



## ***mKETs-Pilot lines project***

The goal of the mKETs-PL project is to prepare and foster a common understanding and consensus for future actions in Europe focusing on multi-KETs pilot lines



*mKETs-PL working document*

## **D6: Final conference report**

**“Public support for multi-KETs pilot production: A roadmap to jobs and growth”**

*Draft*

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The project partners of the mKETs-PL consortium are:

- Netherlands Organisation for Applied Scientific Research TNO
- Fraunhofer-Gesellschaft
- Commissariat à l'énergie atomique et aux énergies alternatives (CEA)
- Cambridge University Technical Services Ltd.
- VTT
- Fundación TECNALIA Research & Innovation
- Technology Partners Foundation
- Joanneum Research
- D'Appolonia S.p.A
- Strauss & Partners
- Spark Legal Network and Consultancy Ltd.
- Noblestreet

During the project, the following four organisations were selected as Demonstrator to collect practical experience on pilot production in a multi-KETs environment:

- Acreo (Norrköping, Sweden)
- Bio Base Europe Pilot Plant (Ghent, Belgium);
- Infineon (Villach, Austria)
- Sofradir (Grenoble, France)

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## Introduction

Within the framework of the multi-KETs pilot lines (mKPL) project, the final conference “Public support for multi-KETs pilot production: A roadmap to jobs and growth” was an important milestone in the dissemination and discussion of the results.

The conference was initiated by a networking reception in the European Parliament on the evening of January 21, 2015, with close to 70 attendees. Welcome addresses were given from Lambert van Nistelrooij, MEP and Arnold Stokking, Managing Director TNO.

The conference was held on January 22, 2015 at the Microsoft Executive Briefing Centre located at Rue Montoyer, 51, 1000 Brussels, Belgium, a short walk from the Tron Metro Station in Brussels. The conference started at 8:30 and ended at 16:00. In total over 130 persons registered to participate, and finally 123 persons signed in at on-site registration. There was a good representation from industry, research and policy makers from EU and national governments.

## Objectives of the conference

The multi-KETs Pilot Lines (mKPL) project developed a shared vision for the development of Key Enabling Technologies (KETs) pilot lines in Europe. The objective of this closing event was to present and disseminate the results and the lessons learned of the mKPL demonstration activities and the project in general. An important issue was to discuss the findings with the broader audience, as well as policy implications in order to finalise the tentative policy roadmap for multi-KETs pilot production activities.

The one-day conference featured high-level experts from industry sharing experience in pilot activities, as well as keynotes from policy makers with insight into new funding opportunities and strategies. The entire experience was moderated and enhanced with the latest findings from the mKPL consortium. Attendees also had the chance to interact with managers of top rated pilot line demonstrators during the showcase of selected demonstration pilots.

## Conference agenda

<b>21.1.</b>	<b>Members Salon in the European Parliament</b>	
19.00	Registration	
19.30	Welcome reception	Lambert van Nistelrooij, MEP Arnold Stokking, Managing Director Industrial Innovation TNO
<b>22.1.</b>	<b>Microsoft Executive Briefing Centre</b>	
08.30	Registration and coffee	
9.00	Welcome	Chairman: Thomas Reiss, Fraunhofer ISI
9.10	Multi KETs Pilot production: EU policy	Pedro Ortun, Director of DG ENTR, European Commission
9.25	The Multi KETs Pilot Lines (mKPL) project	Ruud Baartmans, TNO, mKPL project manager
9.40	mKPL project scope and findings: a common understanding of pilot production activities	Maurits Butter, TNO, mKPL scientific coordinator
10.10	<i>Coffee break</i>	
10.30	Technology validation in a common Pilot production	Tommy Höglund, Acreo Printed Electronics Arena Manufacturing
10.50	mKETs-pilot production in medium sized companies and Mid-caps	David Billon Lanfrey, Sofradir
11.10	Shared facilities for Pilot production	Wim Soetaert, Bio Base Europe Pilot Plant
11.30	Multiple partner consortia and joint innovation in a technology eco-system	Johann Massoner, Infineon
11.50	Tentative Policy roadmap	Maurits Butter, TNO, mKPL scientific manager
12.10	Lunch break	
13.10	Introduction to parallel sessions	Thomas Reiss, Fraunhofer ISI
13.20	Parallel sessions on roadmap: How to handle complexity of KETs – The tentative policy roadmap	
<i>Session 1</i>	Technological complexity: Technology infrastructure and institutional support (Shared facilities, RTOs)	Chair: Göran Gustafsson, Acreo Swedish ICT
<i>Session 2</i>	Value network complexity: aligned development in an Eco-system (Network support)	Chair: Rob Hartman ASML
<i>Session 3</i>	Market complexity: Pilot production for the verification of applications (Demonstrators)	Chair: Olof Sandberg, RISE
14.10	<i>Coffee break</i>	
14.30	Wrap up of parallel sessions	Chairs
14.45	Panel discussion: Panel of representatives from policy, industry and RTOs (see below)	Chair: Thomas Reiss, Fraunhofer ISI
15.45	Conclusions and final remarks	Thomas Reiss, Fraunhofer ISI
16.00	End of the conference: Snacks and drinks	

Panel: Manfred Kircher (CLIB2021), Walter Nadrag (Sico, SME), David Billon Lanfrey (Sofradir, mid-cap), Gavino Murgia (DG ENTR, EC), Mathias Rauch (Fraunhofer), Dr. Martin Pfeiffer (Heliatek), Peter Eriksson (VINNOVA, Sweden), Maurits Butter (TNO, mKPL)

## Conference Highlights

The conference presentations provided a wealth of information and some very interesting perspectives related to implementation of KETs pilot production activities in industry and as shared facilities for pilot production. The presentations and discussions revolved around public support for pilot production activities, the role of different stakeholders and the questions of how to deal with the complexities of pilot production by means of technology, eco-systems and markets.

The presentations have been made available to the participants on the mKPL-website: <http://www.mkpl.eu/conference/final-conference-jan-22-2015/>

### **1<sup>st</sup> Morning Session:**

The first session gave an introduction to the KETs policy of the EC and the background of the mKPL project. Furthermore, the mKPL project itself was presented and some of the main outcomes.

#### **Multi KETs Pilot production: EU policy**

Pedro Ortun, European Commission, Director of DG Growth, Directorate E - Service Industries, where E/4 Key Enabling Technologies and Digital Economy is subordinate

Pedro Ortun emphasised the former DG Enterprise and Industry now has a slightly different shape and is called DG Growth. KETs particularly matters as they are relevant for economic value added, and that in both dimensions product and service. Thus, to promote integration and uptake of KETs are of special concern of political support. Related policy interventions are: improvement of the framework conditions, activation of stakeholders, and financial support. An important European funding mechanism for KETs support, equipped with a big budget, is ESFRI. Particularly big pilot production projects need to be supported from multiple funding sources – certainly in different project phases.

Joint effort will be taken for the Important Projects of Common European Interest (IPCEI). In July 2014 the related guidelines from the European Commission became valid. Currently there are four projects in discussion related to big issues like battery development or carbon capturing and storage. Even if the public contribution in these projects will be high, it has to be underlined that the main financing will be private. But, in order to align the activities, specific governance is needed and the projects will get strong political support.

Another support option for KETs deployment financing will be the European Investment Plan. The member states compile a list of indicative projects. The European Fund of Strategic Investments will be provided with 350 bn € and the European Investment Bank will have a central role in the implementation. Moreover the activities will benefit from political support.

For KETs development, Horizon 2020 is important. Currently there are work program calls for 2016-2017 in progress. The calls will be published already in September-October 2015. As the complexity of KET deployment and particularly multi-KET deployment increases, the financial needs rise. The aim is to cope with that problem by implementing better governance and aligning the efforts. Today, 60%

of the regions in Europe have identified KETs as priority for their smart specialisation strategy. For implementation it is necessary to avoid duplication, to join forces, and to raise additional efforts.

From the KETs High Level Group the final report is expected soon. Beside issues like Horizon 2020, ESIF, and IPCEI special emphasis is expected about SMEs, getting access to big supply chains and thus becoming part of bigger ecosystems. Moreover new levels of skills and international level playing fields are expected to be addressed.

### **The Multi KETs Pilot Lines (mKPL) project**

Ruud Baartmans, Project manager at Strategy and Policy unit of TNO, mKPL project manager

Ruud introduced the multi-KETs Pilot Lines objectives about preparing and fostering a common understanding and consensus for future actions in Europe focusing on multi-KETs pilot lines and then informed about the specificities of the 6 examined KETs and their connections. He presented the partners of the project consortium and informed about the work which was done in phase 1 (country studies, interviews with experts, workshops with external experts, online survey, legal assessment, green paper, mid-term conference) and phase 2 of the project (tender and selection process with final selection of 4 demonstrators by EC, assessment of demonstrators, workshop with external experts, demonstrator workshops, preparation summary papers and final report).

Ruud also informed about the selection criteria for the demonstrators and shortly introduced the 4 selected demonstrators (Acreo, BBEP, Infineon, Sofradir) to the audience.

### **mKPL project scope and findings: a common understanding of pilot production activities**

Maurits Butter, Senior advisor innovation policy at TNO, mKPL scientific manager

Maurits reported about the project scope and findings of the multi-KETs Pilot Lines project. Multi-KET in this connection is the combination of least two different KETs in a high-tech manufacturing environment in a way that value is created above and beyond the mere combination of the individual technologies. It turned out that there exist a lot of different meanings of the terms "Multi-KETs" and "Pilot lines", for instance there are different characteristics for different KETs and therefore to define and establish a common understanding is crucial, but not trivial.

Pilot production needs to combine product, manufacturing, organisational and market aspects. Additionally, it is not only KET technology, but also KETs-based components, KETs-based products and KETs-based subsystems which have to be considered in order to develop suggestions for policy support. As in the phase of pilot production & demonstration the economic risk is the highest, a coordinated risk management has to be a core element to pilot production. The four main barriers in this stage identified in the project are the access to financial capital, the quality of the innovation ecosystem, the limited market articulation-demand, and the availability of human capital.

As the survey revealed, the access to financial capital is mainly disturbed by an unwillingness to invest due to a high uncertainty and the missing opportunity to assess the risks, in combination with the high investments needed. The quality of the innovation ecosystem depends mainly on downstream partnerships and consortia creation. The market articulation-demand depends on the available market information and can arise in a so-called deadlock situation due to missing

demonstrator products. The availability of human capital seems to be especially limited by the missing entrepreneurial mind-set and the not optimal connection to local and regional education.

## 2<sup>nd</sup> Morning Session

The following talks were given by representatives of the four demonstrators of the mKPL project. The talks dealt with different experiences and kinds of pilot production, also related to public policies.

Finally, more insights into the mKPL tentative policy roadmap were given.

The idea of this session was to give broad insights into four topics related to the demonstrators of the mKPL project putting it in the bigger picture of policy for pilot production activities.

### Technology validation in a common Pilot production

Tommy Höglund, Process Manager at Acreo

ACREO is a Shared facility for pilot production for printed electronics and bioelectronics, located in Nörrköping, Sweden. ACREO is able to provide support for the whole process from technology validation to demonstration, which typically embraces pilot production. ACREO prepares the printing process up to a stage that technology transfer is possible. Advantage for the users is that the pilot production facility is very flexible. Many types of companies and industries can test their processes on the equipment, without specific investment needs. Not only SMEs but also large enterprises rely on the facilities, as long as development risks are still high. Moreover, the companies can learn how to handle their new production processes at the facility. Thus, the organization supports companies to cross the so-called “valley of death”.

In technology deployment it is in particular important that a product finds a market. Thus, a main issue is technology integration and validation. Therefore it is necessary to learn and understand the target markets. Moreover an appropriate business model has to be developed and implemented. For successful application development in collaboration with a key customer a period of one year is to be taken into account. And last but not least, the financial situation has to be taken into considerations. All in all, ACREO pursues such a systemic approach to support their customers.

The operational costs of ACREO are covered by private funding. But, for equipment refurbishment public support is highly required. This is in particular important to stay on time. The operation and also the public support of Shared facilities for pilot production have to be calculated for a long period, as the companies base their strategic investment on the use of the facility. Beside refurbishment financing, public funding was useful to support the business set up phase of customers companies.

ACREO is not a standalone activity but is embedded in a whole supporting environment, organized by Printed Electronics Arena. Within this eco-system the University of Linköping has the role of fundamental research. One benefit of this collaboration is a shared lab of ACREO, the university and other partners. Within the network, ACREO is responsible for applied research. And Norrköping Science Park, a regional intermediary, maintains contact to the companies and supports the industry

in their deployment process. This tight collaboration chain is particularly important to accompany the often described back and forth process of KET-development.

### **mKETs-pilot production in medium sized companies and Mid-caps**

David Billon Lanfrey, Vice president of R&D, technology and products at Sofradir

Sofradir is a French manufacturer of infrared sensors for military, space and commercial applications with an annual turnover of about 180 M€ for cooled and uncooled sensors. The KETs which are addressed at Sofradir pilot line production are Advanced Materials, Micro-Nano Electronics and Photonics.

David reported about the specificities of pilot production activities in medium sized companies and Mid-caps. He also named the main hurdles to industrialization and the lesson learned at Sofradir. He tried to derive recommendations for other companies and formulated suitable support actions from public authorities. The specific case at Sofradir for the setup of the pilot production was not a new facility with a new set of equipment, which would be too expensive regarding viability of investment, but an adaptation of the current production line. In general, the setup of the pilot line at Sofradir was part of a larger development process with 4 stages or gates.

The main hurdles to industrialization for Sofradir were a lack of a roadmap and reliable market data in the case of a breakthrough innovation, a lack of communication and coordination between development and industrialization teams, a lack of means because priority is systematically given to the short term actions, and of course the resulting costs.

The lessons learned concerning roadmap and decision were among others that the roadmaps (technology and product) shall be clear and shared by all possible stakeholders. It is important to find the right balance between technological push and market pull projects, which is especially important for the technologies requiring a long time development. Additionally, the complete process from the research to the production shall be considered by setting up a stage gate process covering the whole development from the research to the production. For a fruitful collaboration with a laboratory there should be no competition between research and industrial teams. Also, the product and technological roadmap shall be shared and updated every year.

Concerning the organization, a representative of industrialization and production shall be involved right from the beginning to make the transfer as continuously as possible. Because the worldwide market is limited in volume, the policy of Europe should be to promote one or few champions and to consider pilot line activities in H2020 program at the same level as the R&D programmes.

### **Shared facilities for Pilot production**

Wim Soetaert, CEO and initiator of Bio Base Europe Pilot Plant (BBEPP)

BBEPP is located in Gent, Brussels. The Shared facility for pilot production provides scale up equipment for production processes in industrial biotechnology. BBEPP's customers come from all over the world. In the "one-stop-shop" the complete scale up process can be hosted and additional service is provided. Moreover, technology centred customers benefit from BBEPP when a

development comes to the point of application testing and higher quantities of the target product are needed. At BBEPP this pre-production can be executed without initial investment in an own PPA.

A major advantage of using BBEPP's offer is a much faster technology deployment process. The companies have faster learning curves and can thus accelerate the time-to-market. Even though the expenses for scaling up at BBEPP facilities is decisively lower than at proprietary pilot production facilities, some companies reject from using the opportunity for rather emotional reasons. But, this approach bears significant risk: if first a pilot production facility has to be set up, the risk increases of missing the market.

A crucial precondition of BBEPP's success is its independency. Within the facility industry is just accepted as a customer not as a shareholder. Only then the Shared facility can convincingly claim confidentiality. At BBEPP operating costs are covered by contract revenues. That guarantees the provision is always oriented on the market needs. But, the costs for equipment require public funding. Moreover it is essential that the Shared facility has a critical mass. Currently in many regions in Europe there are activities pursued, building up Shared facilities for pilot production in the area of Industrial Biotechnology. This leads to a fragmentation of the business and might lead to several subcritical activities.

### **Multiple partner consortia and joint innovation in a technology eco-system**

Johann Massoner, Director cooperations and funding and pilot line project coordinator of Infineon Technologies Austria AG

Infineon is the biggest semiconductor manufacturer in Germany and one of the leading companies in Europe in this sector. Today for semiconductor technology deployment huge investments are necessary. Thus, Infineon invests more than 12 percent of its revenue. The R&D and pilot production expenses have increased significantly. Public support is needed, as the companies cannot master this trend on their own. Public investment is justified as, similar to production technology, semiconductor technology can be classified as an enabler for the industry.

Usually, Infineon pursues its pilot production activity within the existing production facilities. Only some steps are processed on new equipment. Thus a pilot production is implemented rather on a virtual pilot line. A pilot production activity requires a large consortium, which covers the whole value chain also including RTOs and universities. Common public funded projects are necessary to build eco-systems with external partners and explore additional paths for risk reduction. Moreover, public support accelerates the overall process.

### **Tentative Policy Roadmap**

Maurits Butter, Senior advisor innovation policy at TNO, mKPL scientific manager

Maurits introduced the tentative policy roadmap of the multi-KETs Pilot Lines project by presenting the survey results and the reasons for a coordinated pilot production policy. The suggested policy strategies for the European Union are mainly the coordination and alignment of policies in order to generate faster, more flexible, more agile and more aligned policy process. Additionally, the direct co-finance of pilot production activities, the development of crucial meta market-information, and

the enhancement of skills and capacities of SMEs would be important. Policy should support brokerage and bring together industry and research by supporting training and education. The direct contribution of politicians could be the creation of awareness and understanding among other policymakers.

Besides the policy strategies for the European Union, Maurits also presented policy strategies for the Member States, where besides the need for policy alignment and increased agility, the support of incubator programs, joining of tripartite programs, development of national action plans on pilot production, support of technology transfer (provided by RTOs), additional national basic funding for universities and RTOs as well as the support of downstream SMEs to valorise KETs opportunities were suggested strategies. On regional government levels he suggested to align regional policy with national and European policy interventions, to create regional public/private investment funds, to support existing and create (when necessary) shared facilities for pilot production and to support incubator programs. Furthermore, it is important that for different target groups, of course different policies are needed. Larger enterprises need support getting access to capital and ecosystem alignment. SMEs need incubator activities, better market articulation, shared facilities, brokerage, and skills. At the same time universities and RTOs benefit through support of basic funding and participation of industry. In general, the priorities should be on market articulation, shared facilities and the innovation ecosystem.

He concluded that scale-up/pilot production policy is an emerging trend, which needs a systemic policy, with regard to product/process/organisation/market. Priorities should be market articulation, shared facilities and the innovation ecosystem.

## ***Afternoon parallel sessions***

**Objective:** Discuss particular parts/topics of the roadmap and of policy for pilot production.

There were three parallel sessions on different topics related to the policy roadmap. Within these sessions, the different topics were discussed with the audience after a short introduction. Afterwards there was a wrap up of each session in the plenary by the chairs.

### **Session 1: “Technological complexity: Technology infrastructure and institutional support (Shared facilities, RTOs)”**

What roles do RTOs/Universities and shared facilities play in public policy for pilot production?

*Chair: Göran Gustafsson, CTO of Printed Electronics Arena at Acreo, shared facility for pilot production for printed electronics and demonstrator of the mKPL project.*

#### **Main points of the discussion:**

- The role of RTOs in pilot production activities is important, but is mainly located at lower and middle TRL.
- There are huge differences between the single KETs regarding the importance of the role of RTOs and shared facilities.

- Shared facilities are located mainly at lower TRL but need feedback from higher TRL and the market.
- The gap between venture capital and private equity is too huge.
- Funding is mainly supporting lower TRL, because the lower the TRL, the higher is the reimbursement.

#### Discussion in detail:

Göran animated the session, providing his views and allowing for interaction with the participants about the critical issues for technology infrastructures with respect to pilot production. It was recognized that most new technologies have their origin in a public research organization and that research institutes and RTOs have heavily invested in infrastructure for technology validation in the last years.

The technology infrastructure is a strong contributor to pilot production. The facilities and equipment of research institutes and RTOs are state-of-the-art and there is a high level of expertise and fundamental understanding of the science behind the technology. Therefore it is a favorable environment for supporting start-ups or SMEs. In general, technology transfer culture is growing nowadays.

Limitations of RTOs are that public research institutes are not allowed to perform commercial activities due to their tax status. The same is true for most non-profit organizations. Confidentiality, IP rights and ownership of results are often a point of conflict. In general, RTOs are mainly located at lower and middle TRL.

Barriers for commercialization of mKETs are the technological complexity of KETs, together with the high capital which is needed. Additionally, R&D on product and process side is needed in pilot production, although a demonstrator of a particular product is already available. The equipment for scale-up and pilot production can differ strongly from laboratory equipment and therefore it is too expensive to engage in pilot production for many SMEs.

Solutions could be indeed the stronger use of shared facilities for pilot production of m-KETs developments. Also, RTOs and universities should play a more prominent role in mKETs pilot production activities.

#### Session 2: “Value network complexity: aligned development in an Eco-system (Network support)”

What role does eco-system/network support for pilot production play and how should it look like?

*Chair: Rob Hartman, Director Strategic Technology Program of ASML, world's leading provider of lithography systems for the semiconductor industry, engaged in ENIAC pilot line projects*

#### Main points of the discussion:

- A clear distinction needs to be made between vertically integrated eco-systems (example Infineon) and horizontally integrated eco-systems (e.g. BBEP) in pilot production. The latter

seems to be in favour of shared facilities (e.g. IMEC, LETI), that are an independent platform. The two types are often mixed up.

- Trust: is important but can be well handled in vertically integrated pilot production eco-systems.
- Shared facilities should build on existing and established eco-systems (could be clusters) and be product oriented with strong involvement of downstream industries that bring the technology to the market aligned with application (downstream) oriented competence centres that combine technology and application.
- Shared facilities serve different purposes for small and large enterprises
- Horizontal and vertical pilot production eco-systems do not need fundamentally different policies.
- SMEs need support for management and administrative issues (including finance, legal and IP aspects).
- One-stop-shop accompanying SMEs organisationally in their effort to bring a technology to the market.
- SME networks with joint management/administrative units and the involvement of final users.
- Assure a commitment that the result of a pilot production, i.e. the full production, is anchored in Europe.

#### Discussion in detail:

Vertically integrated eco-systems (example Infineon) and horizontally integrated eco-systems (e.g. BBEP) in pilot production have different properties and peculiarities. However, they are often mixed up and when people talk about pilot production or pilot lines they mean either one or the other. It became especially evident, that some people see only shared facilities as “the pilot lines” whereas others see pilot production in industry as “the pilot lines”.

Furthermore, it was stated by one of the participants that policy should regard the whole way from laboratory to the market, stating that currently only 80% of the “bridge” over the valley of death are covered. The last 20% up to qualification of devices and a first market access are also needed. This asks for covering all TRL levels to first production and is needed as mKETs are capital intensive and have a high worldwide competition.

With respect to trust it was discussed, whether it would be possible to also collaborate in pilot production if trust is not yet given. For vertical collaborations ENIAC pilot line projects were given as an example, where IP is openly discussed and non-competitive value chains are integrated, allowing a detailed exchange without problems related to collaboration vs. competition. With respect to horizontal collaboration, there is no general solution and decisions are made case by case. However, models exist at IMEC or LETI and it was discussed that “horizontal pilot lines”, i.e. shared facilities for pilot production, have the ability to serve as independent platforms for horizontal collaboration.

It was mentioned, that a concise policy needs a good coordination, meaning that regional eco-systems should be taken into account and aligned (also with other regions). According to this, different pilot production and demonstrators (shared facilities) could be established or existing ones

strengthened. Most important is that they need to be demand driven. Therefore, it is important to consult the involved stakeholders and shared facilities for pilot production.

A very important issue for shared facilities for pilot production is that they need to be product oriented and downstream industry needs to be involved with the clear aim to bring products to the market. They should be usable for small volume production of qualified products, taking into account the specifications of customers. It is also relevant for vertically integrated pilot productions (along the value chain, e.g. Infineon) to involve customers, which was mentioned to be sometimes neglected.

An interesting example was given with respect to the development of Microsystems: Initially a lot of technology push was fostered by policy not leading to a successful market introduction. Only after competence centres for applications together with the downstream industry, e.g. the automotive industry, were established and market introduction and pull were supported, microsystems entered the market.

With respect to established clusters, it was mentioned that a shared pilot production facility can be integrated in such an existing network as a clearly defined element in a bigger network.

It was also stated that shared facilities for pilot production have a role for SME and large enterprises. VTT for example has a shared pilot plant for chemical production and it fulfils different purposes for the customer. For instance SMEs can use it as a production unit, whereas large enterprises use it for testing of processes. A problem is how SMEs can get funding in the beginning of a project and voucher systems were proposed. In order to be successful, shared facilities also have to serve a portfolio of SMEs to have enough impact.

Regarding the differentiation between shared facilities and private pilot production lines, the question was raised whether both are needed and if a policy for the different kinds of business model differs fundamentally. The consensus was that policy is not fundamentally different with respect to vertically and horizontally (shared) integrated pilot production.

A large part of the discussion focused on the role of innovative SMEs and how they can be stronger engaged in pilot production projects. It was reported that SMEs often need administrative support (management and financing), when it comes to bringing a technology to the market. Therefore, support for SMEs shall include help in administrative issues to create the design of an organisation and define a small but important eco-system. The idea of SME networks with joint management/administrative units and the involvement of final users was raised. The Belgium "made different" was mentioned, which supports and consults companies in crossing the valley of death and can be seen as a "one-stop-shop" consultant that also accompany SMEs in becoming part of a bigger picture. It was also raised that SMEs especially need legal support and support for IP protection.

With respect to IP regulation and how it can be established in eco-systems, a model used in ENIAC projects was mentioned, where within a consortium sub-groups are established that share IP without sharing it with the whole consortium. ENIAC provides standard templates for that.

Finally, it was mentioned that any instrument to support an eco-system needs flexibility in terms of changes in the consortium and redirection. And, to create value in Europe, a commitment is needed so that the result of a pilot production project, i.e. the full production, is established in Europe.

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### Session 3: “Market complexity: Pilot production for the verification of applications (Demonstrators)”

What role does market related policy measures play for pilot production and how should the look like?

*Chair: Olof Sandberg, Chief Strategy Officer responsible for strategies and financing as well as international cooperation at RISE Research Institutes of Sweden AB.*

*In 2013 RISE together with Vinnova developed a strategy to increase the accessibility of Test and Demonstration facilities at the RISE institutes, in particular for SME*

#### Main points of the discussion:

- There was a split between market fundamentalists and interventionists. The former plead for leaving market articulation activities to the companies; the latter opt for supporting companies in finding a market.
- What is a KETs market? Manufacturers of KET based products or end user markets?
- It has been disputed if public authorities should support companies in gathering market information.
- In general it has been endorsed to support technology companies in finding a first customer and market and articulate what a product could look like.
- A question has been raised, what part of technology deployment should happen in Europe and what in the rest of the world. Again the overall target has been underlined to keep activities in Europe.

#### Discussion in detail:

For technology companies it is often difficult to be aware of target markets. Innovation networks or incubators can support them to find key customers all over Europe. Moreover, specific funding mechanisms should support such elaboration of market opportunities. But, generic market data appears of minor importance than concrete and personal communication with market actors.

Public authorities should not fund market studies directly. There already exists a well-developed market for this kind of intelligence, which should not be destructed. But, companies can be supported with a kind of a voucher scheme to buy such information and to foster an understanding of potential markets.

In order to overcome critical perceptions of KETs like Nanotechnology, a communication strategy for technologies is needed. Ethical issues should be addressed and publically discussed.

Today, KETs-funding is covered by Horizon 2020, whereas within European Innovation Partnerships like Active and Healthy Aging target applications are fostered. With a new kind of funding approach, the linking of product developers and KET-communities would be of help. Aim of these supply chain projects should be product validation and demonstration.

To use public money to elaborate a market makes no sense as this is an originating task of companies. With regards to markets, funding agencies should have rather a supporting than a driving role. But, public money should be invested to reward companies if they decide in the favor of a value chain partner in Europe and not in a third country. EU funding should help to do business in Europe rather than elsewhere.

There is an ongoing policy competition worldwide. A strategy should be developed how to anchor actors and processes in regions, countries, or in the EU. The wording “anchoring” should be promoted for this activity.

In general it can be stated: Technology based developments usually requires more than five years; market oriented developments are implemented in less than five years. Thus, technology based development is rather to be supported than market oriented development.

In general markets are driving all kind of developments. Without markets there is no business. Decisive for success is the thinking on behalf of the customer.

In the KETs arena, the problem is that a KET product is often still far away from the end user’s market. Technology-market projects would have to cover a long value chain, when they should test an end user application. To make things even more complicated, the KETs product is deployed rather in a value network than in a value chain. There is nothing like “One technology for one product”. However, to support the match of the supply chain in general would be valuable.

The basic aspect behind the “valley of death” is that an invention does not find an application. Thus, an application specialist is needed to make an invention becoming an innovation. However, the risk sharing has to be reconsidered and the application specialist should also take some of the technology risk.

Currently, public money is often claimed for pilot production financing. But, crowd funding could be a sound alternative. This is in particular, as KETs based products often provide solutions for societal challenges, which might appeal private investors.

It has been disputed if crowd funding is suitable for B-to-B activities like pilot production activities.

## **Panel discussion**

**Objective:** Discuss pilot production support with the panel and allow questions from the audience.

The panel discussion was guided by the chair of the day, Thomas Reiss from Fraunhofer ISI. The panel reflected a mix of various stakeholders, including policy makers, representatives of RTOs and from industry. The participants of the panel discussion were:

**Gavino Murgia:** Deputy Head of the Unit “E/4 Key Enabling Technologies and Digital Economy”, European Commission, DG Enterprise & Industry; and project officer of the mKPL project

**Manfred Kircher:** Chairman of the Advisory Board, Cluster Industrielle Biotechnologie CLIB2021, Germany, and member of the steering committee of the mKPL project.

**David Billon Lanfrey:** Vice president of R&D, technology and products, Sofradir, mid-cap company, manufacturer and developer of advanced IR detectors, France. Sofradir is one of the mKPL demonstrators.

**Walter Nadrag:** President, Sico, SME, manufacturer of quartzglass, silicon and ceramics for various industries that include semiconductor, optical, automotive and aerospace. Active in EPT300 project (Infineon demonstrator)

**Dr. Martin Pfeiffer:** CTO, Heliatek, SME, developer and producer of organic photovoltaic films, Germany. Former spin out of Universities Dresden and Ulm, currently doing pilot production in Dresden

**Mathias Rauch:** Director, Fraunhofer Brussels Office (since 2014), before that: seconded national expert for the European Commission.

**Peter Eriksson:** Chief Strategy Officer, Operational Development Division, VINNOVA, Swedish Innovation Agency. With the programme VINNVÄXT Sweden is one of the first European countries which has launched a specific activity for pilot production. Focus of the programme is biotechnology and photonics.

**Maurits Butter:** Senior scientist at TNO and scientific coordinator of the multi-KETs pilot lines project.

Within the one hour panel discussion pilot production and the related support will be discussed. Some aspects from the earlier programme were reflected against the background of the experiences of the experts. The audience was invited to address any open issues or questions related to the topic.

### Summary of the discussion

The first question raised by Thomas Reiss was: Why is public money for pilot production a good investment? What is in for the tax payer?

- Looking at SMEs, pilot production is a large investment, which is hardly bearable. Therefore a support for pilot production facilities is needed.
- In order to not waste the money spent for R&D support, companies need to be enabled to get the technologies supported in R&D to the market.
- SMEs and companies create jobs and therefore the money is well invested and returned to the tax payers.
- Start-ups nowadays in particular focus on licensing and then selling the IP, which is not very sustainable. In order to have production in Europe, start-ups also need to enter into production. However, there is a funding gap and the free market does not provide the money needed for that. Thus, policy needs to intervene to help companies get the venture capital needed.
- A pre-condition for funding and a rationale is that downstream industries that can take up the technologies and are enabled by the pilot production are in Europe.
- KET industries compete in a global arena and there is a competition of support between the countries. Companies need to be anchored and need to find local resource and networks to have incentives to stay in Europe for production. For SMEs, sharing of infrastructure and

resources is needed. Finally, time is important and public support can help to speed up solutions. This all calls for a concise policy for pilot production.

- Public funding reduces risks and allows companies to get additional money for innovation. Multi-KET pilot production activities furthermore stimulate innovations in broader areas.
- The context of pilot production support is technological innovation, which is needed to stay competitive. There is a market failure of the “valley of death”, which calls for intervention beyond borders and thus on European level.
- Audience: There is an issue that policy makers do not understand technology and as such, so they do not understand the need for support and pilot production.

The second question raised was: Which elements are important for a successful pilot production support (e.g. by means of beneficiaries, EU/national/regional level or KETs)?

- SME aspects are important as well as lighthouse projects.
- Pilot production needs to be seen as part of innovation chain of a region (e.g. BBEPP in Gent region, globally leading chemical cluster). It is thus important that the KET pilot production in the right region with supply and/or demand actors.
- Focus is needed on few champions in Europe that can compete worldwide (independent of nationality).
- Product development is not always straight forward and failure or restart need to be allowed.
- Every industry/KET is different (and very complex). Open access is not always possible. Help should especially focus on champions.
- With respect to KETs, the enabling part should be strengthened. KET suppliers shall involve integrators as early as possible. RTOs can play a facilitating role.
- It is important to build on strength; all actors need to be concerted (triple helix of companies, RTOs, policy).
- Alignment of policies is essential. Innovation is like a relay game (e.g. Ohio “be connected”) and policy has to cover that. Besides, shared facilities seem an appropriate element with broad impact.

The third question raised was: What policy is most important to be approached in short term? What is especially urgent?

- Improve and acknowledge the role of pilot plants in attracting investors and investments, because PPA helps to assess cost structures and provides samples for testing and allows a better risk assessment. It shall not focus too much on education and entrepreneurship.
- Mapping of technology clusters is important to allow for better decisions for funding
- Invest money into venture capital (corporate VC). Make sure whenever venture capital is invested, that it is complemented by public support, to allow the money to be acquired and the investment to be done.
- Focus on high value (low volume) markets (mid-caps and SME)

- Enhance existing measures, e.g. develop access to existing shared facilities for pilot production and improvements
- Foster alignment and coordination of policies. Short term effects can be generated through the support of angel funds (that usually invest in earlier phases of the innovation chain)
- Policy for the use of regional funds in innovation (100-120b€!) needs to be put into place and made operational. Regions need to be convinced to use the money for innovation and to not compete. The industry is also part of the game and needs to take risks too.

After that, questions and comments from the audience were allowed.

- Comment: There are business models needed, how results from shared risk projects can be shared and how business can be created from different actors (eco-systems of SME and large enterprises)
- Question: How is the mKETs discussion related to green growth and green jobs?
  - A study is needed on impact of mKETs on green growth and jobs
  - Put a real prize on CO<sub>2</sub> and non-abundant materials. That will trigger green innovation.

## Key messages - Conclusions

In summary, it was a very interesting conference with very good discussions and many participants. The conference clearly showed and provided evidence that multi-KET pilot production activities are a key factor for crossing the valley of death.

It became also very clear that pilot production is not only about technology, process, production, but also about cooperation/interaction, organisation, coordination and people. In other words, pilot production is embedded into the systemic character of innovation. Besides that, the term pilot production is not understood in a similar way by each stakeholder. Some rather see it as shared facilities only, some rather as pilot production in companies. It has to be emphasized, that pilot production can indeed happen in both ways and is neither only one nor only the other. In some cases, open access and shared facilities are no option for pilot production, because the equipment needs to be too specific. A successful policy on pilot production support should take into account both types.

The four main barriers which have to be overcome are the access to financial capital, the quality of the innovation ecosystem, the limited market articulation-demand, and the availability of human capital.

Roadmaps on technology and product should be clear and shared by all stakeholders. It is important to find the right balance between technological push and market pull, which is especially important for the technologies requiring a long time development. Additionally, the complete process from the research to the production should be considered by setting up a stage gate process covering the whole development from the research to the production.

Furthermore, pilot production is versatile and complex and there is a broad variety of pilot production depending on technologies, processes, markets, competition, actors and regional

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settings. This clearly implies that policy towards supporting multi-KET pilot production activities needs to be really flexible and systemic.

The suggested policy strategies for the European Union are mainly the coordination and alignment of policies in order to generate faster, more flexible, more agile and more aligned policy process. Additionally, the direct co-finance of pilot production activities, the development of crucial meta market-information, and the enhancement of skills and capacities of SMEs would be important. Policy should support brokerage and bring together industry and research by supporting training and education.

To conclude, public support for multi-KET pilot production activities indeed is an important element of a roadmap to jobs and growth in Europe.

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