

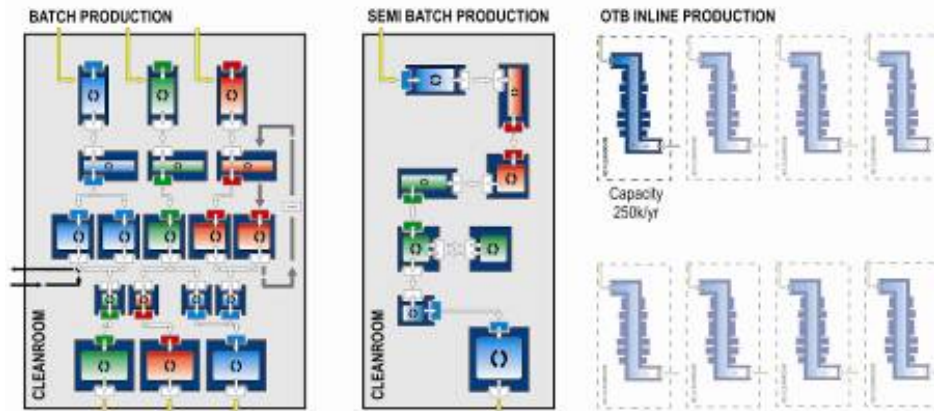
**A quantum leap in production technology..**

**And the bumpy road to get there**

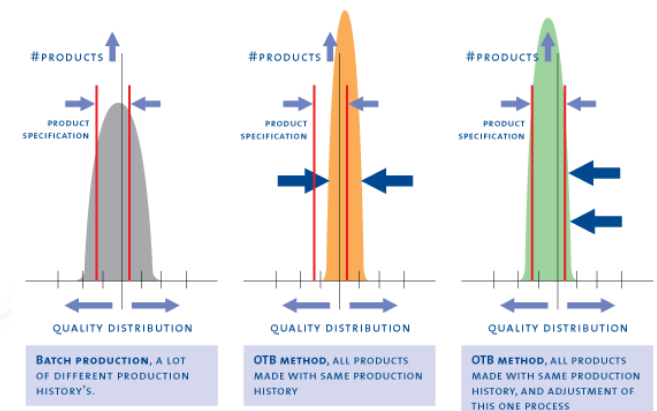
# Introduction OTB Group

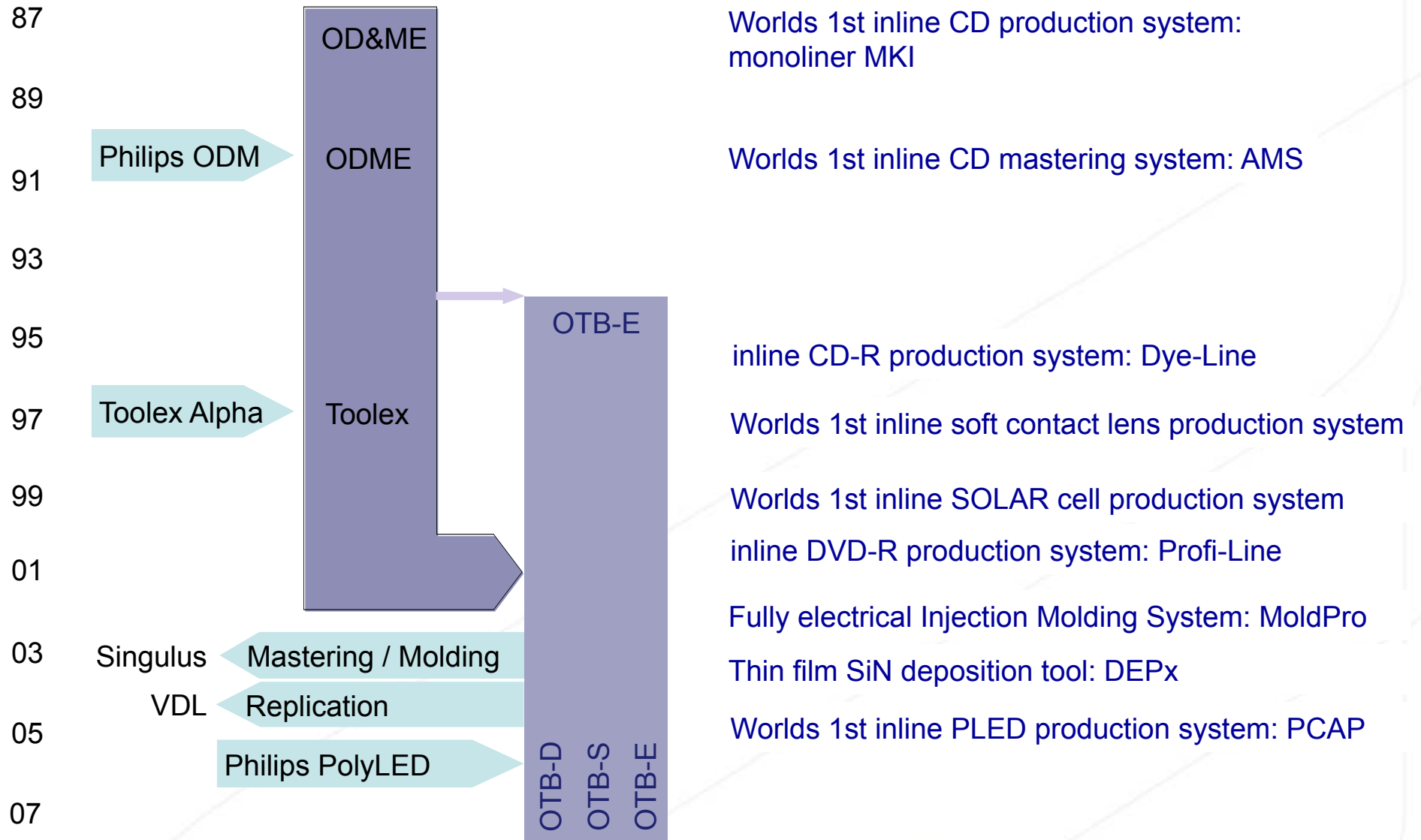
OTB GROUP				
OTB ENGINEERING	OTB SOLAR	OTB DISPLAY	PixDro	OrgaTRONICS
Research Development Tool & Proto Shop Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support	Research Development Tool & Proto Shop Engineering Production Purchase & Logistics Customer Support	Development Engineering Production Purchase & Logistics Customer Support
New development Supporting other BU's Ophthalmic, Car glazing Energyhouse etc. etc.	Inline solar-cell production equipment Tabbers Anti-reflection deposition tools	Inline display equipment for SMOLED and OLED	Development of high accuracy industrial print heads Print strategy software Print material recipes	Application research for organic electronics





- Minimizing process steps and operator intervention
- Production equipment dedicated for a small group of products
- Balancing and reducing of tact times
- Elimination of buffers
- Integration in one machine
- Reduced inspection steps to one at the end
- Fast feed back loops enabled by short throughput times
- Maintain product orientation trough process





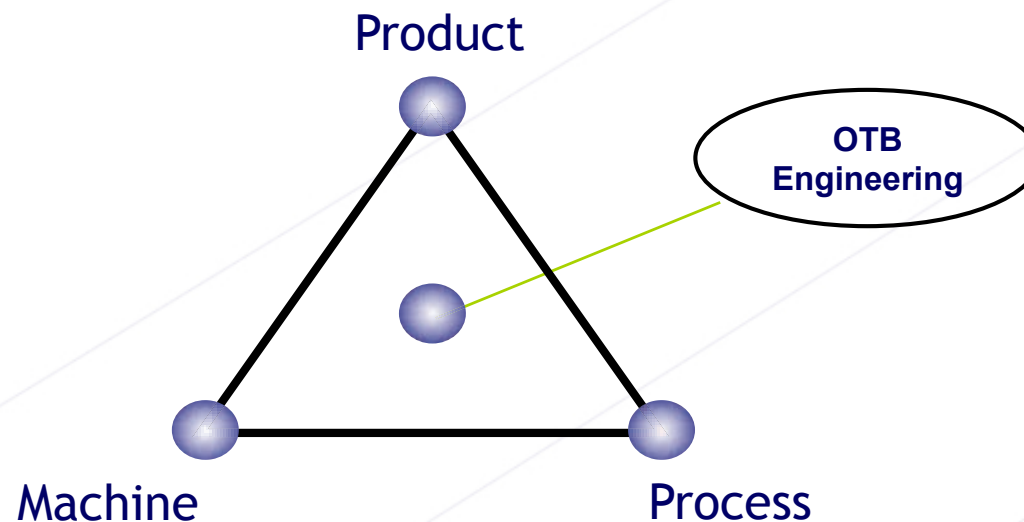
- **1968:** Started as plastics engineer at Krauss Maffei A.G.
- **1979:** Engineer at Philips Plastic Factory (laserdisc/CD)
- **1982:** Krauss Maffei Sales Office NL
- **1985:** Started Rokoma B.V.
- **1987:** First In-line production machine for CD replication MC. (OD&ME)
- **1991:** First in-line Mastering equipment and take over of Optical Disc Mastering of PDO. (ODME)
- **1995:** Sale of shares of ODME and Buy Out OTB Engineering B.V.
- **1999:** First in-line production line for PV solar cells
- **2001:** Acquisition by OTB Group of Toolex activities (former ODME operations)
- **2005:** Sales of all optical disc production units to VDL.
- **2005:** First in-line production machine for P-OLEDS





# **OTB Engineering**

*OTB Engineering is Inventing, designing, and building inline mass production equipment with a guaranteed output volume of high quality products with a low total cost of ownership*

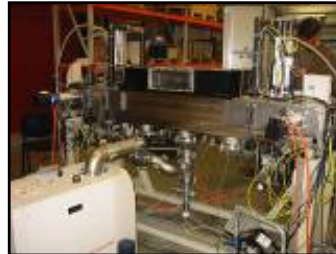
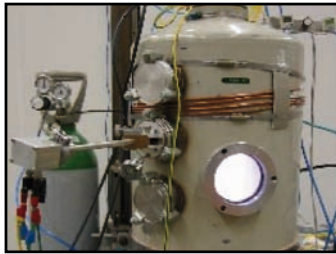




**Polymer Oled  
production  
machine**



**Fast SiNx  
Deposition  
equipment**



**Industrial  
Printer**



**POP  
Phase**

**Proto  
Phase**

**Pilot  
Phase**

**Production  
Phase**





## OTB Achieved results

<u>Product</u>	<u>Batch</u>	<u>In-line</u>
Solar cells	3 MW/year 160 operators 5000 m <sup>2</sup>	50 MW/year 25 operators 100 m <sup>2</sup>
Compact Discs	€ 3,5 / CD 20 Million/Year 400 operators 100 m <sup>2</sup> 80% yield	€ 0,12 / CD 8 Million/year 1 operator 3 m <sup>2</sup> >97% yield
Contact lenses	€ 0,40 / Lens 42 Million/year 25 operators 180 m <sup>2</sup> 70% yield	€ 0,12 / Lens 42 Million/year 1 operator 10 m <sup>2</sup> 90% yield

A close-up, high-angle photograph of a microchip or semiconductor wafer. The surface is a grid of small, square cells, with a central area that is slightly more illuminated, creating a warm, golden glow. The overall image has a soft, slightly blurred quality, emphasizing the intricate patterns of the chip.

# OTB Display

## OTB Display

Designs, develops and delivers in-line production equipment including the process to manufacture OLED displays, and offers the complete display know-how.

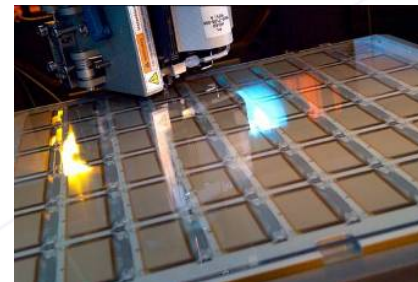
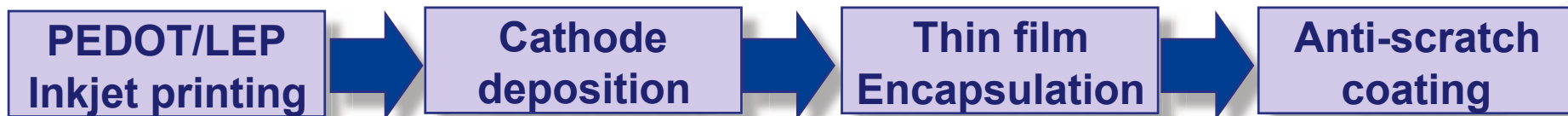
## Features of the manufacturing solution

- Highly automated in-line manufacturing equipment
- An integrated process for guaranteed production volume
- Technology and support in all phases up to and incl. mass production

## Benefits

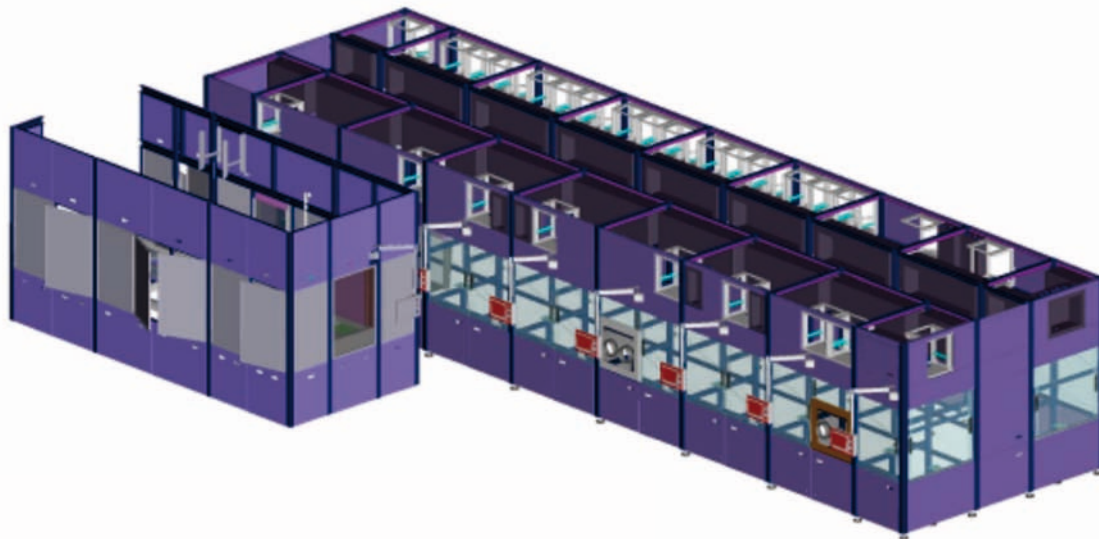
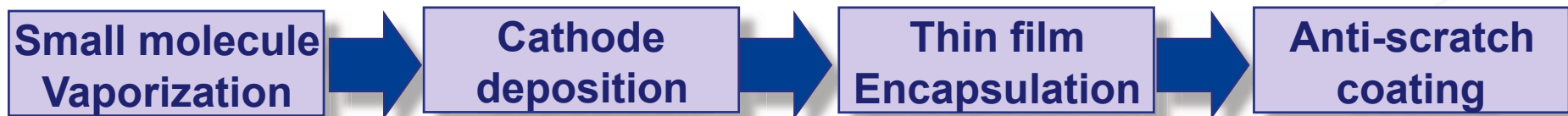
OTB Display enables customers in the display industry to rapidly ramp-up to a guaranteed mass production volume against low cost

In-line mass production equipment for polymer OLED displays

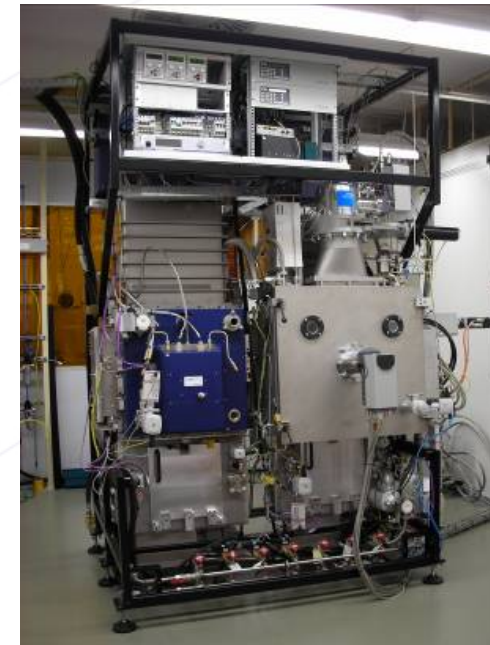




In-line production equipment for small molecule OLED displays  
Under development



Turn-key solution with Kodak



# OLED advantages shown by samples

## Comparison of LCD vs OLED display from OTB Display



**1.1" OLED displays of ca. 0.7 mm thin**



**2.6" Full color  
OLED display**



**1.5" Full color  
OLED display**





# OTB Solar

**OTB Solar** is a leading company in the design, engineering, development and manufacturing of inline production equipment for the solar industry.

**OTB Solar** strategy:

- Inline concepts
- Tailor made solutions
- Breakthrough technologies
- **Partnership with customers**

From equipment delivery to process know how and After Sales support

## Inline Solar Cell manufacturing equipment LINE<sup>X</sup>1400 & LINE<sup>X</sup>1500

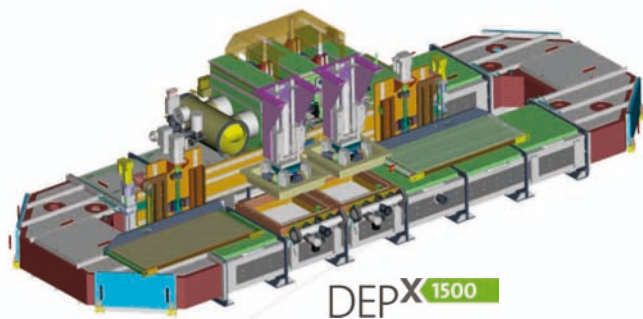
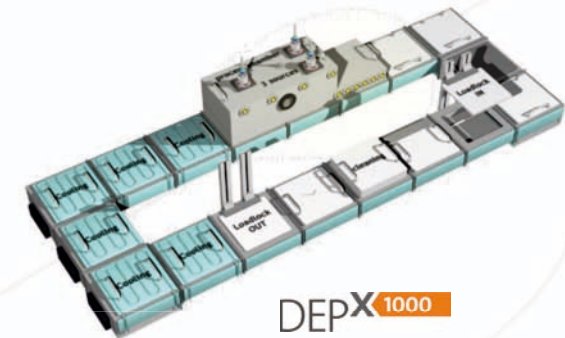
- Fully inline PV production platform
- Integration latest technologies:
  - Wet chemical
  - SiN deposition,
  - Screen printing processes
- Up to 1450 PV Solar Cells / hour
- Capacity up to 40 MW<sub>Peak</sub> / year
- MONO & MULTI process available





## Inline SiN deposition system for ARC DEP<sup>X</sup>750 , DEP<sup>X</sup>1000 & DEP<sup>X</sup>1500

- Ultra fast PECVD with Linear Motor System
- Up to 1440 PV Solar Cells / hour
- Cell efficiency  $\geq 16\%$  (Mono Crystalline)
- MONO & MULTI process available





- The first in-line integrator in the world, ref. Shell
- Low Total Cost of Ownership (TCO)
- Superior process know-how available
- **DEP<sup>x</sup>** has smallest footprint
- Local support available from **OTB** offices (Eindhoven, USA, Hong Kong, India, Singapore)
- Standard **DEP<sup>x</sup>** accommodates 125/156 mm cell sizes
- Different concepts allow different throughputs

# OTB Energyhouse

Independent zero emission solutions

23<sup>rd</sup> January 2007, Dutch business round table, Zurich

Cees Collart, Projectmanager Energyhouse

- 2 years ago
- Ron Kok Technology Pioneer at World Economic Forum
- Expression of disappointment about energy-politics in a forum at WEF
- Vision: from central to decentral power generation, per individual (group of) house(s)
- Independent from gas- and electricity network
- CO2-neutral

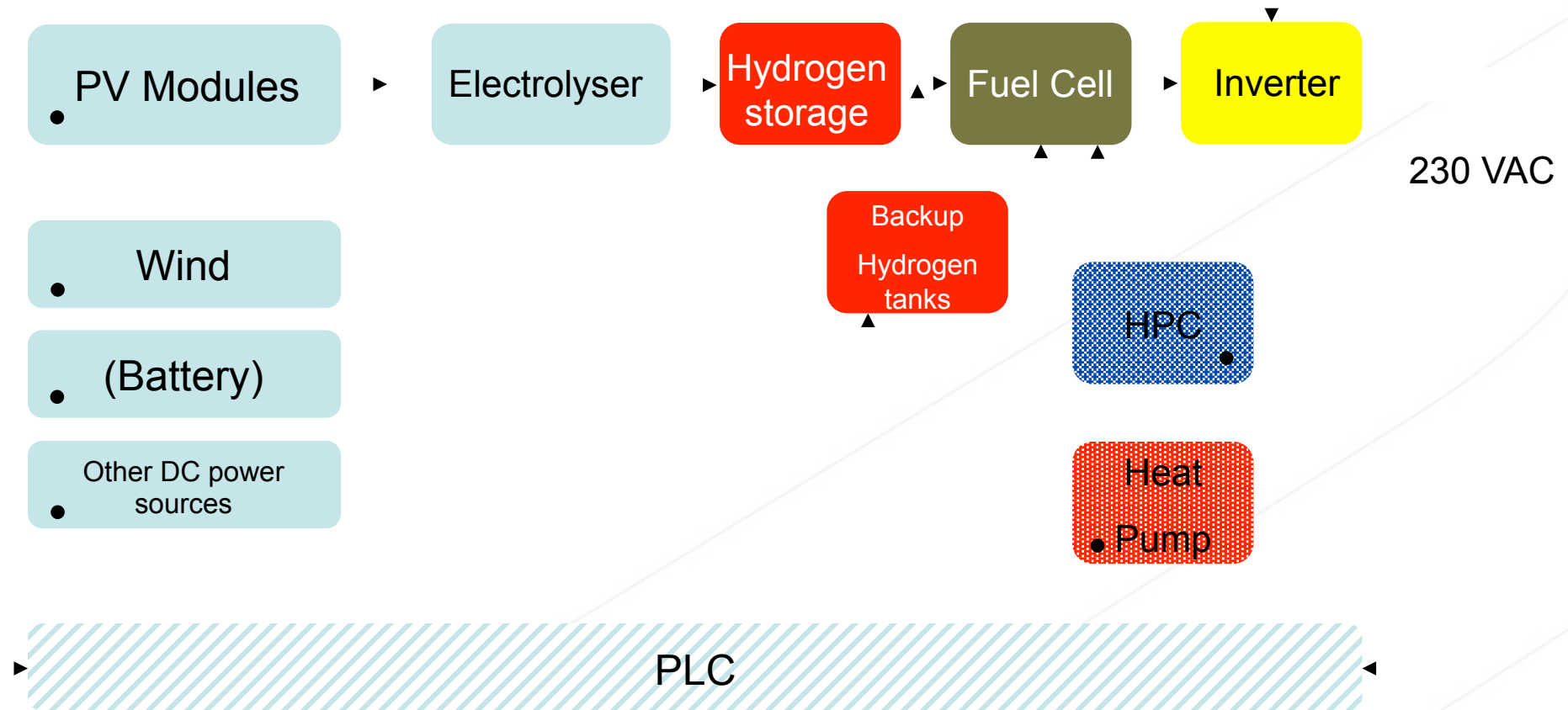
- At first only virtual existence of energyhouse
- Commitment towards many interested parties
- Lots of talking, little action
- Changed by:
- Permanent allocation of staff for energyhouse
- CC as of 1st April 2006

- High Risk
- Independent entity
- Multiple shareholdership (incl. OTB)
- Independent advisory board
- Workstreams: technical, financial, organisation, co-operation, sales, marketing, competition, legal
- Technical workstream “outsourced” = link to OTB-engineering

- Fossil fuels limited and expensive
- Sun and wind unlimited and for free
- Solution in that area
- Technology proven, but not optimised, nor integrated

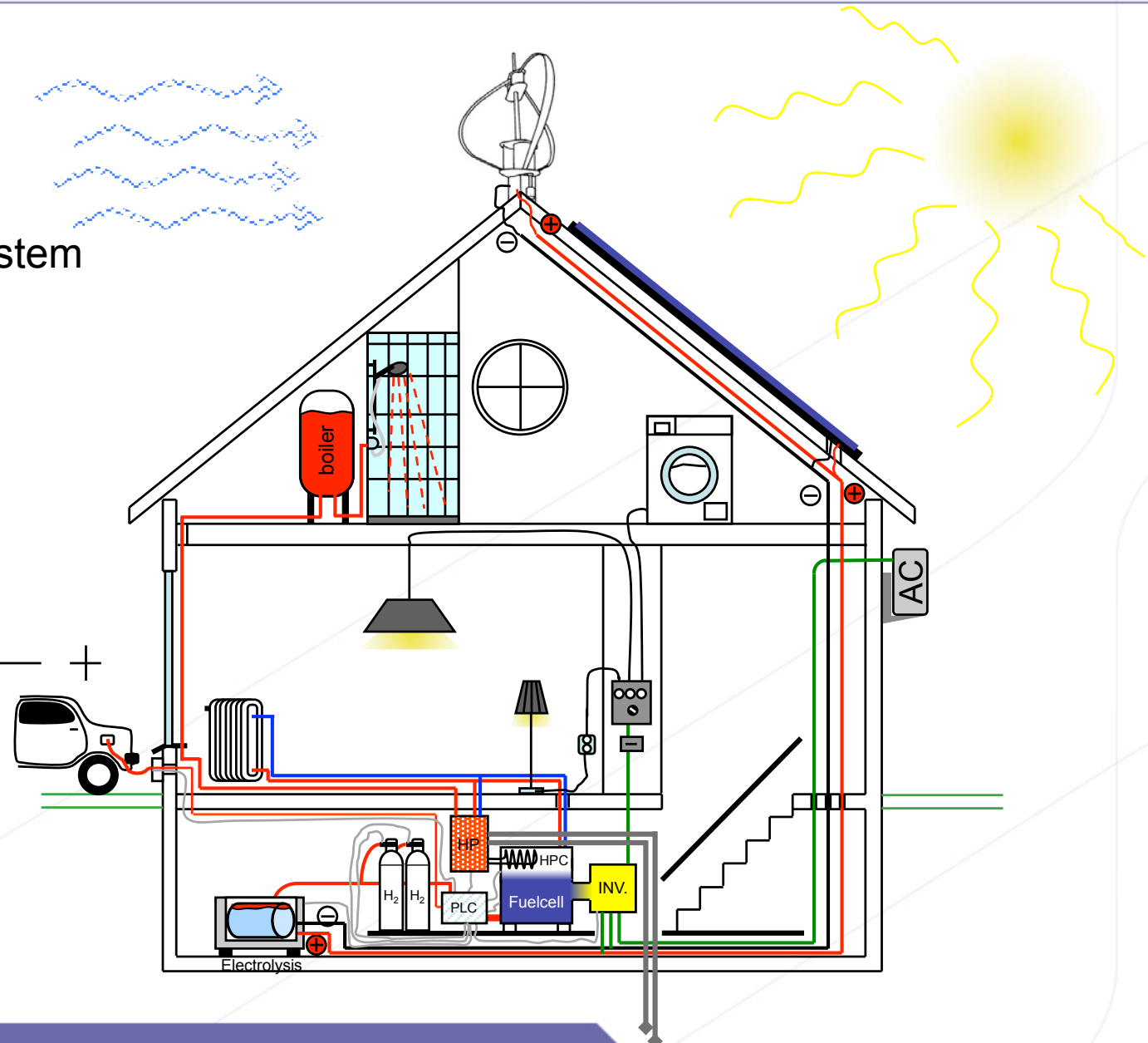


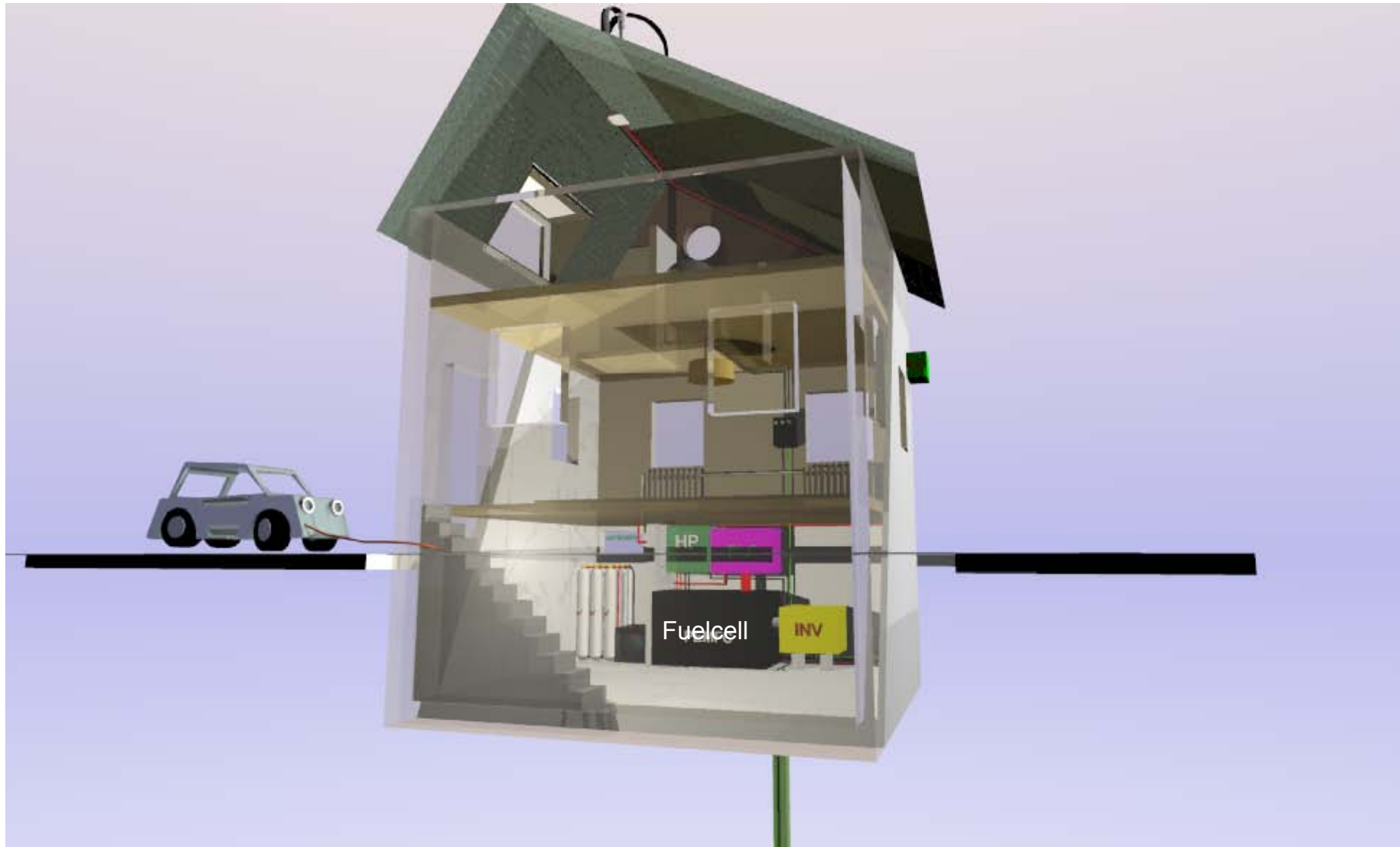
- Research, development, building, testing
- No 1 supplier of decentral and integrated solutions for the generation, storage and supply of home-energy
- 100% based on renewable energy (solar/wind)
- CO2 neutral



- ✓ House
- ✓ Sun / wind
- ✓ Renewable energy system
- ✓ Electrolyser
- ✓ H<sub>2</sub> storage
- ✓ Fuel cell / HPC / HP
- ✓ Inverter
- ✓ Control unit

Total system





- Individual components
- Existing technologies
- Improvement
- Integration into one system

- Oriëntation
- Inventory
- Action
  
- What components for sale
- What components to be developed
- Business Model
- Business Plan

- Technical Project Management Plan
- Ordering and building of components
- Towards 1<sup>st</sup> POP by end of May 2007



- Characterisation of individual components
- Energybalance: input -/- losses = output
- Co-operation with a.o. TU/e / Fontys
- Integrating individual components
- Testing and measuring integrated components
- Until 1<sup>st</sup> go-nogo end of May 2007

- Sales 1<sup>st</sup> system in 2008
- Sales 2000 systems in 2015
- Critical point in 2010 (25 → 100 systemen)
- Target salesprice € 50.000 in 2010
- Target costprice € 35.000 in 2011
- Expected break-even in 2011
- Cash out 2006 - 2010 € 5,5 mio
- Expected cashflow neutral in 2013

# Thank you for your attention

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