Complete Report and List of Dissemination Actions of the MacSheep project

Deliverable 9.6 – Final – 15 December 2015

MacSheep - New Materials and Control for a next generation of compact combined Solar and heat pump systems with boosted energetic and exergetic performance

Dissemination Level: PU – public

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Executive Summary

The MacSheep project results were disseminated over various channels targeting different groups of the society. General information was presented in coverages in print and online media as well as on the MacSheep homepage. A more technical audience and policy makers were reached with print magazines and workshops held in five countries. Scientifically interested audience was informed through papers that were presented in various conferences, both national ones and international ones, as well as through Journal articles and downloads from the MacSheep homepage.

In total, six peer reviewed Journal articles and 19 conference papers were published. Additionally, over 23 presentations were given on the MacSheep project and its results. The webpage www.macsheep.spf.ch was visited over 2000 times, and more than 500 downloads have been registered from this website. More than ten articles in print media (news and technical magazines) and more than six online coverages were registered. Particularly successful were the national workshops, where a total audience of more than 350 people has been reached, originating mostly from industry and the private sector.

Table of Contents

1 Webpage

The project website www.macsheep.spf.ch has been online since one month after start of the project (February 1, 2012). Until December 2015, the Website has registered over 2'000 visitors, with a 20% increase of visitors in 2014 and 40% increase in 2015[1], with respect to the previous year. The most frequented pages were "Reports and Deliverables" and "Publications", followed by the project description and the partner descriptions. More than 500 downloads were registered in total.

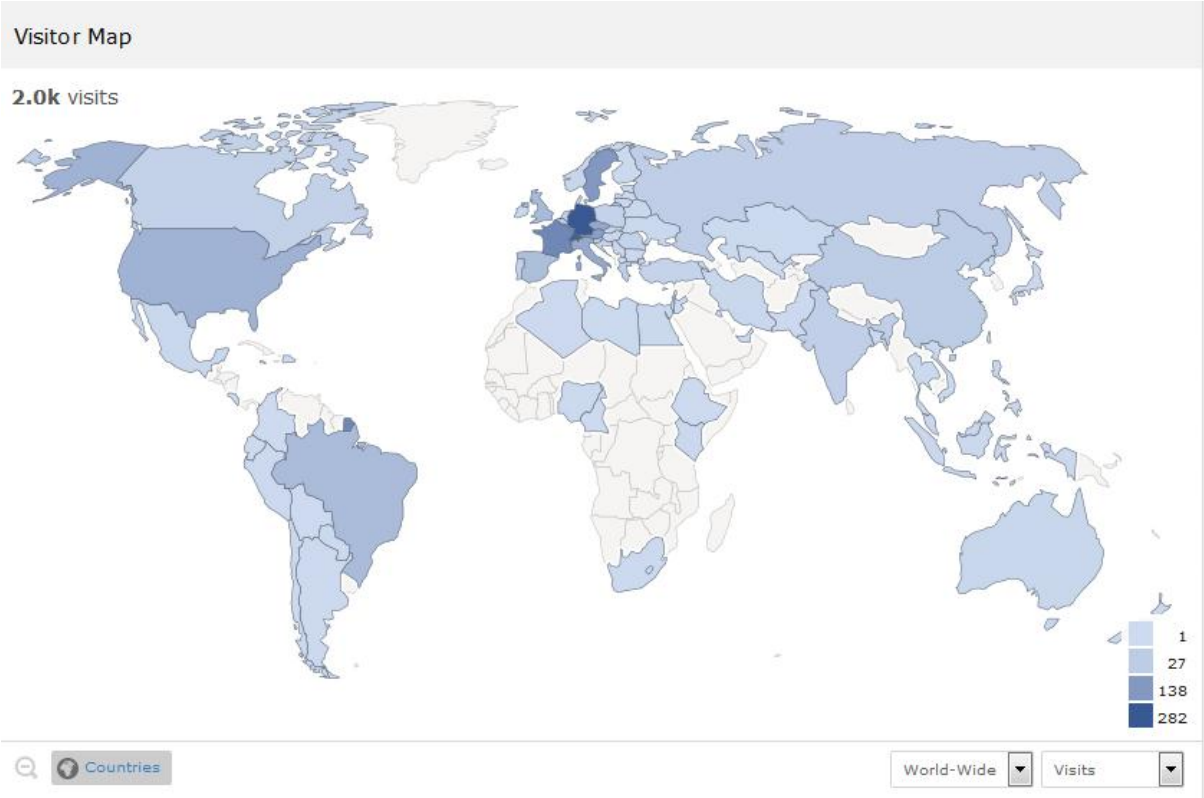

Figure 1: Origin of website visitors.

[1] data from Jan 1 – Nov 28 extrapolated by the factor 12/11.

2 Press communications, mass media and magazines

Press communications were released by HSR at the time of the KickOff meeting of the MacSheep project and together with the final meeting and Swiss national workshop of the project. This has received wide spread attention from the Swiss daily press and online media with over 12 coverages on the project in different media. Other coverages where promoted in the magazines of HSR and FHO, as well as in the Euresearch Success Stories (online), and others.

Print press 2012

- St. Galler Tagblatt, 2012, HSR leitet Europa-Projekt, 20.1.2012, p. 29.
- Südostschweiz, 2012, HSR forscht mit EU-Millionen nach modernen Heizungen, 26.1.2012, p. 2.
- Zürichsee Zeitung, 2012, HSR koordiniert Millionen-Projekt, 21.1.2012, p. 4.
- Bau-Flash, 2012, HSR koordiniert EU-Projekt zur Reduktion des Energiebedarfs, 7.3.2012, p. 21.
- etc...

Print press 2015

- Südostschweiz / Ausgabe Glarus, 2015, EU-Forschungsprojekt abgeschlossen: HSR entwickelt hoch effizientes Heizsystem, 03.12.2015.
- Zürichsee-Zeitung / Obersee, 2015, HSR-Forscher entwickeln neues Heizsystem, 26.11.2015.
- Planer + Installateur, 2015, Markante Energieeinsparungen bei Solar-Wärmepumpen-Heizungssystem, 18.11.2015.
- etc.

Online news

- ee-news, 2012, SPF: HSR koordiniert EU-Projekt zur Reduktion des Energiebedarfs, 23.1.2012, http://www.ee-news.ch/de/article/23770/spf-hsr-koordiniert-eu-projekt-zur-reduktion-des-energiebedarfs
- Euresearch, 2012, International collaboration needed for a product that sells internationally – Research Success Stories – Euresearch – Swiss guide to European research & innovation, http://www.euresearch.ch/fileadmin/documents/PdfDocuments/Success_Stories/2012_07_McSheep_Energy_Web.pdf
- Epp, B, 2014, Switzerland: The Advantages of Solar Thermal and Heat Pump Combinations http://solarthermalworld.org/content/switzerland-advantages-solar-thermal-and-heat-pump-combinations
- ee-news 2015, SPF: Entwickelt hocheffizientes Solar-Wärmepumpen-Heizsystem mit 9 Partnern aus 6 Ländern, 28. Nov 2015, http://www.ee-news.ch/de/article/32486/spf-entwickelt-hocheffizientes-solar-warmepumpen-heizsystem-mit-9-partnern-aus-6-landern
- ZOL, 2015, *Rapperswil-Jona: HSR entwickelt hoch effizientes Heizsystem - Überregional - zol.ch*. Available at: http://www.zol.ch/ueberregional/hsr-entwickelt-hoch-effizientes-heizsystem/story/28364509 [Accessed November 30, 2015].

- *Informationsdienst Cleantech: Forscher entwickeln effizientes Heizsystem*. Available at: http://www.cleantech.ch/rubriken/energie-kohlendioxid/artikel/news/2015/11/27/forscher-entwickeln-effizientes-heizsystem/ [Accessed December 3, 2015].
- Gesthuizen, J., 2015. *Solare Wärmepumpe spart bis zu 30 % Energie*. Available at: http://www.sonnewindwaerme.de/solarthermie-waermepumpe/solare-waermepumpe-spart-30-energie [Accessed December 9, 2015].

Print Magazines

- 3 Millionen EU-Projekt zur Energiereduktion – FHO Campus 2 – 2012 – FHO Fachhoschule Ostschweiz, p. 5.
- Euresearch, 2014. International collaboration needed for a product that sells internationally, In: Success-Stories, Swiss Projects and Partnerships in the 7th European Framework Programme for Research and Technological Development (FP7), Issue 2014, p. 38.
- Lieberherr, M. 2013. Von Schafen und Wärme - Das SPF Institut für Solartechnik leitet das europäische Forschungsprojekt «MacSheep». Ziel ist die Entwicklung eines Heizsystems, das 25 Prozent weniger Energie verbraucht als vergleichbare Systeme. In: HSR Magazin 2013-01, p. 18 – 19.
- Planer + Installateur, 2015. Markante Energieeinsparungen bei Solar-Wärmepumpen-Heizungssystem, In: Planer + Installateur, 18.11. 2015, p. 22.

3 Conference contributions

A total of 17 conference contributions and papers have been written based on the MacSheep project.

1. Broum, M., Sedlar, J., Sourek, B. & Matuska, T., 2014. Tepelné čerpadlo s odvodem tepla na třech úrovních (Heat pump with a three levels heat sink). In: Konference Alternativní zdroje energie 2014, Kromeriz, CZ.
2. Chèze, D., Papillon, P., Leconte, A., Persson, T., Bales, C., Haller, M.Y. & Haberl, R., 2014. Towards an harmonized whole system test method for combined renewable heating systems for houses. In: Proc. of the EuroSun 2014 conference, ISES Europe, Aix-les-Bains, France.
3. Granzotto, M., Chèze, D. & Haller, M.Y., 2014. Impact of Small Weather Data Time Steps on the Simulation of Solar and Heat Pump Systems. *Accepted for publication In: Proc. of the Eurosun 2014 conference*, 16. Sept. 2014, Aix-les-Bains, France.
4. Hengel F., Heinz A., Rieberer R., 2013. Theoretische Analyse zur Effizienzsteigerung durch Drehzahlregelung und Economizer-Schaltung bei einer Luft/Wasser Wärmepumpenanlage. In: Deutsche Kälte-Klima-Tagung 2013, 22. Nov. 2013, Hannover, Germany (German).
5. Hengel F., Heinz A., Rieberer R., 2014. Analysis of an Air Source Heat Pump System with Speed Controlled Compressor and Vapour Injection. In: IEA Heat Pump Conference 2014, 12. May. 2014, Montreal, Canada.

6. Hengel F., Heinz A., Rieberer R., 2015. Analyse eines Wärmepumpensystems mit Heißgasenthitzung für unterschiedliche Regelungs- und Hydraulikstrategien. In: Conference e-nova 2015, 26.-27. Nov. 2015, Pinkafeld, Austria.
7. Matuska, T., Jirka, V. & Poulek, V., 2014. *Use of Polysiloxane Gel as Laminate for Solar PVT Collectors*. In: *Proc. of the EuroSun 2014 conference*, ISES Europe, Aix-les-bains, France.
8. Matuska, T. & Sourek, B., 2013. Energy performance figures of combined solar PVT heat pump system. In: Clima 2013, 16 - 19 June, Prague, Czech Republic, Paper ID 917.
9. Matuška, T. & Šourek, B., 2013. Kombinace Tepelných Čerpadel a Fotovoltaicko – Tepelných Kolektorů. In: Konference Vytápění Třeboň 2013 14. až 16. května 2013, Trebon, Czech Republic (Czech).
10. Matuška, T. & Šourek, B., 2013. Solar Heat Pump System with Hybrid PVT Collectors for a Family House. In: CESB 2013, 26 - 28 June, Prague, Czech Republic.
11. Matuska, T., 2014. *Performance and Economic Analysis of Hybrid PVT Collectors in Solar DHW System*. *Energy Procedia*, 48, p.150–156.
12. Matuska, T., Pokorny, N. & Slanina, P., 2015. Glazed photovoltaic-thermal component for building envelope structures. In: Conference Proceedings of the 10th ENERGY FORUM, Bern, Switzerland, 29–35.
13. Mojic, I., Haller, M.Y., Thissen, B. & Frank, E., 2013. Heat Pump Systems with Uncovered and Free Ventilated Covered Collectors as Only Heat Source. In: Proceedings of CISBAT 2013 International Conference, EPFL, Lausanne, Switzerland, 817–822.
14. Mojic, I., Haller, M.Y., Thissen, B. & Frank, E., 2014. *Heat Pump System with Uncovered and Free Ventilated Covered Collectors in Combination with a Small Ice Storage*. *Energy Procedia*, 48, p.608–617.
15. Mojic, I., Haller, M.Y., Thissen, B. & Frank, E., 2013. Wärmepumpen-Systeme mit selektiven unabgedeckten und frei belüftbaren abgedeckten Kollektoren als einzige Wärmequelle. In: 23. Symposium Thermische Solarenergie, 24.-26. April 2013, OTTI e. V., Regensburg, Kloster Banz, Bad Staffelstein, Germany (German)
16. Mojic, I., Haller, M.Y., Thissen, B., Hengel, F. & Heinz, A., 2015. New generation of a highly compact solar heat pump system with boosted energetic efficiency. In: Proc. of the CISBAT 2015 conference, EPFL, Lausanne, Switzerland, 723–728.
17. Poppi, S., Bales, C., Schubert, V. & Weidinger, A., 2014. Simulation Study of Cascade Heat Pump with Integrated Storage for Solar Combisystems. In: Proc. of the EuroSun 2014 conference, Aix-les-bains, France.
18. Poppi, S. & Bales, C., 2014. Influence of Hydraulics and Control of Thermal Storage in Solar Assisted Heat Pump Combisystems. Energy Procedia, 48, p.946–955.
19. Sedlář J., 2014. Energy analysis of heat pump with subcooler. In: IEA Heat Pump Conference 2014, 12. May 2014, Montreal, Canada.

4 Presentations without conference paper

The MacSheep project or results from the project have been presented over 23 times at workshops, conferences and meetings, where no written paper was submitted:

1. Bales, C., & Poppi, S., 2015, EU project MacSheep - Four different system concepts. In: Workshop om solvärme och värmepumpar, 3.12.2015, Stockholm, Sweden.
2. Bales, C., 2015, Glazed flat plate solar collector and air/water split HP. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
3. Bales, C., 2015, project MacSheep (solar thermal and heat pump) - General results and a new test method. In: Workshop om solvärme och värmepumpar, 3.12.2015, Stockholm, Sweden.
4. Bales, C., 2015, PVT solar collector and brine/water HP. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
5. Broum, M., 2015, Systém MacSheep, zapojení a regulace. In: Trendy v kombinaci solárních systémů a tepelných čerpadel, 18.9.2015, Praha, Czech Republic.
6. Charles, P., Horizon 2020 Energies sûres, propres et efficace - Témoignage : projet Mac Sheep, In: Journée d'information Européenne Horizon 2020 - thématique énergie, 12 Dec. 2013, Université de Lorraine – Nancy.
7. Chèze, D., 2013. Essais expérimentaux sur banc semivirtuel d'un système couplé pompe à chaleur / système solaire, 3ème Congrès Français des Pompes à Chaleur INPAC, 19. Sep. 2013, Paris (French).
8. Chèze, D., 2015, Solar and Heat pump system tests. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
9. Chèze, D., 2015, Vacuum solar tubes and tank integrated condenser split air/water Heat Pump. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
10. Haberl, R., Haller, M.Y., Bales, C., Persson, T., Papillon, P, Chèze, D., Matuska, T., 2013, May 3. Dynamic Whole System Test Methods – Overview and Current Developments – Presentation at the IEA-SHC Task 44 / HPP Annex 38 Meeting in Povoa de Varzim, Portugal.
11. Haller, M., 2015, Entwicklung eines Wärmepumpen Solar Systems - Vorgehen und Resultate im EU Projekt MacSheep. In: Solarenergie und Wärmepumpen, 13.10.2015, Graz, Austria.
12. Haller, M., 2015, Methods and Results of the EU Project MacSheep. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
13. Haller, M., 2015, Unglazed flat plate solar collector and brine/water HP. In: Conférence-débat solaire thermique+PAC, 21.10.2015, Nantes, France.
14. Haller, M.Y., Papillon, P., Bales, C., Matuska, T., Heinz, A., 2013. MacSheep - 25% electric savings in solar & heat pump systems. In: 4th European Conference on Renewable Heating & Cooling, 22-23 April 2013, Dublin, Ireland.
15. Haller, M.Y., Wärmepumpe und Solarwärme: Vermeintliche und tatsächliche Synergien, SPF-Industrietag 19.3.2014.

16. Heinz, A., 2015, Hocheffiziente Wärmepumpenkreisläufe - Wärmepumpen Entwicklung im EU Projekt MacSheep. In: Solarenergie und Wärmepumpen, 18. Nov. 2015, Rapperswil, Switzerland.
17. Heinz, A., Advanced heat pump cycles in combined solar & HP systems - Results from the FP7 project MacSheep. In: 7th Meeting of the IEA-SHC Task44 / HPP Annex 38 "Solar and Heat Pump Systems", 9-10 April 2013, Mechelen, Belgium.
18. Hengel, F., 2015, Wärmepumpenentwicklung für ein Wärmepumpen Solar System im EU Projekt MacSheep. In: Solarenergie und Wärmepumpen, 13.10.2015, Graz, Austria.
19. Matuska, T., 2015, Glazed solar PVT collector development - Results from the EU project MacSheep. In: Solarenergie und Wärmepumpen, 18. Nov. 2015, Rapperswil, Switzerland.
20. Matuška, T., 2015,Spolupráce hybridního FVT kolektoru a tepelného čerpadla. In: Trendy v kombinaci solárních systémů a tepelných čerpadel, 18.9.2015, Praha, Czech Republic.
21. Mojic, M. & Haberl, R., 2015, Entwicklung eines Wärmepumpen Solar Systems - Vorgehen und Resultate EU Projekt MacSheep. In: Solarenergie und Wärmepumpen, 18. Nov. 2015, Rapperswil, Switzerland.
22. Mojic. I., 2013. Unglazed selective Collectors and an Ice Storage as only Heat Source for the Heat Pump. In: 7th Meeting of the IEA-SHC Task44 / HPP Annex 38 "Solar and Heat Pump Systems", 9-10 April 2013, Mechelen, Belgium.
23. Sedlář, J., 2015,Vícevýměníková tepelná čerpadla. In: Trendy v kombinaci solárních systémů a tepelných čerpadel, 18.9.2015, Praha, Czech Republic.

5 Articles published in peer reviewed journals

Five articles have been published in peer reviewed Journals. All of them are available at least in an AAM (Author Accepted Manuscript) version for download on the MacSheep homepage (www.macsheep.spf.ch):

- Haller, M.Y., Haberl, R., Persson, T., Bales, C., Kovacs, P., Chèze, D. & Papillon, P., 2013. Dynamic whole system testing of combined renewable heating systems – The current state of the art. Energy and Buildings, 66, p.667–677.
- Lazrak, A., Leconte, A., Chèze, D., Fraisse, G., Papillon, P. & Souyri, B., 2015. Numerical and experimental results of a novel and generic methodology for energy performance evaluation of thermal systems using renewable energies. Applied Energy, 158, p.142–156.
- Matuska, T., Sourek, B., Jirka, V. & Pokorny, N., 2015. Glazed PVT Collector with Polysiloxane Encapsulation of PV Cells: Performance and Economic Analysis. International Journal of Photoenergy, 2015, p.e718316.
- Pichler, M.F., Lerch, W., Heinz, A., Goertler, G., Schranzhofer, H. & Rieberer, R., 2014. A novel linear predictive control approach for auxiliary energy supply to a solar thermal combistorage. Solar Energy, 101, p.203–219.
- Poppi, S., Bales, C., Haller, M.Y. & Heinz, A., 2016. Influence of boundary conditions and component size on electricity demand in solar thermal and heat pump combisystems. Applied Energy, 162, p.1062–1073.

- Sedlář, J., Broum, M., Matuška, T. & Šourek, B., 2015. Model tepelného čerpadla s odvodem tepla na třech úrovních. Vytápění, větrání, instalace, 1(2015), p.16–21.

6 Five national Workshops

The five national workshops were held from September to December 2015 in Prague (CZ), Graz (AT), Nantes (FR), Rapperswil (CH), and Stockholm (SE). In total, they attracted over 350 participants, mostly from the industrial and private sector (see *Figure 2* and Deliverable 9.5).

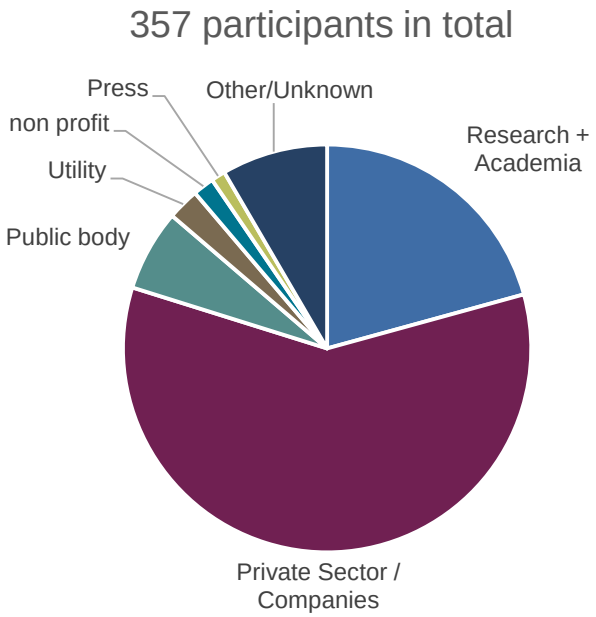

Figure 2: Origin of the visitors of the five national workshops by sectors.

7 Conclusion

The project goals were:

- one webpage with regular updates
- 10 published conference papers, of which five co-authored by MacSheep partners
- 3 peer reviewed Journal articles
- 5 workshops in 5 countries
- coverage in online and print media

All of these project goals have been exceeded by far.