A Case Study in Commercialising Nanotechnology

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Outline

- Introduction to CAP-XX Ltd
- Brief history
- Examples: value proposition for mobile phones and solid state drives
- Issues encountered
- Lessons learnt
- What’s next?
- Q&A
Overview of CAP-XX Ltd

- Australian “Born Global” supercapacitor manufacturer
- Founded 1997
- IPO on LSE (AIM) in April 2006
- A unique technology position - World’s best thin prismatic supercapacitors with strong IP
- Focused on space-constrained electronic devices
- Sold over 3 million devices
- Non-exclusive licence to Murata Manufacturing Co.
- Achieving mobile phone and solid state drive design wins
Myrtle Beach, South Carolina, USA
Reading, UK
Penang, Malaysia
Sydney, Australia

HQ in Sydney, Australia
Approx. 50 direct employees
Volume Manufacturing outsourced employing around 500 people
Extensive network of sales representatives consisting of 200 people

Global coverage via local sales offices and distributors
What is a Supercapacitor?

- **Specific Power (W/l)**
  - Batteries
  - Fuel Cells
  - Capacitors
  - Supercapacitors

- **Specific Energy (Wh/l)**
  - Batteries
  - Fuel Cells
  - Capacitors
  - Supercapacitors
What is a supercapacitor?

- Stores a **small** amount of electrical energy
- Static electricity
- Releases energy very quickly i.e. very high power

- Stores a **moderate** amount of electrical energy
- Static electricity
- Releases energy quickly i.e. high power

- Stores a **large** amount of electrical energy
- Chemical reaction
- Releases energy slowly i.e. low power

The water tank analogy

**Capacitor:**
- High pressure, Small volume, Big tap
- Minimum pressure, inaccessible water

**Supercap:**
- High pressure, Large volume, Big tap

**Battery:**
- Low pressure, Large volume, Small tap
Role for nanotechnology at CAP-XX

Nano-structured materials increase energy (capacitance) and decrease impedance (ESR).
Brief history of CAP-XX

• 1994-99 Partner with CSIRO to research supercapacitors; US$2.5m in seed capital & grants
• 2000 Raise US$6.6m from VCs; First mobile wireless product; Business agreement with Intel for Notebook PCs
• 2001 Raise US$17m from Intel, Acer & VCs; Develop pilot production plant with Invetech; US$3.2m R&D grant
• 2002 Focus shifts from Notebook PCs to wireless; Open US & Taiwan sales offices
• 2004 Establish contract manufacturing in Malaysia; Shipping production quantities; Nokia contacts us re LED flash; First distributors appointed
• 2005 Toshiba demos CAP-XX at 3GSM; Focus moves to camera phones
• 2006 US$31m IPO on London Stock Exchange (AIM)
• 2007 Open UK office; Close Taiwan Office; BriteFlash™ camera phone solutions released
• 2008 Sell manufacturing license to Murata for small prismatic supercapacitors
• Brilliant flash photographs – BriteFlash™
  - Xenon performance
  - Ultra thin, small size flash solution
  - Familiar “true flash” appearance
  - Simple integration into camera phone Industrial Design

• Captivating audio performance – BriteSound™
  - Louder, cleaner music, speakerphone and ringtones
  - Robust audio with less noise issues
  - Extensive audio power headroom for processing or special effects

• Better power management – BritePower™
  - Supports existing batteries to drive power-hungry features
  - Extracts more energy from batteries to increase battery life
  - Enables use of alkaline & next generation battery technology
BriteFlash™: The best flash option

Standard Nokia N73

BriteFlash™ N73
(N73 refitted with CAP-XX Supercapacitor)

SonyEricsson K800i
(xenon strobe)
Electrolytic or supercapacitor

SonyEricsson K800i
SSDs (Solid State Drives) are replacing HDDs (Hard Disk Drives) in computers etc., offering faster access, improved reliability & smaller size.

Market size estimated at close to 100m units by 2010.

Problem is that if power fails (battery or mains) the cache memory will be lost.

Need a supercapacitor to provide backup power.

- Early after-market 128GB SSD modification in an Apple MacBook Pro.
- CAP-XX to replace bulky cylindrical supercapacitor used for power backup.
- Why CAP-XX? Thinner form factor & superior operating temperature range (-40°C to +85°C).
Some of the issues encountered so far

- Raising capital – seed / VC / public
- Dealing with “Investment Bubbles”
- Time taken to find the right people
- Turning R&D into a product ready for mass production
- Building custom production processes & lines
- Selling a new technology into a new application
- Changing the direction of the business
- Changes in Government Policy
Lessons learnt

1. R&D is just a very small part of the effort required for commercialisation
2. Focus on an end market - Don’t push a technology
3. Keep the business plan simple & flexible
4. It will take longer & cost more than forecast
5. Take the funding when offered – it may not be available when you want it
6. Government money is expensive even when its “free”
7. The right team is more important than the business plan
8. Be realistic about the capabilities of the business – partner as appropriate
Focus – The Bowling Alley Concept

Symbol RPDA
- Ruggedised PDA
  - Sierra Wireless PCMCIA GPRS
- Wireless PDA
  - PCMCIA CF
  - USB, RS232 CDMA

AMR
- Toll Tags
  - Automotive, Fuel Cells
- DSC
  - UPS, Toys
- Smart Phones
  - Medical Devices
- Cell Phones

 circa 2002
Why the LSE: AIM Stock Exchange?

- Australian Stock Exchange is dominated by resource & financial stocks – poor coverage of technology
- Cost of NASDAQ prohibitive post-SOX
- AIM is the largest technology exchange in terms of available capital & analyst coverage after NASDAQ
- Cost of listing on AIM & ongoing compliance is significantly less than NASDAQ
The partnership with Murata

The Deal in Brief

- Non-exclusive licence
- Licence is for small prismatic supercapacitors only
- Term is for life of current patents
- Cash up-front
- Royalty fee as a % of sales plus a share of operating profit over a threshold
- On-going cooperation thru R&D and cross sales

KEY POINTS - The partnership with Murata addresses two major issues: It provides integrity of supply to our mobile handset customers, & materially de-risks the process of scaling output for CAP-XX
The partnership with Murata secures CAP-XX’s future

About Murata

- Established: 1944
- Listed on Tokyo & Singapore Stock Exchanges
- Market Capitalisation: £5.8b
- Sales: £2.4b
- R&D expenses (p.a.): £200m
  - as % of sales: 7%
- Capacitors produced / day: 1.3B
- Employees: 29,000
What’s next? – the business model

Murata Manufacturing

Murata Marketing & Distribution

CAP-XX

In-house Electrode Manufacturing

Contract / JV Manufacturing

CAP-XX Sales Organisation

Other Partners

Development of New Products/Materials

Mobile Phones + Other

Solar Panels, wind farms, renewable energy

Automobile Applications

Fuel Cells

Medical, Military Applications

Energy, Medical, Environmental Sectors

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What’s next? – 3 engines of growth

Existing Products

Surface Mount Supercapacitors

Supercapacitors for:
- Renewable Energy
- Automotive
- Memory Backup
- Fuel Cells

Plus new materials for:
- Electronic Industry
- New Batteries

Normalized Market Demand (Units)

2008  2011  2013  2015
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