



Information for growth

Li ion battery material market trends past and future

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Presentation Outline

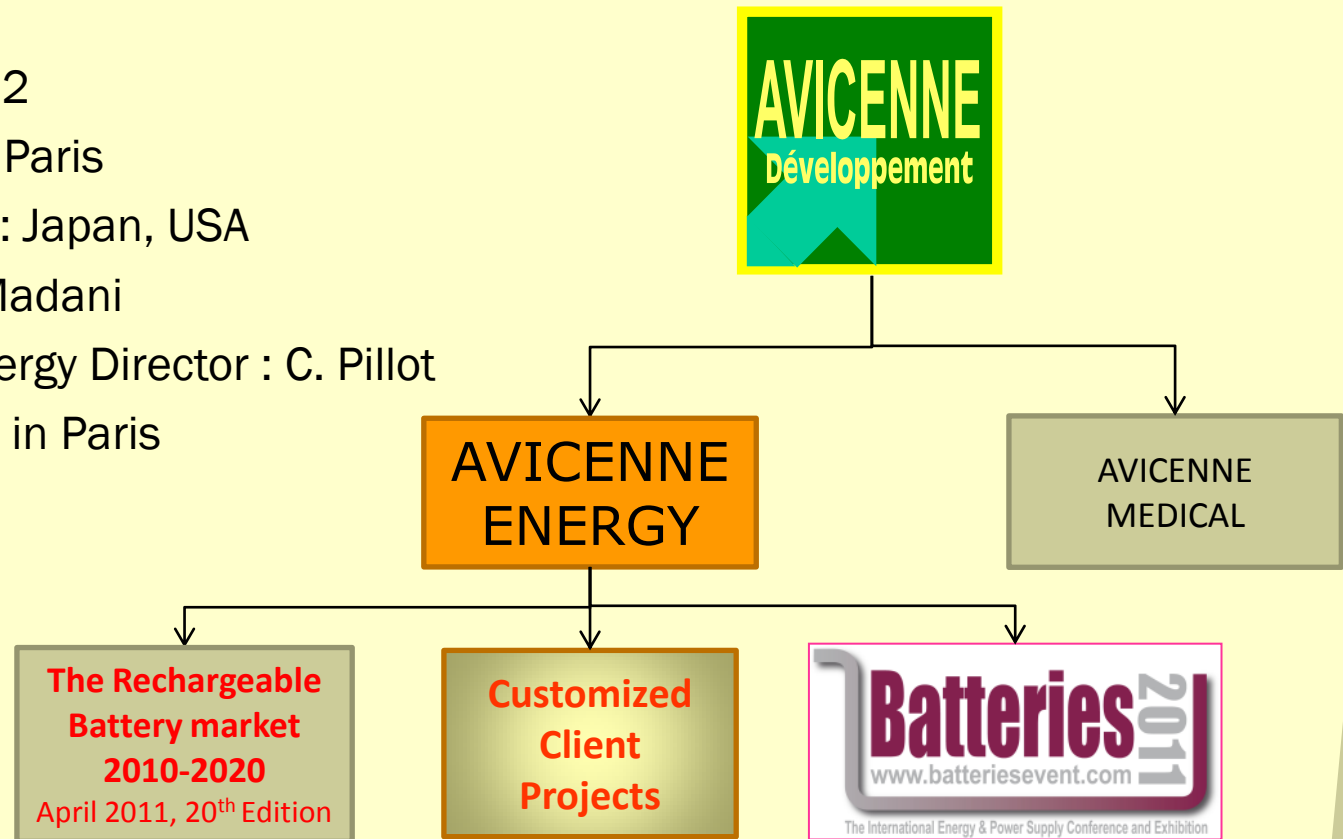
- The Li-ion battery market in 2010
- The Li-ion battery value chain
- Li-ion battery material market
- Forecasts & conclusions

AABC Europe 2011
6-10 June
Mainz, Germany

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Powering your company's market strategy with in-depth research

- Creation: 1992
- Headquarter: Paris
- Liaison Office: Japan, USA
- Director: M. Madani
- AVICENNE Energy Director : C. Pillot
- 4 consultants in Paris



METHODOLOGY: EXTENSIVE FIELD RESEARCH TO RETRIEVE & CROSS CHECK INFORMATION

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Top management contact network



Conferences & Exhibitions



2nd Int'l Rechargeable Battery Expo
BATTERY JAPAN



CIBF2010
9th China International Battery Fair

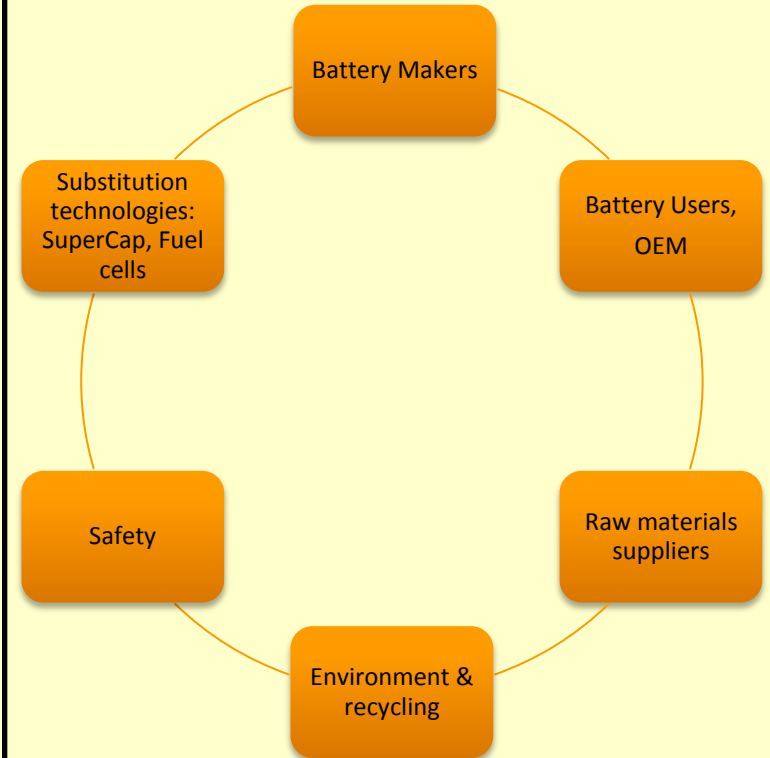
JAPAN ELECTRONICS SHOW

CeBIT

In Depth analysis Of applications



Cross Check Analysis



MORE THAN 130 REFERENCES WORLDWIDE

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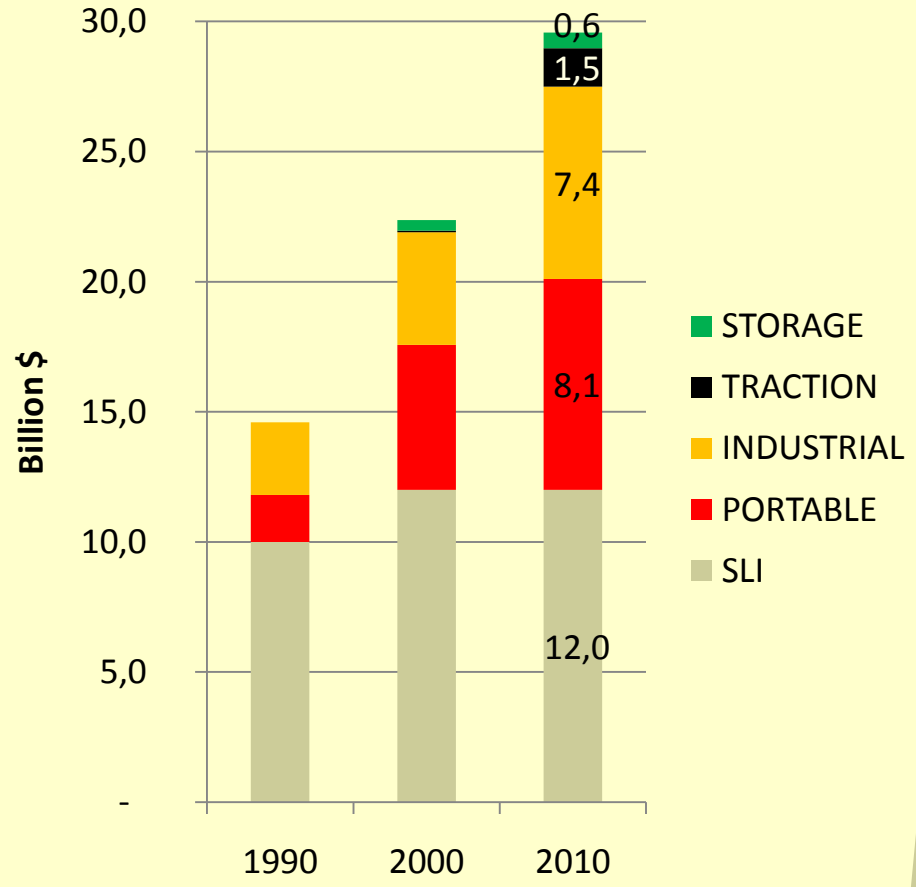
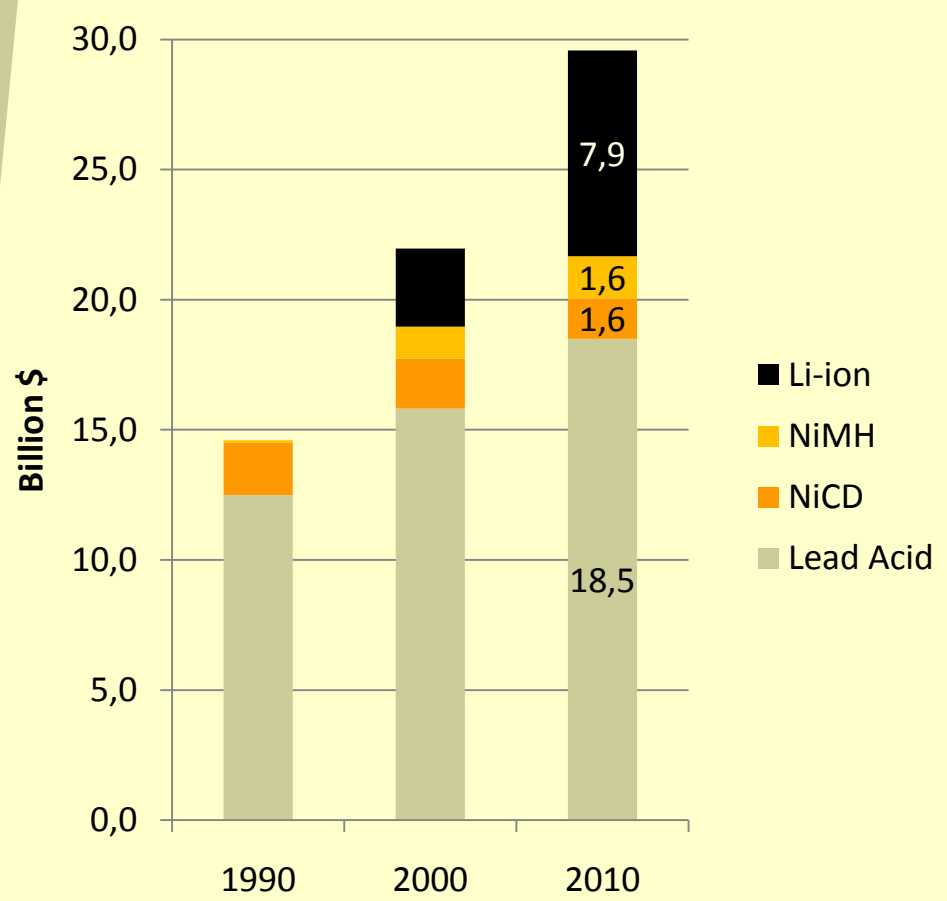
- | | | | |
|------------------------------------|-----------------------------|------------------------|--------------------------------|
| ➤ A123 | ➤ DGA | ➤ Intersil | ➤ Renault |
| ➤ Ahlstrom | ➤ Dialog Semiconductor | ➤ ITRI | ➤ Rhodia |
| ➤ Air Liquide | ➤ Dow Chemical | ➤ ITS | ➤ Saft |
| ➤ Air Product | ➤ Dupont | ➤ Johnson Controls | ➤ Samsung SDI |
| ➤ Alcatel | ➤ Duracell | ➤ JBC | ➤ Sanik |
| ➤ Amperex (ATL) | ➤ EDF | ➤ Kodak | ➤ Schroder Venture |
| ➤ Aros Securities | ➤ Electro Energy | ➤ Kruger | ➤ Scotent Entreprise |
| ➤ ARC | ➤ Ener 1 | ➤ Lazard | ➤ Shenzhen High Power |
| ➤ Atofina - Arkema | ➤ Energizer | ➤ Leclanché | ➤ Technology |
| ➤ AT Kearney | ➤ ETC AB | ➤ Legrand | ➤ Schott AG |
| ➤ Axelon | ➤ Facom | ➤ LG Chemical | ➤ SKC |
| ➤ Bain | ➤ Falcon Bridge | ➤ Lion cells | ➤ SVE - Dassault |
| ➤ Battery R&D Association of Korea | ➤ Fairshild semiconductor | ➤ Little Fuse | ➤ Solvay |
| ➤ B&D | ➤ Fameart | ➤ Lilipucian | ➤ Sony |
| ➤ BHP Billiton | ➤ FIST | ➤ Lynas Corp | ➤ Stibat |
| ➤ Brand Licencing Parners (BLP) | ➤ Floridienne de Chimie | ➤ Matsushita | ➤ Storck |
| ➤ Bourns | ➤ FMC Lithium | ➤ Microsoft | ➤ Toda Kogyo |
| ➤ Bosch | ➤ Fortu Power Cell | ➤ MTI Micro Fuel Cells | ➤ TOTAL |
| ➤ BYD | ➤ France Telecom | ➤ Mindbranch | ➤ Total Wireless Solution |
| ➤ Cap X | ➤ Fulton Innovation | ➤ Moltech | ➤ Toyota |
| ➤ Catella | ➤ GAIA | ➤ Molycorp | ➤ Tyco |
| ➤ Carbone Lorraine | ➤ GIL Import Batteries Ltd. | ➤ Motorola | ➤ Umicore |
| ➤ CDN Cobalt | ➤ GS Melcotec | ➤ NCCP - Russia | ➤ Uniross |
| ➤ CEA/LITEN | ➤ HC Starck (Bayer) | ➤ Nitech | ➤ Varta |
| ➤ Celgard | ➤ HILTI | ➤ NKKPC – Brett Nelson | ➤ Warburgpincus |
| ➤ Chemetall | ➤ Hitachi Maxell | ➤ Norilsk Nickel | ➤ World Industrial Information |
| ➤ CIAPS | ➤ Hollingsworth & Vose Cie | ➤ NTK Powerdex | ➤ Center |
| ➤ CIBA | ➤ Honeywell | ➤ OMG Inc | ➤ WR Grace & Cie |
| ➤ CNRS | ➤ HPL (High Power Lithium) | ➤ Panasonic | ➤ Zebra |
| ➤ Cogema | ➤ Hutchinson | ➤ Philips | ➤ ZPower |
| ➤ CRU Group | ➤ IER | ➤ PK & Wise | |
| ➤ CSC Challenge Strategy Change | ➤ IGL Export. | ➤ PRAYON | |
| ➤ DELTA | ➤ International Component | ➤ PSA | |
| | ➤ Inco | ➤ Rayovac | |

1. THE LI-ION BATTERY MARKET IN 2010
2. THE LI-ION BATTERY VALUE CHAIN
3. LI-ION BATTERY MATERIAL MARKET
4. FORECASTS & CONCLUSIONS

THE WORLDWIDE BATTERY MARKET 1990-2010

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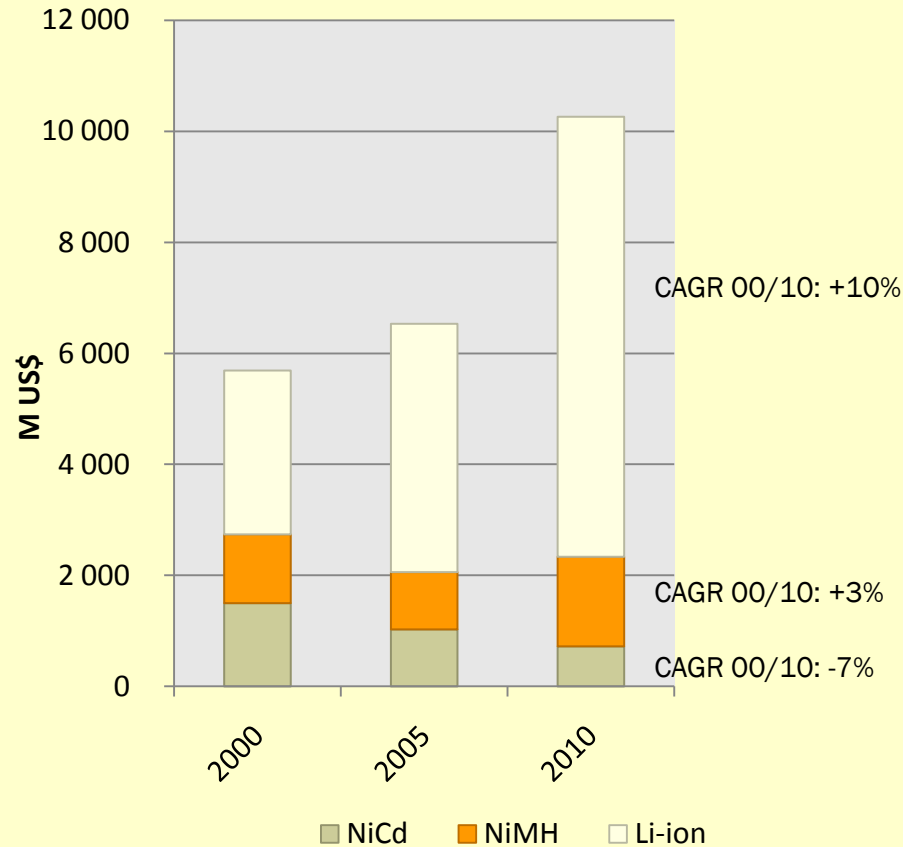
30 BILLION US\$ & 3-4% AVERAGE GROWTH PER YEAR (1990-2010)



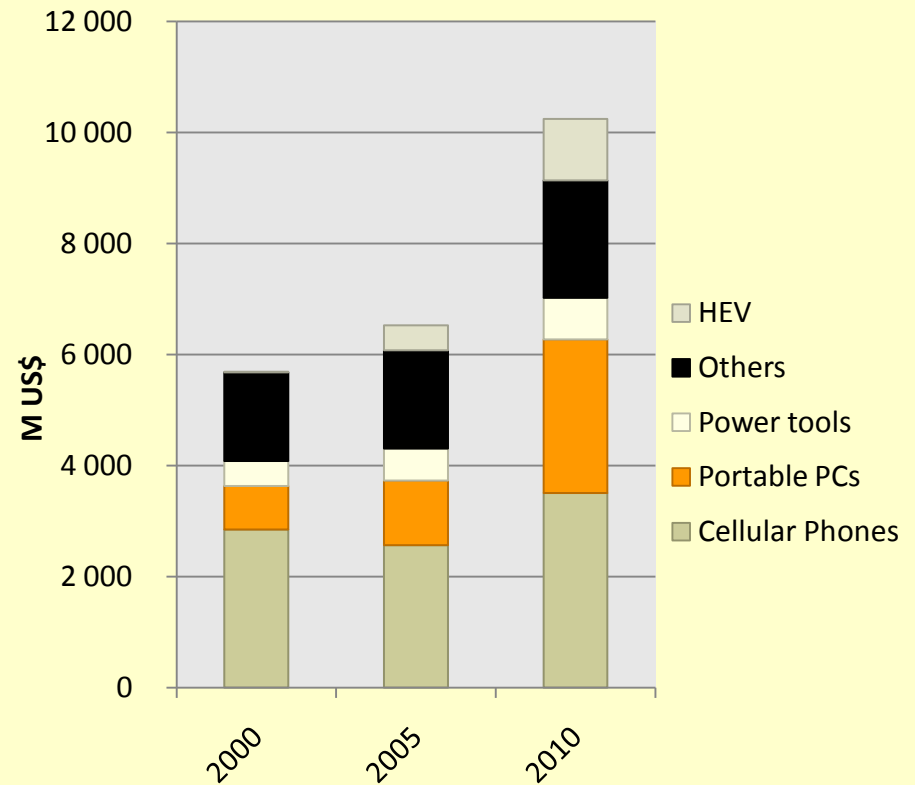
WORLDWIDE RECHARGEABLE BATTERY MARKET (M\$)

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Battery sales, M US\$, Worldwide, 2000 - 2010



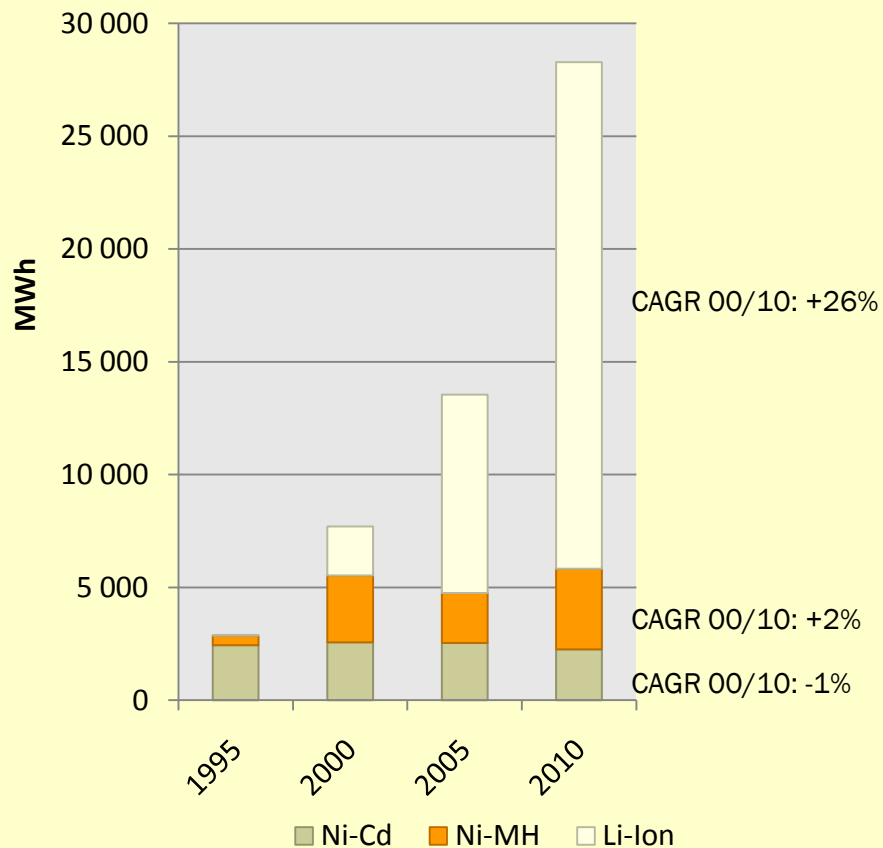
Battery sales, M US\$, Worldwide, 2000 - 2010



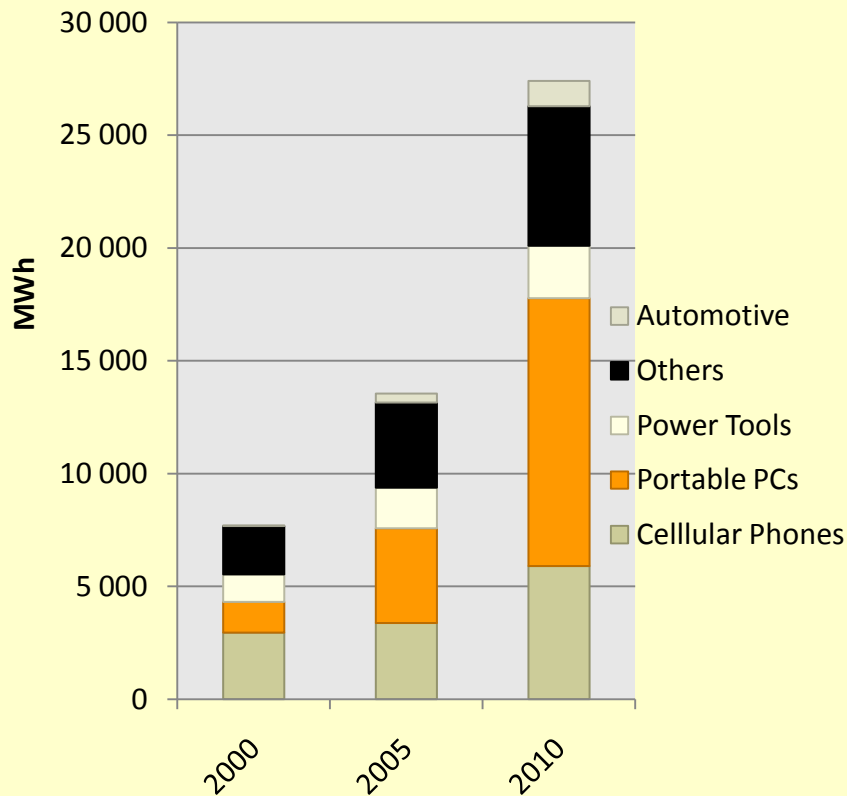
WORLDWIDE RECHARGEABLE BATTERY MARKET (MWh)

Information for growth

The worldwide rechargeable battery market, MWh, 2000-2010



The worldwide rechargeable battery market, MWh, 2000-2010

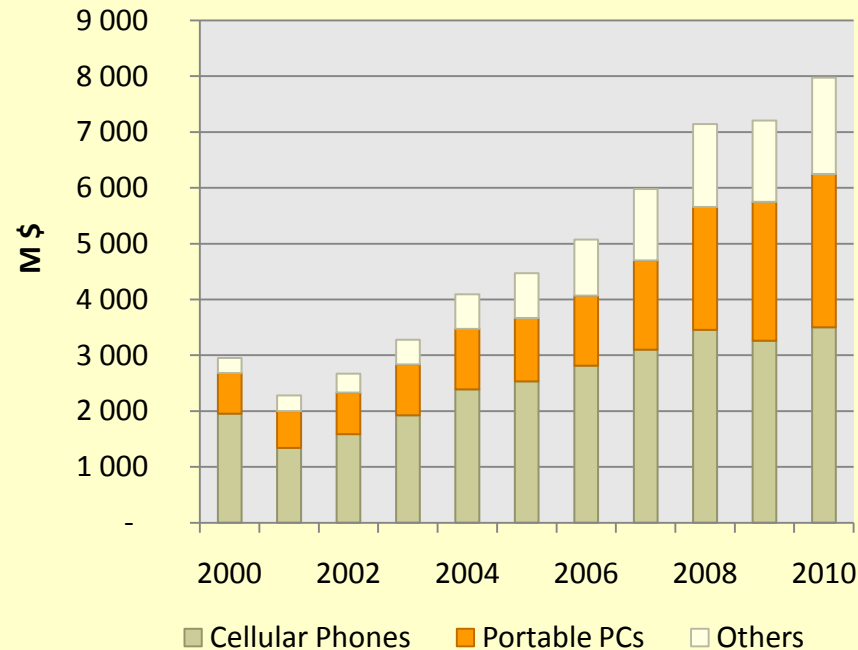


MAIN APPLICATION: CELLULAR, NOTEBOOK

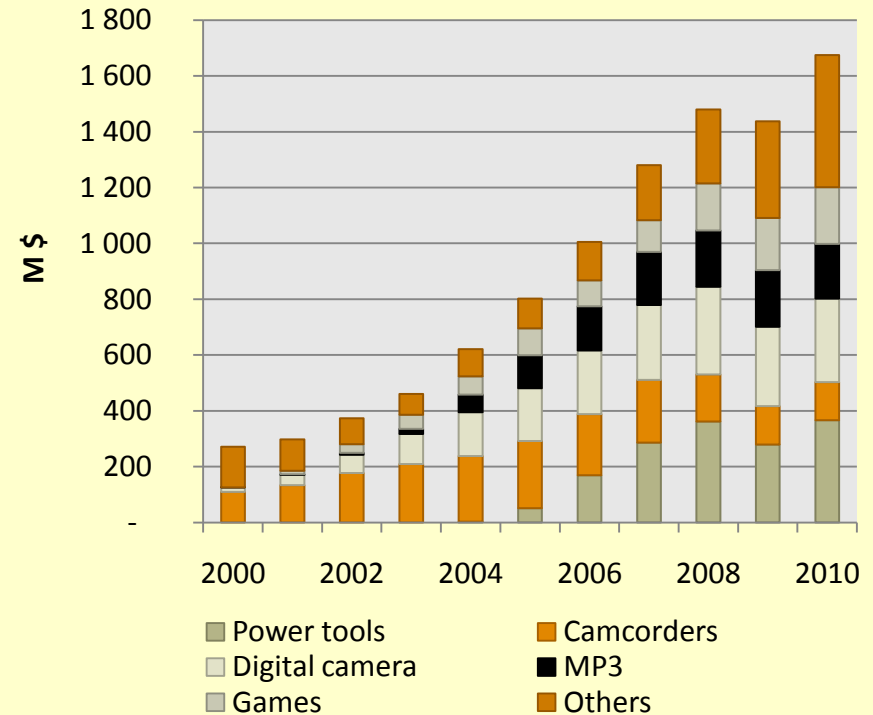
3 800 M Li-ion cells – 22 500 MWh
8 000 M\$

CAGR 2005/2010:
+21% per year in volume
+10% per year in value

Li-ion Battery sales,
M\$, Worldwide, 2000-2010

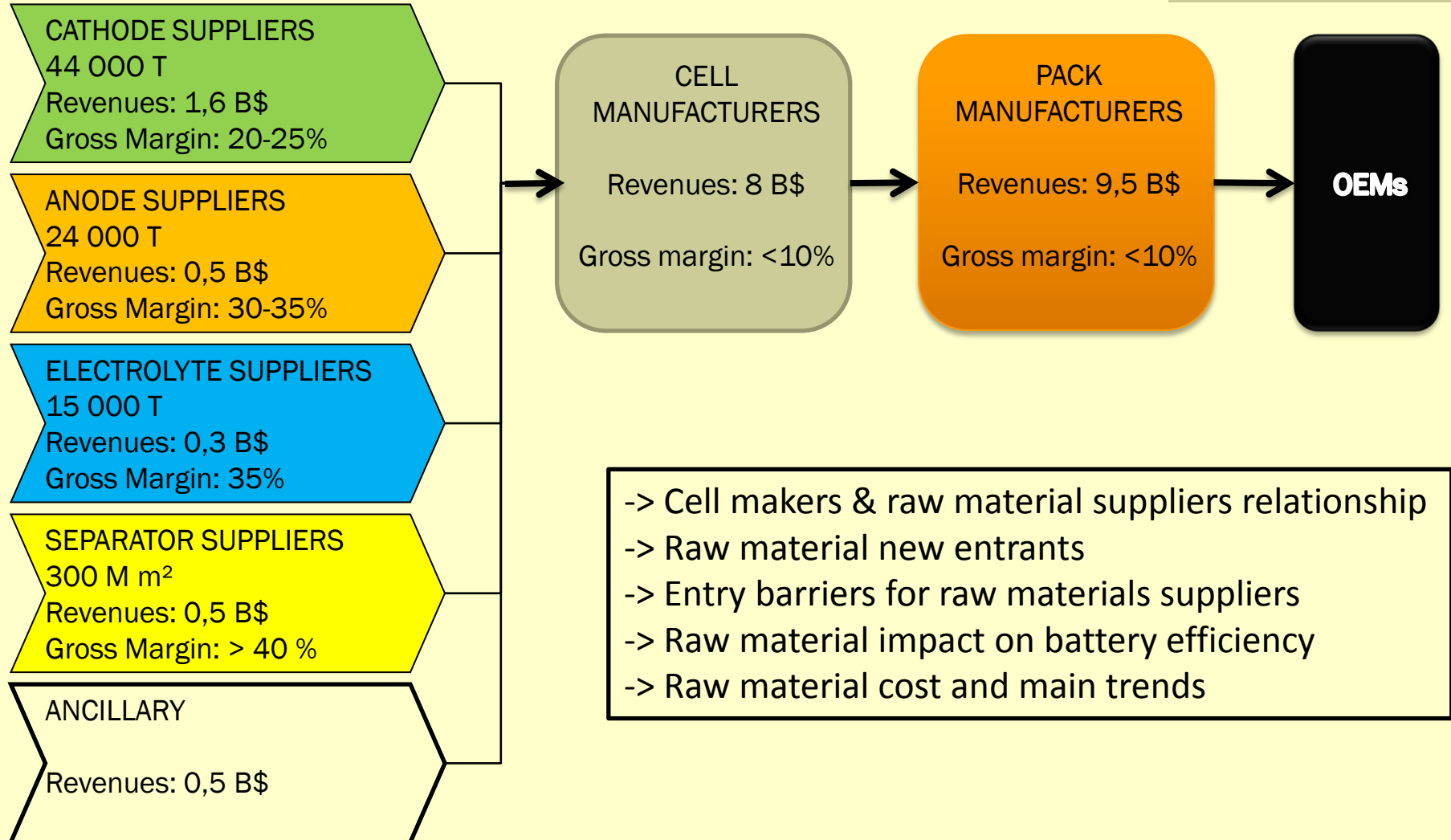


Li-ion Battery sales,
M\$, Worldwide, 2000-2010



LIB VALUE CHAIN IN 2010

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CATHODE ACTIVE MATERIALS

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CATHODE SUPPLIERS
44 000 T
Revenues: 1,6 B\$
Gross Margin: 20-25%

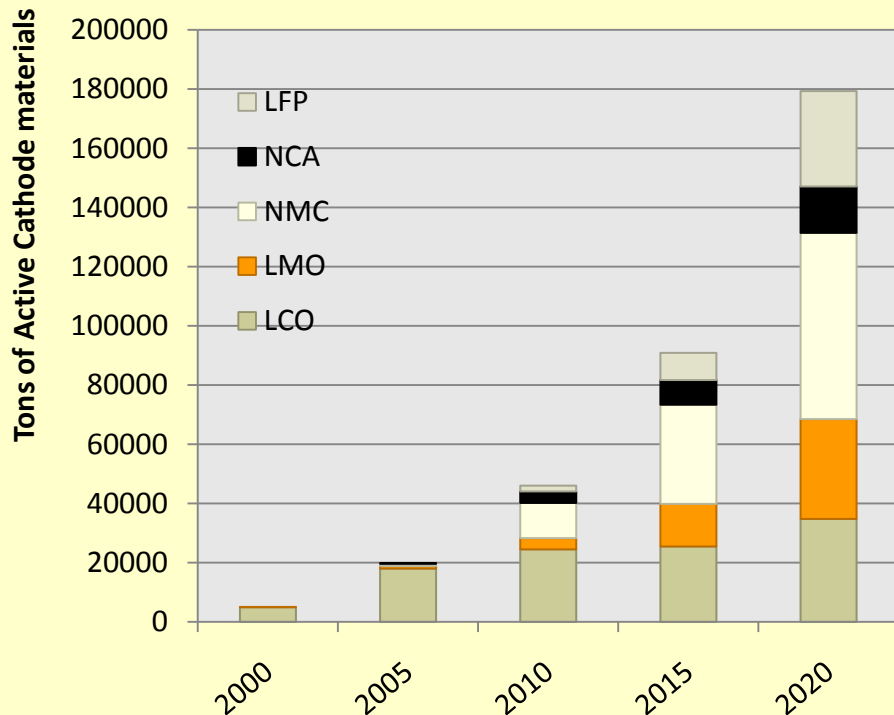
Assumptions

200 000 EV in 2015
1M in 2020
100% Li-ion

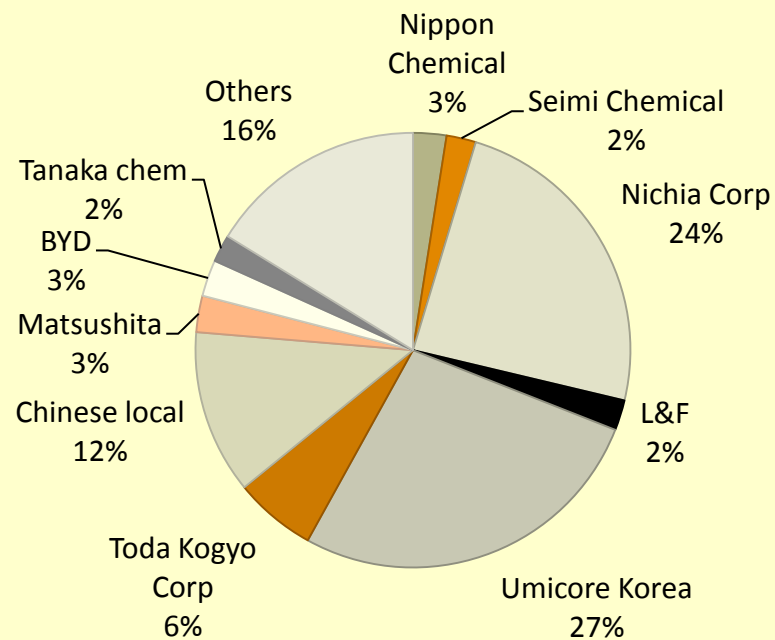
0.1 M P-HEV in 2015
0.4 M in 2020
100% Li-ion

2,2 M HEV in 2015
3,5 M in 2020
35% Li-ion in 2020

Cathode active materials for Li-ion & Pol batteries, in Tons, 2000-2010



Cathode active materials suppliers market share, in volume, 2010



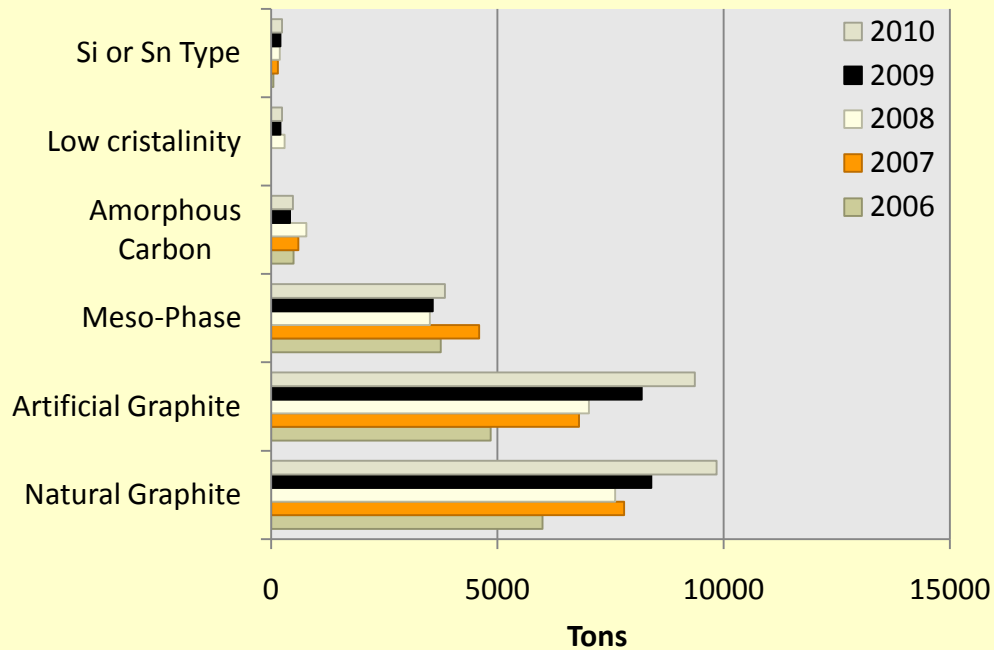
SOURCE : THE RECHARGEABLE BATTERY MARKET 2010-2020 , AVICENNE, MARCH 2011

ANODE ACTIVE MATERIALS

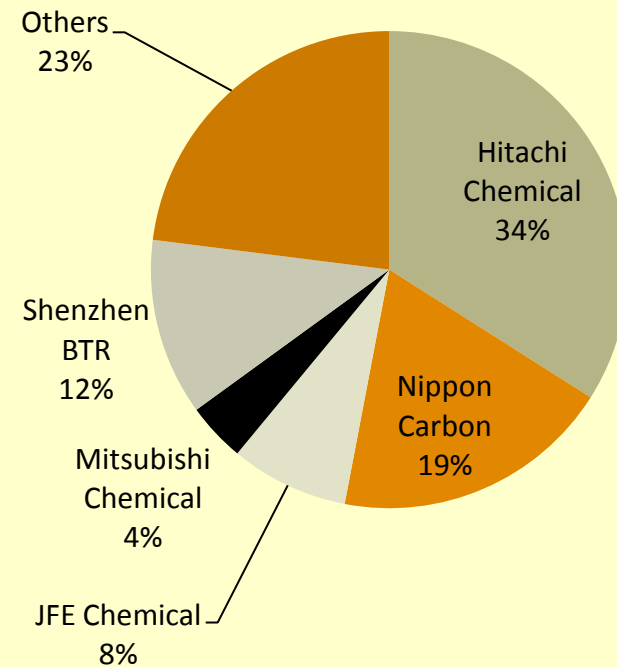
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ANODE SUPPLIERS
24 000 T
Revenues: 0,5 B\$
Gross Margin: 30-35%

Anode active materials by type, in volume, 2006 - 2010



Anode active materials suppliers market share, in volume, 2010



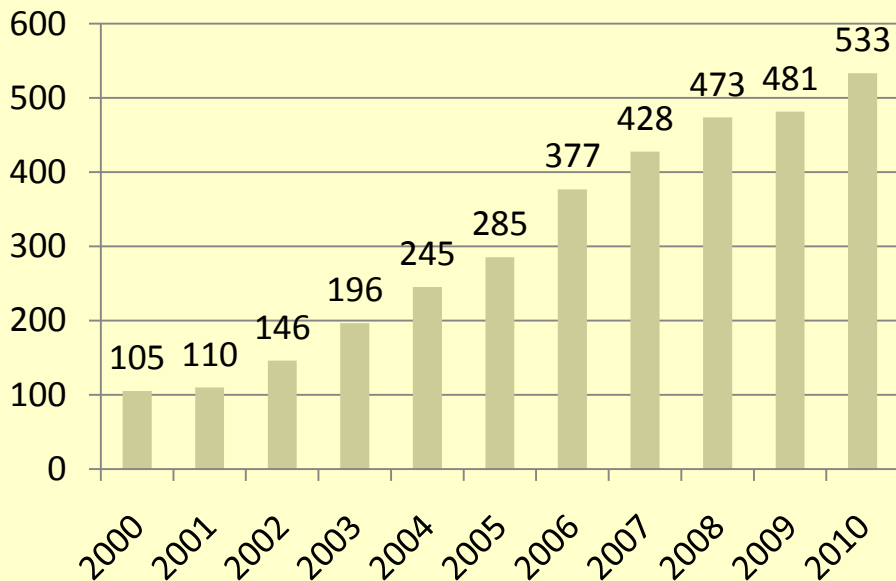
SOURCE : THE RECHARGEABLE BATTERY MARKET 2010-2020 , AVICENNE, MARCH 2011

THE SEPARATOR FOR LIB MARKET

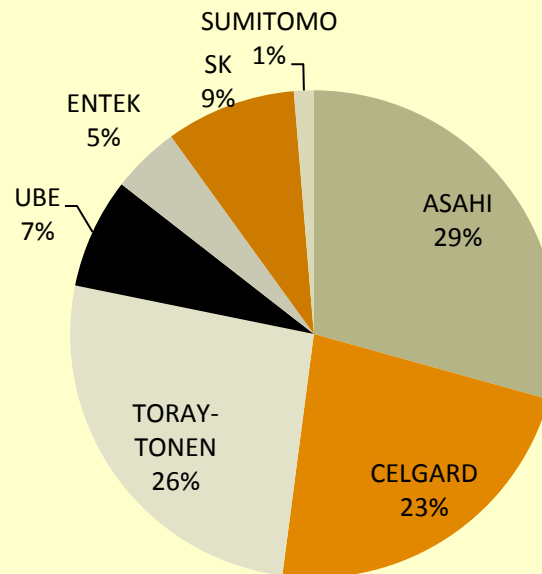
Information for growth

SEPARATOR SUPPLIERS
300 M m²
Revenues: 0,5 B\$
Gross Margin: > 40 %

The LIB separator market worldwide in value (M \$) 2000-2010
CAGR 2000/2010: +18%



The LIB separator market worldwide in value (M \$) 2010 by competitors



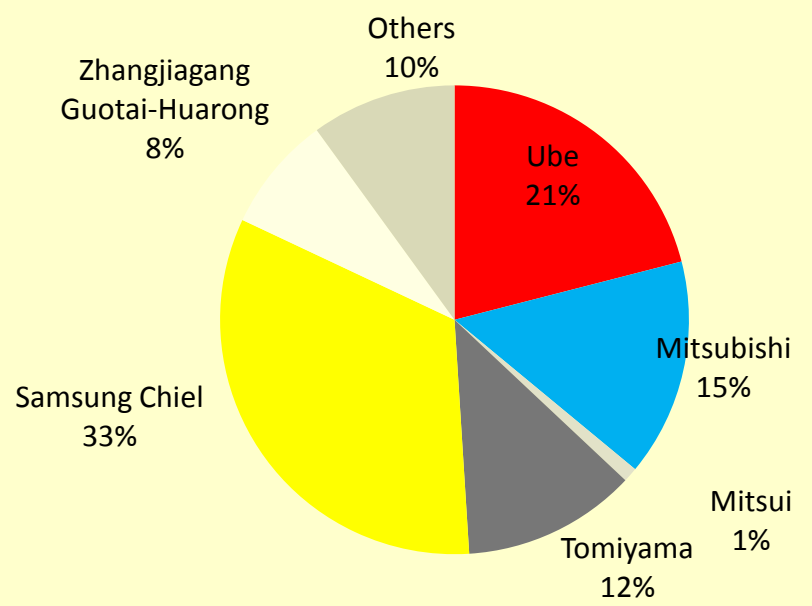
SOURCE : THE RECHARGEABLE BATTERY MARKET 2010-2020 , AVICENNE, MARCH 2011

THE ELECTROLYTE FOR LIB MARKET

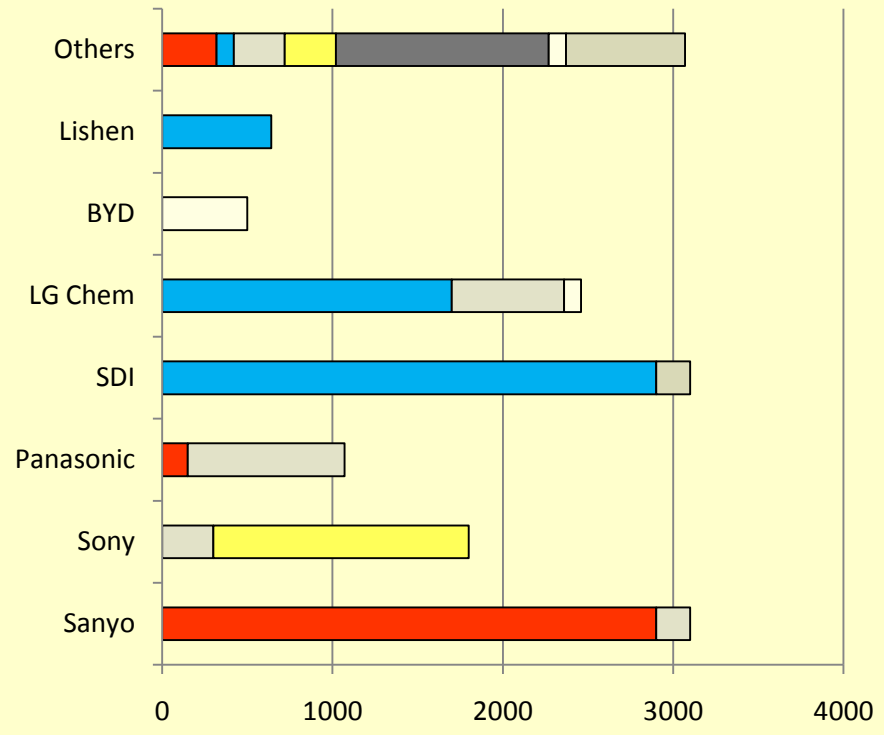
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ELECTROLYTE SUPPLIERS
15 000 T
Revenues: 0,3 B\$
Gross Margin: 35%

Electrolyte suppliers, market shares in 2010



Electrolyte suppliers & battery makers relationship in 2010

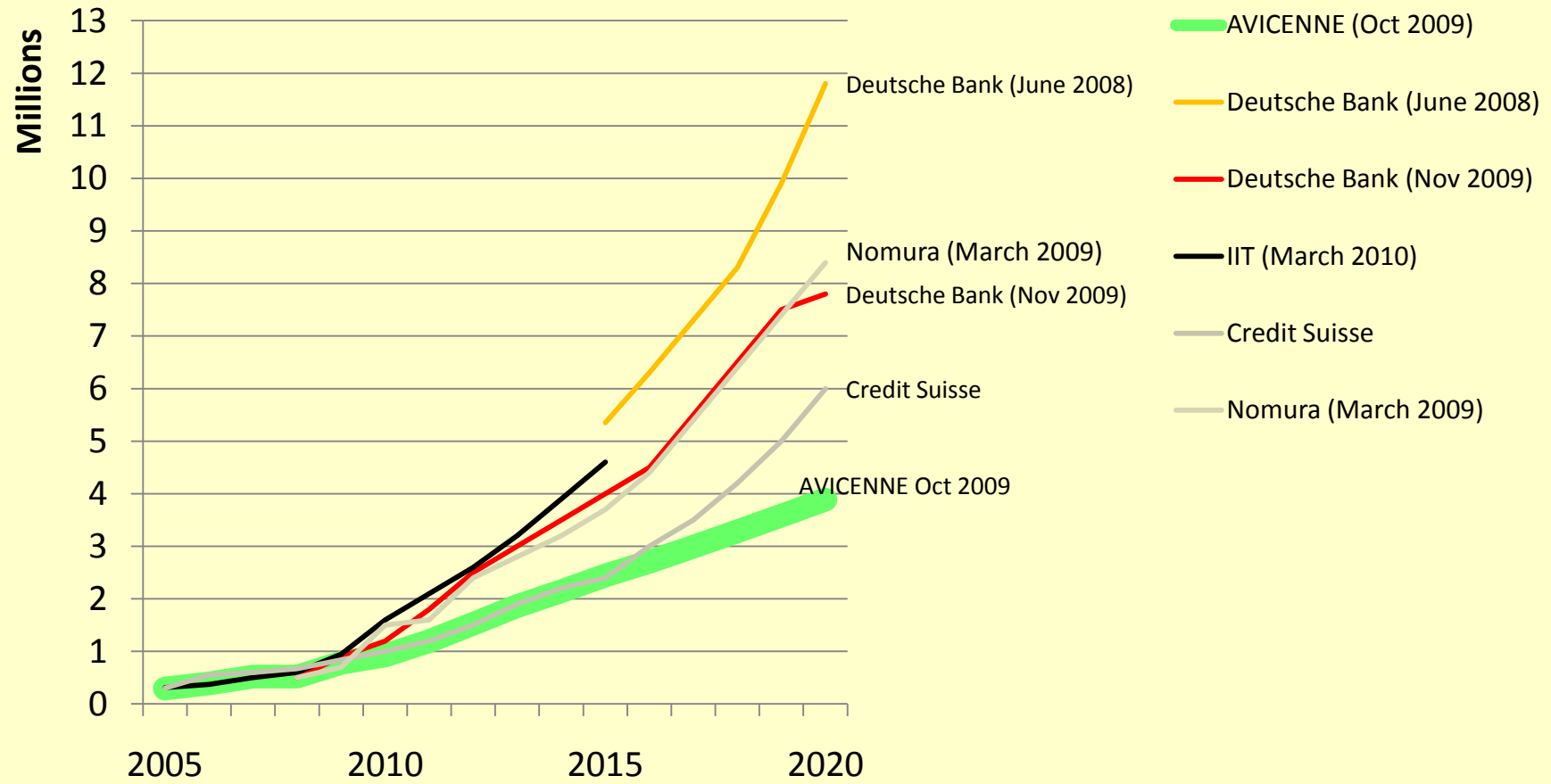


- Tons**
- UBE
 - CHIEL
 - Mitsubishi Chem
 - Tomiyama
 - Zhangjiagang Guotai-Huarong
 - In-house
 - Others

LONG TERM HEV FORECAST FROM 3 TO 8 M HEV IN 2020

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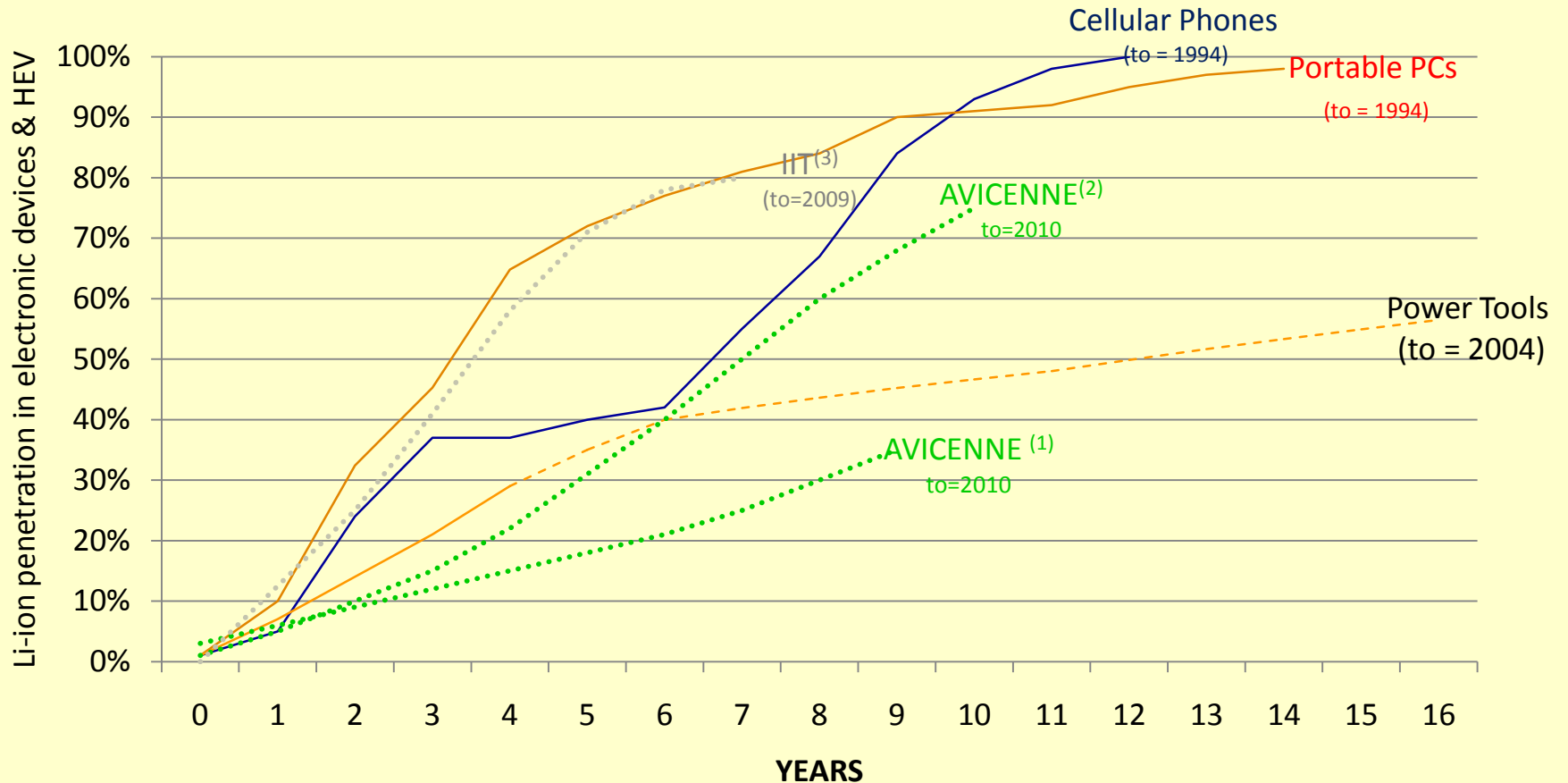
HEV FORECASTS (Million)



SOURCE: AVICENNE COMPILATION, MARCH 2011

LI-ION PENETRATION IN VARIOUS DEVICES AVICENNE & OTHER ANALYSTS FORECAST

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- (1) AVICENNE HEV Forecasts, march 09, Relevant scenario
- (2) AVICENNE HEV Forecasts, march 09, Li-ion Optimistic scenario
- (3) IIT, TAKESHITA, March 08, THE 25th INTERNATIONAL BATTERY SEMINAR & EXHIBIT, Slide 8 & March 2009, 26th Battery Seminar, Slide 5

SOURCE: AVICENNE COMPILATION, MARCH 2011

LI-ION BATTERIES DEVELOPMENTS FOR HEV, P-HEV & EV

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- Li-ion is **THE** solution for the future
 - BUT, SAFETY, LIFE TIME & COST issues
 - Lot of technical solutions (NMC, NCA, LFP, LCO...)
 - Lot of EXPENSIVE Developments...
- So,
 - Lot of JV, partnerships etc...

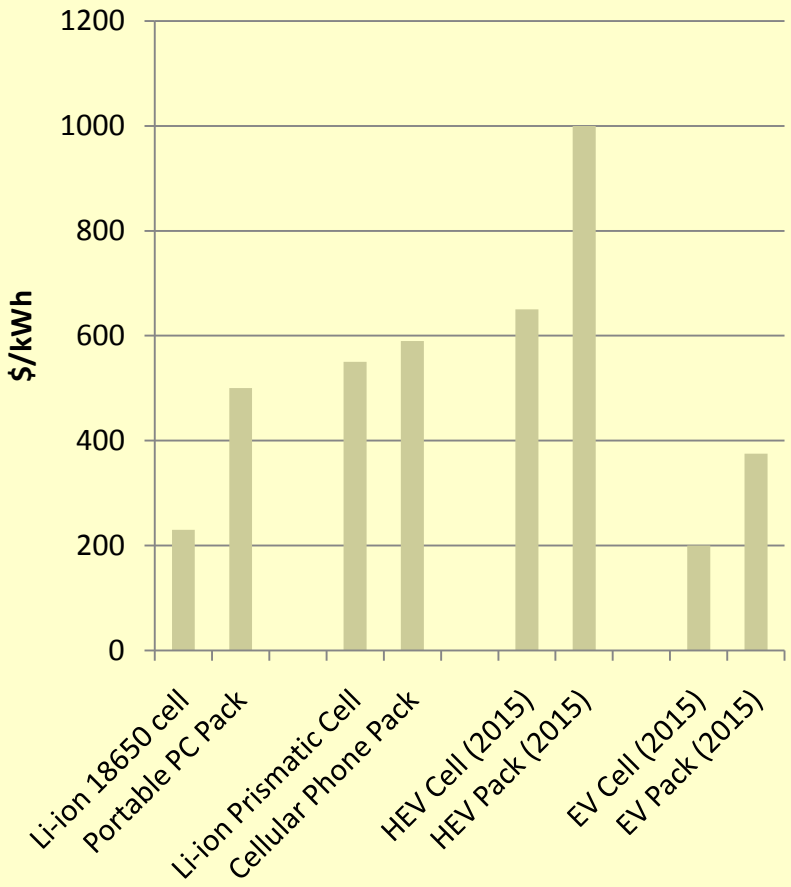
	PRIUS III NiMH	PRIUS x - Li-ion
Volts	201.6	201.6
Cells	168 (28*6)	56
Capacity	6.5 Ah	3.8 Ah
Energy	1310 Wh	766 Wh
Weight	38 kg	25 kg
T°C Range	+	+
Cyclability	+	++
Safety		
Cost		

JOINT VENTURE & STRONG PARTNERSHIP

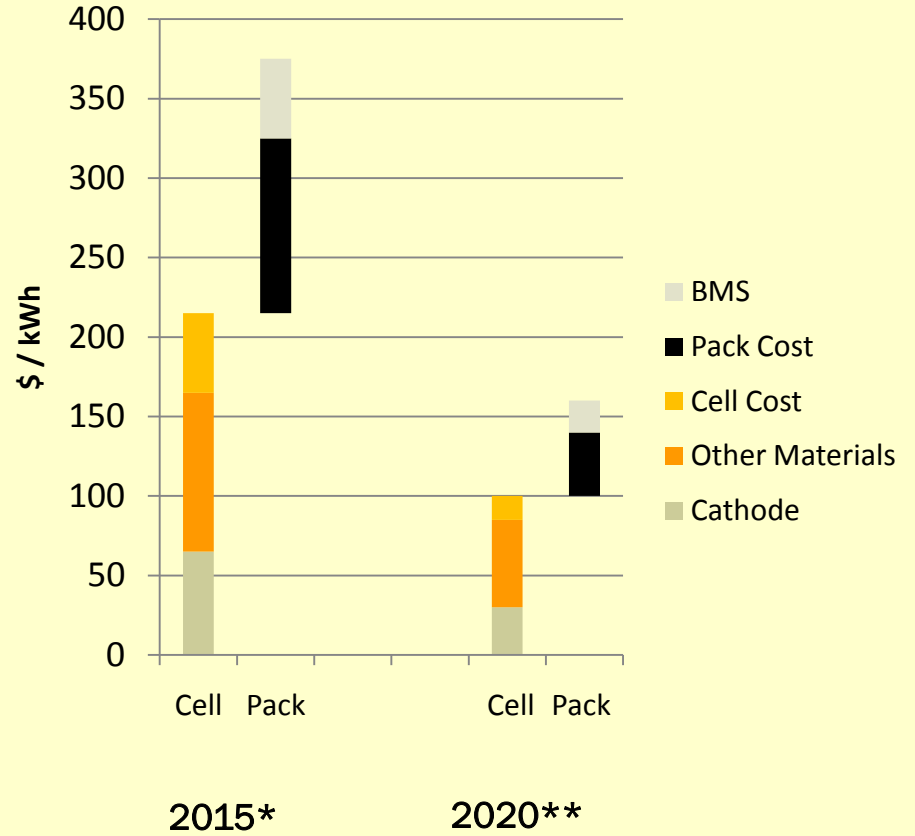
	TOYOTA	NISSAN	HONDA	FORD	MITSUBISHI	DAIMLER	BYD AUTO	BOSCH	CONTINENTAL	JC
PANASONIC	PEVE									
NEC		AESC								
GSY			JV (HEV)		LEJ (EV)					
SDI								SB LiMotive		
SAFT										JV
BYD						JV in China	HEV, EV			
ENAX									Partner	
MAGNA				Partner						

LI-ION BATTERY COST

LI-ION BATTERY COST CELLS / PACK



LI-ION BATTERY PACK COST FOR EV AVICENNE FORECASTS



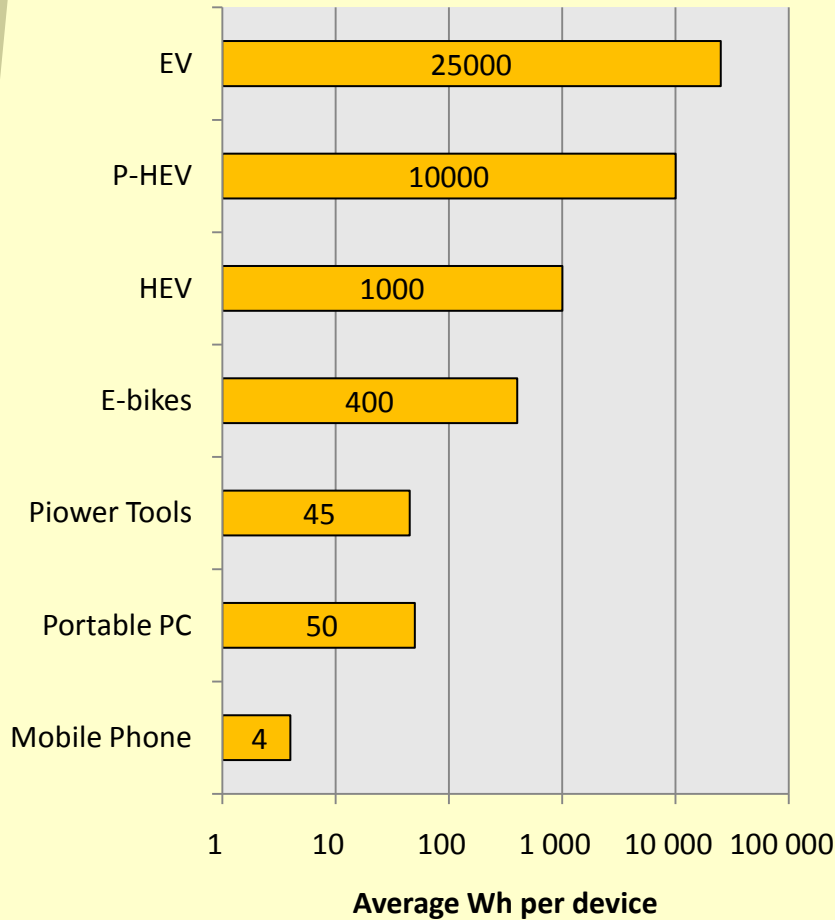
* For Production > 100 000 packs/year
** USBAC Goal in 2020

Source : AVICENNE Compilation, March 2011

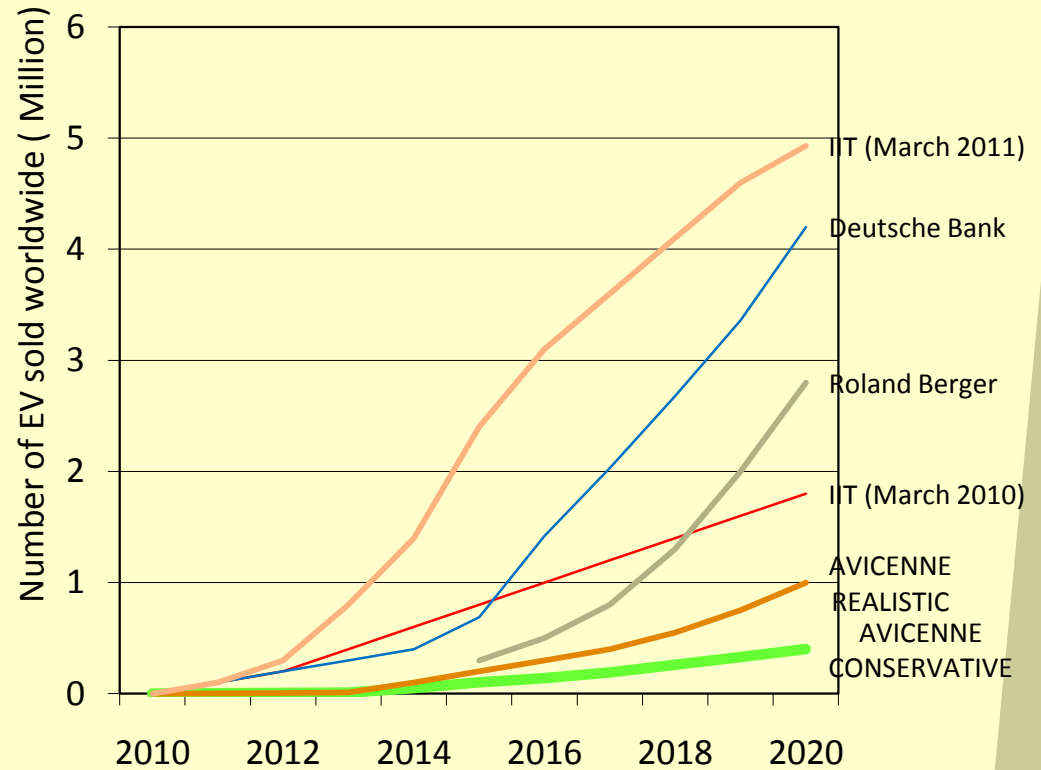
HEV, P-HEV & EV LONG TERM FORECASTS

EV ENERGY NEED: 25 MORE THAN HEV!

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EV sold, in million units, worldwide, 2010 - 2020



SOURCE : THE RECHARGEABLE BATTERY MARKET 2010-2020 , AVICENNE, MARCH 2011

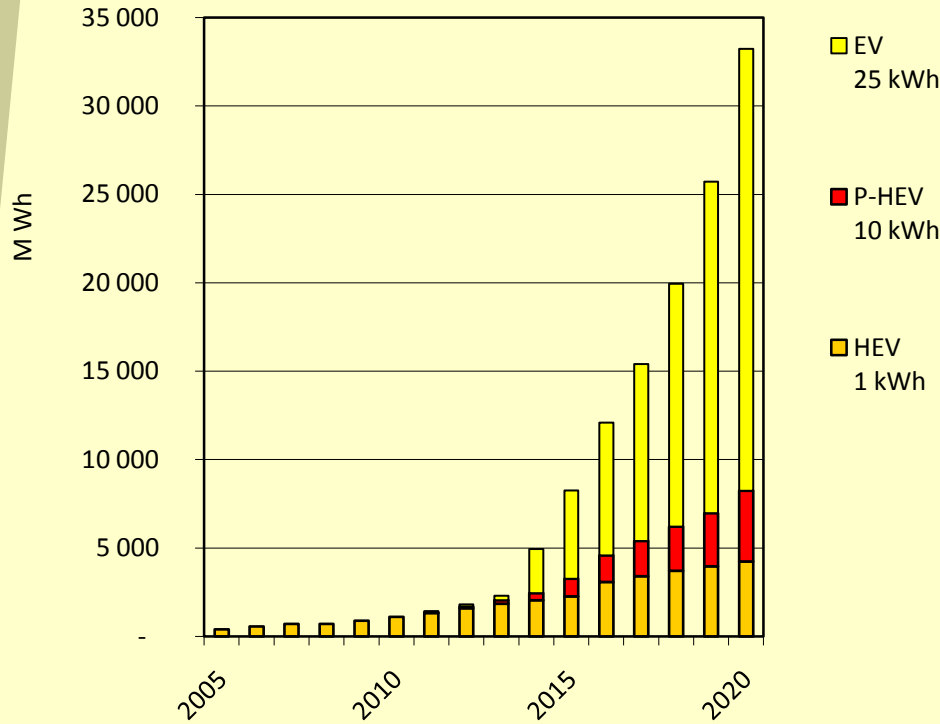
Assumptions

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1M in 2020
100% Li-ion

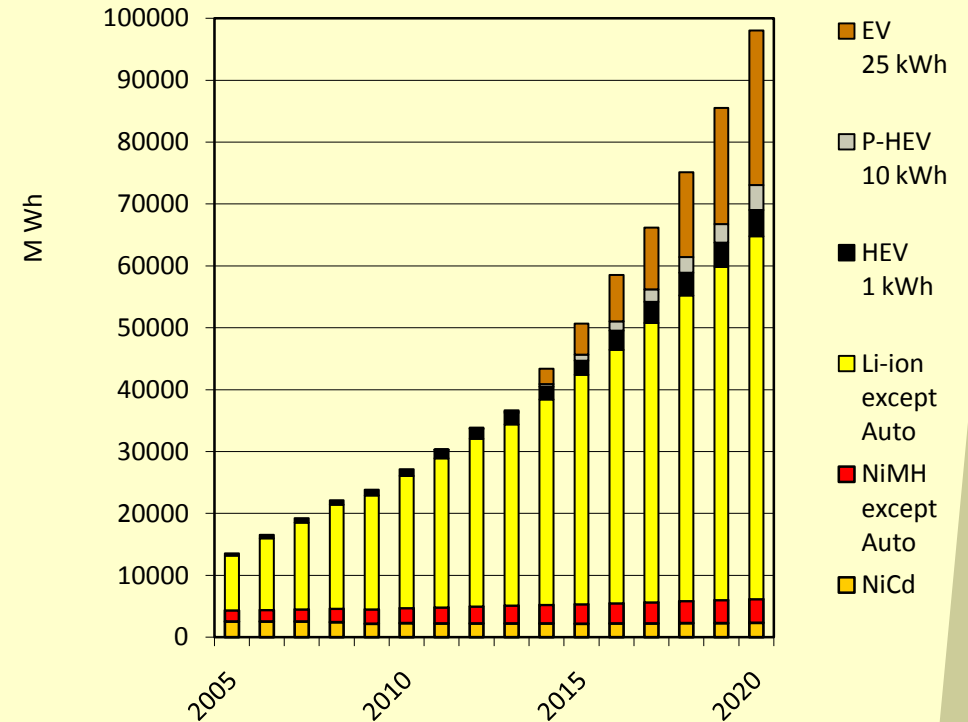
0.1 M P-HEV in 2015
0.4 M in 2020
100% Li-ion

2,2 M HEV in 2015
3,5 M in 2020
35% Li-ion in 2020

EV, HEV & P-HEV Battery needs (M Wh)
2005 – 2020 (Scenario 2)



Total battery demand (M Wh)
2005 – 2020



SOURCE : THE RECHARGEABLE BATTERY MARKET 2010-2020 , AVICENNE, MARCH 2011

- Li-ion battery is driven today by Portable PCs & electronic devices
- For automotive, the battery technology is today the NiMH, we don't expect the Li-ion to be significant on the HEV mass market in the next few years
- P-HEV & EV will be powered by Li-ion
- 1 M EV represent roughly 20 000 MWh, or 40 000 tones of cathode materials!
- 1M EV represent from 3 to 5 Billion US\$ revenues for Li-ion materials
- EV expectations attract now large Chemical companies
- New materials are needed to meet Automotive standards

