

## Index and programme

### Friday, 22 April 2016

#### Plenary session

09:00 Opening remarks

**Wolfgang Feist**

Unit of Energy Efficient Construction at the University of  
Innsbruck and Scientific Director of the Passive House Institute

**Mathias Samson**

State Secretary of Ministry of Economics, Energy, Transport  
and Regional Development, State of Hesse

**Jochen Partsch**

Lord Mayor of the City of Darmstadt

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**Brigitte Holz**

President of the Chamber of Architects and Urban Planners,  
Hessen

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09:30 **Claude Turmes**

Member of the European Parliament

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10:00 **Franz Alt**

On the bright side – why we all win with a sustainable energy  
future

10:45 **Wolfgang Feist**

Passive House – the long-lasting solution

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Session 1:		Hall Spectrum
Passive House Plus		
13:00	<b>Frankel, Alexandra; Feirer, Martina</b> GreenHouse: Austria's first Passive House Plus student dormitory in Vienna Energy demand is much higher in dormitories than in normal residential buildings because of the greater number of components per m <sup>2</sup> consuming power in the various apartments. Three building owners came together to develop an innovative project in a new district: a highly energy-efficient Passive House complex.	85
13:25	<b>Vallentin, Gernot</b> The new Passive House Plus administration building of the Erdinger Moos wastewater association The new administration building for the Erdinger Moos wastewater association was built to comply with Passive House Plus before the Passive House Institute had defined the standard. Based on a low-tech concept, both the Passive House Standard and the use of photovoltaics were successfully implemented.	91
13:50	<b>Spiß, Engelbert</b> A Passive House Plus residential building in Innsbruck NEUE HEIMAT TIROL built the first Passive House Plus multi-storey residential complex. This Net-Zero Building provides affordable, energy-saving dwellings and highly efficient energy usage based on insights from research and development, allowing us to go down new paths today.	97
14:15	<b>Beckmannshagen, Lars</b> Experience from the Effizienzhaus Plus network Effizienzhaus Plus means that, over the year, a building produces more energy than it and its users consume. The German Federal Building Ministry adopted a research support programme for these model homes. Across Germany, 36 building owners received funding, and new results are now available.	103
14:40	<b>Reinberg, Georg W.</b> Strategy, implementation and monitoring of a Plus Energy Passive House For the headquarters of a wind energy company, an architectural solution was found that passively reduces energy consumption and optimises gains (from solar, wind, water and the soil) in many ways. Optimised in terms of building biology, the Plus Energy building can even cover mobility energy and offers especially high architectural quality.	109

15:05	<b>Krick, Benjamin</b> A Passive House Plus building made of bales of straw	117
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This paper presents the construction and operation of a straw bale house, largely constructed by the author himself, and energy balances from PHPP and designPH. It also focuses on embodied energy demand based on the example of a straw bale wall. The PHPP results for energy demand were found to correlate quite accurately with measured energy consumption. Energy demand for operation makes up the largest share of embodied energy demand for common Passive House insulation thicknesses. However, the current way that embodied energy is generally calculated is misleading. The method needs to be revised to produce useful conclusions.

Session 2:		Hall Titanium
New projects and components		
13:00	<b>Zielke, Georg W.</b> Ecological homes: Ambitious yet affordable Ecological timbered architecture offers a wide range of options, especially for residential buildings. Great residential quality can be achieved here without particular additional costs. The solutions for the Passive House Standard have been proven in practice and are available. Coordination with tradespeople is especially important.	129
13:25	<b>Kreutzer, Simone</b> Circuitus – What goes around comes around Villa Circuitus is a single-storey detached home made with sustainable materials and excellent components that fulfils the Passive House Standard for the Swedish climate. This presentation includes discussion of “fossilised” timber, a solar cell balustrade and a cellular glass floor slab.	135
13:50	<b>Werneke, Klaus</b> Affordable and sustainable: A timbered Passive House row house for rent “Wolke 7” is a completely timbered row of seven rowhouses built in 2012-2013 in Lüneburg in compliance with the Passive House Standard. The result is a very affordable, sustainable rental complex thanks to planning across disciplines in close coordination with construction workers and some special aspects of production.	141
14:15	<b>Hasper, Wolfgang</b> A government building annex overcomes all challenges The keys to an annex built for the Ministry of Finance of the German State of Hesse in Wiesbaden with ca. 3,070 m <sup>2</sup> of treated floor area were handed over in the spring of 2016. The building was planned and built in compliance with Passive House. This paper describes how various challenges were solved in the project.	147
14:40	<b>Rongen, Ludwig</b> Passive House today and beyond 2015: Developments and trends Passive House is recognised worldwide as the highest standard for energy-saving construction. But as a standard that implies quality, it has to go beyond mere consideration of energy data and start requiring high quality in other aspects if it wants to remain successful globally.	153
15:05	<b>Böttrich, Nadine</b> Large variety of balcony connections in Passive House	159

Session 3:		Hall Europium
EnerPHit-latest retrofit projects-		
13:00	<b>Nettleton, Laura; Whartnaby, Michael</b> EnerPHit in the United States : Multi-unit Residential and Commercial Retrofit Case Studies  This presentation will chart measured energy consumption of two large-scale commercial Passive House retrofit (EnerPHit Standard) projects in the United States.	163
13:25	<b>Keverling Buisman, Floris</b> Historic 1870 2-whyte brick house to EnerPHit Standard in Upstate New York  A masonry building in disrepair, was renovated to EnerPHit performance. Natural insulation, combined with careful detailing and onsite solutions can achieve 0.8 h <sup>-1</sup> . Additional sustainable aspects are that all wood flooring is reused and that after a 6.5 kW PV system is installed the building meets EnergyStar net-zero performance.	169
13:50	<b>Ingui, Michael; Brennan, Kevin</b> Masonry Retrofits – Repeatable Results in a Collaborative Environment  Eight historic masonry townhouse retrofit projects in the New York City area were designed and completed to meet the Passive House Standard. This approach requires that all passive details be on the interior of the front façades. It also allows for interesting design solutions and homes that are great to live in.	175
14:15	<b>von Meding, Reimar</b> Reimarkt: The first supermarket for sustainable retrofits as off-the-shelf consumer products	181
14:40	<b>de Bourgraaf, Robert; Janssen, Martijn</b> From Scrap Value to High Quality Dwelling	187
14:45	<b>Uyttebrouck, Constance; Hebbelinck, Pierre</b> Installing geothermal boreholes under a historical building in the city-centre of Liège	189
14:50	<b>Marcinonis, Dominykas</b> Retrofit of Lithuanian Large Concrete Panel Buildings with Prefabricated Timber Elements – Theoretical Study	193
15:05	<b>Osborne, Patrick; Budden, Alan</b> Hiley Road Retrofit Project, London	197

Session 4:		Hall Helium 2
Warm climates		
13:00	<b>Style, Oliver</b> Measured performance of a lightweight straw bale Passive House in a Mediterranean heat wave  The summer performance of Passive Houses must be fully addressed if quality assurance associated with the Passive House standard is to be maintained. The measured results of the Larixhaus during the 2015 heat wave indicate that lightweight, super-insulated, airtight Passive Houses can be passively cooled with adequate external shading devices, good natural night ventilation, and careful operation by occupants, to provide a comfortable indoor climate during heatwaves.	201
13:25	<b>Pallantzas, Stefan; Roditi, Athanasia</b> Passivistas: The House Project  Passivistas: TheHouseProject is a stepping stone on the road to the Greek NZEB. We, all engineers and Passive House designers and members of the Hellenic Passive House Institute, want to show to the people, to the engineers, to the market, to the government that energy efficiency is achievable and cost effective.	207
13:50	<b>Pardo Calderon, Esteban</b> First Steps in Passive House Public Buildings in Spain  Recently, the first steps in Passive House public buildings have taken place in Spain. Reaching the Passive House Standard, however, presents some difficulties and regulatory barriers that must be overcome. Two case studies are discussed: a public library and a public office building.	213
14:15	<b>Salman Gürçan, Tuğba; Gülec, Seda</b> A comparison of LEED and Passive House certification on a built example: Gaziantep Yeşil Ev  The Yeşil Ev project of Gaziantep Metropolitan Municipality is the first Certified Passive House of Turkey and was also awarded by the US Green Building Council with LEED's highest certificate level – Platinum. The two certification schemes are compared with regards to costs and feasibility.	219

14:40	<b>Chatzoulis, Stefan</b> Long-term experience of Passive House Component implementation in 30 buildings in the warm climate of Greece	225
14:45	<b>Pietrobon, Marco; Pagliano, Lorenzo</b> Comfort Conditions and User Behaviour Surveys in Passive House Buildings Throughout Europe	227
14:50	<b>Ruiz-Cuevas Peña, Ramón</b> Passive House 'FUV'	229
15:05	<b>Vicente, Romeu; Oliveira, Rui; Alves, Ana; Rodrigues, Fernanda; Saracin, Adrian</b> Design, Optimisation and Construction of a Steel Frame Efficient House in a South European Country	231
15:10	<b>Fokaides, Paris A.; Christoforou, Elias; Illic, Milos; Papadopoulos, Agis</b> Monitored performance of a Passive House under subtropical climatic conditions	233
15:15	<b>Bonilauri, Enrico</b> The first certified construction system for warm climates: from prototype to production	235
15:20	<b>Mc Kenzie, Fiona</b> Superpod® Podhouse® – An innovative steel passive house system from Australia	237

## Session 5:

## Hall Spectrum

## Long-term experiences

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|-------|---|-----|
| 16:00 | <p><b>Vallentin, Gernot</b><br/>         Montessori School in Aufkirchen: 12 years of operation in the first certified Passive House school</p> <p>The Montessori School presented in this paper is the world's first certified Passive House school and has undergone a number of changes in its 12 years of operation. The consistent building concept coped with these changes well. The Passive House Standard has proven successful, as the consumption values show.</p>   | 241 |
| 16:25 | <p><b>Kirtschig, Thomas</b><br/>         Measurement results from ENERCON in Ulm</p> <p>The amounts of energy calculated in PHPP for the office complex ENERCON correlate very well with measured data. The building owner's decision more than ten years ago in favour of the Passive House Standard paid for itself. At least two years of monitoring is recommended for complex building services.</p>   | 247 |
| 16:50 | <p><b>Zeine, Carl</b><br/>         KWEFF 2015: Consumption values of highly energy-efficient buildings</p> <p>This paper presents the findings of the research report "KWEFF 2015: Energy consumption values for highly energy-efficient buildings". It discusses the collection, creation and assessment of consumption data for highly energy-efficient buildings. The consumption data assessed were actually measured.</p>  | 255 |
| 17:15 | <p><b>Horn, Gerrit</b><br/>         Two decades of timbered Passive House</p> <p>Passive House was initially focused on solid walls, but the first timbered Passive House buildings appeared in the second half of the 1990's with new structures. Half of Passive House buildings use timber – a much higher rate than for all buildings in Germany, 16 % of which are timbered.</p>   | 261 |
| 17:40 | <p><b>Reiter, Olaf</b><br/>         Four kindergartens in Saxony: Construction system analysis and a critical review</p> <p>We constructed four different types of kindergarten buildings: a timber frame construction with loam infills (Döbeln), two-storey reinforced concrete constructions with a curtain façade (Dresden and Delitzsch), and a single-storey sand-lime structure with a timbered façade (Senftenberg). This paper also explains the different heating and ventilation systems in the kindergartens and reports on our long-term experience with them.</p> | 267 |

- 18:05 **Feist, Wolfgang; Ebel, Witta; Peper, Søren; Hasper, Wolfgang** 273
- Long-term experience and measurements from the first Passive House building in Darmstadt-Kranichstein
- The first Passive House building in Darmstadt-Kranichstein has consistently had extremely low heating energy consumption. Twenty-five years after it was completed, the building and its main components were studied in greater detail. The findings show that the structures and components used are durable and have maintained their value. Their service lives are expected to be at least as long as those of conventional options.

Session 6:		Hall Titanium
Non-residential buildings		
16:00	<b>Höfle, Ingo; Ernst, Marion</b> Passive House offices with renewable energy supply on the path to the Passive House Premium Standard Two examples show how very different office complexes were developed step by step toward Passive House Premium, how added value was created instead of just added costs, and how client benefits, future usefulness and sustainability were simultaneously increased.	285
16:25	<b>Krämer, Walter; Kaufmann, Berthold</b> Summer conquered: The Lu-teco office building This paper describes the optimisation of operation in the Lu-teco office complex in Ludwigshafen. The control systems for shading and concrete core tempering, the main components of summer heat protection, were fundamentally revised. User satisfaction and acceptance improved considerably as a result.	293
16:50	<b>Gollwitzer, Esther; Gressier, Florian; Peper, Søren</b> Bambados: A Passive House indoor swimming pool in practice Several years of monitoring the 'Bambados' recreational pool confirm that energy was successfully conserved. There is further potential for future indoor Passive House swimming pool halls.	299
17:15	<b>Oehler, Stefan</b> Holistic retrofit of the Gross-Umstadt Sparkasse The "holistic retrofit" of a 50-year-old office building into a fossil-free building is a helpful example on the path towards a carbon-neutral built environment by 2050. The renovated building is one of the first EnerPHit office buildings in Europe, and staff members are excited.	305
17:40	<b>Kah, Oliver</b> The importance of use-specific energy applications in non-residential Passive House buildings Building energy concepts focus primarily on demand for heating energy; Passive House often does as well. However, the basic idea behind Passive House is to reduce the energy demand of all energy applications within a building significantly, while at the same time improving comfort. This paper shows how important usage-specific energy applications are in non-residential buildings.	311
18:15	<b>Pietrobon, Marco; Pagliano, Lorenzo; Tribus, Michael</b> Analyses of multifunctional wooden components for Passive House renovations of schools	317

Session 7:		Hall Europium
Cost-effective Passive House buildings		
16:00	<p><b>Schild, Robert</b>  “Does residential comfort have to pay for itself?”</p> <p>The Passive Health concept offers users excellent comfort at an affordable price even as it reduces resource consumption. Nonetheless, architects and investors still need to highlight the right motives between additional comfort, sustainability and profitability.</p>	321
16:25	<p><b>Clarke, Alan; Grant, Nick</b>  Simple and cheap heating systems for individual Passive Houses</p> <p>Simple heating systems for single-family houses using standard gas boilers or heat pumps with simplified radiator or floor heating systems suit the low heat load of Passive Houses with reduced installation cost. The performance was demonstrated with monitoring of room and heating system temperatures.</p>	327
16:50	<p><b>Bodem, Mario</b>  Passive House school project: Lowering costs with the Passive House Standard</p> <p>Minor but clever changes allowed the Passive House Standard to be met in a school project where the standard was previously considered impossible. Intelligent optimisation and improvement of the insulation standard considerably reduced construction costs below the level originally planned.</p>	333
17:15	<p><b>Branders, Aline; Moreno-Vacca, Sebastian</b>  Large-scale total Passive House renovations in Brussels</p> <p>Three case studies – the renovation of a brewery into a hotel, of a high-rise office building and of a high-rise social housing block – verify that large-scale retrofits can achieve full Passive House Standard. Two of these retrofits are beacon projects in the Brussels Region and have been awarded.</p>	339
17:40	<p><b>Fasouli, Myrtia; Levey, Mike</b>  First privately rented EnerPHit homes in London,  Whole-Life Carbon story</p> <p>Sturgis Carbon Profiling have been monitoring the first privately rented EnerPHit retrofits in London. The results show that EnerPHits achieve a further 40 % reduction in whole-life carbon emissions compared to a conventional UK refurbishment. Adopting low-embodied carbon strategies in EnerPHit upgrades makes them more cost-effective and paves the way to a zero-carbon future.</p>	345

18:05	<b>Schneider, Peter</b> The Modular Housing Innovation Project	351
18:10	<b>Shaw, Siena; Rubin, Brian</b> MightyHouse – Rolling Passive House	353
18:15	<b>McDonald, Timothy</b> The PHFA Project	355

Session 8:		Hall Helium 2
Experiences from UK and Ireland		
16:00	<b>Burrell, Elrond</b> How architects can drive adoption of Passive Houses for primary schools in England and Wales Architects have limited opportunity to design Passive House buildings if clients don't ask for Passive House. Architype has identified the following key obstacles to Passive House that architects can help clients successfully overcome; competing standards, cost, education, the supply chain and quality.	361
16:25	<b>Hines, Jonathan; Thoua, Chryssa</b> Closing the performance gap in UK schools – 3 years energy and comfort monitoring evidence Monitoring over three years shows that Passive House is closing the performance gap in UK schools. Lessons learned from monitoring the first Passive House schools has enabled design improvements, leading to progressively better performance in subsequent schools, including even better internal conditions.	367
16:50	<b>Grant, Nick; Clarke, Alan</b> The first Passive House Archive in the UK The first Passive House (sic) archive in the UK draws considerable inspiration from the passive (sic) approach to archive and museum storage developed by Tim Padfield and colleagues in Denmark. Performance has exceeded expectations suggesting considerable simplification would be possible in future.	373
17:15	<b>Siddall, Mark; Johnston, David; Harvie-Clark, Jack; Wyke, Andrew</b> Long Term Experience of the Passive House Standard in North East England: Does Airtightness Decay? Within the UK construction industry there is skepticism about whether or not the Passive House Standard provides a robust long-term solution. A primary concern is that airtightness may degrade over time. This paper examines the performance of certified Passive House homes located in the North East of England to compare as-built and current airtightness, five years on.	379
17:40	<b>Moreira, Mariana; McCormack, Art</b> EnerPHit for Social Apartments: Marrying old and new Retrofitting of social housing apartments to the EnerPHit Standard as part of the EU-funded EuroPHit project is challenging, but becomes particularly complex where an entirely new floor is required. This is what the Dún Laoghaire-Rathdown County Council, Ireland, required for Rochestown House.	385

18:05	<b>O'Donoghue, Ed</b> Passive House, Building on Solid Foundations	391
	<b>Wright, Frances; Burford, Neil</b> Development of a Scottish Straw Bale-Wrapped Timber Frame Passive House Construction System	393

**Saturday, 23 April 2016**

Plenary Session

09:00

Greeting

**Wolfgang Feist**

Unit of Energy Efficient Construction at the University of Innsbruck and  
Scientific Director of the Passive House Institute

**Ernst Ulrich von Weizsäcker**

Club of Rome

Politics as a partner

**Heinrich Bottermann**

Secretary General of the German Federal Environmental Foundation (DBU)

09:45

**Scott Foster**

Director, Sustainable Energy Division, United Nations Economic Commission for  
Europe

## Session 9:

## Hall Spectrum

## Ventilation solutions

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|-------|---|-----|
| 10:30 | <p><b>Bräunlich, Kristin</b><br/>         Component Award 2016: Affordable ventilation solutions for retrofits</p> <p>The Component Award 2016 focuses on affordable ventilation solutions for retrofits. The participants submit ventilation solutions for a typical building from the 1960's, and the assessment is based on lifecycle costs and scores from a jury of experts. The award aims to highlight, promote and help disseminate affordable and practical Passive House ventilation units.</p>   | 405 |
| 10:55 | <p><b>Pflugger, Rainer</b><br/>         Reducing ventilation duct networks: Retrofit of the Siegmair School as part of the EU project SINFONIA</p> <p>As a part of the EU project SINFONIA, a demonstration project at the Siegmair School in Innsbruck, Austria, shows how a central ventilation system with active overflow elements can be easily integrated, complete with a reduced supply and extract air duct network, even in a retrofitted heritage school building.</p>   | 411 |
| 11:20 | <p><b>Stärz, Norbert</b><br/>         Central stairwell ventilation in multi-family houses</p> <p>Stairwells in multi-family houses must have controlled aeration and de-aeration to produce pleasant indoor air quality. Window ventilation leads to high losses; systems with heat recovery are better. Various solutions are presented and compared in an analysis.</p>  | 417 |
| 11:20 | <p><b>Martin, Bernhard</b><br/>         More efficient ventilation with intelligent active overflow systems</p> <p>Intelligent active overflow elements allow additional rooms to be connected to living room ventilation without additional air ducts based on the principle of controlled cascading. As a result, less effort is required and costs and energy consumption are reduced, making this solution an especially efficient one for energy retrofits.</p>  | 423 |
| 11:45 | <p><b>Farr, Andrew; Godber, Sally; Warm, Peter</b><br/>         MVHR in the UK – Lessons Learnt from Commissioning and a Suggested New “Final Protocol Sheet” for Domestic Use</p> <p>Mechanical ventilation and heat recovery (MVHR) and airtight construction is still a relatively new technology in the UK. It has been accepted as part of the UK Building Regulations for some time now, but experience has shown many systems to be poorly designed and installed. This paper looks at lessons learnt from UK installations and makes recommendations for design criteria, delivery process and commissioning methods.</p> | 429 |

- 12:10 **Peel, Andrew** 435  
North American Ventilation Systems Assessed According to Passive House Requirements  
This paper presents a comparison of the North American Ventilation standard CSA439 and the Passive House Component Certification standard for determining the Heat Recovery Efficiency. CSA439 test data are analysed to determine suitability for use in Passive House Building and Component Certification.
- 12:45 **Mikeska, Tomas** 443  
Concept of Passive House Institute Certification for split-type air-to-air heat pumps

Session 10:		Hall Titanium
Components for retrofits and new constructions		
10:30	<b>Ottinger, Oliver; Schulz, Tanja</b> Interior insulation: What works?  This paper first presents monitoring results and compares them with simulations of various insulation systems. Then, combinations of boundary climate conditions (such as driving rain load) and exterior coatings are studied for various insulation systems, and application limits are identified.	447
10:55	<b>Krick, Benjamin; Vahalova, Eva</b> Windows in a step-by-step retrofit  Often, windows and walls are retrofitted separately. Nonetheless, good overall results are possible: If the window is replaced first, it should be made flush with the old façade on the outside. If the wall is insulated first, provisions should be made for a new window, such as by using front-wall mounting systems. If the old windows are in good shape, inserting triple glazing into the old frame might be a good idea.	453
11:20	<b>Freundorfer, Franz</b> Cross-trade retrofit systems: an EnerPHit innovation  For the certification of an EnerPHit wall and construction system, a corresponding window was designed for the first time ever so that a window frame is dispensable in production and installation. The finished solution features lower costs and greater energy efficiency.	459
11:45	<b>Tywoniak, Jan; Bureš, Michal; Volf, Martin; Hejtmánek, Petr; Nováček, Jiří ; Lupíšek, Antonín</b> Lightweight timbered element façade for modified buildings – development and application  This paper presents the development of a system solution to replace old non-loadbearing exterior walls. The main idea was to develop a prefabricated system that uses modern timbered products to provide a Passive House-suitable alternative to the usual metal systems.	465
12:10	<b>Drössler, Eckart</b> Retrofit to a small multi-generational Passive House residential complex  A building originally constructed in 1964/1972 with good transport connections was expanded and restructured to produce a small multi-generational residential complex that fulfils the Passive House Standard. The building costs are lower than for a new build in the area, and expectations for energy consumption and operating costs were met.	471

<b>Muskatewitz, Adrian</b>	477
Guidelines for Passive House-suitable attic stairs	
<b>Theumer, Susanne</b>	479
Relevance of typical thermal bridges in a detached Franconian house from 1959	

Session 11: Hall Europium  
Tools – new features and latest developments

- 10:30 **Vogt, Anne; Díaz Antón, Nuria; Robledo Ruano, Laura; Jiménez López, Diana** 483  
PHPP 9 as a design tool for the first Passive House Premium buildings in Spain  
Although Spain has a lot of solar energy, current law makes it impossible to reach Passive House Plus and Passive House Premium with photovoltaics. At present, Spanish buildings are not allowed to produce more electricity than they consume; and energy companies do not pay for any excess.
- 10:55 **Rojas, Gabriel; Schnieders, Jürgen** 489  
Accurately predicting energy demand and room temperatures in various programs
- 11:20 **Edwards, David; Malzer, Harald Konrad** 491  
Latest Developments in designPH SketchUp Plugin – the 3D Interface for PHPP  
designPH is the SketchUp plugin developed by Passive House Institute. designPH 1.0 was conceived as a 3D interface for PHPP, to aid the entry of building geometry from a 3D model. The next developments will improve its usefulness as a complete design and analysis tool, with a new graphical user interface and improved analysis features.
- 11:45 **Barry, Bronwyn** 497  
Optimising Passive House: A look at Kranichstein (and Saskatoon) through the lens of PDT-Passivhaus  
'PDT-Passivhaus' is a new software tool that was developed to assist designers and architects with finding the most efficient combination of all their various building components. This paper explores the Kranichstein Passive House building and another cold climate project using 'PDT-Passivhaus'.
- 12:10 **Ochs, Fabian; Dermentzis, Georgios; Siegele, Dietmar; Calabrese, Toni; Feist, Wolfgang** 503  
"Auditing tool" PHPP – New Features and Comprehensive Validation  
The scope of energy audits, the methodology of comparing with dynamic simulation, considering heating and cooling demand and validation results of PHPP for different energy standards and climates are discussed and (new) features of PHPP are presented. Different levels of modelling and simulation details have been applied in order to be able to separate model (such as monthly balance) from input differences (such as occupation profiles or shading control).

12:35	<b>Tzanev, Dragomir</b> The New Building Knowledge Hubs of Europe: Successful Promotion of Passive House Trainings	509
12:40	<b>Weber, Jens-Erik</b> New Component Database	511
12:45	<b>Ottinger, Oliver; Schnieders, Jürgen; Hasper, Wolfgang</b> Determination of the heat loss coefficient of built Passive House buildings	515

Session 12:		Hall Helium 2
Passive Houses in North America and cold climates		
10:30	<b>Harrmann, André</b> Passivhaus in Vancouver: Made Possible by PHPPv9 and the City	
10:55	<b>Zouari, Sonia; Isaacs, Malcolm</b> Reaching for the Passive House Standard in Canadian Social Housing The 42-apartment Salus Clementine project in Ottawa's cold climate is Canada's first social housing project targeting the Passive House Standard. The project successfully demonstrates the feasibility of achieving Passive House in a challenging climate and an unsupportive building culture, and it can serve as an inspiration for many other building owners, tenants and regulatory agencies across North America.	519
11:20	<b>Paulsen, Monte</b> Factory-built Passive House: An affordable solution for remote Canadian communities The Bella Bella Passive House is a row house terrace comprised of prefabricated modules constructed near Vancouver and assembled in a remote First Nations community 760 km north. Constructed for less than the cost of a site-built project, it provides a prototype for affordable delivery of energy-efficient buildings to off-grid communities.	525
11:45	<b>Lindgren, Tomas; Granit, Simon</b> Högåsskolan – a Passive House school Högåsskolan in Knivsta is the first school in Sweden built according to the International Passive House definition and is financed entirely with Green Loans. With reference to measured values taken so far, the school shows impressive Passive House qualities and is nominated as "The Building of the Year", the finest price of its category in Sweden.	531
12:10	<b>Päätaalo, Juha</b> Onnelanpolku: The first Passive House retirement home in Finland A retirement home shows that Passive House is no problem for multi-storey residential buildings even in the Finnish climate. While planners have to use every strategy they can find for single-family homes in Finland to stay within the limits, this retirement home complies using building components and costs that are already standard.	537

- 12:35     **Wong, Terrell; Cook, Sylvia; Ebanks, Peta-Gay**     543  
Rammed Earth: Passive House, Naturally  
Insulated rammed earth maximises both thermal mass and resistance where temperatures fluctuate over a greater range both daily and seasonally. It increases energy efficiency, comfort levels and reduces the amount of insulation required in comparison to a similar lightweight structure.
- 12:40     **Stich, Tomaz**     549  
Off Grid Passive House in the Canadian Prairies

Session 13:

Hall Spectrum

Passive House districts and major projects

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|-------|---|-----|
| 14:15 | <b>Peper, Søren; Persch, Robert</b><br>Monitoring energy consumption in the new district Bahnstadt in Heidelberg<br><br>A study of the Passive House settlement in Bahnstadt-Heidelberg (more than 1,200 dwellings with over 75,000 m <sup>2</sup> of floor space) focused on energy consumption. On average, consumption of heating energy comes in at 15 kWh/(m <sup>2</sup> a) ( $\pm$ 4 kWh/(m <sup>2</sup> a)), an excellent outcome for such a large project. | 553 |
| 14:40 | <b>Bermich, Ralf</b><br>Passive House district Heidelberg-Bahnstadt in the eyes of its residents<br><br>The new Heidelberg-Bahnstadt district is currently the world's largest Passive House building area. A survey of all households in Bahnstadt revealed great satisfaction with living in a Passive House building, indoor air quality and room temperatures in the winter. Satisfaction was lower when it came to indoor temperatures in the summer.          | 559 |
| 15:05 | <b>Lilge, Thomas</b><br>Student dormitory complex in Münster, Germany: More than 500 units built to the Passive House Standard<br><br>This paper sheds light on the importance of quality assurance for a new student dormitory on Boeselagerstrasse in Münster, Germany, for which the Passive House Standard was adopted after the architectural competition had been won.  | 565 |
| 15:30 | <b>Lang, Günter</b><br>Passive more affordable than conventional: How?<br><br>The PopUpDorms are student dormitories in Vienna. Built in record time, they are of Passive House quality, with construction costs being 12 % lower than the usual local cost for social housing – proving that anyone can achieve the Passive House Standard and that it could even be used for refugee housing.   | 571 |

Session 14:

Hall Titanium

Passive House and renewables

- 14:15 Loga, Tobias; Frank, Milena** 579  
Photovoltaic power generation to cover domestic power demand in Passive House: A parameter study  
A parameter study was conducted on a Passive House building with a geothermal heat pump to determine the share of household power demand that a photovoltaic array can cover. Different temporal step-sizes were used to investigate the relation between power generation and demand.
- 14:40 Vallentin, Rainer** 585  
PER assessment and the new Passive House classes: A critique  
The PER model is a valuable thought experiment, but its application in the future assessment of buildings in combination with the new Passive House classes leads to a number of issues that are hard to solve. A reform of the old system is proposed as an alternative, and comments are welcome.
- 15:05 Krick, Benjamin** 601  
Is electricity (still) bad?  
This paper presents how the German CO<sub>2</sub>eq emission factor (electricity) has developed over time and what it might look like in the future. The CO<sub>2</sub> emissions of a variety of heat supply systems are investigated, with findings showing that heat pumps are better than fossil-based systems. Even direct electric supply with hot water heat recovery is better than heating with oil. The PER method is on the right path.
- 15:30 Großklos, Marc; Stein, Britta** 611  
Dimensioning of and performance data from an electricity storage system in a Passive House Plus building with 17 residential units  
In a Passive House Plus building, the combination of a PV array, a cogeneration unit and power storage provides for around 80 % self-sufficiency. The storage system is specifically half as large as it would need to be in single-family homes, which reduces costs.
- 15:55 Marcelino, João; Gavião, João** 617  
The impact of the standby consumption in a Passive House  
The standby consumption represents a significant share of the total electricity consumption in standard buildings as well as in Passive Houses. This paper analyses and discusses the impact of the standby consumption in the first certified Passive House in Portugal and how it can be mitigated.
- 16:25 Hall, Monika; Geissler, Achim** 623  
Is net zero energy possible for high-rise buildings?

Session 15:

Hall Europium

Step-by-step retrofits

- 14:15 Steiger, Jan; Vahalova, Eva** 627  
Overall retrofit plan for step-by-step retrofits to EnerPHit Standard  
As of April 2016 it will be possible to pre-certify deep retrofit processes, even if the implemented efficiency improvements only consist of a single step towards EnerPHit. With the new EnerPHit Retrofit Plan, a separate output file is added to PHPP as a comprehensive document for the building owner to illustrate the whole retrofit process with specific parameters and considerations for each retrofit step.
- 14:40 McCormack, Art; Moreira, Mariana** 633  
Step-by-Step EnerPHit Retrofit: Coordinated Design and Build  
Retrofitting to the EnerPHit Standard (as part of the EU funded EuroPHit project) is challenging, but becomes particularly complex where the house concerned comprises three different wall construction, is located on an exposed site and has curtailed exposure to the south sun.
- 15:05 Brown, Helen; Traynor, James; Newman, Nick** 639  
Large scale EnerPHit – Whole life costs and lessons learnt on high rise retrofit  
Retrofit strategies and whole life costing analysis, together with a study on whole life cost of heat supply and barriers to certification. The subject of the study is Wilmcote House in Portsmouth, UK, a 1960's 11-storey large panel concrete system building containing 107 properties.
- 15:30 Norwood, Zack; Theoboldt, Ingo; Archer, Dan-Eric** 645  
Step-by-step deep retrofit and building integrated façade/roof on a 'million program' house  
Kollektivhuset Stacken is a building from the 'miljonprogrammet' – the housing program implemented in Sweden from 1964 to 1975 to ensure everyone could have an affordable home. Step by step, it achieves Passive House Standard, building integrated solar photovoltaics covers its electricity demand, and the indoor comfort is improved.

- 15:55 **Diaz Antón, Nuria; Vogt, Anne; Sánchez Mateos, Mercedes** 651  
Step-by-step Retrofits towards EnerPHit Standard in Social Housing in Spain  
Step-by-step retrofits are a sensible solution to achieve the social housing refurbishment challenge in Spain. Three examples with different approaches are presented: a detached house, a single apartment in a building, and the common areas of a social housing. Low budgets and user awareness are the common features of these three projects.
- 16:20 **Lutzkanova, Iglia** 657  
A road towards deep building renovation on a step-by-step basis in Bulgaria  
The article presents the lessons learned from a pilot project for deep retrofit of a school building in Gabrovo (Bulgaria), outlining the difficulties encountered in each stage of the investment process, the measures undertaken to overcome them and the recommendations to prevent them in future.

Session 16:		Hall Helium 2
China goes passive!		
14:15	<b>Guo, Ling</b> Passive House in China: Present Situation and Future Trends The review of important changes in the development of Passive House in China in the past five years helps to gain insight and overall understanding, thereby creating the vision of a new era and shaping the future of China.	665
	<b>Yu, Zou; Deyu, Sun; Xi, Chen</b> Compiling Principles and Key Points of Passive Ultra-low Energy Green Building Technical Guideline China At present, the Chinese government and market have paid more and more attention on passive ultra-low energy green buildings. This paper introduces background, principles, key points and main contents of the National Technical Guideline for Passive Green Buildings with Ultra-low Energy Consumption, which was issued by the Ministry of Housing and Urban-Rural Development (MoHURD) in November 2015.	671
	<b>Song, Angyang; Wu, Jianlin; Gao, Caifeng; Yu, Zhen</b> Design optimisation of Tianjin Sino-Singapore Eco-City Passive House project using PHPP This study presented the important role of the computational tool PHPP in the process of design optimisation for a passive residential high-rise building in Sino-Singapore Eco-city, Tianjin, China. PHPP is a powerful tool for guiding passive building design. In this study, the building performance factors were pre-selected to identify the key design issues. Then, technical parameters were prioritised after sensitivity analysis.	679
	<b>Cunz, Thilo; Reuter, Friedrich</b> BuildTog Passive House in Tianjin, China In the framework of the international BuildTog project, LUWOGÉ consult adapts their methodology for mass replication of Passive Houses within the design for a 16-level residential building in Tianjin to Chinese boundary conditions in close collaboration with local planning and construction teams.	685
	<b>Cui, Yuansheng; Sun, Jicheng; Liu, Wei; Xue, Guibin; Guo, Sichen</b> Status, Problems and Solutions of Passive House Construction in China In this paper, the history and actual development of Passive House construction in China are reviewed. Existing problems in construction are summarised and proposals for the future development of Passive House in China are offered.	691

- Schirmer, Stefan** 697  
Experience and challenges from heating and cooling in Chinese pilot projects  
China currently has more than 30 pilot projects for energy-efficient new builds in compliance with the Passive House Standard – with quality assurance from Dena. Best-practice examples show how to solve building service issues.
- Meyer-Olbersleben, Michael** 703  
Experience from 11 blower-door tests for Passive House in China  
For the first seven Passive House buildings in China, we conducted 11 blower-door tests. Good levels of airtightness can be achieved in China as well, but training of local workers and measurement service providers is still to be improved.
- Lu, Quinn; Li, Jiang** 709  
Building a Passive House with EPS Module System in the Severe Cold Region of China  
North China has extremely cold winters, in which the temperature may go well below  $-30\text{ }^{\circ}\text{C}$ . Building Passive Houses here is a challenge. Commissioned as the design consultant for one pilot Passive House with an EPS Module System, which is now under construction in a severe cold region in China, the authors attempt to share the ideal design, simulation and calculation effort as well as technical approach.
- Kaufmann, Berthold** 713  
Good user-experiences from first Passive House buildings in China  
As of today, several buildings in China have been realised according to the principles of Passive House. This article summarises the experience gained with some of these buildings and reports some monitoring data in brief. With the aid of monitoring our knowledge in theory and practice can be broadened.
- Schnieders, Jürgen; Kaufmann, Berthold; Schulz, Tanja; Jiang, Huijun; Winkel, Susanne; Feist, Wolfgang** 719  
Passive House design in different Chinese climates – it works everywhere  
The Passive House requirements for typical high-rise residential buildings in nine different Chinese climates are determined. In addition, using the example of Beijing, it is shown that the Passive House standard offers several cost-efficient options for space conditioning.

Plenary Session

Hall Spectrum

- 17:15     **Feist, Wolfgang; von Weizsäcker, Ernst Ulrich; Alt, Franz**     729  
Sustainable energy for all. Panel discussion on the Passive House anniversary
- To conclude the 20th International Passive House Conference, Ernst Ulrich von Weizsäcker, Franz Alt and Wolfgang Feist will take part in a panel discussion on the economic and social implications of the energy transition along with its effects on society, the economy and the environment. The Passive House concept brings together the decisive foundations of a sustainable energy trend: high energy efficiency and the use of renewables.