A close-up photograph of a human hand holding a flexible, stretchable electronic device. The device is made of a thin, yellowish-gold material with intricate circuit patterns. Several small, rectangular components are attached to the device with fine, wavy gold wires. The background is a soft, out-of-focus view of the hand's skin.

Welcome to the world of
flexible and stretchable electronics!

Welcome to Holst Centre!

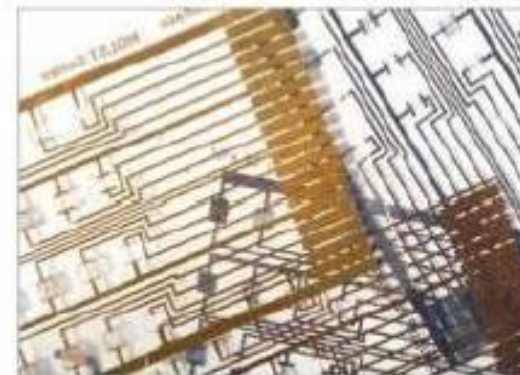


Open innovation system

**Wireless
Autonomous
Transducer
Solutions**

**Technology
Integration
Programs**

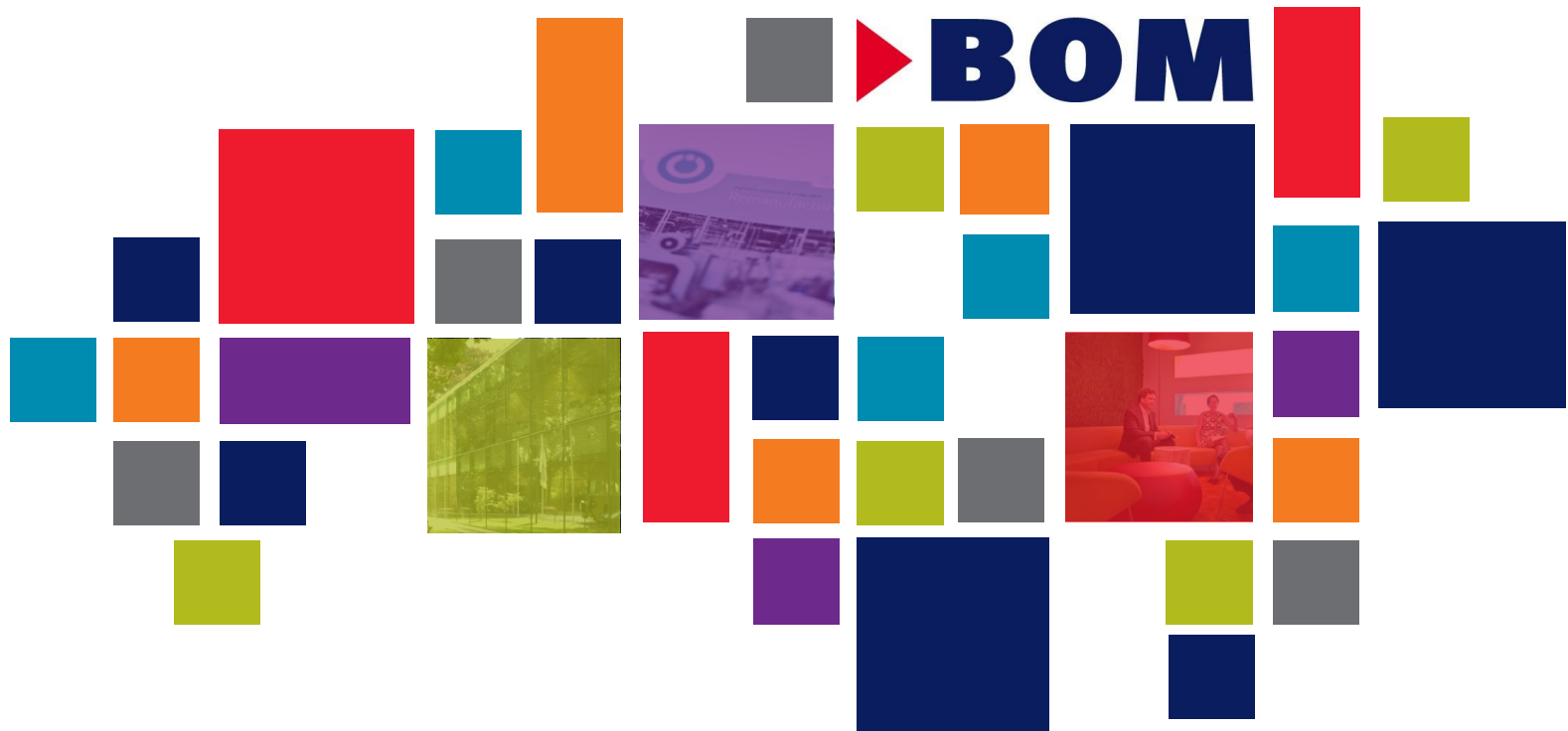
**Systems
in
Foil**



Building the PE business chain

Chances for the Netherlands

Brabantse Ontwikkelings Maatschappij



Peter Visser – BOM business development



Brabantse Ontwikkelings Maatschappij



Overzicht

- What's the BOM?
- Why PE ?
- Benefits
- Chances
- PE projects & Ecosysteem
- Conclusions

Brabant Development Agency



Goal: Sustainable growth of the Economy of Noord Brabant

- ▶ Founded 1983
- ▶ Funded by Min EZ and Province of Noord-Brabant
- ▶ Ca 70 fte / 90 people
- ▶ Office in Tilburg, Netherlands





Goal: Sustainable growth of the Economy of Noord Brabant

4 department

- *Foreign Investment*
- *Venture Capital*
- *Business parks (incl Pivot Park Oss)*
- ***Business Development***



 AcertaPharma
ADVANCED GENETIC THERAPY

Airborne

Anteryon

BIO-CONNECTION
SPECIALTY MEDS IN RESEARCH/Clinical DEVELOPMENT & MANUFACTURING

BOTEMP
green refrigeration

EFFECT
PHOTONICS

 eggciting products

 **FORTIFIED**
FOOD INGREDIENTS

fruit funk
naturally

GreenFlux
Mobilität Za

heliox

 hemics

innatoss
laboratories by

INNECS

ITVE
Technologies

KWB

LabTIE
Improving Productivity

LEAD PHARMA

LITEQ

MCE
medical concepts europe

Methods
2 Business

 **MTT**
micro turbine technology by


mint solutions


etulipa

newtricious

NTRC


ONE OF A KIND
TECHNOLOGIES


PRECEYES

 **Profix Biosystems BV**
enriching the future

 **RODENBURG**
Biopolymers

Smart Robotics (BOM alumnus)

brabantse ontwikke... Printed electronics High-Barrier Films Working Groups TeqNow | Top Techn... Photographs :: Print Nieuw tabblad

teqnow.nl/partners/smart-Robotics

teqnow
TOP TECHNOLOGIE MKB METAAL

home thema's robotatlas teqnowquest teqknowledge partners **teqnow**

smart Robotics

Slimme robots inzetten als uitzendkrachten,
dat is wat we doen bij Smart Robotics

SMART ROBOTICS
UITSZENDBUREAU VOOR ROBOTEN

**De atlas met
aanbieders voor
industriële
robotisering.**

> Vind de partner die bij u past!

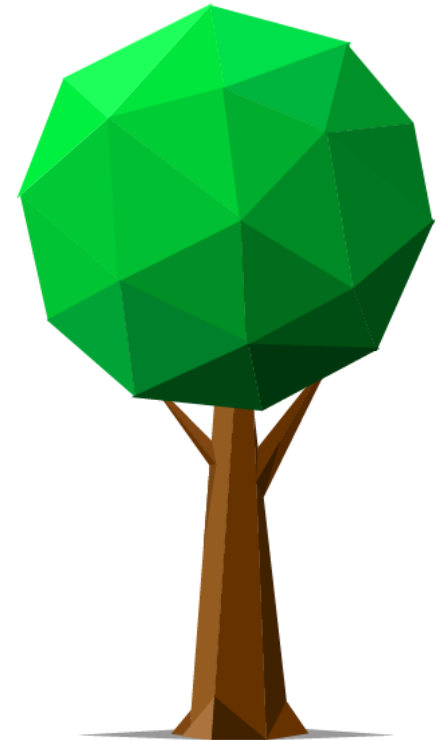
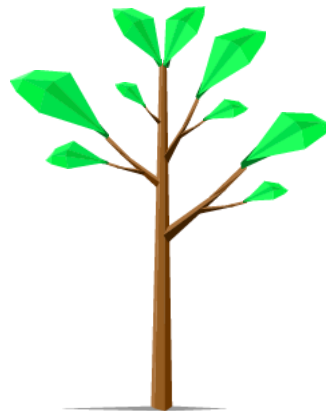
Wat is smart Robotics?

smart Robotics, het uitzendbureau voor robots, ontwikkelt en detacheert robots die eenvoudig kunnen worden aangepast om een nieuwe opdracht uit te voeren. Met deze flexibel inzetbare robots maakt smart Robotics een grote stap vooruit t.o.v. de klassieke manier van

23:34
5-12-2017

Phases of Development

Growth & Ambition



Ideation



Start-up



Scale-Up

SNEL GROEIENDE BEDRIJVEN IN NOORD BRABANT

AANTAL GROEIERS

Nederland telt ruim 2800 snelle groeiers waarvan 466 in Noord-Brabant.

2800



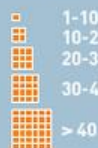
466



75%

van de snelle groeiers bestaat langer dan 10 jaar.

AANTAL SNELGROEIENDE BEDRIJVEN IN NOORD-BRABANT.



Snelgroeiende bedrijven zitten geclusterd rondom de stedelijke gebieden en zijn over de hele provincie Noord-Brabant verspreid.



IDEATION



START-UP



SCALE - UP



Internationaal onderzoek door de OESO wijst uit dat bedrijven in elke fase behoefte hebben aan kapitaal, kennis, talent, markt en faciliteiten.

Snelgroeiende bedrijven zijn bedrijven die gedurende een periode van 3 jaar een groei van meer dan 20% per jaar gerealiseerd hebben in werknemers en/of omzet.

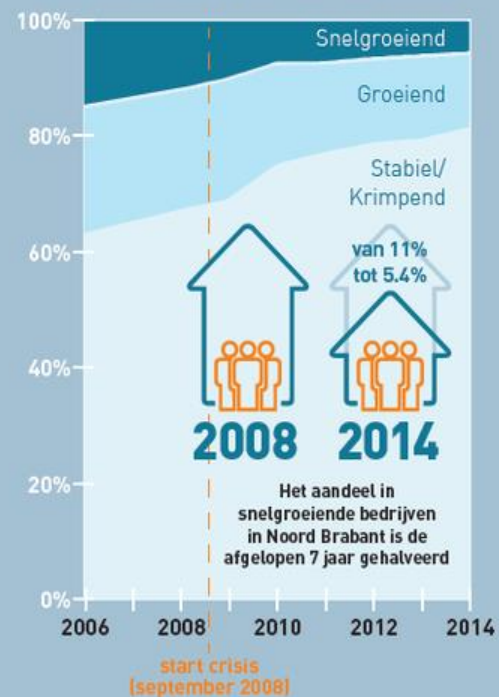
- Geset- en Detailhandel
- Advisering en Onderzoek
- Informatie en Communicatie
- Industrie
- Zakelijke Dienstverlening
- Overige Sectoren



24,5% van de snelgroeiende bedrijven bevindt zich in de groot- en detailhandel.

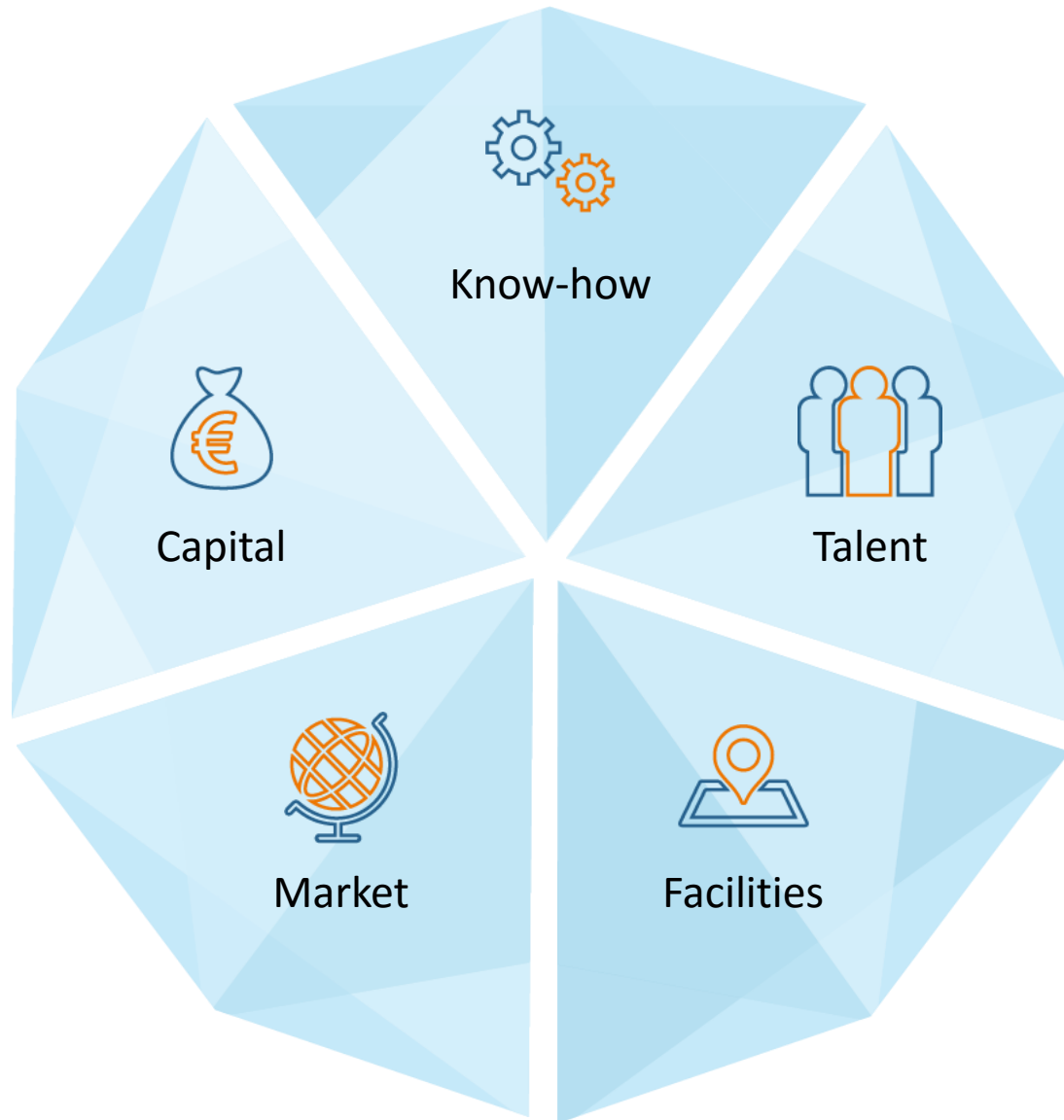
24,5%

HOE STAAT HET NU MET DE GROEI?



Het aandeel in snelgroeiende bedrijven in Noord Brabant is de afgelopen 7 jaar gehalveerd

5 basic growth drivers



Brabant Development Agency





Brabantse Ontwikkelings Maatschappij

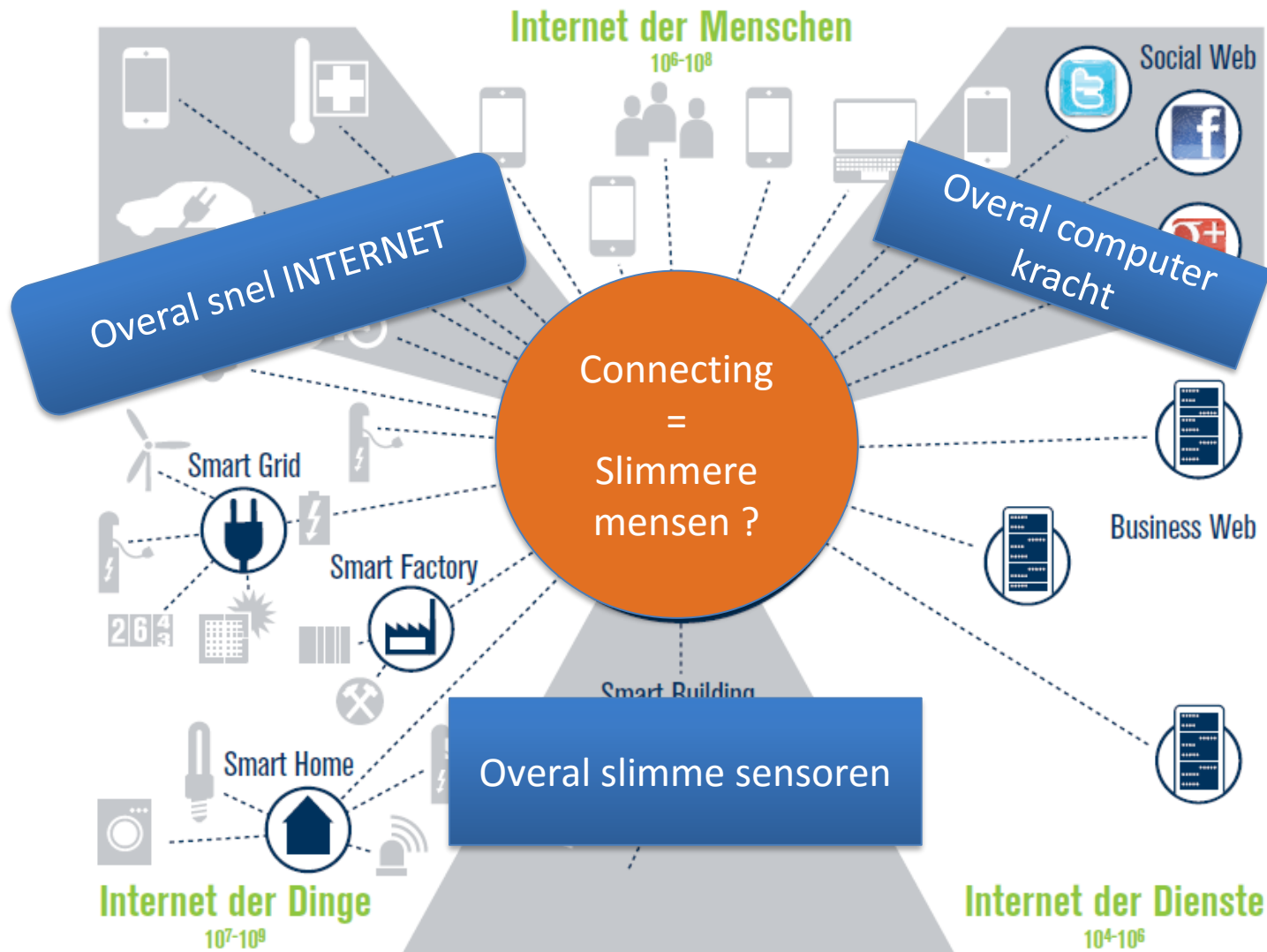
BOM

Printed by Metafas

smart industry

DUTCH INDUSTRY FIT FOR THE FUTURE

The changing face of industry and society



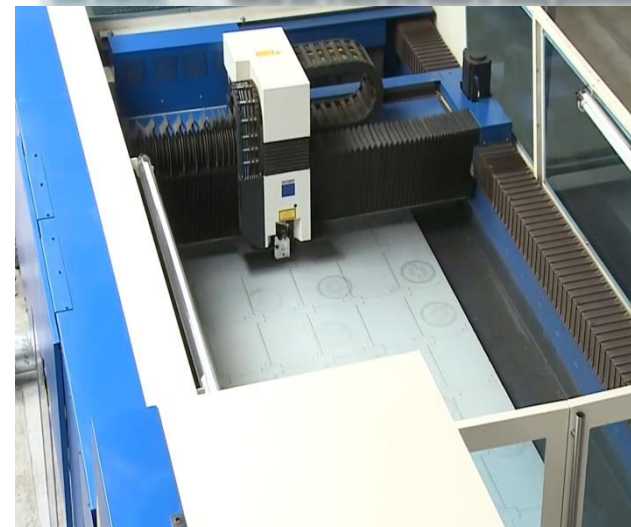
SMART BENDING FACTORY

Varsseveld (Gelderland)

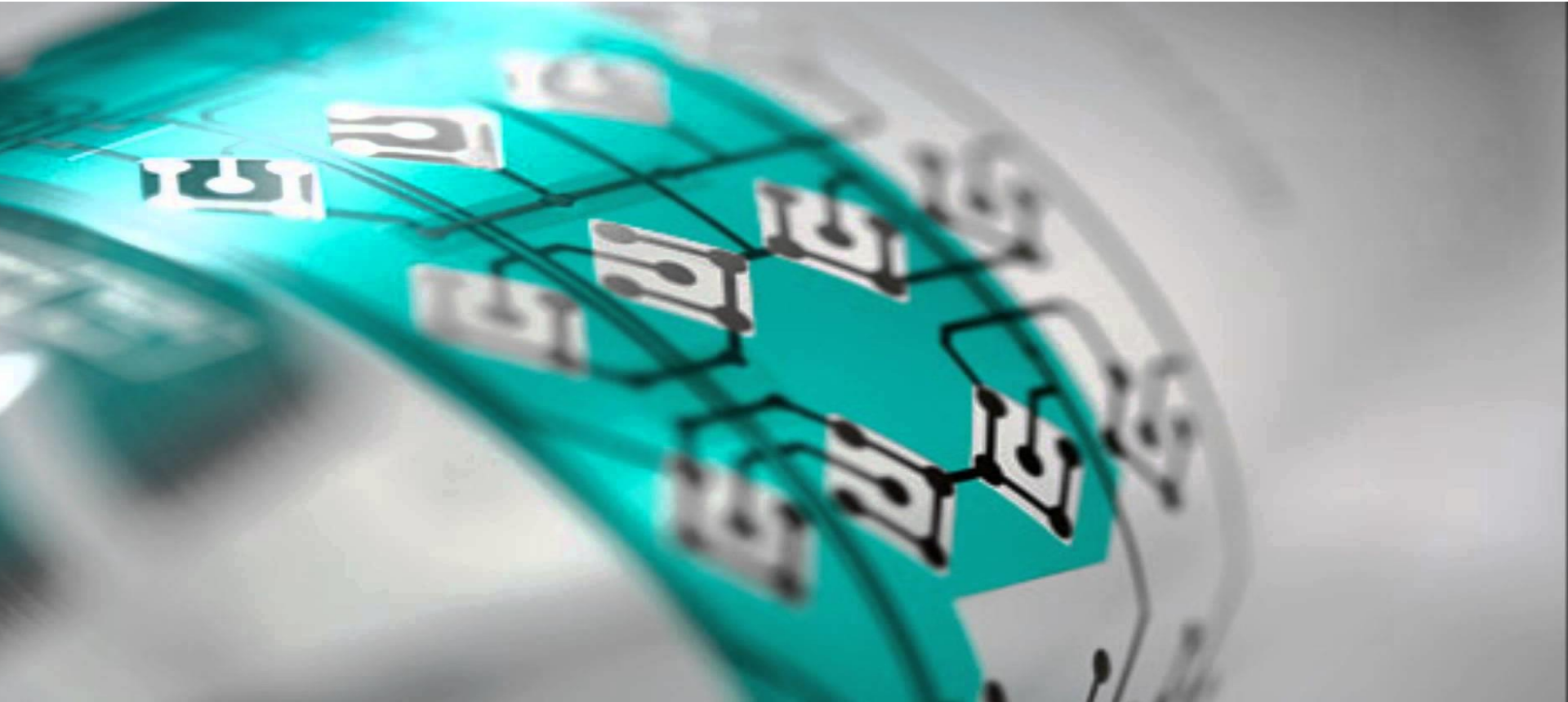


Radicaal doel: Wereldwijd innovatie-toonbeeld worden in maatwerk voor de metaalindustrie om kleine series 25% goedkoper en 5 keer sneller op de markt te brengen.

Binnen het project wordt een fysieke ultramoderne fabriek op het gebied van metaalbewerking opgezet, waarin bedrijven kennis, ervaring en middelen met elkaar delen en bewerkingsprocessen gezamenlijk exploiteren. Via internet kunnen klanten volledig gedigitaliseerd producten bestellen, waarvan de kosten van één product gelijk zijn als ware het een product uit een serie van 500 stuks. Hierdoor worden de totale kosten over de levensduur van het product verlaagd, bedrijfsprocessen versneld, en wordt materiaalbesparing gerealiseerd en de concurrentiepositie van deelnemende bedrijven verhoogd. *Trekkers: 247TailorSteel, CO2BO.*

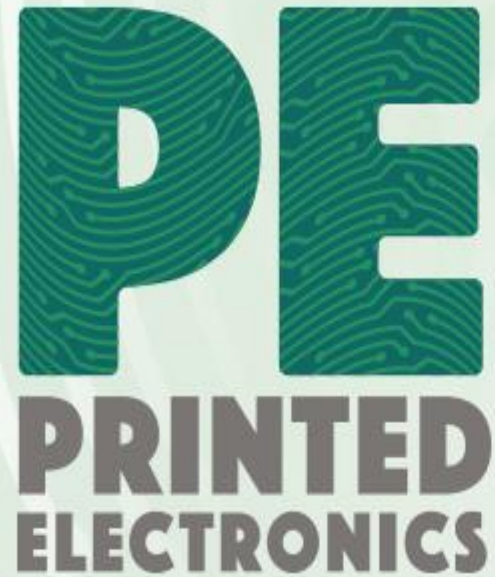


Van Smart



Naar Flex

WHY AND WHAT?

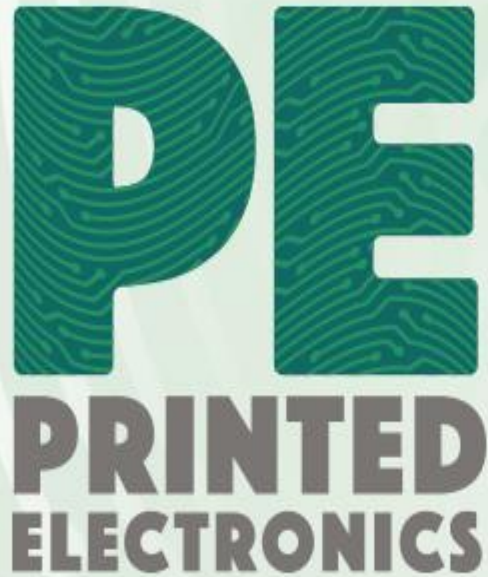


PE
PRINTED
ELECTRONICS

The logo features the letters 'PE' in a large, bold, dark green font with a circuit-like texture. Below it, the words 'PRINTED' and 'ELECTRONICS' are stacked in a smaller, bold, dark grey font. The background of the logo area is a light green with a faint, repeating pattern of white and light green circuit traces.

PE / Organic, Large Area Electronics (OLAE)

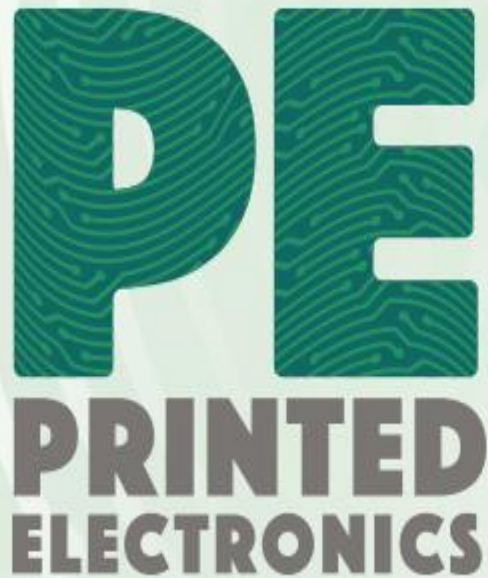
Flexible electronics / plastic electronics



= printing of electronic circuits and components* in 2D on media such as paper, plastic, glass, metal and textile, using standard printing processes and press equipment.

(including hybrid electronics)

** thin-film transistors, resistors, inductors, and capacitors into printed batteries, displays, sensors, RFID tags, interactive packaging, solar panels, and even speakers*



Kenmerken:

Additieve techniek

Minder materialen

Kan digitaal (*inktjet*)

Vormvrijheid / dunner

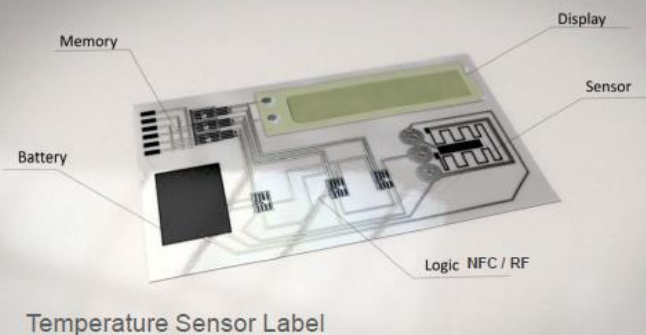
Goedkoper

In (snelle) ontwikkeling

= Vele
Toepassingen

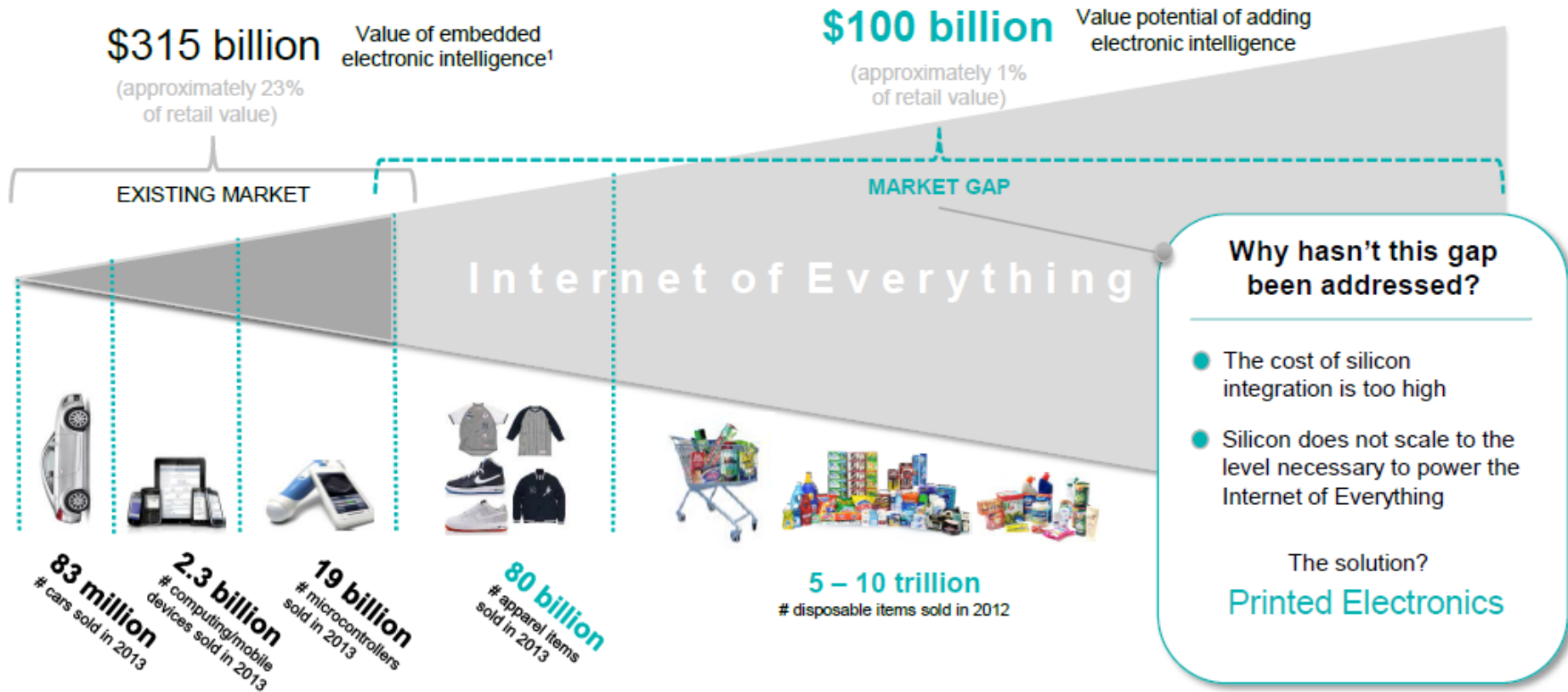
Benefits of printed electronics?

- very large volumes possible
- (promise of) lower cost-to-functions
- ease of integration / more wearable / flexible
- disposable? / more eco friendly vs IC production



The \$100 Billion Market Opportunity

Penetration of electronic intelligence in physical objects



¹ Global semiconductor market (2013)

Source: IDC; Gartner; World Bank; IMF; HIS; The Semiconductor Industry Association; OICA; IC Insights; MarketLine; Apparel Market; Planet Forward

IoT initiates the change from semiconductor to printed electronics
> higher volume, *lower costs*

PE Markt voorspellingen

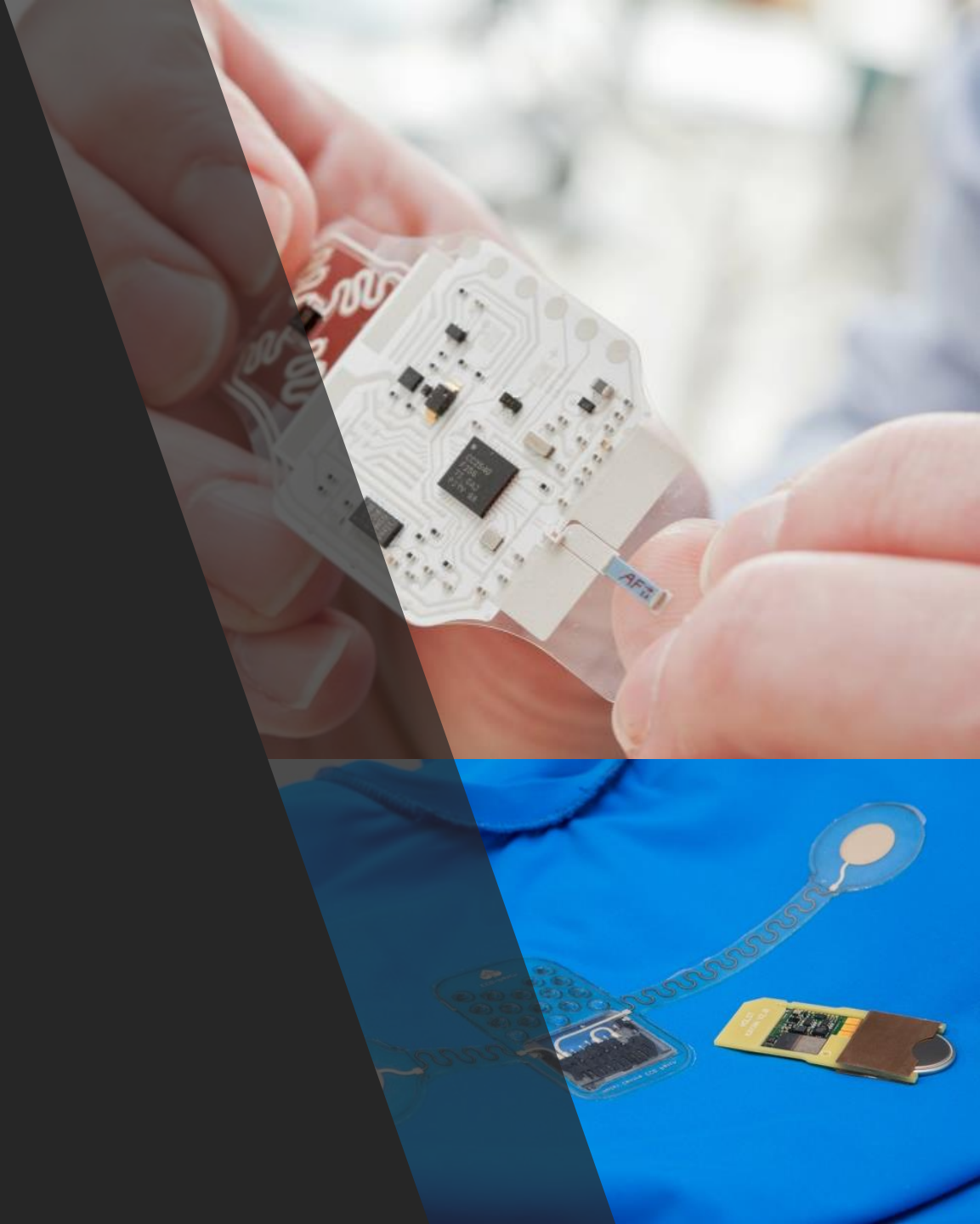
- **Total printed electronics market**
(covering products like membrane switches, RFID antennas, and connective circuitry, along with products like display, lighting and photovoltaics):
revenues of USD 5.64 billion in 2010,
growing to USD **26.9 billion** in 2016
—a year-on-year growth of 31.8 percent- .
It will grow USD **43 billion** in 2020,
and will continue at a rate of 13.9 percent.

[Source: Smithers Apex](#)

PE Märkten

- Medisch
- Automotive
- Logistics / industry
- Consumenten Elektronica
- Printing & Packaging
- Smart Buildings
- Internet of Things
-

- PE Medical:
- healthpatches
 - smart blisters
 - trackers



PE in Automotive

Printed & Flexible Electronics Opportunities Automotive



Courtesy Fiat

Key features:

- ✓ Reduced weight, volume and cabling
- ✓ Increased safety and comfort
- ✓ Fuel savings and reduced emissions

Conformal In-mould Interiors:

- Integrated lighting & overhead consoles
- Control panels for doors, armrests, pillars and central console
- Printed Heaters for floors, seats

Conformal autonomous exteriors:

- Photovoltaic and batteries
- Tail lights
- Embedded climatic sensors

Vision enhancement & info availability:

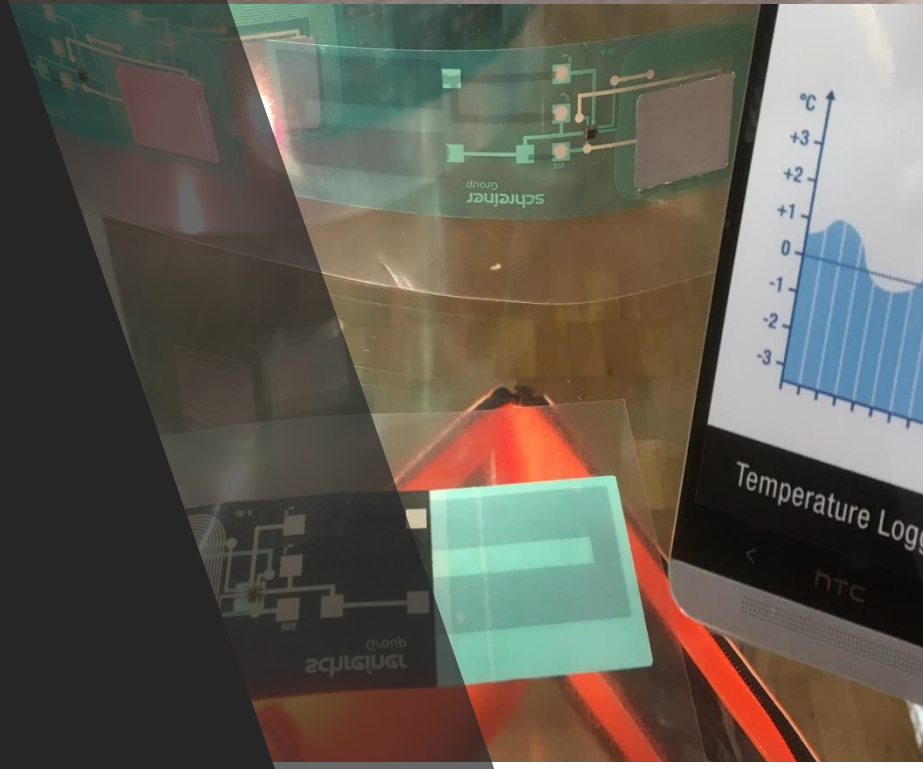
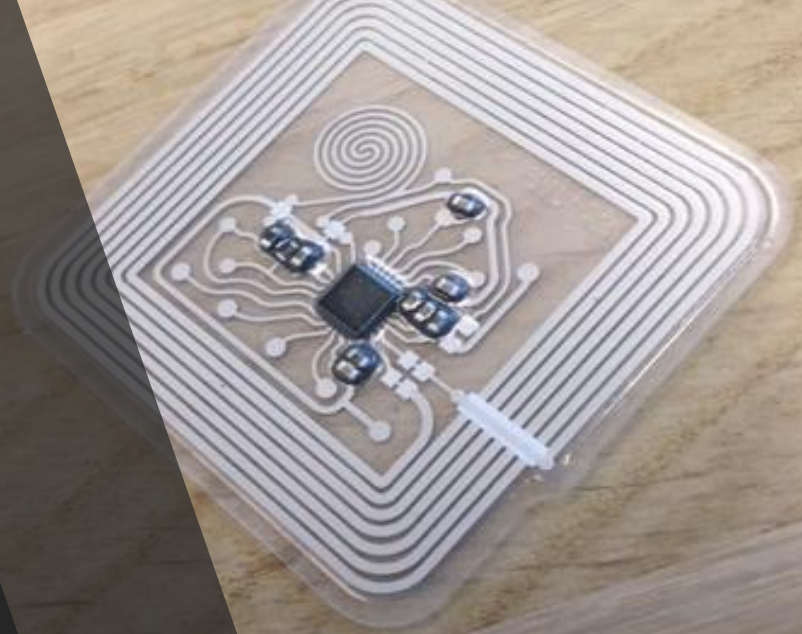
- Transparent displays
- Head-up-display optical films
- Sun protection electrochromic films



printed NFC temperature logger
for logistic purposes

PE MARKETS: LOGISTICS

NFC BASED SENSORS



Process control measurement

INDUSTRY

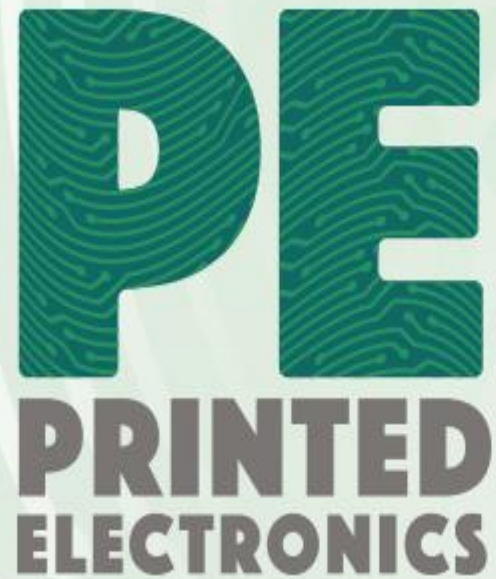


Sensors, lighting, activity

TEXTILE INTEGRATION



HOW TO BUILD



PE
PRINTED
ELECTRONICS

?



Create the breeding grounds

- Build ecosystems
- Make PE known (SME!)
- Know-how & IP sharing
- Demonstrations
- Early pilots / Fieldlabs
- Talent development
- Investments

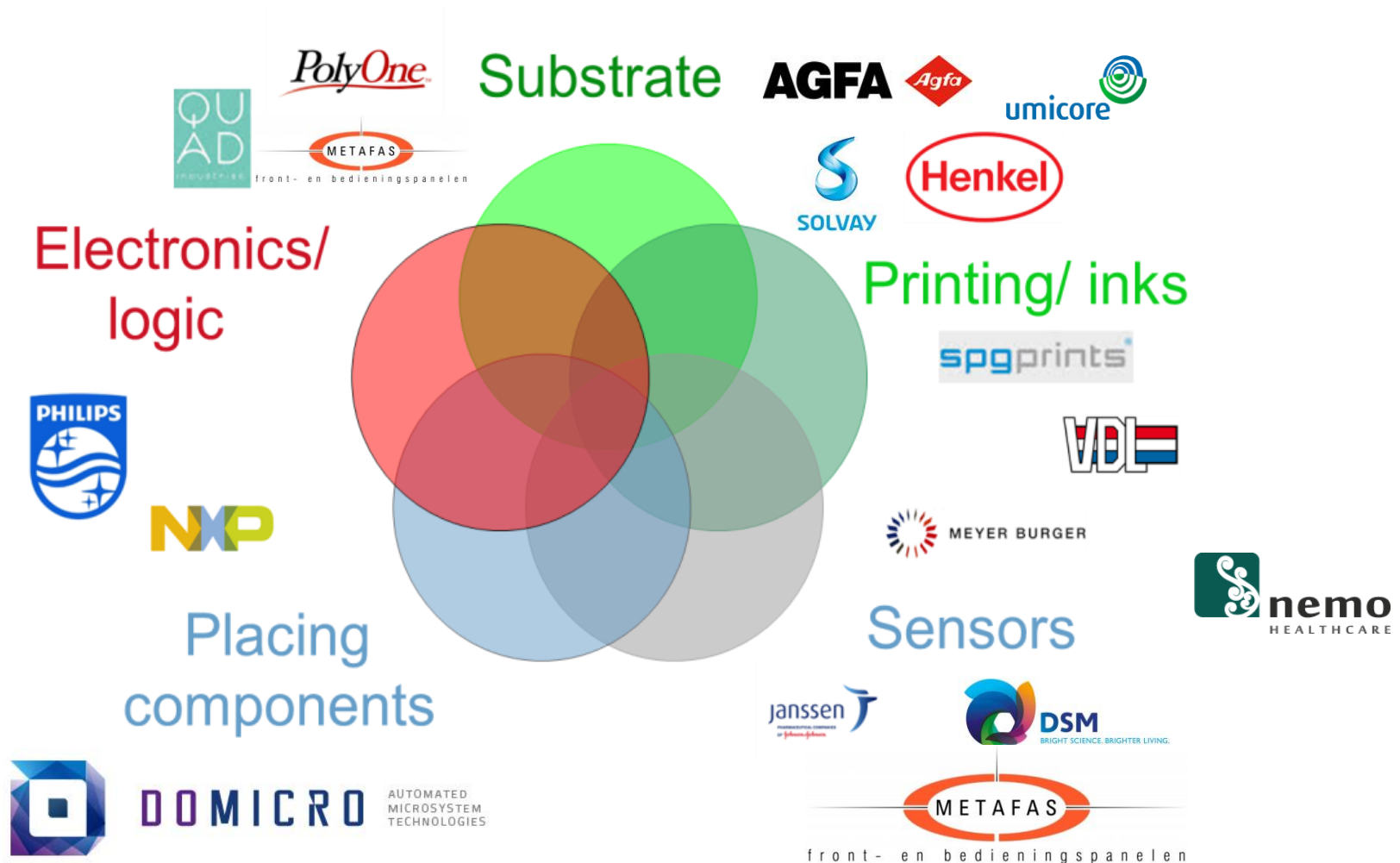
And do everything at the same time

In Brabant !

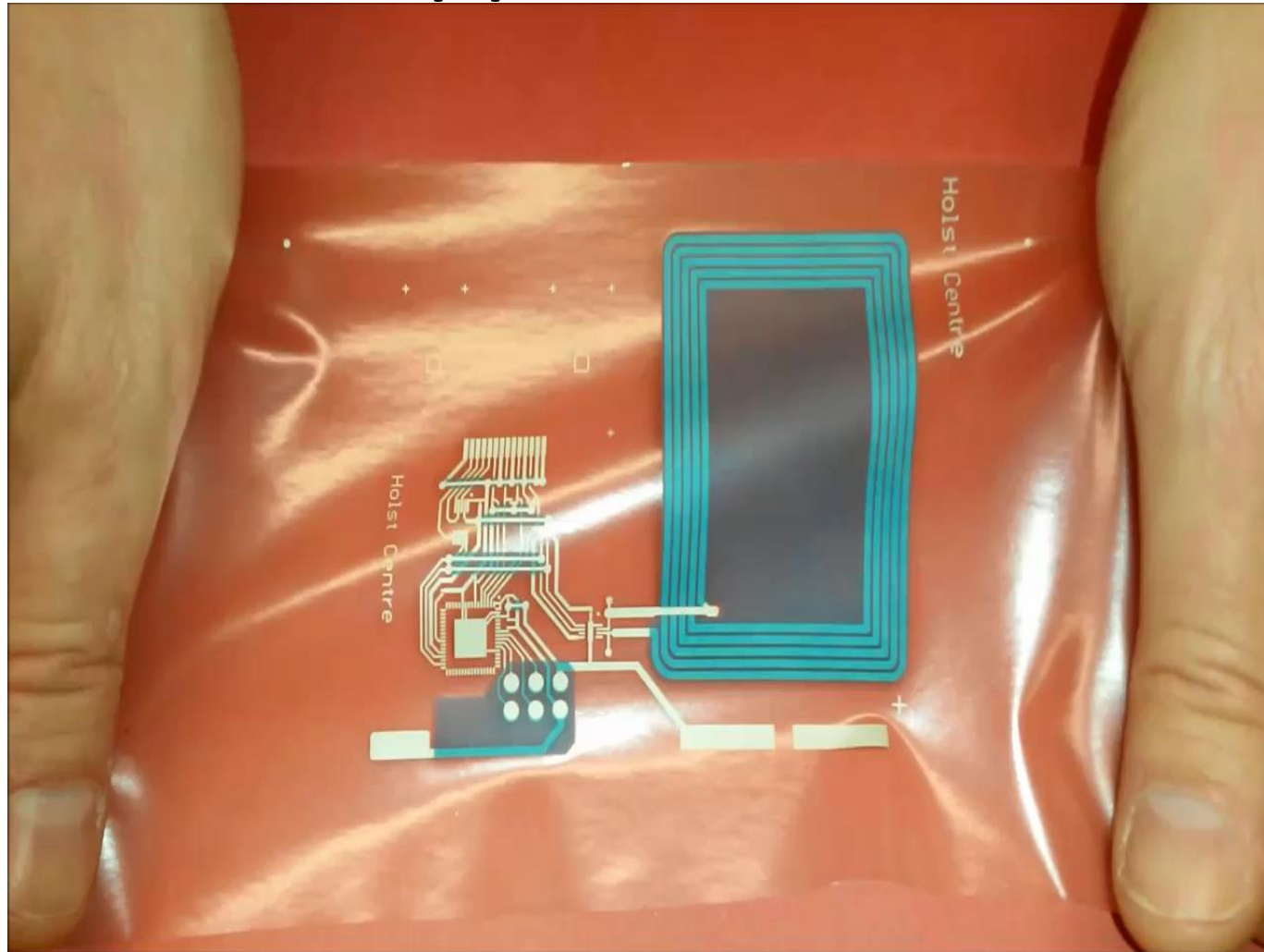


PE business chain: *Power of Proximity*

all within 50 km's range



New application research



Building the PE ecosystem in NL

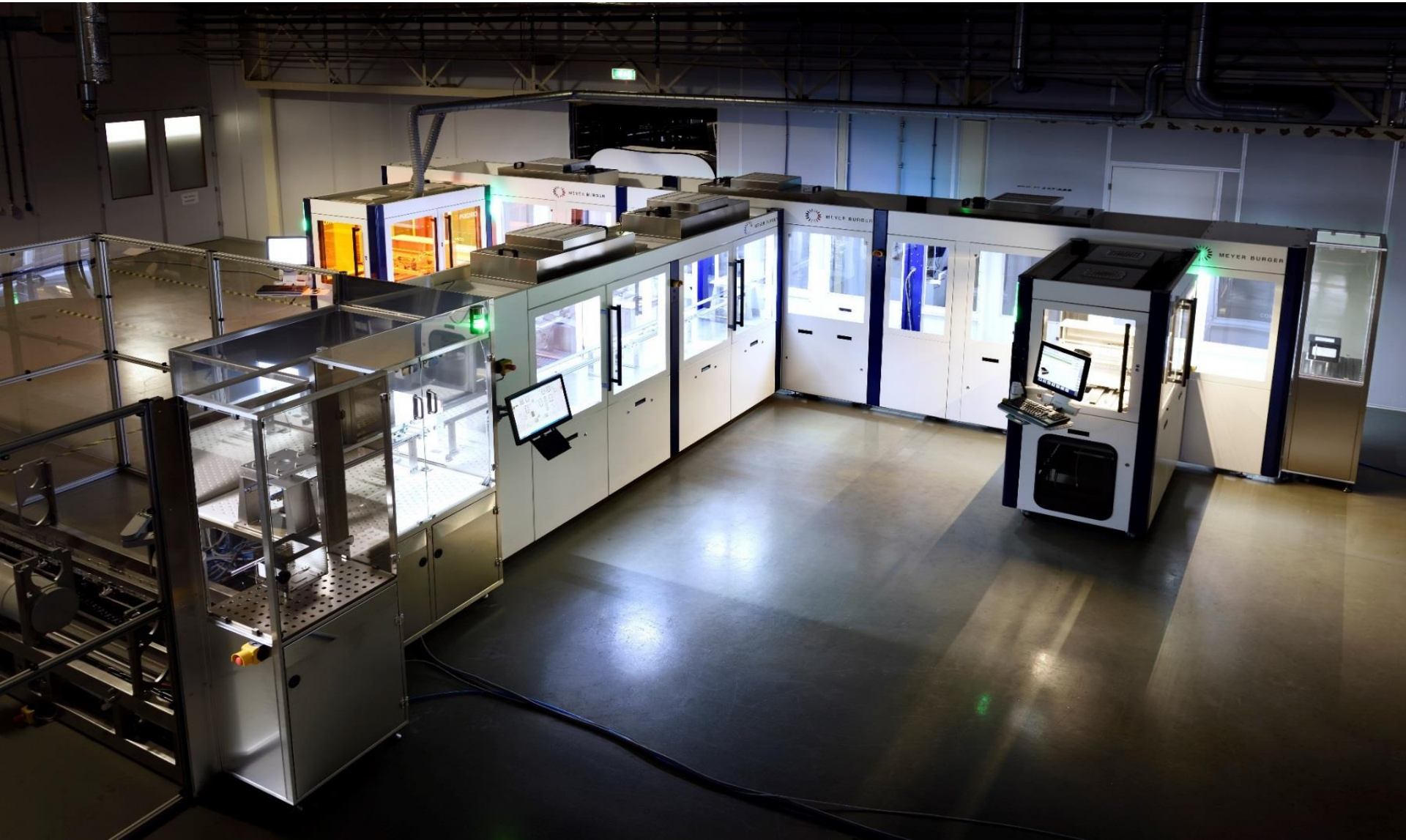
- Inspiring PE events & demo cases
- Information sharing, PE newsletter (in NL)
- PE events and conferences
- Funded collaboration projects
- IP for SME's program
- PE capital investments

Brabant Development Agency



DOMICRO: Micro Device Fab

on demand production 10-10.000 pcs / month



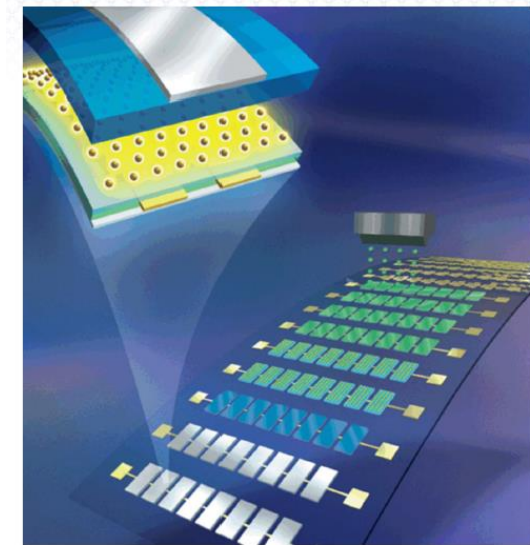


Early know-how & IP sharing

- PE Newsletter (in Dutch) > *Bits&Chips*
- Yearly open PE.NL event > next in October 2017
- **HOLST-IP-License program**
 - Access to joint Holst Centre IP for SME's (BOM)
 - SME's in NL and Belgium

Project: *Printed Electronics NL*

- OPzuid programma (EFRO/Noord-Brabant)
 - Goal: Development of the NL PE Ecosystem
 - Started on Sept 1st, 2016
 - Duration 3 years
 - **Demonstration projects with 10 companies**
 - including training, promotion, investigations



Partners: *Printed Electronics NL*

LIFESENSE
GROUP



ATOGEAR



HIGH TECH CAMPUS
EINDHOVEN



Brabant Development Agency

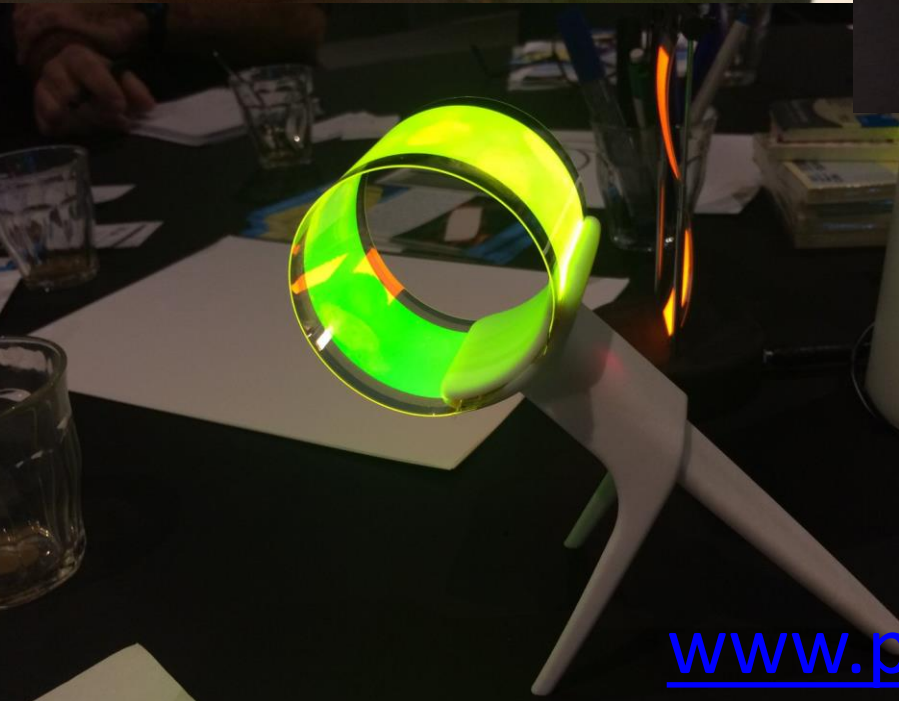
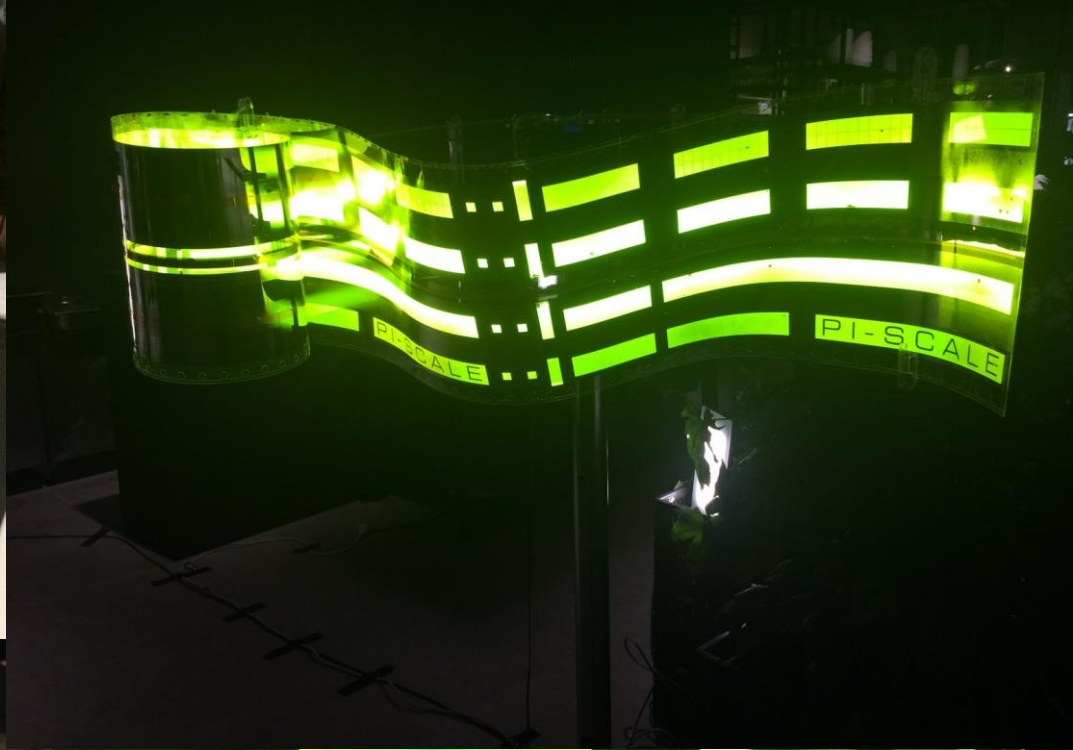


EU pilot-line project on flexible OLED LIGHTING:



PI - SCALE

SHAPING THE FUTURE IN OLED LIGHTING



www.pi-scale.eu



Conclusion



- PE is creating new opportunities
- Ecosystem for production is in Development (Noord Brabant)
- Key industries use organic electronics
- Collaboration is key to success in PE market approach

But we need :

- More applications, believers to make scale
- Co-investors/believers in PE
- Better materials / sensors / integration / skilled people

So let's collaborate!

Brabantse Ontwikkelings Maatschappij

 **BOM**



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