Methodologies to bring innovative environmental technology R&D results into the market

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ABSTRACT

It has been widely recognised that too few projects initiated under both national as well as EU funded research projects find their way to commercial exploitation. It has also become clear that there is a lack of communication/ information channels between the R&D institutions and financial institutions as providers of financial support for the commercial exploitation of the R&D results, and industry. The author addresses the problems of: sub-optimal exploitation of EU public research results fragmentation of stakeholders & policy framework which result in an insufficient translation into market innovation of Europe's scientific excellence in renewable energy.
The main purpose of the new methodology is to apply an innovative & structured methodology for quicker & broader exploitation of existing scientific RTD results licensing & spin-off creation based on scientific RTD results. The main steps of the methodology are to identify the most promising RTD results that are ready for innovation activities agree on a common long term vision for each of them design for each of them a series of business model options that will be supported by private investors. The overall objective of the methodology is to address the technical barriers for transforming scientific research results into viable innovations, to unite all stakeholders relevant for technology transfer (research, industry, investors, technology transfer professionals), to promote the market uptake of renewable electricity and renewable heating and cooling technologies by European companies or start-ups, and to distil best practices & policy recommendations.

1. ANALYSIS OF THE CHALLENGE

Technology or knowledge transfer is the single most complex process in industry worldwide. Yet it is the least understood and managed of all entrepreneurial processes. But wwithout technology transfer and innovation, there is no linkage between research and market, and ultimately no technology-based economic growth.
Taking a look at the definitions is a starting point to frame the reflexions: Technology transfer is defined as the process of detecting, developing and validating the potential for practical applications of the results of scientific and technological research. Innovation is the process of developing, industrialising and profitably selling the products or services which may have benefited from scientific and technology research.
Both processes are intimately linked, and often people talk about one and mean both. In fact, it is hardly possible to tackle one without taking care of the other.
Further in this article, we shall refer to both by the expression "technological innovation" or "R&D-based innovation".
While technological innovation is often not understood and well managed, it has demonstrably led to superior growth performances for the USA and Japan – therefore Europe must rely more on innovation-based growth. Hence it is crucial to understand the challenges in the process and address them with effective support actions.
The value of public funded scientific research to society consists primarily in the development of new or improved technologies, materials, processes and applications that support sustainable growth and that create employment in a knowledge-based competitive economy. Yet, society can only benefit from research results if these are transferred from the laboratories to the market in the form of licensed technology or as a newly created technology-based company.
Renewable energy, energy efficiency and sustainable building technologies are currently being commercialised successfully in Europe; yet, for Europe to optimally capitalise on its R&D achievements, an even broader number of research results should be brought to the market in less time.
Technology transfer does not happen by itself, even if a research team comprises of researchers and people from industry. An explanatory element is the fact that at the end of research projects (ideally) stands an excellent technology, but not yet an excellent business idea.
There is a structural gap in the technological innovation process in the renewable energy, energy efficiency and sustainable construction sectors. And that gap is multiple: it is among other a skills gap, a responsibility and motivation gap, and a funding gap.
1) Skills gap: researchers are scientists trained for R&D and not for market analysis, business model development, business plan drafting and presentations to investors, nor are they trained to lead a new business. Communication between science and business is also critical, with different priorities producing different patterns of communicating information. The information itself is often considered of different importance: scientists usually stress the technology aspects, while investors are only marginally interested in "how it works", but

mainly in "how it translated into business advantages".
2) Responsibility and motivation gap: once the R&D outcome is achieved, research centres typically do not feel responsible for further product development. Aside from few exceptions, innovation and commercialisation activities beyond R&D are not the core business of public research centres. The problem is that it is not yet the business of anybody else. Blaming the scientists would be simplistic in this case. People are reactive to stimuli. Yet most research centres in Europe are doing too little to motivate their staff to engage in commercialisation activities – in contrast to practice in the U.S.
3) Funding gap: public money does not fund product development due to competition and state aid rules. It does typically fund pre-competitive research. However, we do not have a product yet, further engineering, fine-tuning, testing work is needed, and there are no dedicated funds available for this. Therefore, we see a lot of good concepts that still need to be proven for real-life, that need to be up-scaled to full final product versions. These concepts are not yet interesting for investors because they are too immature, that means: too risky.
This gap between laboratory and market can be closed if the required resources are made available. We call this set of resources „innovation support services".

2. ROUTES TOWARDS MORE EFFICIENT AND EFFECTIVE INNOVATION

2.1 Innovation support services

Innovation support services are a range of services needed to bring innovative research results to the market in the form of knowledge transfer, training, licensing, or creation of a technology-based start-up. These services comprise typically the following:
• Assessment of the business potential of new technologies
• Risk analysis (market, financial, entrepreneurial risk)
• Advice on IPR management and exploitation
• Definition of an exploitation plan
• Coaching in business plan development
• Brokering contacts with interested investors
• Technical, management and legal due diligence
• Help with licensing deals
• Entrepreneurial training for scientists interested in start-up creation
• Assistance in start-up creation
• Support with technology / know-how acquisition
• Long-term support to the willing teams
These different services require different expertise and experience, and multiple actors are involved in different parts of the technological innovation chain. In addition, most of these actors only intervene on a very local or regional level.
It should be stressed that most research centres and universities today have some kind of technology transfer office (TTO). These structures provide support with patent applications and often some of the services mentioned. A study of European TTOs in the frame of the EU-financed project PROTON (PROTON, see reference)made an analysis of the different technology transfer services provided by European technology transfer offices attached to EU public research centres. The result showed that the vast majority of TTOs only provided a fraction of the above-mentioned innovation support services. This demonstrated that individual research centres usually don't possess the skills and resources to offer the entire range of innovation support services – and they don't need to. Considering the financial implications of offering all innovation support services, it quickly becomes obvious that public research institutions cannot afford to recruit all technical, legal, managerial and financial expertise. Not to mention the networks needed and the in-depth industry knowledge.
However, each team willing to commercialise research results should be able to have easy and affordable access to the full range of innovation services.

2.2 New methodology to support commercialising efforts

The European Renewable Energy Centres Agency (EUREC Agency), which groups together mostly public research centres from all over Europe has therefore taken the initiative to bring together all this expertise and offer it in a professional way, out of one hand in the frame of the EU-funded ProRETT project (ProRETT, see reference). Since January 2005 a group of technology innovation professionals is testing and applying a new methodology for quicker and broader technology transfer in the renewable energy and energy efficiency sector where professionals from the entire innovation chain pool their expertise to act as virtual technology transfer office cooperating with individual teams in public research institutions from all over Europe and providing them tailor-made support in their commercialisation efforts.
The project has set up a team that comprises of all actors needed in the innovation chain:
• EUREC Agency brings in the research centres producing the R&D results.
• Four technology transfer professionals contribute their different individual specialisations and knowledge of different geographical areas.
• A Venture Capital fund specialising in clean tech and a bank provide the link to the financing community.
• And EREC, the European Renewable Energy Council is the link to the different industrial association, i.e. to RE companies.
The main steps of the specific support action are:
1. To identify which are the most promising RTD results that are ready for innovation activities.
• The team contacts RE R&D centres and talks with directors, individual researchers and TTOs to find out which are commercially interesting and existing RTD results available at EU research centres that have not yet been exploited. The emphasis is on R&D results in the maturity of a pilot project.
• Project results can come from any public-co-funded

R&D project (EU, national) in the area of RE and energy efficiency.
• The R&D results are sources in European public research centres.
2. To build the business case and to agree on a common long term exploitation vision for each of the research results
• The team checks issues like: is there a market for the product? What needs does it satisfy? What are the competing products? Does it need further R&D or is it ready as it is? How much money and time is needed to get it on the market? Who would be interested in investing in it?
3. To design for each of them a series of business model options that are likely to be supported by private investors.
• There are two distinct ways to bring new technologies to the market: the traditional licensing channel to an existing firm – or the start-up channel. It is worthwhile looking at both channels to optimise the transfer rate of scientific research to the market. Licensing or start-up creation are appropriate for different technologies, teams and circumstances, and taking the correct decision is crucial for the success of the undertaking.
• Once this decision taken, a business plan is developed by the innovation support professionals together with the R&D team in view of presenting it to potential investors
4. Brokerage to potential investors
• The consortium has quite some access to finance that is looking for well-prepared investment opportunities in our sector. It is expected to arrange a number of real deals at the end of the ProRETT project.
5. Raising awareness for innovation and building entrepreneurial capacities at public research centres
• A lack of motivation and awareness for innovation activities inside public research institutions is a clear hindrance to technology transfer. The team proposes therefore entrepreneurship training for researchers held on the premises of interested PRIs to groups of researchers. The aim of this training is to increase the scientist's understanding for and interest in technology transfer.
Since the project started one year ago, the team has screened over 50 proposals from 17 European countries coming from a broad range of renewable energy technologies. 14 among them have been retained for further support. To date, already two R&D results have received further private investment for their commercialisation. Some more are close to a deal, others still need more time.

3. CONCLUSIONS

3.1 Observations

The author would like to conclude with a few observations made during the ProRETT project:
1. Many – if not most of the R&D research result proposals need further development in order to bridge the gap between laboratory and market. In many cases, this concerns upscaling of a prototype to real-life commercial size or demonstration activities. Yet, funding for such activities is rarely available.
2. Many investors claim that: "finance is not a problem, there is lots of money around - good projects are the problem." In our opinion however, we tend to admit that there is money for new technologies available, but most innovative projects in the early stage can't get it because they can't quickly deliver the high expected rates of return on investment. Thus the access to innovation finance still is a problem
3. There is not a single fund for eco-innovation that operates on EU-level, all existing funds currently operate in a limited geographical area, mostly regionally, less often nationally; this makes it tricky for entrepreneurs to identify the right fund to approach. Transaction costs are very high and precious time can be lost.
4. Commercial banks are not suitable investors for early stage and even later stage renewable energy and energy efficiency innovation financing. In general, they are not aware of the potential and the challenges of the RE and EE sector. Lack of knowledge makes them reluctant to invest in a sector / an activity they do not fully understand. Outreach and awareness raising with the financing sector is crucial to attract mainstream finance in the future. However, we observe that some banks are getting interested and are moving into the RE sector.
5. In many cases, venture capital (VC) funds are also not suitable investors for very early stage RE and EE financing because most projects are not mature enough even for VC, and because of VCs' high expectations on project's internal rates of return.
6. Corporate investors look most promising for early-stage innovation funding in the studied cases.

3.2 Consequences

The observations bring us to the conclusion that Europe needs a dedicated fund to support very early stage eco-innovation or another innovative instrument to bridge this funding gap. This fund should provide financing at preferential interest rates, not at commercial rates that take into account the high risk of the investment. Such a fund should operate on EU level to overcome the fragmentation and limitation of the multiple regional funds. Further if becomes clear that it makes sense to permanently establish at EU level a group or a platform that offers innovation support service in order to allow each R&D team willing to commercialise its results to have easy access to professional and all-in-one commercialization support. Such a group should not replace the individual centre's TTOs but cooperate with them, complete the set of services they offer, and back them up with the pool of European experience in the field.

REFERENCES

PROTON, Management of intellectual property in publicly-funded research organisations: Towards European Guidelines, 03.2006
ProRETT: Promotion of Renewable Energy Technology Transfer, EC project, www.prorett.eu