Energy storage system based on lithium batteries for signaling and station

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H line commuter @ Sarcelles Saint-Brice
Sarcelles Saint-Brice
~ 5 200 000 passengers/year (2015)
~100 trains/day
More than 3000 stations in France (~400 in IdF)

- ~130 passengers stations of national interest (a)
- ~1000 passengers stations of regional interest (b)
- ~1900 passengers stations of local interest (c)

500 SES* substations

- ~250 backup by Genset**
- ~30 Genset less than 30 years

Sarcelles Saint-Brice station (b)

SES Substation & Technical local

• No second power supply for (b) & (c) stations,
• No energy storage in case of power blackout for elevators, smoke extraction, …,
• Without lightning in station or platform, trains don’t have to stop in station, for the passengers safety.

* SES Substation: installation that provides power to railway signaling (signals, switching motors, relays, etc.).

** Genset:

- Only one usage (signaling backup)
- Barely used (ex: 300h in 50 years)
- Aging → costly maintenance, noisy, pollutant.
Solution: a multifunction energy storage

SIGALi project implemented an multifunction energy storage system based on lithium batteries for backup, in case of a power outage, and for the energy management of the “Sarcelles St Brice” station.

Genset for signaling backup (January 2017)

Lithium battery energy storage (Juin 2018)
Redundant backup of the signaling

Rescue vital consumers of the station

Energy management means new business!

- Peak-shaving
- Load shifting
- Flexibility, Renewables, …
Issues

Travellers safety, in station or on platforms

Test a new maintenance free battery technology

Improve the energy efficiency in stations

Mutualize means and functions between the 3 EPIC
“Genset cost” means mainly maintenance cost.

“Gain station” means gains from peak-shaving (subscription reduction) or consumption cut-off (flexibility).

Very difficult to value the station backup despite the latest events in Montparnasse & Aix stations, …
Technical description

1. Immediate dumped loads: CAB rack (doors holders, turnstiles, metallic shutters),
2. Temporarily backup: rack TD Platform (elevators, sewage pumps, lightning, audio & video system), rack TD Station energy (Information system, passenger building, ...),
3. Backup loads: Signaling, HVAC.

92 kWh (NMC)
14 modules EM48126P3BA
(2p14s, 42..59V, 126Ah)
IEC 6219:2017
Modes of operation (1/2)

Peak-shaving
Load shifting
Discharge @ $P_{\text{load}} - 30$

Standby

Charge @ $25-P_{\text{Load}}$

Peak-shaving

Peak-shaving

Full

Energy stock level:
4 hours only for signaling
Modes of operation (2/2)

Islanding (backup for station & signaling)

Movements of the turnout systems

Signaling & station consumption

Signaling consumption

Station shedding

Reconnection to DSO

Redémarrage du système connecté à Enedis

Arret système

02/07/2018 | UIC Workshop
Fire risk management

LG SRS (Safety Reinforced Separator) increase the mechanical & thermal stability of NMC cells

Nano scale ceramic particles

SRS®

Micro porous poly olefin film

Building level
- HVAC (freecooling ventilating)
- Concrete walls, 2h false ceiling, fireproof doors, brick filled windows.

System level
- Current control,
- Overcurrent control by inverter semiconductor’s.

Battery rack level
- Fuse,
- Breaker.

Battery Management System
- Power control as a function of temperature,
- Voltage control at cell level,
- SoC & SoH estimation.

Module level
- 2 temperature sensors,
- Voltage sensor at cell level,
- Fuse,
- Breaker.
Conclusions & Perspective

• Human factor, the most important capital,

• System integration, a complex job even for the best … still look for a supplier with experience and an industrial product installed in many places,

• Storages of an interesting size for the railway stationary (50 - 200kWh) are in adolescence,

• An energy storage system opens a lot of opportunities of business and new services for Network and Stations: renewables integration, energy recovery, flexibility, V2G, ...
Merci de votre attention

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