

Le stockage de l'énergie: Un role clé dans la transition énergétique

Emmanuel Maubert

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Agenda

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2. Drivers for more flexibilities in electricity system
3. Main market trends
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Who is Saft today ?

GROUP PROFILE

100 years of history

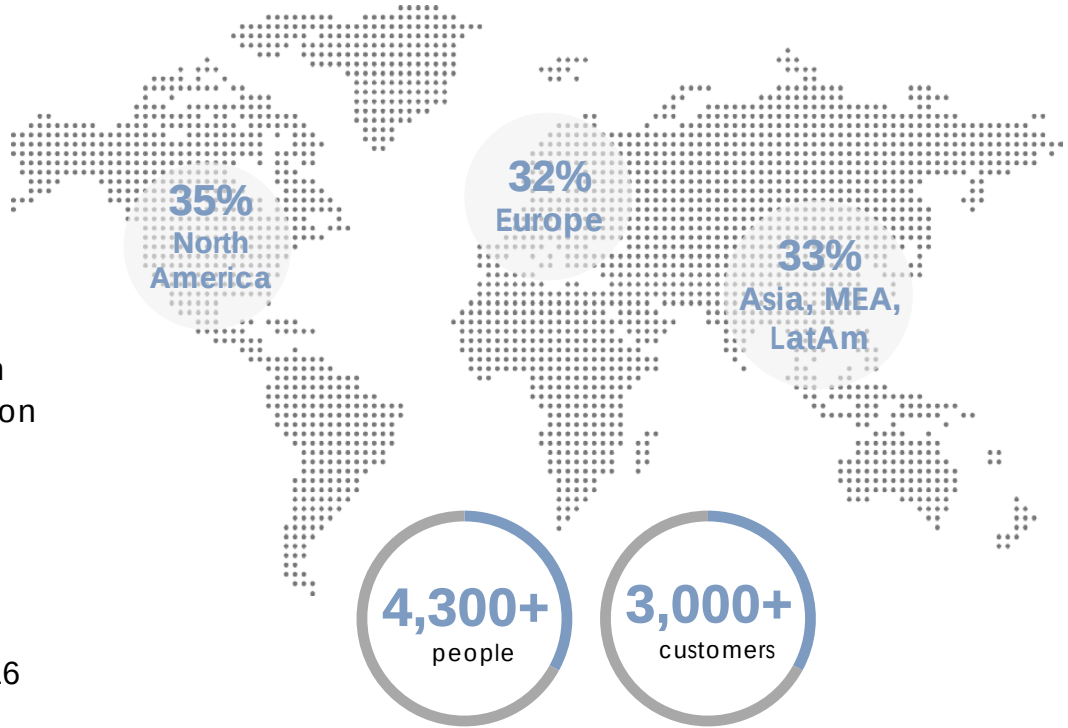
Leadership position on 75-80% of revenue base

9.7% invested in **R&D** with **3** main technologies; primary lithium, lithium-ion & nickel-cadmium,

€744m revenue FY 2017

TOTAL 100% subsidiary since 2016

GLOBAL PRESENCE - SALES

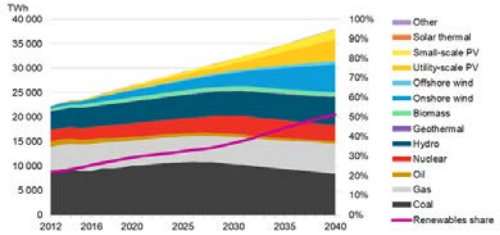


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Drivers for more flexibilities in electricity systems

Decarbonization - Clean Energy

- 51% of the world electricity generation will be based on renewable generation by 2040, thereof 67% wind and solar
- > 70% of 9000 GW new built generation by 2040 will be renewables
  (BNEF 06/2017)





Digitalization

- 53% global penetration of smart electricity meters by 2025 (Navigant)
- Smart grid market[1] growing at 19.4% CAGR to reach 50bn$ by 2022 (Markets&Markets)

Decentralization

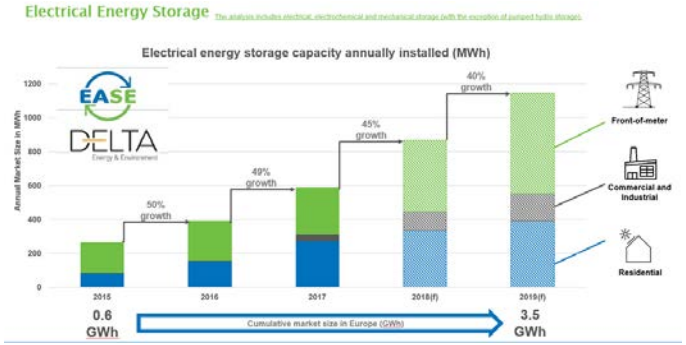
- 530 GW of distributed energy resources installed annually by 2026 (GE)
- Global microgrid market[2] growing at 12.4% to reach 39bn$ by 2022 (Markets&Markets)



1) AMI, Smart Grid Distribution Management, Smart Grid Communication, Grid Asset Management, Substation Automation, and Billing and Customer Information System
2) Hardware- Power Generation & Energy Storage System, Software, and Service

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Main market trends



– **Li-ion market driven by EV**
  - Massive capacity build-up in China and ww
  - Continuous pack price decrease ~10% / p.a.
  - EV players enter ESS market (Tesla, Mercedes, …)

– **ESS market growing double-digit**
  - New applications enter zone of profitability (arbitrage, peaking, T&D)
  - More energy installed for given power – application stacking multiplies revenue streams
  - Emerge of very large projects up to 100 MW

– **Main geographies: where energy demand grows over weak infrastructure**
  - Remote / isolated areas
  - Australia, S-E Asia, India, North & South America

– **Dynamic "Behind-The-Meter" (BTM) market grows faster than regulated utility market**
  - Residential, Commercial and Industrial

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The EU Regulatory Framework for Storage Evolves … And France



The 'Clean Energy for all Europeans' package addressed major market barriers hampering storage growth :

- Includes a definition for energy storage
- Establishes energy storage as a key element of the energy system
- Supports inclusion of energy storage in network planning
- Encourages self-consumption and storage of RES, as well as local energy communities
- A resource that should be subject to non-discrimination in network charging policy
- Establishes the principle of market-based procurement for non frequency ancillary services, including the participation of energy storage

But, Barriers and Uncertainties Remain…

- Eliminate double network charging
- Establish clarity on the rules under which energy storage can access markets
- Implement / evolve corresponding grid codes



France is a pioneer in Energy Storage

- ❑ **Storage technology and system solutions**
- ❑ **Regulation and public Tenders**
- ❑ **Extensive experience from demonstration & commercial projects**

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Flexibilities for the Power System



Renewable Power Generation

Photovoltaic Power Plants
Wind Power Plants

Grid Compatibility

Renewables integration: Ramping, smoothing, shaping



Power System Transmission & Distribution

Transmission & Distribution Grids
Microgrids / Cmart Communities
Private Grids (e.g. railways)

Supply-Demand Flexibility
Peak Management
Power Flow Management

Short term balancing, FCR
T & D deferral
Peaking Capacity



Utilization: Behind the Meter

Residential /
Industrial / Commercial

Energy Management

Self-consumption
Peak demand reduction
Demand flexibility

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Evolving Saft's Li-ion Energy Storage Solutions



Units from **100kWh** to **2.5 MWh**

- Containerized DC system solutions
- High Power to High Energy
- Deployed in > 50 systems worldwide

More Energy !

- Longer discharge duration 4h +
- Larger projects 100MW +
- Limited space
  buildings, industries, urban smart grids, …

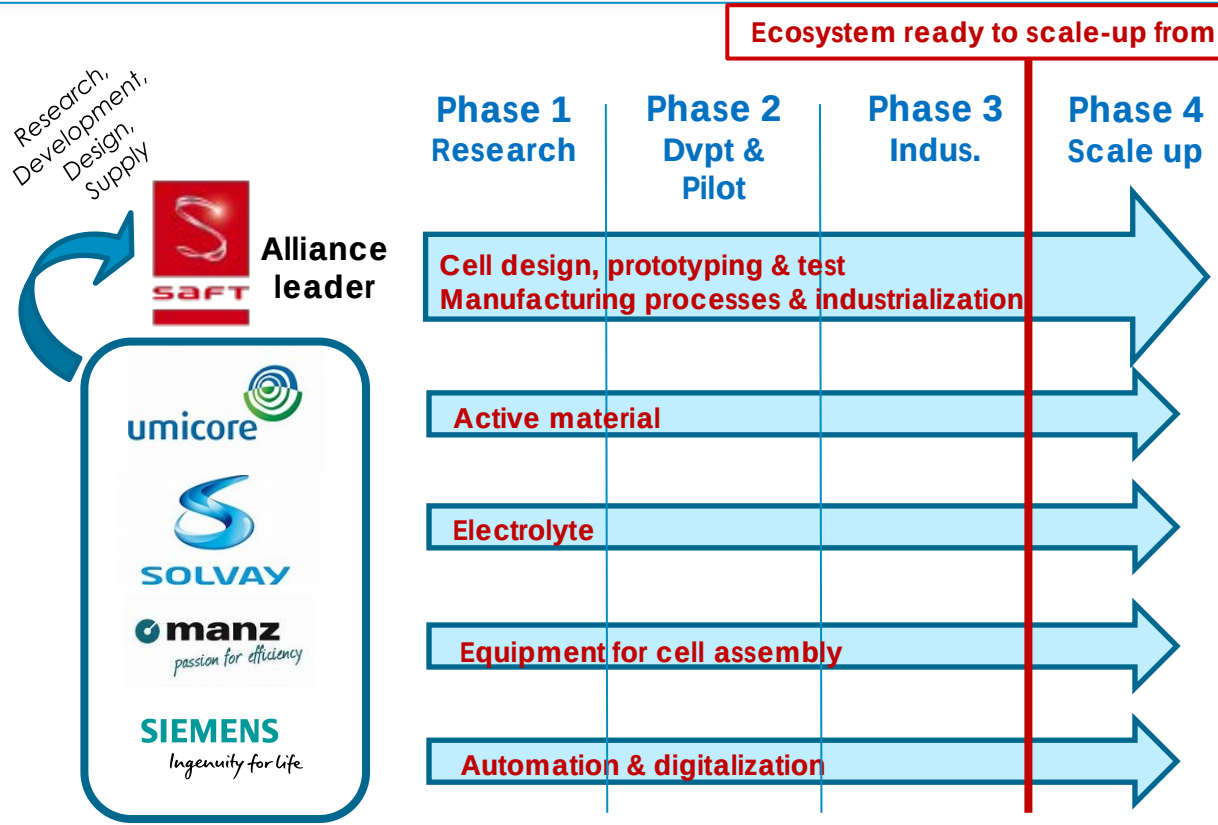
Saft targeted markets

	Customers	Typical size	Application	Battery Type
Utility	▪ Utility ▪ IPP ▪ Developers	**1-100 MW**	- Renewables Integration (ramping, smoothing, shaping) - Frequency Regulation - T & D Grid Support - Peaking Capacity	- E or M - M - E - E
Large C&I	▪ Industry ▪ Large commercial areas	**0.5-10 MW**	- PV self consumption - Peak demand reduction - Backup - Energy Efficiency	- E - E - E - E
Remote Microgrids	▪ Microgrid integrators & operators	**50 kW-1 MW**	- Spinning Reserve - Diesel Optimization - PV / Wind harvesting	- M - M - E
Residential and small C&I	▪ PV system integrators & installers	**< 100 kW**	- PV Self consumption - VPP / Aggregation	- E - E

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The Alliance for the European battery of the future - launched in February 2018

5 European groups join forces : Saft, Umicore, Solvay, Manz, Siemens



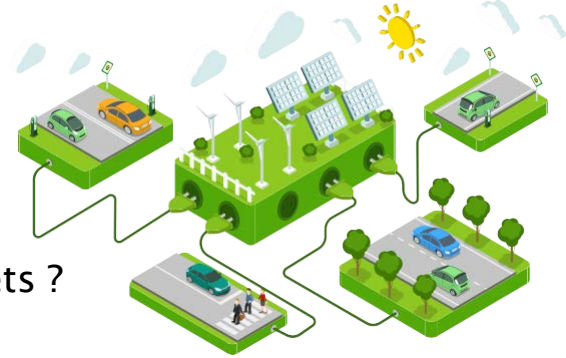
2025 Competitiveness criteria

- Cost competitiveness
- 700-800 Wh/L at pack level (x2 vs today)
- 5000 -10000 cycles (more than 10 years EV usage)
- 20 year calendar life
- Safe: EUCAR 3/4 cell/pack level
- Large scale
- Eco designed
- Circular : 2nd life, 100% recycled
- Ethics / traceability
- Made in Europe

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Key questions that will shape the future of the storage sector in EU …

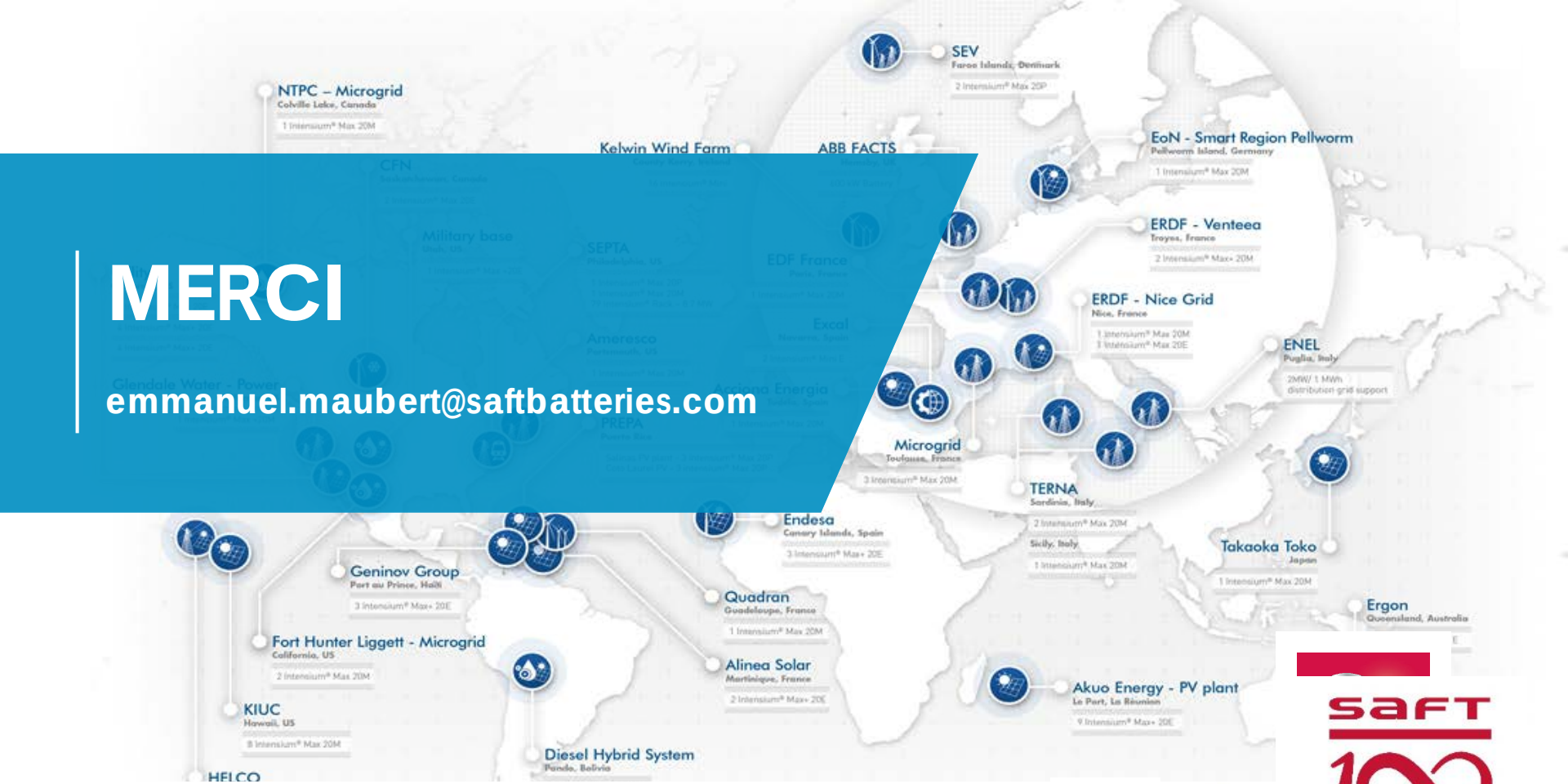
- Use of storage to support efficient transmission & distribution grids
  - ✓ How will the ownership provisions be implemented?
  - ✓ How will different services be defined and monetised?
  - ✓ How to enable revenue ‘stack’ to allow for storage business case?
  - ✓ How to ensure customers & aggregators access to flexibility markets ?



- Storage and clean mobility
  - ✓ How will stationary storage support the roll-out of charging infrastructure?
  - ✓ How will V1G (smart charging) and V2G (EVs providing flexibility services to the system) solutions work in practice?
- Sustainability
  - ✓ How to achieve a circular economy?
  - ✓ What is the potential of 2nd life batteries?
  - ✓ How to support recycling, esp. for battery storage technologies?



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emmanuel.maubert@saftbatteries.com

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