

Roads2HyCom

www.roads2hy.com

WORK PACK 7, TASK 7.2

FINANCING AND BUSINESS DEVELOPMENT

FOR HYDROGEN COMMUNITIES

Prepared by:

Michaela Mönter, NTDA Energía

Phil Doran, Coretec Ventures

Document Number: R2H7001PU.2

Date: June 2007

The European Commission is supporting the Coordination Action "HyLights" and the Integrated Project "Roads2HyCom" in the field of Hydrogen and Fuel Cells. The two projects support the Commission in the monitoring and coordination of ongoing activities of the HFP, and provide input to the HFP for the planning and preparation of future research and demonstration activities within an integrated EU strategy.

The two projects are complementary and are working in close coordination. HyLights focuses on the preparation of the large scale demonstration for transport applications, while Roads2HyCom focuses on identifying opportunities for research activities relative to the needs of industrial stakeholders and Hydrogen Communities that could contribute to the early adoption of hydrogen as a universal energy vector.

Further information on the projects and their partners is available on the project web-sites www.roads2hy.com and www.hylights.org



FINANCING AND BUSINESS DEVELOPMENT FOR HYDROGEN COMMUNITIES

TABLE OF CONTENTS

1.	Introduction - Background information	4
1.1	Financing Early Stage Companies	5
2.	Strategy & Structure criteria for business development within a Hydrogen Community	10
2.1	EU Strategies, Visions & Instruments for the Hydrogen Economy development.....	10
2.1.1	Financing Programmes and Initiatives.....	13
2.2	Business Development strategies	19
2.2.1	Value Chain and H2 Development Structures	22
2.2.2	The PPP as a cornerstone for the Hydrogen Community.....	24
3.	Financial Instruments	28
3.1	Public Funding Options	33
3.2	Equity Financing	34
3.2.1	Exit Routes	37
3.3	Debt Financing	37
3.3.1	European Investment Bank concepts.....	41
4.	Conclusion	43
5.	Bibliography	45
Annex I:	Overview EU PUBLIC FUNDING	47
Annex II:	Glossary of Terms Used in the Documents	49



TABLE OF ILLUSTRATIONS & TABLES

Figure 1.1 – Equity Financing	8
Figure 2.1 – HFP Structure and Operations	11
Figure 2.2 – Interactions between stakeholders intervening in defining strategies for Hydrogen and Fuel Cells Technologies and the JTI	14
Figure 2.3 – Structure of the Industry Grouping	14
Figure 2.4 – Foreseen financing scheme of the JTI	15
Figure 2.5 – FP7 set-up (NTDA diagram)	16
Figure 2.6 – Porter Value Chain (NTDA diagram)	23
Figure 2.7 – Vision and Strategy for Europe’s Electricity Networks of the Future	24
Figure 3.1 – Generic Stages of Research Projects	30
Figure 3.2 – Long-term relationship with University	35
Figure 3.3 – Example of alternative tech transfer financing	36
Figure 3.4 – SME use of different debt financing forms in the EU	39
Figure 3.5 – Corporate & Project Finance	41
Figure 4.1 – Single businesses and the Community (NTDA diagram)	43
Table 2.1– Snapshot 2020 Key Assumption on Hydrogen and Fuel Cell Applications (NTDA table)	10
Table 2.2 – Financing Tools (NTDA table)	12
Table 2.3 – Drivers, Early Markets, Financing Options, and Barriers (NTDA table)	20
Table 2.4 – Primary Activities (NTDA table)	23
Table 2.5 – PPPs in Transport (NTDA table)	26
Table 2.6 – Private Partner Risk Assumption / Return Profile as a Function of Tax-Exempt Bond Structure (NTDA table)	27
Table 3.1 – Matrix of Financial Instruments: Debt, Equity & Subsidies (Core Technology Ventures table)	29
Table 3.2 – Finance Access Criteria for SMEs (NTDA table)	32
Table 3.3 – European Ecological Banks (NTDA table)	40



1. Introduction

This document on Financing and Business Development will:

- Identify strategies for hydrogen-related business development within communities
- Provide information on the financing of Hydrogen Community development

Hence, this document concentrates on the financial aspects of business development regarding businesses within a Hydrogen Community. It thus attempts to present financing and business development roadmaps and guidelines for existing hydrogen companies which may be located in a Hydrogen Community.

Business development has to bridge the gap between technology development, innovation and commercialisation. In order to achieve a successful market entry and a thorough market penetration, sophisticated financing concepts and non-financial elements on the legal framework, proficiency and networks are required.

Hydrogen and fuel cell technologies are by their very nature disruptive technologies, meaning that “they have the potential to change fundamentally the way we use energy, and products using energy, in our daily lives.”¹ A disruptive technology is a commercially successful innovation that essentially alters the manufacturing and delivery of goods and services, while at the same time generating novel, unanticipated products and services, opportunities and benefits. Examples of disruptive technologies include the printing press, Alexander Graham Bell’s “electrical speech machine”, gasification and electrification, and the introduction of computers. A defining feature of disruptive technologies, and one that’s not always appreciated, is the fact that they are often delivered by new-entrant companies, to such an extent that many long-established businesses fail to survive the ensuing shakeout. The family of technologies making up the Hydrogen and Fuel Cell market segment displays all the characteristics of being disruptive.

The results emerging from the Technology Review within the Roads2HyCom project indicate that Europe’s Hydrogen and Fuel Cell industry is numerically dominated by private independent developers² and academic institutions. Given many regions have expressed an interest in building hydrogen communities³ and the fact that H₂&FC technologies are still very much in development, the following section deals with how new companies are financed and the programmes and institutions available to emerging hydrogen communities. Contrary to other approaches in the area of new energy sources, the focus of our study is on market-based financing concepts, and

¹ HFB Business Development Subgroup, Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006, 2006, p. 9.

²In H₂&FC activities “Independent Developers” are referred to as companies whose business activities deal exclusively with the development of H₂&FC technologies. The terminology “Corporate” refers to companies whose main business activity is not the development of fuel cells, e.g. auto assemblers and chemical companies.

³As can be seen in the Registration of Interest Responses of the Roads2HyCom WP3 Initiative



not solely on public funding by the EU, although public EU funding is also analysed. Hence it can be considered a new approach.

The proportion in which financing sources are required and should be applied will change as technologies enter the market and undergo the regular cycle of business development.

1.1 Financing Early Stage Companies

The following section outlines the essential differences between the three basic financing stages of company evolution and the so-called 'exit routes' for its early investors.

A. Seed Capital (*Typically raising less than €300,000*)

Company Characteristics:

Typically, the company has been recently founded, probably at the behest of the seed capital investor to ensure that his/her investment is secured against any assets that may exist. The 'technology' is often a scientific concept with a potential future use which has yet to be practically demonstrated. It is often the case that no patents have been applied for let alone granted.

Use of Capital:

The capital raised is to cover the cost of taking the scientific concept through various experimental phases towards a reproducible, practical, demonstration. This is often referred to as the 'proof of concept' stage. Capital is also needed to pay salaries, develop the business plan and to fund additional technical and market research.

Sources of Seed Capital:

Access to seed capital is difficult and limited, particularly in Europe, as the risk of failure and therefore loss of capital for the investor is normally at its highest. Seed Capital is commonly raised from family and friends (by and large not more than 10.000 €) as the company is unlikely to meet the banks requirements for lending and very few venture capital funds will invest at such an early stage of the company's expansion. Seed Capital may also be supplied by independent private investors, so-called 'business angels' (usually up to 150.000€ or up to 250.000€ if in a syndicated form). Another option of financing a company prior to its formal creation is convertible debt, which is a loan that is exchangeable for equity once the company is created. This type of loan is commonly issued by a private investor or another company seeing a strategic interest in the early participation of this start-up company, e.g. a company anticipating this new company as complementary to their own business lines.



B. Start-Up / Early Stage: *(Typically raising less than €3m)*

Company Characteristics:

Characteristically, the business concept in the Start-Up Phase has now been technically proven and an outline business plan is in place, although likely based on fairly rudimentary market forecasts. Few, if any, non-scientific members of staff may as yet exist.

Use of Capital:

In this phase, capital is normally used to develop the technology from its present 'proof of concept' stage to something akin to a prototype. Yet, whether that target is achieved as a part of this phase is dependent on the scale of the engineering task at hand. Significantly more technological development and testing are required, which in turn entails the purchase of laboratory, machineries and testing equipment.

Some patents may be ready at this stage for filing or even granted. Specialist members of staff, including project engineers and experienced start-up business executives will be hired to enable the start of the transition by the company from technology to product developer. A small board may be required by the investor or needed by the company, to facilitate collaborative engineering projects with potential future customers, and stricter financial controls will need to be put in place.

Sources of Seed Capital:

Specialist early-stage venture capitalists and / or corporate ventures with a strategic interest are active at this stage of a company's growth. Although the broad energy sector is starting to attract the venture capital community, few funds exist with the expertise needed to invest in the H₂&FC sector. There have also been some high profile failures by fund managers attempting to raise funds to invest in the sustainable energy industry which suggests that the core investors in funds which includes pension funds, have yet to be convinced by government policy towards the sector.

C. Development Capital/ Expansion Capital: *(Typically raising in excess of €3m)*

Company Characteristics:

A company in this growth stage classically has a prototype or is rapidly approaching prototype stage. It is under discussion, or has begun collaborative work, with developers that will help the company to maximise its future value either through the provision of further technology, and engineering or a route to market expertise. Some or all of these advantages may be provided by large scale industrials looking for product developers to pump prime emerging markets through their existing customer base.

Use of Capital:

Capital at this stage is commonly invested to participate in the funding of the collaborations noted above as well as to enhance staffing in areas such as project engineering, marketing and finance. The company may also need to



move to more spacious or more convenient premises e.g. located closer to suppliers, collaborative partners or potential end-customers. The business may also be looking to acquire specialist teams or to acquire businesses to accelerate its growth beyond what is possible organically. Once companies have established the market viability of their product, they often require additional capital to expand and bolster their infrastructure, to accelerate market penetration or to expand into new geographic markets.

Sources of Capital:

Most companies remain loss-making throughout this phase of their evolution, which prevents them from borrowing money from lending institutions. Venture Capital companies are the most common source of capital for this stage of development (usually up to €250,000), although increasingly there are alternative providers emerging including hedge funds and corporate venturing funds.

D. Exit Strategies:

Early stage investors, e.g. business angels and venture capitalists will ultimately look to exit the company, which typically takes the form of an initial public offering (IPO) i.e. a stock market flotation or a trade sale to a larger corporate.

Normally, companies at this stage of the business development will be commercialising their product or service and will also raise new capital on flotation.

Given the often huge investments required over a long period of time to convert a technology into a marketable product it is important for independent technology developers to regard financing as a continuous process. Each stage brings with it a new set of challenges. In the first instance it is extremely difficult to attract any finance at all, though the requirements of the investor may not be too demanding in terms of technical or commercial performance. As the technology risk declines and finance becomes relatively easier to source, the level of technical and commercial performance increases. Further, an expanding enterprise requires the acquisition of professional managers, without which professional investors would be unlikely to commit funds. Thus, it is crucial that the management of an emerging company explicitly links the company's technical progress to its financing needs and plans accordingly.

The growth of a Hydrogen Community requires a flexible financing plan, as well as an appropriate legal framework and a strategy which is supported by long term political commitment and underpinned by finance and policy support. Clear political commitments trigger, amongst other things, the behaviour of pension funds which hold a share or invest in venture capital funds.

As has been mentioned previously, the financial planning will have to take a variety of diverse financing instruments into account. A thorough funding concept, which includes the entire project duration, is essential for successful project advancement. Therefore a systematic analysis of all available funding sources is an essential step for successful business development.



This funding analysis should consider all potential public and private funding sources, which may include local, national and international participants. Documentation including a detailed business plan, presentation materials and a one page summary of the proposal and the benefits of participating in the 'Hydrogen Community' will be required by potential investors.

The development stage of a business will demand a succession of financial instruments. In order to facilitate the creation of successful business development schemes, both continuity and stability in the financing of seed and early stage developers is crucial.

However, since the 'crash' in 2000 early-stage (seed and start-up) venture capital investments in Europe seem to have reached a bottom in 2003 and rose slightly in 2004. Seed investments totalled just €33.6m or 1.4 % of total venture capital investments (excluding buyouts) while start-up investments accounted for €528m or 22 % of the total.⁴ This low level of seed investments presents a serious problem for companies in the early stage, as financing via debt is rarely an option. The range of funding sources is not so extensive for a micro-companies or SMEs. Firstly, early stage companies are unlikely to receive loans on favourable terms and secondly, the use of loans at the beginning of an enterprise constrains the company in its further financing options. For example, the EIB funding options presented later in this document are not a realistic option for micros or SMEs as the debt provided under the guarantee would have a negative impact on the company's balance sheet, making an investment even less attractive. Hence, for the successful business development of these entities increased equity access similar to the one envisaged in MAP / CIP and JEREMIE (discussed below) is important.

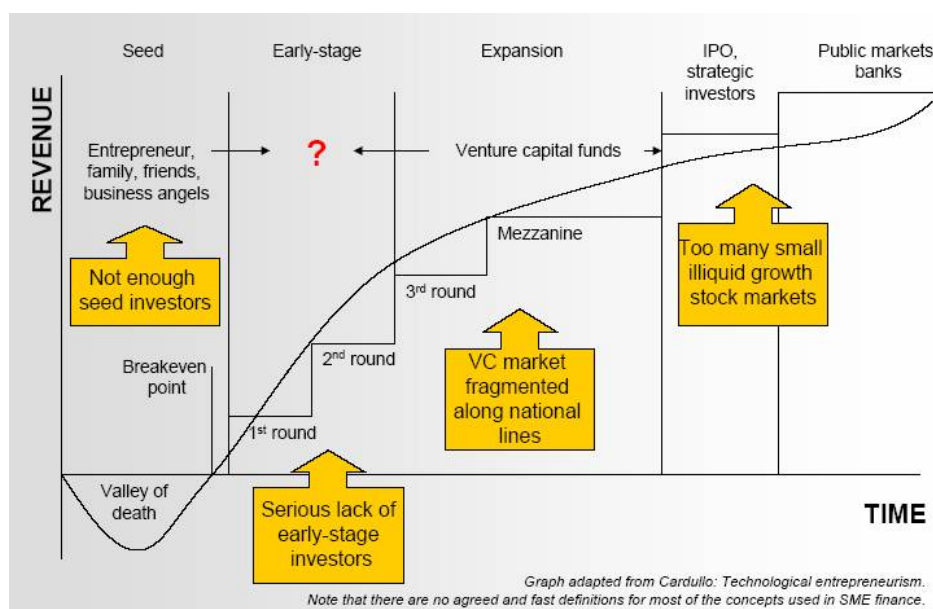


Figure 1.1 – Equity Financings

⁴EC DG Enterprise & Industry, Best practises of public support for early-stage equity finance; Final report of the Expert Group, September 2005, p. 5.

⁵ EC DG Enterprise & Industry, Best practises of public support for early-stage equity finance, Final report of the expert group, September 2005, p. 8.



Figure 1.1 shows the financing timeline of projects as well as of the business developments of individual companies indicating when the various types of financing instruments and capital providers come into play. The diagram illustrates the general flow of financing along a company's expansion path. During "Seed Financing" a company commonly receives monetary support from friends, family, business angels or public sources. At this stage, the company is most likely to fail. Once the company has reached the breakeven point, several rounds of "Equity Financing" have to be performed before the company expands and is likely to receive support from venture capital funds. See also Figure 3.2 for an overview on various capital providers.

One form for SMEs to commercialise their products at an early stage are by the means of providing services for public authorities (e.g. public procurement). As Public Authorities also have the welfare of their community in mind they are more likely to purchase products or services which are not most cost-efficient in order to support the start-up of new local businesses.

***Company financing is a long-term continuous process
Financing a 'Hydrogen Community' can be complex, involve many participants
and requiring political support***



2. Strategy & Structure criteria for business development within a Hydrogen Community

2.1 EU Strategies, Visions & Instruments for the Hydrogen Economy development

When using the term “European Strategy” with respect to the creation of Hydrogen Communities this document refers to the Hydrogen & Fuel Cell roadmap developed under the auspices of the European Commission. The Hydrogen & Fuel Cell roadmap specifies expected time-frames for the market commercialisation of the various Hydrogen and Fuel Cell applications, current market opportunities and existing as well as future key players.

Table 2.1– Snapshot 2020 Key Assumption on Hydrogen and Fuel Cell Applications (NTDA table)

	Portable FCs for handheld electronic devices	Portable Generators % Early Markets	Stationary FCs Combined Heat and Power (CHP)	Road Transport
EU H2/FC units sold per year projection 2020	~ 250 million	~ 100.000 per year (~1 GWe)	100.00 to 200.00 per year (2-4 GWe)	0.4 million to 1.8 million
EU cumulative sales projections until 2020	n.a.	600.00 (~6 GWe)	400.000 to 800.000 (8-16 GWe)	1-5 million
EU Expected 2020 Market Status	Established	Established	Growth	Mass market roll-out
Average power FC system	15 W	10 kW	<100 kW (Micro HP) >100 kW (industrial CHP)	80 kW
FC system cost target	1-2 €/W	500 €/kW	2.000 €/kW (Micro) 1.000 - 1.500 €/kW (industrial CHP)	< 100 €/kW (for 150.000 units per year)



The Lisbon Strategy (or Lisbon Agenda) was formed as a development strategy by the European Council as a result of the Lisbon Conference in 2000. The goal of the strategy, running between 2000 and 2010, is to promote more economic growth as well as environmental and social renewal, and sustainability within the European Union and anticipate economic development actions (i.e. policies and initiatives) to stimulate the EU economy between 2000 and 2010. The underlying economic principles of this strategy are the concept of a learning economy and the J. Schumpeter theory that innovation triggers per capita economic growth.

The Hydrogen and Fuel Cell Technology Platform (HFP) was launched in 2004 with the specific objective of supporting the commercialisation of Fuel Cells and components of the Hydrogen Supply chain. That is to “facilitate and accelerate the elaboration and deployment of cost-effective, world class hydrogen and fuel cell based energy systems and component technologies for applications in transport, stationary and portable power”⁶ and has to date published three critical strategy documents. These are the Strategic Overview, the Strategic Research Agenda and the Deployment Strategy⁷, which all propose the joint pursuit of long-term research, technological progress and demonstration activities along with programmes to prepare the market for these new technologies. These documents envisage fuel cells becoming commercially available for all application types (portable, stationary, transport) by 2020 and foresee widespread market penetration by 2050.

The HFP and the Lisbon Strategy can be regarded as the two pillars on which the European Hydrogen and Fuel Cell Strategy is based.

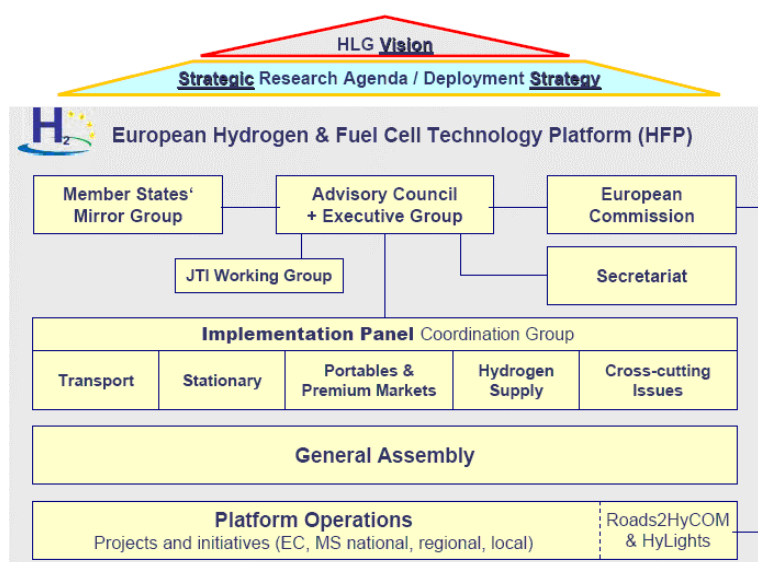


Figure 2.1 – HFP Structure and Operations⁸

⁶ Web European Hydrogen and Fuel Cell Technology Platform www.hfpeurope.org , 2006

⁷ Online versions of these documents may be found at: <https://www.hfpeurope.org/hfp/keydocs>

⁸ Giuseppe Rovera, Vision, Strategy and Programme of the HFP, Presentation at the EnerMotive, slide 7, Milan, 6-10 February 2007,



The HFP Initiative Group on Financing & Business Development concluded together with key European financing stakeholders (e.g. the European Investment Bank and Private Sector Finance Experts) that large companies are the principal beneficiaries of existing EU financing tools. Although SMEs contribute significantly to innovation, they still don't have access to appropriate financing schemes. The central European financing problem is the relative absence of seed and early stage financing (through venture capital, business angels or other means). The typical lead time for receiving public funding is at least one year and the probability of receiving public funding is just 30-50% for SMEs.⁹

The following table shows which financing tools are suitable for the 3 stages, research, growth /demonstration and market introduction¹⁰:

Table 2.2 – Financing Tools (NTDA table)

	Research	Growth / Demonstration	Market Introduction
Grants	+	+	+
Public contracts (including defence)	+	+	+
Venture Capital (seed & early stage financing) [especially important for SMEs]	+	+	+
Seed & early stage financing [especially important for SMEs] e.g. EIF	+		
Early listing of companies (at stock exchanges)	+	+	
EIB loans (SFF facility) combined with RSF of EC (risk sharing facility; under development by EC and EIB)	+	+	+
Technology Transfer Accelerator (under development): goal of providing seed financing	+		
Public support measures (subsidies, incentives etc.)	+	+	+

Recently, the HFP published its 'Implementation Plan – Status 2006.'¹¹ The portfolio of actions that make up the Implementation Plan will serve as the first attempt at developing a comprehensive, coherent EU-wide work program for accelerating the commercialisation timeline of hydrogen and fuel cell technologies. This plan aims at enabling the scenario outlined in "Snapshot 2020" as described in the Deployment Strategy, which established ambitious commercialisation goals by the year 2020. The focus within the Implementation Plan (IP) is on transport applications (together with H2 production and distribution to support the mass market rollout of fuel cell-powered passenger cars) and stationary applications. The Implementation Plan established

⁹ HFP Initiative Group on Financing & Business Development, Final report, 2004.
¹⁰ HFP Initiative Group on Financing & Business Development, Final report, 2004.
¹¹ Online versions may be found at: <https://www.hfpeurope.org/hfp/keydocs>



four Main Innovation and Development Actions (IDAs) as the principal European H₂FC RTD&D lines of activity the pursuit of which should lead to the targets envisaged in the Snapshot 2020.¹² These IDAs are:

- IDA 1 - H₂ Vehicles and Refuelling Stations
- IDA 2 – Sustainable H₂ Supply
- IDA 3 – Fuel Cells for CHP and Power Generation
- IDA 4 – Fuel Cells for Early Markets

2.1.1 Financing Programmes and Initiatives

Various financing programmes and initiatives exist and operate at the European level. A selection of the most relevant is briefly outlined below. Overall, they are significant for the Business Development of companies in a Hydrogen Community as they offer financial support and consultation.

The Joint Technology Initiative (JTI) on Fuel Cells and Hydrogen

The proposed Joint Technology Initiative (JTI) is designed as an equity vehicle operating within the framework of a European Public-Private-Partnership (PPP). It aims at being a long term public private partnership (joint venture) between the European Commission and European Industry in the form of a new legal entity. The JTI is still in the planning phase, with the European Hydrogen and Fuel Cell Technology Platform and the European Commission leading the process. The Partnership is scheduled to start in early 2008 and the funds should (if successful) be available throughout the FP7 period from mid or last quarter of 2008.

On 28th March, 2007 the first *Constitutive General Assembly of the JTI Industry Grouping* took place at which 45 European companies created a new international not-for-profit organisation serving as the private part of the envisaged PPP. The JTI Industry Grouping voted its Board of Directors consisting of:

- Gijs van Breda (Chair), Shell, The Netherlands
- Herbert Wancura (Vice-Chair), ALPPS Fuel Cell Systems GmbH, Austria
- Herbert Kohler (Vice-Chair), DaimlerChrysler, Germany
- Agustín Escardino Malva, NTDA Energía, Spain
- Jonathan Lewis, Rolls Royce Fuel Cell Systems, United Kingdom
- Alberto Ravagni, SOFC Power, Italy

¹² Giuseppe Rovera, Vision, Strategy and Programme of the HFP, Presentation at the EnerMotive, slide 9, Milan, 6-10 February 2007

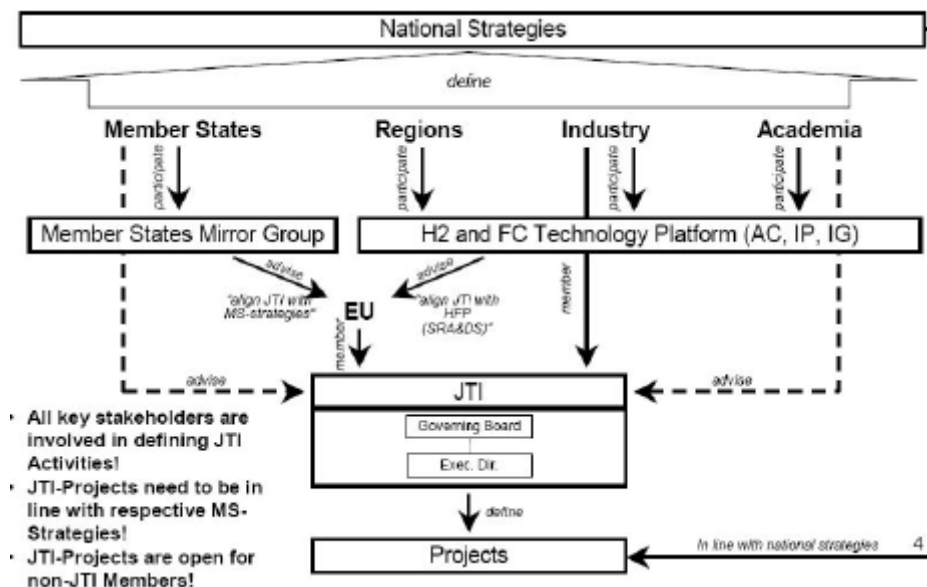


Figure 2.2 – Interactions between stakeholders intervening in defining strategies for Hydrogen and Fuel Cells Technologies and the JTI

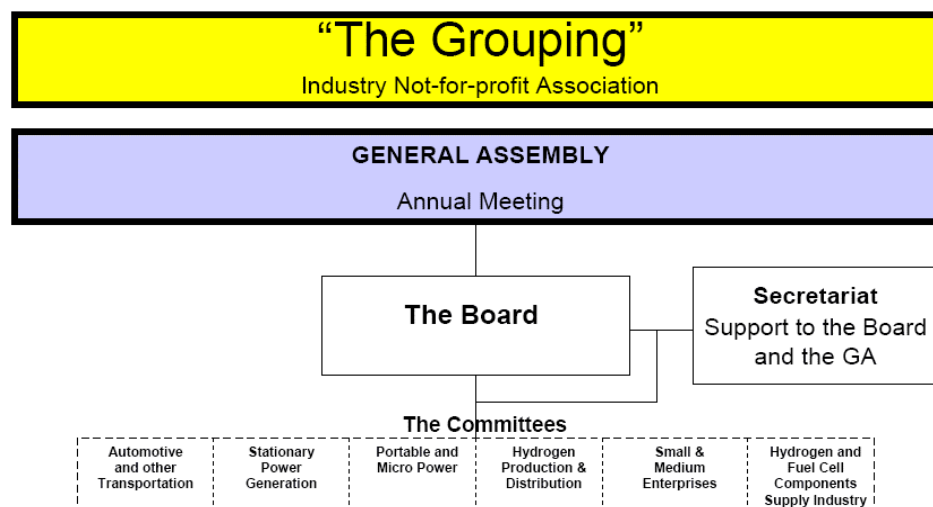


Figure 2.3 – Structure of the Industry Grouping¹³

The scope of the JTI is not direct commercialisation of products, but promotion of research to effectively advance technologies so that commercialisation can take place. Both technology demonstration and applied R&D will be within the scope of the JTI. However, although some basic research is supposed to be considered by the JTI it is expected that the majority of the basic research will remain in the traditional activities' part of the Framework Programmes.

¹³ Giuseppe Rovera, Vision, Strategy and Programme of the HFP, Presentation at the EnerMotive, slide 20, Milan, 6-10 February 2007



The JTI will combine private sector investment with national and European public funding (anticipated EC contribution of approx. 80-100 M€/year), including both grant funding from FP7 and loan finance from the European Investment Bank, which is owned by the 27 EU Member States¹⁴. Further, R&D Centres, and regions (as represented by a public institution) as well as Member States could also invest in the JTI. However, this group, in all probability will only participate on an advisory basis, i.e. providing the Member State perspective on certain issues. The JTI vehicle is expected to be the main focus for funding hydrogen and fuel cells applied Research and Development (R&D) of high-tec industrial and technological projects over a timeframe of seven years. It is expected that 50% of the funding will be provided by industry, around 16% by the Commission's FP7 and the balance of 33% from member states.¹⁵ The private sector (industry and markets) will provide the matching 50%. The financing of the JTI allows for contributions from the private sector, agreed on the basis of the project content, [e.g. demonstration costs]. Part of the administrative costs for running the JTI once the projects have begun will be charged against the projects carried out within the joint undertaking (overhead or project fee). The JTI Industry Grouping is committed "to invest over Euro 5 Billion in the next 10 years in hydrogen and fuel cell technologies"¹⁶

Further information on the JTI is available at www.hfpeurope.org.

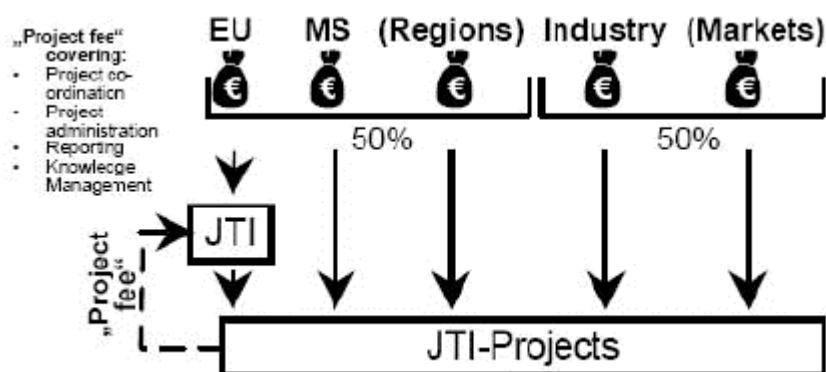


Figure 2.4 – Foreseen financing scheme of the JTI¹⁷

JOINT TECHNOLOGY INITIATIVE		
Nature & Size of Funding	Subsidies	Size under discussion
Eligibility	Communities, demonstration projects	
Minimum financial requirement	Under discussion	
More information	https://www.hfpeurope.org/hfp/jti	

¹⁴ Member States' EIB shareholdings: <http://www.eib.org/about/structure/shareholders/index.htm>

¹⁵ Euractiv.com News, Business urges quick establishment of JTIs, Published: Thursday 8 March 2007, Updated: Friday 9 March 2007.

¹⁶ Giuseppe Rovera, Vision, Strategy and Programme of the HFP, Presentation at the EnerMotive, slide 17, Milan, 6-10 February 2007.

¹⁷ HFP, Business Development Subgroup, 2005



The 7th Framework Programme

Broadly speaking, Framework Programmes are grants awarded to companies (and academia) for the furtherance of research and development projects. They represent partial subsidies where successful industrial recipients are required to provide a certain percentage of the project's budget and as such demand that industrial applicants have sufficient funds to match the grant awarded.

The basic set-up of European Framework programmes is based on specific calls for project and network proposals which rely on prior acknowledged key thematic priorities.

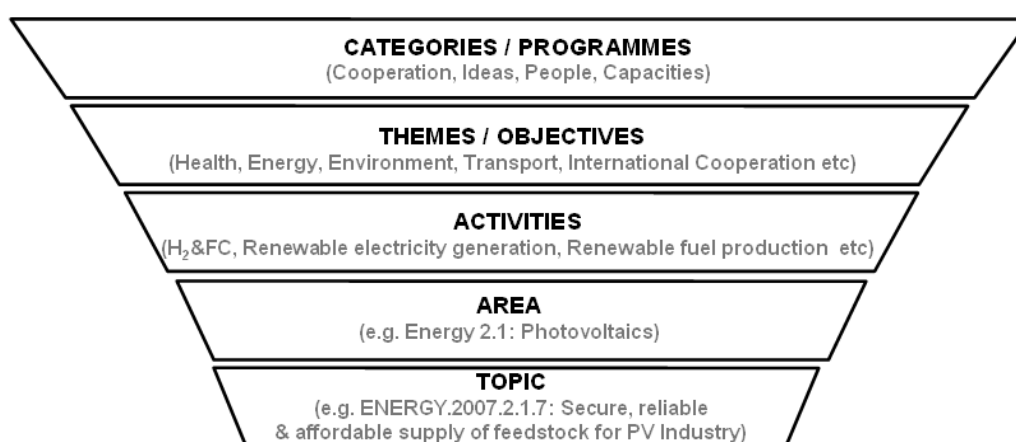


Figure 2.5 – FP7 set-up (NTDA diagram)

The EU 7th Framework (FP7) Programme for Research and Technological Development is designed to build on the achievements of preceding Framework Programmes towards the creation of the European Research Area, which will integrate efforts across all EU countries.

Two of the ten themes proposed for EU action include hydrogen and fuel cell RD&D. These are Energy and Transport. The Energy thematic priority will be covered by two Directorate Generals, namely DG TREN and DG RTD. The budget for the Energy theme will be divided between the two DGs and the calls will be synchronized. DG TREN will issue its calls annually whereas the DG RTD budget has been merged for 2007 and 2008. After 2008 the call procedure for DG RTD is still undefined.

The programme started recently and will run for seven years; during this time it is seen as being Europe's primary instrument for research funding. Compared to the FP6 budget, FP7 represents a 41% budget increase with an overall budget of more than €54 billion for a timeframe of over seven years.¹⁸

The activities to be co-funded by the EC within the Cooperation Programme and which are related to hydrogen and fuel cells are:

¹⁸ European Commission DG Research, EU-funded research FP7 Tomorrow's answers start today, downloadable at CORDIS – Understanding FP7, 2006, p. 12.



Energy - Activities

- Hydrogen and fuel cells
Integrated action to provide a strong technological foundation for competitive EU H₂FC industries, for stationary, portable and transport applications.
- Renewable fuel production
- Clean coal technologies

Transport – Activities

- Sustainable surface transport (rail, road and waterborne)

FP7 grant conditions:

- RTD Projects :
 - Max. 50% of eligible costs
 - Max. 75% for public institutions and SMEs
- Demonstration Projects:
 - Max. 100% for exploratory actions, coordination and training for researchers
 - Max. 100% for management, audits

The European H₂&FC industry is characterised by independent private companies, which in turn can be characterised as micro companies. Although the public funding share has been raised to 75 % and FP7 therefore diminishes the equity gap which SMEs and early stage companies have to face, a significant gap still exists.

7th FRAMEWORK PROGRAMME		
Nature & Size of Funding	Grants	Up to 4 Mio
Eligibility	Basic R&D projects	
Minimum financial requirement	25%	
More information	http://cordis.europa.eu/fp7	



Joint European Resources for Micro to Medium Enterprises (JEREMIE)

JEREMIE is a flexible programme employing a number of financial instruments designed to increase the access to finance of micro companies and SMEs. In January 2007, this Programme was launched jointly by the European Commission, the *European Investment Bank* (EIB) and the *European Investment Fund* (EIF) and allows EU Member States to use parts of their national structural and cohesion funding sources to create financial instruments which are customised to the needs of micro companies and SMEs. By using the EIF as an intermediary a share of the funding issued by the structural funding source, i.e. the *European Regional Development Fund* (ERDF), otherwise used for grants can be transformed into financial support to the EU Member States and Regions, which in turn may be reimbursed and as such offers the possibility of recycling the funding. These financial products can take various forms, including equity instruments and loan guarantees.

The roles of the EIF and the EIB within the JEREMIE scheme are to access financing sources which range from a local to an international level. Moreover, the EIF will advise public authorities on the set-up of local (or national) schemes.

JEREMIE includes two phases, the first one consists on the identification of fund-holder and the second one contains the call for expressions of interest.

In addition to the use of structural funds, JEREMIE provides for advisory and technical assistance (via the EIF), equity and guarantees. One of JEREMIE's uses of structural funds is the utilisation of *ERDF* (*European Regional Development Fund*) to finance the business development of SMEs and micro companies. The ERDF is a structural fund which supports the economic development of regions and is primarily aimed at fostering employment possibilities. Financial support can be accessed via development programmes, EU financing is provided if the programme has been accepted by both the European Commission as well as by the responsible Member State authorities.

Hence, the equity gap decrease achieved by the current EU strategy is unlikely to have a major impact on micro companies as the remaining gap is still too significant considering the disruptiveness of the technology and the early stage of the entire market. A financing gap in a market, which is still in an early development phase, has a more severe impact than in a developed market, due to the fact that it is more difficult to find business partners. Consequently, along with the original financing problem, a company may face the insecurity of being able to sell their business in a subsequent stage. However, according to press statements EC representatives seems to be aware of the remaining equity gap and new instruments address these deficits, but their success is difficult to foresee.



2.2 Business Development strategies

When referring to business development in relation to Hydrogen Communities, it may refer to the growth of

- A. individual businesses active in the Hydrogen field that are located within this community¹⁹ or to
- B. the development of the Community itself

When referring to companies the term 'business development' describes a continuous process, incorporating various methods of fostering the profitability of the business. The concepts underlying 'business development concepts' in the case of a company include:

- the identification of target markets
- the identification of marketing opportunities
- the increase of knowledge about end-users and competitors
- the identification of appropriate financing instruments and financing structure
- the elaboration of a long-term business strategy and vision

As a consequence, a Hydrogen Community faces the following; Main drivers, Early markets, Financing options and Barriers during its business development (see Table 2.3).

¹⁹ In H₂&FC activities "Independent Developers" are referred to as companies whose business activities deal exclusively with the development of H₂&FC technologies. The terminology "Corporate" refers to companies whose main business activity is not the development of fuel cells, e.g. auto assemblers and chemical companies.



Table 2.3 – Drivers, Early Markets, Financing Options, and Barriers²⁰ (NTDA table)

HYDROGEN COMMUNITY	
MAIN DRIVERS	<p>Policy-driven: <i>projects driven by the local authority/government:</i> <i>Important factors:</i> job creation, climate change, local air quality concerns, increased use of renewable energy sources and introduction of new energy technologies within the community. These projects are thought to have strong potential to evolve into a larger scale hydrogen community.</p> <p>Technology-driven: <i>projects mainly driven by industry:</i> Main drivers are development of hydrogen and/or fuel cell technologies and investigation of their feasibility (both through R&D and demonstration projects)</p>
EARLY MARKETS²¹	<p>Multiple applications and end-use sectors: A combination of transport and/or stationary and/or portable applications</p> <p>Public and large-scale transport: Public transport e.g. H₂/FC buses, large-scale private transportation e.g. H₂/FC cars, cargo transportation e.g. ships, related infrastructure e.g. fuelling stations</p> <p>Residential/services: Base load power, CHP for buildings e.g. homes, offices, hospitals, recreation centres</p>
APPLIED FINANCING OPTIONS	<p>Roads2Hycom Analysis of financing sources reveals that 74% of projects receive some degree of funding from national budgets (i.e. significant involvement of national governments). Regional financing and EU financial contributions also appear to be important in supporting hydrogen and fuel cell projects, with 50% of projects receiving some degree of regional funding, and 40% receiving EU funding. In descending order the following sources of financing appear to be frequently applied: Corporate Financing, Private Financing, Academic Funding and Bank Loans.</p>
BARRIERS	<p>Lack of funding in particular public funding and the provision of equity for independent technology developers</p> <p>Technology procurement obstacles</p> <p>Local expertise or lack thereof</p> <p>Community acceptance or lack thereof</p>

²⁰ Based on Results from Call for Community Registration of Interest: Mapping Analysis of Potential Hydrogen Communities in Europe, Roads2HyCom, JRC, 2006.

²¹ HFP Business Development Subgroup - Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006, Early Markets for Hydrogen and Fuel Cell Energy, 2005, p.1. "Early markets are defined as those where a hydrogen/fuel-cell energy product or system solution may be deemed competitive by a potential customer, even at a price that would be considered to be above the fair price in a mature market."



According to the HFP Business Development Subgroup, “markets for fuel cells can be separated into three categories according to the character of the user and the application area: military, industrial and the consumer market”.²² Among these market segments a further division into mobile, stationary and portable applications can be made. Moreover, the HFP Business Development Subgroup “Early markets can contribute to create economic return for hydrogen and fuel cells companies in the short-term; companies can therefore become self-funding, attract more investment and speed-up the technological development in automotive and stationary markets.”²³ In general the Subgroup warns against the application of “one-fits-all” marketing and business development models due to the fact that the overall hydrogen market is still in its initial stage and differs significantly depending on application types. They consider these differences as mirrored in “price sensitivity, technical requirements, openness to novel technologies and the adoption rate of customers”. Another set of considerations is the presence of industrial users, military procurers and the role of codes and standards in market penetration.²⁴

The growth of a Hydrogen Community depends on various fundamental pillars which include unequivocal political support within the community, an existing technological research infrastructure - as characterised by large scale demonstration and infrastructure projects, a clearly defined strategic plan, adequate financial instruments and strong industrial sector involvement. General guidelines for the growth of a Hydrogen Community can be regarded as the following:

- Mapping of the existing capacities against the “state of the art” (benchmarking)
- Creation of a structure / institution (possibly PPP or cluster) which will become the driving force behind the stages (coordination, planning, networking & evaluation of opportunities, assessment of results, technologies and necessary legal steps)
- Identify prospective community potential in terms of research and industry potential (Gap analysis)
- Identification of existing and potential financial and non-financial incentives (European, national, local)
- Elaboration of a strategic agenda for the further business development of the community / deployment as well as of the companies situated within the community
- Dissemination on the technology and its potential impact for the society
- Creation of visibility by developing demonstration projects

²² HFP Business Development Subgroup, Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006, 2006, p. 6.

²³ HFP Business Development Subgroup, Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006, 2006, p. 5.

²⁴ HFP Business Development Subgroup, Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006, 2006, p. 6.



- Concentration on early regulatory stages and implementation (infrastructure in densely populated areas, communication of achievements, implementations of lessons learned)
- Collaboration with other communities in order to increase knowledge and enhance financial capability for larger joint projects
- Pay attention to public awareness, acceptance and public understanding of the technology and resulting community prospects

2.2.1 Value Chain and H2 Development Structures

In order to analyse the precise channels through which businesses develop hydrogen and fuel cell technologies within a hydrogen community, the HFP Business Development Subgroup regards it as useful to depict the businesses along a chain of value-creating activities.

Michael Porter, whose proposals on value chain analysis have been acknowledged within the field of market development studies, identified a set of interrelated generic activities and developed the value chain model.²⁵ Value chain analysis offers a fundamental analytical tool for Hydrogen communities. On the one hand, it allows communities to identify the key players within their communities, and on the other, allows the businesses within Hydrogen communities to identify their market position and potential future market opportunities. Thus, the value chain categorises activities that add value in an organization or, in this particular case, in a potential Hydrogen community.

Overall, the value chain is divided into primary and secondary or support activities. It is interesting for Hydrogen Communities to audit their community in the context of value chain analysis as this analysis identifies all potential agents that operate along the entire value chain as can be seen above. It allows communities to identify both the potential and the shortcomings of their community businesses. Moreover this approach enables them to recognize whether or not their community is particularly well positioned for a specific H2&FC industry sector (e.g. the existing Valencia Ceramic Industry cluster). As a consequence, the outcome of a value chain analysis for a community facilitates the mapping of the Community strategy and the identification of the requirements to build a Hydrogen Community.

²⁵ Michael Porter, Competitive Advantage - Creating and Sustaining Superior Performance, New York, NY, The Free Press, 1986. See also Porter M. (2003): The economic performance of regions, *Regional Studies*, Vol. 37.6&7, pp. 549-578.

²⁶ Value Chain Concept of Michael Porter: Competitive Advantage: Creating and Sustaining Superior Performance. New York, NY The Free Press, 1986. Please merge those two references 24+25

²⁷ See e.g. the contributions made by Stephan Ramesohl and Manfred Fishedick to the special issue on "hydrogen" in "Energy Policy" Vol. 34, July 2006, edited by Raimund Bleischwitz and K. Fuhrmann.

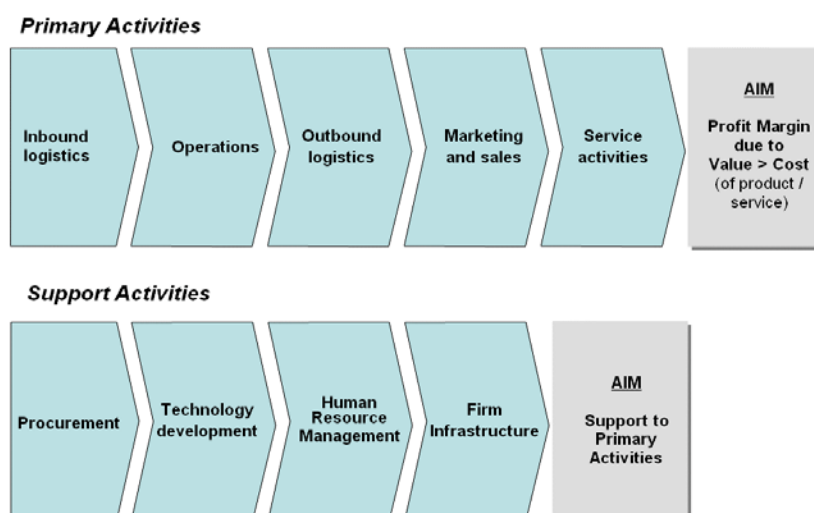


Figure 2.6 – Porter Value Chain (NTDA diagram) 26

Table 2.4 below outlines the individual value chain components, appropriate to the specific activities for the hydrogen and fuel cells sector.

Table 2.4 – Primary Activities (NTDA table)

Inbound logistics	Storage and inventory control of input materials
Operations	All value-increasing activities that convert the inputs into the final product
Outbound logistics	Activities which coordinate and transport the product to the customer
Marketing & sales	Actions related to motivating potential buyers, including channel selection, advertising, promotion, selling and pricing
Service activities	Preserve & develop the product's value, including customer support, repair services, etc.

The local energy system may serve as an example of how hydrogen and fuel cells can influence the business development of companies within a community. The local energy system constitutes a fundamental component for the economic development within communities. Current energy systems are predominately based on fossil fuels, which are characterised by structural weaknesses and geopolitical, social and environmental problems. These, in turn, have a direct impact on the local economy and quality of life. The inclusion of hydrogen to the current energy system would favour its decentralization and allow an increase of renewable energies into the system²⁷. As can be seen in Figure 2.7 below, the introduction of hydrogen into local energy systems may have an impact all along the value chain – and thus the business development – within this community.

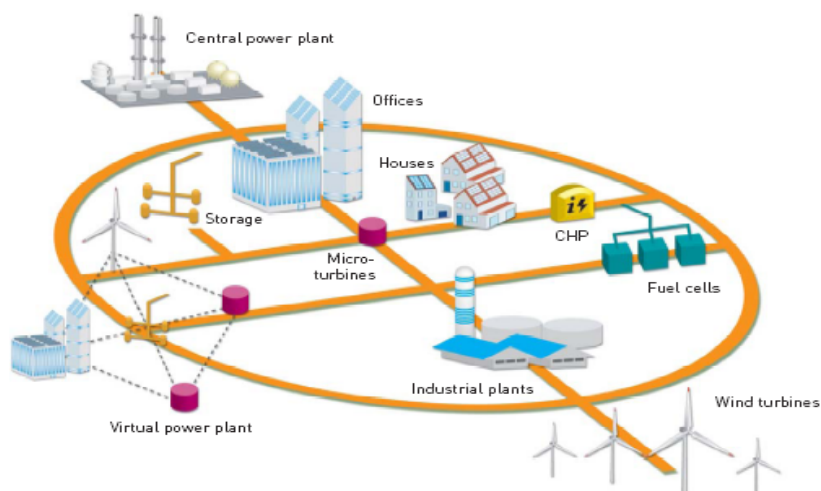


Figure 2.7 – Vision and Strategy for Europe’s Electricity Networks of the Future²⁸

2.2.2 The PPP as a cornerstone for the Hydrogen Community

Public – Private – Partnerships (PPPs) embody an innovative connection of public policy aims and private sector incentives.²⁹ At a local level, PPPs are not obligatory for the creation of a flourishing Hydrogen Community, but nonetheless offer various significant advantages for the business development as they stimulate R&D. The “share of public-private partnerships in competitive funding of research in France increased from 37% in 1998 to 78% in 2002 and the Dutch government has reserved €805 million for public-private research proposals in strategic areas for the 2003-10 period.”³⁰ Examples for the creation of Public-Private Partnerships at the European Level are the technology based Joint Technology Initiatives. The EC proposes the following roadmap to pursue the creation and implementation of a Public Private Partnership³¹:

- 1) Emergence and Setting up, i.e. gathering of stakeholders, formulating a common vision including short- as well as long-term objectives, defining of management
- 2) Defining the Strategic Agenda, i.e. formulate priorities for the medium as well as for long-term, indicate by which deployments these priorities will be pursued
- 3) Implementation, i.e. putting the Strategic Agenda in place and arranging for the corresponding finance access.

The creation of a local PPP would reduce the risk of the individual partners, allowing the participants to take on larger scale projects, and more adequately implement their

²⁸ European Technology Platform SmartGrids. EU Commission, DG Research

²⁹ Shane, Jeffrey, *Public Private Partnerships*, 2007.

³⁰ OECD Science, Technology and Industry Outlook, 2004, page 92.

³¹ With special focus on ETPs, EC working staff document, 2005, p.6.



R&D strategies. The strategic benefits associated with the establishment of a PPP are:

- The facilitation and acceleration of infrastructure progress by utilising both public and private funds.
- The enhancement of public awareness with respect to the wider hydrogen economy and its component technologies.
- The creation of a positive fiscal setting for private entities, e.g. local tax incentives, contribute monetarily to the procurement / creation of hydrogen infrastructure components.
- The creation of new jobs and superior labour skills
- The creation of incentives to innovate

The formation of PPPs has the potential to encourage the participation of financial institutions in the financing of hydrogen and fuel cell projects. In addition to any direct subsidies used in the financing of projects undertaken by these partnerships, and the equity contributed to the PPP by its members, financing instruments such as guaranteed and subsidised loans should also be considered. The creation of a public and a private entity engenders strategic as well as practical synergies from the merging of their various contacts and financing know-how.

Public Private Partnerships are also a means of introducing to community members (e.g. businesses within a Community) financial instruments outside of EU, national and regional renewable energy subsidies such as certain green funding sources, partly financed through revenues from eco-taxes. In establishing these green funds governmental ministries have collaborated Environmental Banks (Banks officially dedicating their main business line in the support of environmental projects and businesses pursuing environmental ideas) and national tax authorities which in some cases have resulted in subsidised interest rates for environmental projects or market introduction programmes for environmental technologies. Projects and strategies for the implementation of Hydrogen and Fuel Cells also qualify in these schemes. According to the European Platform on Financial Support to Eco – Innovation “government can generate up to 40 € of private funds invested in eco-innovation and the environment” for every Euro invested in a Green Fund.³²

On a long-term basis PPPs support the harmonisation at the European level as the existing communication among public entities from different countries at governmental level facilitates the cross border contact of the corresponding private entities.

At an informal meeting of the EC with High Level Member State Representatives the following issues have been identified as main barriers for the success of PPPs:³³

- Sharing risk;
- Managing Intellectual Property Rights;

³² European Platform on Financial Support for Eco – Innovation, Eco-Innovation Invest, presentation at the Financing Eco-Innovation in Central and Eastern Europe, Budapest, 23. April, 2007.

³³ Informal Seminar with High-Level Representatives of Member States on Public-Private Partnerships in Research, Summary Report, Brussels, November 2005, p.2.



- Attracting quality researchers;
- Involving SMEs;
- Using R&D to drive public procurement;
- Financial instruments (e.g. loans, grants)

Some of the risks involved in the creation of a Public Private Partnership relate to the presence of monopolists, competition, bankruptcy, and the inexperience of the public sector. Public entities are often local monopolies in the provision of certain public services so that the merging of a public entity with a private entity may cause public scepticism and concerns about price increases for public services. The public entity faces the risk that its private partner fails to raise sufficient funds not least owing to the difficulties in raising private finance. Hence, the public part of the partnership may find itself in a position in which it has to provide the majority of the partnership financing if the project is not to fail. Likewise, the public authority has to ensure that in the case of bankruptcy of the private entity the public services are provided without delay and that the public authority will not be liable. Finally, the lack of experience in the establishment of a PPP entails the general risk of failure.³⁴

The greatest number of well established Public Private Partnerships can be found in the Transport sector. Typically they are classified into various models, determined on the one hand by the ownership criteria used, and on the other, by the estimated life of the project as can be seen in the table below:

Table 2.5 – PPPs in Transport³⁵ (NTDA table)

PPP CONCEPT	OWNERSHIP	OPERATION	DURATION	MODEL
1.	Public	Private	3 – 5 years	Operations only
2.	Public	Private	5 – 25 years	Design / Build / Operate
3.	Private	Private	> 25 years	Design / Build / Operate / Own with possible transfer
4.	Private	Private	Various	Design / Build / Operate / Own

³⁴ Shane, Jeffrey, *Public Private Partnerships*, 2007.

³⁵ Lehman Brothers, *Overview of Transportation Public-Private Partnership Project Financing, Combining Private Equity, Economic Development and Transportation*, December 2003, slide 2.



Most private sector investment and risk taking occurs in sectors with a high percentage of private activity bond issuances.³⁶

Table 2.6 – Private Partner Risk Assumption / Return Profile as a Function of Tax-Exempt Bond Structure³⁷ (NTDA table)

Private Partner Risk Assumption/Return Profile	Governmental Purpose Bonds	Private Activity Bonds
Proposal Costs	Yes	Yes
Negotiation and Development Costs	Yes	Yes
Fixed Construction Costs	Possible	Yes
Fixed Operation Costs	Possible	Yes
Fixed Subordinated debt return	Possible	Yes
Debt Guarantee	Possible for limited amount typically subordinated	Yes
Equity Investment with upside	No	Yes
Residual Value	No	Yes

A Public-private partnership (PPP) is a variation of privatisation in which elements of a service previously run solely by the public sector are provided through a partnership between the government and one or more private sector companies. The ownership is transferred to the private entity.

³⁶ Lehman Brothers, Overview of Transportation Public-Private Partnership Project Financing, Combining Private Equity, Economic Development and Transportation, December 2003, slide 10.

³⁷ Lehman Brothers, Overview of Transportation Public-Private Partnership Project Financing, Combining Private Equity, Economic Development and Transportation, December 2003, slide 12.



3. Financial Instruments

Generally speaking, financial instruments can be sub-divided into three broad categories³⁸:

- Debt (e.g. bank loans, bonds, mortgages).
- Equity (e.g. retained profits, share capital) and
- Public funding (e.g. EU, national and regional funds)

Table 3.1 gives an overview of a selection of these instruments. As can be seen the table highlights the main users and issuers of these instruments and discusses the reasons why each class of instrument is used and the benefits it affords the issuer.

A company's stage of development and its available resources will usually determine its financial structure and which sources of finance are most appropriate. The proportion in which these financing sources are required and should be employed will change as these technologies enter the market and undergo the market penetration process. In the event that the company is a start-up, both its financial structure and its access to various financing sources will change as the company moves from the research & development phases through to product sales and profitability, as outlined below.

The type of the H₂&FC Company, e.g. privately owned or publicly listed, and the stage of its development e.g. prototyping or commercialisation stage, play an important role in the types of funds it can reasonably expect to access. A company which has net assets and generates income, regardless of the source will be able to take advantage of the various public funding sources. For example it would have the necessary internal funds to match any government R&D grants. Equally, well-resourced companies generating revenues can make use of government tax breaks and/ or capital allowances. At the same time such companies can expect to raise bank loans and/ or issue fixed interest securities (corporate bonds). Finally, listed companies can also raise funds on the equity markets by issuing new shares. Thus the plethora of fund raising possibilities is open to companies generating income with sound balance sheets.

Assuming a company is privately owned is at an early-stage in its development and focussed on some aspect of the "Sustainable Energy Economy", it is unlikely to be generating income of any note, or be particularly well-resourced. Hence, its funding sources are more or less limited to the financial support provided by 'family & friends', business angels and/or venture capitalists. Given the lack of financial resources and the absence of meaningful income it is unlikely that such a company could access official R&D grants, not having the funds to match the grant, or make use of tax breaks, not having any taxable income to offset.

³⁸ As presented in the previous chapters of this document



Table 3.1 – Matrix of Financial Instruments: Debt, Equity & Subsidies 39 (Core Technology Ventures table)

	<u>Debt</u>		<u>Equity</u>		<u>Subsidies</u>	
Type of Instrument	Bonds	Mortgages	Publicly traded shares	Privately traded shares	R&D Grants: e.g. EU Framework Grants	Tax Credits: e.g. accelerated depreciation
Examples of users	Institutional Investors, Financial companies	Companies, Home owners	Institutional investors, Private Individuals	Business angels, Venture capitalists, Corporate Ventures	Companies, Universities, Research Institutes	Companies
Typical Issuers	Companies, Governments	Retail banks, Building societies	Quoted Companies	Private Companies	National & local governments, European Union	National & local governments
Constraints	Ability to pay interest & principal	Ability to pay interest & principal	Capacity to generate profits and pay dividends	Ability to show superior technology & management	For companies, proven capacity to match the subsidy	Ability to make profits to benefit from tax credit
Purpose of issue	<p>Debt allows companies to pursue their own interests by leveraging profits with little or no impact on control.</p> <p>Unlike equity, debt can attract tax breaks with interest payments treated as a cost.</p> <p>Typically companies choose a mixture of debt and equity that suits their aims and the current state of the economy. E.g. as interest rates fall companies may seek to finance increased investment by debt rather than issuing new equity to shareholders.</p>		<p>Equity gives companies the freedom to pursue their own best interests in the manner they regard as most appropriate, as well affording them the ability to make use of various government subsidies, such as EU Framework grants.</p> <p>However, subsidies related to income tax relief require a company to generate taxable profits.</p>		<p>Subsidies can allow both governments & companies to pursue social welfare & profit simultaneously by promoting economic growth (jobs).</p> <p>In the case of R&D, subsidies encourage firms to pursue socially beneficial projects that otherwise may be lost to society. The drawback for newly emerging companies is that they often do not have the capital required to match grants nor the profits to benefit from tax breaks.</p>	

39 Source: Core Technology Ventures Presentation : “Guide to Financing R2H Workshop Brussels April 2006”



We now turn to the case of how projects can be financed. Figure 3.1 below, was created by the working group⁴⁰ on financial instruments for the implementation of European Technology Platforms and published in the European Investment Bank working paper “Guide to Financing Projects from European Technology Platforms” This schematic generalises the various stages of project development together with the associated potential financing sources and typical promoters. It is modelled on a generic Research Project and shows how the financial risk involved in a research project diminishes as the project’s technical risk falls.

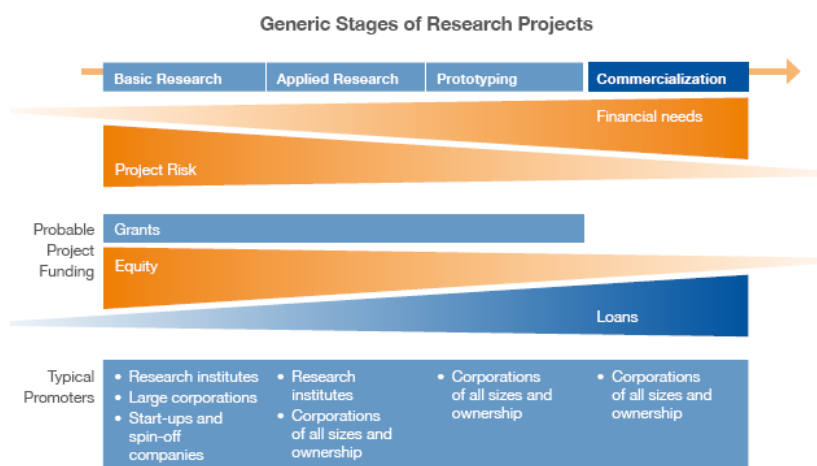


Figure 3.1 – Generic Stages of Research Projects⁴¹

This concept is equally applicable to a Business Development scenario. As can be seen above, as technical risk declines the proportion of equity financing decreases, while the degree of debt financing increases. Clearly, bank loans and other forms of debt are unlikely to be available to the project during its early development phase, as the risk of failure is too great. However, as the project / technical risk decreases, loan-finance becomes the most common source of funding. As the project progresses through to commercialisation the total financing requirement increases, particularly at the commercialisation phase. It should also be noted that grant funding completely disappears as the project approaches commercial market entry. It is important to note that the figure highlights the potential funding methods appropriate to each stage but does not comment on the likelihood that such funding is actually available for the project.

If transferred to the case of the Business Development of individual companies’ example, it is possible that an early stage business (micro) could receive grants for its further business development. However, this is unlikely unless the micro company were able to provide the financing not covered by the grant, i.e. overcome the equity

⁴⁰ Besides representatives from the European Commission and the European Investment Bank, the following members of the working group contributed to the document: P. Doran (Core Technology Ventures Ltd.), C. Roulet (Schlumberger Water Services), M. Viaud (European Photovoltaic Industry Association), M. vom Baur (Akeryards), L. Walter (EURATEX)

⁴¹ EIB Innovation 2010 Initiative, Guide to Financing Projects from European Technology Platforms, Financing Instruments of the European Commission and the European Investment Bank, p.5.

⁴² EURADA, December 2003 p.10



gap. Thus, if the company cannot 'match' the subsidy it makes no sense to apply for a grant.

In summary, it can be said that when discussing financial instruments and their usefulness to the business development of companies within a Hydrogen Community it is crucial that the company considers its resources and its ability to meet liabilities. Specifically, the company has to consider whether it has the financial (and human) resources necessary to access R&D grants or subsidies that require the company to at least partially match the grant funding/ subsidy. Equally, it should consider whether it generates the income needed to finance debt instruments that require ongoing interest payments, or to make use of tax breaks. In the case of independent developers these are crucial considerations. Further considerations are related to the fact that due to legal restrictions or out of tradition, different entities (SMEs, Micros, etc.) only have accesses to specific funds. Another critical aspect is that the ideal application of financing instruments has to be aligned with the business stage in which the company is in at the given point.

The following table gives an overview of various capital providers along with the general access criteria for these funding sources:



Table 3.2 – Finance Access Criteria for SMEs⁴² (NTDA table)

<u>CAPITAL PROVIDER</u>	<u>ACCESS CRITERIA</u>
Family, Friends	Personal connection Question of trust
Business Angels / Informal investors / Spin-off corporate venturing	Formal meetings Question of trust Convincing business plan
Banks	Availability of guarantees Ability for loan repayment Financial history
Short loans	Innovative Business concept Convincing business plan Management Skills
Venture Capital / Financial Corporate Venturing	Convincing business plan Financial history Ability to grow fast & have a quick Rol Management Skills
Public Funding	Job Creation Productivity
Guarantees	Financial history Management Skills
Seed Capital Funds	Convincing business plan Innovative Business concept
Corporate Venturing	Convincing business plan Industry related possibilities Innovative Business concept
New Capital Markets	Viability & Consolidation Established company for >3 years Positive monthly returns > 2x in previous year Shareholder equity >1,5 € million Capacity to publish quarterly results



3.1 Public Funding Options

Public Funding sources can be divided into grants and subsidies. This may be public support in the form of subsidies (such as the FP7) or in the form of subsidised loans (i.e. loans with interest rates below market rates). A grant can be described as a direct financial contribution from the European Commission (or national authorities) to support a “specific action or project of a non-commercial nature, to cover eligible costs directly incurred by the beneficiaries.”⁴³

Another gap within the current financing system is the availability of finance for micro companies. These companies are commonly found in the fuel cell market and are likely to be small companies comprising two or three people. These companies rarely have access to subsidy or grant financing, and in those cases where they do have access, they are unlikely to pursue such funding as they are generally not in a position to provide the required internal funds to bridge the financial gap necessary for a project.

The distinct Directorate Generals of the European Commission provide certain funding and support instruments to develop their specific area of interest. In addition to providing these instruments many DGs issue tenders and calls of interest in their respective fields of expertise. These calls provide a framework that can be used to apply for co-financing up to 50% of relevant research studies.

Within the European Commission the responsibility for Energy related projects lies with the Directorate General for Transport & Energy (DG TREN). Further sources of relevant grants are those offered by the Directorate General Enterprise and Industry, which supports the Business Development of innovative companies. Directorate Generals open tenders to the public (i.e. interested companies) to supply a product and / or a service on a regular basis.

DG Transport and Energy (DG TREN)

Project related objectives and tasks:

- Intelligent Energy Europe Executive Agency (see below)
- Set-up of Community transport and energy policies

DG TREN is responsible for managing financial support programmes for Trans-European networks, technological progress and innovation, which on average total €1 billion per year⁴⁴

⁴³ European Commission, DG Enterprise and Industry,
<http://ec.europa.eu/enterprise/funding/index.htm>

⁴⁴ for the period 2000-2006

⁴⁵ EC DG TREN, (AF, Business Region Göteborg, Chalmers University of Technology, ETC Battery and FuelCells, Faasen & Partners, KTH Royal Institute of Technology, Norsk Hydro, Statoil, Volvo Technology, Development of Hydrogen and Fuel Cell Technologies in a Large-Scale Lighthouse Project, Final Report, July 2006, p. 11.



The concept of Lighthouse projects may serve as an example for significant DG TREN activities in the field of Hydrogen and Fuel Cells. Lighthouse Projects are defined as a “Limited number of long-term, large-scale integrated hydrogen and fuel cells demonstration and market preparation projects in Europe with stable funding during a transition phase to market maturity.”⁴⁵

Intelligent Energy Europe (IEE)

The Intelligent Energy Europe (IEE) programme provides funding for energy efficiency, new technologies and renewable energy applications. A new programme will be launched in 2007 with a budget of about €730 million.

Further information on the IEE programme can be found at:

http://europa.eu.int/comm/energy/intelligent/index_en.html

DG TREN Tenders http://ec.europa.eu/dgs/energy_transport/tenders/index_en.htm

3.2 Equity Financing

Equity is used by all companies. The subject of equity finance covers both publicly and privately-owned companies. Publicly-owned companies issue shares (equity) to investors via a stock exchange. In contrast, privately-owned company's issue shares to private individuals, business angels, venture capitalists and corporate ventures in privately organised transactions.

A key hurdle to the development of any early-stage company is its initial access to equity. Given the risks associated with early-stage companies the initial financing is almost invariably equity. Access to equity finance is essential for a business in order to expand throughout the initial stages of its business idea. The European hydrogen and fuel cell sector has a significant share of small independent private companies⁴⁶. These companies would benefit substantially from the introduction of publicly provided Debt and Equity funding, which in turn would allow them to take advantage of grants and subsidies.

Loans & Guarantees:

Currently, a significant source of loan capital is funds (such as the EIF or Environmental Funds) established by banks and financial institutions which offer capital to promising R&D projects or the commercialisation aims of small businesses. Many of these funds, as in the case of the EIB, are raised at extremely low market interest rates, a benefit which is subsequently passed on by the bank to the borrower. The European Investment Bank created the European Investment Fund (EIF), together with the European Union and European private and public financial institutions. The EIF is focussed on two areas, namely venture capital and the

⁴⁶ See particularly Slide 2: ‘Financing the Hydrogen (and Fuel Cell) Economy’, Nick Owen (Ricardo) & Phil Doran (Core Technology Ventures), presentation to the conference “Funding for RTD Projects and Infrastructures from the European Technology Platforms by the European Investment Bank”, Brussels, October 17th 2006: R2H Document reference, R2H6028PP. Available from http://www.roadsh2hy.com/Downloads/R2H%2017%20Oct%2006_EIB_v5.pdf



provision of loan guarantees. On the one hand, it acts a fund-of-funds provider, investing in venture capital funds, which make direct investments in companies. On the other, it provides (loan) guarantees to financial institutions that provide credit to SMEs. While these loan guarantees are not debt, they increase a small and medium sized company's chances of raising a loan by offering the lender insurance against the company defaulting on the loan. An example of such a guarantee is the EIF's 'Growth & Environment Scheme' in which it offers loan guarantees for SMEs which are engaged in environmental activities. Generally speaking, the EIF uses financial instruments, which have been established within the EU Multi Annual Programme for Enterprises and Entrepreneurship (MAP 2001-2005) such as the SME Guarantee Facility, mentioned above, the ETF Start-up Facility for investments in risk capital finances and the Seed Capital Action, which aims "to stimulate the supply of capital for the creation of innovative new businesses with growth and job creation potential"⁴⁷. An important point to bear in mind with loan guarantees is that loan guarantees generally only cover a portion of the loan.

Technology Transfer Accelerator (TTA)

The following illustration shows an example of an alternative tech transfer financing model.

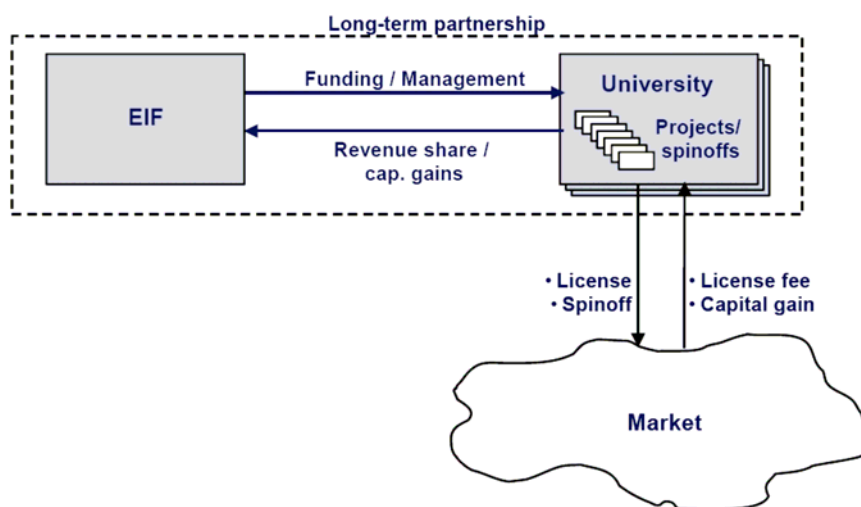


Figure 3.2 – Long-term relationship with University⁴⁸

This concept is based on the long-term relationship between the European Investment Fund (or a comparable public fund) and Research Organisations. The Fund facilitates financing to the technology transfer projects and in return receives revenues which are generated from the technology transfer activity of the research organisation. Hence, the fund and the Research Organisations form an operational joint venture which includes a joint management coordination of commercialising the final product. As a result the business development is proceeding faster than in the regular case.

⁴⁷ Seed Capital Action Guidelines:
http://www.eif.org/Attachments/pub_operational/seed_guidelines.pdf
⁴⁸ EIF TTA Project 2005

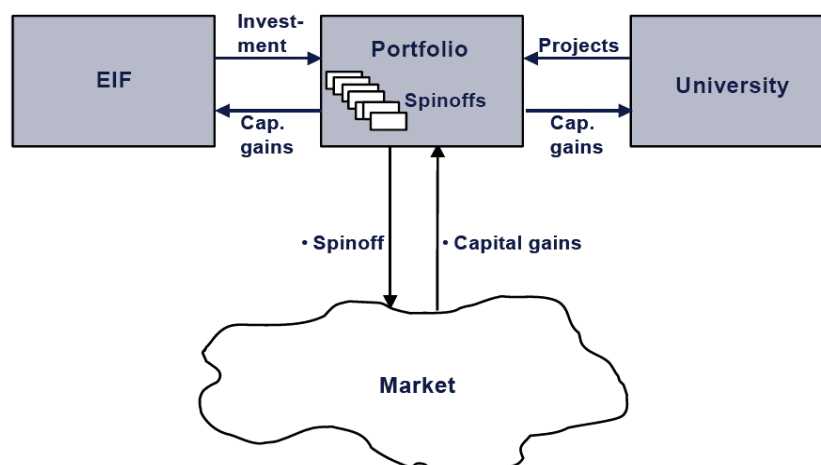


Figure 3.3 – Example of alternative tech transfer financing⁴⁹

Venture capital:

Venture capital provides medium to long-term finance in return for an equity stake in highly risky, but potentially high-growth private companies. Investors of venture capital and corporate venture funds understand the high degree of risk associated with early-stage investing. In order to mitigate the high rate of failure amongst start-up companies early stage investors require higher returns on their investments (RoI) than either later-stage investors, who face significantly lower risks or loan providers, who often require some form of security on the amount loaned. In order to spread the risks venture capital providers face, they typically invest in a number of companies. The group of companies invested in by a single capital provider is referred to as the 'Portfolio'. Likewise, strategic investors look for sectors with attractive market prospects in multiple sectors. Strategic investors often spread their interest to an innovative market from other connected market sectors such as the oil, electricity, or automobile sector. As a result these investors provide share capital in different phases; an initial strategic investment (initial stages) which is ideally followed by an investment for expansion. In some instances, and particularly in start-up companies, the venture capitalist will demand the right of veto over pre-defined areas of the business and how the finances provided are used.

Another potential financing access for the emerging companies within a hydrogen community are the via venture capital networks such as I-TecNet, or Eurotech Capital, which is a network composed of 14 EU venture capital funds focused on technology. The equity (venture capital) financing programme I-Tec was launched by a pan-European network of early-stage technology venture capital investors⁵⁰ in 1997 in order to support micro companies and those SMEs which are unlikely to receive financing from other sources. However, one shortfall of this scheme is the fact that the company seeking financing has to spend a certain budget prior to receiving the equity investment of I-TecNet for this budget. Thus, the I-Tec is leaving the micros and SMEs with the original equity gap, i.e. does not provide start-up finance.

⁴⁹ EIF TTA Project 2005

⁵⁰ As well supported by the European Commission as part of the Gate2Growth Initiative



Business Angels:

These are often wealthy individuals who have made their fortunes in business they have created themselves and then sold. These individuals often invest their personal wealth, and time and expertise in order to get a business idea off the ground. Equity financing facilitated by Business Angels is often the first form of finance a new company receives. It can be considered as a form of venture capital. The European Business Angel Network (EBAN) serves as a platform to network individual Business Angels allowing them to share their experiences as well as market knowledge. It was launched by the European Association of Development Agencies (EURADA) on an initiative of the European Commission in 1999. EBANs exist on a European, as well as on national, regional and local levels.

More information at <http://www.eban.org/>

3.2.1 Exit Routes

As companies grow so do does their need for capital to fund expansion. At this point a company may attempt to raise funds on a public stock exchange, a process often referred to as 'going public'. The first time a company sells shares to the general public is known as an Initial Public Offering (IPO), which is the point when some or all of the early investors begin to exit the company, i.e. sell their shares. Thus both new shares and existing shares may be made publicly available. The sale of the securities will be managed by one or more investment banks. The investors who buy the shares contribute cash that the company uses to acquire the necessary real assets (e.g. machinery) and generally expand the business. In return the investors become part-owners of the firm.

Attractive as an IPO or 'listing' may appear, there are stringent legal regulations and reporting requirements tied to an IPO, which should not be overlooked. The usual procedure of an IPO is that the company engages an investment bank, which, for a fee, will market the firm's shares to its clients, including pension funds, unit trusts and insurance companies. The final sale (public listing) of company shares may take different forms.⁵¹ In general, IPOs are followed by further, so-called secondary offerings of company shares.

3.3 Debt Financing

Debt is a general term for securities other than equity. Debt comes in a wide variety of forms including government or corporate or bonds, bank loans, corporate and personal mortgages. The distinguishing feature of debt regardless of the form it debt takes, is that unlike equity, the holder of the debt (normally) does not have any claim on the company beyond the principal (i.e. money loaned) and any accrued and unpaid interest.

Apart from discussing the various types of debt which are generally available to SMEs we will also discuss the possibility of applying for a loan under the EIB Risk Sharing Finance Facility, which is geared towards lending to higher-risk projects.

⁵¹ Gregoriou, Greg, Initial Public Offerings (IPOs), Butterworth – Heineman, Elsevier, 2006.



Furthermore the concepts of financing promoted by the EIB, such as project financing will be explained.

There are a number of different types of banking activities, which can broadly be divided into investment banks and retail banks (e.g. Commercial Banks, Postal Saving Banks). Generally speaking, Investment Banks act as intermediaries between the corporate and financial sectors, supporting companies in the raising of new capital and providing advisory services. On the other hand, retail banks offer their products, such as current and saving accounts, mortgages and personal loans to the general public. Investment Banks are unlikely to offer their services to companies in the seed and early stage, focusing on well-established companies and companies preparing to list on a stock exchange. As a result, early stage companies are most likely to make use of retail banks, where the company founders often borrow against their private assets such as their homes.

Overall, the access to debt financing is more complicated for SMEs than for larger organisations. In order to provide a loan to a company, banks often require the company provides proof of its track record or even demand the loan be secured against a company asset such as an office or factory. Both conditions are unlikely to be fulfilled in the case of SMEs or micro companies. One option to overcome this financing barrier is the use of certification or guarantees. Overall, SMEs and micro companies form the main target groups for Guarantee Networks. Interesting within this field is also the possibility of mutual guarantees, meaning the option to issue guarantees for each other within a defined group of companies.

As already mentioned, Debt holders normally have no claim on the company beyond the loan made and the associated interest payments. Nonetheless, in the event of bankruptcy, a receiver will be appointed to manage any assets that may remain. In this event, those with claims on the company are ranked according to the nature of their claim. Debt holders who have secured their loan will be paid first, followed by non-secured debt holders with shareholders being the last to be paid. Needless to say, in the event of a bankruptcy there is often no money left to repay the investment made by shareholders.

When it comes to SME expansion the majority of European SMEs consider debt financing as the main source of external finance and tend to neglect equity financing possibilities.⁵² The reason for this may lie in the low probability of finding the correct investor for individual business ideas. Another cause could be the fact that the founder of a company does not want an investor to meddle with his vision of a company. Thus, the company founder declines the financing source along with the advice.

Within the range of debt financing options the most commonly used is bank loans, followed by overdrafts. Overdrafts are generally a relatively expensive form of debt financing but nonetheless are favoured sometimes due to the high degree of flexibility they offer. Furthermore, the use of leasing is increasing within Europe and in some EU countries (e.g. France, Luxembourg, Netherlands, Portugal, Spain) is

⁵² Microcredit for small businesses and business creation: bridging a market gap”, European Commission, December 2003 as well as in SMEs and Access to Finance”, 2003 Observatory of European SMEs, European Commission; Equity financing as demonstrated in the Bach database of the European Commission



even more frequently used applied than overdrafts. Additionally the use of factoring⁵³ by SMEs is increasing in Europe but still remains an uncommon option within the collection of debt financing instruments.⁵⁴

Regional banks such as Savings Banks can play a crucial role in the support of business development of SMEs (i.e. the company within the Hydrogen Community) as their monitoring costs are lower as those in commercial banks. As the monitoring costs stand in relation to the returns, it is principally regional banks that consider providing bank loans to smaller firms.⁵⁵ Traditionally, Savings Banks and Cooperative Banks aim to support local growth and thus provide bank loans to local SMEs but moreover provide them with financial advice, e.g. information regarding tax benefits as well as pairing them with business development advisors.

Figure 3.4 below details the various debt financing forms and how they are used within 15 EU countries:

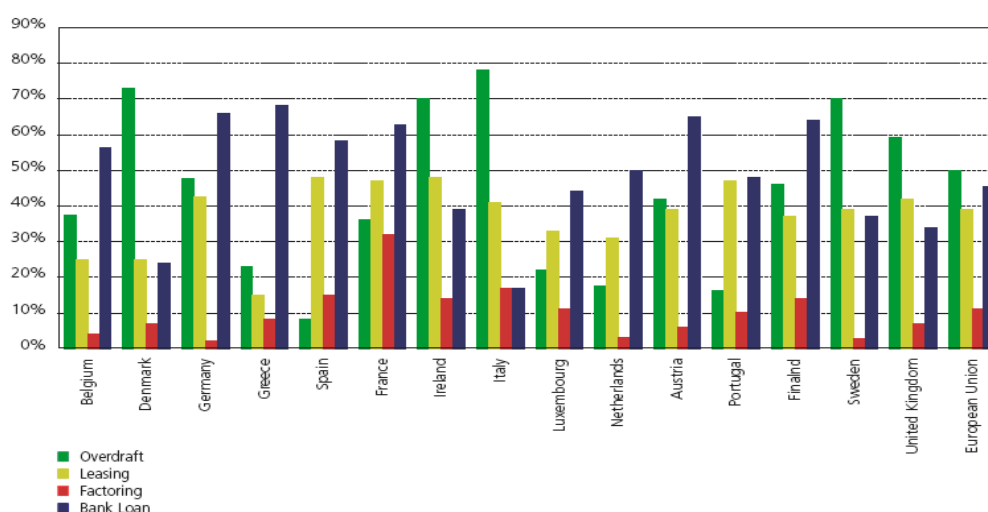


Figure 3.4 – SME use of different debt financing forms in the EU⁵⁶

The securitisation of bank loans issued to small and medium sized companies in the EU only accounts to roughly 10% of the overall Asset-backed securities (i.e. debt secured by one or more company assets) issued in the EU between 1999 to 2004.⁵⁷ This data has been generated in a European Commission study on asset-backed

⁵³ Factoring companies – provide finance to companies by buying their trade debts at a discount, either on a recourse basis (i.e. the company retains the credit risk on the debts) or on a non-recourse basis (the factoring company assumes the credit risk).

⁵⁴ The Grant Thornton European Business Survey, Grant Thornton International and Business Strategies Ltd., produced annually since 1992

⁵⁵ UK’s Economic and Social Research Council, entitled: “Europe’s Advantage: Banks and Small Firms in Europe and Britain”, by Dr. Francesca Carnevali, September 2005

⁵⁶ The Grant Thornton European Business Survey, Grant Thornton International and Business Strategies Ltd., data 2001

⁵⁷ Study on asset-backed securities: impact and use of ABS on SME finance”, GBRW Limited for the European Commission, November 2004.



securities, which also estimated that “the European securitisation market is dominated by residential mortgage-backed securities, which represented 74% of securitised bank assets in 2003, while in comparison SME asset-backed securities represented only 1% of total bank assets securitised in 2003”.⁵⁸ Relating to the overall SME loans in the EU, it seems that only up to 2% of these loans are securitised.⁵⁹

Another form of debt is subsidized loans, which offer the possibility of low interest rates or long repayment duration. The loans are offered under favourable conditions because the lending institution receives a subsidy on the loan. Overall, these loans facilitate the uptake of a loan by a start-up company as the repayment schedule and conditions are not as severe. Low interest rate loans may also be facilitated by selected groups of professionals, industrials, universities or further local stakeholders which create a fund in order to support the local business development.

Another flexible financing form which is available to businesses is leasing. With leasing, equipment can be purchased, which is significant for the further business development of a company (for example laboratory equipment). In the leasing scheme the financing of equipment is backed / secured by the value of the equipment itself. Another advantage of leasing finance can be the combination of leasing with fiscal incentives.

Companies have the possibility to issue bonds or new shares (rights issues) in order to improve their financial situation. Funding sources in this field are especially open for companies engaged in the field of environmental improvements and sustainable energy. The general financing schemes are venture capital investments, project finance as well as corporate finance.

Moreover, there are some banks in the European Union, which have an ecological focus. These banks are commonly quite small and thus also offer support on a minor scale. The following table gives a non exhaustive selection of European Ecological Banks together with the countries in which they are accessible.

Table 3.3 – European Ecological Banks (NTDA table)

Bank	Country
Co-operative Bank	UK
Ecology Building Society	UK
European Investment Bank (EIB) Energy Efficiency Loan Scheme	EU Member States
GLS Gemeinschaftsbank eG	Germany
Triodos Bank	Netherlands, Belgium, UK

⁵⁸ Study on asset-backed securities: impact and use of ABS on SME finance”, GBRW Limited for the European Commission, November 2004.

⁵⁹ Study on asset-backed securities: impact and use of ABS on SME finance”, GBRW Limited for the European Commission, November 2004.



Microcredits are particularly interesting for small companies. Microcredits, are commonly defined as a loans below €25,000.⁶⁰ This form of loan is especially significant as 93% of the 22 million European SMEs are micro companies.⁶¹

3.3.1 European Investment Bank concepts

The Higher Risk Sharing Finance Facility (HRSFF) is a financing mechanism provided by the European Investment Bank, which intends to facilitate loan access and aims at leveraging research, technical development, demonstration and innovation investments from private entities owing to the catalytic effect which a project awarded an EIB loan is likely to generate. Overall, the new scheme allows the EIB to become involved in more risky projects and enables an increase in financing volume issued by the EIB. Access to the risk sharing finance facility can take two different routes. One route is through participation in a FP7 project which automatically qualifies for the EIB Financial evaluation. The other route to an EIB Financial evaluation is via participation in other European Projects. Ideas which pass the EIB Financial Evaluation are evaluated again according to bank ability. Those RTD projects which prove themselves to be bankable, will receive an EIB Loan.

Debt financing includes mechanisms to facilitate the financing of projects by means of Project finance. Traditionally, financing uses Corporate Financing Models in place of Project Financing Models. Yet, especially for RTD projects it can be difficult to support and thus monetarily commit the often heterogeneous project promoters (corporate finance) instead of supporting a stand-alone project company (project finance) and thus the RTD project itself.



Figure 3.5 – Corporate & Project Finance⁶²

The classic Project Finance scheme can be used for the creation of infrastructure and thus is applicable to the business development of companies within a Hydrogen Community. The project finance scheme is based on the idea that future generated cash flow is used to repay the loan issued to finance the project. Thus, the main difference between corporate and project finance is the transference of responsibility. Whereas the promoter is responsible for the prepayments in the corporate finance model, the financial responsibility is therefore shifted from the company to the project itself under the project finance model. It should be noted that although the EIB

⁶⁰ European Commission, Microcredit for European small businesses, SEC (2004) 1156, 2004, p. 3.

⁶¹ European Commission, Microcredit for European small businesses, SEC (2004) 1156, 2004, p. 3.

⁶² EIB, Guide to Financing Projects from European Technology Platforms, Financing instruments of the European Commission and the European Investment Bank, p.6



“Project Finance” scheme offers a very interesting approach it is not yet viable for small companies.

Another organisation initiative of the EIB is the concept of so-called Global loans - Loans for SMEs through an intermediary. This concept facilitates credit lines to financial institutions, which use these credits to lend the profits further for small or medium-scale investment projects that are eligible for loans of these banks. The intermediary bank is therefore the contact point for loan requests. Eligible entities are in general local authorities or small or medium sized companies with less than 250 employees, an annual turnover not exceeding € 50 million and an annual balance sheet of up to € 43 million. The type of eligible projects is limited to projects dealing with new capital investment of up to € 25 million and should be carried out by SMEs or, in the case of small infrastructure projects, by local authorities. The investment type should be of corporate nature in advanced technologies, R&D projects, rational use of energy, environmental protection, water supply and sanitation projects, other infrastructure projects. Entities from regional development areas are especially eligible for this loan scheme. The loans are limited to a maximum of € 12.5 million and may cover up to 50% of the investment costs.

More information on European Investment Bank concepts under www.eib.europa.eu



4. Conclusion

The development of hydrogen – related businesses, which are situated within a community, has various impacts on the overall state of the community as business accomplishments create certain overall benefits for the community which in turn increases the attractiveness of this community for other investors. A general market mechanism is that the flourishing of one business may have a positive impact on the development of other local companies. For example, the business development of hydrogen – related companies may have a positive impact on local innovation options, the local employment rate and overall financial situation. For instance, a business increase in a new technology is likely to need the participation of local research facilities. Thus, the capabilities for local universities may increase the possibility of receiving research funding and R&D awards increases with the enhancement of local reputation and experience. Hence, the academic body of a community may experience an augmented investment into their R&D department.

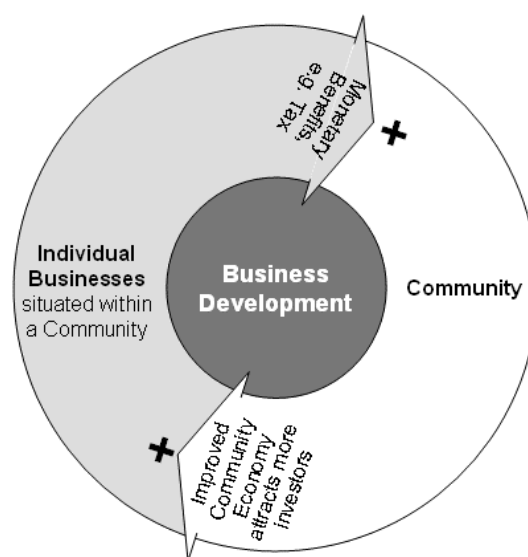


Figure 4.1 – Single businesses and the Community (NTDA diagram)

Thus, the fostering of a number of hydrogen – related businesses of one community may lead to the stimulation of local industry and an accomplishment of a significant industrial position on the European level. Such an established position may draw more financial investors to the community. Another local monetary circle is the creation of new jobs and thus the increase in overall consumer disposition on capacity to buy products, which in the long-term may foster the overall regional economic growth.

In a project such as the creation of a hydrogen community not only the technical requirements are significant, but also the economic financing strategy to verify the long-term viability of the Community. This however implies the need to apply a range



of flexible innovative financial instruments. The proportion in which financing sources are required and should be applied will change as the project undergoes the regular cycle of business development.

All businesses require some element of seed funding, but the purposes for which it is required vary depending on the source of the business concept. University spinouts are technology rich, but need to bring in management and undertake commercial and market research. Private companies often have a strong understanding of their commercial position but need to develop a concept through to pre-production. Traditionally seed funding has been released privately through personal contacts, but increasingly there are subsidised funds becoming available, either specifically tied to universities or other academic institutions (for example the university challenge funds in the UK) or linked to EU funding priorities (such as the ERDF seed corn funds).

Overall, the access to capital at early stages of market development is a crucial issue and despite the European activities still remains difficult for small-and-medium sized companies. Recent developments however indicate that better financing options are available and that those options need to be considered in H2/FC development of both regions and SMEs.



5. Bibliography

Carnevali, Dr. Francesca: UK's Economic and Social Research Council, Europe's Advantage: Banks and Small Firms in Europe and Britain, September 2005.

Doran, Phil: Hydrogen and Fuel Cells: a new take on financing. Core Technology Ventures published in The Fuel Cell Review. June/ July 2005.

Ecorys Research and Consulting, R&D Innovation Financing in the European Union, 2004,

European Association of Development Agencies, EURADA, online at <http://www.eurada.org/home.php>, 2007.

European Investment Bank, Guide to Financing Projects from European Technology Platforms, Financing instruments of the European Commission and the European Investment Bank,

European Commission: Commission Staff Working Document, Report on European Technology Platforms and Joint Technology Initiatives: Fostering Public-Private R&D Partnerships to Boost Europe's Industrial Competitiveness, SEC (2005)800, Brussels, 06/2005.

European Commission: Microcredit for European small businesses, SEC (2004) 1156, 2004.

European Commission: Microcredit for small businesses and business creation: bridging a market gap, December 2003.

European Commission: Observatory of European SMEs, SMEs and Access to Finance, 2003.

European Commission DG Enterprise & Industry: Best practises of public support for early-stage equity finance, Final report of the Expert Group, September 2005.

European Commission, DG Enterprise and Industry, 2006, online at <http://ec.europa.eu/enterprise/funding/index.htm>

European Commission DG TREN, (AF, Business Region Göteborg, Chalmers University of Technology, ETC Battery and FuelCells, Faasen & Partners, KTH Royal Institute of Technology, Norsk Hydro, Statoil, Volvo Technology, Development of Hydrogen and Fuel Cell Technologies in a Large-Scale Lighthouse Project, Final Report, July 2006

European Commission DG Research, EU-funded research FP7 Tomorrow's answers start today, online at CORDIS – Understanding FP7, 2006.

European Investment Bank, EIB Innovation 2010 Initiative, Guide to Financing Projects from European Technology Platforms, Financing Instruments of the European Commission and the European Investment Bank, 2006.



European Investment Fund: Technology Transfer and Technology Transfer Accelerator, Final Report and Executive Summary online version of the documents at http://www.eif.europa.eu/tech_transfer/, 2007.

European Platform on Financial Support for Eco – Innovation, Eco-Innovation Invest, presentation at the Financing Eco-Innovation in Central and Eastern Europe, Budapest, 23. April, 2007.

European Union Information Website Euractiv.com News, Business urges quick establishment of JTIs, Published: Thursday 8 March 2007, Updated: Friday 9 March 2007. <http://euractiv.com/en/science/business-urges-quick-establishment-jtis/article-162323De>

GBRW Limited for the European Commission: Study on asset-backed securities: impact and use of ABS on SME finance, November 2004.

Grant Thornton International and Business Strategies Ltd.: The Grant Thornton European Business Survey, London, produced annually since 1992

Hydrogen and Fuel Cell Technology Platform, Initiative Group on Financing & Business Development, Key outcomes of the Business Development Subgroup work conducted between June 2004 and March 2006 - Final report, 2006.

Hydrogen and Fuel Cell Technology Platform, Online information under www.hfpeurope.org, 2006.

Informal Seminar with High-Level Representatives of Member States on Public-Private Partnerships in Research, Summary Report, Brussels, November 2005.

Lehman Brothers Ltd.: Overview of Transportation Public-Private Partnership Project Financing, Combining Private Equity, Economic Development and Transportation, December 2003.

Noose: The Coordination Committee, The Financial Regulation Committee, The Economic Affairs Committee, The main means of financing SMEs in the EU, A comparative analysis of the US and EU Retail Banking Markets, EU/US RETAIL BANKING FORUM September 2006

Organisation for Economic Co-operation and Development (OECD): Science, Technology and Industry Outlook, 2004.

Roads2HyCom (JRC): Results from Call for Community Registration of Interest: Mapping Analysis of Potential Hydrogen Communities in Europe, 2006.

Rovera, Giuseppe: Vision, Strategy and Programme of the HFP, Presentation at the EnerMotive, Milan, 6-10 February 2007

Shane, Jeffrey: Public Private Partnerships, Presentation at the 3rd Annual Public Private Partnerships USA Summit, Washington, February 2007



Annex I: Overview EU PUBLIC FUNDING

Funding Agency (Program)	Scope Objectives	Beneficiaries	Funding and Eligible Costs (Budget)	Deadline/Frequency	Comments
EUROPEAN COMMISSION (FP7)	Basic R&D	Depends on specific calls for project and network proposals	Budget: – Energy: €2,300 million – Transport: €4,180 million	2007-2013 Annual calls	Need to create Consortium with at least two partners from two European countries.
JOINT TECHNOLOGY INITIATIVE ON HYDROGEN AND FUEL CELLS	Funding hydrogen and fuel cells applied Research and Development (R&D) of high-tech industrial and technological projects		Combining private sector investment and national and European public funding, including grant funding from FP7 and loan finance from the European Investment Bank 50% of total project costs covered through subsidies		The JTI is still in a planning phase and will aim at being a long term public private partnership between European Industry and the European Commission. If JTI is finally not approved, demonstration projects will be funded under FP7.
EUROPEAN COMMISSION TENDERS AND OTHER INSTRUMENTS	Funding and supporting instruments for the development of their topic		Co-financing of calls for proposals up to 50% of relevant studies	Regularly	Tenders focused on different topics, which differ in scope and budget
INTELLIGENT ENERGY FOR EUROPE	Funding for overcoming market barriers for energy efficiency, new technologies and renewable energy applications. Not technological development.		€730 million Maximum of 50% EC contribution of the overall project costs	Annual Deadlines (2007 on 28 th of September). 2007 call launched in April 2007	No infrastructure funding. Focused on market entry for developed technologies.
JEREMIE	Increasing the finance access of micro companies and SMEs	Micro companies and SMEs			Using <i>ERDF</i> (<u>European Regional Development Fund</u>) to finance the business development of SMEs and micro companies



Funding Agency (Program)	Scope Objectives	Beneficiaries	Funding and Eligible Costs (Budget)	Deadline/Frequency	Comments
EUREKA	Promoting competitiveness within EU companies by supporting the implementation of innovative technological projects	Companies or research centres within Europe			Proposal has to be supported from at least two companies from distinct EU countries. Technological development for pre-commercial products is a crucial access criteria.



Annex II: Glossary of Terms Used in the Documents

Business Angel (also in Networks = BAN)	Equity; private (individual) form of venture capital to provide seed capital to high-risk, start-up companies in return for a stake in the company. Private individual prepared to provide seed capital (see below) to high-risk, start-up companies in return for a stake in the company. Such equity financing is often the first form of finance a new company receives. It can be considered as a form of venture capital
Cohesion Funds	The Cohesion Fund is a structural instrument that helps EU Member States to reduce economic and social disparities and to stabilise their economies since 1994. The Cohesion Fund finances up to 85 % of eligible expenditure of major projects involving the environment and transport infrastructure. This strengthens cohesion and solidarity within the EU. Eligible are the least prosperous member states of the Union whose gross national product (GNP) per capita is below 90% of the EU-average (since 1/5/2004 Greece, Portugal, Spain, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia). See: http://ec.europa.eu/regional_policy/funds/procf/cf_en.htm
Debt E.g. Bonds, debentures, loans	Sum of money owed by one party to another and used together with EQUITY to fund a company. Normally only granted to individuals and organisations that provide evidence of their ability to repay original loan plus pay interest charged for the loan. In the case of companies it often relates to legally enforceable agreements. Debts may be secured against company assets e.g. a building.
Early stage finance (also start-up finance)	Equity; Financial investment for companies beyond the R&D state but have not reached commercialisation yet.
EIB	European Investment Bank; established under the Treaty of Rome (1958) and owned by the 27 EU member states, the EIB's function is to support the financing of major regional, capital investment projects and contribute to the balanced development of the EU. Allows to lend at favourable rates
European Investment Fund	The EIF provides capital to so-called 'Funds of Funds' i.e. Venture capitalist companies that invest in new companies. It also provides guarantees.



Eligible Costs	Those costs which are identifiable as specific costs directly linked to the performance of the corresponding action and can thus be booked to it direct, i.e. cost of assigned staff, travel and subsistence for this staff, purchase costs for equipment for this action, costs of consumables and supplies, costs, arising directly from requirements
European Regional Development Fund (ERDF)	Established in 1975 and provides funds to finance the business development of SMEs and micro companies for infrastructure development in the least prosperous regions of the EU. The ERDF is a structural fund which supports the economic as well as social development of the regions.
Equity E.g. ordinary & preferred shares	Risk capital of a company; Together with DEBT it forms company's long-term liabilities used to fund activities. Equity holders (shareholders) take part in profits via dividend payments yet as owners of the company are the last people to be paid in the event of a company going out of business.
Fixed Costs	A cost that does not vary depending on production or sales levels, such as rent, property tax, insurance, or interest expense
Microcredit	Loan below 25.000€
Mezzanine	Bridge between Equity and Debt which under certain pre-specified conditions converts from debt into equity. Generally high interest rates (reflecting the high level of risk to the lender), funding can be assimilated into convertible loans
Risk-Sharing-Finance Facility (RSFF)	New EIB and EC financing instrument, which participates in projects with higher risk shares
Seed Capital	Seed Capital represents the money used for the initial investment in a project or start-up company, for proof-of-concept, market research, or initial product development.
Structural Funds	The European Union provides structural funds to support social and economic restructuring across the EU. They account for over a third of the European Union budget. Structural funds are delivered through agreed operational spending programmes and strategies. These comprise the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the European Agricultural Guarantee and Guidance Fund (EAGGF).



Venture Capital (also risk capital) Equity; temporary company investment via company shares by another company / investment group provided to young, small or risky private companies by institutional (i.e. professional) investors. While venture capital is widely associated with EQUITY, DEBT can also be used often in the form of secured (against an asset) debt. Venture capitalists may or may not also offer advice, lend their expertise and provide contacts to the companies they invest in. The venture capitalist will expect to make a capital gain on his/her investment via a trade sale of the company (to another firm), a flotation (on a stock market) or by selling the stake back to the management.