mKETs-PL working document

Country report Poland

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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-Cambridge enterprise
- VTT
- Tecnalia
- Technology Partners Foundation
- Joanneum Research Austria
- D'Appolonia S.p.A
- Strauss & Partners
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Content

1. Policy perspective

1.1. Country specific innovation system with emphasis on KET

There are several schemes that support R&D efforts in Poland. They are of a general nature and are not designed specifically for mKETs development. Two ministries are responsible for the schemes – Ministry of Economy (via PARP – Polish Agency for Enterprise Development) and Ministry of Science and Higher Education (via NCBR – National Centre for Research and Development and NCN – The National Science Centre).

PARP is a government agency that has been providing support to entrepreneurs in the implementation of competitive and innovative projects for over 10 years. The primary objective of PARP's activity is to develop the sector of small and medium-sized enterprises in Poland. To support entrepreneurs, PARP uses the funds from the State budget and European Funds. In the 2007-2013 financial perspective, the Agency has been responsible for the implementation of measures under three Operational Programmes: Innovative Economy, Human Capital and Development of Eastern Poland.

One of the key tasks of the Polish Agency for Enterprise Development is to support export, including strengthening of the competitive position of Polish enterprises on foreign markets and making it easier for small and medium-sized enterprises to get in touch with foreign companies in their business. To that end, PARP offers Polish SMEs an opportunity to participate in economic missions organised around the world, cooperative exchanges and fair events. Furthermore, Enterprise Europe Network operating under PARP provides an opportunity for the entrepreneurs seeking foreign partners to publish their company profile in the Cooperation Offers' Database accessible by approximately 600 network units in Europe and around the world. Moreover, Enterprise Europe Network offers comprehensive services covering information, training and counselling measures mainly in the field of European Union law and policies, business activity in Poland and abroad, access to sources of financing, internationalisation of enterprises, transfer of technologies and participation in EU framework programmes.

The National Centre for Research and Development (NCBR) is the implementing agency of the Minister of Science and Higher Education. It was appointed in the summer 2007 as an entity in charge of the performance of the tasks within the area of national science, science and technology and innovation policies. When it was founded, it was the first entity of this type, created as the platform of an effective dialogue between the scientific and business communities.

In addition, the National Centre for Research and Development extended its activity with new initiatives and possibilities on 1 September 2011. Assigned by the Ministry of Science and Higher Education the function of the Mediation Institution in three operational programmes: Human Capital, Innovative Economy and Infrastructure and Environment, the Centre became one of the greatest innovation supporting centres in Poland.

The national treasury and the European Union fund the activity of the Centre.

ARP (The Industrial Development Agency) is a State Treasury company with unique scope of powers and responsibility. As a commercial company, it functions according to commercial principles, is characterised by a modern organisational structure and is an active player on the Polish capital market. Since at the same time it is a government agency, it undertakes tasks important for the state's current and long-term economic policy objectives.

ARP's mission is to create innovation-supporting solutions to increase the competitiveness of enterprises. It supports actions promoting investment in a knowledge-based economy, making use of the creative potential of Polish industrial human resources, and promoting cooperation between industry and the research and development sector. This is one of the most important elements of the Industrial Development Agency Development Strategy for 2012-2015.

Based on its 20 years of experience, ARP S.A. supports Poland's economic and regional development and restructuring and privatisation processes. The Industrial Development Agency has a record of successful cooperation with foreign partners, acquiring investors for the special economic zones it manages and entrepreneurs interested in the privatisation of the Polish economy.

The National Science Centre (NCN) is a government executive agency set up to fund basic research. The NCN was established by the Act on the National Science Centre, which came into force on 1 October 2010. The activities of the NCN are supervised by the Ministry of Science and Higher Education. Basic research is original experimental or theoretical research work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct practical application or use.

NCN funds basic research in the form of research projects, doctoral fellowships and post-doctoral internships, research projects carried out by experienced researchers aimed at implementing pioneering research important for the development of science, research projects outside the scope of research funded by the National Centre for Research and Development.
Additionally NCN supervises the implementation of the above mentioned research projects; fosters and monitors the funding of basic research funded from outside the state budget; participates in international cooperation in financing basic research; its other tasks include the development of research programmes that are important for national culture.

One of the priorities of the Centre is to support and develop the scientific careers of pre-doctoral and doctoral researchers starting their career in research (up to 5 years of experience since the PhD award).

1.2. Organisation of mKETs policy

The main drivers for multi-KETs match making activities in Poland are scientific institutes and their commercial spin-offs. Examples of such institutions are The Institute of High Pressure Physics Unipress with its Top GaN spin off, The Institute of Electronic Materials Technology with spin-off company Epi-Lab. Worth mentioning is also a stand-alone company called Ammono (the world leader in truly bulk Gallium Nitride (GaN) manufacturing).

No fixed scheme for the mKETs development projects is defined in Poland. Some sector activities are supported on a case by case basis. The basic condition for the state participation in the development of such project is industrial partner's commitment to cover 50% of the R&D cost. Good example of such activities are the R&D partnerships between KGHM (global producer of copper and silver) and Institute of Non-Ferrous Metals in the area of advanced materials and between Azoty Group and The Institute of Electronic Materials Technology in the area of nano-materials (mainly graphene manufacturing technology and applications).

Legal Environment
There is no legal framework defining public support for R&D efforts in the area of multi-KETs. Scientific institutions may apply for funding to the organizations listed in section 1.1 above. Tax incentives for companies' R&D spending are too complex to apply. If however applied, Inland Revenue in many cases questions their legitimacy.
One of the interviewers mentioned several organizational and legal dilemmas, which need to be addressed in the near future. The dilemmas relate to several areas:

(i) Maximum allowed by the EU amount of public support for private companies is considered to be too little. It is suggested that for the 2014-2020 financing period, public financing be raised to 70%.

(ii) The responsibility for public support of R&D efforts is spread across several institutions each reporting to different ministry in the government. This causes certain co-ordination challenges and duplication of efforts.

(iii) Public budgets that support R&D spending are served on regional and central levels causing another co-ordination challenge.

Mentioned above co-ordination and organization challenges lead to disintegration of the strategically defined efforts, overinvestment in some areas and underinvestment elsewhere.

1.3. Main policies for Pilot lines

With one exception, there are no formal programmes or institutions that address public support of pilot lines. The exception is related to supporting the development of technologies for shale gas extraction and pilot line testing.

Within the general scope of R&D support organizations may apply for financial grants. Industrial entities investing in innovative technologies (eg. purchase of the production line) may receive a subsidy until 2014. From then on, subsidies will be replaced with low interest loans. Four major institutions (PARP, ARP, NCN and NCBR) reporting to the Ministry of Economy (PARP, ARP) and Ministry of Science and Higher Education (NCN and NCBR) manage funds designated to the scientific research. Institutions organize programmes such as "Demonstrator" which finance prototype design and production.

PARP grants support under European Union and State budget co-financing. The total budget of the Agency for the implementation of operational programmes for 2007-2013 amounts to over EUR 7 billion. From this amount, most funds fall for the implementation of measures under the Operational Programme Innovative Economy (OP IE) – EUR 3.9 billion, followed by the Operational Programme Development of Eastern Poland (OP DEP) – EUR 2.67 billion and the Operational Programme Human Capital (OP HC) – EUR 672 million.

Sample programmes initiated by NCBR include the following:

- National Centre for Research and Development – R&D financing arm of Ministry of Science and Higher Education has developed several initiatives for financing R&D projects. One of the initiatives is called "Demonstrator+" and its aim is to provide up to 500 mln PLN (125 mln EUR) on top of 330 mln (82 mln EUR) provided by applying industries within the 4 years time frame until 2016. New undertaking aims at enforcement of research result transfer to economy via supporting activities related to elaboration of new technologies or products including testing and demonstration. Financing of single project may not exceed amount of 100 mln PLN (25 mln EUR). The undertaking is focussed on supporting:

  (i) Large and integrated R&D activities oriented on research results commercialization covering all phases from scientific research to innovation product or technology tested on pilot/demonstration installation.
  (ii) Construction of pilot/demonstration installation to be used for testing new technology solutions elaborated in research organization or companies.

  Target addressees are entrepreneurs, research organizations and scientific consortia with entrepreneurs. The final deadline for applications is 2 May 2013.

- The strategic research and development programme called Advanced Technologies for Energy Generation was launched to develop technological solutions the implementation of which would reduce a negative impact of the energy production sector on the natural environment. Those solutions shall enable the reduction of pollutant releases to the air and meet the European targets set up in the so-called 3x20 Strategy (improvement of the energy effectiveness by 20 %, increasing the share of renewable energy up to 20% and reduction of CO_2 emissions by 20% in total in the EU by 2020, in relation to the year 1990). Results of this programme shall be of great importance to the implementation of scientific research results and coal-based technologies – the main Polish fuel resource – and technologies based on other primary energy sources available in Poland.

Within the framework of this program, the National Centre for Research and Development spent close to PLN 300 MM on 4 different research tasks, the implementation of which started in 2010 and will end in 2015.

- The director of the National Research and Development Centre announces call for proposals within the framework of the GRAF-TECH Programme. The programme is addressed to the scientific consortia (a consortium has to consist of at least one scientific unit and at least one entrepreneur) and industrial-scientific centres undertaking research activities and preparatory work connected with implementation and aimed at elaborating innovative graphene-based products.
  The main aim of the GRAF-TECH Programme is increasing the innovativeness of Polish economy through practical use of results of research on graphene aimed at elaboration and implementation of innovative solutions based on the use of this material.
  Call for applications will last from 5th of April until 4th of June 2012.

Polish government is going to put forward a proposal to relax maximum EU funds involvement in the 2014-2020 period from 50% to 70% in commercial projects.

Government is supporting and an initiative for subsidised joint ventures between public scientific institutions and industrial sector. Industrial partner is required to participate with 50% funding. In order to foster further product development and commercialization, this initiative insists on intellectual property rights be transferred to the industry.

Examples of public policy in practice:

KGHM – large copper mining group with significant state shareholding, in co-operation with universities sponsors students' foreign internships. Another state owned conglomerate – Grupa Azoty – one of the largest European producers of fertilizers - funds pilot line development for graphene manufacturing on industrial scale. The beneficiary of funding is ITME, The Institute of Electronic Materials Technology.

NCBR promotes an initiative to co-fund R&D projects together with industry. Commercial partner defines strategic goals and is required to provide 50% of capital. Potential areas to start with are – shale gas extraction and aircraft industry.

Considering low practical and market experience of highly educated scientists, some universities and scientific institutes introduced regulation, which requires industrial experience from the candidates before granting them professorial title in exact and technical sciences.

Table 1: Classification of policy measures and examples

A. Policies for knowledge base support 1. Funds dedicated for specific programmes 2. Scientific research grants 3. State funding of students' foreign internships	**B. Policies for commercialisation support** 1. Equal matching of the investment if demand and financial commitment for R&D comes from the industrial entity. 2. R&D tax credits
C. Demand oriented polices 1. Voucher schemes	**D. Legislation** 1. Intellectual property rights are transferred to the funding commercial organization.

2. Business perspective

2.1. Implementation of multi-KETs pilot lines

There is virtually no initiative for the mKETs pilot lines lies within state area of responsibility and scientific institutes. These initiatives should serve as a platform for co-operation between various scientific institutes or between commercial partner and a scientific organization. In very few cases, state owned companies fund R&D work closely resembling pilot line projects. They originate from political involvement, rather than company's strategy.

At least four government-controlled institutions manage R&D budgets. Over 60 scientific institutes compete for the funds, sometimes in partnership with companies. State budgets are served on regional and federal branches, which adds to the administrative complexity of the system. Such fragmentation causes co-ordination and organization challenges which lead to disintegration of the strategically defined efforts, overinvestment in some areas and underinvestment elsewhere.

Some regional centers of excellence evolve and they concentrate demand for state support. Good example is aircraft industry in southeastern Poland. The concentration does not influence competitiveness. Since the industry is so wide that companies specializing in their own fields (eg. engine turbines) co-exist with others who specialize in another (eg. chassis) while all of them supply major worldwide aircraft producers.

In some interviews CONTINUITY of the project was mentioned as a key success factor. It is important that the state controlled financing body maintains interest in further development of research up until the commercialization stage. Otherwise projects risk being put on a shelf and the final report "ticks them off as an item on a purchasing list in a supermarket". Continuity may also help to identify and develop a project in another area. Good example identified during one of the interviews was the development of new SiC technologies in nano- and micro-electronics, which contributed to the epitaxial method of graphene production in nanotechnology.

Scientific institutes are organized around and focused on very narrow scientific subject. This high specialization "successfully" keeps single institute off the market development track. Hence any market oriented initiative has to probe single technologies from various places by negotiating each party's own interest in order to obtain financing for the development of new product. On the other hand each Institute keeps their "own" R&D infrastructure, labs and know-how, which very often duplicates efforts of their "competing" counterparts.

Similarly to institutes, universities are also highly specialized. Their educational offer does not match market demand. Students do not have a choice between varieties of subjects taught at different universities. Therefore, the final "product" – the graduate – does not fit into what contemporary high-tech employer might be looking for.

The solution for the dispersed science and educational centers would be their clustering based on complementary criteria, not similarity. Similarity causes unhealthy competition while complementary specializations deliver new value. "Enrichment through diversity" seems to be the right expression in this case.

2.2. Evaluation of KET policies/KET innovation eco-System

It is hard to point at a single entity or a group that has particular interest in developing pilot lines for multi-KETs. Industry is rather short-sighted with its short term financial targets set by the shareholders, scientific institutes do not have marketing know-how and resources to envision production technology development into a massive scale production, while politicians focus mainly on road infrastructure development and large spectacular construction projects.

Multi-KETs projects apply for financing via general R&D schemes available through mentioned earlier institutions such as PARP, ARP, NCN and NCBR. The schemes do not address particular technological details of the R&D with relation to KETs or multi-KETs. The applicants are required to present general benefits of the suggested research and they do not get extra points for involving advanced technologies.

Major issue in the development of multi-KETs pilot lines is lack of industrial pull and no long-term strategy for the applications of new technologies.

The other obstacle is lack of cross-competence between specialists in their fields – highly educated professor lacks industrial and marketing expertise while top executive does not have knowledge base required to comprehend complexities of the technology. Certain pride in ignorance about the other field can be observed.

3. Conclusions

3.1. Summary of policy perspective

At least four government-controlled institutions manage R&D budgets. Over 60 scientific institutes compete for the funds, sometimes in partnership with companies. State budgets are served on regional and federal branches, which adds to the administrative complexity of the system. Such fragmentation causes co-ordination and organization challenges which lead to disintegration of the strategically defined efforts, overinvestment in some areas and underinvestment elsewhere.

We recommend higher concentration of funding institutions as well as better regional co-ordination between various entities that grant funds for R&D.

3.2. Summary of business perspective

The situation of Poland in key technology development and implementation is far from satisfactory. There is a significant technology gap with the world's most developed economies and highly industrialised European states in this area. It is due to a number of factors, mainly related to the common features of such technologies, which are characterised by:

(i) very high R&D intensity and the consequent need for highly-qualified specialists,
(ii) short innovation cycles,
(iii) high capital outlays,
(iv) a high degree of business risk.

Compared with global players, Polish enterprises are still financially weak. For this reason, they avoid undertakings that – although promising – carry a high degree of risk. It is very difficult to find external funding sources for new commercially untested technical ideas. Our VC funds' and business angels' assets are relatively limited, and hence their policy for capital involvement is extremely cautious. Banks demand guarantees in the form of assets which most small and medium entrepreneurs do not possess. Guarantees in the form of ceding IPR are usually not accepted.

At the same time, the circumstances under which KET development is occurring are favourable for Polish business, which is characterised by significant capital and ownership dispersal. In certain KETs, large Polish enterprises are practically unrepresented. Observation of the world market of the products made based on these technologies shows that they possess a very large number of niches. Many new ideas using the potential and production flexibility of KETs appear; their market potential may be insignificant to global enterprises but for SMEs they may represent extremely promising opportunities.

One of the market segments related to KETs that is interesting to Polish SMEs is supplying large enterprises. Due to the high diversity of KET-based materials, elements and components, large enterprises cooperate with a large number of specialised sub-contractors, limiting their activity to practically only R&D and assembly of complex products. The production of the individual components is left to specialised enterprises, usually SMEs.

3.3. Recommendations to support pilot lines

In our opinion the most effective government policy for multi-KETs would be to encourage joint ventures between public scientific institutions and industrial sector. Industrial partner would be required to participate with 50% funding. The other 50% would be covered by public funds. In order to foster further product development and commercialization, this initiative should insist on intellectual property rights be transferred to the industry.

Considering low practical and market experience of highly educated scientists, universities and scientific institutes should be encouraged to introduced regulation, which would require industrial experience from the candidates before granting them professorial title in exact and technical sciences.

As a remedy to highly fragmented groups of budget holders and state fund recipients we would recommend concentration of the institutions on both sides of the funds transfer sides. It is important to eliminate ambiguities between governmental institutions and to delegate responsibility for R&D spending to one single entity. Its main task would be to co-ordinate spending having in mind the following criteria:

(i) Joint efforts of COMPLEMENTING rather than competing scientific institutes guarantee better results. Similarity causes unhealthy competition while complementary specializations deliver new value. “Enrichment through diversity” seems to be the right expression in this case.

(ii) SHARED rather than dedicated facilities not only optimize spending but also foster better knowledge transfer and exchange, which results in profitable application of new technology and products.

(iii) Project managers with multi-disciplinary skills covering basic understanding of technology and good business skills should co-ordinate project implementation. The managers should work as individuals independent from industrial and scientific project partners.

4. References

4.1. Literature

1. The Act on the National Centre for Research and Development dated 30 April 2010 (Journal no. 96, position 616)
2. The Act on the Principles of Financing Science dated 30 April 2010 (Journal no. 96, position 615)
3. Regulation of the Ministry of Science and Higher Education dated 17 September 2010 (Journal no. 178, position 1200)
4. Regulation of the Ministry of Science and Higher Education dated 28 October 2010 (Journal no. 215, position 1411)
5. Web sites of NCBR, NCN, PARP and ARP
    a. http://www.ncbir.pl
    b. http://www.ncn.gov.pl
    c. http://www.parp.gov.pl
    d. http://www.arp.com.pl

4.2. Interviews

1	Prof. Krzysztof Kurzydłowski, Director, National Centre for Research and Development	Policy
2	Prof. Jacek Guliński, Vice Minister, Ministry of Science and Higher Education (MSHE)	Policy
3	Ryszard Pregiel, Prof., Polish Chamber fo Commerce for High Techology	Industry
4	Andrzej Jeleński, Prof. DSc., Scientific Manager, Institute Of Electronic Materials Technology	Industry/Policy
5	Konstanty Donimirski, MBA, Partner in Seen Semiconductors	Industry
6	Mieczysław Woch, Ph.D., prof. Institute Of Non-Ferrous Metals, Director for Material Science and Processing	Industry
7	Tadeusz Gancarczyk, PhD, Eng., Program Manager, WSK "PZL-Rzeszów" S.A. (United Technologies Group)	Industry
8	Olaf Gajl, PhD, Information Processing Institute	Industry/Policy

4.3. Pilot lines

Pilot Production	Location	Description	Internet
prototype jet engine part / advanced manufacturing	Rzeszów, PL	WSK, as a member of United Technology Group co-operates closely with passenger jet engine manufacturers. In one of their projects an opportunity arises to develop the prototype engine part to test its physical parameters. Such test on a physical object provides much more reliable and trustworthy data than the theoretically obtained results from the simulation software. Having such opportunity to construct a prototype gives WSK a head start position in a tender for the development project co-ordinated by Pratt & Whitney. The key argument to get an order from P&W for WSK is that such prototype would save total project cost by one billion Euro! However, the R&D cost is significant for WSK and the positive decision to risk 25 million Eur in the prototype before getting the order from P&W would be largely influenced by the availability of public funds.	http://www.wskrz.com
Nanotechnology/ advanced manufacturing	Warsaw/ Świebodzin, PL	A good example of co-operation between industry (Seco/Warwick) and science (Institute Of Electronic Materials Technology) on the development of low cost grafen manufacturing technology.	http://www.ekonomia.rp.pl/artykul/996190.html
Advanced materials	Gliwice, PL	In 2012 the representatives of KGHM Polska Miedź S.A. and National Research and Development Centre (NCBiR) signed an agreement regarding the execution of a joint project concerning the support for scientific studies and development works for the non-ferrous metals industry. Total budget of the Programme: 200 000 000.00 PLN KGHM's share: 50% NCBiR's share: 50% Term of the Agreement: 10 years	http://www.kghm.pl/index.dhtml?category_id=21&lang=en

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