



*Information for growth*

# **The Worldwide Rechargeable Battery market 2003-2008**

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**Brussels, April 2004**

**Christophe Pillot**

**Battery Survey Manager**

# To drop or to Fly ?

- **AVICENNE & Batteries**
- **The worldwide battery market in 2003**
- **The main trends 2003- 2008**
- **Conclusions**



# AVICENNE Profile

*Information for a competitive Edge*  
*Powering your company's market strategy with in-depth research*

- **Creation : 1992**
- **Headquarter : Paris**
- **Liaison Office : Japan, USA**
- **Director : M. Madani**
- **Battery survey Manager : C. Pillot**



# Extensive field research to retrieve & cross check information

## Top management contact network



## Conferences & Exhibitions



JAPAN ELECTRONICS SHOW

CeBIT

Power

CIBF 2004 The sixth China International Battery Fair

## In Depth analysis Of applications



## Cross Check Analysis

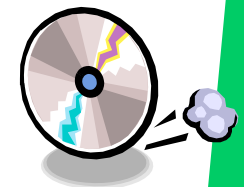
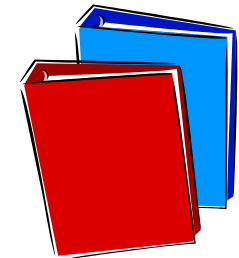


## ➤ Specific surveys

&

### ➤ Yearly Market Survey : “The rechargeable Battery market & its main application 2003 - 2008” (last edition March 2004)

- Published yearly since 1994
- More than 550 slides
- Available in English, on CD Rom, E-mail, or Paper version
- 5 years forecasts
- Divided and purchasable by Applications : Cellular Phones, Portable PCs, Cordless Tools, Toys, Home Appliances, Security lighting systems, RC Cars, Digital Camera, ...
- Geographic Areas : North America, Japan, Western Europe, Asia-Pacific, China, Others
- More than 60 yearly customers



**AVICENNE Développement**  
12<sup>th</sup> Edition  
**The Rechargeable Battery Market 2003-2008**  
Information for growth  
**THE MOST ACCURATE FORECASTS FOR THE BATTERY INDUSTRY!**

**MARKET RESEARCH COVERING FOLLOWING APPLICATIONS**

- GSM, GPRS, COMA...
- 3G, EDGE, ...
- Smart Phones
- PDA
- Portable PCs
- WiFi
- Bluetooth
- Cordless Phones
- Digital Cameras
- Camcorders
- Power Tools
- RC Cars
- Toys
- E-Bikes
- Security Lighting
- Portable Video
- Electronic Games
- ...

**Report Summary**

Battery Market in 2003

- ☐ By technology
- ☐ By Application
- ☐ By battery manufacturers
- ☐ By battery suppliers

550 pages & +500 figures & tables

Panorama of Future Trends

- ☐ Technical : Anode, cathode & raw materials new perspectives
- ☐ Price Decrease
- ☐ Regulatory

Forecasts up to 2008

**Samples of customized survey realized:**

- ☐ The battery market for Tire Pressure Monitoring systems
- ☐ Battery main trends for hybrids vehicles
- ☐ Alkaline vs. Rechargeable for digital cameras
- ☐ Lithium Polymer batteries main application for the future
- ☐ LFPSE market for Li-ion batteries
- ☐ Supervisors for Li-ion batteries (2002-2008)
- ☐ NIMH prismatic market
- ☐ Battery Pack market for portable PCs: Pack makers value added analysis

AVICENNE & EUROFORUM (IBC Infima Group) organize the 8<sup>th</sup> Edition of the major Conference & Exhibition on Batteries: +500 Attendees, 50 exhibitors & 35 international experts in PARIS-June 2<sup>nd</sup>-4<sup>th</sup> 2004.

Customized surveys on demand!  
Ask for a free quotation & receive it within 48 hours!

**Batteries 2004**  
Conference & Exhibition

**Batteries 2004**

### ➤ Small & Micro Fuel cells market (2003 - 2010)

# Our References : More than 60 references worldwide

ALCATEL

AROS SECURITY

ATOFINA

BATTERY OF KOREA

BAIN & Cie Inc,

BOLLORE

BOURNS

BOUYGUES TELECOM

BYD

CARBONE LORRAINE

CELGARD

COGEMA

DIALOG SEMICONDUCTOR

DUPONT

DURACELL

EDF

FAIRCHILD SEMICONDUCTOR

FALCON BRIDGE

FRANCE TELECOM

GAIA

GS MELCOTEC

HOLLINGSWORTH & VOSE Cie

IER

INCO

ITRI

LEGRAND

MATSUSHITA

MTI MicroFuel Cells

MOLTECH

MOTOROLA

NITECH

NTK POWERDEX

PEACE BAY

PHILIPS

RAYOVAC

RHODIA

SAFT

SANIC

SCHRODERS VENTURES

SOLVAY

SONY

STORCK

TYCO

UNIROSS

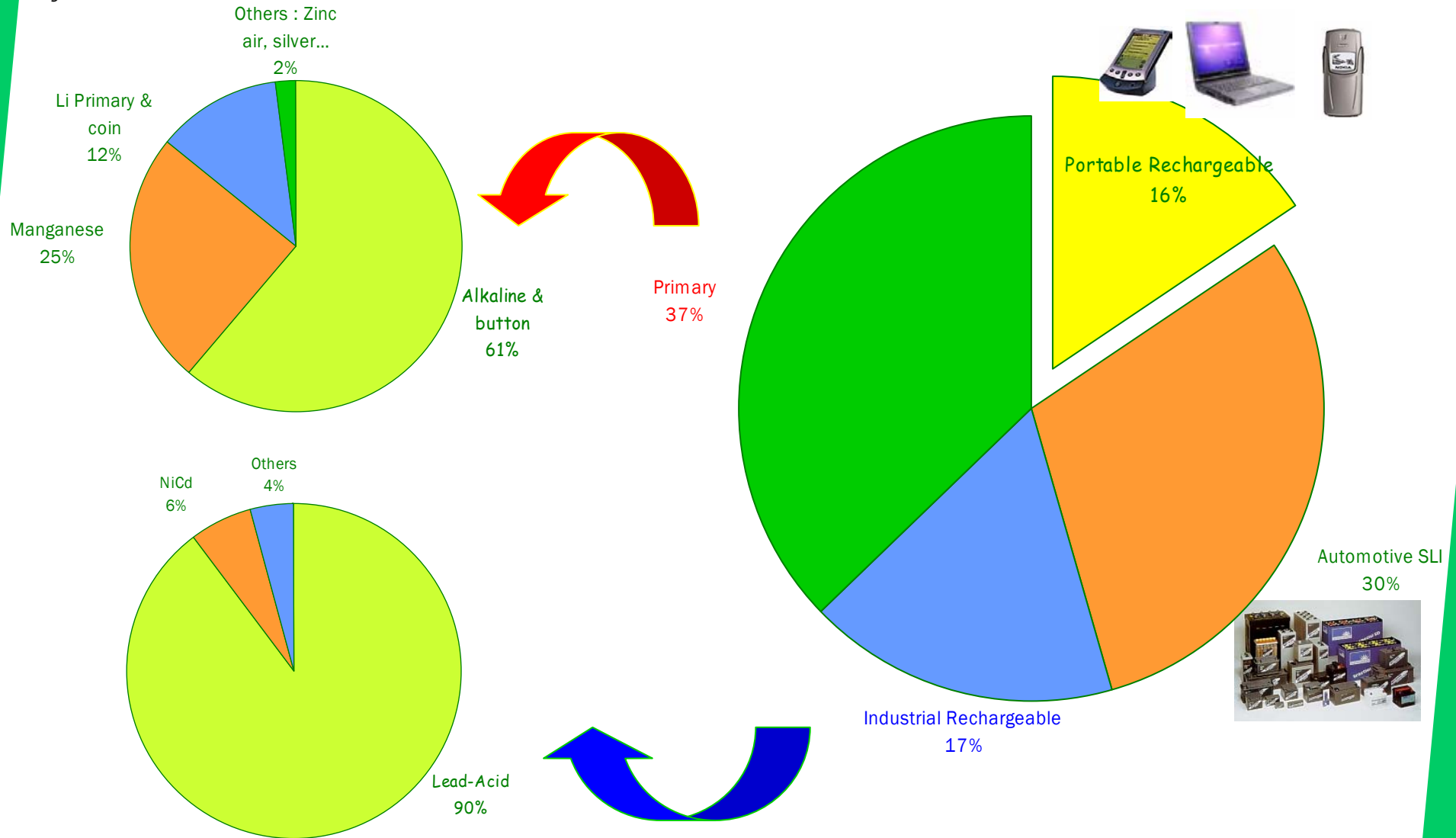
VARTA

WIRELESS TOTAL SOLUTION

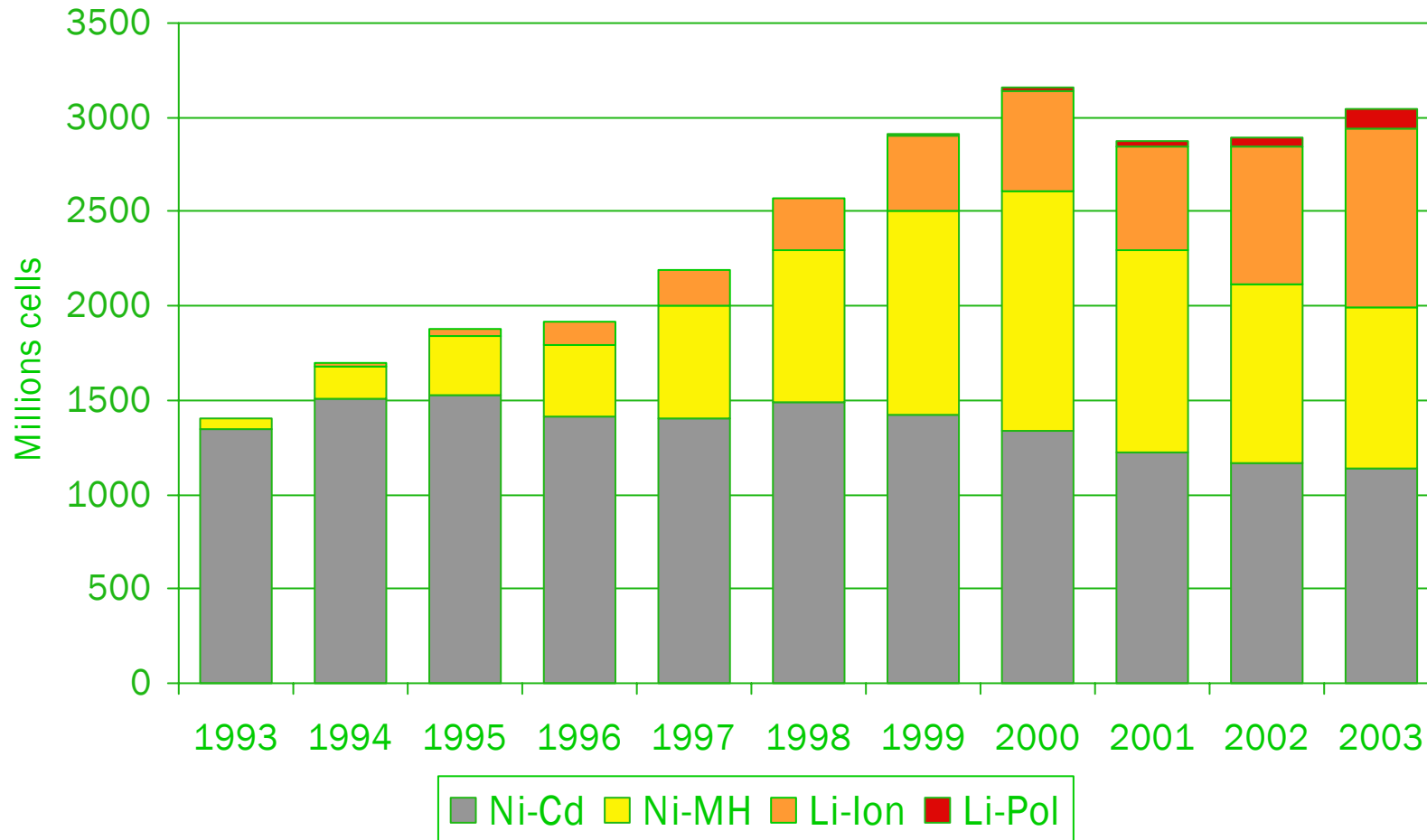
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# 2003 - Battery market worldwide

## Roughly 30 Billion US \$

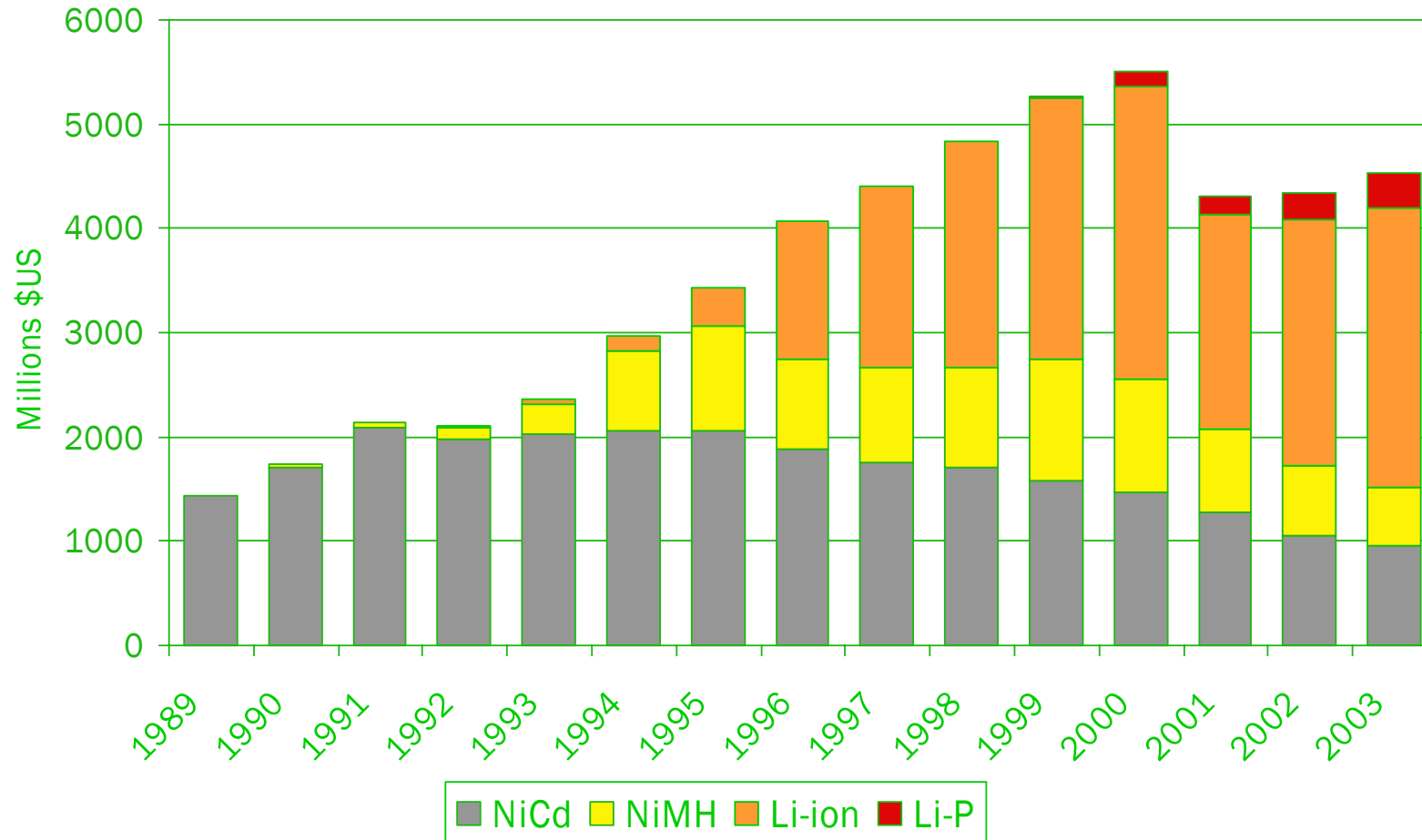


# Worldwide rechargeable Battery Sales (Units ) 1993 - 2003



Source : Battery makers

# After a huge decrease in 2001, market is increasing again in 2002 & 2003



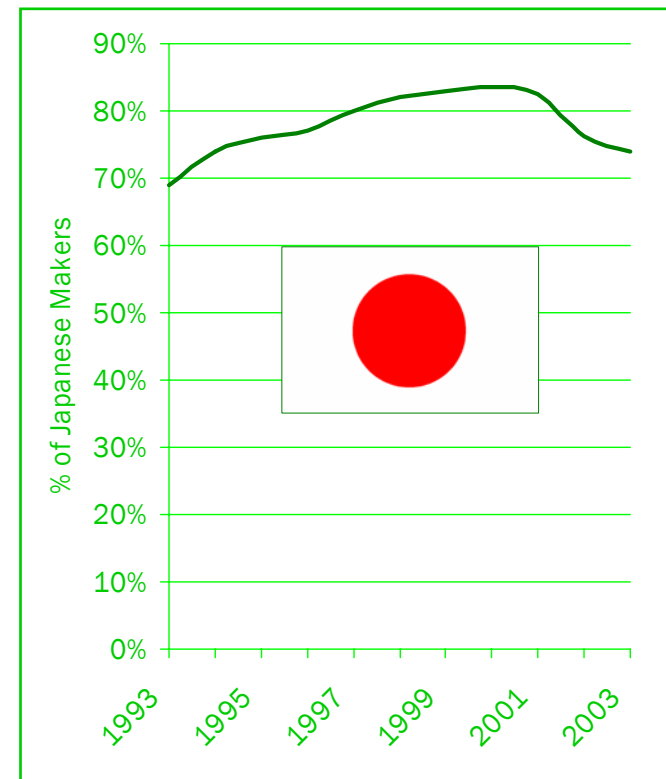
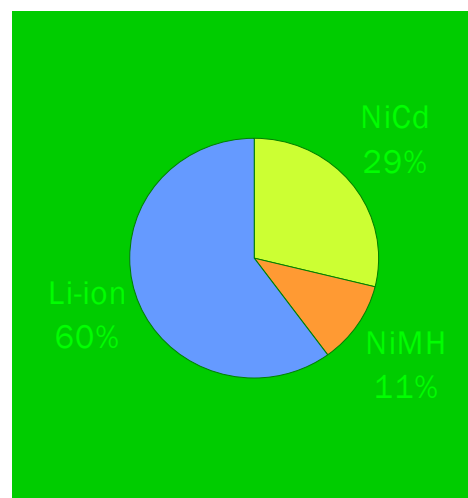
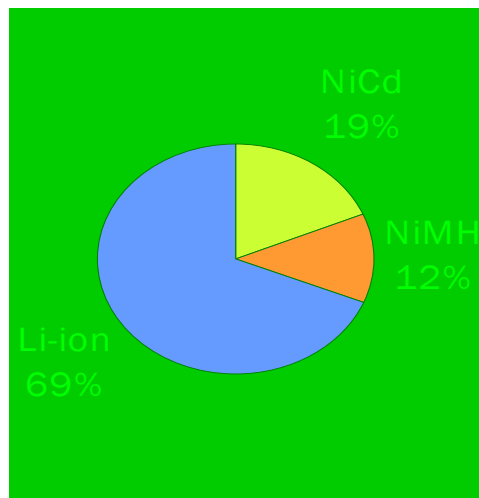
Source : Battery makers

# Japanese makers are suffering Vs. Korean & Chinese

**Japanese market share (value) fell : from 82 % of the market in 2001 to less than 75% in 2003**

**JAPANESE SALES**  
from 3.6 Billions \$ in 2001 to 3.4 B\$ in 2003  
(-6%)

**REST OF THE WORLD**  
0,75 Billion \$ in 2001 to 1.1 B\$ in 2003  
(+ 42 % )



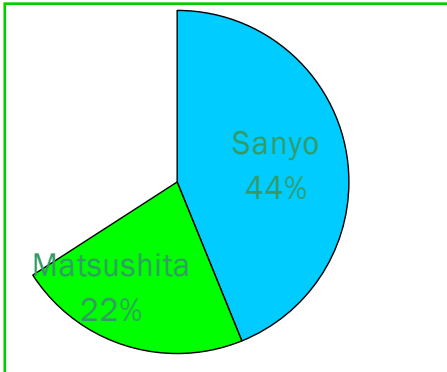
Source : AVICENNE Développement, Battery makers

# Each secondary battery Technology has its specific absolute advantages

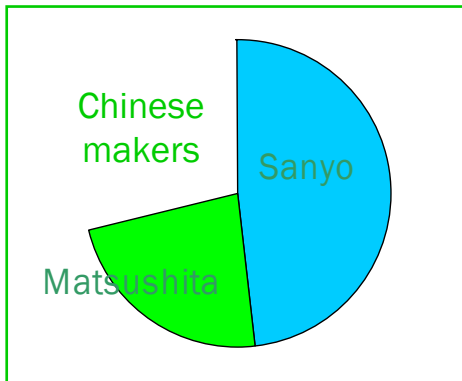
Advantage of ... ...On		Lead Acid	Nickel Cadmium NiCd	Nickel Metal Hydride NiMH	Lithium-Ion	
					Conventional	Polymer
Lead Acid			<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Operating temperature range</li> <li>Self discharge rate</li> <li>Reliability (progressive extinction)</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Self discharge rate</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Voltage output</li> <li>Self discharge rate</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Self discharge rate</li> <li>Design characteristics</li> </ul>
Nickel Cadmium NiCd		<ul style="list-style-type: none"> <li>Higher cyclability</li> <li>Voltage output</li> <li>Price</li> </ul>		<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Voltage output</li> <li>Self discharge rate</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Self discharge rate</li> <li>Design characteristics</li> </ul>
Nickel Metal Hydride NiMH		<ul style="list-style-type: none"> <li>Higher cyclability</li> <li>Voltage output</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Operating temperature range</li> <li>Higher cyclability</li> <li>Self discharge rate</li> <li>Price</li> </ul>		<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Operating temperature range</li> <li>Higher cyclability</li> <li>Voltage output</li> <li>Self discharge rate</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Operating temperature range</li> <li>Self discharge rate</li> <li>Design characteristics</li> </ul>
Lithium-Ion	Conventional	<ul style="list-style-type: none"> <li>Higher cyclability</li> <li>Price</li> <li>Safety</li> <li>Recyclability</li> </ul>	<ul style="list-style-type: none"> <li>Operating temperature range</li> <li>Higher cyclability</li> <li>Price</li> <li>Safety</li> <li>Recyclability</li> </ul>	<ul style="list-style-type: none"> <li>Price</li> <li>Safety</li> <li>Discharge rate</li> <li>Recyclability</li> </ul>		<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density (potentially)</li> <li>Design characteristics</li> <li>Safety</li> <li>Price</li> </ul>
	Polymer	<ul style="list-style-type: none"> <li>Higher cyclability</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Operating temperature range</li> <li>Higher cyclability</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Volumetric energy density</li> <li>Higher cyclability</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Operating temperature range</li> <li>Higher cyclability</li> </ul>	
Absolute advantages		<ul style="list-style-type: none"> <li>Higher cyclability</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Operating temperature range</li> <li>Price</li> </ul>	<ul style="list-style-type: none"> <li>Volumetric energy density</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Self discharge rate</li> <li>Voltage output</li> </ul>	<ul style="list-style-type: none"> <li>Gravimetric energy density</li> <li>Volumetric energy density</li> <li>Self discharge rate</li> <li>Voltage output</li> <li>Design characteristics</li> </ul>

# Battery Industry in 2003

NiCd : < 1 Billion US\$  
Annual Growth = - 10%

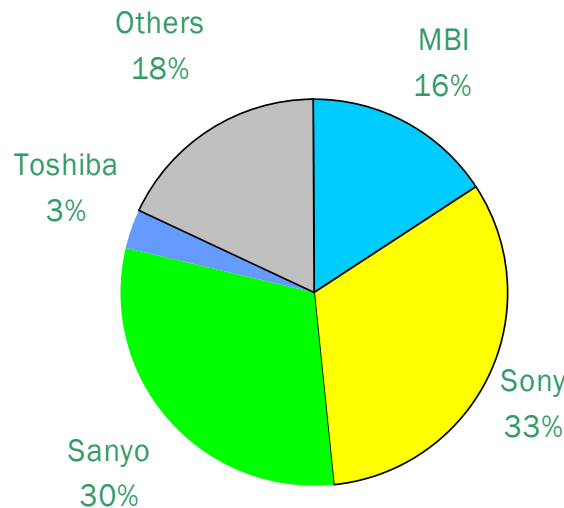


NiMH : 0.5 Billion US\$  
Annual Growth = - 20%

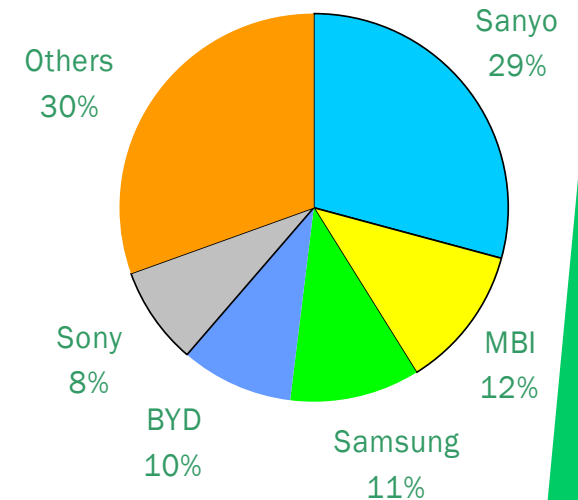


Li-ion : 2.7 Billion US\$  
Annual Growth = +13%

## CYLINDRICAL CELLS



## PRISMATIC CELLS

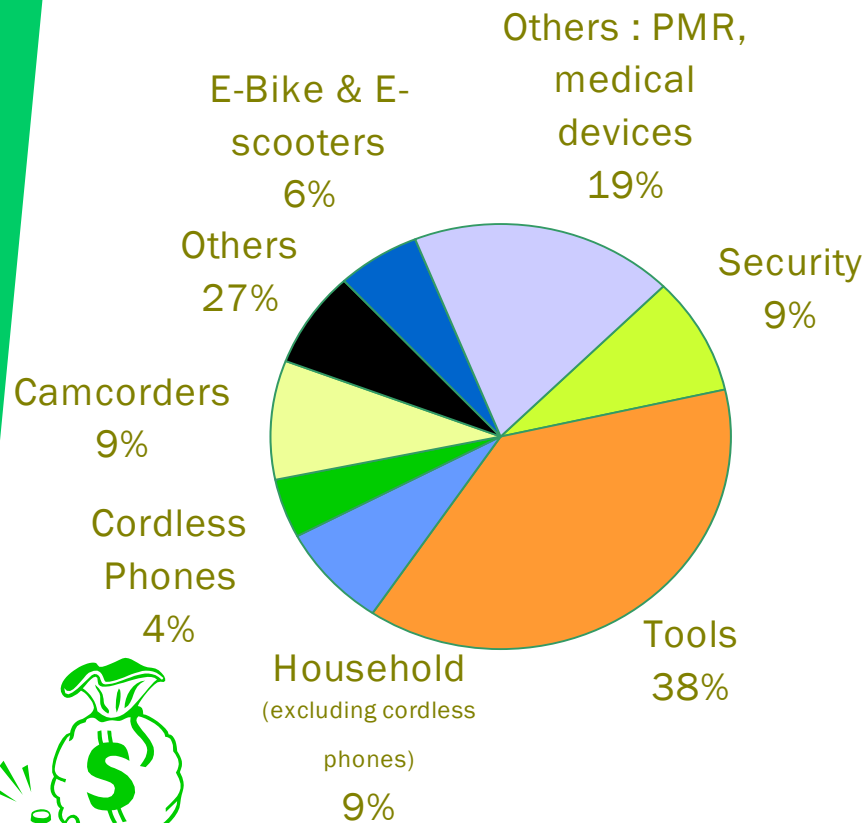


**Li-P**  
0.3 Billion US\$  
Annual Growth  
+ 30%

# What are the key markets for NiCd in 2003 ?

**1140 Million NiCd cells - 960 M\$**

- All the market segments are stable or decreased a little except e-bike which is increasing.
- Strong competition with NiMH for Toys, cordless Phones, Household devices & power tools
- What will be the next step?

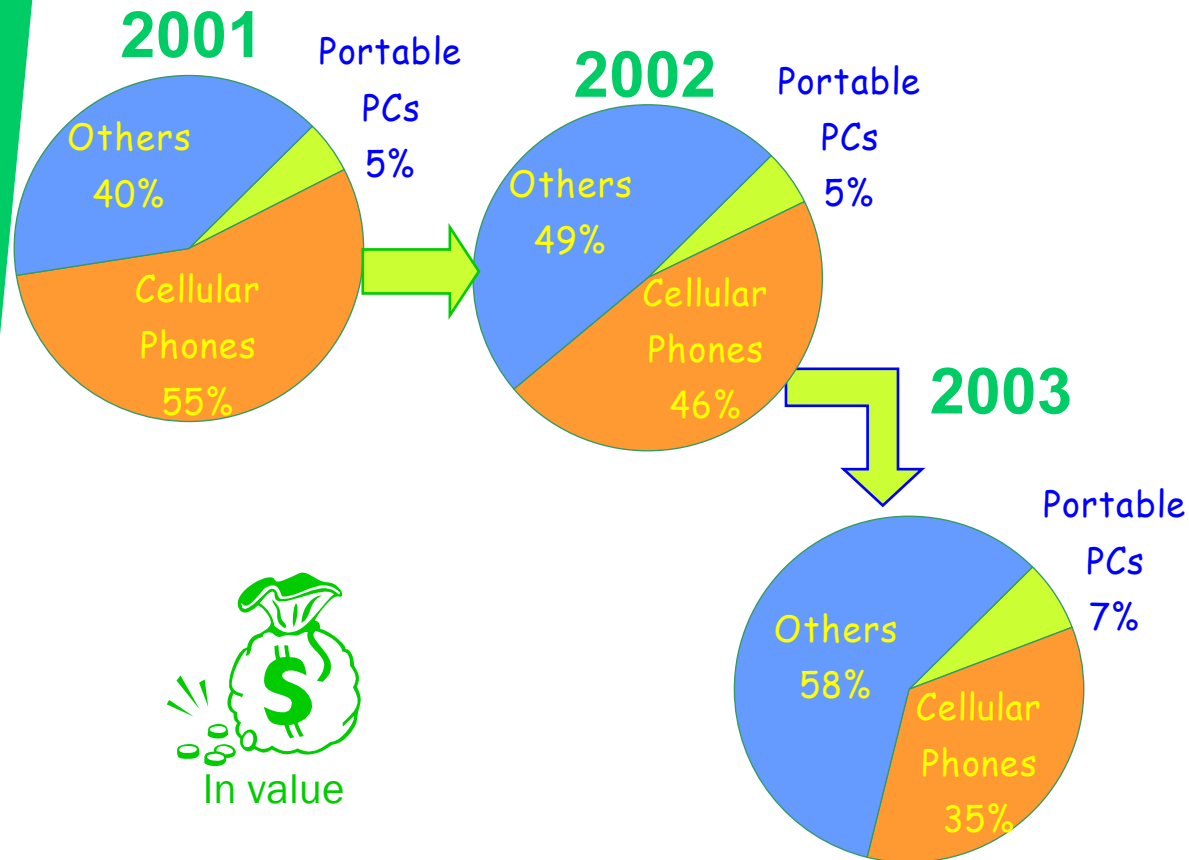


In value

Source : Compilation - Battery makers & users

# What are the key markets for NiMH ?

**In 2003 :**  
**>800 Million NiMH cells : 550 M\$**

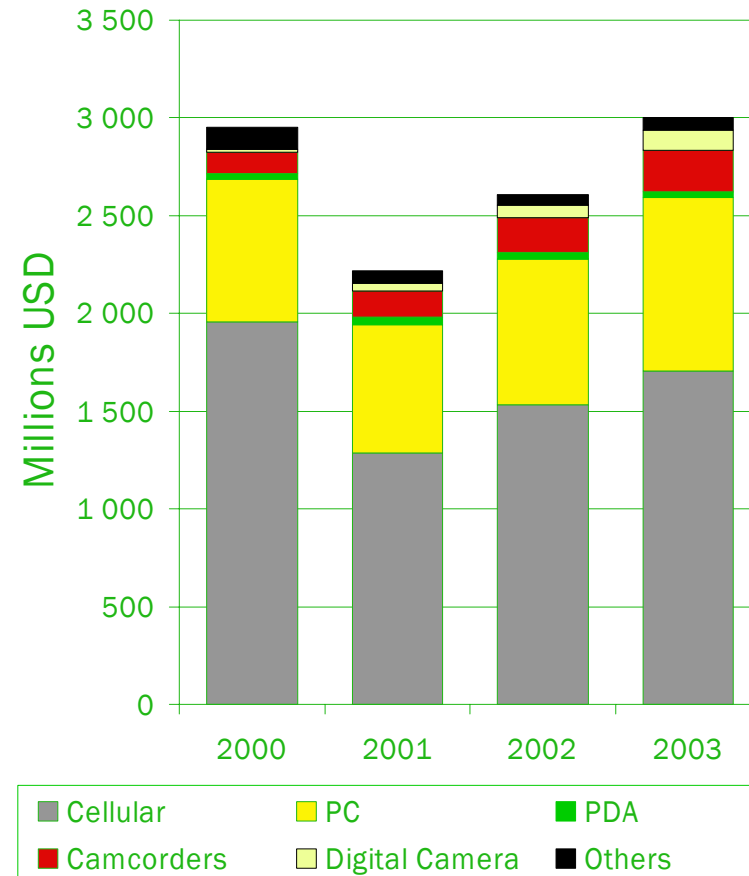
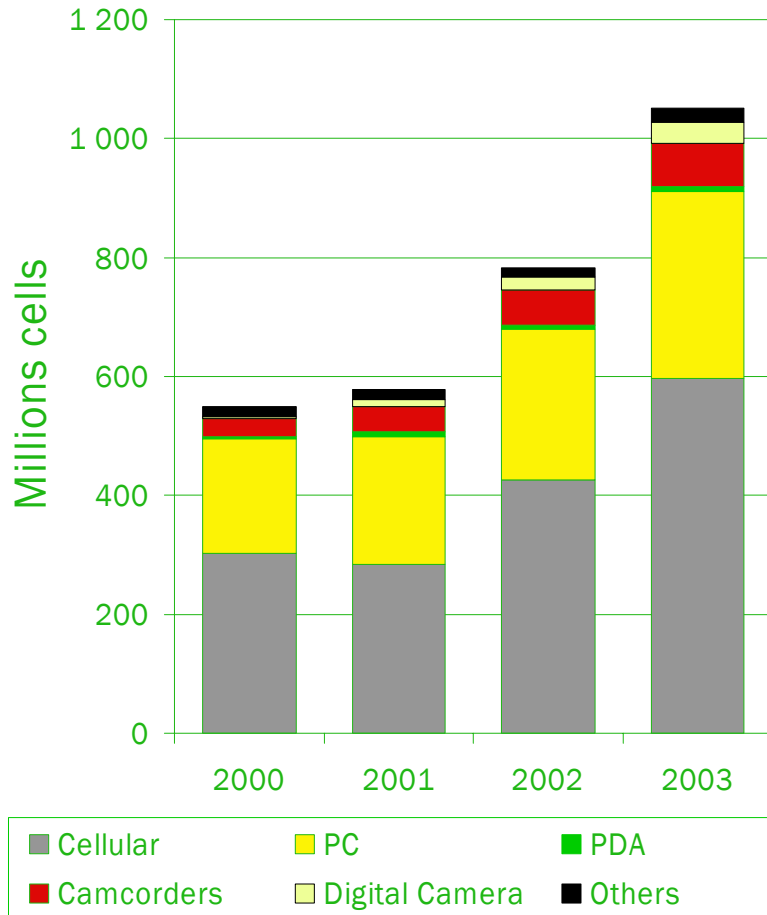


- Cellular phones is no more the driving application for NiMH
- New applications appeared: power tools, home appliances (shavers), RC Cars, cordless Phones,...
- What will be the next step ?
  - E-Bike & E-scooters ?
  - Video Games
  - Digital Cameras ?

Source : Compilation - Battery makers & users

# Lithium ion & Polymer cell usage per market 2000 -> 2003

## Two main markets : Portable PCs and Cellular Phones



Source : Compilation - Battery makers & OEM

# 3- The Main Trends Flying or Dropping ?

## Economical trends

Price decreases,  
Investment,

## Technical trends

new technologies, higher  
capacities, improving  
performances for raw  
materials,

## Regulation trends

Products banned,  
cyclability,



## Applications trends

Mobile - Portable PC - Digital Cameras  
- PDA - Power Tools - Toys - Cordless  
Phones - Home Appliances -  
Camcorders - Security systems - RC  
Cars -

## Geographic Area

US - Western Europe - Japan -  
China - Latin America -  
Eastern Europe - Asia Pacific -  
Middle East - Row

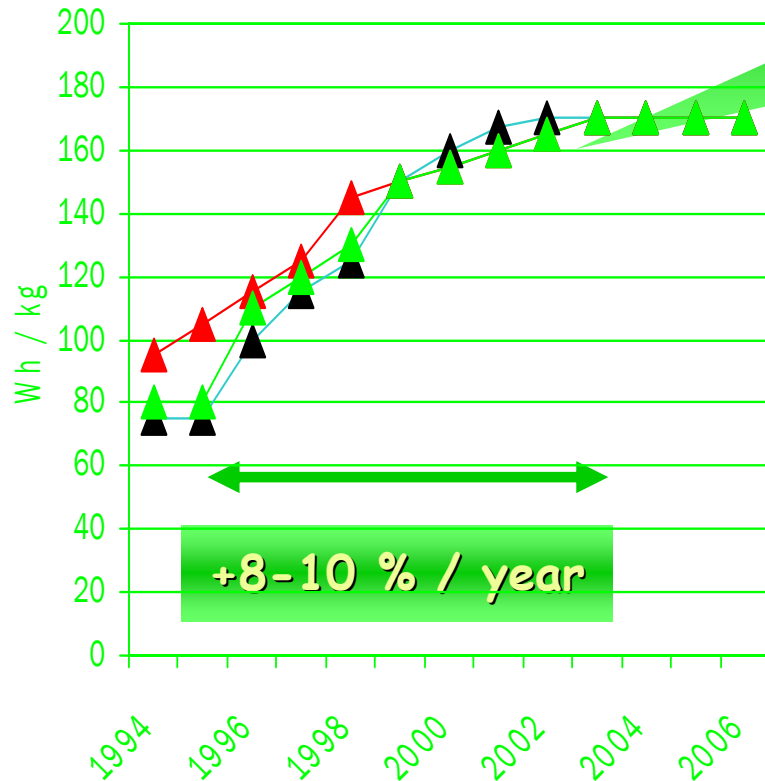
# Forecasts until 2008

## Market and competitive environment

- Portable PCs
- PDA
- Cellular Phones
- Camcorders
- Cordless Tools
- Digital Camera
- Cordless Phones
- Household devices
- RC Cars
- E-bikes
- Security lighting
- Others
- Main segment trends
- Power need trends (volume, weight, capacity, running time)
- Environment, recycling & Regulation
- Safety
- Raw Material Costs
- Penetration rate for each Technology
- 2008 Forecasts
- Battery maker & OEM maker strategies and positions

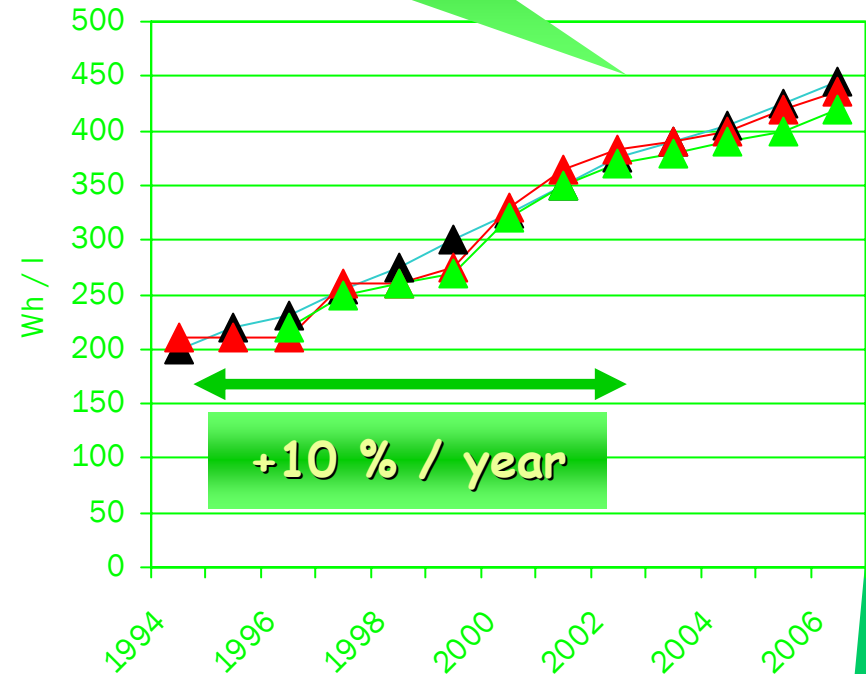
# Changing of Energy Density for Li-ion Prismatic cells

2004 - 2006 :  
Will New materials  
appeared?



+8-10 % / year

▲ GS ▲ SANYO ▲ TOSHIBA

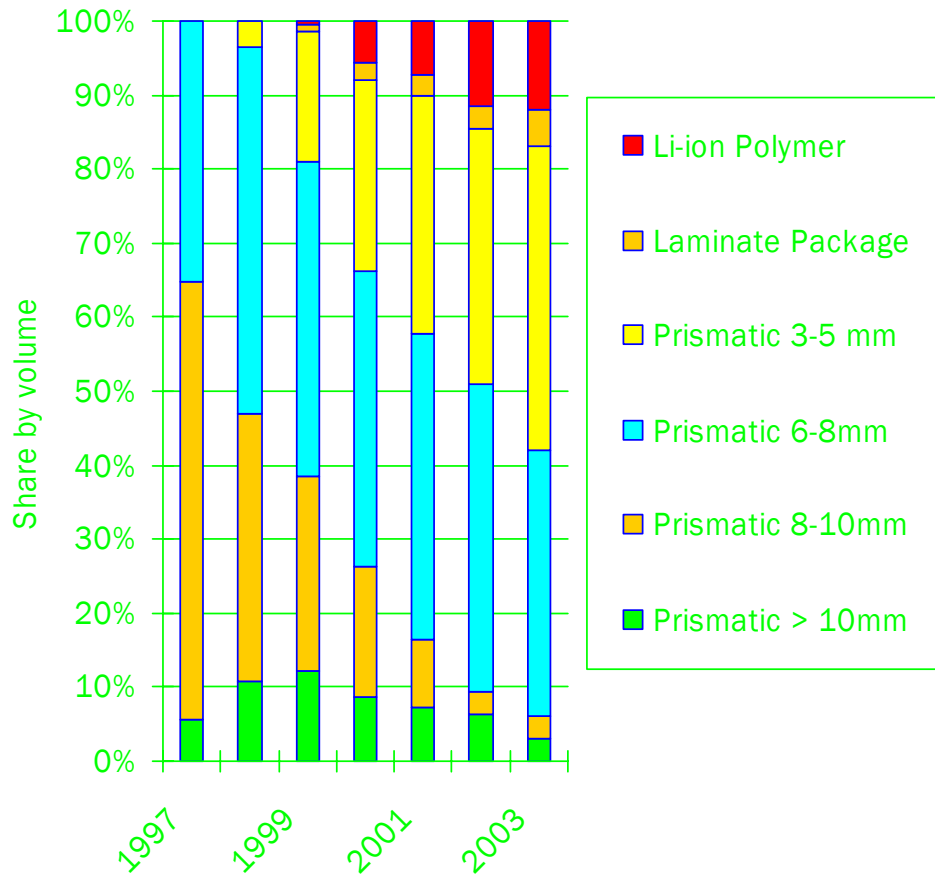


+10 % / year

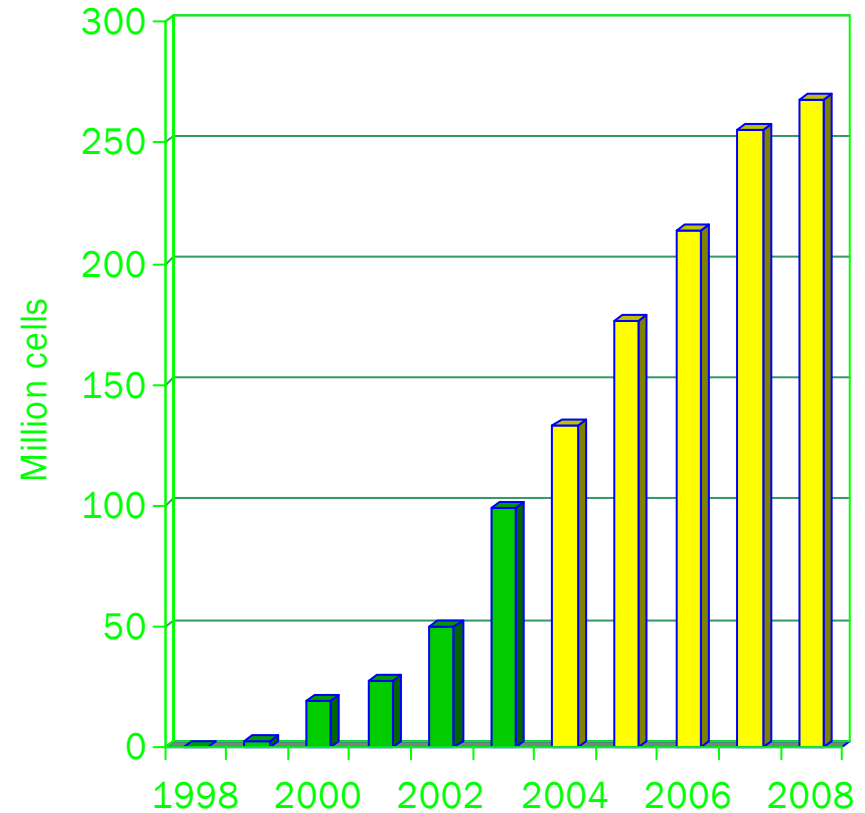
▲ Sanyo ▲ GS ▲ Toshiba

# Li-Polymer Market : The growth will continue

**Li-ion BATTERY SIZE**



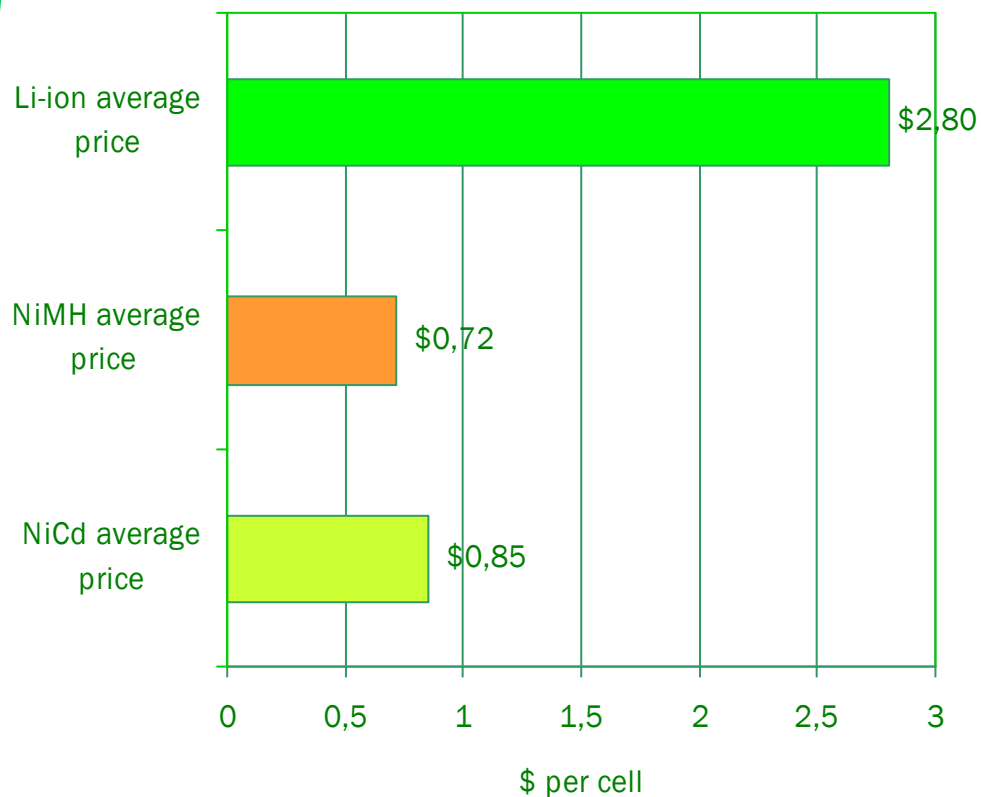
**Li-Pol BATTERY UP TO 2008**



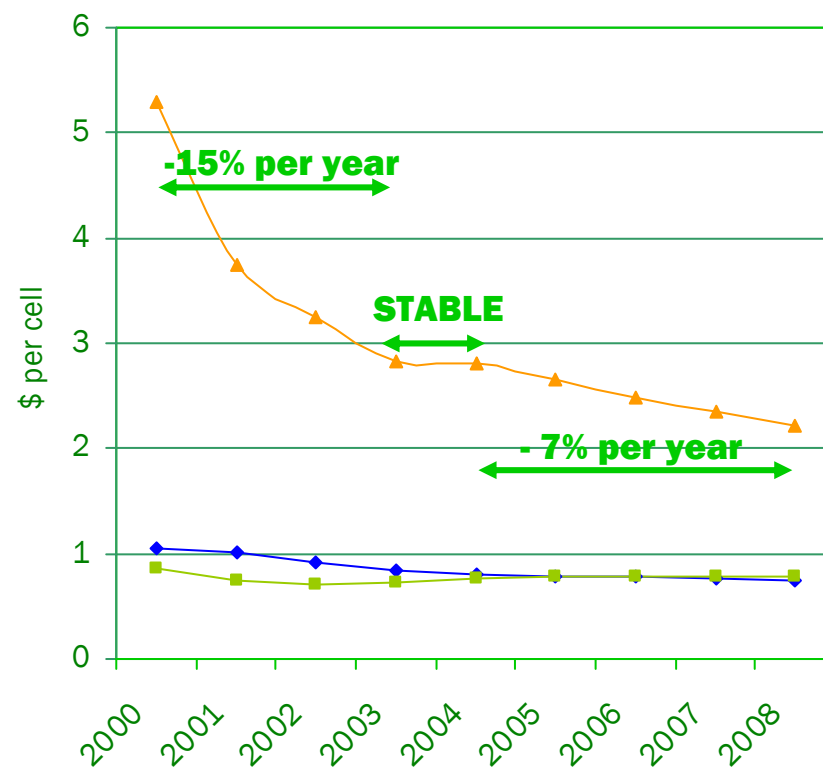
Source : AVICENNE Forecasts

# Average price for each Technology

## AVERAGE PRICE PER CELL IN 2003

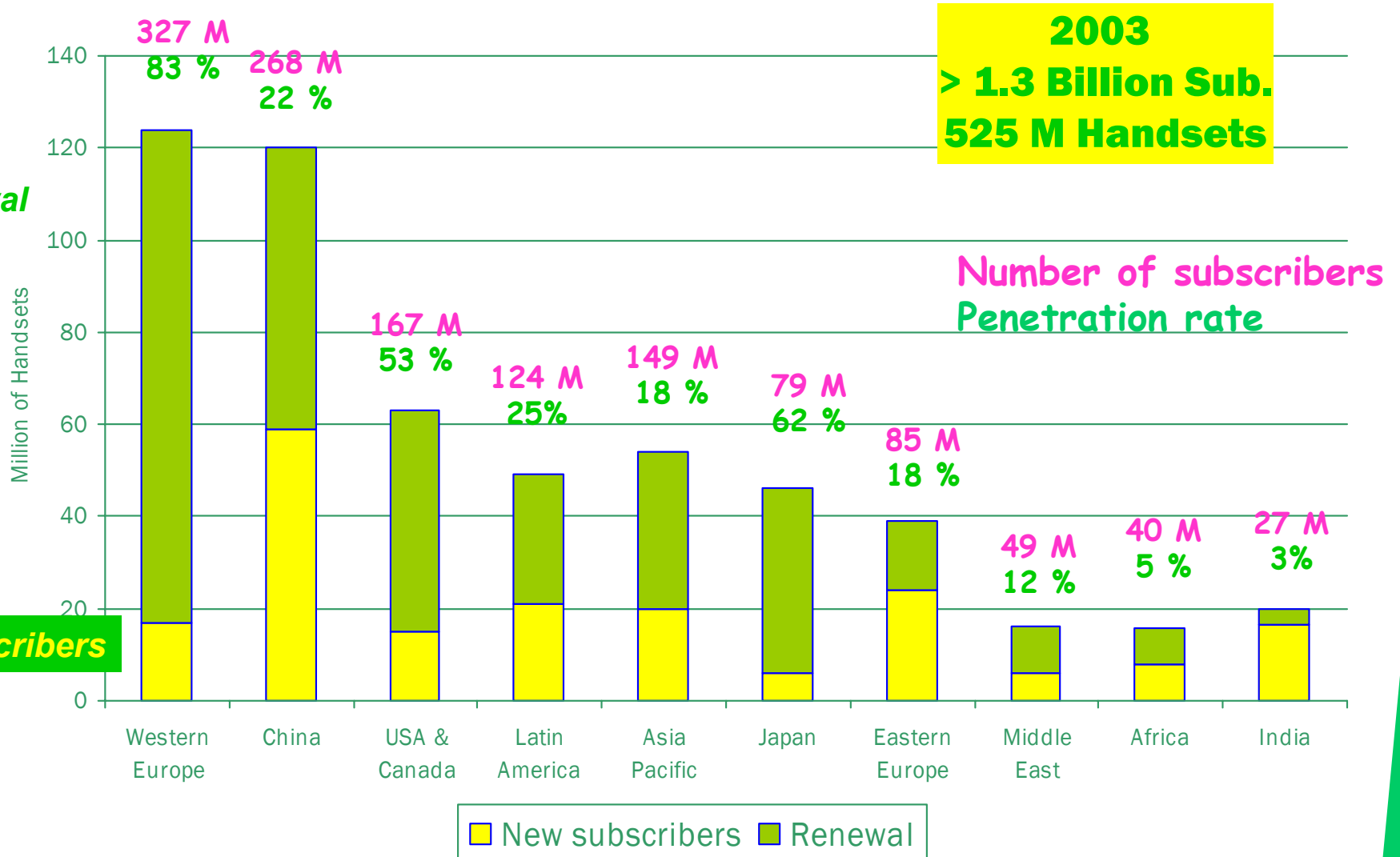


## AVERAGE PRICE FORECASTS

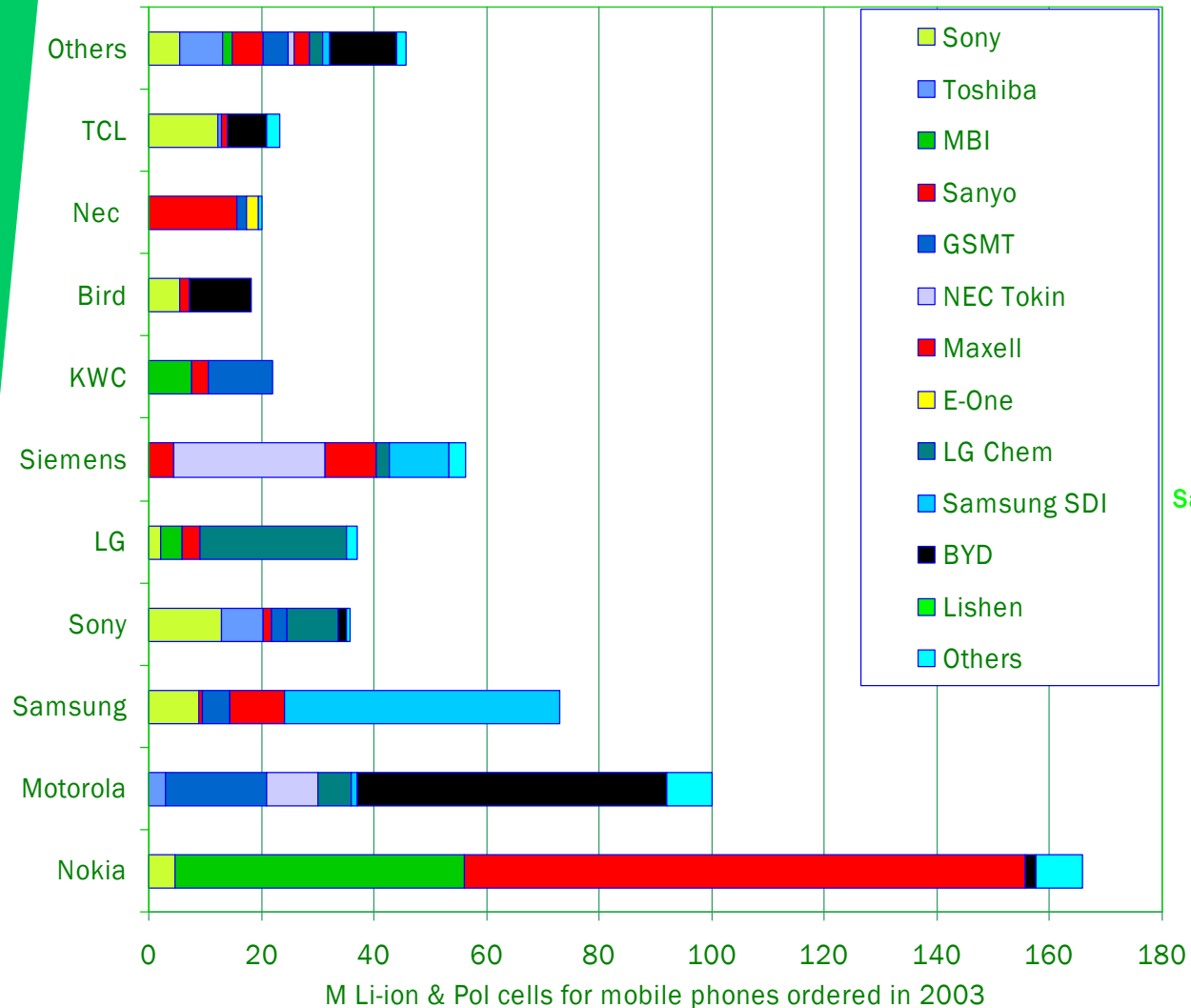


# FORCASTING APPLICATIONS

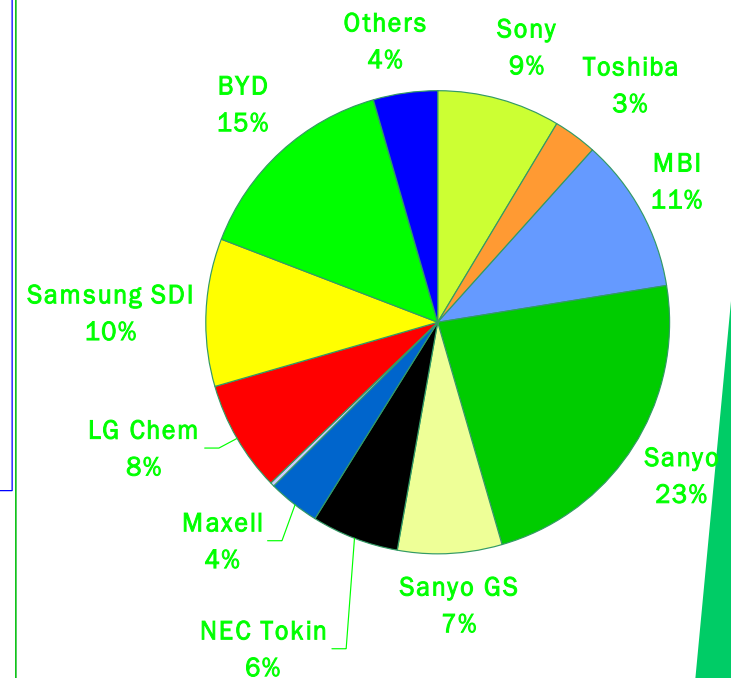
## ONE EXAMPLE : CELLULAR PHONES



# Li-ion, Li-P cells demand by cellular phone makers & by battery makers in 2003

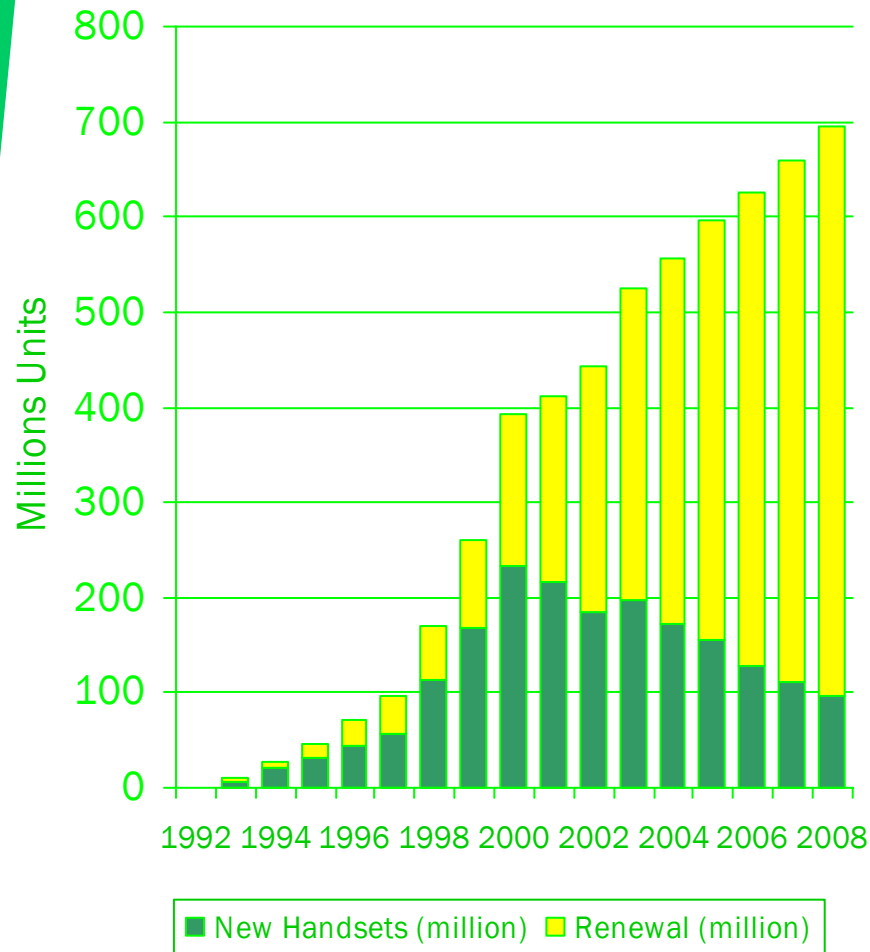


BATTERIES FOR CELLULAR PHONES MARKET SHARE (Volume) - 2003

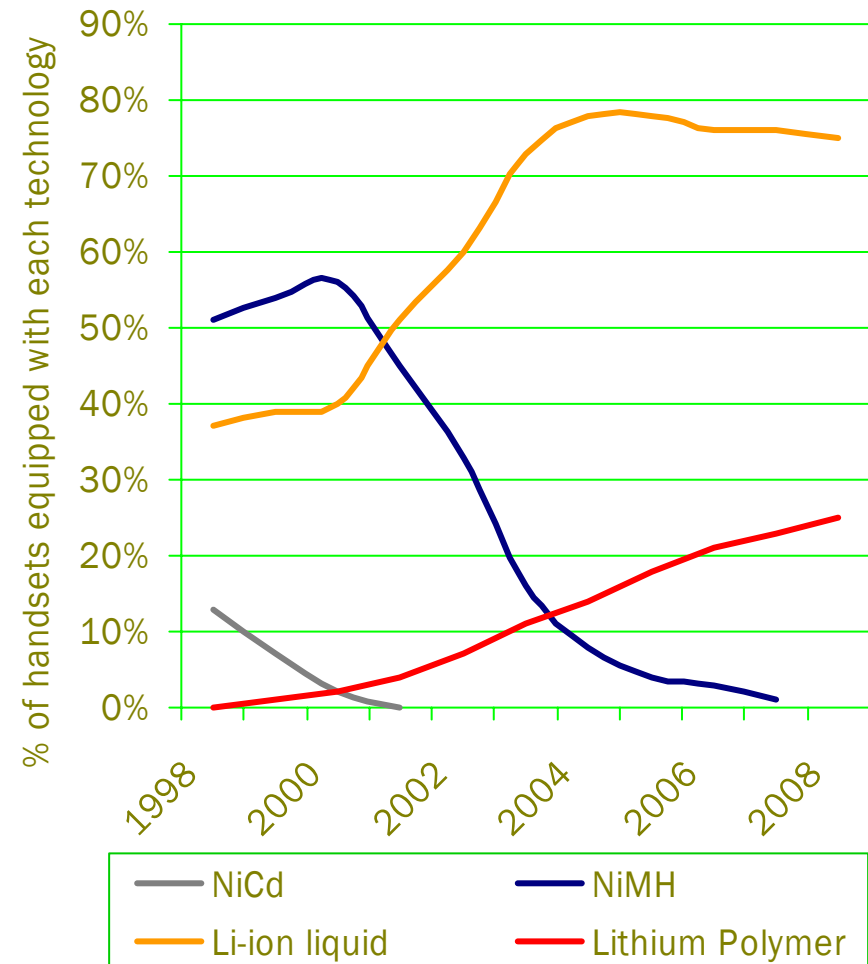


# Batteries for Cellular Phone market

## Cellular Phones Shipment increases



## Li-ion & Pol ratio increase



# Demand for Cellular Phones in 2008

## 700 million handsets

But, the market is moving

From

To

Europe, Japan, USA



China, Asia, India, Middle East, Eastern Europe...

New users



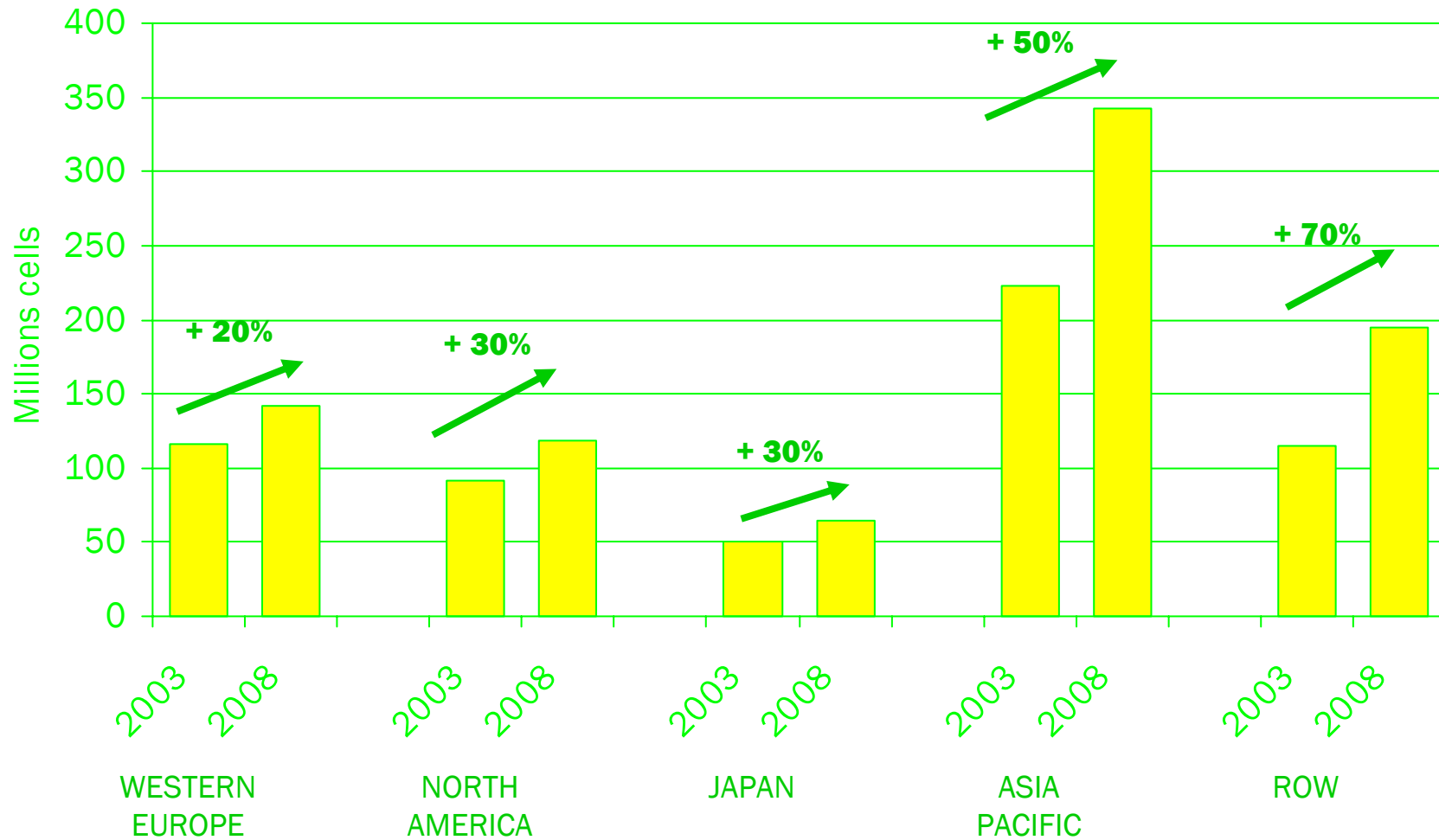
Renewal handsets

OEM  
Nokia, Motorola, Ericsson...

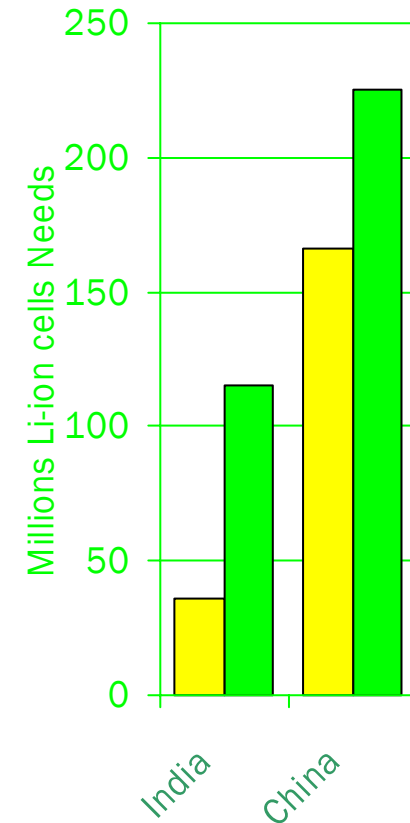
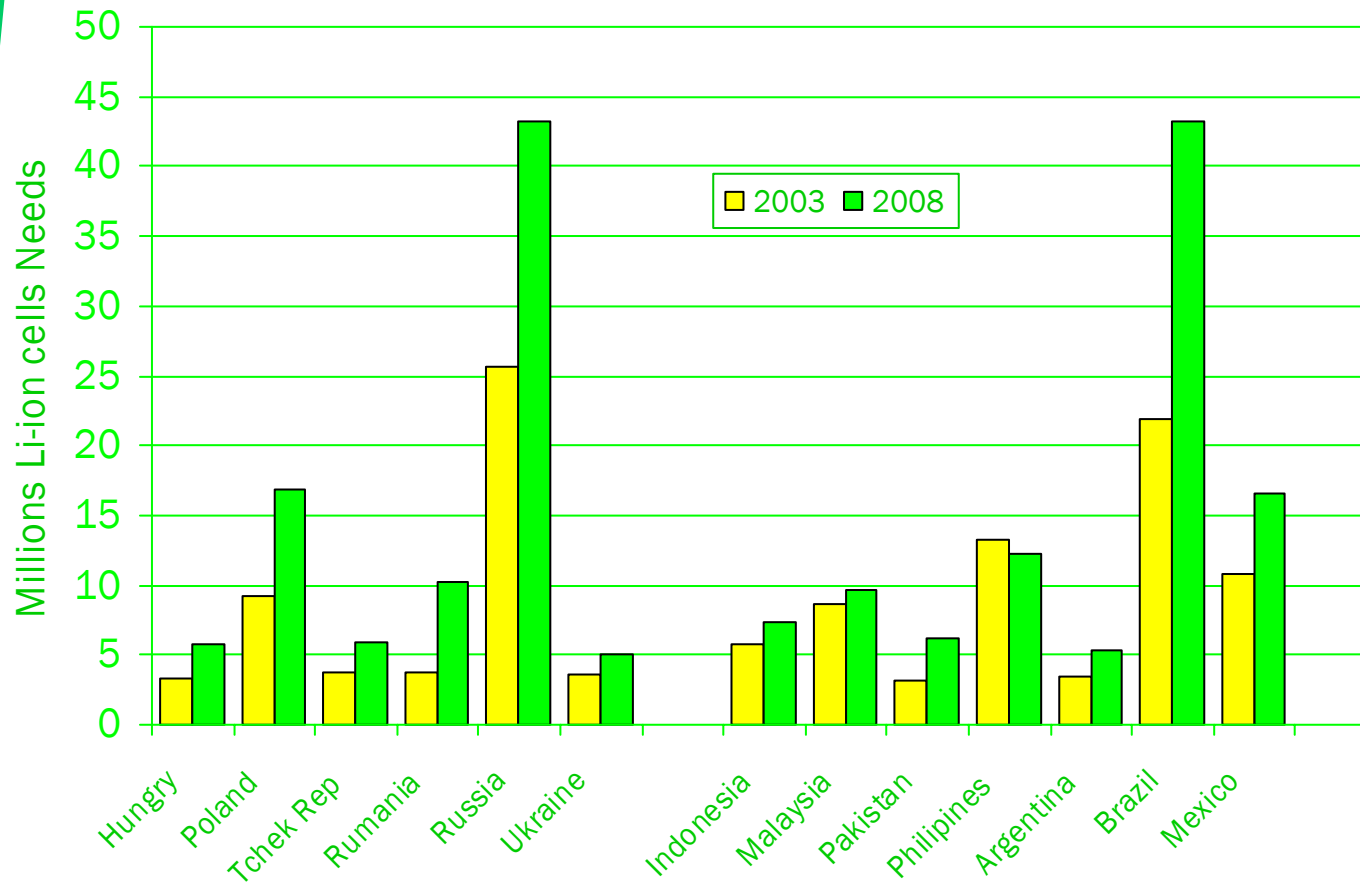


Subcontractors  
Flextronics, Elcoteq,  
Solectron...

# Li-ion & Pol Battery for cellular Phones (M cells)

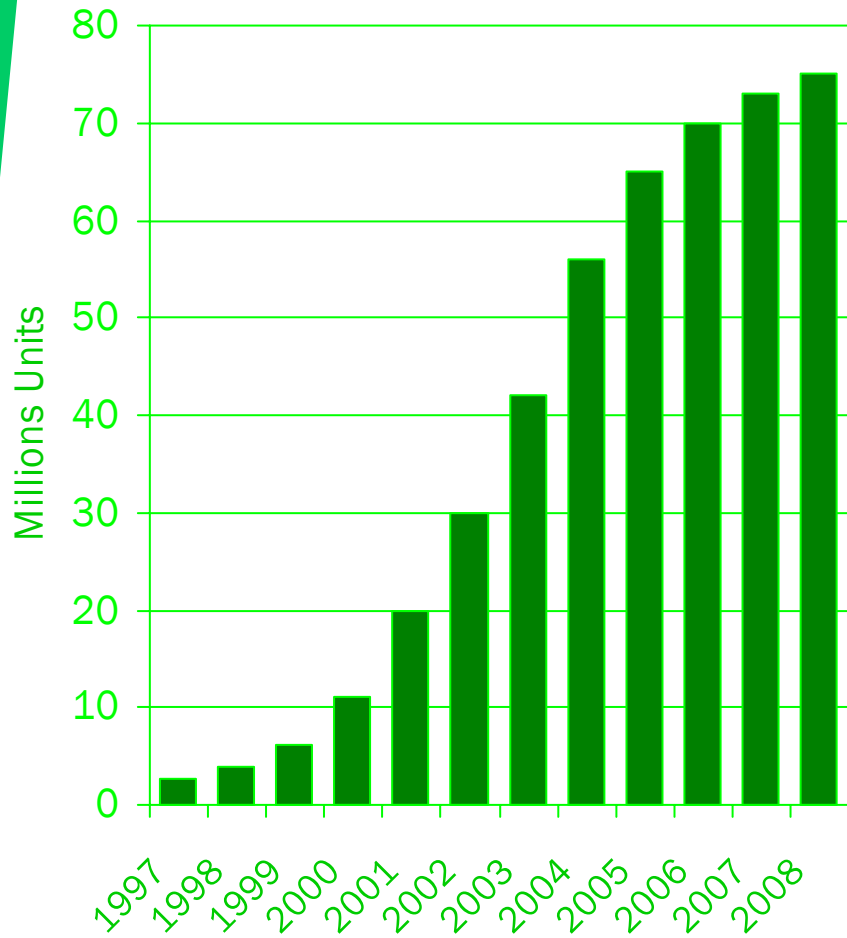


# Li-ion cells need in "Rest Of the World" countries

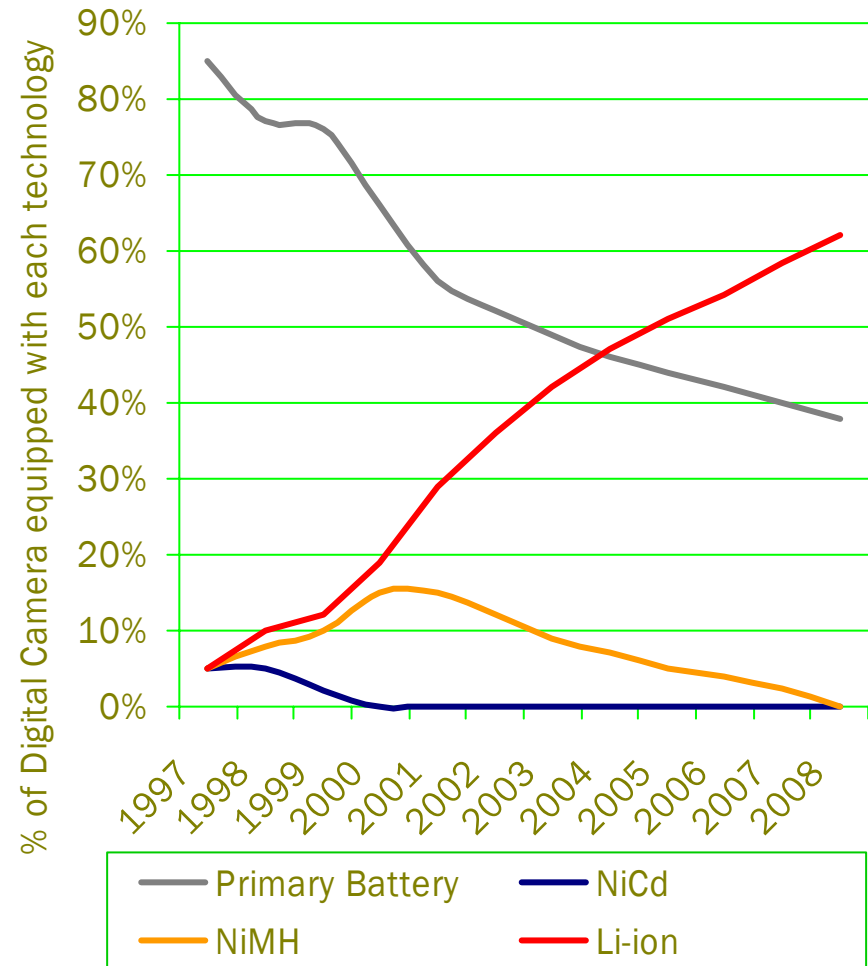


# An other example : Digital Camera

**DSC Shipment increases drastically**

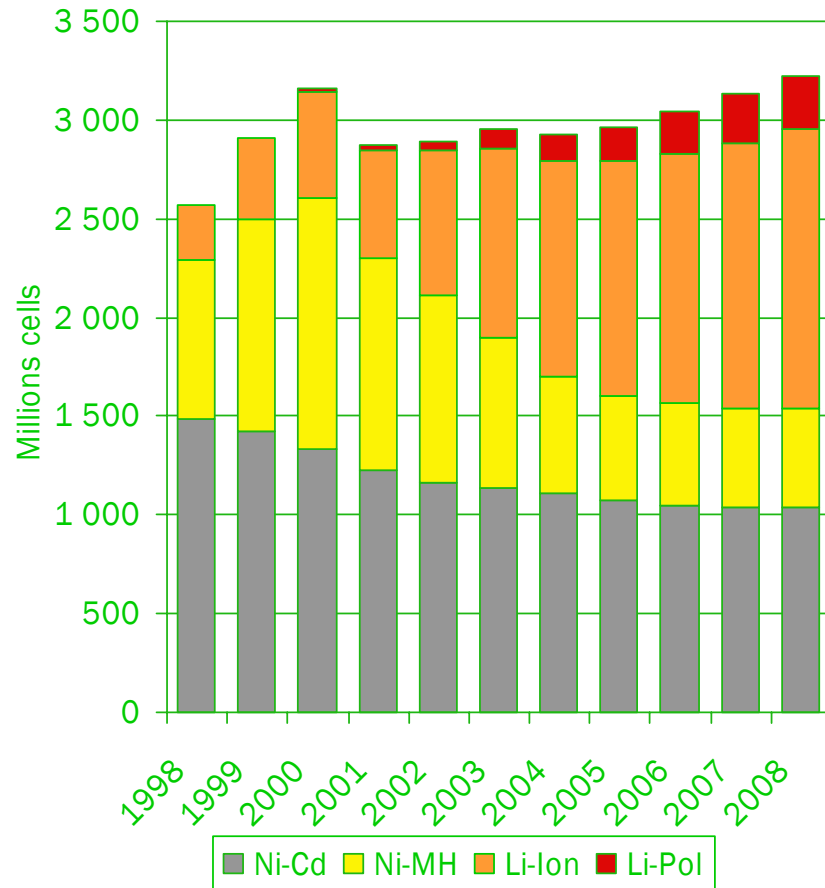


**Li-ion & Pol ration is increasing**

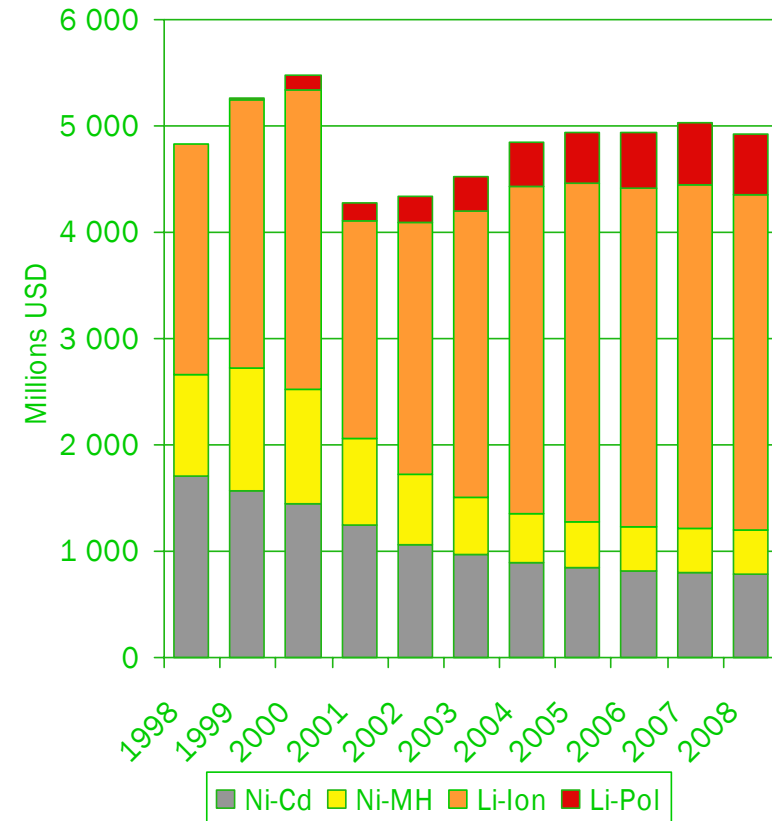


# Worldwide battery market in volume (1993 - 2008)

**VOLUME (M Units)**



**VALUE (M US \$)**

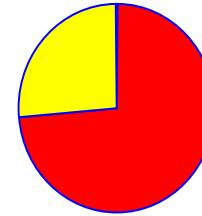
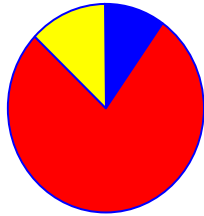


# Battery Application trends

2003

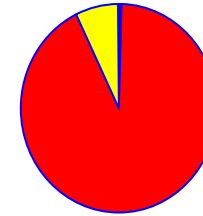
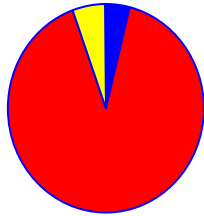
2008

1900 M\$



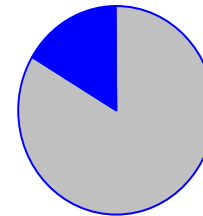
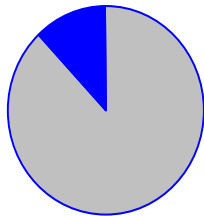
1750 M\$

1000 M\$



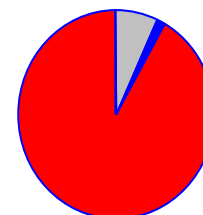
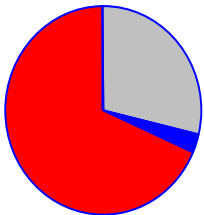
1400 M\$

400 M\$



470 M\$

300 M\$



300 M\$

NiCd

NiMH

Li-ion

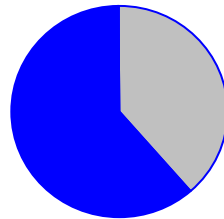
Li-P

# Battery Application trends

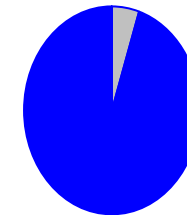
2003

2008

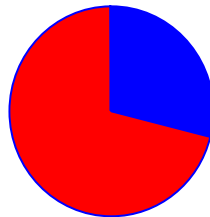
100 M\$



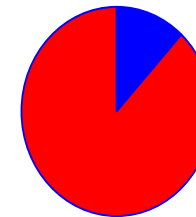
80 M\$



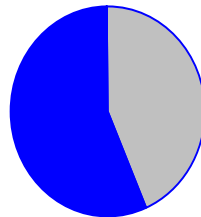
140 M\$



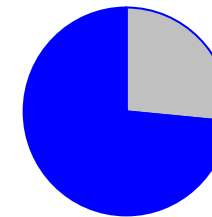
250 M\$



160 M\$



170 M\$



NiCd

NiMH

Li-ion

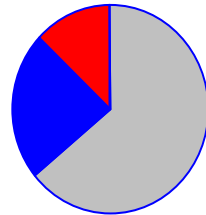
Li-P

# Battery Application trends

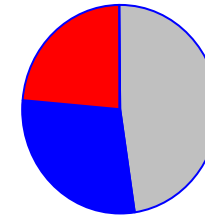
2003

2008

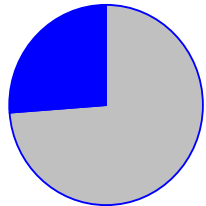
85 M\$



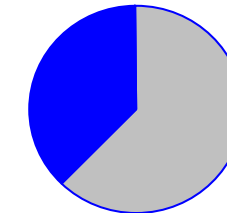
130 M\$



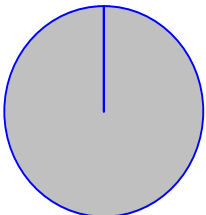
100 M\$



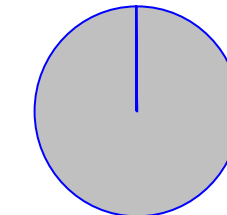
75 M\$



85 M\$



70 M\$



260 M\$

Others

220 M\$

+ ?



NiCd



NiMH



Li-ion

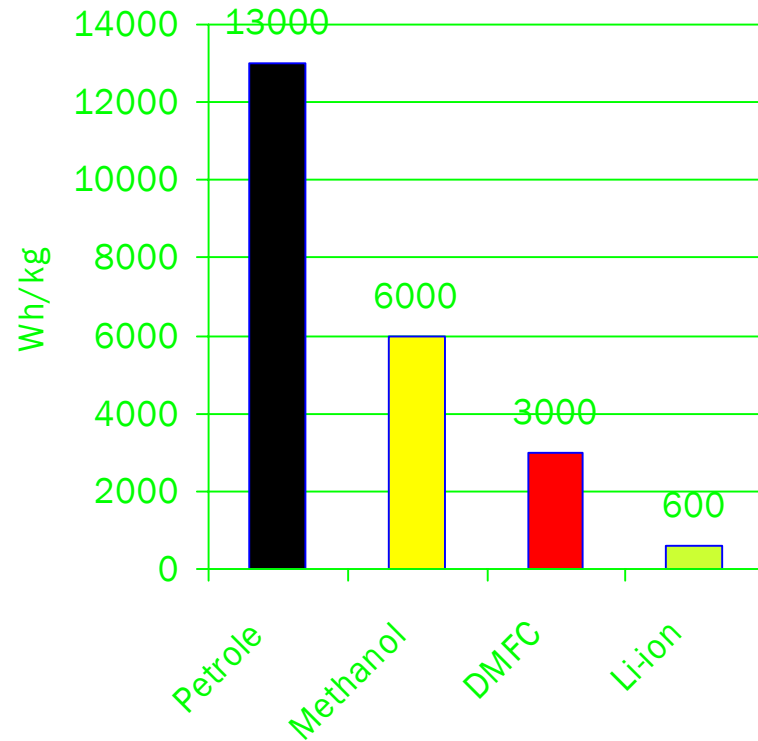


Li-P

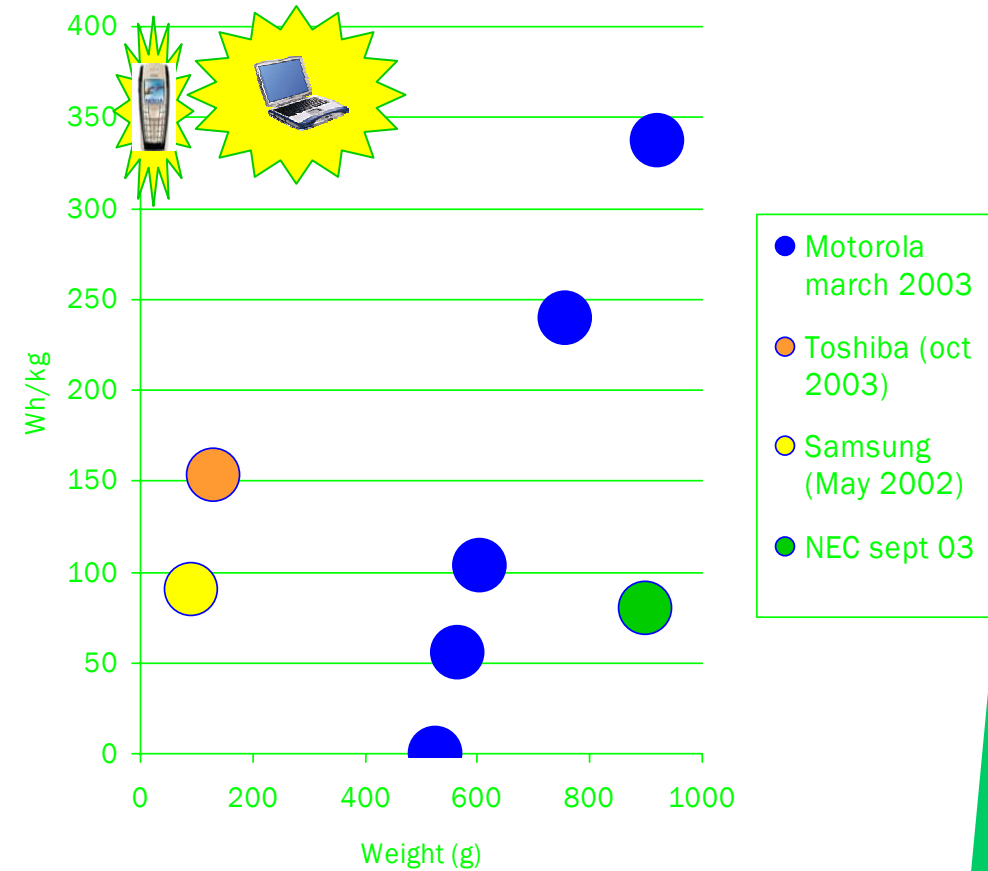
# Small & Micro Fuel cells

## Miniaturization & efficiency have to be improved

### Micro Fuel Cells Theoretical Energy Density

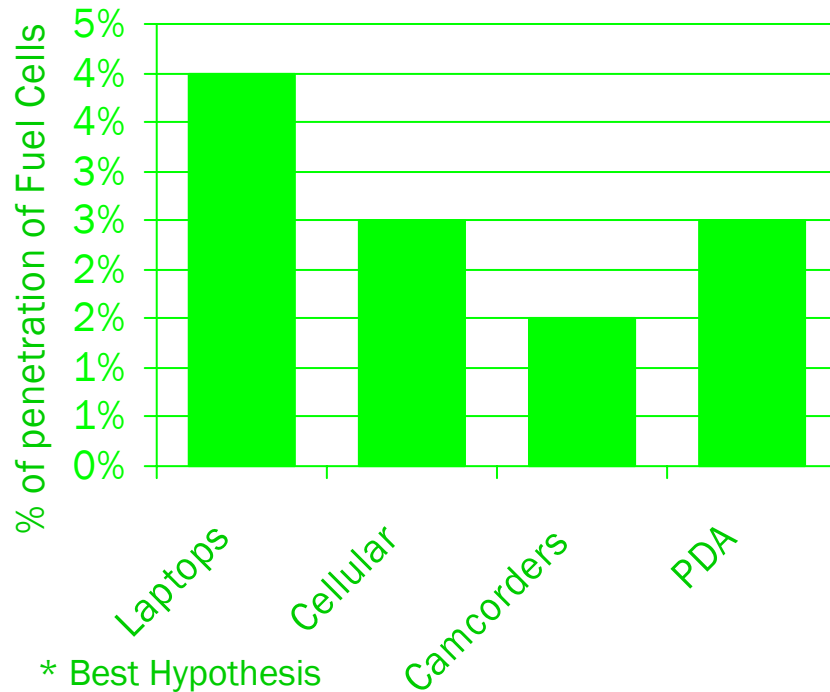


### Micro Fuel Cells Prototype today

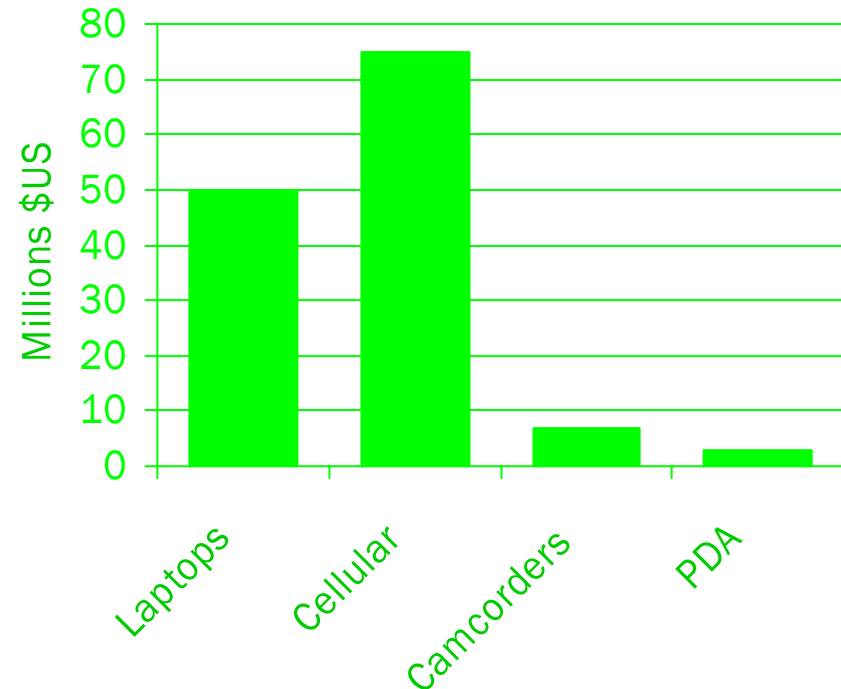


# Micro Fuel Cells : A niche market by 2010

**% of Penetration of Fuel cells**



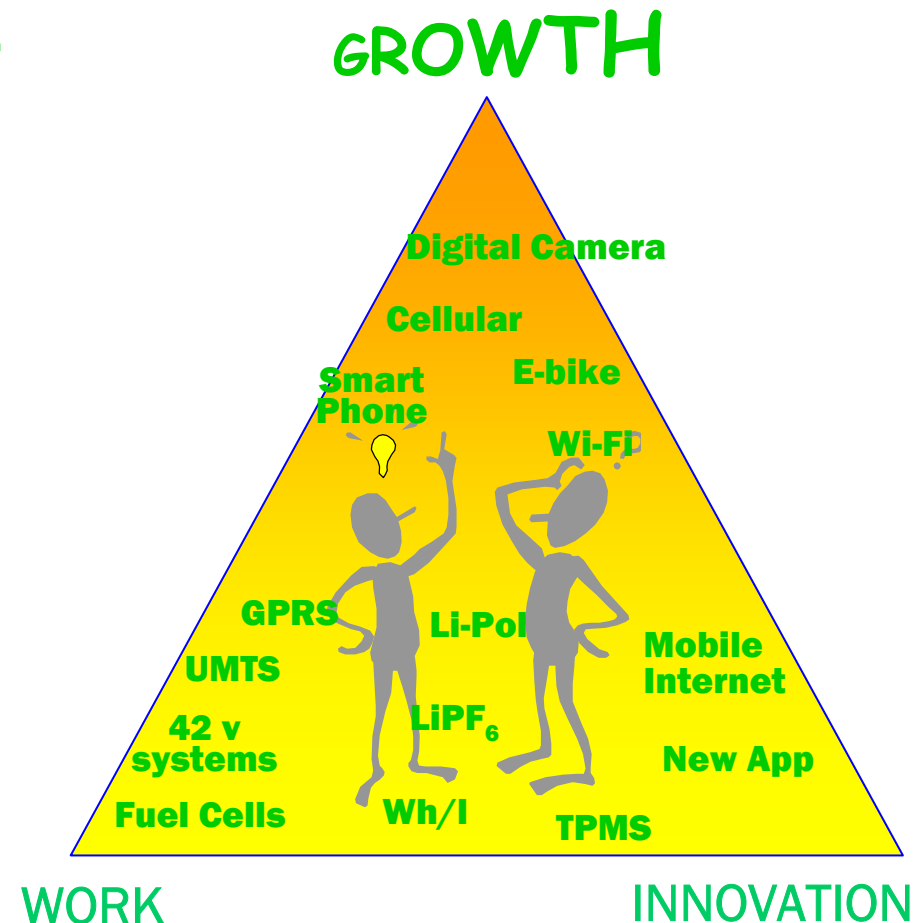
**2010 MARKET**



- **Cartridge market is more than 10 times higher than MFC market, it will be the biggest market => More than a US\$ 1 billion market in 2010**

# CONCLUSION

- Are users totally satisfy with their batteries ?
- Will the portable electronic market increase ?
- Are the power needs per electronic devices increasing ?
- Is miniaturization a high trend in portable electronics ?
- More than half of the worldwide population had never made a phone call in their life...



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