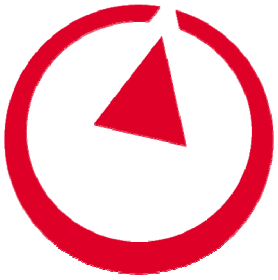


BAIN & COMPANY

Sustainable Energy Fund Project

Report, July 14th 2006

Agenda

- Introduction

- Findings

Key questions

1. Is there indeed shortage of capital supply for high quality innovation projects in sustainable energy in The Netherlands in the phase between Research & Development and market introduction? If so, why?
2. Can the Dutch State fill this gap by co-investing with commercial venture capital investors in these projects? Are commercial venture capitalists indeed interested to co-invest? At what terms?
3. What are potential other measures that the Dutch State can take to stimulate innovation in sustainable energy in The Netherlands effectively?

We have spoken to >70 experts from different angels in the field of sustainable energy

Government / related

- P. Koutstaal (Fin)
- L. Meyering (SenterNovem)
- B. Stuij (SenterNovem)
- R. Starmans (SenterNovem)
- P. Voigtländer (AER)
- J. Dopper (ketenefficiency)
- P. Hamm (Groene Grondstoffen)
- G.A.M. Hermans (duurzame mobiliteit)
- U. Vermeulen (nieuw gas, schoon fossiel)
- H. Groeneveld (Koplopersloket)

RE experts

- J. Dings (Transport Environment)
- P. Oei (Innovatienetwerk Glasdtuinbouw)
- J.P. van Soest (JPVS sustainability cons.)
- A. van Wijk (Ecofys)
- R. Wit (Stichting Natuur & Milieu)

Comparable funds

- G. Dinkla (Twinning)
- P. Stones (Carbon Trust)*
- M. Stutterheim (TechnoPartner)
- M. McGrath (Massachusetts Green Energy Fund)

Universities/ research inst.

- P. Alderliesten (ECN)
- F. de Bruijn (ECN)
- Prof. C. Daey Ouwens (TU Eindhoven)
- T. Hoff (ECN)
- K. van der Klein (ECN)
- M. Lafleur (ECN)
- Th. de Lange (ECN)
- Prof. W. Sinke (ECN)
- P. Wyers (ECN)

Investment opportunities

- Aquafox Holding (P. Ludde)
- Biomassa Holding (F. van der Zee)
- Chemconserve (D. Kesber)
- Demopark Duurzame Energie (B. vd Staaij)
- e-Traction (A. Heinen)
- EWT (Van Alkemade)
- Fiwihex (E. van Andel)
- Greenchoice (M. Rexwinkel)
- Helianthos (Dubbeld)
- NedStack (L. Huiting)
- Nonox (W. Luijten)
- Onroerend Groen (J. de Theije)
- Orgaworld (Mollink)
- PVTwins (M.J. Elswijk)
- Solland (H. Thijs)
- SulphCatch (De Bruijn)
- SunDye (Veltkamp)
- Techneco (P. v Alphen)
- Terreco (N. Grootjen)
- True Solar Autonomy (F. Biegstraten)
- Warmtebedrijf R'dam (G. Brouwer)
- Waste Paper Mining (R.W.R. Zwart)

Corporates

- M. Boersma (Essent)
- B. de Bruijn (Eneco)
- R. Willems (Shell)

Investors

- EIB
- Hg Capital
- S. Bosch (Prime Technology Ventures)
- K. Dijkers (Yard Capital)
- J. Dingeman (Triodos)
- M. Kerr (3i)
- A. Marsden (GE Capital)
- M. Moor (Sustainable Asset Management)
- M. Pieterse (Planet Capital)
- E. Wintzen (Ex'tent)
- L. Roozenboom (Doen Participaties)
- J. Verbeek/D. Dijk (Rabobank)
- B. Wiersma (Sunergy)

Agenda

- Introduction

- Findings

Findings

1. Interest of Venture Capitalists to invest in sustainable energy innovation is increasing rapidly both in North America and Europe overall.
2. However, in The Netherlands specifically, there is still very limited Venture Capital supply for sustainable energy innovation, especially in the early prototyping and piloting development stages right after the conceptual Research & Development phase. Partly this is driven by lack of a clear and consistent long term strategy and policy of the Dutch Government on innovation in sustainable energy. Partly this also seems to be driven by an insufficient need or incentive for Dutch R&D in general to push its ideas effectively further into the innovation pipeline towards actual market introduction.
3. In order to build a more productive innovation pipeline in sustainable energy in The Netherlands, financing and incubation support by the Dutch State can obviously help to close the early stage Venture Capital gap short term. However, as the underlying root causes for the gap have not only to do with "market failure" but also with "government failure", this measure will only be truly effective in attracting commercial Venture Capital in the longer term, when the other identified issues related to Government strategy and policy and the link between R&D and business are being addressed in parallel.
4. Overall there are three different options (each with some possible variations) for the State to help close the current Venture Capital gap in early stage sustainable energy innovation in the short term. One of the options is to provide loan guarantees to project financing banks and by doing so attract Venture Capital with a more attractive risk/return profile of the leveraged innovation projects. First assessment indicates that this loan guarantee option can provide the most flexible and quickest transition to the ultimately optimal solution, which is better availability of commercial Venture Capital. Estimated total required funds to close the most urgent early stage Venture Capital gap is Euro 100-200 million over a five year period.

Summary (1/4)

Interest of Venture Capitalists to invest in sustainable energy innovation is increasing rapidly both in North America and Europe overall.

a. Several macro factors like high oil prices, increasing uncertainty about fossil fuel supply, environmental pressure, and changing consumer preferences drive the increasing importance and improving returns on innovation in sustainable energy.

b. Notwithstanding still existing concerns about relatively large capital requirements, long time-to-exit investment periods and dependence on regulation and subsidy support (in addition to technology risks that are inherent to any technological innovation), an increasing number of leading Venture Capitalists indicate therefore that sustainable energy, or broader clean technology, is becoming a priority investment area for them. Experts predict a new investment wave for the Venture Capital industry in this area.

c. Indeed total Venture Capital allocated to sustainable energy innovation is a rapidly growing part of the total Venture Capital invested, both in the US and Europe. A recently fast growing number of successful Initial Public Offerings of sustainable energy companies encourage investors further that attractive investment returns can be made.

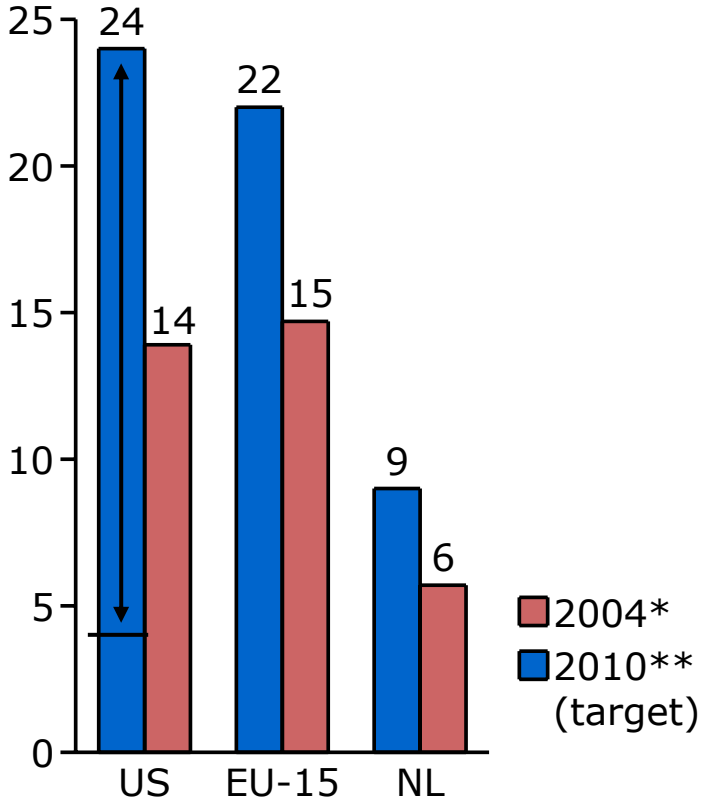
d. As sophistication of investors in this area is further improving, innovation will further segment out in technology areas that will have relatively little difficulty to find funding (assuming it is carried by a good management team and backed-up by a solid business plan) and areas that will have significantly more difficulty to find investors. Obviously projects with high capital requirements that are still early phase and have a long time-to-market (e.g. new energy generation technologies like tidal wave power, or second generation biomass), as well as technologies with an uncertain market potential (e.g. sustainable energy building equipment) are high risk with uncertain returns and therefore less attractive to Venture Capitalists.

There are several macro trends leading to growing importance of renewable energy innovation

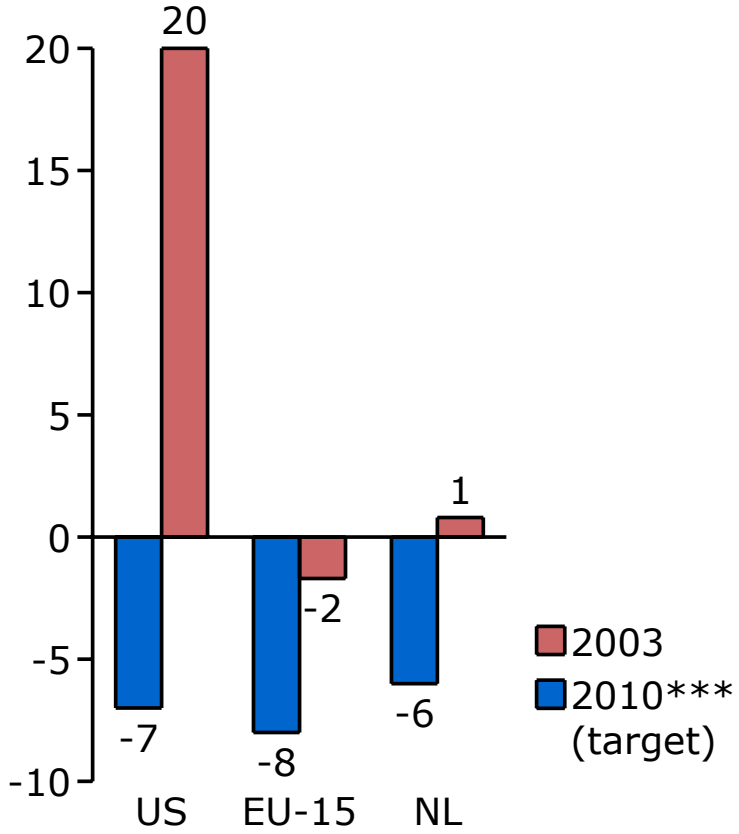
- **High and volatile prices for oil and natural gas**
  - Short-term supply constraints
  - Long-term under-investment in capacity, ongoing depletion
- **Implementation of Kyoto accords**
  - Price discovery mechanism for carbon emissions credits
  - Incentives to improve resource efficiency and reduce carbon intensity
- **Growing risk of political instability through depending on oil exporting nations**
- **Local and national policy initiatives**
  - Renewable energy portfolio standards for utilities
  - Subsidies for wind and solar power systems
  - Environmental procurement requirements
- **Changing consumer preferences** that drive companies towards greater social and environmental responsibility and create demand for "green" energy
- **Advances in science and engineering** that make numerous renewable energy technologies more economical
- **Growing interest among major corporations** in adopting RE technology to enhance productivity and reduce waste

Governments have set ambitious targets in renewable energy and CO2 reduction

Share of renewable energy sources in electricity production (%)



Change in CO2 emission since 1990 (%)



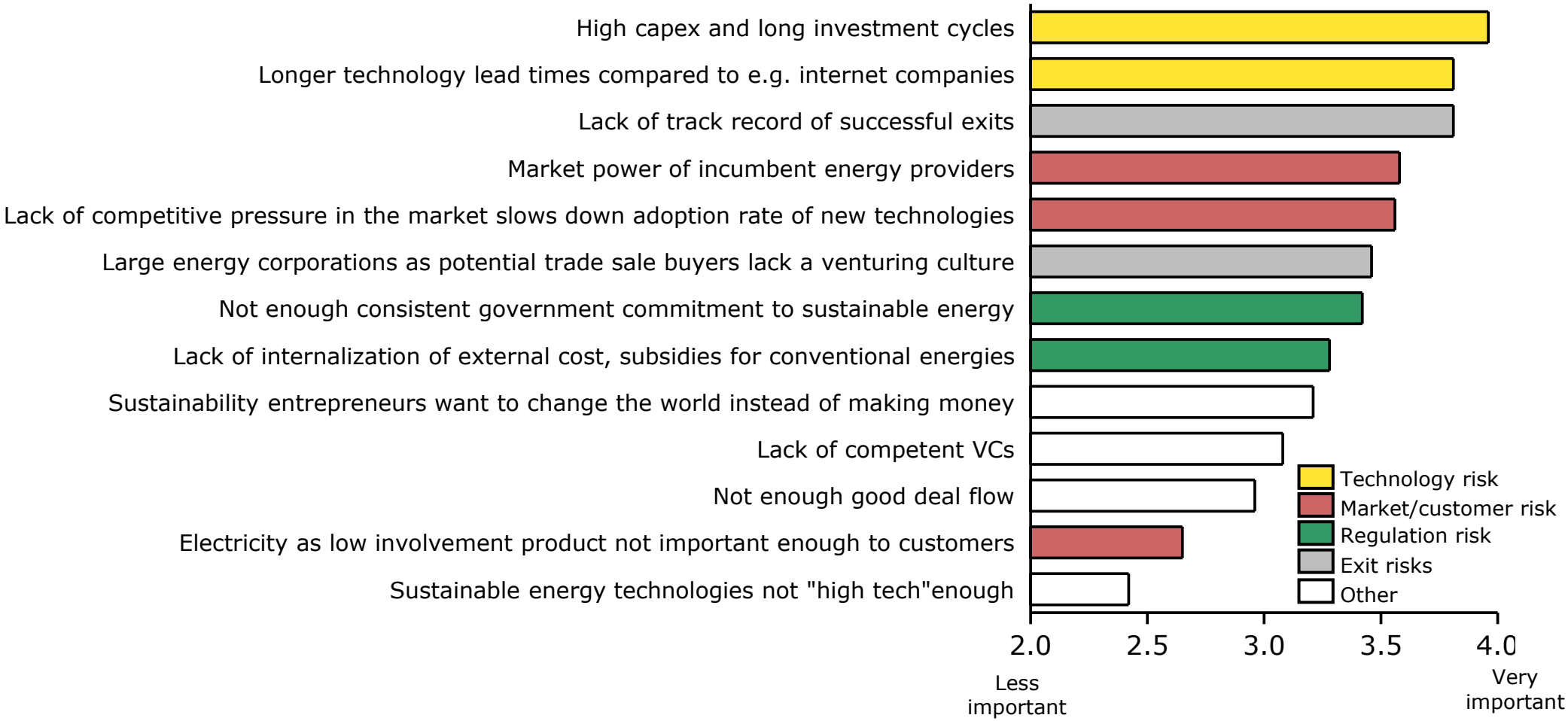
* US data on renewable electricity are from 2003.
** US targets vary per state, lowest and highest are given, target years vary from 2009 to 2022. Only 20 states have set targets by now.
*** For the US, Kyoto target for 2012 is given (US has not ratified Kyoto protocol, so there is no federal incentive to meet this goal).

Sources: EuroStat, EIA and Marland, G., T.A. Boden, and R.J. Andres. 2006. Global, Regional, and National CO2 Emissions. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy

Venture Capitalists used to have concerns about the attractiveness of the sector

Questionnaire to VCs at European Energy Venture Fair 2003*:

"Why is there so little VC investment in sustainable energy? How important do you rate the following factors?"

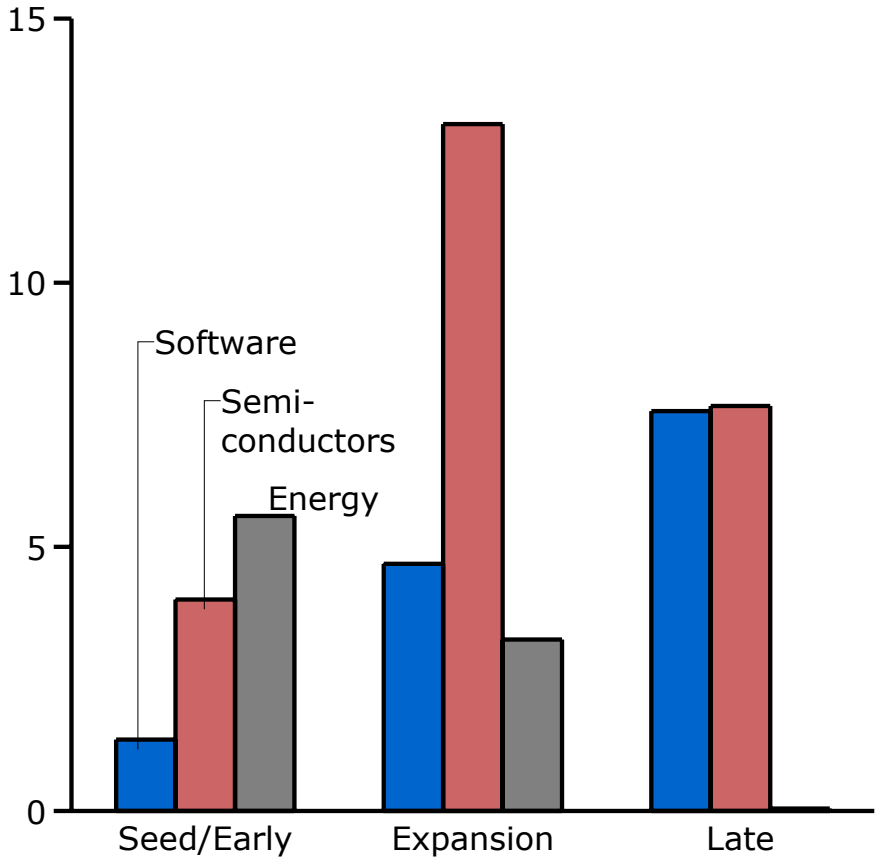


* N = 26

Source: Wüstenhagen/Teppo 2004

Larger capital requirement in early stage sustainable energy projects limits investments

Average US VC investment per deal Q1/2003 (in M $)



"This (the capital intensity of developing new energy technology) means that there are some sectors that I think cannot be financed by VC."

VC survey IWÖ-HSG 2004

"(If you develop a microturbine with) $200M of capital need to go in there, there are very few and almost no deals unless you are in a bold market like 1999/2000."

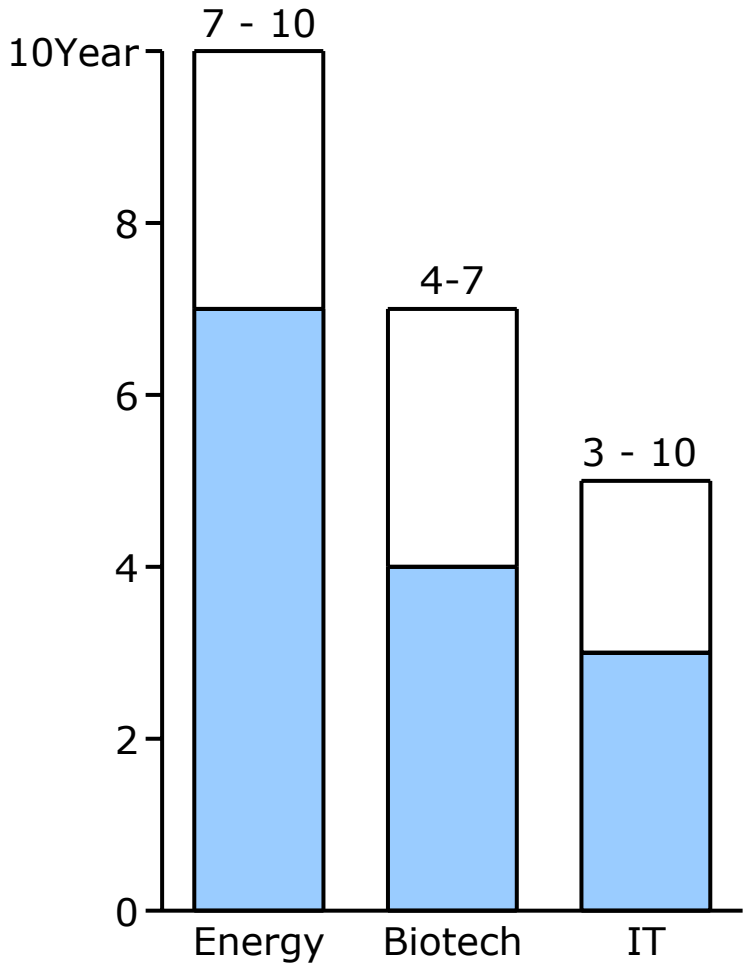
VC survey IWÖ-HSG 2004

Note: This data should be seen as an estimate. It is only US, only for one quarter and takes 31 energy deals, 34 semiconductor deals and 166 software deals into account

Source: PWC/Thomson Venture Economics/NVCA MoneyTree in Steen/Frankel

Long periods between investment and exit make sustainable energy less attractive

Expected time between first VC investment and exit



"Biotech VCs manage capital intensity by taking investments only to a certain stage, such as FDA approval for their product, and then exiting through trade sale or IPO."

Zider, HBS

Source: "The flow of venture capital into clean technology ventures" Steen/Frankel VC survey, IWO HSG Wüstenhagen; interview Cofra

On an international level, there is a large number of VC funds active in sustainable energy already

NOT EXHAUSTIVE

North America

Private VC

- Altira Group (USA)
- Apax (USA)
- Aretê Corporation (USA)
- Atlas Venture (USA + Europe)
- Battery Ventures (USA)
- Benchmark Capital (USA)
- CDP Capital – Technology Ventures (Can)
- Chrysalix Energy Managem. (Can)
- EnerTech Capital (USA)
- Kleiner Perkins (USA)
- Massachusetts Green Energy Fund (USA)
- New Energy Capital (USA)
- Nth Power (USA)
- Oak Investment (USA)
- Perseus Capital (USA)
- Rockport Capital (USA)
- Yellowstone Energy Ventures (USA)

Corporate VC

- BCE Capital (USA)
- Chevron VC (USA)
- Dow Venture Capital (USA)
- EDS (USA)
- General Electric Equity (USA)
- Global Crossings Ventures (USA)
- Global Technology Ventures (USA)
- Hydro-Québec CapiTech (Can)
- Koch Ventures (USA)
- Pacific Venture Capital (USA)
- St. Paul Companies (USA)
- SunAmerica (USA)

Europe

Private VC

- 3i Group (UK)
- Axiom Venture Capital (Bel)
- BankInvest New Energy Solutions (Den)
- Carbon Trust (UK)
- Conduit Ventures (UK)
- DOEN Participaties (NL)
- Dynamics VC Fund (Ger)
- EcoVentures (Ecofys) (NL)
- EmerTec (Fra)
- FourSome (UK)
- Good Energies (COFRA) (Swi)
- HgCapital (UK)
- HitecVision (Nor)
- Merrill Lynch – New Energy Technology (UK)
- New Energies Invest (Swi)
- Planet Capital (NL)
- SAM (Swi)
- Sustainable Energy Vent. (B)
- Zouk Ventures (UK)

Corporate VC

- BASF Venture Capital (Ger)
- EdF Venture Capital (Fra)
- Endesa Netfactory (Spa)
- Eon Venture Partners (Ger)
- MVV/Acera (Ger)
- Norsk Hydro Technology Ventures (Nor)
- RWE dynamics (Ger)
- Shell Technology Ventures (NL)
- Schneider Electric Ventures (Fra)
- Siemens Venture Capital (Ger)
- Suez Nov Invest (Fra)
- Vattenfall Europe Venture (Swe)

Sources: Investors' websites * (country of origin)

Experts expect the sustainable energy market to offer huge investment opportunities

*"Innovation in green tech could be **the biggest economic opportunity of the 21st century**."*

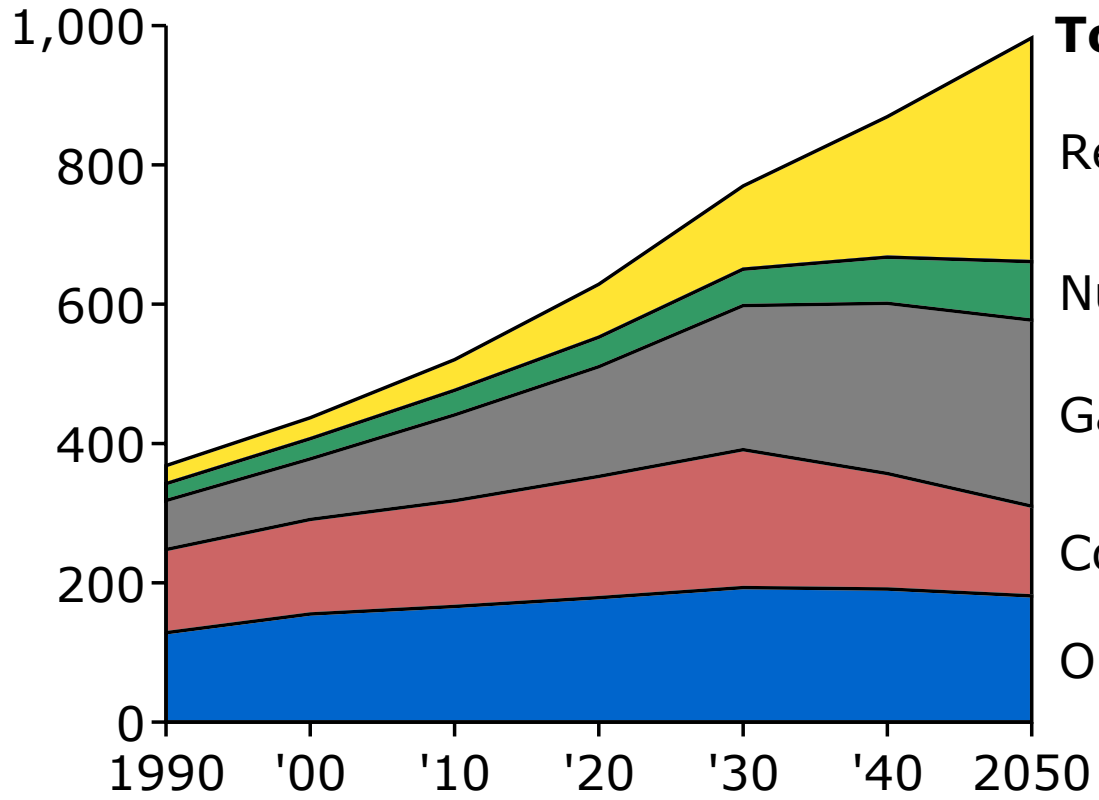
John Doerr, Partner at Kleiner Perkins

*"The International Energy Agency forecasts that investment in the world's energy infrastructure over the coming 30 years will **total $16 trillion** (~3 times US GDP)."*

IEA 2005

Renewable will outgrow market by factor 3

Primary energy supply forecast (in exajoules)



	CAGR (00-50)
Total	**1.6%**
Renewable	4.9%
Nuclear	2.1%
Gas	2.3%
Coal	-0.1%
Oil	0.3%

Electricity (Exajoules)	58	72	93	112	133

Growth drivers

- Industrialization (GDP growth)
- Urbanization
- Population growth

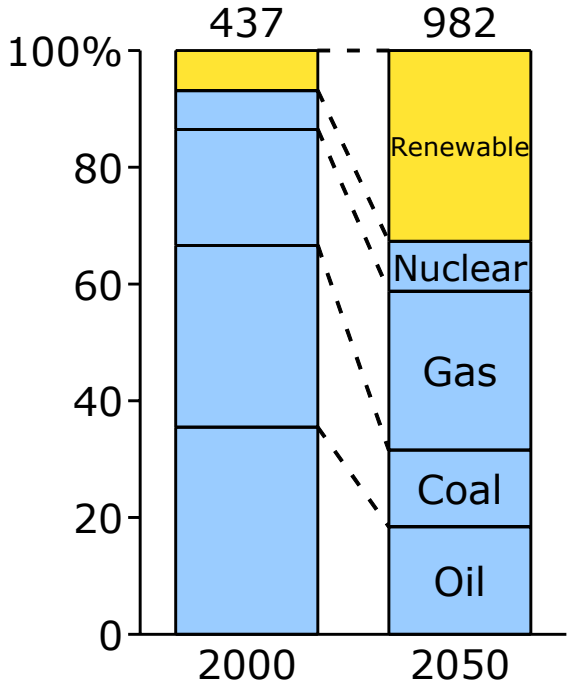
- IEA scenario conservative
  - IPCC: 5.1% to 5.4%
  - Shell: 4.6% to 5.0%

Source: IEA: Energy to 2050; Shell: Energy needs, choices and possibilities
BMU: Erneuerbare Energien in Zahlen – Nationale und internationale Entwicklung

Renewable growth driven by scarce fossil energy and decentralized demand

Forecast

Primary energy supply (in EJ)



Drivers

- Increasing costs for **scarce fossil energy** due to
  - Exhaustion of most accessible deposits
  - Environmental taxes
  - Political instability in fossil energy generating countries
- **Decreasing production costs** for renewable energies
- **De-centralized power** sources
  - Avoidance of power breakdowns (e.g. North East USA)
  - Lack of transmission infrastructure in emerging countries

- Decreasing governmental support programs
- Revival of nuclear energy
- New technologies/sources in fossil energy (e.g. oil sand)

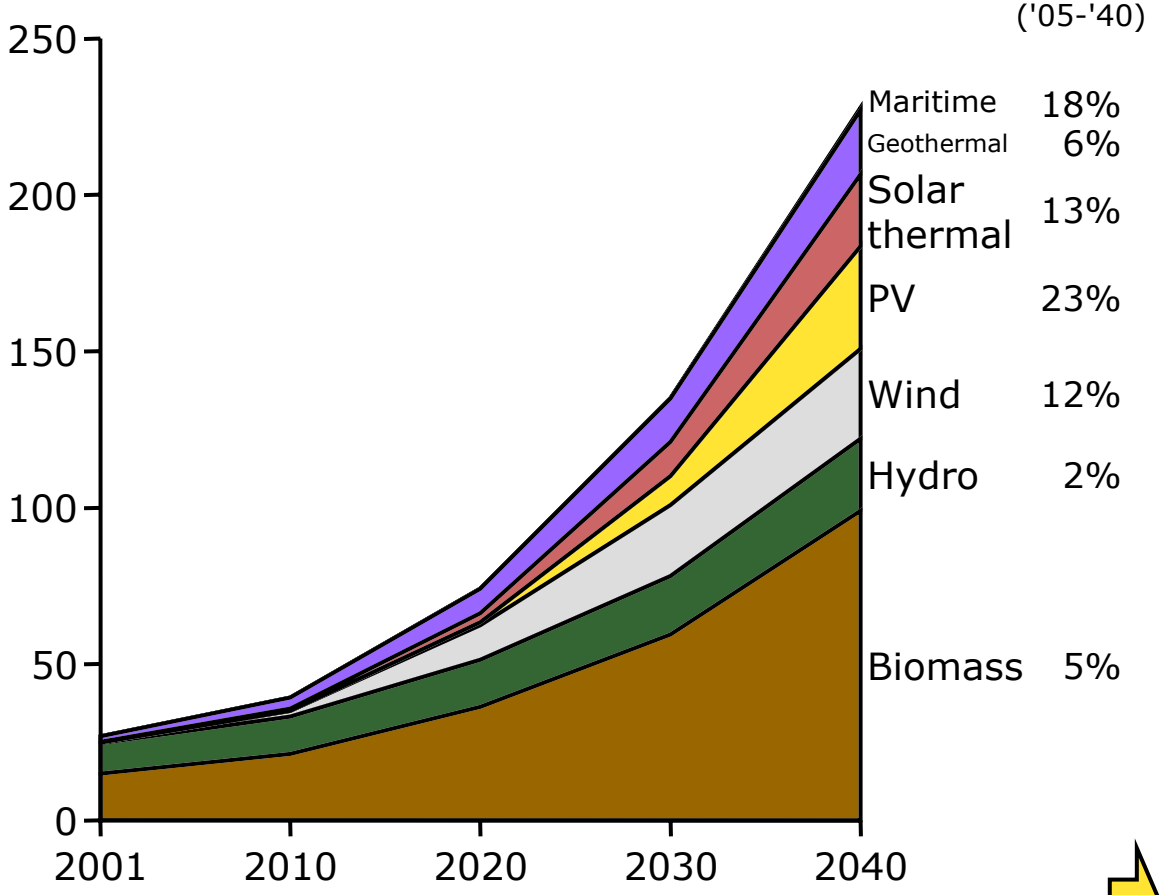
"We are witnessing a historic shift from oil to gas to renewable forms of energy."

Jeroen van der Veer, Managing Director, Royal Dutch Shell Group

Source: IEA: Energy to 2050; Shell: Energy needs, choices and possibilities; BMU: Erneuerbare Energien in Zahlen – Nationale und internationale Entwicklung; Clean Edge; Litsearch

Solar PV strongest growing renewable energy

RE primary energy supply (in EJ)



Main drivers	Constraints
Small local power plants (up to 5MW)	Geograph. limited, techn. immature
Heating for residential	Heat production, no electricity
Residential, commercial	Currently high production costs
Large windparks by energy companies	Geographically limited
Base-load energy supply	Geographically limited
Heating, fuel	Heat production, no electricity

Industry consensus on growth projections

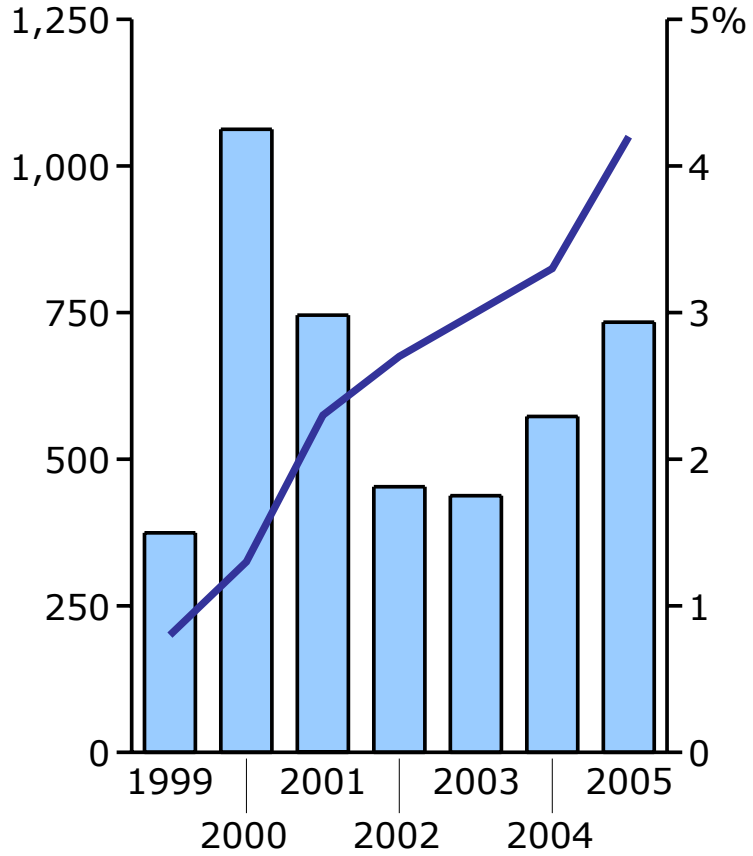
Source: EREC: Renewable Energy Scenario to 2040

Investment in (sustainable) energy is increasing both in the US and in Europe

US

VC investments in sustainable energy in US based companies (M€)

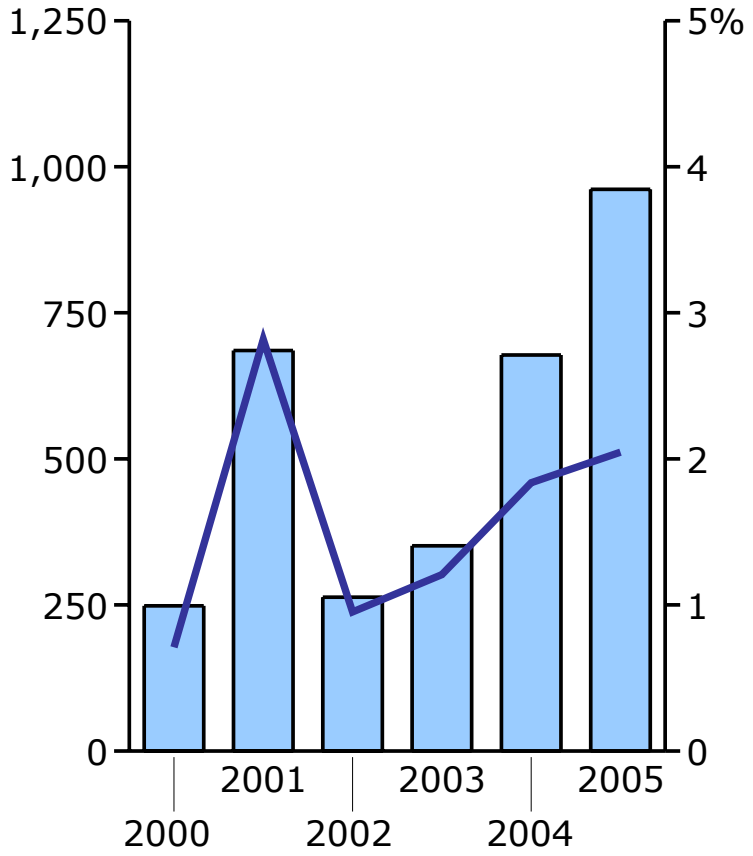
in % of total VC investment



EU

VC and PE investments in all energy in EU based companies (M€)

in % of total VC and PE investment

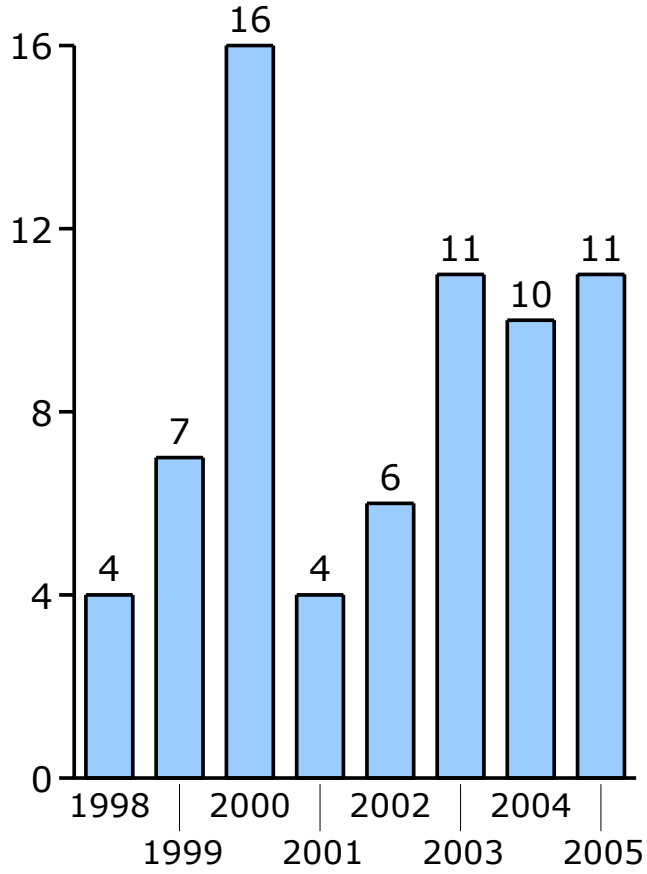


Sources: Nth power, Clean Edge, EVCA

Recently there has been a sharp increase in Initial Public Offerings in renewable energy

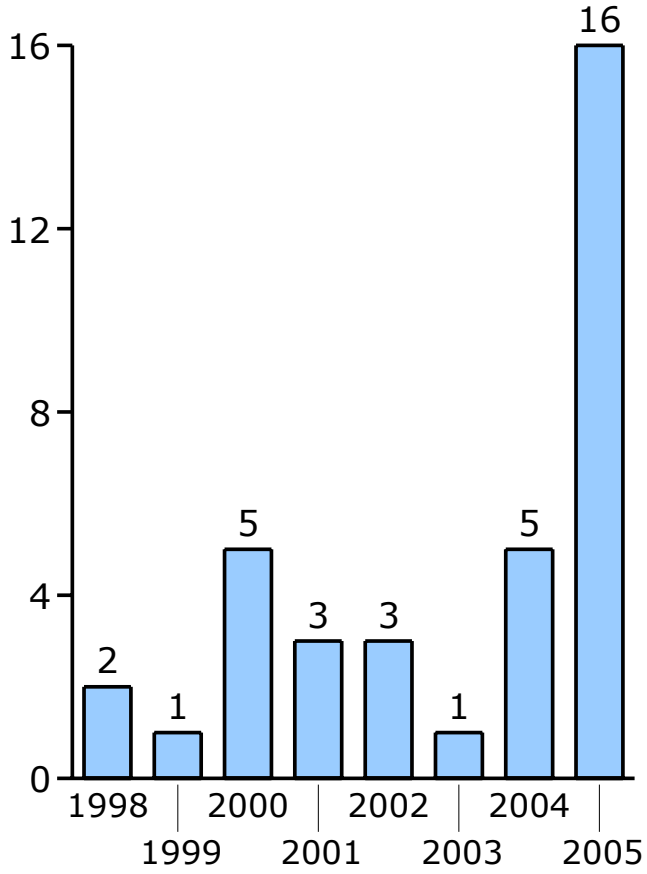
US

Number of IPO's in renewable energy at US stock markets



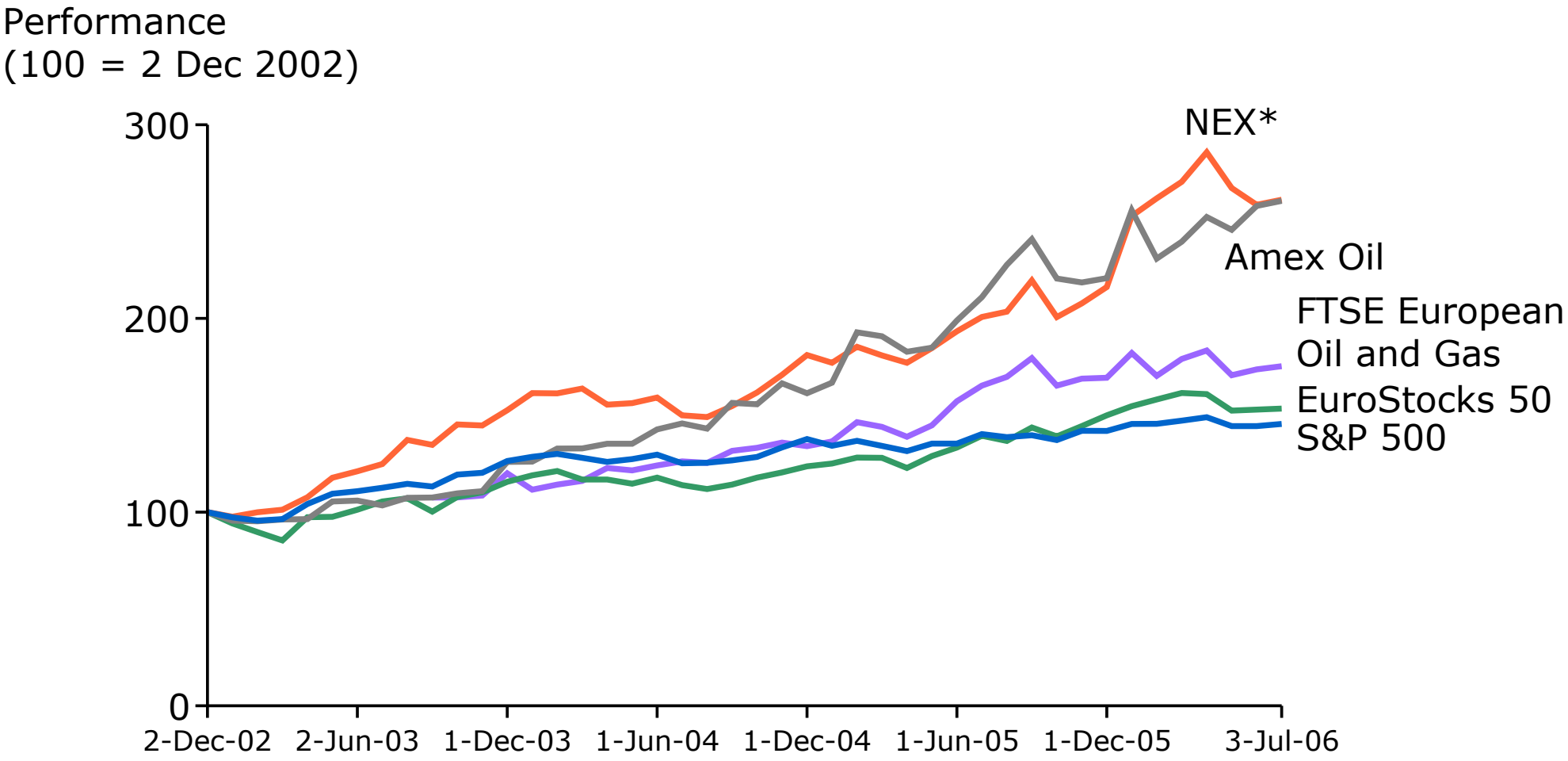
EU

Number of IPO's in renewable energy at EU stock markets



Sources: Report "Cleantech Venture Investing" by James LoGerfo (Vortex Energy LLC, 2005), AIM (London Stock Exchange) and literature search

Stock market performance of new energy index proves further that returns can be made



*NEX = New Energy Global Innovation Index

Source: Yahoo Finance

There are different areas of innovation in sustainable energy

EXAMPLES ARE ILLUSTRATIVE

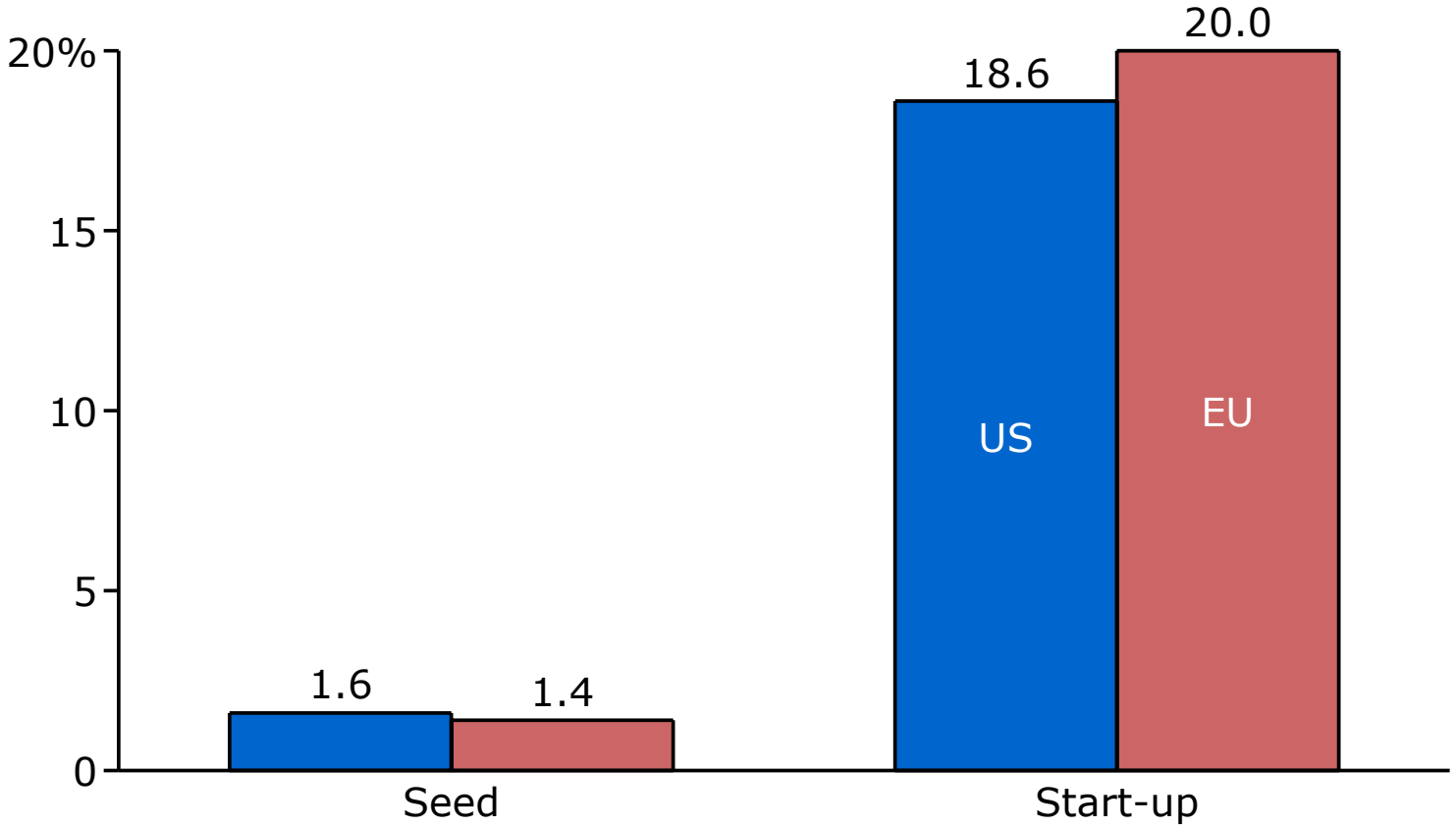
	Conceptual research and development	Prototyping (proof of concept)	Piloting (proof of feasibility)	Upscaling	Mature operations
Energy generation	• Blue energy (salt energy) • Wave and tidal energy	• New off-shore wind turbine • Flexible solar cells	• Off-shore wind park • Fuel cell production	• Large scale biomass plants • Solar cell factory • Biofuel production	• On-shore wind park • Small scale biomass plants
Supply chain efficiency	• Waste stream management • Models to optimize localization of factories	• Centralisation of pulp production from used paper	• Software for electricity grid optimization	• Redistribution of industrial heat	• Optimization of industrial production processes
Energy storage	• New methods for energy storage • Hydrogen economy	• Hydrogen applications	• Hydrogen production		
Energy usage efficiency	• Smart building • Heat pumps	• Gas engines • Low temperature heat exchangers • Electric bus	• Micro WKK (local production of heat and electricity)		

Source: Literature search

Very early stage investment (seed) is typically low

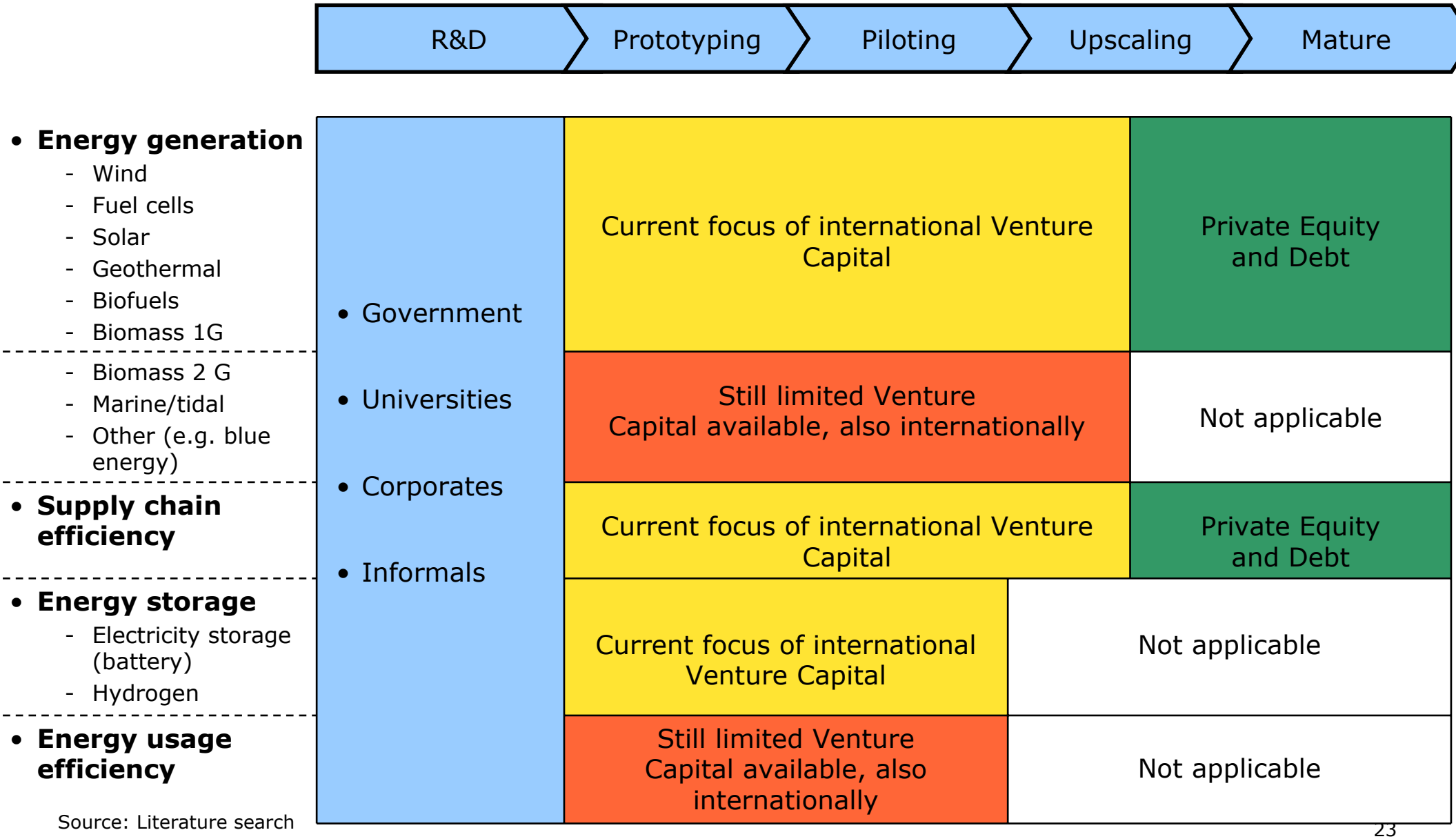
BACKUP

Investments as % of total (2004)



Source: Ondernemend vermogen; De Nederlandse Private Equity Markt in 2005, NVP, April 2006; Technopolis Venture Capitalist Interviews, 2005

Internationally, there is still a capital gap in latest generation/usage efficiencies technologies



Source: Literature search

Reasons for flow of venture capital in selected fields of technology only

BACKUP

Energy generation		
Wind Solar Fuel cell Biomass 1G	• Innovation in energy generation (i.e. new solar cells, fuel cells etc.) often have more applications (often commercial application rather than dependence on large utilities or governments) • Timeframe to market not as long	• Proven technology generation plants pose low risk
Biomass 2G Geothermal Marine/Tidal Other (e.g. blue energy)	• Large scale generation projects with very immature technology and high capital requirements	
Supply chain efficiency	• Technologies offering immediate benefit in terms of energy efficiency; many commercial applications	
Energy storage		
Electricity storage (battery) Biofuels Hydrogen	• Technologies being necessarily required with the implementation of new energy generation sites • Immediate usage is possible	
Energy usage efficiency	• Market potential often small (as consumers do not value the environmental benefit) and uncertain due to high dependence on government regulation	

Confidence in renewable energy generation technologies is increasing, mainly solar

BACKUP

NOT EXHAUSTIVE

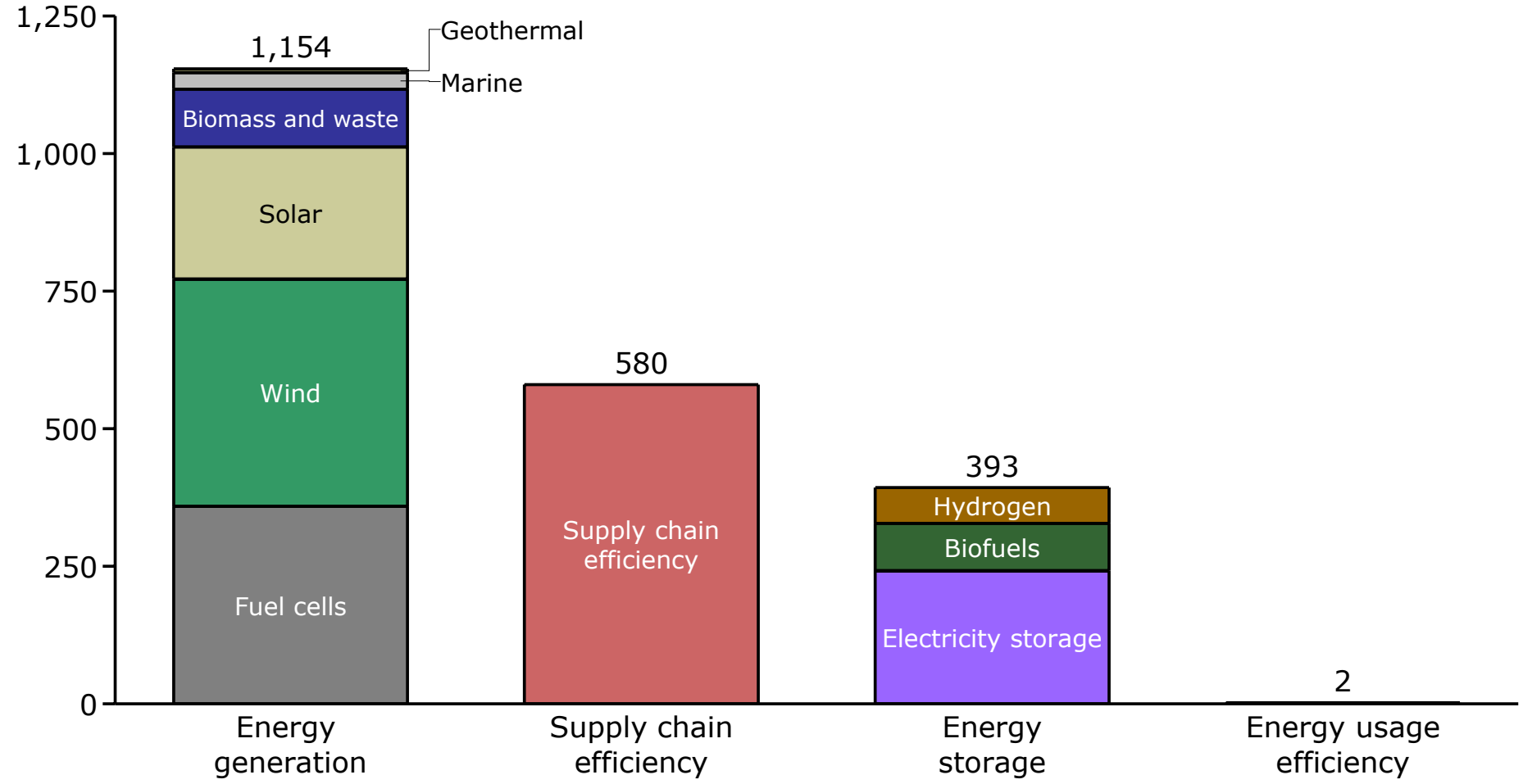
VC deals	Energy generation	Supply chain efficiency	Energy storage	Energy usage efficiency
US	• Biomass plant Greenville (2005, $ 6,9 M,2nd round) • ReliOn, fuel cells (2004, $ 25 M)	• Catalytic Solutions (2002/3, $ 62 M, two rounds) • STM power, Stirling motor (2004, $ 29,6 M)	• Bio-ethanol plant Albion (2005, $ 86 M, 2nd rnd)	
	• Advent Solar (2005, $ 30 M, 3rd round) • Energy Innovations (2005, $ 16,5 M, seed financing) • HelioVolt Corp. (2005, $ 8 M, seed) • Konarka (2006, $ 20 M, 4th round) • Miasole (2005, $ 16 M, 2nd round) • Nanosolar (2005, $ 20 M, 2nd round)			
Other	• Bowman Power (UK, 2004, € 23,5 M, 2nd round) • Heliswirl (UK, 2004, € 0,22 M, seed) • Whitfield Solar (UK, no further data)			• Natural Building Technologies (UK, 2004, € 0,59 M, seed)

= solar

Sources: Literature search and report "Cleantech Venture Investing" by James LoGerfo (Vortex Energy LLC, 2005)

Energy generation is attracting most VC followed by supply chain efficiency

World-wide VC investments in renewable energy (2001 - 2004) split by sector (M$)



Source: New Energy Finance Ltd

More early stage deals expected in more educated market; solar very hot, other areas following

BACKUP

"*We expect steady growth in early stage investment as **flow of technology innovation** makes it out of the universities, national labs, and incubators.*"

Red Herring magazine 2006 (US)

"*I am surprised at how familiar mainstream VCs are with (..) solar technology and clean tech in general (..) We found a high level of receptivity and a lot of people who have thought through the space (..) In 3 years of talking (to VCs) I have seen a **real transformation in terms of interest level and depths of knowledge**.*"

Andre Beebe, President Energy Innovation (US)

"***Sola**r has been a big driver in the last 2 years, but in the next 12 months, you're also going to see some of the other niches in energy technology really come into their own. These other niches will include **hybrids and other transportation technologies, energy management technologies, biofuels, batteries,** and carbon trading.*"

La Ruffa, Senior Associate at NGP Energy Technology Partners (US)

Summary (2/4)

However in The Netherlands specifically, there is still very limited Venture Capital supply for sustainable energy innovation, especially in the early prototyping and piloting development stages right after the conceptual Research & Development phase. Partly this is driven by lack of a clear and consistent long term strategy and policy of the Dutch Government on innovation in sustainable energy. Partly this also seems to be driven by an insufficient need or incentive for Dutch R&D in general to push its ideas effectively further into the innovation pipeline towards actual market introduction.

a. In general, Venture Capital is significantly under-penetrated in The Netherlands compared to the US and the rest of Europe, especially in early stage seed and start-up investments right after the conceptual Research & Development phase. The issue does not seem to be driven by lack of strong R&D in The Netherlands. People that have been interviewed in this study and performance indicators like number of patents and number of R&D publications indicate in general that Dutch R&D is strong. Also in sustainable energy there seems to be plenty of strong R&D going on. However, Dutch R&D institutions do not seem to have sufficient need or incentive to actively push their ideas into the next phases of prototyping and piloting, and have limited drive therefore to effectively position their ideas as commercial opportunities for potential investors and to attract higher amounts of early stage Venture Capital.

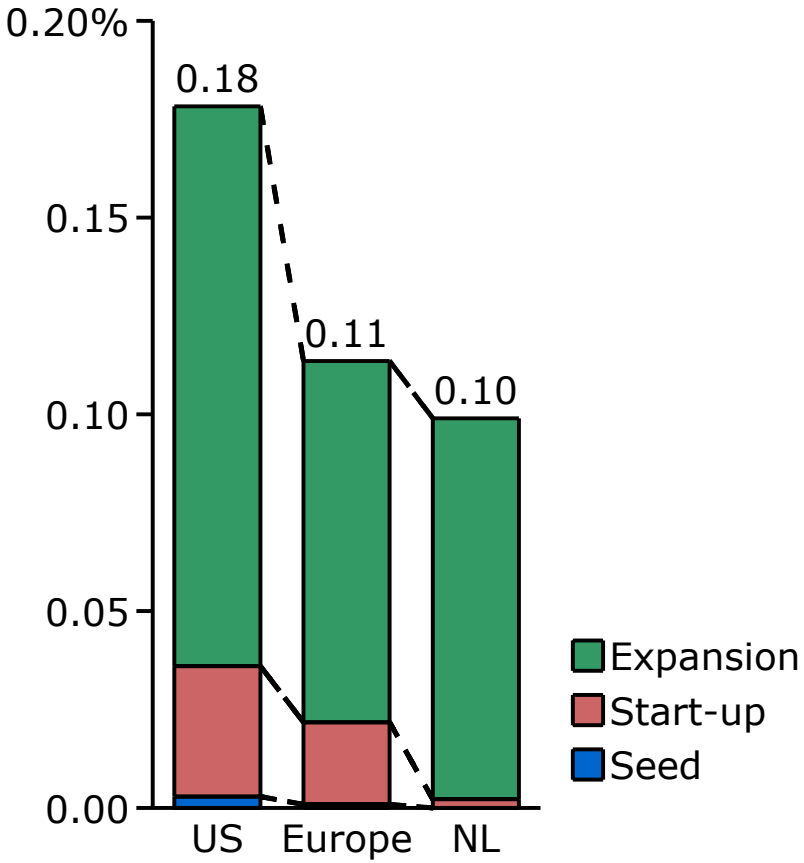
b. Looking at sustainable energy specifically, there are only a very limited number of Venture Capitalists active in the Dutch market with a focus on this sector. Most of these are relatively small and some are based on a broader social and environmental philosophy rather than a pure commercial investment objective. Moreover, most focus on later stage investments in proven technologies as opposed to seed and start-up investments in technologies that still need to be proven feasible technically and economically. In other words, there is hardly any early stage commercial Venture Capital available that is allocated to sustainable energy innovation in The Netherlands.

Summary (2/4)

c. When asked for the specific reasons for the low interest to invest in sustainable energy in The Netherlands relative to other European countries such as Germany, Spain or Italy, international Venture Capitalists first of all indicate that The Netherlands lacks a clear and stable long term vision and policy on sustainable energy in terms of where it wants to win in innovation and how it wants to achieve that. Subsidy policies have been changing, and subsidy levels are uncompetitive relative to some other European countries. Moreover, allocation of subsidies is fragmented in different sources and decision bodies across the innovation pipeline. Finally, the Netherlands seems well known for its relatively cumbersome permitting processes at later stages of venturing.

Early stage Venture Capital penetration in The Netherlands is very low

Invested VC in % of GDP (2005)



Venture Capital funds active in NL

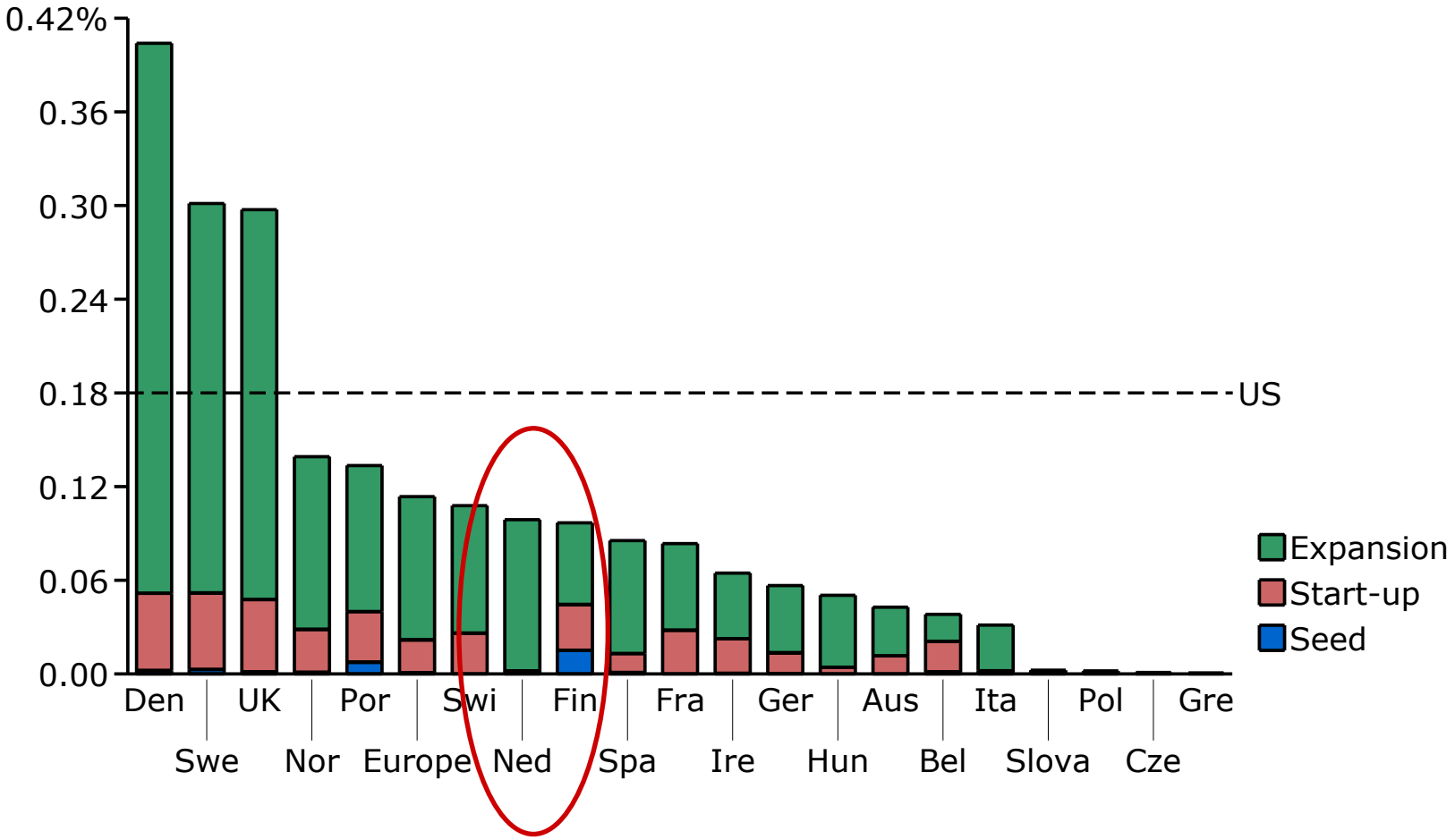
- ABN AMRO Participaties (NL)
- Antea Participaties (NL)
- Astor Participaties (NL)
- BOM (NL)
- DOEN Participaties (NL)
- Ecart Invest (NL)
- EcoVentures – Ecofys (NL)
- Ex'tent (NL)
- Gilde Investment Mgt. (NL)
- Holland Venture (NL)
- Life Sciences Partners (NL)
- LIOF (NL)
- NeSBIC (NL)
- NOM (NL)
- NovaCap Venture Capital Network (NL)
- Planet Capital (NL)
- PPM Oost (NL)
- Rabo Participaties (NL)
- Shell Technology Ventures (NL)
- Trimoteur (NL)
- Triodos Venture Capital (NL)
- Venturion Participaties (NL)
- Yard Capital Netherlands
- 3i Group (UK)
- Apax (USA)
- Atlas Venture (USA)
- BankInvest New Energies Solutions (Den)
- Carlyle Europe Venture Partners (USA)
- Energy Ventures AS (Nor)
- Hg Capital (UK)
- StoneFund (Bel)

Note: Europe includes EU-15 minus Luxemburg and additionally Poland, Czech Republic, Slovakia, Hungary, Norway and Switzerland
Sources: EVCA, NVCA, NVP and investors' websites

The Netherlands ranks regarding early stage Venture Capital among the lowest five in Europe

BACKUP

Invested VC in % of GDP (2005)



Note: Europe includes EU-15 minus Luxemburg and additionally Poland, Czech Republic, Slovakia, Hungary, Norway and Switzerland
Source: EVCA

High early stage VC investing reflects Finland's innovation spurt that started in the late 1990's

BACKUP

Besides the drastic improvement of the education system, three organisations played a crucial role in Finland's turn-over from an old fashioned industrial into a high-tech economy

	Tekes (Science and Technology Policy Council)	Sitra (National Fund for R&D)	Finnish Academy of Sciences and Letters
Budget (p.a.)	• € 430 M	• € 40 M	• € 200 M
Description	• Autonomous agency, funded by the government that sets out Finland's innovation course	• Publicly funded Venture Capital fund that operates as a revolving fund	• Organisation that coordinates the funding of basic research in Finland
Actions	• Providing capital to industrial R&D projects	• **Providing Venture Capital to technology start-ups**	• Funding was redirected from established researchers to good research projects
Effects	• Dramatic growth of high-tech initiatives in Finland starting from the late 90's • **Stimulation of private investments in early stage projects** • Stimulation of universities and research organisations to collaborate with business	• Many technology start-ups have been funded, including Nokia • Total outstanding equity of Sitra equals over € 600 M, guaranteeing the support of many future projects	• Drastic improvement of the quality of Finnish basic research, which proved fundamental to support the technology innovation spurt • Creation of a more open scientific society, attracting new people

Source: Literature search

US VC's support technology start-ups not only by providing capital but also by lobbying

BACKUP

Strong VC sector but decreasing number of start-ups

- The US has a strong Venture Capital sector that is convinced of the importance of early stage technology development to ensure future returns, hence the high level of early stage Venture Capital investments.
- However, currently in the US, the amount of technology start-ups is decreasing, so that the supply of early stage Venture Capital threatens to overcome the demand.

MAGNET lobby initiative

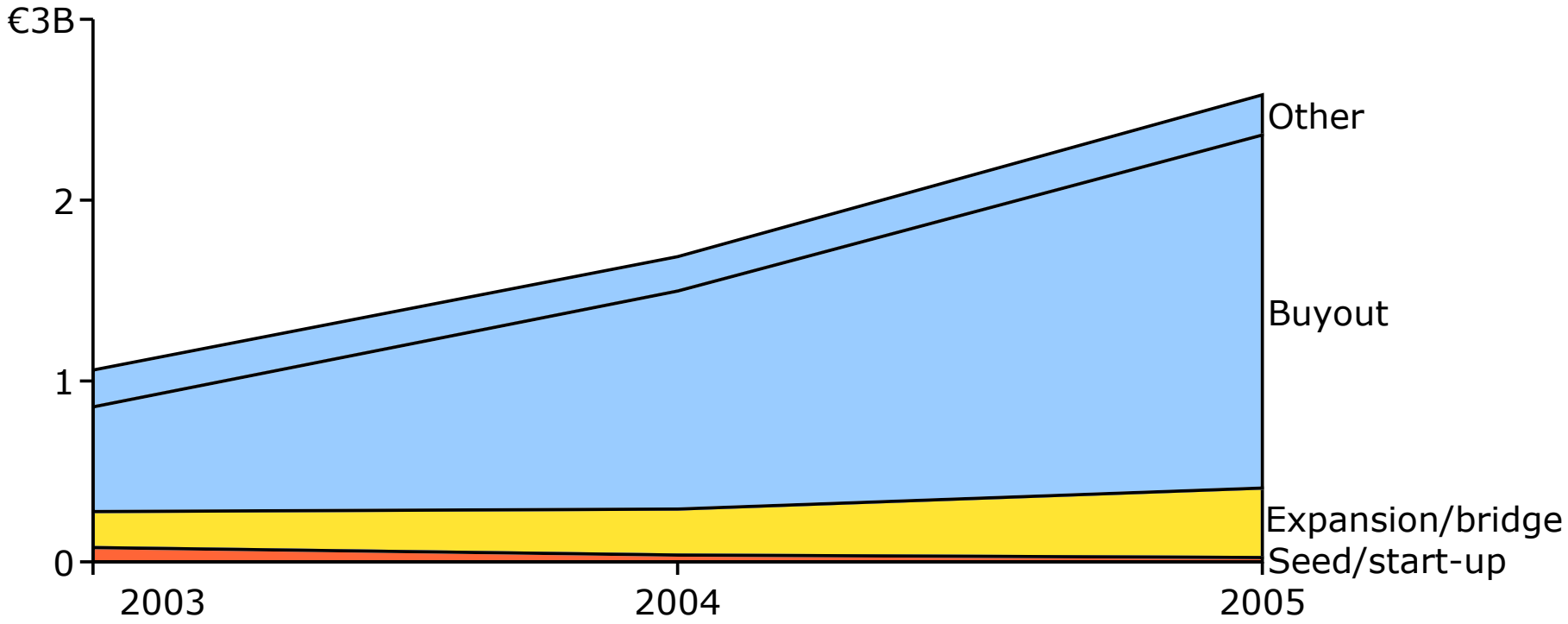
- To stimulate technology ventures, the NVCA (National Venture Capital Association) has launched in 2006 the MAGNET (Maximizing America's Growth for the Nation's Entrepreneurs and Technologists) lobby initiative.
- Actions within MAGNET
  - Lobby at the federal and state levels for a better mathematics and science education.
  - Lobby at the federal level for the further release of restrictions on the immigration and employment of foreign technology workers and entrepreneurs.
  - Lobby with the federal government for more funding for basic research.

Sources: NVCA, Red Herring

And the share of seed/start-up financing in NL is still decreasing

BACKUP

Private equity investments



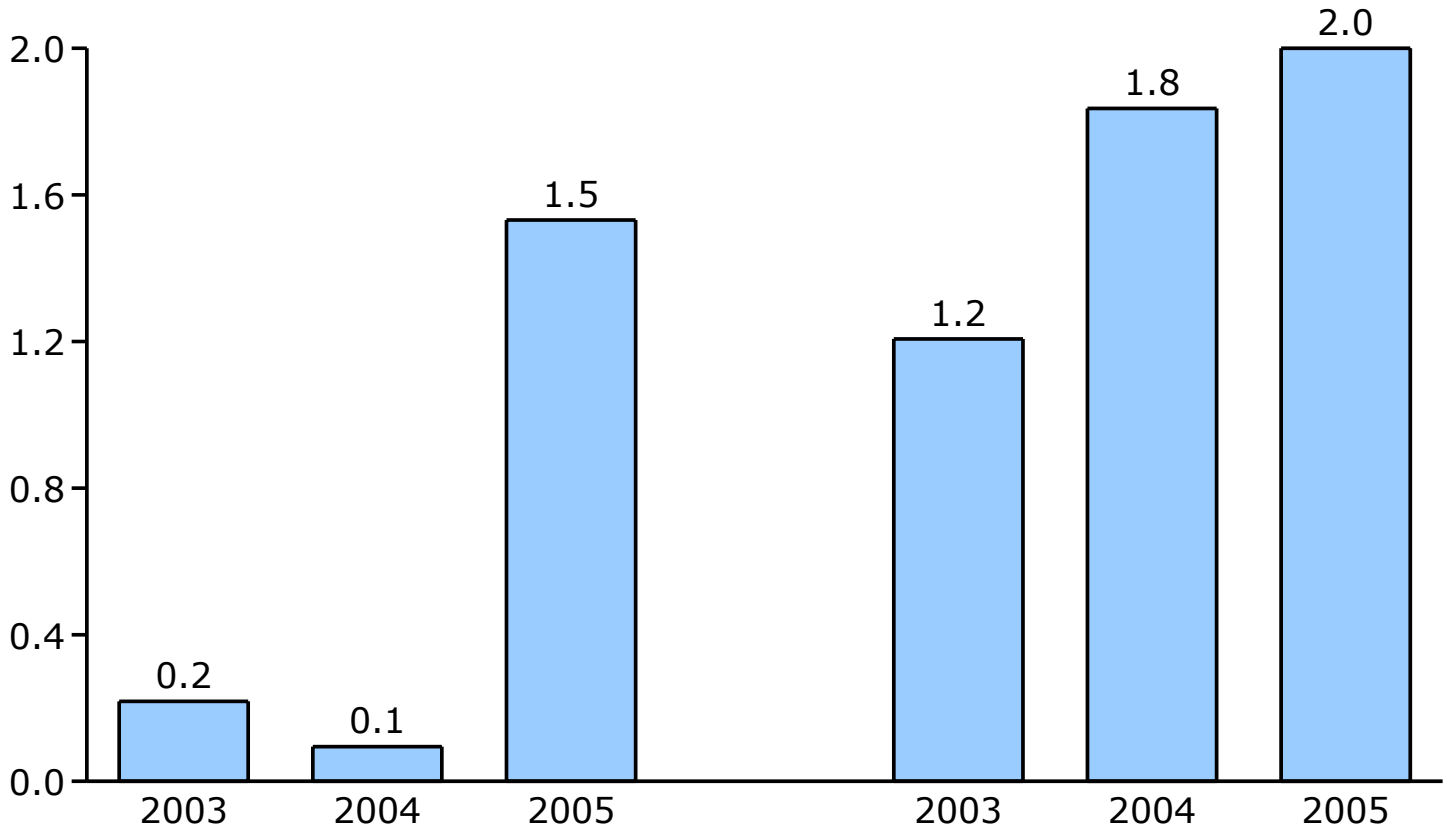
	2003	2004	2005
% Expansion	18.8%	15.1%	14.9%
% Early stage	7.4%	2.2%	0.9%

Source: Ondernemend vermogen; De Nederlandse Private Equity Markt in 2005, NVP, April 2006

However, at least the share of energy in VC and PE investments is increasing

BACKUP

Share of energy in total VC and PE investments (%)



	The Netherlands			Europe		
Total (M€)	1,092	1,659	2,336	29,096	36,920	47,000
Energy (M€)	2.4	1.6	35.8	351.2	677.8	961.5

Source: EVCA

Number of VC funds in renewable energy in The Netherlands is limited; no seed capital

VC's investing in NL with focus on Clean Tech (country of origin)	Focus area	Prototyping	Piloting	Upscaling
• DOEN Participaties (NL)	• Clean technology (not exclusively)	x	x	x
• Ex'tent (NL)	• Clean technology	x	x	x
• Planet Capital (NL)	• Clean technology	x	x	x
• Triodos Venture Capital (NL)	• Clean technology	x	x	x
• EcoVentures – Ecofys (NL)	• Energy generation	x	x	x
• Yard Capital Netherlands	• Energy generation	x	x	x
• 3i Group (UK)	• Clean technology (not exclusively)	x	x	x
• BankInvest New Energies Solutions (Den)	• Energy generation	x	x	x
• Energy Ventures AS (Nor)	• Energy generation (mainly old energy)	x	x	x

x = not investing
x = investing

Note: Essent and Delta have agreed to start a venture capital fund, which once active will become part of this list
Sources: Investors' websites

European based VC investors in renewable energy are not interested in NL

	Multi-sector focus (incl. ren. energy)	Renewable energy focus
NL target (among other countries)	• 3i Group • DOEN Participaties • Energy Ventures	**BACKUP** • BankInvest New Energy Solutions • EcoVentures (Ecofys) • Ex'tent • Planet Capital • Triodos Venture Capital • Yard Capital Netherlands
NL not target *	• BASF Venture Capital • Dynamics Venture Capital Fund (RWE) • Hg Capital • HiTecVision • ITI Energy • Scottish Equity Partners • Siemens Venture Capital • Truffle Venture • Warburg Pincus	• Axiom Venture Capital • Carbon Trust • Conduit Ventures • EmerTec – Energy and Environment Fund • FourSome • Good Energies (COFRA) • Merrill Lynch – New Energy Technology • New Energies Invest • Sustainable Asset Management • Sustainable Energy Ventures • Zouk Ventures

* VC investor either specifically states to be not targeting NL, or has no investments in NL in its portfolio.

Source: Investors' websites

Interviews with investors and start-ups revealed 4 main obstacles to successful innovation

Issues

- No issue: strong R&D in NL

1. Dutch uncertain energy policy causes good projects to leave
   - Uncertainty about government regulation
   - Lower level of subsidies
2. Little subsidy to proto-typing and piloting/introduction phase
3. Projects are slowed down in complex Dutch permit and subsidy processes
4. Broken venture pipeline
   - Limited early involvement of industrial partners
   - Limited business skills/wills of academics

- Little issue: strong subsidies (MEP), even though not consistent

Activity and quality of Dutch R&D in Clean Tech does not seem to be the issue

ILLUSTRATIVE

Energy generation	Supply chain efficiency	Energy storage	Energy usage efficiency
• TNO – Afval en biomassa • ECN – Vergassing en gasconditionering • TNO – Duurzame brandstoffen • TU Delft – Gasifiers with solid oxide fuel cells • ECN – Silicium PV technologie • ECN – PV module technologie • ECN – Aeroelasticiteit, wind • ECN – Conditiebewaking • TU Delft – Sectie windenergie • Wetsus (Blue energy)	• ECN – Industriële warmtehuishouding • TNO – Energy and environment • ECN – Multifunct. Reactoren • ECN – Process system eng.	• ECN – Biotransport-brandstoffen en raffinageprocessen • TNO – Geothermal energy and energy storage • ECN – Hydrogen and clean fossil	• ECN – Bouwenergetica • ECN – Warmtepompen • ECN – Micro WKK • TNO – Milieu en leefomgeving

"R&D in the Netherlands in sustainable energy is very strong. We have enough promising R&D ideas, more than enough."

Researcher

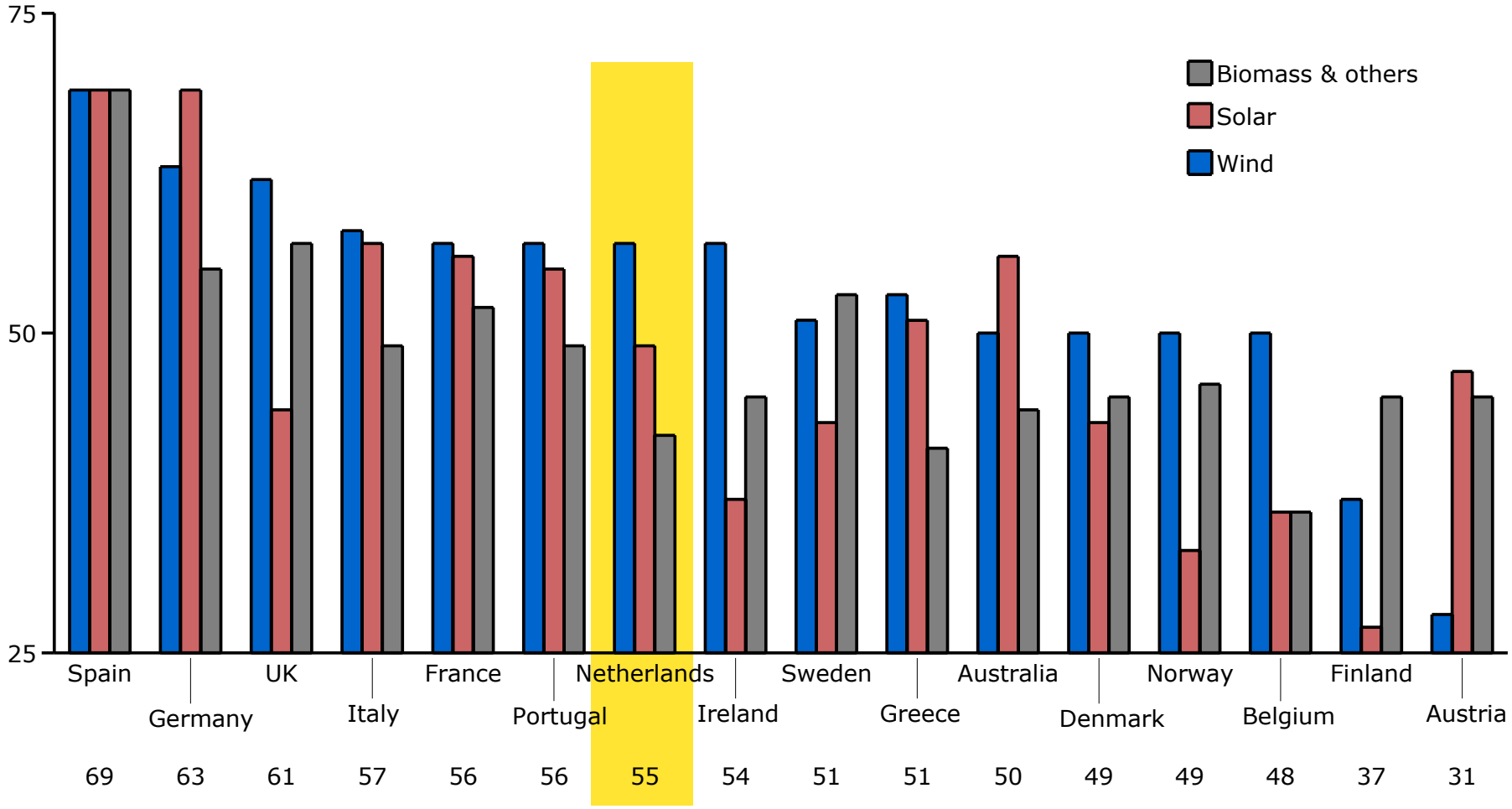
Sources: Literature search and interview with researcher

1 There are examples of technologies which moved out of NL to be further developed elsewhere

Project R&D NL	Issue	Moved to
Wind turbines in 1970s	Slow process in supporting development	Denmark
Bio mass to bio liquid	Slow process in deciding on next steps Little risk-taking	Germany
Wave rotor	No financing (subsidy) for development of prototype	DK and eventually to UK
Nonox	No corporate partner for development in NL	Thailand

1 NL is not considered a very attractive country for renewable energy investments (except for wind)

Ernst & Young Long term Renewable Energy Attractiveness Index (Winter 2006)



	Spain	Germany	UK	Italy	France	Portugal	Netherlands	Ireland	Sweden	Greece	Australia	Denmark	Norway	Belgium	Finland	Austria
Overall	69	63	61	57	56	56	55	54	51	51	50	49	49	48	37	31

Note: Index is based on national renewable energy markets, renewable energy infrastructure and their suitability for individual technologies
Index is forward looking and is also taking e.g. amounts of unexploited resources and grid capacity into account. That explains why e.g. UK is scoring high on wind (high un exploited resources and attractive tariffs) and Denmark with highest installed wind capacity is scoring low (limited grid capacity and reduced tariff incentives)

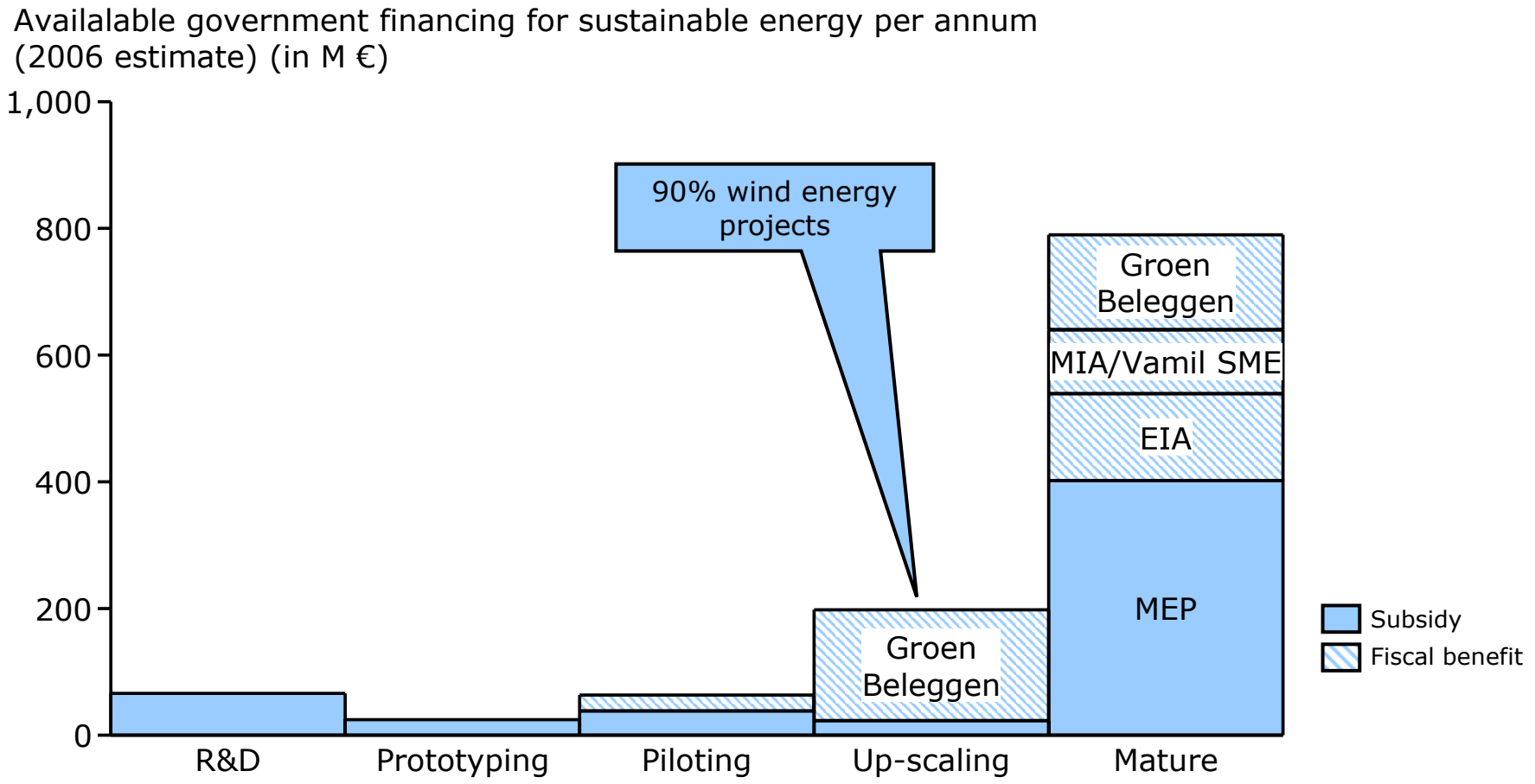
Source: Ernst & Young 2006

1 Innovation support in The Netherlands is lower and less consistent than in Germany and Spain

	The Netherlands	Germany	Spain
Level of support			
• Total energy subsidy	• ~€1B (~0.2% of GDP)	• ~€7B (~0.3% of GDP)	• N.d.
• Subsidy to energy generation (€ct/kWh)	• 0-9.7	• 9.29	• 18.8 (solar PV); 3-4 (other)
• Subsidy on investments	• ~10%	• ~30-40%	• High (50% in solar PV)
Stability of support			
• Changes in subsidy programmes	• Several different programs in last years (subsidy, REB/ecotax, MEP)	• Comparable program in place since 1991	• 2 long-term plans (91-00; 00-10)
• Clarity on duration of subsidy*	• 10 year support horizon	• 20 year support horizon	• 10-20 year support horizon (per technology)
• Consistency of subsidy amounts*	• New levels developed every year	• Fixed relative to energy market price • Fixed degression	• Annually adjusted, but very stable

Source: Literature search, Eurelectric, interviews, ESRU * subsidies on energy generation considered here only

2 Most of government subsidies in sustainable energy go to mature companies (MEP)

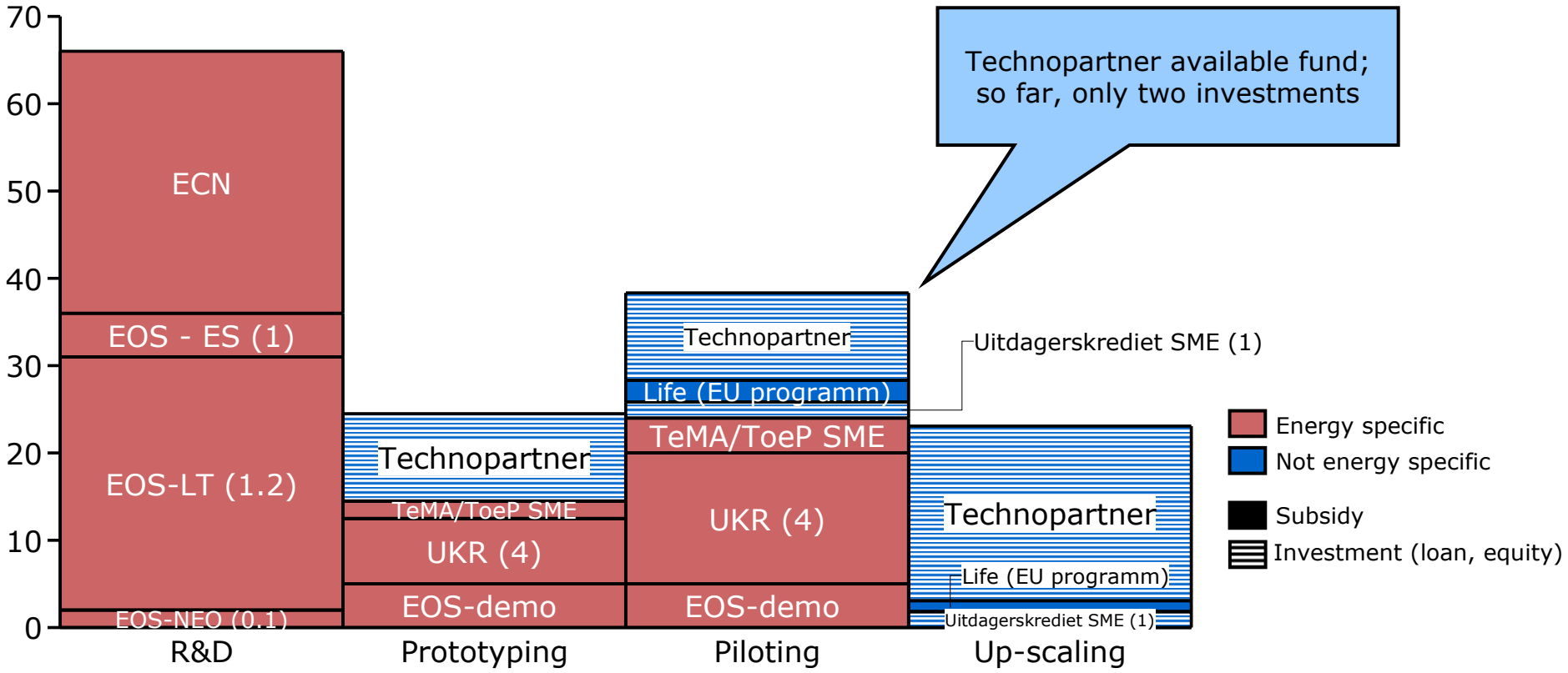


Notes: This is still 2006 estimate, latest 2006 budget not yet included
Only those parts of Groen Beleggen that are invested in energy (100%) or green houses projects (30%) are considered here

Source: SenterNovem, MinEZ

2 Subsidy for prototyping, piloting and up-scaling is fragmented and relatively low

Availalable government financing for sustainable energy per annum (2006 estimate) (in € M)



Notes: This is still 2006 estimate, latest 2006 budget not yet included
Groen Beleggen is excluded here for reasons of clarity
Split of available Technopartner funds across development stages is estimated

Source: SenterNovem, MinEZ

3 Start-ups are complaining about slow, complex and unpredictable permit and subsidy processes

Permit process

"One of the objectives of the Demopark Duurzame Energie is to provide starting entrepreneurs in renewable energy with a location that carries all required permits. Currently, each starter has to apply for the permits himself, ***which easily takes up to 18 months****"*

Subsidy process

"I do not even bother anymore with subsidies, ***the procedures are simply too long*** *and the requirements almost equal those of commercial parties."*

"Even after consulting a subsidy expert, we did not get any of the subsidies we applied for. ***The outcome of the application procedures should definitely be much more predictable****."*

4 The innovation pipeline is broken between R&D and the later stages

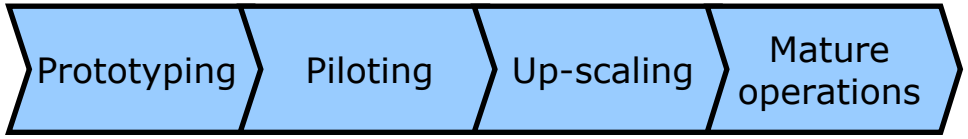
- Insufficient incentive to push technologies into next phase
- Insufficient link with business community (for skills and market-driven innovation)

*"Researchers often do not like to be busy with commercialization of their ideas. Their core task is R&D and they do not really **know how to write a business plan**."*

Researcher

*"Since we cannot get **subsidies for commercial development**, we keep our projects at pre-commercial R&D level for the objective of getting more subsidies."*

Researcher



- No strong incubation platform (also due to limited VC availability)

*"We need to improve the **linkage between us and top research universities**."*

Utility company

*"Majority is **lacking management skills**"*

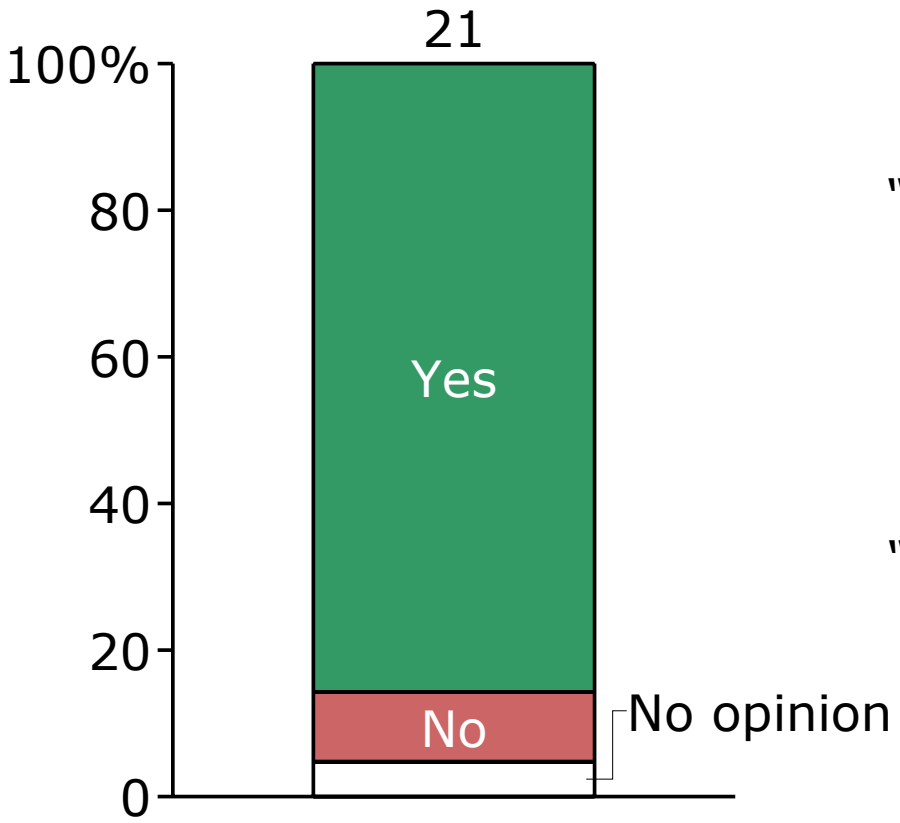
Investor

*"Getting commercial input early on in the R&D is crucial for the success of the project…We need to **know what industry really wants**."*

Researcher

Interviewed start-ups confirm the presence of a capital gap between R&D and commercialisation

Is there a capital gap between R&D and commercialisation in renewable energy in NL?



*"The capital gap prior to commercialisation is **the** problem of The Netherlands"*

Startup

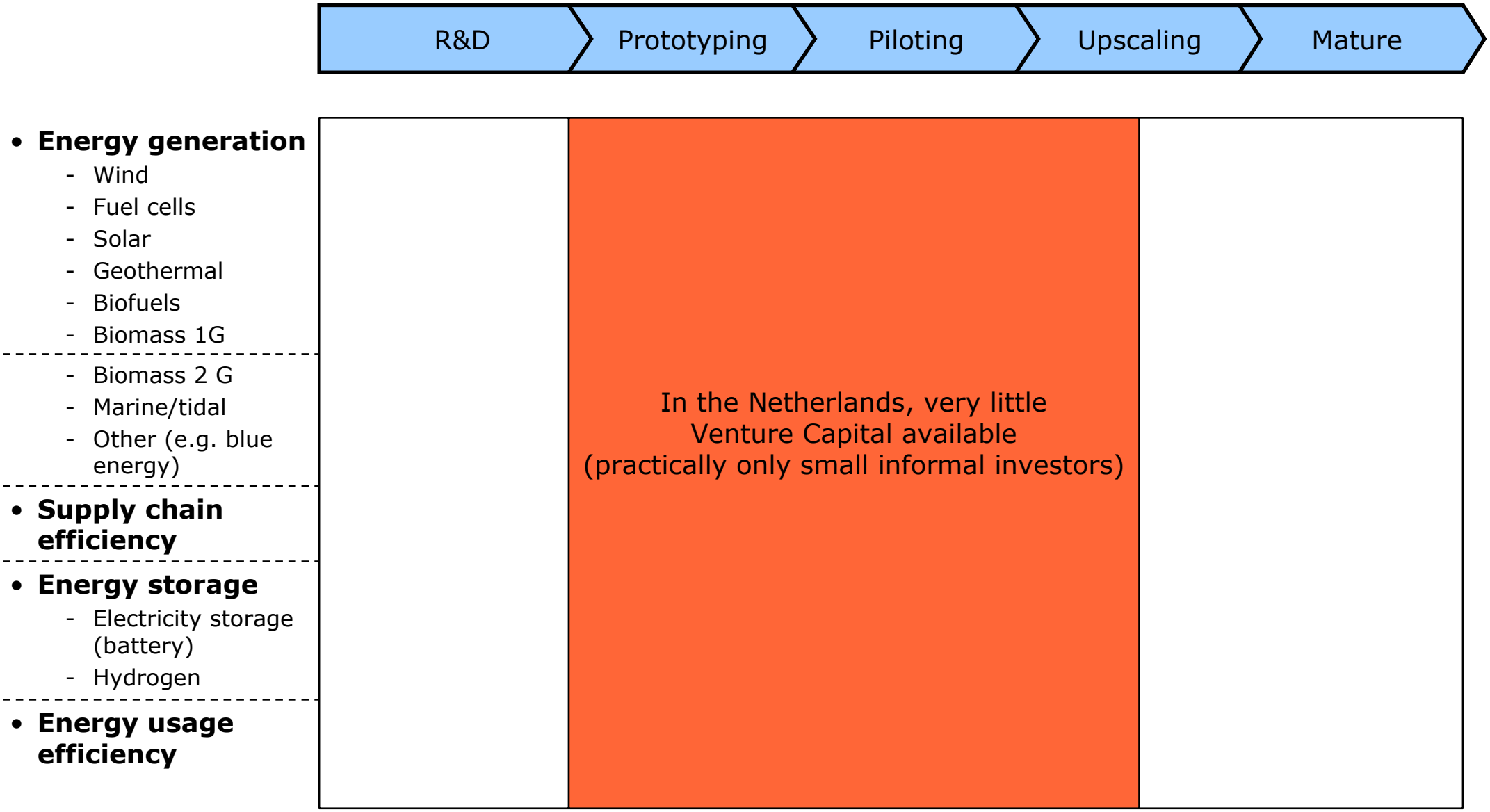
"No investor is willing to support a pilot project, and neither are many subsidies available"

Startup

"Fortunately, the inventor was so passionate that he invested his own money, otherwise we would have never made it through the prototyping and piloting phases."

Startup

In the Netherlands, there is a shortage of early stage Venture Capital



Source: Literature search

A significant number of potentially attractive innovation projects in NL had financing difficulties

	Prototyping	Piloting	Upscaling
Energy generation	• Dye-sensitised solar cells: difficult to obtain funding • Low-cost silicon production for solar cells: project terminated • Wind energy technology developed in NL: turbine production went abroad • Wave rotor: taken abroad	• New solar cell production method (Ribbon growth on substrates): difficult to obtain funding • Combined heat and electricity production by solar cells: difficult to obtain funding	• Solar cell production: long waiting time to obtain capital
Supply chain efficiency	• Centralised production of pulp from old paper: corporates willing to fund a factory later, but not a demo • Zero emission power plant: difficult to obtain funding	• Production of GTBE from glycerine (co-product of biodiesel): insufficient capital obtained	• *No projects identified*
Energy storage	• *No failed projects identified*	• *No failed projects identified*	• *No projects identified*
Energy usage efficiency	• Low temperature heat exchangers: insufficient capital obtained • Intelligent climate management of buildings: insufficient capital obtained • Energy-efficient natural gas engine: moved to Thailand • Electric bus: no capital	• Device for water and soap efficient cleaning of glasses: no capital • Micro WKK: moved to New Zealand	• Production and installation of energy efficient heating systems: no capital

Source: Bain analysis of sustainable energy companies in NL

Overview of the 37 Dutch RE initiatives considered for the statistical analysis

BACKUP

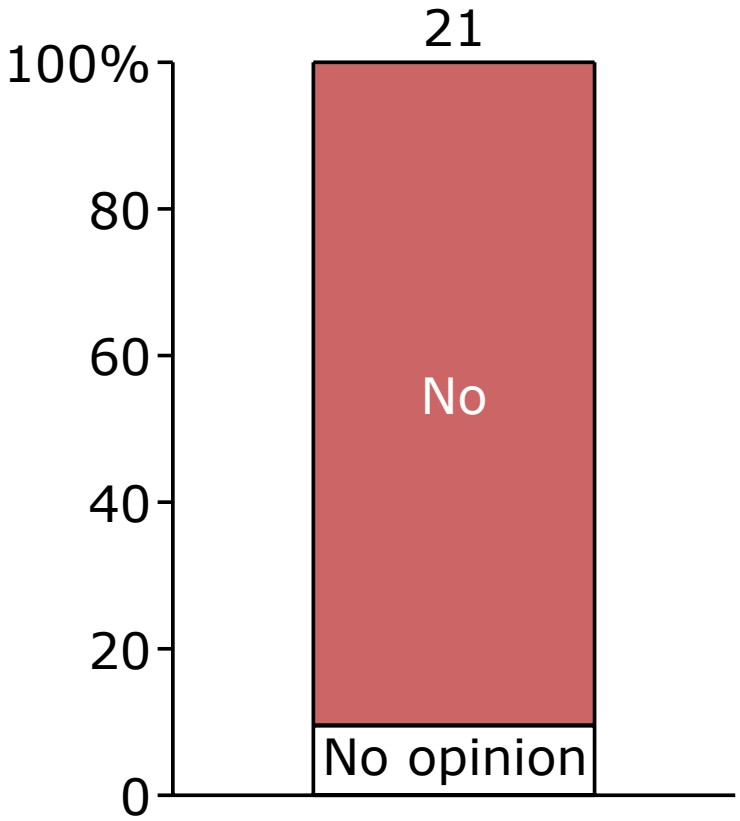
	R&D	Prototyping/ proof of concept	Piloting & Introduction (proof of feasibility)	Up-scaling	Mature operations
Energy generation		• Helianthos (flexible solar cells) • SOLSILC (low cost silicon production) • SunDye (dye sensitised solar cells) • Darwind (off-shore turbine) • Dowel (wind technology) • Wave Rotor, Ecofys (wave and tidal energy)	• Biomassa Holding (electricity from biomass) • Nedstack (hydrogen fuel cells) • SulphCatch (removal of organic sulphur) • PVTwins (solar cells producing heat and electr.) • RGS (solar cells)	• Orgaworld (biomass) • Two representative biomass plants • InDEC (ceramic parts, now H.C. Stark) • Solland (solar cells) • True Solar Autonomy (amplifiers) • EWT (production of wind turbines) • Windpark Delfzijl-Zuid • Two representative wind parks	
Supply chain efficiency		• Waste Paper Mining • Zero Emission Power Plant	• ChemConserve (GTBE process) • Innogrow (owner of GeslotenKas)	• FROG Navigation (navigation for electric vehicles) • VP Instruments (sensors for pressurised air) • Warmtebedrijf Rotterdam	
Energy storage			• HyGear (hydrogen generators) • Mobinol (bio-methanol)		
Energy usage		• e-Traction (electric bus) • Fiwihex (heat exchangers) • Nonox (engines on gas) • Onroerend Groen	• Aquafox Holding (saving water in glass cleaning in cafes) • Magic Boiler (heating systems, micro-WKK)	• Techneco (heating and cooling equipment)	

1 There are several case examples of the issue "inconsistent policy"

	Solland Solar	Techneco
Development phase	• Up-scaling	• Up-scaling
Technology	• Production of silicon PV cells	• Heat pumps, boilers, temperature storage systems (started as distributor, now developing own heating/cooling equipment)
Capital required	• Approximately € 40 M	• Approximately € 0,5 M
Achieved financing	• After a lot of efforts € 20 M has been collected, of which € 3 M were subsidies. With this investment, an initial production plant has been set up (production capacity of 20 MWp/yr).	• None, at least thus far
Key reason for lack of success	• There has not been a clear government policy on photovoltaic energy which made investors reluctant. • Subsidy levels are dramatically lower than in Germany.	• Sudden decrease of subsidies for environmental friendly technologies made it hard for Techneco to obtain further commercial loans.

1 Interviews with start-ups confirm fluctuating government policy as obstacle to investing

Has the Dutch government policy been consistent for renewable energy?



"The largest improvement the Dutch government could make is to create a stable and long term policy on renewable energy."

Startup

"As long as the Dutch government does not create a long term incentive for solar energy, it will remain difficult for us to obtain capital from commercial investors."

Startup

"Compared to foreign governments, the Dutch government was late with a policy on biofuels, thereby seriously delaying Dutch initiatives in that very promising sector."

Startup

2 There are several case examples of the issue "inefficient subsidy allocation"

	e-Traction	Fiwihex	Magic Boiler
Development phase	• Prototyping	• Prototyping	• Piloting and introduction
Technology	• Energy efficient bus (50% reduction in energy need) owing to electric propulsion	• Low temperature heat exchangers that are used to cool during summer and heat in winter (heat is stored underground)	• Micro WKK's (local heat and electricity production systems) for consumers
Capital required	• Approximately € 2 M for demo • Roughly € 50 M for a factory	• € 4 M for 2 initial demo's • € 20 M for 2 large scale demo's	• Approximately € 5 – 10 M
Achieved financing	• No demonstration projects have been funded thus far.	• Two EOS-demo projects (€ 1 M each) were given, but consequent UKR was refused, so that large scale demo cannot proceed.	• None, company moved production facility to New Zealand.
Key reason for lack of success	• Local politicians (in this case allocating the subsidies) are not willing to invest as they deem the risk of the project too high, although it is a demo project (!)	• Although SenterNovem acknowledges great potential of technique, follow-up subsidies are not given, which makes first subsidies useless as well.	• Product is too expensive (7 k€ instead of 2 k€ for a normal kettle). Costs can only be brought down when enough subsidy is provided to achieve a scale increase of production.

3 There are several case examples of the issue "complex permit processes"

	Waste Paper Mining	Zero Emission Power Plant
Development phase	• Prototyping	• Prototyping
Technology	• Production of pulp from used paper. This pulp can be locally processed into new paper. The centralisation of the first step saves a huge amount of energy.	• CO2 neutral electricity generation from natural gas.
Capital required	• Approximately € 200 M	• Approximately € 50 M
Achieved financing	• Corporate partners (Siemens, BASF) and AEB (Afval Energiebedrijf Amsterdam) have promised investments to build a large scale factory, but first prototype is required.	• Until now, only limited subsidies were given for the research phase. Undisclosed investors are willing to participate once technology is fully proven.
Key reason for lack of success	• Very long permit procedures hamper the quick setup of a prototype plant. • Furthermore, there is no subsidy available for the prototyping phase, while the corporates will only invest once the technology is fully proven.	• Very long permit procedures hamper the quick demonstration of the applied technologies.

4 There are several case examples of the issue "broken venture pipeline"

	RGS	NedStack	SunDye
Development phase	• Piloting and introduction	• Piloting and introduction	• Prototyping
Technology	• Alternative production scheme for solar cells	• Hydrogen fuel cells	• Dye sensitised (= cheap) solar cells
Capital required	• Approximately € 200 M	• Approximately € 10 M	• € 5 – 10 M
Achieved financing	• After a lot of efforts € 25 M has been collected from strategic investors Deutsche Solar and Sunergy	• Financing was successful: 45% from an undisclosed private investor and 55% from the employees	• None thus far, but still trying
Key reason for (lack of) success	• Capital requirements of project are very high, which makes investors reluctant. Consequently, good business skills should be present in the company (which could not be offered by ECN alone).	• The initiators of NedStack originate from Akzo, so they had sufficient experience to build up the company and secure investments.	• Initiators (ECN) feel they do not possess sufficient business skills. However, investors are not willing to bring in skills and expect fully equipped management team.

Summary (3/4)

In order to build a more productive innovation pipeline in sustainable energy in The Netherlands, financing and incubation support by the Dutch State can obviously help to close the early stage Venture Capital gap short term. However, as the underlying root causes for the gap have not only to do with "market failure" but also with "government failure", this measure will only be truly effective in attracting commercial Venture Capital in the longer term, when the other identified issues related to Government strategy and policy and the link between R&D and business are being addressed in parallel.

a. If the objective of the Government is indeed to position The Netherlands as a leading player in innovation in (selected) sustainable energy technologies, it is critical to overcome the issues in the innovation pipeline mentioned in the diagnostic section above. If the objective would be purely to accelerate the transition to more sustainable energy in The Netherlands, it is less critical to keep innovation in the country; proven technologies could be imported from elsewhere and financial support by the State could be focused on compensation of higher costs of sustainable energy. Assuming it is indeed the intention of the Government to make The Netherlands a leading player in (selected) sustainable energy technologies, it is required that the Dutch State develops a clear and convincing strategy and implementation policy on where and how it wants to win in the international competitive field.

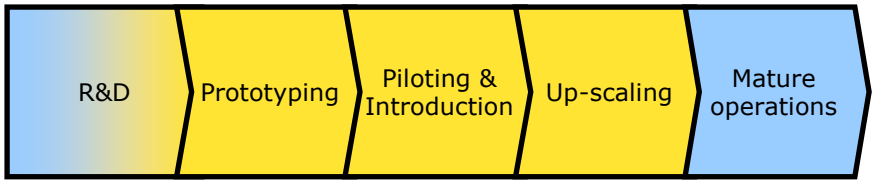
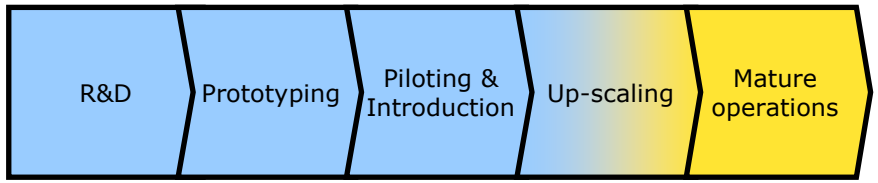
b. Prioritization of different technological areas (e.g. based on the current strength of The Netherlands of different relevant competencies, the relative competitive position of The Netherlands versus other countries and the estimated economic upside potential) will help to focus the efforts well, and to increase the chances of international success by more critical mass and momentum (as apposed to spreading the effort too thin over too many different areas). The selected areas can be a subset of the currently existing transition platforms.

Summary (3/4)

c. Part of the competitive battle between countries will be about the amount of available subsidies in different countries. A stable, transparent and coordinated subsidy allocation process across the innovation pipeline will be required to make the subsidy support optimally effective. Also a more convenient innovation infrastructure and environment (e.g. transparent and efficient permitting processes) should be facilitated.

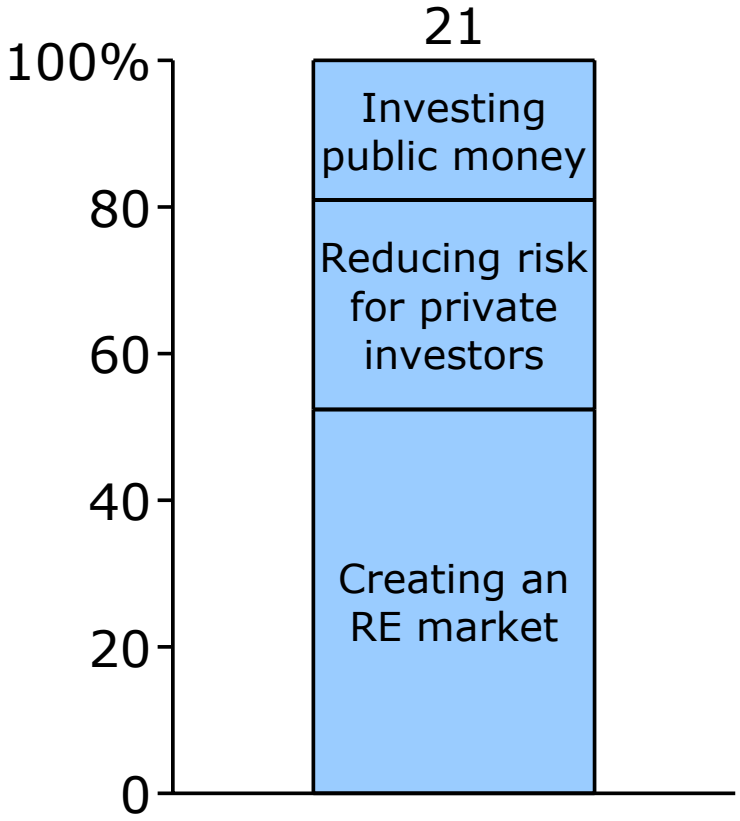
d. Last but not least, R&D institutes and Universities in The Netherlands should be stimulated and incentivized to push their ideas further through the innovation pipeline by selling their ideas pro-actively to Venture Capitalists and by getting their funding and incubation support in the prototyping and piloting phases (and beyond). The current platforms for transition to sustainable energy can possibly play a stronger market maker role in this respect as well.

If objective is to position NL as a key player in sustainable energy, innovation is crucial

	Position NL as a key player in sustainable energy technology	**Accelerate transition to a more sustainable energy usage**
Objective	Economic and environmental	Environmental
Timeframe	Long-term: 2050	Short-term: ~2010
Crucial to keep in NL		
Reasoning	• For benefiting from businesses in NL, owning the business through keeping development of technology and up-scaling in NL is crucial • Creating a local market is less important as products can be exported	• Energy generation does not depend on innovation in NL - components and technologies can be acquired from other countries • Government should focus on market creation, e.g. MEP for new energy generation and regulations on energy efficiency (e.g. biofuel usage, building requirements)

Start-ups see various roles for government - investing public money is the least important

What should be the role of the Dutch government in closing the capital gap?



"The government should work hard to establish the sustainable energy sector as an accepted part of our economic landscape."

Startup

"There is clearly a shortage of capital, but the government should rather stimulate private investments than give more subsidies.

Startup

"The government should not invest itself in renewable energy, but should create a market for it."

Startup

Government has several levers to overcome obstacles in innovation process

1 Uncertain government policy

- Develop long-term consistent policy on sustainable energy
- Review overall level of support to sustainable energy compared to other EU countries (however, hard to compete on subsidies with e.g. Germany due to sheer size and East Germany exception)
- Focus efforts on certain technologies which are most relevant and most suitable to NL

2 Inefficient distribution of subsidy

- Reallocate subsidies in order to make step from R&D to commercialising easier (increase subsidy for demo/prototyping

3 Slow, complex and unpredictable permit and subsidy process

- Review criteria for permits and subsidies
- Review process (process steps and responsibilities) to obtain permits and subsidies

4 Broken venture pipeline (academic vs. commercial

- Improve the network between academic, industrial and venture parties (e.g. example biotech in Gent) – energy transition platforms can be used
- Serve as a project scanner and matchmaker between investors and start-ups (like Carbon Trust)
- Offer management support to ventures
  - Government incubation (e.g. CT accelerator)
  - Foster private VC incubation

4 Example CT shows that incubation, public and private investments need to be coordinated

Carbon Trust venture activities

Programme	Playing field	Activities
Incubator network	• Removing break in venture pipeline	• Proving business support - Providing strategic and business development consultancy - Advising on corporate finance - Mentoring for the management team - Energy related market research - Guidance on technical support • Scanning the market for attractive ideas
Technology Acceleration Programme	• Increasing attractiveness of RE sector	• Providing subsidies, coordination and expertise to accelerate the development of specific RE sectors • Recommending attractive R&D ideas to further commercialization and helping selecting industrial partner
Venture capital arm	• Increasing attractiveness of RE sector	• The VC arm makes equity investments in RE companies • The investments are always a minority share with a maximum of € 2,5 M and done on commercial terms • The health of the investments is closely monitored and active management feedback is given • The VC-arm is independent from, but makes use of the extensive know-how of the other activities of The Carbon Trust to assess investment opportunities

The Incubator Network and the Technology Acceleration Programme are part of the Low-Carbon Technology Development activity with a yearly budget of about € 15 M, while all investments of the VC-arm amount to € 10 M

4 Example Biotech Ghent University: streng-thening the link between R&D and business

BACKUP

	R&D	Prototyping/ proof of concept	Piloting & Introduction (proof of feasibility)	Up-scaling
Actions at Ghent Univ.	• Informing researchers about patents and IP • Making patent literature accessible • Evaluating the feasibility of a patent • Help patent requests • Supporting with contracts regarding patents and IP	• Evaluating the feasibility to commercialise a developed technology • Helping researchers find industrial partners to achieve commercialisation	• Assisting with writing of business plans • Providing seed capital through Baekeland fund of Ghent Univ. • Maintaining business incubators → Technology Parks Ardoyen (Gent) and Plassendale (Oostende)	• Valuing the business, specially intangible assets like know-how • Negotiating with potential share holders • Handling required administrative affairs • Assisting with practical issues (e.g. housing, admin, recruitment)
Key success factor	• Linking research community • Helping patents process	• Business skills support • Match-maker between business and R&D	• Business skills and financial support	• Business skills support
"Plant Genetic Systems" success story	• During 1970's Ghent Univ. obtains leading position in plant biotechnology	• Prof. Van Montagu and others decide to commercialise their successful technologies	• 1982: founding of Plant Genetic Systems • Success of PGS stimulates the founding of new companies (DevGen, CropDesign)	• 1996: PGS is bought and eventually becomes part of Bayer CropScience (2002) • 2004: Bayer opens new R&D lab in Gent • 2006: Bayer acquires CropDesign

Summary (4/4)

Overall there are three different options (each with some possible variations) for the State to help close the current Venture Capital gap in early stage sustainable energy innovation in the short term. One of the options is to provide loan guarantees to project financing banks and by doing so attract Venture Capital with a more attractive risk/return profile of the leveraged innovation projects. First assessment indicates that this loan guarantee option can provide the most flexible and quickest transition to the ultimately optimal solution, which is better availability of commercial Venture Capital. Estimated total required funds to close the most urgent early stage Venture Capital gap is Euro 100-200 million over a five year period.

a. One option for the State is to start a Venture Capital incubation fund similar like Carbon Trust in the UK (or like Twinning before in The Netherlands) with or without private co-investors. In this option the State maintains (a strong level of) control over the General Partner running the fund. Experience learns that these types of funds have trouble becoming effective due to political constraints and insufficient commercial discipline in the screening of opportunities and management of investments. Because of this reason and lack of control, most private Venture Capitalists whom we interviewed indicated that they would not be interested in co-investing with the State in such a fund. We have also not identified any significant indirect ("fund of fund") venture capital investors with an interest to invest in such a fund. Only in case the Government would provide (strongly) subsidized equity (i.e. with limited/no return requirements) to this fund, such a fund would be able to attract additional private capital. Essent and Delta, though, have indicated willingness before to use the "Borssele money" to start a joint fund with the State; apparently the State declined at that point in time and currently Essent and Delta are starting up a Euro 50 million fund themselves. The Accelerator Fund described by Fred Hoogeland is similar to this option with the difference that the Accelerator Fund would be focused on later stage innovation projects primarily. Our analysis suggests however that the most critical Venture Capital gap exists in the early prototyping and piloting stages.

b. Another option would be to allocate State money to one or more private investment companies as a Limited Partner only. In this case the State would have no direct control over the investment decision

Summary (4/4)

process anymore after the money has been invested in the fund. A similar option is suggested by Jan Paul van Soest ("Energie-innovatie MOET"). Advantage of this option is that the disadvantages of the previous option under a. do not apply; the fund is run by professional investment managers without direct State interference or influencing. It is still questionable, however, if this option would attract private capital from other investors without strongly subsidized State investment through a-symmetric (less favourable) return economics. Moreover, the question is if the Government can politically afford to delegate power to a third-party investment manager without direct supervision or control.

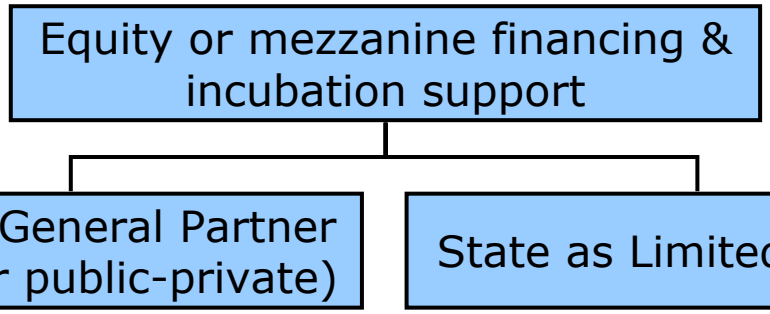
c. A third option for the State is to provide loan guarantees (up to a certain level) to banks to project finance early stage innovation projects. This would make it more attractive for Venture Capitalists to provide equity to the project because of the provided financial leverage effect. Moreover, this would ensure that a strong commercial discipline with the appropriate diligence checks and balances (which commercial investors like) is maintained. Obviously this option still needs further detailing too. However, initial reactions of banks and investors are positive. In order to bring maximum market working into this process the government could invite multiple banks to bid for project financing on a certain project (that is approved by a government body for a loan guarantee – that way the Government can still control where the money is going) and indicate what interest they would charge at what guarantee level. Because of the strong commercial diligence by the banks and VC's, it can be expected that the odds for success of the funded projects increase (relative to a fully government led equity fund), and therefore loss of capital for the State should be overall lower. To compensate for the lack of upside for the State, Venture Capitalists can be asked to pay an "insurance premium" for the loan guarantee (like in export financing guarantees) which could even be a function of the success of the project (this fee will probably also be a requirement for the EU to approve this loan guarantee measure). Moreover, when over time the Venture Capital market is maturing in The Netherlands, this system will allow for a more flexible and quicker transition to a complete "free functioning market" (as opposed to a revolving "competing" government led fund); loan guarantees can be limited further when the appetite of Venture Capitalists to invest grows.

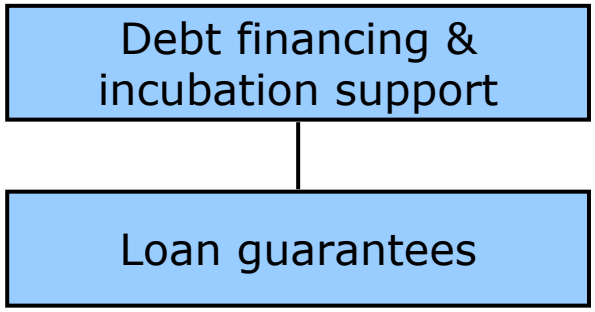
Summary (4/4)

d. Total estimated required capital to close the most urgent financing gap in the prototyping, piloting and (to a lesser extent upscaling phase) is estimated to be Euro 100-200 million over a 5 year investment period.

e. Obviously, restrictions on State aid by the EU are a potential constraint on how the State can support innovation in sustainable energy. However, comparable examples for all three options mentioned above both in The Netherlands and other European countries indicate that a well prepared proposal with a constructive approach towards the EU can result in flexible application of the guidelines and EU approval. In many expert interviews, people expressed the view that the Dutch State can still improve a lot in dealing with EU regulation more effectively and that the State has a tendency to be overly prudent.

Three (generic) options for the State to provide support can be identified





	State as General Partner (public or public-private)	State as Limited Partner	Loan guarantees
Role State	• Controls investment / financing decision and provides incubation support	• Provides capital	• Approves project for loan guarantee and provides guarantee to bank (up to certain level)
Role VC	• Potentially co-invests (in fund or on deal by deal basis)	• Takes investment decision and provides incubation support	• Provides equity with leverage from project finance from bank
Role Bank	• -	• -	• Provides project financing with loan guarantee of the State
Example	• Carbon Trust (UK) • Twinning	• Technopartner	• Export financing • Nationale Investeringsbank (historically)

A loan guarantee system may in the end provide the most flexible and effective option

	Equity or mezzanine financing & incubation support		Debt financing & incubation support
	State as General Partner (public or public-private)	State as Limited Partner	Loan guarantees
+	• Control over investment by State • No dependence on private capital (if not available)	• Professional private Venture Capitalists bring expertise and discipline • (Obviously) private investors will be interested…	• Leverage potential will make VC investment more attractive • Commercial project discipline ensured • State can still approve / disapprove projects • Level of guarantee is flexible depending on what is required to attract private capital - Also provides gradual transition to 100% market financing when VC market develops
–	• Risk of inefficient allocation of capital - Political agenda, lack of diligence skills • Risk of suboptimal commercial project discipline • Limited interest from private investors to co-invest	• No control of the State over public capital (other than private fund selection)	• Limited upside for the State (possibly an "insurance premium" to be charged to VC in case project is successful)

The effectiveness of incubators by the State is, in general, being criticized

"Carbon Trust is limited in how much it can do by limited availability of money, but also by the political agenda and accountability it has to deal with ."

"The Massachusetts fund is hindered by politics and bureaucracy."

"Twinning failed in the end because it was not run by experienced professionals with clear decision authority."

"Entrepreneurs view State money as free money that you can gamble with. Accountability is much lower."

Venture Capitalists

Source: Interviews with Venture Capitalists

EU limitations on structure of fund or loan guarantee scheme

Risk Capital (loan and equity)

- A measure is being considered state aid when all of the below apply (art. 87 (1))
  - Use of state resources
  - Not operated under market conditions (pari passu)
  - Selective to certain undertakings
  - Affect trade between EU members
- State aid needs to be analysed at 3 levels
  - To investor
  - To fund/vehicle
  - To fund
- Exceptions on the state aid rules
  - If market failure exists (for certain regions, development stages, sectors)
  - If investments are small (max. €0.5-1M per 6 months; total €4M)

Loan guarantee to enterprise

- A loan guarantee is not considered state aid when:
  - The guarantee is not granted to borrowers in financial difficulty
  - The borrower would in principle be able to obtain a loan on market conditions without state intervention
  - The guarantee is linked to a specific financial transaction, a fixed maximum amount, does not cover >80% of the outstanding loan, and is not open-ended
  - The premiums paid by the beneficiary enterprise make it self-financing
  - Premiums both cover normal business risks and administrative costs of the scheme

Note: Legislation on state aid in innovation is currently being developed and not included here yet

But there are many examples of a more flexible interpretation of these ruling

State as General Partner (public or public-private)

- High Tech Gründerfond (D)
  - SME, max. €0.5M per company per half year
- VINNOF (B)
  - SME, max. €0.5M per half year
- ERP Startfund (D)
  - starter, max. €3M public capital = €6M public/private
- Digital leap VC fund (Greece)
  - SME; max, €3M
- Carbon Trust VC Fund (UK)
  - max. €2.2M, however no legal limit; *pari passu*
- Facility emerging markets (NL)
  - focus SME, max. €5M
- Plan Biotech 2002 (F)*
  - total VC fund €60M

State as Limited Partner

- Technopartner (NL)
  - SME, max. €2,5M, only €0,5M per half year
- TANEO (Greece)
  - SME, max. €5M
- NEOTEC risk capital fund (E)
  - SME, max. €2-5M
- UK High Tech fund (UK) (*no longer active)*
  - Total funds of funds size ~€220M

Loan guarantees

- BBMKB (NL)
  - SME, €1M
- SFLG (UK)
  - SME, €0.4M
- Plan Biotech 2002 (F)*
  - Enables loans of total amount €450M
- Guarantee for shipbuilding financing (NL)
  - ~max. €65M per ship
- Guarantee for shipbuilding (F)
  - ~min. €30M

* Plan Biotech 2002 has not been brought forward to the EC Directorate General on Competition to be judged concerning the treaty articles on State Aid.
Source: Literature search

Total amount of €100-200M seems sufficient to close large parts of the capital gap

How much capital is required to close the capital gap in renewable energy in NL?

Bottom-up estimates

NL start-up analysis (per annum)	**€20-30M**
• Capital needs per project	€5-10M
• # of deals p.a.	3-4
- Identified projects with funding issues	~20
- % identified projects of total projects	50%
- Total projects per year (4 year period)	10
- % economically viable projects	35%

EU comparison (per annum)	**€30-40M**
• Average EU size of VC deals:	€14M
- Seed (€5-15M); growth (€10-30M) (for breakthrough innovation up to €80M)	
• # of deals per fund p.a.	2-3
- Carbon Trust (UK only, only small amounts)	~2-3
- SAM (Europe/North America)	~3-4

Top-down estimates

NL gap in VC investing (per annum)	**€10-20M**
• Increase total VC invested in % of GDP to US level	€400M
• Focus on early stage VC rather than total VC (focus seed/start-up rather than expansion stage)	~50%
• Relevant renewable energy share of total early stage VC	~5-10%

Benchmark total fund size	**€15-150M**
• Smallest identified fund: Sustainable Energy Ventures (B)	€ 16M
• Largest identified fund: Good Energies (Cofra) (CH)	€144M

With an investment period of 5 years, a total amount of €100-200 M should suffice to close most of the capital gap in early stage innovation

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