KIS-PIMS

" Knowledge Intensive Services in the Planning, Installation, Maintenance, and Scrapping services (PIMS) for renewable energy production systems "

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D1.3 – MAP OF RESEARCH AND TRAINING CENTRES ABLE OF MEETING KNOWLEDGE / SKILL GAPS

Revision [V1]	Organization	Date & Visa	Due date of the Deliverable
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PP	Restricted to other programme participants (including the Commission Services)	
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2	Motiva Oy	MOTIVA	Finland
3	OSEO Innovation	OSEO	France
4	Agence de l'Environnement et de la Maîtrise de l'Energie	ADEME	France
5	LandesEnergieVerein	LEV	Austria
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EXECUTIVE SUMMARY

Deliverable D1.3 of the KIS-PIMS Project provides a critical analysis of research and knowledge centres able to answer the need of knowledge and skills expressed by innovative PIMS companies, with the aim to find new forms of support for these ventures through technology transfer or expert training.

This objective is pursued following both a top-down (enterprises express their innovation needs) and a bottom-up approach (research centres propose their innovative ideas / technology / knowledge to SMEs). Focusing on this latter typology of innovation transfer mechanism, Deliverable 1.3 presents the results of a survey conducted by the KIS-PIMS consortium in order to identify:

- the main laboratories addressing the PIMS sector in their research programmes on renewable energy,
- the existing training offer aiming at upgrading the skills of the PIMS professionals,
- and innovation support platforms able to sustain the growth of PIMS companies by making available their knowledge / technologies for Renewable Energy services.

For each renewable energy technology D1.3 provides matrix tables showing which centres are willing to make their own expertise available and collaborate with PIMS companies in specific research areas. The overarching picture emerging from this report indicates that enough **renewable energy research centres** in Austria, Finland and France have the capacity to develop customised technological solutions to answer the needs of PIMS ventures by addressing their shortfalls.

Although sevral highly recognised **training providers** are identified and analysed in section 2.2 of this report, the evidence collected suggests that much more training will be needed in the next year to accommodate the demand of qualified human resources in the Planning of new systems, Installation and commissioning, Maintenance/repair and Scrapping of end-of-life RET.

The greatest challenges, which make the opportunities of tomorrow, occur where the service SMEs expressed needs for which neither technological nor training solutions were found. To identify these openings, D1.3 features a section dedicated to **matching offer and demand for technology and training in renewable energy services**.

After 12 months of investigation through surveys and interviews with a wide base of contacts, the Authors of this paper conclude that **a vast unexploited potential exists** in the Countries included in this study **to enhance the collaboration between "solution providers" and PIMS companies**.

GLOSSARY

"BOS" stands for Balance of System. It is the expression used to designate the equipments needed for a RE installation which are not the core technology, e.g. power converter and cables of a PV system.

"EC" stands for the European Commission.

"KIS" stands for Knowledge Intensive Services, meaning services based on science-based and technology-based innovations, process and business model innovations.

"PIMS" stands for "Planning, Installation, Maintenance and Scrap services".

"RES" stands for Renewable Energy Sources.

"RET" stands for Renewable Energy Technologies. Main technologies under scrutiny within the KIS-PIMS project are solar, wind, biomass, small hydro and geothermal.

"RTD" stands for Research and Technical Development and designates the related activities.

"SME" stands for Small and Medium size Enterprise, as defined by the European Commission (see http://ec.europa.eu/research/sme-techweb/pdf/sme-definition_en.pdf).

"WP" stands for Work Package.

TABLE OF CONTENT

INTRODUCTION

This Deliverable refers to Work Package 1 of the KIS-PIMS project, WP aimed at "Assessing the Knowledge and Skill Needs in Support of Innovative PIMS Services for Renewable Energy Sources".

In particular, this Deliverable addresses the objectives of project Task 1.3 "Mapping of public and private research laboratories and business partners capable of helping ventures meet some or all of the knowledge and skills gaps". By mapping training and innovative technologies providers for PIMS ventures, the project aims at encouraging the adoption of enhanced organisation processes or technological innovations that would guarantee cost reduction for PIMS firms.

Deliverable 1.3 presents the results of a survey conducted by the KIS-PIMS consortium in order to identify:

- the main laboratories addressing the PIMS sector in their research programmes on renewable energies,
- the existing training offer aiming at upgrading the skills of the PIMS professionals,
- and innovation support platforms able to sustain the growth of PIMS companies by making available their knowledge / technologies for Renewable Energy services.

Then, a matching between SMEs' needs reported in Deliverable D1.2 and the identified offers is performed in order to identify the gaps where SMEs' needs are not yet covered by identified competences.

This report has been prepared under the lead of the EUREC agency, relying on the country coordination of ARMINES in France, VTT in Finland and ATB in Austria. Michael Heidenreich, LEV, MOTIVA and TECHNOFI have also significantly contributed to this work.

ANNEX I presents the template that was used by relevant project partners (namely EUREC, ARMINES, VTT, ATB) in order to identify which research laboratories are able to support the growth of innovative PIMS companies through technology transfer.

ANNEX II presents a synoptic table summarising all the significant information gathered with reference to the research centres mapped within the activities of this Deliverable.

ANNEX III presents a synoptic table containing all the significant information related to the knowledge and training providers mapped within the activities of this Deliverable.

The Authors would like to dedicate this report to the memory of Armin Baumgartner (1961 – 2009), a friend and colleague from the Austrian energy agency LEV which committed his invaluable enthusiasm and competences to make of KIS-PIMS a true success story.

1. RESEARCH LABORATORIES IN FIGURES

Within the framework of the Work Package 1 of the KIS-PIMS project, the leading Participant EUREC Agency coordinated the task of identifying and selecting the research and innovation centres capable and willing to engage with PIMS enterprises in knowledge, skills and eventually technology transfer mechanisms.

The collection of data from research laboratories in Austria, France and Finland was conducted over the first year of implementation of KIS-PIMS, in parallel with the PIMS enterprises' markets and needs mapping (tasks 1.1 and 1.2).

Cumulatively, 33 laboratories were identified for having relevant research activities in relation to the PIMS services in the 3 Countries under scrutiny following a thorough screening of research centres effectively able to address the needs and fill the gaps of KIS-PIMS SMEs, both in terms of competences and in terms of available equipment and structures.

The extensive knowledge of the territory, together with the consolidated experience in the fields of innovation and technology brokerage were the key factors enabling the KIS-PIMS participants ARMINES, VTT and ATB (this latter in close co-operation with the other Austrian partners) to successfully accomplish task 1.3 of this project.

The aforementioned participants established individual contacts with each of the centres identified, mainly with the person in charge for knowledge / technology transfer or IPR management, and also directly with research teams and individual researchers. These contacts were first made by a preparatory e-mail, and then followed up with a set of subsequent phone calls. EUREC Agency complemented the data base of KIS-PIMS laboratories with direct involvement of its Member organisations in Austria, France and Finland.

The aim of the initial contacts focused on informing the laboratories about the objectives of the KIS-PIMS project and presenting the added value to the centre collaborating in this initiative. With interested centres, a deeper inquiry about prominent scientific and technical expertise with a potential for transfer to the industry or commercial application was performed. The accomplishment of this task proved to be harder than expected. In most of the cases, the cooperation was only achieved after numerous email and phone contacts and sometimes triggered only by the direct action on-site of KIS-PIMS Participants. The research centres ready to make their knowledge available to SMEs providing PIMS services were few compare to those rather interested in conducting joint research activities, or eventually willing to investigate technology transfer.

As a matter of facts, this highlights the importance of the KIS-PIMS project also as a means to trigger new collaborations between RE service firms and research centres.

The data collected have been classified by RE technology and geographical location of the research centre. This classification is organised in a database (ANNEX II to this Deliverable), which is used as reference information to keep track of the future interactions eventually created between PIMS companies and laboratories.

Figure 1 shows the distribution of research centres by country.

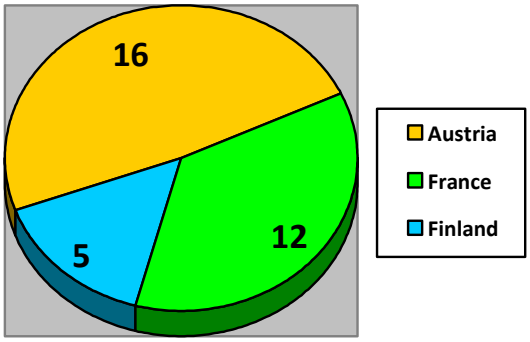

Figure 1: geographical distribution of mapped laboratories

The quantitative heterogeneity in the Austrian amount of data (16 laboratories) compare to Finland and France (5 and 12 respectively) is partly explained with a different structure of the research system (less fragmented in Finland) and partly with a difference in the methodology of data collection. The research centres selected for Finland are highly representative of the best technology and skills providers in Finland, while in France only those laboratories effectively available for a transfer of knowledge and technologies were selected.

The particularity of the Austrian innovation centres is the result of the federal political system. In a study recently published in Austria[1], innovation processes are investigated by using Social Network Analysis (SNA) approach in order to map the existing innovation networks of renewable energy technologies in Styria. Figure 2 represents the example of *"… a network of institutions which collaborate in at least two regional or national funded projects dealing with renewable energy technologies (EU funded projects not included). The most central projects (which connect actors from different regions) all have to do with biomass technologies – mainly biomass projects lead to clustering and critical masses of actors and relations. Two clusters can be identified – a Viennese and a Styrian cluster."*

In general, technology providers SMEs and connecting innovation centres in Austria are interested in further use and integration of the innovative know-how in their future

[1] Anna Schreuer, Christian Gulas and Harald Katzmair (2008): "The Innovation Network of Renewable Energy Technologies in Styria: A Combined Innovation System and Social Network Analysis Perspective"

business but also to maintain and extend the integration components and system set-ups securing the future technical operability. For the applied research partners the main interest can be found in expanding specific knowledge in methodological development, standardisation aspects and further innovative or completely new integration concepts.

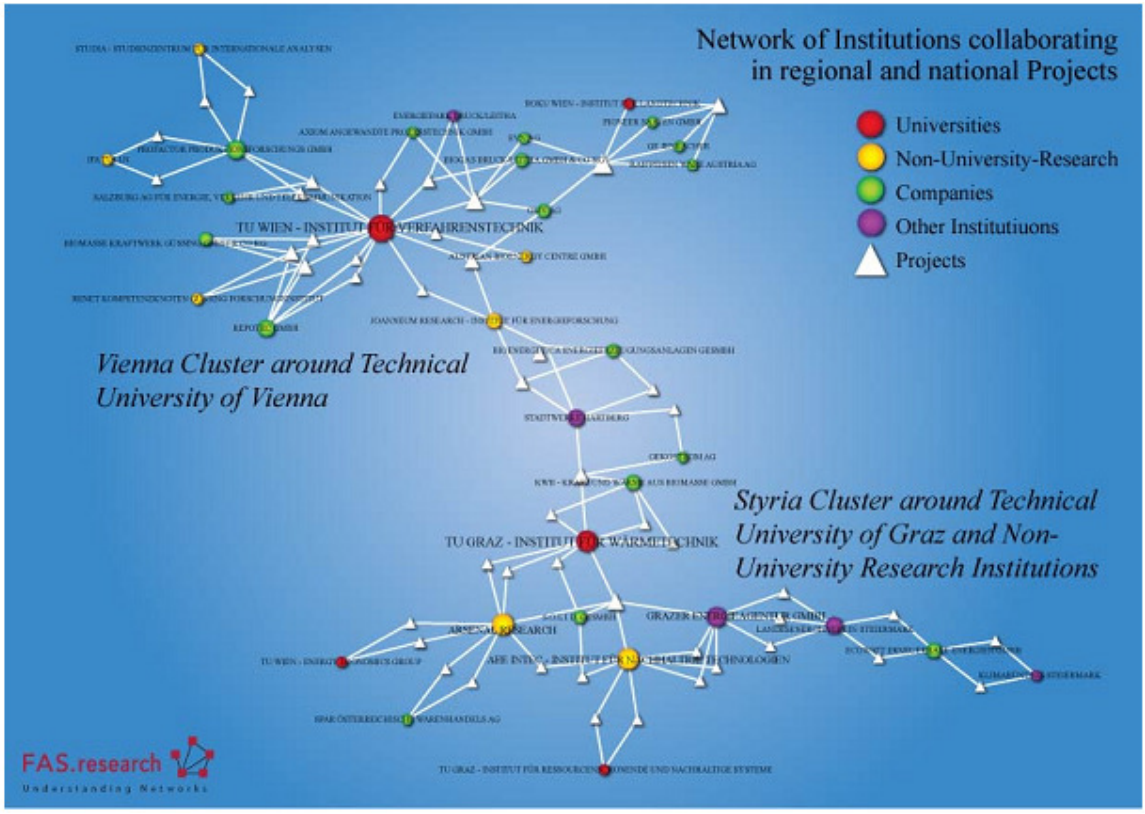

Figure 2: Visualised networks of Austrian co-operations within RET (source: FAS.research)

Besides the scientific aspects, the innovation centres are determined to make the acquired know-how available for exploitation of the results and common consulting support to their relevant clients. This can take place in the form of research/consulting support to the commercial partners, of participation in common contracts or further co-operation in the newly established fields of research.

The research laboratories mapped in KIS-PIMS cover the whole range of renewable energy technologies. Figure 3 shows the distribution of these centres per RE competences and per country:

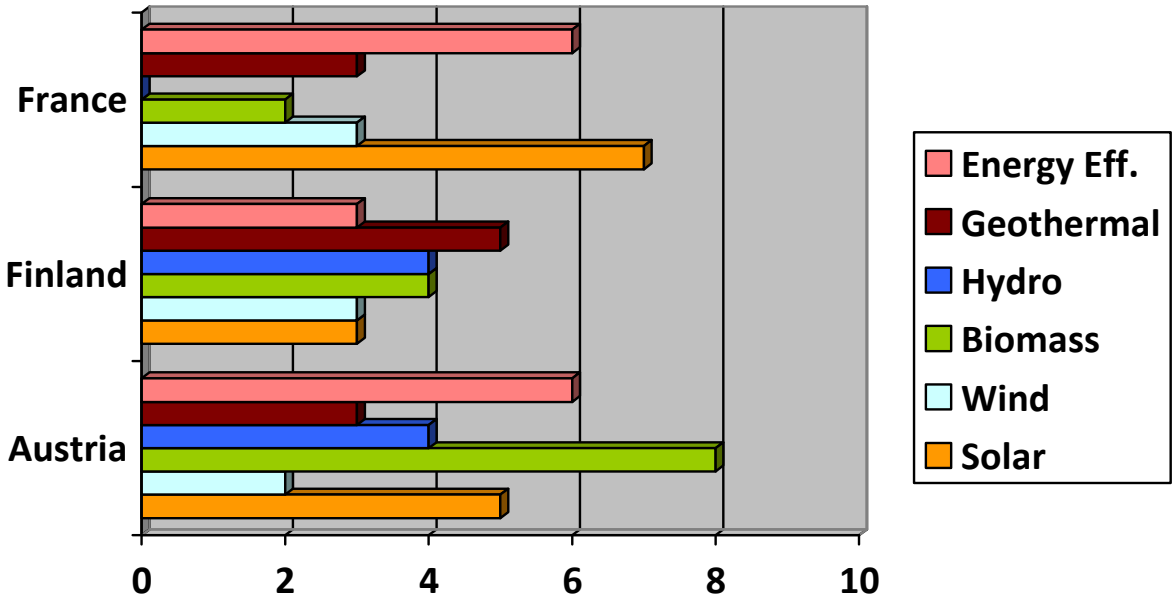

Figure 3: centres distribution per RET competence and per country

Figure 3 shows a predominance of Energy Efficiency and Solar Power among the sector of scientific expertise available at the laboratories for knowledge / technology transfer towards PIMS companies. In Austria and France this tendency is quite marked, with Austria having also an important presence of biomass research centres.

In Finland the picture seems characterized by an overall equilibrium among the scientific competencies available at the national and regional research centres. This result is mainly due to the concentrated multi-disciplinary structure of the research system in Finland, so that a smaller number of research organizations was taken in consideration for Finland compare to the other countries.

2. THE RESEARCH CENTRES' OFFER: TECHNOLOGY, KNOWLEDGE & TRAINING

2.1. Science and technology

Renewable energy technologies have the potential of significant market expansion in the near future if PIMS service companies will succeed in integrating science and technology-based innovations in their operative activities.

The following sections provide the results of the analytic work performed under the KIS-PIMS project to identify for each RE technology the specific areas where enhanced cooperation between PIMS ventures and research centres would lead to the achievement of one or more of the following:

- **reduce costs** at the **component** and/or **system** level;
- **increase the overall performance** of the systems, including aspects of increased and harmonised component lifetimes, reduce losses and maintain performance levels throughout system life;
- **improve the functionality** of the systems, so adding value to the electricity, heating or cooling produced;
- **improve the aesthetics of systems** to be integrated in the built environment and in the surrounding landscape, to win public support for large-scale deployment.

For each RET it was created a matrix presenting which research centres (identified with their ID) are willing to make their own expertise available and collaborate with PIMS companies in specific research areas. The tables which follow offer an original elaboration of the detailed data collected during KIS-PIMS. For the complete analytical information please refer to ANNEX II to this report, where the following data were gathered for each research centre:

- complete name, address and contact details (with names of the relevant contact person);
- research fields of the centre;
- key equipment available;
- specific competences in the PIMS activities;
- skills /technology available for transfer (and favourite transfer mechanism)
- responsible contact person in the KIS-PIMS consortium.

2.1.1. Solar

Photovoltaic Solar Energy Technologies

RET / ID of the centre	Silicon wafer solar cells	Thin-film solar cells	Organic solar cells	Module technology	PV systems design	PV system integration	Lifecycle analysis & recycling
A7							X
A8	X	X	X				X
A9	X	X	X				
A11						X	X
A12							X
A15				X	X	X	
SF1	X	X	X	X	X	X	X
SF2							X
SF5	X	X	X	X	X	X	X
FR1	X		X	X	X	X	
FR3					X		X
FR4					X	X	
FR5					X		
FR6					X	X	
FR7				X			
FR9					X	X	

Solar Thermal Technologies

RET / ID of the centre	Solar collectors	Solar cooling systems	Intelligent control systems	System integration in buildings	Lifecycle analysis and recycling
A5	X	X	X		X
A6	X	X	X	X	X
A7					X
A8	X	X	X	X	X
A9	X				X
A11				X	X
A12					X
A15	X	X	X	X	
SF1	X	X	X	X	X
SF2					
SF5	X	X	X	X	X
FR1	X		X	X	
FR2		X	X	X	X
FR3	X				X
FR4		X	X	X	
FR5			X	X	
FR6	X	X	X	X	
FR8			X	X	

2.1.2. Wind

RET / ID of the centre	Wind climatology and ambient conditions	Improvement in system technology	System integration	Offshore deployment and operations
A8	X			
A16	X			
SF1	X	X	X	X
SF2	X			
SF5	X	X	X	X
FR3	X	X	X	
FR5	X			
FR6	X		X	

2.1.3. Biomass

RET / ID of the centre	Feedstock supply chain	Conversion processes	Combined heat and power (CHP)	District heating	Biogas systems	Lifecycle analysis and recycling
A1	X	X	X	X	X	
A3		X	X			X
A4						X
A5	X	X	X	X	X	X
A7						X
A8	X	X	X	X	X	X
A10	X	X	X	X		X
A13	X	X	X	X		X
A14		X			X	X
A16			X	X		
SF1	X	X	X	X	X	X
SF2						X
SF3					X	X
SF5	X	X	X	X	X	X
FR2	X	X	X	X	X	
FR3		X				

2.1.4. Hydro

RET / ID of the centre	Environmental integration	Intelligent control systems	Hydrological assessment	Electrical engineering
A1	X			
A4	X			
A6	X			
A8	X	X	X	X
A16			X	
SF1	X	X	X	X
SF2	X	X	X	
SF4			X	
SF5	X	X	X	X

2.1.5. Geothermal

RET / ID of the centre	Drilling technologies	Resource and site assessment	District heating	System components	Deep geothermics
A4	X				
A5			X		
A8			X		
A9			X		
A15			X	X	
SF1		X	X	X	
SF2		X			
SF3		X			
SF4	X	X	X	X	X
SF5	X	X	X	X	X
FR2			X		
FR6			X	X	
FR10	X	X	X	X	X

2.1.6. Cross-cutting issues

RET / ID of the centre	Thermal energy storage	Electricity storage	Grid technologies & integration	Energy demand management	Hybrid systems
A1	X				
A2		X			X
A4			X	X	
A5	X	X	X	X	X
A6	X				
A8	X	X	X	X	X
A12			X	X	
A15	X		X	X	X
A16				X	
SF1	X	X	X	X	X
SF4	X	X		X	
SF5	X	X	X	X	X
FR1		X	X	X	X
FR2				X	X
FR3	X		X		X
FR4	X				X
FR5		X	X		X
FR6	X	X		X	
FR7			X		
FR8		X	X		X
FR9		X	X	X	X

2.2. Knowledge and Training

The European Union's concern for climate change and search for green, reliable energy sources is more and more influencing the education offer from universities and training providers. Unsurprisingly, the rapid expansion of the renewable energy industry has put the sector under pressure to find new skilled engineers and qualified technicians.

Across Europe, the shift to a low-carbon economy and the growing importance of the knowledge economy, in particular the diffusion of ICTs and nano-technologies, offer great potential for the creation of sustainable jobs.

In the service sector, there is a clear tendency towards the broadening of the required skills portfolio at all occupational levels, linked to "non-routine" tasks[2]. In the renewable energy service industry, like in many other knowledge-intensive sectors, workers will be increasingly required to have both managerial skills and technical /scientific knowledge.

However, to avoid a human resources shortage that might jeopardise the perspectives of development of the renewable energy technologies and its service industry, it is crucial that potential **workers**, including the younger generations, are **aware of the opportunities associated with the sector**. Information on careers in PIMS services should be provided already at secondary school, before students decide which courses to take, and by employment offices and training centres. This is key step toward a much needed re-qualification of professional profiles such as the plumber or the electrician which play important role in the deployment of renewable energy technologies.

It is also of **primary importance that the demand from PIMS ventures for specialised training and RET-focused skills finds an adequate response from training centres, universities and laboratories.**

Section 2.2 of this report presents an original elaboration of the data collected within KIS-PIMS about the training courses and knowledge offer available to PIMS services providers in Austria, Finland and France. For the complete analytical information please refer to Annex III to this report.

[2] Commission Communication "New Skills for New Jobs - Anticipating and matching labour market and skills needs" - COM(2008) 868/3

2.2.1. Solar

Training and knowledge offer for **Photovoltaic** systems

Training / ID of the centre	Technician & craftsman undergraduate degree	Professional qualification / certification	Post-graduate specialization	Training for end-of life recovery
T-A2	X	X	X	
T-A6			X	
T-A11			X	
T-A12			X	
T-SF1		X		
T-SF4			X	
T-SF7			X	
T-SF13			X	
T-SF14			X	
T-FR1		X		
T-FR2		X		
T-FR3	X			
T-FR5		X		
T-FR6		X		
T-FR7		X		
T-FR8		X	X	
T-FR9	X	X		
T-FR10		X		
T-FR12		X		
T-FR13				
T-FR14		X		
T-FR17		X		
T-FR18		X		
T-FR19		X		
T-FR20		X		
T-FR21		X		
T-FR22		X		
T-FR23		X		
T-FR29			X	
T-FR51		X		

Training and knowledge offer for **Solar thermal** systems

Training / ID of the centre	Technician & craftsman undergraduate degree	Professional qualification / certification	Post-graduate specialization	Training for end-of-life recovery
T-A1		X		X
T-A2	X	X	X	
T-A6			X	
T-A11			X	
T-A12			X	
T-SF1		X		
T-SF4			X	
T-SF7			X	
T-SF14			X	
T-FR1	X	X		
T-FR2		X		
T-FR3	X			
T-FR4	X			
T-FR5		X		
T-FR6		X		
T-FR7		X		
T-FR8		X	X	
T-FR9	X	X		
T-FR10		X		
T-FR11		X		
T-FR12		X		
T-FR13		X		
T-FR14		X		
T-FR15		X		
T-FR16		X		
T-FR17		X		
T-FR23		X		
T-FR24		X		
T-FR25		X		
T-FR28	X			
T-FR29			X	
T-FR31	X			
T-FR51		X		

2.2.2. Wind

Training / ID of the centre	Technicians in operations and management	Health and safety experts	Post-graduate specialization for engineers	Training for project managers
T-A7			X	
T-SF1				X
T-SF4			X	
T-SF7			X	
T-SF13			X	
T-SF14			X	
T-SF15				X
T-FR26	X			X
T-FR29			X	

2.2.3. Biomass

Training / ID of the centre	Technicians in operations and management	Training for installers of bioheat systems	Professional certification / qualification	Post-graduate specialization for engineers	Supply chain and feedstock
T-A3	X	X	X		X
T-A4	X	X	X		X
T-A5	X	X			X
T-A7				X	
T-SF2		X			X
T-SF3			X		
T-SF4				X	
T-SF5	X	X			
T-SF7				X	
T-SF8			X		
T-SF9			X		X
T-SF11		X			X
T-SF12					X
T-SF13				X	
T-SF14				X	
T-SF16				X	
T-FR1	X				
T-FR5		X	X		
T-FR11		X	X		
T-FR15		X	X		
T-FR26	X				X
T-FR29				X	
T-FR46	X				X

2.2.4. Hydro

Training / ID of the centre	Technicians in operations and management	Environmental impact and engineering	Planning and building for civil engineers	Training to electricity specialists
T-A7		X	X	
T-A14	X	X	X	
T-SF4		X	X	
T-SF7		X	X	
T-SF13			X	
T-FR5		X		X
T-FR29		X		

2.2.5. Geothermal

Training / ID of the centre	Technicians in operations and management	Training for installers of heat pumps	Professional certification / qualification	Post-graduate specialization for engineers	Exploitation of resources in depth
T-A2	X	X	X		
T-A7				X	
T-SF4				X	
T-SF13				X	
T-SF14				X	
T-FR5			X		
T-FR27	X		X		X
T-FR28	X	X			
T-FR29				X	

2.2.6. Cross-cutting education and training

Training / ID of the centre	Long duration graduate degrees	Infrastructure management	Energy storage	Energy efficiency and integration in buildings	Relevant training in Socio-economic areas	Finance of RET
T-A4		X	X	X	X	
T-A6				X		
T-A7	X	X	X	X	X	
T-A8	X	X	X	X	X	
T-A9	X	X	X	X	X	
T-A10	X	X	X	X	X	
T-A11		X		X		
T-A12		X	X	X		
T-A13		X			X	
T-SF4	X	X	X	X	X	
T-SF5	X	X				
T-SF6	X				X	
T-SF7	X	X	X		X	
T-SF9	X					
T-SF13	X	X	X	X	X	
T-SF14	X		X		X	
T-FR5					X	
T-FR11					X	
T-FR12	X				X	
T-FR22			X		X	
T-FR26		X			X	
T-FR28	X					
T-FR29	X	X	X	X	X	
T-FR30	X			X		
T-FR31	X					
T-FR32	X					
T-FR33	X	X	X	X	X	
T-FR34	X	X	X			
T-FR35	X					
T-FR36	X			X	X	
T-FR37	X			X	X	
T-FR38	X			X	X	
T-FR39	X	X	X			
T-FR40	X	X	X		X	
T-FR41	X	X	X		X	

T-FR42	X			X	X	
T-FR43			X	X	X	
T-FR44						X
T-FR45	X	X			X	X
T-FR46				X	X	
T-FR47		X		X	X	
T-FR48	X	X		X	X	
T-FR49		X	X			
T-FR50	X	X		X		
T-FR51				X		

3. MATCHING OFFER AND DEMAND FOR TECHNOLOGY AND TRAINING IN RE SERVICES

This section draws the matrix of SMEs' needs versus the technology and training offers in view of identifying the areas where the existing offer and demand do not match.

The main gaps exist where in order the satisfaction of SMEs' needs requires technologies which are not yet existing or not yet developed at commercial stage, therefore new research is necessary. Equally critical are the areas where no SMEs have been identified to acquire and commercialize research and development results. The greatest challenges, which make the opportunities of tomorrow, are the cases where expressed needs (for instance in roadmaps) do not have any industrial carrier and the technology is still at research stage (even fundamental).

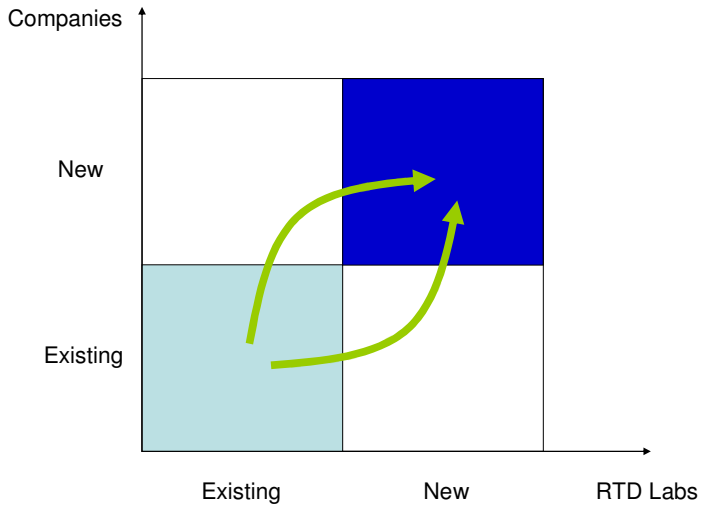

Fig. 4: Knowledge transfer configurations

The tables presented in the next pages show how the specific needs emerged from the research conducted under D1.2 of KIS-PIMS can find suitable solutions in the technologies and knowledge offered by research and training centres mapped in ANNEX II and ANNEX III to this report. For confidentiality reasons, it was not possible at this stage to disclose the names of the service company adopters.

3.1. Science and technology: matching solution providers and service company adopters

3.1.1. Solar

Needs (Photovoltaics)	N. of solution providers	N. of service companies potential adopters
Improvement in cell technologies: - wafer-based crystalline silicon - thin-film technologies - organic solar cells	Austria: 2 Finland: 2 France: 1	Austria: 4 Finland: 1 France: 3
Improvements in photovoltaic module technologies	Austria: 1 Finland: 2 France: 2	Austria: 5 Finland: 5 France: 5
Improvements in photovoltaic systems design	Austria: 1 Finland: 2 France: 6	Austria: 6 Finland: 5 France: 40
Solutions for photovoltaic system integration	Austria: 2 Finland: 2 France: 4	Austria: 8 Finland: 5 France: 100
Lifecycle analysis and recycling	Austria: 4 Finland: 3 France: 1	Austria: 8 Finland: 5 France: 5

Needs (Solar Thermal)	N. of solution providers	N. of service companies potential adopters
Improvements in solar collectors	Austria: 5 Finland: 2 France: 3	Austria: 8 Finland: 5 France: 10

Needs (Solar Thermal)	N. of solution providers	N. of service companies potential adopters
Improvements in solar cooling systems	Austria: 4 Finland: 2 France: 3	Austria: 5 Finland: 5 France: 10
Improvements in intelligent control systems	Austria: 4 Finland: 2 France: 6	Austria: 12 Finland: 10 France: 40
Improvements in system integration in buildings	Austria: 4 Finland: 2 France: 6	Austria: 15 Finland: 15 France: 50
Lifecycle analysis and recycling	Austria: 4 Finland: 3 France: 2	Austria: 4 Finland: 5 France: 5

3.1.2. Wind

Needs	N. of solution providers	N. of service companies potential adopters
Solutions for wind climatology and ambient conditions	Austria: 2 Finland: 3 France: 3	Austria: 6 Finland: 5 France: 10
Improvement in system technology	Austria: 0 Finland: 2 France: 1	Austria: 2 Finland: 5 France: 15
Improvement in system integration	Austria: 0 Finland: 2 France: 2	Austria: 8 Finland: 5 France: 15

Needs	N. of solution providers	N. of service companies potential adopters
Offshore deployment and operations	Austria: 0 Finland: 2 France: 0	Austria: 0 Finland: 5 France: 5
Socio economic independent studies to ease wind energy penetration	Austria: 1 Finland: 1 France: 0	Austria: 8 Finland: 2 France: 10

3.1.3. Biomass

Needs	N. of solution providers	N. of service companies potential adopters
Better understanding and development of the feedstock supply chain	Austria: 5 Finland: 2 France: 1	Austria: 10 Finland: 20 France: 20
Improvement in the conversion process	Austria: 7 Finland: 2 France: 2	Austria: 18 Finland: 20 France: 5
Further development and deployment of systems generating combined heat and power (CHP)	Austria: 7 Finland: 2 France: 1	Austria: 18 Finland: 20 France: 20
Solutions for district heating	Austria: 6 Finland: 2 France: 1	Austria: 42 Finland: 30 France: 20
Improvement in biogas systems	Austria: 4 Finland: 3 France: 0	Austria: 14 Finland: 20 France: 5

Needs	N. of solution providers	N. of service companies potential adopters
Lifecycle analysis and recycling	Austria: 8 Finland: 4 France: 0	Austria: 6 Finland: 5 France: 5

3.1.4. Hydro

Needs	N. of solution providers	N. of service companies potential adopters
Solutions for environmental integration of the plants	Austria: 4 Finland: 3 France: 0	Austria: 12 Finland: 5 France: 15
Improvement in the intelligent control systems	Austria: 1 Finland: 3 France: 0	Austria: 6 Finland: 5 France: 15
Solutions for hydrological assessment	Austria: 2 Finland: 4 France: 0	Austria: 6 Finland: 5 France: 10
Improvement in the electrical engineering of the plants	Austria: 1 Finland: 2 France: 0	Austria: 3 Finland: 5 France: 5

3.1.5. Geothermal

Needs	N. of solution providers	N. of service companies potential adopters
Improvement in drilling technologies	Austria: 1 Finland: 2 France: 1	Austria: 2 Finland: 5 France: 10

Needs	N. of solution providers	N. of service companies potential adopters
Solutions for resources and site assessment	Austria: 0 Finland: 5 France: 1	Austria: 0 Finland: 5 France: 2
Solutions for district heating	Austria: 4 Finland: 3 France: 3	Austria: 15 Finland: 10 France: 10
Improvements in system components	Austria: 1 Finland: 3 France: 2	Austria: 8 Finland: 15 France: 30
Cost reduction and innovative solutions for deep geothermics	Austria: 0 Finland: 2 France: 1	Austria: 0 Finland: 5 France: 2

3.1.6. Cross-cutting issues

Needs	N. of solution providers	N. of service companies potential adopters
Improvement in thermal energy storage	Austria: 5 Finland: 3 France: 3	Austria: 14 Finland: 5 France: 50
Improvement in electricity storage	Austria: 3 Finland: 3 France: 4	Austria: 9 Finland: 10 France: 10
Improvements in the grid network infrastructure and better energy supply management	Austria: 5 Finland: 2 France: 5	Austria: 42 Finland: 15 France: 10

Needs	N. of solution providers	N. of service companies potential adopters
Solutions and innovative devices for the energy demand management	Austria: 6 Finland: 3 France: 3	Austria: 12 Finland: 5 France: 12
Solutions for the hybrid systems	Austria: 4 Finland: 2 France: 6	Austria: 28 Finland: 10 France: 20

3.2. Skills & Training: matching knowledge providers with the needs of service companies

Service sector	Field of Activity	Job profiles for which additional skills and training are needed
Planning	Managing all the tasks related to the development of new RE power plants (planning, permits, construction…)	- Project managers (engineers, economists) to co-ordinate the process; - Environmental engineers and other specialists to analyse the environmental impact of the new plants / installations; - Programmers and meteorologists for resources forecasts and prediction models; - Specialised lawyers and economists to deal with the legal and financial aspects of project development.
Installation	Building the RE power plant (transport of the components, assemblage, etc…)	- Technical staff specialised in RET installation, including (where appropriate) activities in cranes, fitters, nacelles, etc. - Electrical and civil engineers to co-ordinate the building works; - Health and safety experts; - Specialists in the transport of heavy goods, in particular for wind farms and hydroelectric plants; - Electricians with technical competences in RET.
Maintenance	Operation of the RE power plant, regular inspection and repair activities	- Electrical, environmental and civil engineers for the management of the plants; - Technical staff for the maintenance and repairing activities; - Information and communication technologies specialists for the remote control and continuous monitoring of the process (where appropriate); - Financiers, sales persons, marketing people with specialist knowledge of the electricity market (to sell the electricity produced).
Scrapping	End-of-life dismantling, scrap material recycling and valorisation	- Specialists in end-of-life dismantling techniques; - Operators of scrap material recycling technologies; - Technical staff for dismantling & scraping logistics.

Synoptic table: crucial job profiles for which skills and training are needed by different renewable energy services

3.2.1. Solar

Needs (Photovoltaics)	N. of training providers	N. of service companies interested
Undergraduate education for technicians & craftsmen	Austria: 4 Finland: 0 France: 9	Austria: 10 Finland: 5 France: 50
Professional qualification and / or certification	Austria: 1 Finland: 1 France: 19	Austria:10 Finland: 5 France: 50
Post-graduate specialization	Austria: 4 Finland: 4 France: 7	Austria: 6 Finland: 3 France: 20
Training for end-of-life recovery	Austria: 0 Finland: 4 France: 4	Austria: 5 Finland: 3 France: 0

Needs (Solar Thermal)	N. of training providers	N. of service companies interested
Undergraduate education for technicians & craftsmen	Austria: 4 Finland: 0 France: 12	Austria: 15 Finland: 10 France:50
Professional qualification and / or certification	Austria: 5 Finland: 1 France: 22	Austria: 30 Finland: 30 France:50
Post-graduate specialization	Austria: 3 Finland: 3 France: 14	Austria: 10 Finland: 5 France: 20
Training for end-of-life recovery	Austria: 3 Finland: 0 France: 4	Austria: 15 Finland: 5 France: 5

3.2.2. Wind

Needs	N. of training providers	N. of service companies interested
Training for technicians in Operations and Maintenance	Austria: 0 Finland: 0 France: 2	Austria: 4 Finland: 10 France: 15
Training for health and safety experts	Austria: 0 Finland: 0 France: 0	Austria: 4 Finland: 10 France: 10
Post-graduate specialization for engineers	Austria: 1 Finland: 4 France: 9	Austria: 3 Finland: 5 France: 10
Training for project managers	Austria: 1 Finland: 2 France: 3	Austria: 4 Finland: 10 France: 10

3.2.3. Biomass

Needs	N. of training providers	N. of service companies interested
Training for technicians in Operations and Maintenance	Austria: 3 Finland: 1 France: 9	Austria: 40 Finland: 30 France: 50
Training for installers of bioheat systems	Austria: 5 Finland: 3 France: 7	Austria: 40 Finland: 30 France: 50

Needs	N. of training providers	N. of service companies interested
Professional qualification and / or certification	Austria: 2 Finland: 3 France: 5	Austria: 25 Finland: 40 France: 50
Post-graduate specialization for engineers	Austria: 4 Finland: 5 France: 6	Austria: 23 Finland: 20 France: 20
Supply chain and feedstock	Austria: 4 Finland: 4 France: 3	Austria: 30 Finland: 40 France: 40

3.2.4. Hydro

Needs	N. of training providers	N. of service companies interested
Training for technicians in Operations and Maintenance	Austria: 1 Finland: 0 France: 3	Austria: 10 Finland: 5 France: 15
Training for environmental impact experts and plant engineering	Austria: 2 Finland: 2 France: 8	Austria: 8 Finland: 5 France: 15
Training for civil engineers on innovative planning and building concepts	Austria: 2 Finland: 3 France: 1	Austria: 7 Finland: 5 France: 5
Training for electricity specialists	Austria: 0 Finland: 0 France: 4	Austria: 3 Finland: 10 France: 10

3.2.5. Geothermal

Needs	N. of training providers	N. of service companies interested
Training for technicians in Operations and Maintenance	Austria: 1 Finland: 0 France: 11	Austria: 20 Finland: 20 France: 40
Training for installers of heat pumps	Austria: 3 Finland: 0 France: 11	Austria: 35 Finland: 80 France: 40
Professional qualification and / or certification	Austria: 3 Finland: 0 France: 9	Austria: 25 Finland: 60 France: 30
Post-graduate specialization for engineers	Austria: 1 Finland: 3 France: 7	Austria: 1 Finland: 5 France: 2
Advanced training on the exploitation of resources in depth	Austria: 0 Finland: 0 France: 1	Austria: 2 Finland: 5 France: 2

3.2.6. Cross-cutting education and training

Needs	N. of training providers	N. of service companies interested
Long duration graduate education in renewable energy technologies	Austria: 4 Finland: 7 France: 9	Austria: 150 Finland: 80 France: 200

Needs	N. of training providers	N. of service companies interested
Training for the management of energy infrastructure	Austria: 5 Finland: 4 France: 0	Austria: 20 Finland: 25 France: 20
Advanced training on installation and maintenance of energy storage devices	Austria: 3 Finland: 4 France: 0	Austria: 70 Finland: 50 France: 20
Training on energy efficiency and RET integration in buildings	Austria: 8 Finland: 2 France: 5	Austria: 50 Finland: 50 France: 100
Relevant training in socio-economic areas	Austria: 6 Finland: 5 France: 3	Austria: 20 Finland: 25 France: 20
Training and business education specialised in financing of RET	Austria: 0 Finland: 0 France: 1	Austria: 30 Finland: 30 France: 50

4. INNOVATION FACILITATORS

Besides Universities, Research Centres and other scientific and technological laboratories, several publicly supported organisations and private consultancies act as innovation facilitators. They bring their innovation expertise in terms of:

- Technology potential assessment
- Business model evaluation at different scales (Regional, National, European, Worldwide)
- Financing schemes available for each step of the innovation project
- Intellectual Property protection

These Innovation Facilitators have the capacity of assessing and helping to reduce the risks inherent to a project. They have the potential to make SMEs save time and resources. A few key innovation facilitators active in the field of renewable energy technologies are presented hereafter.

4.1. Non-profit and publicly supported innovation intermediaries active in the RE sector

4.1.1. The Enterprise Europe Network (EEN)

The Enterprise Europe Network is the largest network of contact points providing information and advice to EU companies on EU matters, in particular small and medium enterprises (SMEs).

A one-stop shop for EU businesses

Launched in 2008 by the European Commission, the Enterprise Europe Network combines and builds on the former Innovation Relay Centres and Euro Info Centres (established in 1995 and 1987 respectively). The new integrated Network offers a "one-stop shop" to meet all the information needs of SMEs and companies in Europe.

Instruments include business partner search within technology and business cooperation databases and fast access to information on funding opportunities. Individual on-site visits to companies to assess their needs and a broad range of promotion and information material. Representatives of the Network can also help businesses understand EU law,

how it applies to their business and how to make the most the internal market and EU programmes.

The Enterprise Europe Network fully exploits the synergies between all support services and helpdesks aimed at European businesses. The "one-stop shop" service is accompanied by a "no wrong door" policy: an entrepreneur or business actor can enter the Network through any contact point, and will then be assisted and personally directed to the relevant service or organisation.

The Enterprise Europe Network counts numerous Chambers of Commerce and regional representatives of innovation agencies (e.g. OSEO). The Members' list is accessible via internet at: http://www.enterprise-europe-network.ec.europa.eu/network_en.htm .

Exchanging best practices to boost competitiveness and regional excellence

The Enterprise Europe Network offers easy access and proximity to local services for SMEs, thus creating regional business gateways. Regional consortia cooperate to create a coherent support structure for local companies, boosting the region's profile and its competitiveness.

Business actors are encouraged to share, define and disseminate best practices in fields such as innovation, expansion to new markets, enlargement of the client base, improvement of market position, etc. As a result, the Enterprise Europe Network helps SMEs realise their potential in terms of growth and regional job creation.

A two-way street

The Network will also improve the relationship between the European Commission and business. Network representatives will provide the Commission with regular feedback on EU policy, the difficulties SMEs face operating in the EU and the effectiveness of the EU's programmes. All this will help shape EU law that is more business-friendly and will stimulate growth and competitiveness across the EU. The Network is there to support the European Commission and help it to help business.

4.1.2. Energy Agencies

Austria: LEV

LandesEnergieVerein Steiermark (LEV) is the Styrian Energy Agency, probably one of the earliest non-profit-organisation in Austria to promote energy efficiency, the use of renewable energy and measures leading to reductions in energy consumption.

The primary objective of the energy agency is the increase of efficiency of the energy use and the use of renewable, domestic sources of energy in the interest of the regional

development policy, the environment protection and long term effectiveness. LEV is the interface between public administration, policy makers, research and the users of energy. Its activities comprise the technical and organizational support of energy projects, consciousness raising and PR work (exhibitions, publications, conferences etc.), training (expert further training, promotion of research), European cooperation (participation in EU-research and development projects), energy counselling as well as the organization and award of grants.

According to the statutes LEV carried out more than 180 projects, mainly in the field of biomass – descriptions of ecological circles, determination of potentials and development of innovative technologies. Thereby LEV closely works together with the energy commissioner of Styria and the energy department of the Styrian government. One current task is the organization and implementation of the "Network Eco-Energy Styria" shortly called NOEST, which is a one-stop-shop and knowledge base for all R&D projects in the area of renewable energy and energy efficiency.

Finland: MOTIVA

Motiva Oy was established in 1993 by the Finnish Ministry of Trade and Industry to act as an Information Centre for Energy Efficiency. In 1996 the promotion of the use of renewable energy sources was included into Motiva's responsibilities. As of December 2000 Motiva Oy has been an impartial and state-owned joint stock company located in Helsinki, Finland. The annual turnover of Motiva is about € 4M.

International climate agreements, National Climate Strategy, Energy Conservation Programme and Action Plan for Renewable Energy Sources are the umbrella behind Motiva's operations. The mission of Motiva is to improve energy-efficiency and promote the use of renewable energy sources. The core task of Motiva is to produce, refine and disseminate information as well as to boost the introduction of advanced energy-saving technologies. One way of implementing Motiva's mission is also to improve and increase the business opportunities, help in removing the barriers from businesses and assist collaboration and networking between companies operating in the energy sector.

Motiva's core fields of activity are:

- To prepare, support and monitor energy conservation agreements
- To develop and market energy audits and analyses, together with other methods of energy conservation
- To boost the introduction of advanced energy-saving technologies
- To develop and assist new business models and innovations in the energy sector
- To influence people's attitudes in favour of energy conservation and permanently change their habits of using energy

- To provide project management and co-ordination services

France: ADEME

The French Environment and Energy Management Agency (ADEME) is a state-funded public industrial and commercial establishment whose activity is supervised by the French government ministries in charge of research, environment and energy. ADEME came into existence on January 1992, under legislation adopted 19 December 1990 and a government decree dated 28 July 1991.

ADEME is actively involved in the implementation of national policies linked to environment and energy issues. The agency conducts information campaigns designed to foster changes in the behaviour of actors in the economy and the general public. ADEME comprises specialised technical departments and a strong local presence, with 26 regional delegations. The agency administers an annual budget of close to 400 million euros. Close to 20 % of ADEME's programme credits are devoted to research and development (R&D).

The promotion of renewable energy is one of the 6 primary areas of activity at ADEME, which also has from the French government a clear mandate for a long-term commitment to energy management. ADEME has 3 areas of expertise:

- Stimulate research and development;
- Advisory and decision-making assistance;
- Dissemination of best practices.

At European and international level the agency has consolidated a vast network of specialists, enabling to pursue activities in emerging and developing economies as well as in industrialised countries, most notably by providing assistance in devising and implementing energy and environmental policies and programmes.

France: OSEO

OSEO was created in 2005 by bringing together ANVAR (French innovation agency) and BDPME (SME development bank), around a mission of general interest: supporting the regional and national policies. OSEO's mission is to provide assistance and financial support to French SMEs and micro-enterprises in the most decisive phases of their life cycle: start up, innovation, development, business transfer / buy out. By sharing the risk, it facilitates the access of SMEs to financing by banking partners and equity capital investors.

OSEO covers three areas of activity:

- Innovation support and funding: for technology transfer and innovative technology-based projects with real marketing prospects.

- Funding investments and operating cycle alongside the banks.
- Guaranteeing funding granted by banks and equity capital investors.

OSEO head structure is a holding with public status. It reports to both the Ministry for Economy, Finance and Industry, and Ministry for Higher Education and Research.

4.2. Private consultancies supporting innovation to the benefit of SMEs in the RE sector

European level: GREENOVATE! Europe EEIG

Greenovate! Europe is a European Economic Interest Group (E.E.I.G.) founded in 2007 by European companies and associations specialised in innovation and clean technologies. The Group pools and provides strategic expertise to stimulate eco innovation within European businesses and aspires to become THE expert group for eco-innovative technologies and processes in Europe. The Group is headquartered in Brussels and offers an entire range of innovation support services to public and private clients, mainly in Europe, in order to develop sustainable technologies and services.

Greenovate! Europe pursues four strategic objectives:

1. **From research to market:** To create for investors an attractive deal flow of development projects, by offering the expertise and resources in support of the complex eco innovation cycles
2. **Greening industries:** To support European industries in the adoption of new cleaner technologies or processes by identifying solutions, facilitating their implementation, and developing new business models
3. **SME market access and internationalisation:** To support European eco innovative SMEs to access international markets and state-of-the-art knowledge through public-private partnerships involving EU, national and regional funds.
4. **Think tank:** To act as a supra-think tank and contribute to policy design and programme development in support of eco-innovation at European, national and regional levels.

Greenovate! Europe offers a very broad range of innovation support services out of one hand, at EU level, to public and private research laboratories, technology developers, companies willing to acquire new technologies as well as investors.

The members are highly specialised small innovation consultancies with complementary expertise and geographical focus enabling the Group to propose a wide range of innovation support services, from the assessment of the business potential of new up to

start-up creation or licensing. Associate members are clean tech clusters and professional organisations. Through these, Greenovate has access to companies active in environmental services and technologies, as well as to companies that wish to acquire such technologies or services.

Austria: Michael Heidenreich Consultant

The consulting company Michael Heidenreich offers Management consultancy to support SMEs to grow and innovate. Michael Heidenreich advises researchers both from universities and private companies in finding the right funding source for their project idea and then developing the idea into a full scale project proposal. This includes:

- Project summary / consortium building
- Organisation and moderation of a partner meeting
- Project design with the researchers
- Policy-related, management and finance contributions to proposal
- Gaining feedback on concept from various stakeholders
- Finishing touches to ensure a highly competitive proposal

Michael Heidenreich is specialised in the development and management of RTD projects in the field of renewable energy and energy efficiency.

Finland: ADVANSIS Oy

ADVANSIS Oy is a Finnish research and consulting company with a wealth of experience in research and innovation management, innovation policy analysis and technology policy design. The company provides services for national and regional governments and their agencies, research establishments, international organisations, as well as for innovative enterprises.

A research and consulting company well-versed in demanding projects, ADVANSIS conducts research and analyses, offers tailored support for planning and decision-making, and organises the planning and implementation of development projects.

Core competences include assessment and further development of research structures, operational analyses of innovation systems, streamlining of innovation infrastructures, design and management of research programmes, impact assessments of innovation measures, and planning and preparation of policy guidelines.

ADVANSIS high level of service is based on:

- strong and broad expertise coupled with customer-oriented thinking;
- quick, dependable and flexible service;

- a thoroughly professional research approach;
- profound knowledge of the latest research and the most advanced methods;
- a comprehensive network of domestic and international experts.

France: TECHNOFI SA

TECHNOFI is a private company based in the science park of Sophia Antipolis (France). Since its foundation in 1985, TECHNOFI is dedicated to **innovation management and innovation financing**. Its experience covers single company projects up to large, multi organisation European projects, very often supported by the EUREKA or the EC (DG Enterprise, DG Research, DG Regio).

The added value brought to its customers by TECHNOFI' s experts, with the help of its proprietary ***Symple***® tool, covers the following support actions:

Introducing **initiative** raising processes in innovative SMEs to favour their diversification at European level;

- Giving management **autonomy** to multidisciplinary teams through "learning by doing" approaches;
- Helping project holders and investors **converge** on collective goals. In partnership with entrepreneurs and investors, TECHNOFI implements ***Symple***® to close deals at a faster pace;
- Implementing **innovative process improvement** techniques in manufacturing and service industries;
- Reaching **stable** result production from breakthrough change projects.

TECHNOFI obtained the French OPQCM quality accreditation in 2002 and is preparing the ISO certification for the end of 2005.

5. CONCLUSIONS

In 2009 an historic legislative package on energy and climate change is entering into force in the European Union, which also includes measures to support the increase of the share of renewable energy sources in the total EU energy consumption.

This will open new opportunities for the European companies providing services related to the deployment of renewable energy technologies. At the same time these PIMS providers will face intense competition and will need to reduce the actual operative costs while increasing their quality and reliability, as analysed in Deliverable D1.2 of KIS-PIMS.

Deliverable D1.3 focused on the identification and analysis of the research and knowledge centres in Austria, Finland and France capable and willing to engage with PIMS enterprises to help SMEs to answer to this competitive challenge by innovating.

After 12 months of investigation through surveys and interviews with a wide base of contacts, the Authors of this paper conclude that **a vast unexploited potential exists** in the Countries included in this study **to enhance the collaboration between "solution providers"[3] and PIMS companies**.

RET research centres and laboratories are not always aware of the presence of the highly dynamic network of small enterprises providing **PIMS services** operating on the territory, hence we found out that these institutes tend to neglect the commercialisation of specific technological solutions that could be adopted by service companies. Technology transfer is a business activity per se and can only be successfully tackled if it is addressed with the right means. Some technology transfer offices of the research centres merely focus on licensing deals with large industrial players, forgetting the large number of SMEs that could adopt the many incremental solutions developed there for renewable energy services.

On the other hand, the overarching picture emerged from this report shows that the mapped **renewable energy research centres do have the capacity to develop customised technological solutions which answer the needs of PIMS ventures** by addressing their shortfalls. Where the technological solutions currently offered do not match perfectly the demand from SMEs, new challenging opportunities will arise in the next future for those laboratories which will be faster and more accurate in answering the unfulfilled needs.

Deliverable D1.3 also highlights the presence of some highly recognised **training providers**, which already play a crucial role for the growth of the European renewable energy services industry in Austria, Finland and France. However, the evidence collected suggests that much more training will be needed in the next year to accommodate the

[3] By "solution providers" we mean any research centre, training provider or business consultancy able to deliver value to a service company by responding to one or more of its needs.

demand of qualified human resources in the Planning of new systems, Installation and commissioning, Maintenance/repair and Scrapping of end-of-life RET. The training demand will range from skilled, engineering related education in the design and manufacture of renewable energy products to technical jobs for which a certification will be required such as the installation and maintenance of renewable energy systems.

Post graduate studies, like the **European Master in Renewable Energy** offered by the EUREC Agency, are an essential education route, not only for young graduates but also to allow retraining to meet the rapidly growing need for skilled personnel in the renewable energy industry. Research training is also an excellent grounding for a career in this rapidly developing sector.

The application of proper methodologies and tools supporting the process of innovation can facilitate a company's ability to appropriately introduce new technologies in services or processes, as well as the necessary organisational changes. For this reason D1.3 also includes a chapter dedicated to the **intermediaries that act as innovation facilitators** in the target countries.

KIS-PIMS recognises the full complexity of innovation processes in RET and addresses them accordingly, pooling the entire range of innovation expertise within the consortium.

ANNEX I: Template for mapping research laboratories

Name of the research organisation:
Headquarters contact details (* Mandatory fields)
- Address* - Country* - Contact person (position) - Phone - Email* - Website*
Main field(s) of research, per Laboratory:
Lab1 name* - Address* - Contact person (position)* - Phone* - Email* - Website - Field(s) of research* **Etc…**
Key equipment available:

Competences related to the RE PIMS Technology focus:
Planning services (*Site investigation, energy resource measurement / evaluation, RE technology appraisal, plant sizing, simulation, training at Planning*)
Installation services (*New techniques for optimal installation, security devices, building / in-site integration methodologies, logistics, installers' training*)
Maintenance services (*Predictive maintenance techniques & tools, remote monitoring, remote maintenance, curative maintenance techniques & tools, failure engineering, training at maintaining*)
Scrap services (*End-of-life dismantling techniques, scrap material recycling technologies, dismantling & scraping logistics, scrap materials valorisation)*

Key skills (knowledge) available for transfer:
Key technologies available for transfer:
Please provide for each technology the following information: *a) target adopters;* *b) key features of the technology;* *c) progress compared to market standards.*
Proposed Technology / Knowledge Transfer mechanism :
☐ licensing ☐ joint venture / spin-off ☐ knowledge transfer / training

ANNEX II: Map of research centres responding to the scientific and technological needs of PIMS ventures

ANNEX III: Map of the centres responding to the knowledge and training needs of PIMS ventures