**Saft Energy Storage Solutions**
EPRI Renewable Energy Council
April 5-6, 2011

---

**The Saft Group in 2010 - Key figures***

*1.33 $/€ exchange rate (Dec. 2010)*

<table>
<thead>
<tr>
<th><strong>Group</strong></th>
<th><strong>Sales 2010</strong></th>
<th><strong>Percentage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Specialty Battery Group</td>
<td>$345.8m</td>
<td>44.0%</td>
</tr>
<tr>
<td>Industrial Battery Group</td>
<td>$440.4m</td>
<td>56.0%</td>
</tr>
<tr>
<td>Total</td>
<td>$786.2m</td>
<td></td>
</tr>
</tbody>
</table>

- High performance primary and rechargeable lithium and silver batteries for the electronics, defence and space industries.
- Rechargeable nickel and lithium-based batteries for demanding industrial applications.

---

**Joint-Ventures:**
- Johnson Controls-Saft HEV and EV batteries
- ABB Group Thermal batteries
- Equity accounted
Strong Financial Track Record

Sales - At Actual FX Rates (€m)

EBITDA (€m)

Cash Flow from Operating Activities (€m)

Net Debt / EBITDA (x)

Note: Sales at actual exchange rates; EBITDA restated including Research Tax Credit. 2005 EBITDA restated for IPO costs. Restated figures for 2009 exclude the costs incurred by the Group in respect of the project for the new production facility in Jacksonville, USA for an amount of €0.7 million.

12/04/2011

Johnson Controls - Saft Advanced Power Solutions

- JV to leverage Saft’s technological leadership in automotive Li-ion
- JCI position as a tier 1 automotive supplier
- First contract to supply Li-ion to a major manufacturer (Daimler)
- Joint purchasing arrangement with Saft
- Synergies with energy storage
Saft: Recognized as a Very Credible Player

**Johnson Controls-Saft and Saft are together the leading beneficiaries of the US grants**

<table>
<thead>
<tr>
<th>Company</th>
<th>USD m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson Controls-Saft*</td>
<td>299</td>
</tr>
<tr>
<td>A123 Systems</td>
<td>249</td>
</tr>
<tr>
<td>KD ABG MI</td>
<td>161</td>
</tr>
<tr>
<td>LG Chem</td>
<td>151</td>
</tr>
<tr>
<td>EnerDel</td>
<td>119</td>
</tr>
<tr>
<td>GM Corp**</td>
<td>106</td>
</tr>
<tr>
<td>Saft America</td>
<td>96</td>
</tr>
<tr>
<td>Exide Tech.**</td>
<td>34</td>
</tr>
<tr>
<td>East Penn**</td>
<td>33</td>
</tr>
</tbody>
</table>

* Johnson Controls-Saft industrial project submitted by Johnson Controls Inc. to the Department of Energy
** non Li-ion manufacturing project

Source: US DoE

- Focused solely on non automotive renewable energy project

---

Jacksonville Project Update

- Contract signed with Department of Energy
- Factory construction contract signed
- Official ground-breaking ceremony 15th March
- Over 350 MWh plant capacity by 2015 with room for further expansion
- Start of production H2 2011
Building Progress (as of February)

Southeast Energy Storage Learning Center

- Saft initiative with Florida-based partners
- Couple 1 MW rooftop PV with 1 MW / 1 MWh energy storage system
- Students will experiment with optimal dispatch
  - PV output
  - Grid signals from JEA
Li-ion technology has the flexibility to address all three functions.
Smoothing

- Example - ramping support for wind farms
- Individual 2.5 MW turbine ramping from full output to zero in approx. 40 minutes
- Storage ratings
  - Approx. power 1 MW
  - Approx. energy 0.5 MWh (usable)
- Aggregation of wind output should lead to smaller storage ratings

Solutions for smoothing - large-scale

- ABB DynaPeaQ system
  (SVC Light with energy storage)
- Up to 50 MW, up to 1 hour
- Up to 80 kV dc
- Capability to sell VAR support to wind farms
Solutions for smoothing - smaller-scale

- Intensium Max containerized systems
- ISO containers - 20-ft or 40-ft
- Separate PCS
- Allows for maximum flexibility
  - Transportation
  - Siting
- Flexible power-to-energy ratio
- Medium power 20-ft
  - 560 kWh
  - 1.1 MW, 30 min

Shaping

- Allows renewable energy source to be firmed
- Especially important in island grids

Source: Aerowatt
Smoothing and shaping PV farm output

- Storage of ~20% of daily PV output
- Smoothed injection to grid
- Conformance to forecast output

Example:
- Per MW of PV rating
- 0.5 to 1 MW battery power
- 0.5 to 1 MWh battery energy

Shifting

- Hours of storage
- Low value in remote systems
- Locate closer to users to achieve higher value

Local options
- Substation storage
- Community energy storage
- Residential storage (with rooftop PV)
SMUD Anatolia III project

- ARRA FOA 85 Topic 4: High penetration solar development
- Installing 15 RES and 3 CES units in Anatolia ‘SolarSmart’ Homes that currently have 2kW PV systems
- Installing utility and customer portals to monitor PV, storage, customer load
- Sending price signals to effect changes in customer usage
- Developing specification for smart meter/inverter interface to enable management of distributed PV/storage system with AMI
- Saft is storage partner using advanced Li-ion technology developed for EV
SMUD CES systems

- 30 kW / 34 kWh systems
- Each serving 5 homes
- Partner companies
  - GridPoint - communications
  - PowerHub - PCS
  - Saft - battery

SMUD RES systems

- 4 kW / 8.8 kWh
- Partner companies
  - GridPoint - communications
  - Silent Power - PCS
  - Saft - battery
2500 R Street microgrid project

- Pacific Housing 34-home project in Sacramento
- Partner companies
  - Sunverge - system integrator
  - Schneider / Xantrex - PCS
  - Saft - battery
- Enhanced grid benefits with less PV

Optimizing value from PV storage

- Minimize cost of storage
  - Synergies with EV applications for Li-ion
- Storage requirements
  - Maximum life
  - Wide operating state of charge range
  - Very high efficiency (>95% dc)
- Maximize value streams
  - Residential PV shifting to avoid peak rates
  - Power reliability - islanding / microgrids
  - Participation in demand-response programs
  - Night-time ancillary services
Summary

- Energy storage provides solutions to RE integration issues, allowing higher penetration levels
- The cost of energy storage can be mitigated by addressing multiple value streams
- Saft’s long history with Li-ion and success with EV make it a strong player in this market

Thanks for listening!

- jim.mcdowall@saftbatteries.com