
(3 Z37 620V 38Ah)

**ENERGY: 70 KWh**

**POWER: 25 KW**



One of the most important coach design companies in the world, the Spanish IRIZAR company (3,500 employees, €570 million of turnover) launched the "Irizar i2e", a 12 metre, completely electric coach that has a range of 200 to 250 km, with 376kWh of FIAMM Sonick batteries installed on board coupled with super capacitors. The coach has passed the IDIADA automotive test circuit validation with flying colours with a six-month life simulation equal to 12 years and 600,000 km of use. IRIZAR has an industrial plan

signline  
Abu Dhabi  
+50°C



with significant investments for development and production of electric coaches in a new dedicated plant that will go into operation in 2016. Last, but not least, IRIZAR was recently recognised in Spain with the “2015 Bus Award” for a 100% electric vehicle.

Installed in various electric coach fleets all over the world, the FIAMM sodium-nickel batteries have already been ‘travelling’ for some time in IRIZAR coaches in various cities such as Barcelona, San Sebastian and Marseille.

In Mountain View California, the site of the web giant Google, four electric eco-coaches have been on the road since the beginning of the year with ecological FIAMM ‘sodium’ SoNick batteries for electric drives mounted in them.

This is a project sustained by Google, a company which is increasingly attentive to developing sustainable mobility, with the involvement of the CEC, the California Energy Commission which is part of Governor Jerry Brown's office and which has sustained the coach electrification project with the use of batteries that guarantee maximum reduction of environmental impact.

Tecnobus  
Canada  
-30° C



A new field of application in which FIAMM has just recently launched some experiments is underground transportation systems in mines. The application of sodium-nickel batteries is providing very interesting results in that there are multiple advantages / benefits compared to internal combustion engine (ICE) vehicles: zero noise, zero emissions, decidedly lower maintenance costs and above all a decrease in the cost of tunnel ventilation that makes EV vehicles very competitive compared to their ICE counterparts.

These are just a few of the successes that FIAMM has had with sodium nickel technology and the prospective future of the three business segments mentioned is particularly interesting.

## References from may highly regarded organizations

         	<p><b>TELECOM</b></p> <ul style="list-style-type: none"> <li>+ MTN – RSA</li> <li>+ Eltek Valere – US</li> <li>+ Nokia Siemens – Finland</li> <li>+ Telecom Italia – Italy</li> <li>+ T-Mobile – US</li> <li>+ Cosmote – Romania</li> <li>+ Century link – US</li> <li>+ Telefonica – Spain</li> <li>+ Elcos – Italy</li> <li>+ AT&amp;T - US</li> <li>+ Vimpelcom - Russia</li> <li>+ Ericsson – Sweden</li> <li>+ Saudi Telecom – Saudi Arabia</li> </ul> <p><b>Under Evaluation</b></p> <ul style="list-style-type: none"> <li>+ Oreedoo – Qatar</li> <li>+ Zamtel – Zambia</li> <li>+ Ascot – Italy</li> </ul>	<p><b>RAILWAYS</b></p> <ul style="list-style-type: none"> <li>+ PRASA/SIEMENS – RSA</li> <li>+ BOMBARDIER – Canada</li> <li>+ SCOMI – Malaysia</li> </ul> <p><b>Under Evaluation</b></p> <ul style="list-style-type: none"> <li>+ SNCF – France</li> <li>+ OMNI TRAX - US</li> </ul> <p><b>OIL&amp;GAS</b></p> <ul style="list-style-type: none"> <li>+ ABB – CH</li> </ul> <p><b>Under Evaluation</b></p> <ul style="list-style-type: none"> <li>+ Petronas – Malaysia</li> </ul>	       
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