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10 years back  
10 years forward  
In bio-based venture capital investments

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**Sustainable Resources  
Chemicals & Materials**

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Rob van der Meij  
Brussels, November 7, 2018



# CAPRICORN VENTURE PARTNERS

Capricorn  
SUSTAINABLE  
CHEMISTRY  
Fund  
€ 55 million\*

Capricorn ICT  
Fund  
€ 33 million\*

Capricorn  
HEALTH-TECH  
Fund  
€ 42 million\*

Capricorn  
CLEANTECH  
Fund  
€ 112 million\*

Quest for  
Growth  
€ 140 million \*\*

Quest Cleantech  
Fund  
€ 203 million \*\*

Quest+  
€ 5.3 million \*\*  
(launched Dec.  
2017)



Leuven, Belgium

Partners owned

Sector Focused/Dedicated investment teams

AIFMD licensed asset manager - Fully regulated – European Passport

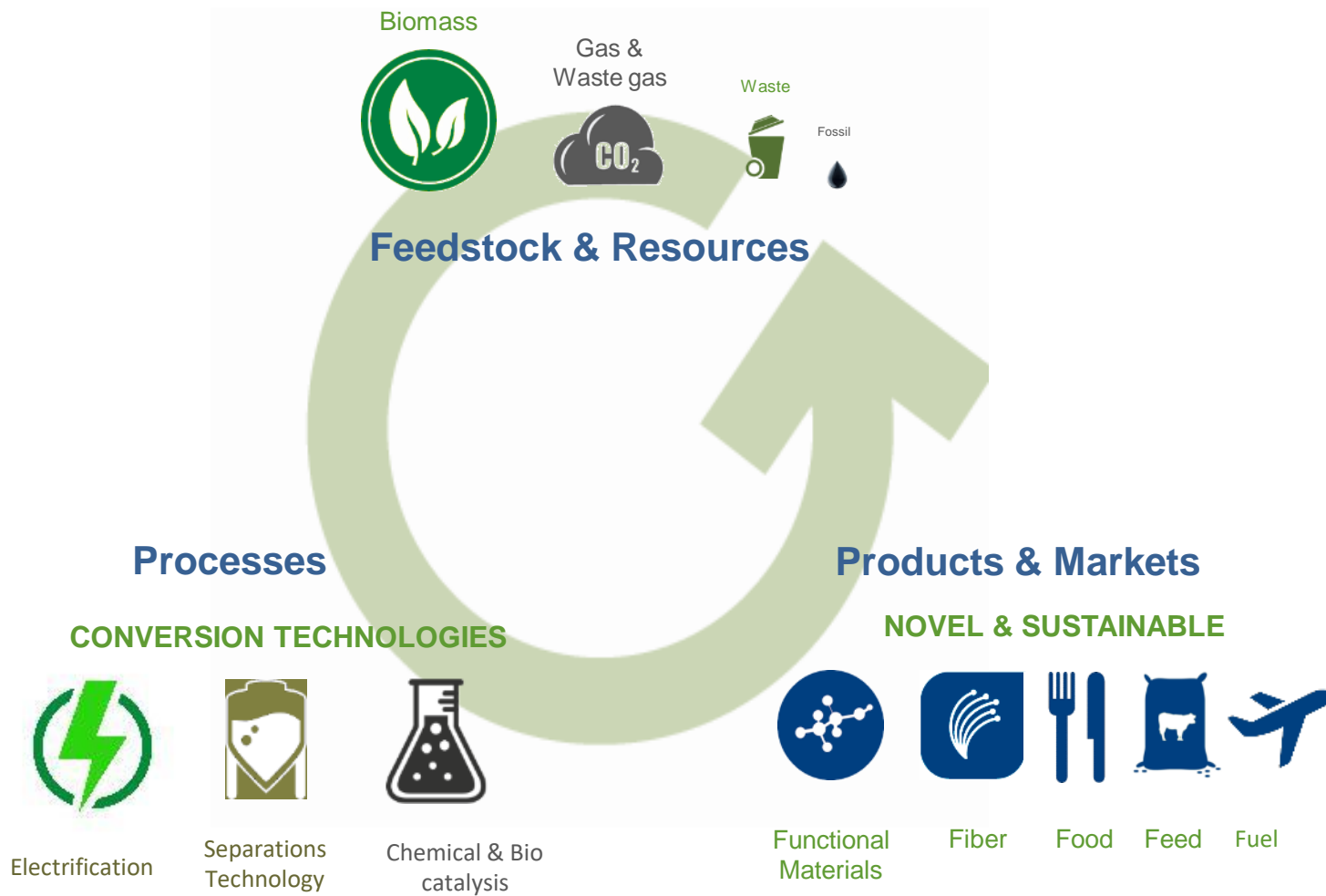
> € 500 million under management

> € 230 million in venture capital

\* committed capital

\*\* last published net asset value

# CAPRICORN SUSTAINABLE CHEMISTRY FUN(D)



# My story in 2007

1987                      Chemical Engineer

1987-2007            20 years, Akzo Nobel, Gemini Consulting, Shell Chemicals

Technical, Commercial, Business, General Management roles

2007                      Bio-e-con

Fundraise Europe    -->    Turn-down by Capricorn, “do not belief in biofuels”

USA                      →    Khosla Ventures

CEO

Move KiOR to USA

2 → 10 people in 3 months

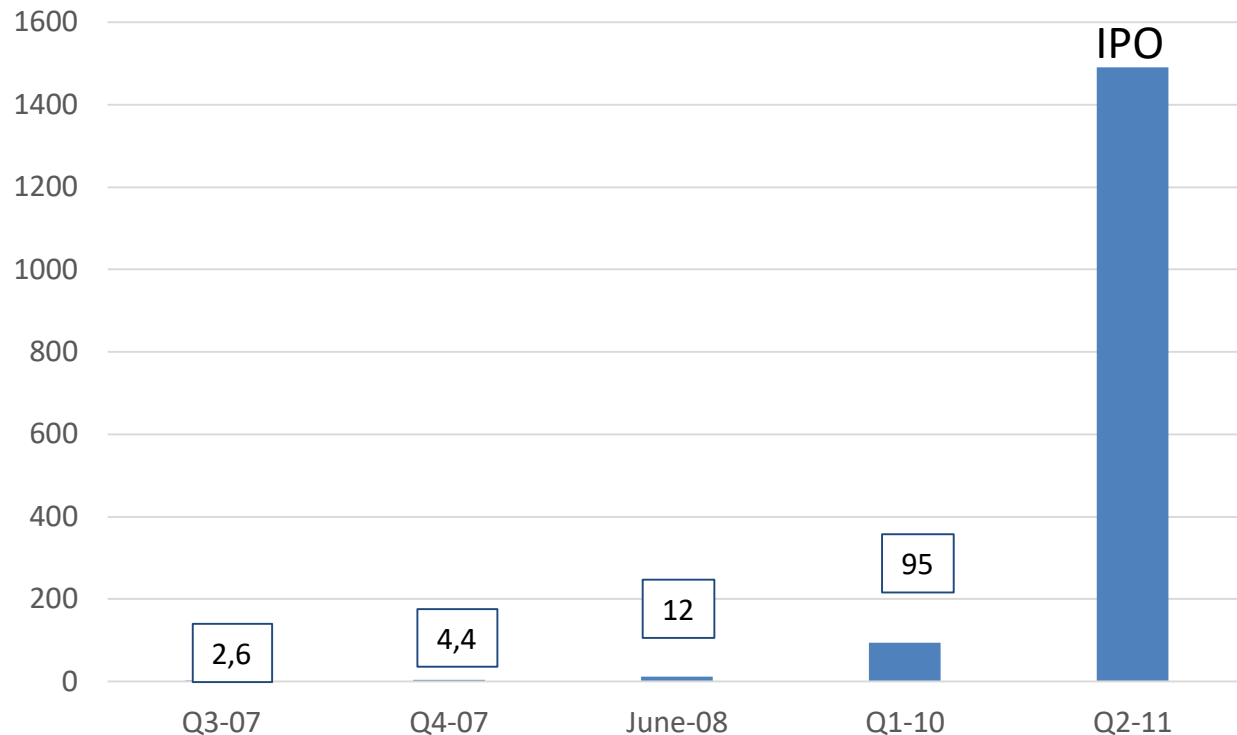
+12 million within 12 months



# KiOR valuation did very well 2007-2011



Kior Valuation (million USD (!))



Multiplier vs previous round  
Multiplier vs start valuation

2X  
2X

3X  
5X

8X  
37X

16X  
573X

 YOU'RE  
FIRED

Misalignment issues

# 2008 Environment with strong drivers

## Promising companies



## Keen Investors

HIGH CONFIDENCE

Drivers

- Lots of Money
- Government USA
- money
- loan
- subsidy
- regulations
- feedstocks
- military drive

Market

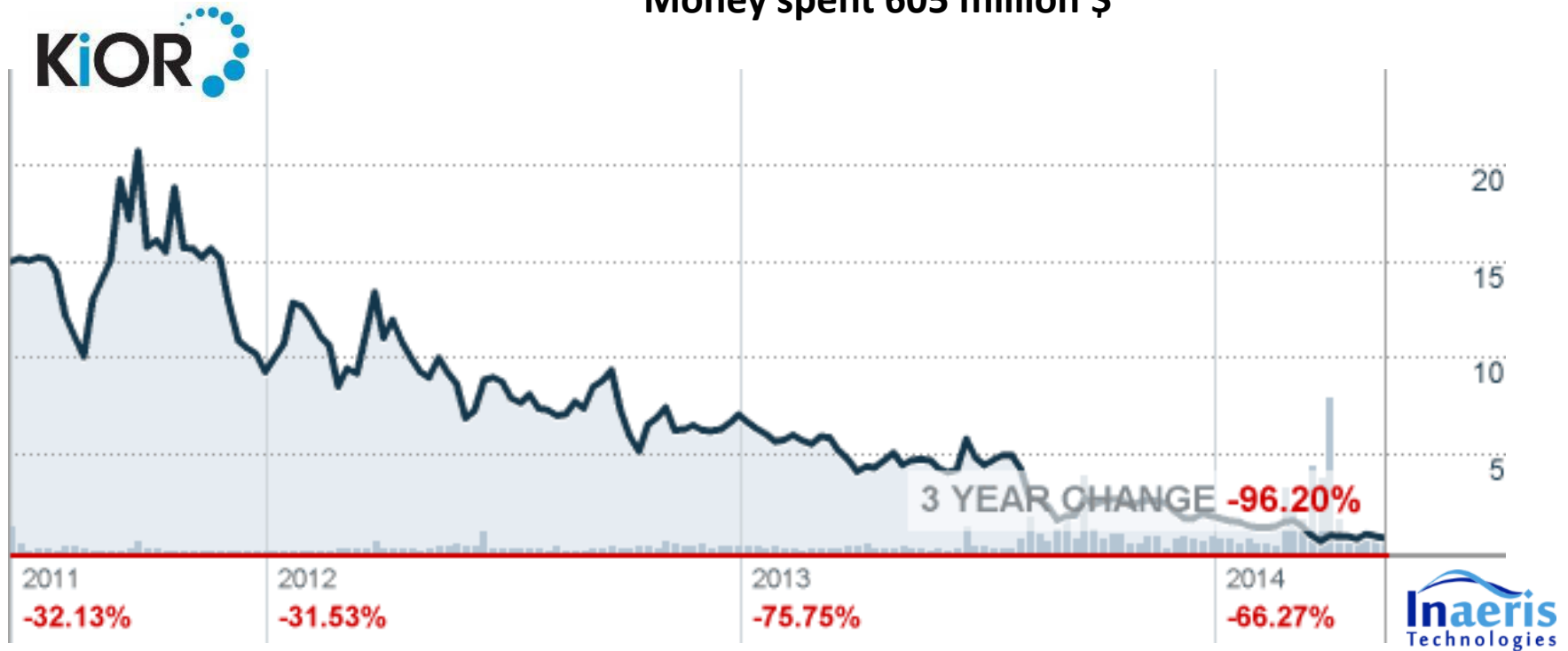
- Fuels
- Drop in chemicals

‘What can possibly go wrong’?



But post-IPO it went down quick

Money spent 605 million \$



**Plant did not work**

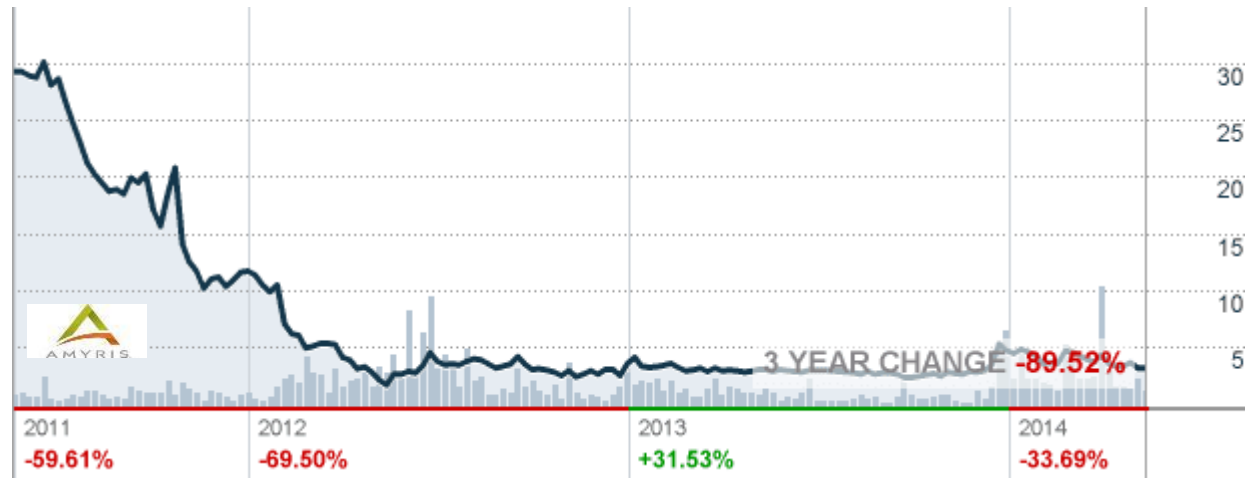
# IT DID NOT GO WELL FOR OTHERS TOO.....

IPOs

Amyris

Gevo

KiOR

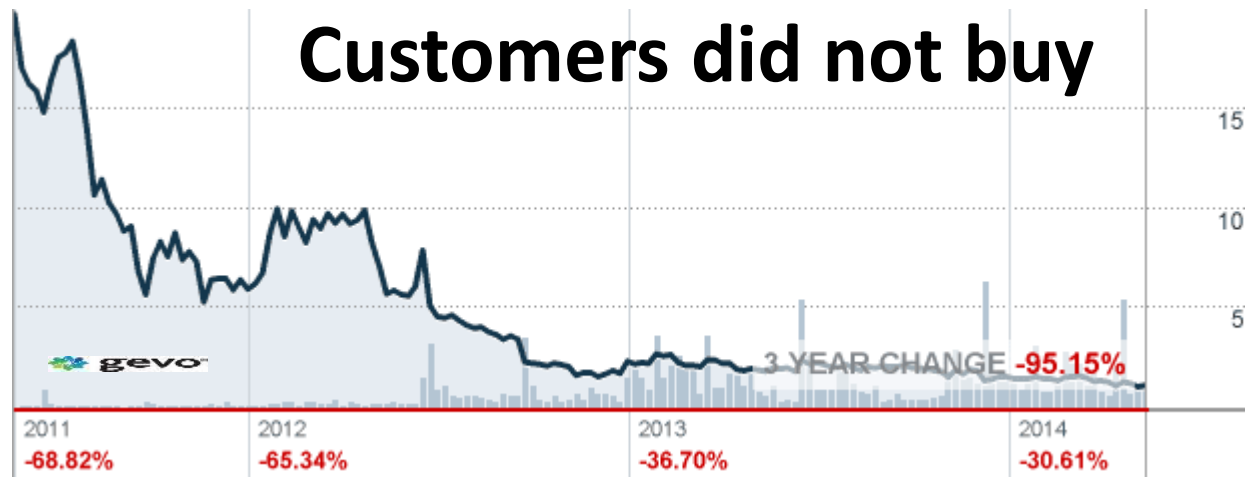


High valuations

**Plant did not work**  
**Customers did not buy**

Based on promise of  
technology

Internet bubble  
repeater





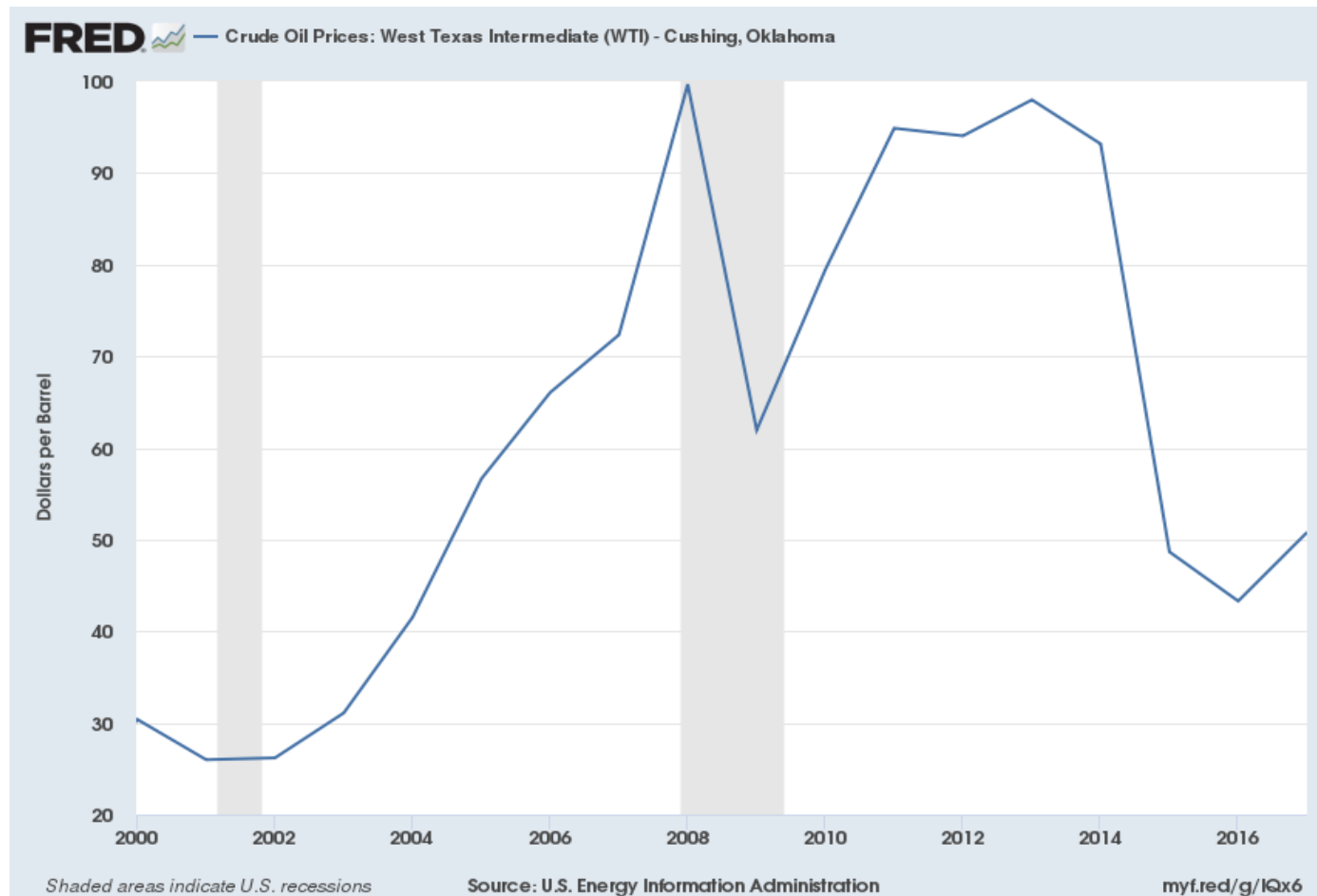
# ONLY A FEW SURVIVED



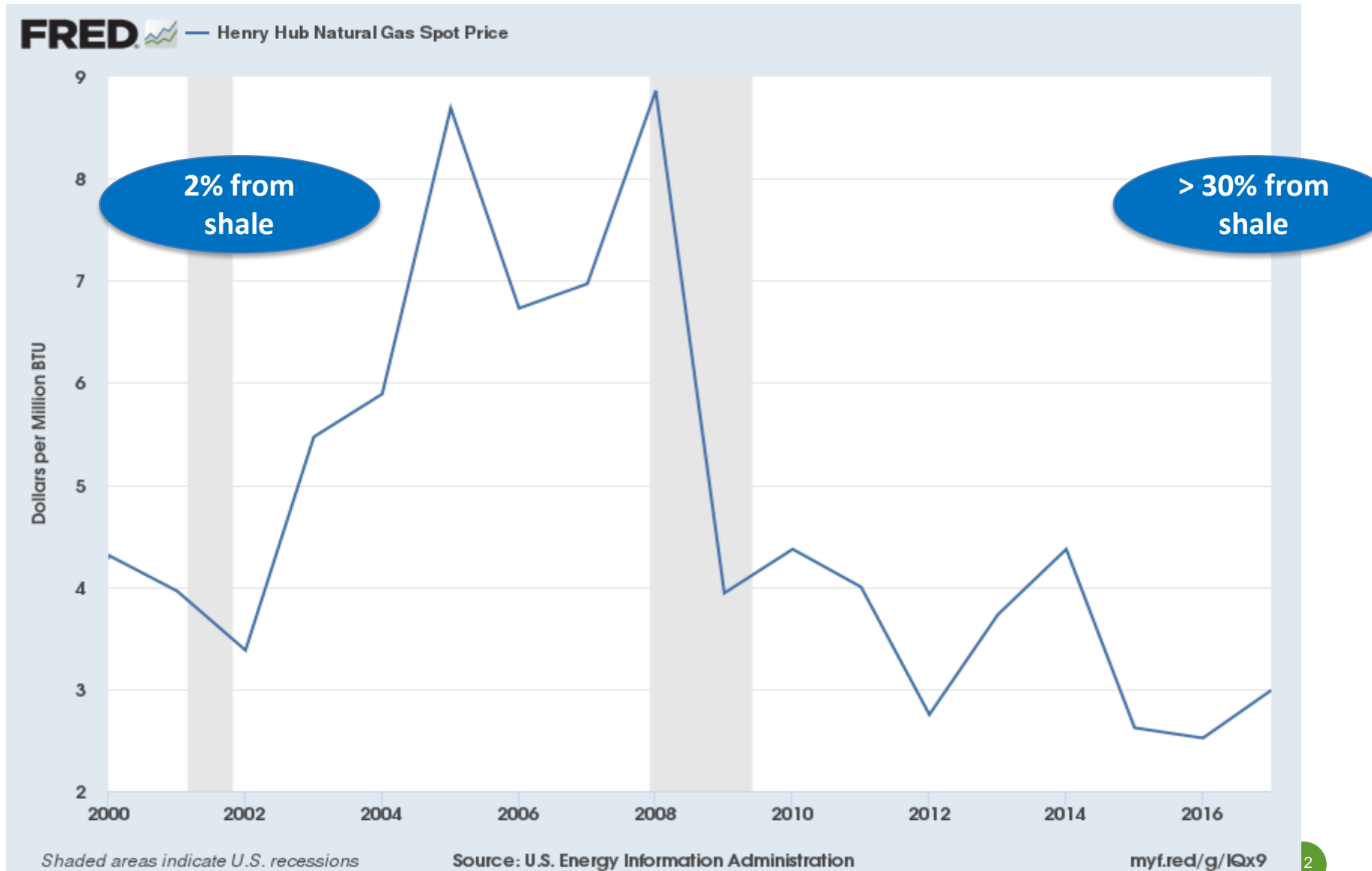
- Few successes
- Some pivoted
- Partnerships made
- Some still not there yet
- Major loss for original investors
- Many examples
- But, credits to those still present !

**SO WHAT HAPPENED ?**

# The oil price stayed high till 2014

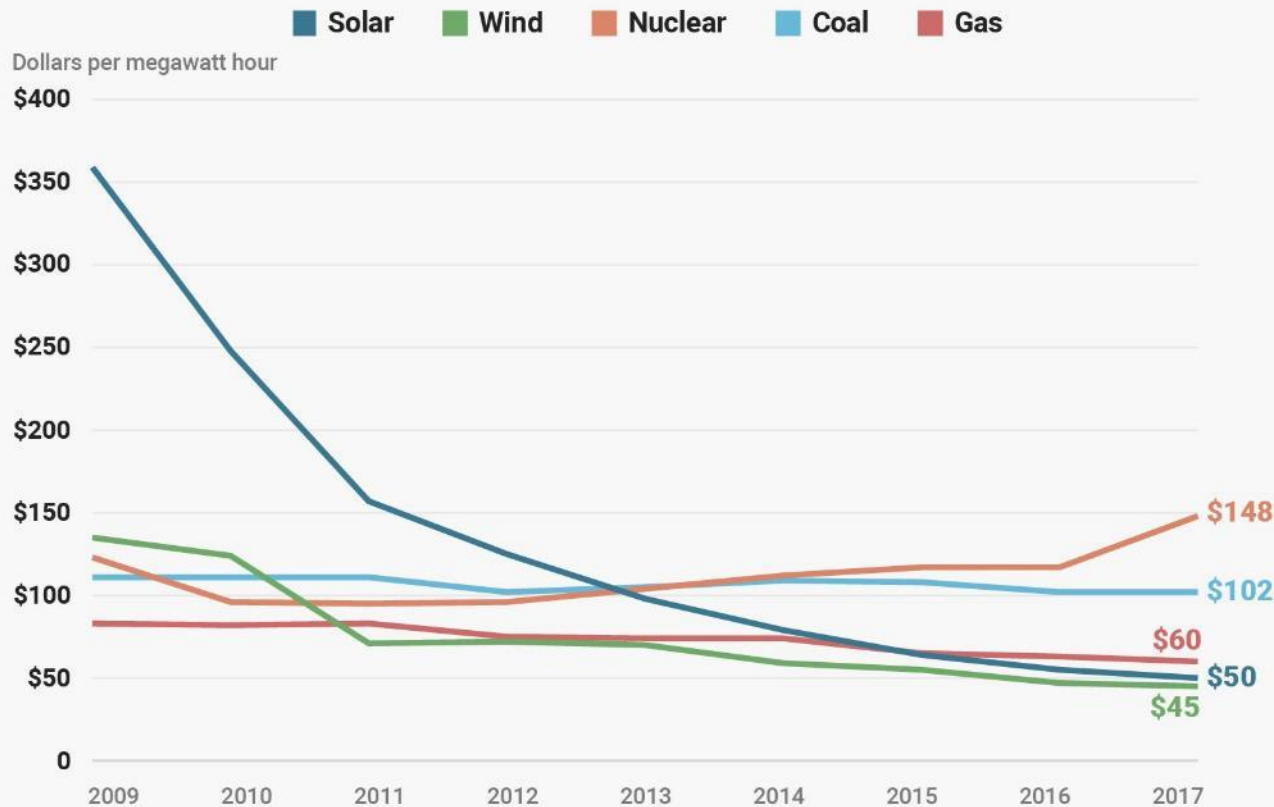


# Gas price dropped !



# electricity price low and near energy parity by 2017

## The average cost of energy in North America



Cost of solar  
dropped  
hard

Source: Lazard levelized cost of energy analysis

BUSINESS INSIDER

**BUT THE BIGGEST ISSUE**

**PROCESS TECHNOLOGY IS NOT AS EASY  
AS WAS ASSUMED !**

**CUSTOMERS DID NOT BUY EASILY !**

# Process technology is not easy (2008-2016)

- The chemicals and energy industry was considered 'conservative' by clean tech investors and ready to be taken over by the fast and furious from the Internet age
  - It is not and industry of stupids
  - Clean tech is more difficult than IT tech
  - And more expensive !
- "Parallel Engineering (pilot & commercial plant)"
- "Build the plant first, solve the problems later"
- Field of dreams approach
  - If we build it, they will come
    - technology problems will be solved, customers will magically appear
- "it is just connecting well proven standard unit operations"
- "First to market" ?
- CAPEX/OPEX estimation for new processes, "we can be cheaper"
- IPO with technology only, no proven technology
- HIGH CAPEX for pilot and demo facilities → carried by company



SO WHAT IS DIFFERENT NOW  
2018

# DRIVERS ARE STRONG AND RECOGNIZED

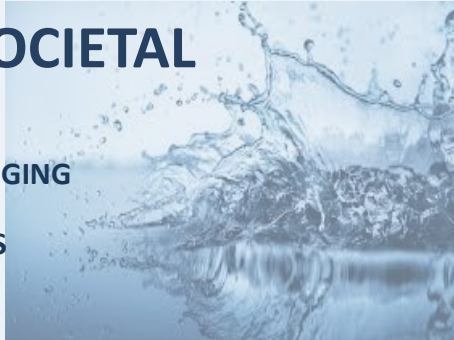
## CHANGING DEMOGRAPHICS

WORLD POPULATION 7.3 - 9.6 BILLION (2050)  
URBANIZATION  $\pm$  20% INCREASE (2050)  
LIFE EXPECTANCY 67 TO 75 YEARS (2050)



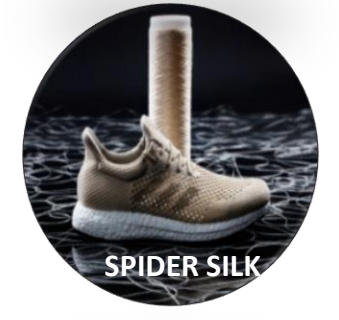
## ENVIRONMENT & SOCIETAL

ENVIRONMENT & CLIMATE CHANGE  
FOOD DEMAND GROWING AND CHANGING  
SUSTAINABLE AGRICULTURE  
CHANGING CONSUMER EXPECTATIONS



## INDUSTRIAL & TECHNOLOGICAL

FEEDSTOCK DIVERSIFICATION & SECURITY  
INNOVATION & SUSTAINABILITY  
DIGITALIZATION AND AUTOMATION  
SUSTAINABLE SUPPLY CHAINS



# ALIGNMENT WITH SUSTAINABLE GOALS IS REAL

## THE GLOBAL GOALS For Sustainable Development



and embraced  
by corporates



Category	Companies				
Financial services	delta lloyd	ING	PGGM	Rabobank	Triodos Bank
Retail & consumer	Ahold	HEINEKEN	IKEA	PVH	Unilever
Energy & chemicals	AkzoNobel	alliander	DSM	Eneco	SBM OFFSHORE
Transport & logistics	Port of Rotterdam	KLM	postnl	philips	Schiphol
Other	ASML	bam	kpn	randstad	

# Brands and corporates are stepping up, increasing early partnership options for renewable based products



SYNTHETIC BASED 100%  
BIOBASED



RENEWABLE ISOBUTENE  
FOR COSMETICS



PARTNER  
SHIP FOR  
DELIVERY  
OF BIO-  
PLASTICS

IKEA GREENTECH INVESTS IN GAME CHANGING  
TECHNIQUE TO REPLACE TODAY'S SYNTHETIC  
CONVENTIONAL PESTICIDES



JOINT VENTURE FOR BIOBASED  
SUCCINIC ACID



CORBION AND TOTAL PLA  
(POLYLACTIC ACID)



acquires



BIO BASED DETERGENTS



NIKE, INC. ANNOUNCES STRATEGIC  
PARTNERSHIP TO SCALE WATERLESS  
DYEING TECHNOLOGY



BASF AND AVANTIUM CREATED A  
JOINT VENTURE FOR PEF



BIOPOLYMERS

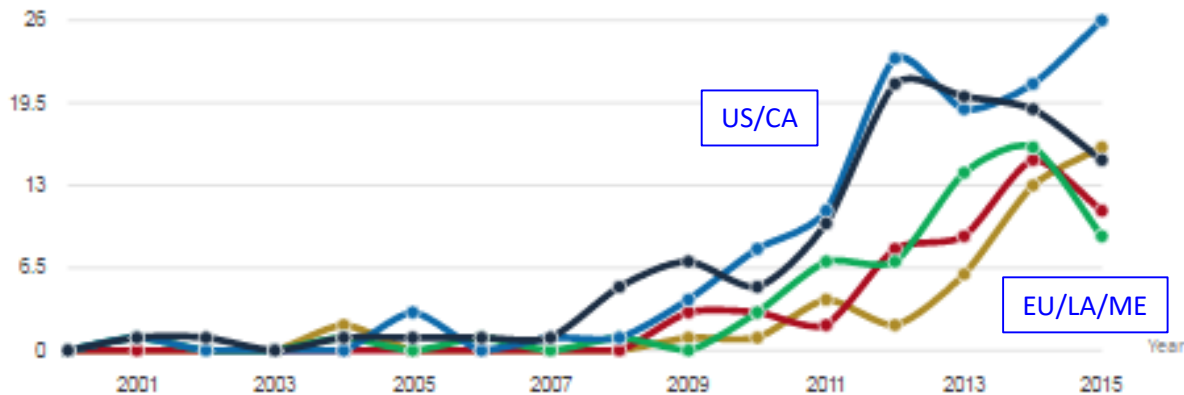


# AND AN ECO-SYSTEM HAS BEEN CREATED

A lot of accelerators & regional development funding makes access to pilot plants easier

## EVOLUTION OF THE ACCELERATOR INDUSTRY

NEW accelerators



US and Canada led the wave for new accelerator program launches and reached a peak in 2012. While some regions have reached the peak in 2014/2015, others have not yet done so.

Availability of standard pilot facilities reduce CAPEX need

Regional funds often invest pre-revenue

Risk for fragmentation and 'regionalism'



Random selection  
hubs, pilot, fund etc



Bio Base Europe  
Pilot Plant

BIOGIS Center



ONREL  
NATIONAL RENEWABLE ENERGY LABORATORY



LRM  
Oxygen for growth



USD 12m Credit Line



cpi



SRIW  
INVESTMENT & GROWTH

De Dietrich

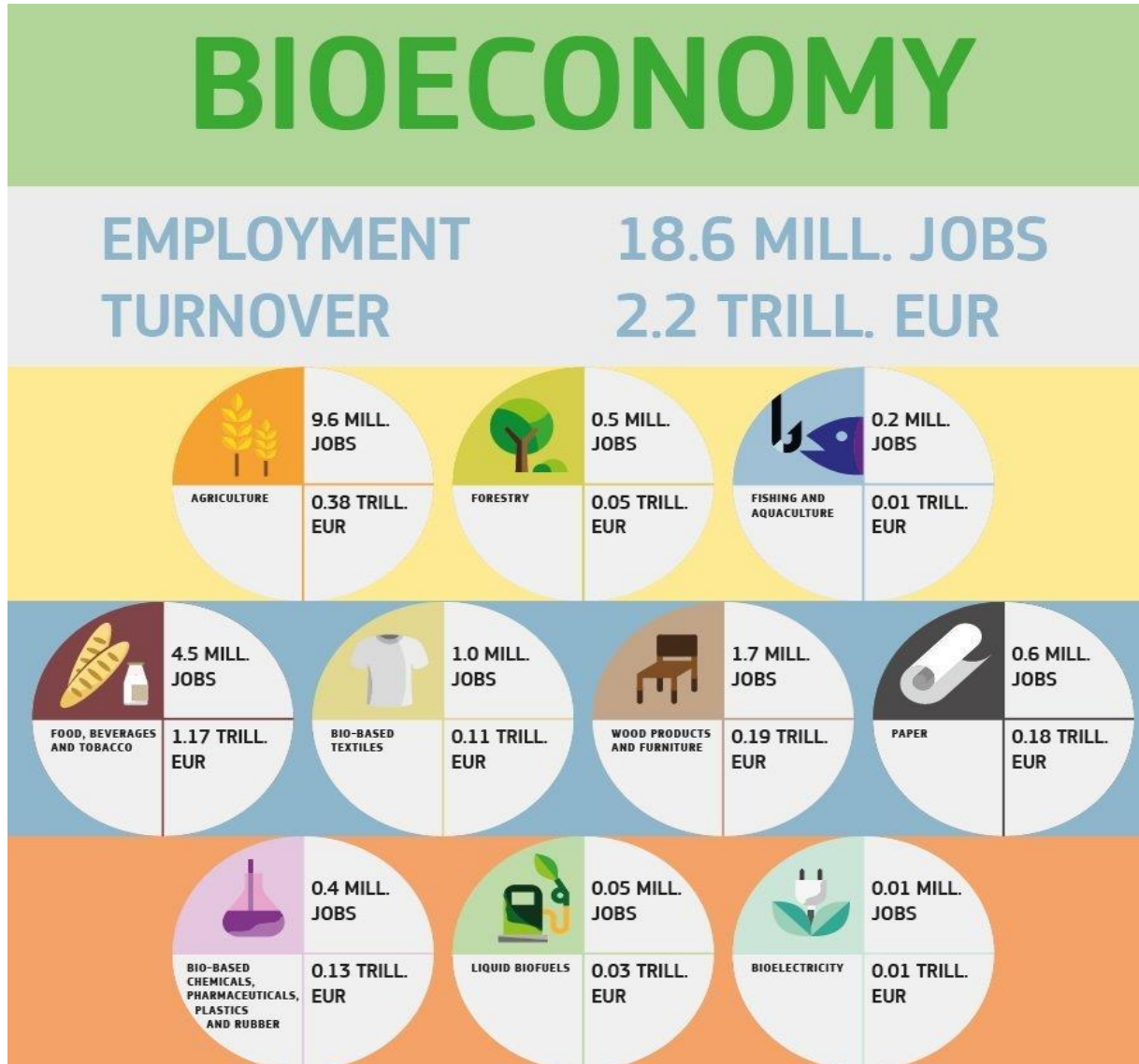
SAS PIVERT

# More finance structures coming (ease of access EU finance improving)

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- Circular Bio-economy Investment Platform (2019)
  - 200-250 million Euro fund by EIB and fund manager to be appointed
  - Debt and Equity fund !
- 10 billion Euro in Horizon programs
- BioBased Industries Consortium
  - > 3 billion Euro Public Private Partnership
  - First three years
    - 65 projects, 20 demo, 6 flagship
    - >400 million Euro grants in 3 years, 4:1 leverage with private money, > 1,5 billion Euro
  - 2020 outcome expected
    - >100 new bio-based materials, >40 consumer products

# THE BIO-ECONOMY IS REAL NOW



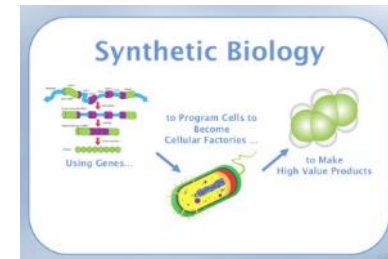
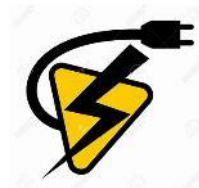
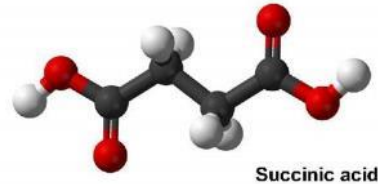
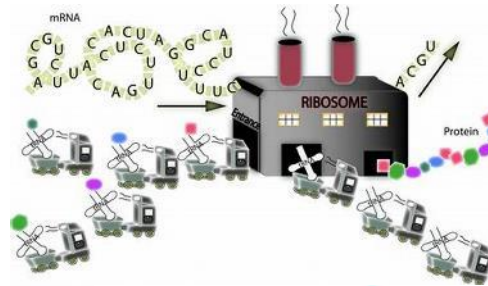


AND WHAT WILL WE DO  
DIFFERENTLY ?

# IDENTIFIED PROMISING MARKETS AND MOLECULES

## EXAMPLES

- Protein for feed
- Natural non-sugar sweeteners
- Industrial molecules from biomass
- Specialty molecules
  - Terpenes, terpenoids
  - Nootkatone
- Synthetic biology
- Electrification
- Bio stimulants
- etc

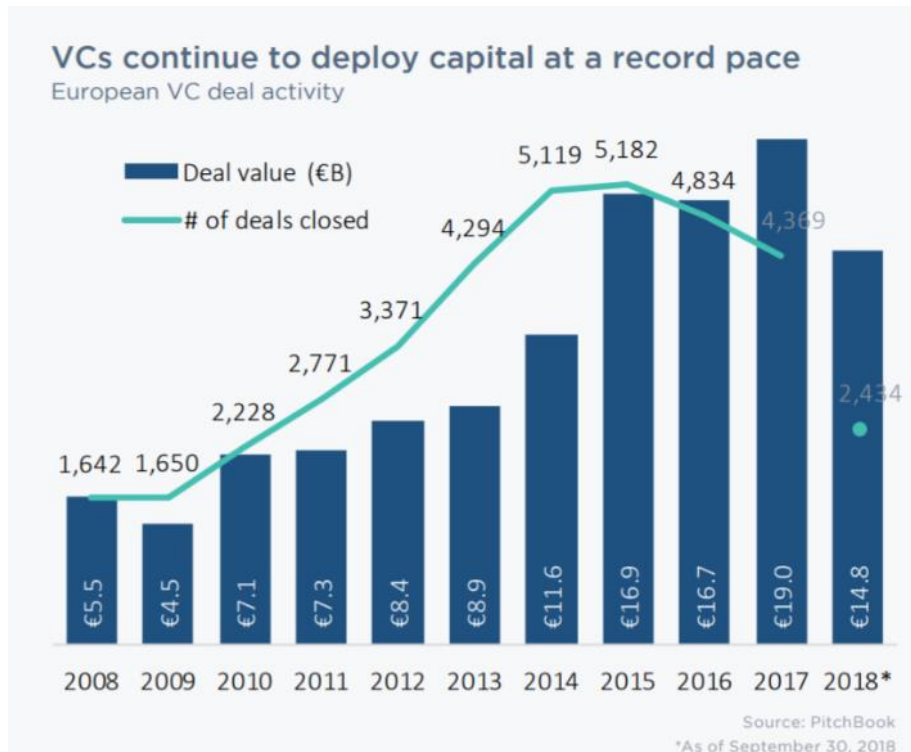


# ALL RUSHING IN ?



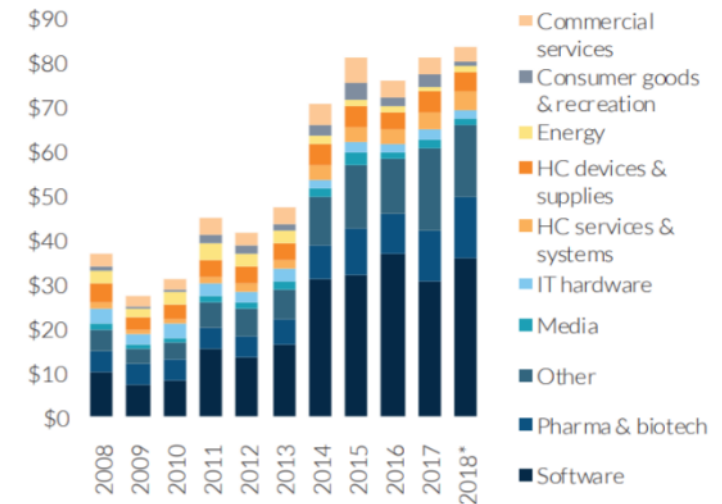
# LOTS of money again, most runs to Pharma and Software

- Both European and US VC activity to record levels



## Pharma & biotech sets annual record high of \$14B+

US VC deals (\$B) by sector



PitchBook-NVCA Venture Monitor  
\*As of September 30, 2018

<https://pitchbook.com/news/reports/3q-2018-european-venture-report>,  
[https://files.pitchbook.com/website/files/pdf/3Q\\_2018\\_PitchBook\\_NVCA\\_Venture\\_Monitor.pdf](https://files.pitchbook.com/website/files/pdf/3Q_2018_PitchBook_NVCA_Venture_Monitor.pdf), \*As of September 30, 2018

Acknowledgment

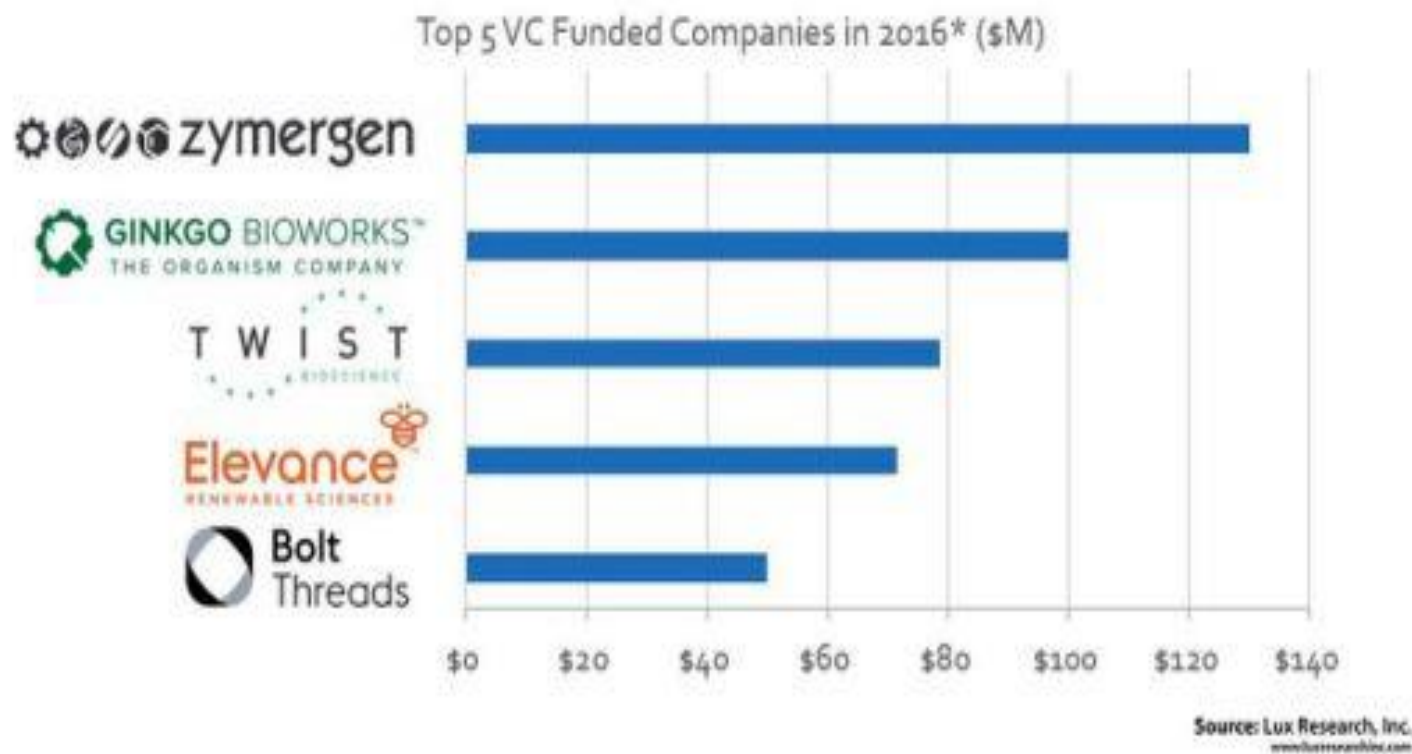
**Arthur D Little**

# Again, high valuations .....

## VCs Invest \$5.8 Billion in Bio-based Chemicals, as Focus Shifts to Disruptive Synthetic Biology



[Marketwired](#) December 20, 2016



# AND TECHNOLOGY IS EASIER NOW .... right ?

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Access to pilot plants create lower barrier and reduce initial capital need

Access to CMO enable low CAPEX market entry  
and enable faster scale up

Scale up experience has increased  
but process development know how more scarce

Opportunities for decentralized business models with lower capital need

Modular technology development  
Multiplication  
Standardization  
Large cost down possible

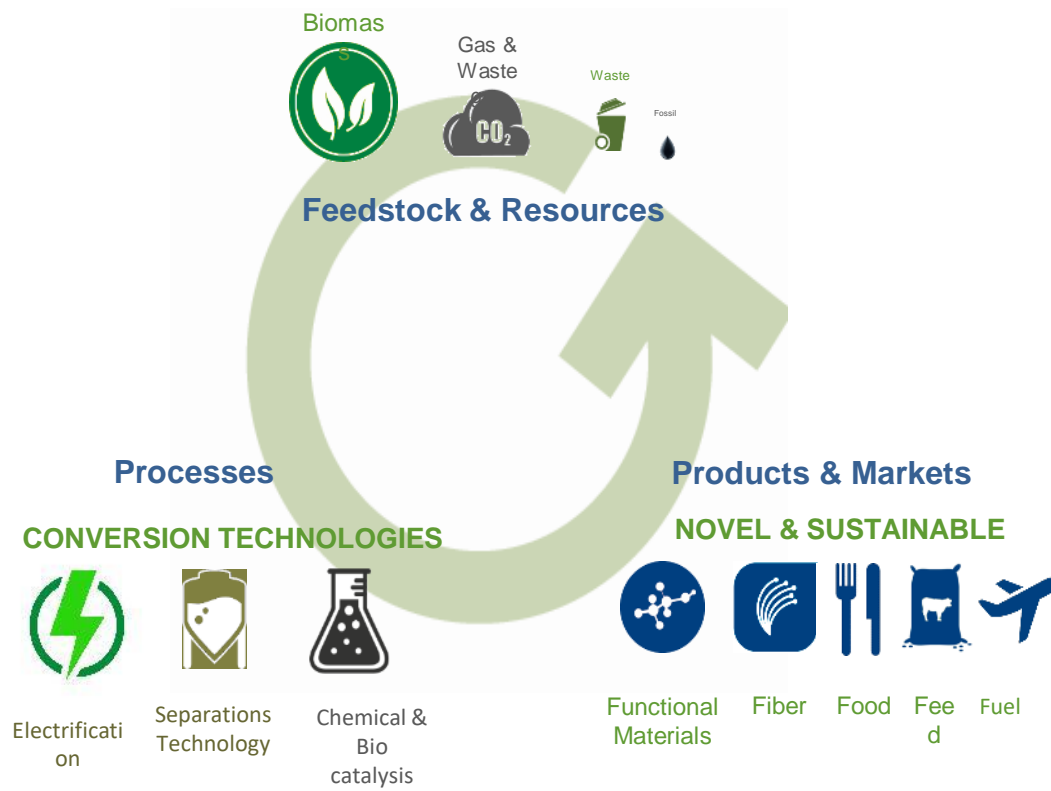
# CAPRICORN SUSTAINABLE CHEMISTRY FUND

## Keen Investors



2018

## Promising companies





‘What can possibly go wrong’?





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