

Index and Programme

Friday, 9 March 2018

Plenary Session

Hall 2 (Level 0)

09:00 Opening remarks

Ilse Aigner

Bavarian State Minister for Economic Affairs and Media, Energy and Technology

Stephanie Jacobs

Head of Health and Environment, City of Munich

Christine Degenhart

President of the Bavarian Chamber of Architects

Michael Kordon

1st Vice President of the Bavarian Chamber of Civil Engineers

09:45 **Frank Junker**

Over 15 years of economic success with Passive Houses in Frankfurt am Main

10:15 **Wolfgang Feist**

The Passive House for affordable housing construction

Awards Ceremony: Component Award for cost-effective home ventilation

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Session 1:		Hall 2 (Level 0)
Passive House in Bavaria		
1:00 PM	Reich, Karin Passive House buildings in the Bavarian State Administration By regularly constructing new office buildings and, during a pilot phase, selected special-use buildings that meet the Passive House Standard, the German state of Bavaria is fulfilling its duty to act as a role model in the construction of energy-efficient public buildings. The examples of operational Passive Houses discussed here are excellent proof of that.	85
1:25 PM	Hochhuber, Josef The Bavarian 10,000-houses-programme – promoting efficient and system-relevant buildings The “EnergieSystemHaus” part of the Bavarian 10,000 Houses Programme funds new builds and retrofits of properties that will support the energy system of the future with an intelligent combination of energy efficiency and innovative heat/storage technologies. The amounts of grants are graded: the more advanced the respective technology or efficiency measure, the higher the grant payable. The highest amounts of grants are for Passive Houses in the new build category and for “3 litre houses” for retrofits. The funding is closely aligned with the federal funding provided by KfW and BAFA and can be fully combined with grants from those sources.	91
1:50 PM	Vallentin, Gernot; Vallentin, Rena Passive House development in Munich and Bavaria This contribution comprises a presentation of Passive House projects in the city of Munich, in the greater Munich area and further afield. The following types of buildings are presented: residential buildings, residential complexes, educational buildings, office buildings and administrative and commercial buildings.	97
2:15 PM	Kirschbaum, Alexander; Kuckelkorn, Jens M. Monitoring and operational optimisation of a new Passive House school building A three-year monitoring phase including comprehensive optimisation and evaluation of operation enabled the FOS/BOS Erding’s sustainable Passive House school building to achieve a high functionality, a good level of indoor comfort and excellent energy efficiency.	103
2:40 PM	Lang, Florian; Klaffke, Julius The sustainable city of the future The amount of energy and resources consumed by a building during its lifecycle determines its level of sustainability. The Passive House Standard provides the ideal basis for sustainable design and this is boosted through the use of sustainable construction materials. During this project, a sustainable design could be drawn up thanks to the close involvement of the residents.	109

- 3:05 PM **Freundorfer, Franz; Brütsch, Andrea** 115
Passive House through cooperation in regional networks – it's worth it!
- The Passivhauskreis is a regional network financed by members' contributions. The association supports its members through joint public relations work, professional development opportunities and the sharing of experience. Its regional work is integrated into the activities of the iPHA and IG Passivhaus Deutschland networks.

Session 2:		Room K 1 (Level 0)
Components / Building services		
1:00 PM	Siegele, Dietmar; Ochs, Fabian; Feist, Wolfgang	123
	Simulation study on the use of enthalpy exchangers in cold climates This simulation study on enthalpy exchangers in the Alpine regions shows that relative humidity can be significantly increased. The overall efficiency of the systems, when the sizes are the same, is somewhat less than with heat exchangers. The need for frost protection is considerably reduced.	
1:25 PM	Wollnow, Jörg	129
	Possible applications for a new vapour control layer based on hygrobrid technology Roof structures were hygrothermally simulated in parameter studies. Investigations demonstrated the effectiveness of a newly developed direction-variable and moisture-variable vapour control layer. The results show that the directional use of moisture-variable vapour control layers in structures with high moisture levels help to ensure greater reliability in the construction process.	
1:50 PM	Kluth, Solitair	135
	Building materials in the spotlight – economics, ecology and grey energy	
2:15 PM	Pflugger, Rainer	141
	Reproducible low-cost solutions for Passive House multi-storey residential buildings, Campagne site, Innsbruck (Austria) The CAMPAGNE Smart City demonstration project (Innsbruck, Austria) made it possible to identify low-cost Passive House standard components and design elements which enable reproducible high quality in Passive House multi-storey residential construction through higher levels of prefabrication or simplified assembly processes.	
2:40 PM	Sambale, Martin; Andreas-Tschiesche, Peter	147
	Using Passive House certification to avoid mistakes The Energie- und Umweltzentrum Allgäu (Allgäu Energy and Environmental Centre – eza!) has been certifying Passive Houses on behalf of the Passive House Institute for many years. Experience has shown that many mistakes can be avoided by arranging to have projects certified, through having work checked by a second pair of eyes and by drawing on the experience of the member of staff responsible for the certification. To ensure that the certification process is as beneficial as possible, certifiers should be involved in the project early on during the planning stage so that they can provide important planning tips. They can give crucial advice, especially on complex topics such as shadowing and shading, thermal bridges and building systems technology. However, certifiers are not involved in sufficient time for this in more than half of the certifications performed by eza!energie- und Umweltzentrum Allgäu (eza!)	

- 3:05 PM **Stegemann, Michael; Roik, Matthias** 153
- Thermal optimization of anchoring components, here: brickwork support brackets
- The article gives an overview of the development process, as well as the optimization of thermal properties and production efficiency using the example of a masonry bracket. It shows how a bracket with improved thermal properties is completely redeveloped from scratch.

Session 3:		Room D 111 (Level 1)
Projects in North America		
1:00 PM	Zakrzewski, Stas	161
	The Importance of Embodied Energy in Today's Passive House Design This case study analysis of an 8-story Passive House building compares the lifetime CO2 emissions of concrete and timber frame designs. Embodied and Operational energy analysis shows that while Passive House is still most important, timber construction also provides substantial emissions reductions	
1:25 PM	Arifuzzaman, Andrew; Bryrne, Deborah; Senko, Daniel	167
	750 Bed Residence; Sustainability is the new Economy! 750 Bed Passive House Student Residence: a pedagogy, a game changer, an exemplary building to which many can learn from in order to meet mandated 2030 net zero carbon targets; A key driver of the Sustainable Economy in North America.	
1:50 PM	Nicholson, Brandon; Semke, Zack	173
	Passive House proof in Pettsburgh: profit + Paris progres With a simple policy move on tax credits, Pennsylvania has become a pioneer in Passive House progress in the U.S., with the Pennsylvania Housing Finance Agency leading the way. Two PHFA-funded affordable housing projects in Pittsburgh show how Passive House makes economic sense and can help cities like Pittsburgh reach their Paris climate goals.	
2:15 PM	Studer, Marcel; Picciano, Lucio	179
	Market rate Passive Design – Vancouver, BC How can Passivhaus buildings become more efficient and still be within market rate costs? A question that two local design-build firms teamed up to answer. Three completed projects and one in-progress, all located in the Greater Vancouver Area (GVA), form a study that moves from design considerations to construction optimization and looks at the overall financial and process economics. Their 'lessons learned' are then implemented and expanded upon in the last project of the group shown, which is currently under construction to be completed late 2018.	
2:40 PM	McMath, Katerina; Maurer, Alexander; Sharma, Ayme	185
	Canada's Northernmost Passive House	
	Wall, Stephanie; Wimmers, Guido	187
	A comparative LCA of the Wood Innovation Research Lab: An industrial PH for cold climates The case study on the University of Northern British Columbia's Wood Innovation Research Lab illustrates that while designing to Passive House standards increases the impact of the materials, it significantly decreases the operational energy and the overall Global Warming Potential of the building.	

	Fahssi, Elias	189
	Calgary, Carbon, and Components: Opportunities for Passive House in “C-Town”	
	Calgary, Alberta, Canada has access to 901 kWh/(m2a) solar radiation from South, but 0 certified Passive House projects. Why? This research develops a socio-historical context for this lack of Passive Houses, arguing that pre-construction aspects like marketing are key to us realizing the goal of the 2017 conference: “Passive House for all.”	
	Moorhead, Buck	193
	Designing Passive House on the Sly	
	This article examines two retrofit case studies in which clients had no prior knowledge of Passive House. Buck Moorhead Architect was successful in educating the clients about Passive House possibilities, and meeting their project needs and specifications using Passive House design standards.	
3:05 PM	Paulsen, Monte; Montgomery, James	195
	Clearing the air: Is flowrate a sufficient measure of kitchen range hood efficacy?	
	Many North American building codes favour direct-vent kitchen exhaust. This short presentation will suggest techniques for pairing recirculating range hoods with whole-house heat-recovery ventilation so that the system performs better than typical direct-vent systems.	
	Zouari, Sonia	197
	Passive House Feasibility in Extreme Cold Climates	
	Parks Canada is evaluating various energy efficiency standards and exploring the limits of conservation as a primary resource. This exercise allows Parks Canada to set a new approach to its northern assets and take advantage of the real opportunities that Passive House can bring to the Far North.	
	Peel, Andrew	201
	PER assessment of a large mixed-used student dorm	
	This paper explores the PER demand assessment and reduction strategies for the University of Toronto’s large 750 bed mixed-use Passive House student dorm. High occupancy combined with very client-specific requirements proved difficult obstacles to overcome in efforts to drive down the PER demand.	
	Romano, Adam; Buffone, Gina	203
	HANAC Corona: A Case Study on Passive House in Multifamily Affordable Housing.	

Session 4:		Room C 112 (Level 1)
Politics, Networks and Trainings		
1:00 PM	Colclough, Shane; Mullins, Seamus; Mernagh, John; Sinnott, Derek; Tansey, Peter; Riley, David; Foster, Scott; Hewitt, Neil J. The Passive House standard and its relevance for the implementing nZEB and the Global UN framework for energy efficient buildings.	207
1:25 PM	Knoch, Birgit Luxembourg – more than just banks Luxembourg is known for its banks, for the small border town called Schengen, and perhaps also as one of the homes of the European Parliament. But who would have associated Luxembourg with the highest density of Passive House Designers and Passive House Tradespeople in the world?	213
1:50 PM	Meitern, Maarja Long-term renovation strategies for housing providers: 4 international case studies The quantitative research from the REVALUE project did not provide a clear conclusion that better energy performing dwellings have a recognised higher market value. It has been found that some lenders are beginning to recognise that energy inefficiency stocks may represent an increased default risk.	219
2:15 PM	Herz, Dieter Implementing and securing Passive House requirements in public buildings It is no more difficult or costly to construct public buildings to Passive House Standard. Clear task definition, integrated planning and a greater regard for energy efficiency than in conventional construction ensure that building to PH Standard is possible and economically feasible despite the diversity and variety of uses of public buildings.	225
2:40 PM	Grant, Nick; Grylls, Charles Passivhaus for the many not the few Cost effectiveness is a key part of the Passivhaus approach and yet cost continues to be a barrier to widespread uptake. The authors argue for an apparently controversial approach that is common in manufacturing but almost absent from one-off build projects.	231

- 3:05 PM **Jedliczka, Günther** 239
Educate yourself and influence others through what you are. (Wilhelm von Humboldt)
The Passive House Standard is the minimum standard required by OeAD-WVGmbH for the construction of students' halls of residence. The company accommodates 3,000 international guests in energy-efficient Passive Houses every year. In addition, the company offers 2 summer programmes on sustainability topics which are the only ones of their kind in the world.
- Feirer, Martina; Frankel, Alexandra** 241
Passive House is child's play – knowledge transfer for the builders of tomorrow
A children's book was created with the idea of spreading information and combatting children and adults' fear of the unknown surrounding Passive House technology. The book explains how a Passive House works. It conveys information about engineering and building physics in a playful manner through flaps and moveable parts.
- Tzanev, Dragomir** 243
The building knowledge hubs: successfully running PH trainings in Southeastern Europe
The article is focused on the results of 4 consecutive EU-financed projects in reforming of the outdated training practices in the construction sector in 8 countries in Southern and Eastern Europe through adoption of PH training schemes and promoting the PH standard as the shortest way to NZEBs.
- McKenzie, Fiona** 245
Superpod® - Without a certificate, it's just a passive house. Or is it?

Session 5:

Hall 2 (Level 0)

Cost-effectiveness / Economics in residential buildings

- 4:00 PM **Bodem, Mario; Aurbach, Markus** 249
Passive House school project – using Passive House standard to reduce costs – operational experience and additional optimisation strategies
The energy standard was improved and at the same time the construction costs were reduced by skilful optimisation of the planning. In the early stage of operation there was still a significant need for improvement, especially in the commissioning of the building systems technology and in the further optimisation of the building control in the first years of operation.
- 4:25 PM **Horn, Gerrit** 255
The real costs of building components
Much has been discussed, written and claimed about the additional cost of Passive Houses. It is often said that Passive Houses are much too expensive. The question is just how high these extra costs really are. Passive Houses are not expensive. The additional costs referred to above for the building envelope are between 3 and 5% of the usual construction costs for residential buildings.
- 4:50 PM **Spiß, Engelbert** 261
Showcase project: the first 5-euro residential building to meet the Passive House Standard in Tyrol
Affordable housing is and will remain a fundamental requirement in Tyrol. With its 5-euro flats, Neue Heimat Tirol, in close cooperation with the state of Tyrol, is setting new standards. Schwaz was chosen as the location in which to implement the first project of this kind in Tyrol. Built to Passive House quality, the building here comprises 18 rented flats with high-quality fixtures and fittings and is wheelchair accessible with a lift. Each flat has a spacious balcony and a ground-floor storage area. The total rent of 5 euros per m² includes running and heating costs as well as VAT. A 50 m² flat for just 243.00 euros gross rent a month (includes heating and other running costs).
- 5:15 PM **Stein, Britta; von Malottki, Christian** 267
Reducing ancillary costs in social housing
There is a need to reduce both rents excluding heating and ancillary costs, thereby relieving the burden on the public purse. Ancillary costs related to consumption offer particular savings potential here. Moreover, billing costs can be reduced by using budgets for ancillary expenses.

- 5:40 PM **Nordhoff, Andreas** 273
- Colonia: Passive House with 4 kWh/(m²a) for heating and hot water built for less than 2,000 euros/m²
- Walking barefoot on wooden floors all year long, enjoying the sun as it shines through large windows, solar thermal energy, PV for electric cars and other purposes, 22°C in winter, 25°C in summer, a constant supply of fresh air (despite an air change rate of 0.15 h⁻¹), wheelchair accessible, comprehensive protection against burglaries – and all that with a nature reserve on your doorstep and just 20 minutes from Cologne... it's a dream house!

Session 6:

Room K 1 (Level 0)

Retrofit projects

- 4:00 PM **Schöberl, Helmut; Kronberger, Andreas** 281
Passive House refurbishment on an occupied property
Taking the high-quality features of a building dating from the Gründerzeit as a starting point, a modern standard of construction and living has been achieved. In terms of its thermal and energy-related characteristics, the property has been brought up to the level of a new build and marks the first time worldwide that an occupied building from this period has been refurbished to meet the Passive House Standard.
- 4:25 PM **Rentzsch, Friedrich-Günther** 289
Wichtel integration nursery in Lübbenau/Spreewald
In comparison to constructing a similar building from scratch, extending a building shell with a gross floor area of approximately 689 m² can save around 200 thousand euros. This amounts to a saving of around 8% of the total construction costs. The pedagogical aspects should be viewed with equal importance as the conservation of resources. A critical examination should be performed before any construction work is carried out in an existing building.
- 4:50 PM **Le Levé, Clemens; Badergruber, Thomas; Flach, Michael** 295
Ecological retrofit with a new façade system using the example of the Mayrhof farmhouse in Trins
The Mayrhof was thermally renovated with a prefabricated and ecological façade system. The timber frame construction elements with integrated windows were prefabricated in a factory before being mounted on the existing building in an extremely short time. This exciting pilot project showcases significant benefits over conventional systems.
- 5:15 PM **Schnieders, Jürgen** 301
An attempt to explain why old buildings do not consume as much heat as was thought
In many cases, the levels of heating energy consumption recorded in old buildings are lower than the calculated demand values. This paper investigates the causes for this and suggests an equivalent room temperature that provides more realistic calculation results.
- 5:40 PM **Iannetti, Roberto; Kaufmann, Berthold** 307
Reconciling efficiency - Economical evaluation of refurbishment for a condominium in Northern Italy

- 6:05 PM **Music, Admir** 309
- Air distribution: utilising the façade/experiences from the Sinfonia research project (A)
- Solutions for integrating central ventilation systems in retrofitted buildings are presented in this contribution. As the properties involved were occupied, minimally-invasive solutions with air ducts routed on the façade were devised which are presented in this contribution for 4 properties.

Session 7:		Room D 111 (Level 1)
Hot Climates and Summer Comfort		
4:00 PM	Barambio Buisán, Amarante	317
	Premium, Ecological and Autarc. A House in Mallorca Premium: Traditional architecture of Mallorca Island meets the highest passive house standard. Ecological: The soil from the site itself is manufactured to produce the brick walls. Self-sufficient: As an economical decision to produce the energy and water on site instead of bringing it from far away.	
4:25 PM	Nesi, Francesco; Iannone, Ileana; Tselifis, Matteo	323
	A systematic LCC analysis for the Mediterranean: the emblematic case of Italy This paper investigates the retrofit of a sample building located in all climatic zones in Italy and designed according to different energy levels. Using a common price reference for all the energy efficiency measures, it emerged that the PH standard is the most economically convenient approach according to a LCC analysis.	
4:50 PM	Pallantzias, Stefan	331
	Can a single 2kW Mini-split heat and cool a 100m ² passive house? Our project is a stepping-stone to NZEB in Greece. Our measurements over the last 24 months proof that we can heat and cool a house with a single minisplit, having met the boundary conditions for thermal comfort and the consumption of a passive house. In addition, all this was achieved with a very low construction budget.	
5:15 PM	Oliveira, Rui; Vicente, Romeu; Andrade, Luis; Varajão, Joana; Loureiro, Júlio; Lopes, Emanuel	337
	Innovative sustainable construction: Energy independent CLT Passive House for South Europe The paper provides a reference experience for future energy-independent building design based on Passive House concept, assuring thermal comfort with low energy demand aiming at the NZEB target resorting to on-site energy production (PV and Solar panels).	
	Dobrevski, Svetlin	339
	How to get cost effective summer comfort This paper shows the advantages of the integrated design regarding summer comfort with the Passive House Standard. The use of air-to-air heat pump, integrated into the MVHR, for heating and cooling, allows high and cost-effective comfort.	

- Gavião, João; Marcelino, João** 341
Passive House in Brazil: different solutions for different climatic conditions
This study aims at the definition of basic strategies to implement Passive Houses in different Brazilian locations which are representative of Brazil's vast climatic conditions. The Passive House requirements can be achieved in the four chosen locations: Curitiba, São Paulo, Brasília and Salvador.
- Stathopoulou, Aggeliki; Pallantzas, Stefan** 343
Single family Passive House Plus in Attica, Greece
The project is a new detached family house and is the first building in Attica that was designed and constructed by Greek CPH Designers from scratch. Due to its altitude of 554 m -not a typical climate for Athens- it leads the climate independent way to low cost PH Plus buildings in the region.
- 5:40 PM **Russo, Piero; Faganello, Stefano** 345
Cost-effective MEP solutions for a multifamily building in Mediterranean climate
A MEP solution in a PH multilevel residential building in a warm climate. The compact solution adopted for heating, cooling, HW production and mechanical controlled ventilation is an individual application for each apartment helping the customer to achieve autonomous control of thermal parameters, reducing cost and installation plant's complexity.
- Abercromby, Andrew Keith** 347
Construction & evaluation of a complex Passivhaus in the warm climate of Western Australia.
- Pagliano, Lorenzo; Pietrobon, Marco; Charani Shandiz, Saeid; Sapienza, Carmelo** 349
Monitoring results of a zero energy Passive House with renewables in a Mediterranean climate
A certified passive house in Mediterranean climate, under continuous monitoring, shows very good comfort and energy performance. Considering all the energy uses, the energy balance, in term of electrical energy, is positive in the yearly period and often considering monthly periods.
- Clarke, Alan; Godber, Sally** 351
Boundary conditions for robust summer comfort predictions in PHPP
Summer conditions are important for occupant comfort. PHPP provides prediction for summer temperatures but Passivhaus dwellings still overheat. We propose conditions to impose on PHPP modelling to ensure summer comfort predictions are more robust.

- 6:05 PM **Treiberspurg, Martin; Treiberspurg, Christoph; Hofbauer, Wilhelm** 353
Summer-proofed Passive House residential buildings with thermally activated reinforced concrete ceilings
A residential duplex with thermally activated ceilings controlled on a room by room basis and with predictive control was examined and evaluated by means of a comprehensive measuring programme as part of a research project. A housing complex with about 300 dwellings and component activation will be prepared as a subsequent project.
- Arda, Can** 355
A Modular Approach to Building Purpose-Oriented Self-Sufficient Structures

Session 8:
Methods and tools

Room C 112 (Level 1)

- 4:00 PM **Cuesta, Pablo; Calvo, Juan** 359
Passivhaus users and BIM. How to make the most of Revit models on PHPP certifications
BIM software provide with lots of information that are sometimes difficult to grasp. We developed a strategy that focuses on two points: the visual analysis of the model and the creation and management of specific data. To that end we created an app that exports data directly from Revit to PHPP.
- 4:25 PM **Martel, Tim** 365
Time Saving Tools for PHPP: Window Tool and Lifetime costing witz co-benefits
Two tools for PHPP are presented. The Window Tool makes windows much easier to enter (v8 and v9 of PHPP). REALcosting is economics software that writes PHPPs and is a complete package specifically for retrofits (v9.6 of PHPP). It can include co-benefits, Step-by-Step retrofit and optimisation.
- 4:50 PM **Crilly, Michael; Toledo, Linda** 371
Convergence and interoperability of BIM with passive design principles
Case study in the application of the designPH tool for two UK based domestic design projects; one new build and one refurbishment; and the practical issues of interoperability, with a simplified and integrated BIM workflow to benefit passive design projects using PHPP and BIM enabled software.
- 5:15 PM **Cremers, Bart; Bakker, Tristan** 379
Effects of condensation in exchangers of ventilation units - analysis of field studies
A flow balance correcting algorithm maintains a high thermal recovery efficiency for a balanced ventilation system, even with condensation in the heat exchanger. Enthalpy exchangers show no change in thermal recovery, even when outdoor temperature drops below the indoor dew point.
- 5:40 PM **Kalnciems, Krisjanis; Mitrevica, Mare** 385
The Passive House standard as the backbone for successful PPP infrastructure development projects
The public-private partnership (PPP) projects are playing increasingly important role in financing large scale public infrastructure development projects throughout the European Union. This paper describes how Passive House standard can help delivering successful PPP projects.

Kampouropoulos, Konstantinos; Crespo Sánchez, Eva; Macià, Jordi; Cases, Laia; Castellà, Marc 391

A novel methodology for the optimisation of the retrofitting actions in building of the tertiary sector

The proposed methodology has been developed as a software tool, which through a simplified GUI permits the customization of the databased, the configuration of the building's characteristics, as well as the evaluation and optimisation of different retrofitting actions of a given building.

Ottinger, Oliver; Peper, Søren 393

Monitoring and modelling heat losses through interior waste pipes and downpipes

An air flow ventilation generated by the open connection that runs through the pipe system from the waste water connection, through the building up to the upper roof penetration. The permanent flow of cold air leads to material heat losses which were assessed here at about 2% of the total losses of the building based on a combination of measurement and simulation. This percentage can quickly rise to over 5% in residential buildings with more sanitary installations. The model developed enables a detailed assessment to be made of the heat losses through rainwater and other downpipes. Simplified algorithms for the PHPP can be derived from this.

Saturday, 10 March 2018

Plenary Session

Hall 2 (Level 0)

08:30	Janna Schönfeld Energy efficiency in buildings: state-of-play on EU-level	397
08:45	Frank Heidrich Federal Ministry of Economics and Energy	399
09:00	Burkhard Schulze Darup Passivhaus Quo Vadis?	401
09:35	Elrond Burrell Love Passive House	413

- Session 9: Hall 2 (Level 0)
Cost-effective non-residential projects in operation
- 10:30 AM **Lepp, Laszlo; Reich, Mario** 417
MPREIS Passive House supermarkets – an economic success story
While the company MPREIS is known for the sophisticated architecture of its supermarkets, it also attaches great importance to energy efficiency and sustainability. And the economic comparison of a Passive House supermarket with the conventional method of construction also shows that the Passive House supermarket is worth it!
- 10:55 AM **Robrecht, Andreas; Kuckelkorn, Jens M.** 423
Monitoring and operational optimisation of the Plus Energy school
Schmuttertal-Gymnasium in Diedorf
The newly constructed, sustainable school, the Schmuttertal-Gymnasium in Diedorf, features open-plan educational environments to a Plus Energy Standard. Despite its complexity, it demonstrated a high level of user quality as soon as it was brought into operation. Monitoring showed that the Plus Energy Standard could easily be achieved with high levels of indoor comfort.
- 11:20 AM **Peper, Søren; Hasper, Wolfgang** 429
Monitoring: Passive House Quality Administrative Building of the Police Service
With this building, a functioning energy efficient administrative building was realised in which a high level of thermal comfort has been verified. This was achieved due to the extremely high quality of the building envelope and adapted building technology, with very little use of energy.
- 11:45 AM **Moll, Rainer** 435
Solving problems arising in maintaining a comfortable indoor climate in the Passive House
In its role as the provider of energy management services for the municipality, the Energie- und Umweltzentrum Allgäu (Energy and Environmental Centre Allgäu, or eza!) manages more than 200 municipal properties. These include a number of Passive Houses. This contribution gives an account of the practical experience gathered in managing these properties.
- 12:10 PM **Reiter, Olaf** 441
IHD Conference centre in Dresden – the next generation lecture hall
The conference centre was built in stacked plank construction as a Passive House. The exclusively north-facing room prevents rays of sunlight from shining in from the side. Four normal spruce planks are nailed across each other to form rhomboid shapes. Together with the arched trusses in the thermal insulation layer, they form the stacked plank vaults.

12:35 PM **Endhardt, Martin**

447

Office building using hybrid construction

The office building using hybrid construction methods has foundations of 30 driven piles that were equipped with ground probes, enabling them to function as energy piles. The structural reinforced concrete structure ensures thermal comfort during the summer. The thermal envelope is formed from wood-laminated walls suspended between the reinforced concrete ceilings, which create a thermal bridge-free envelope with air-injected wood fibre, Steico wall studs and soft fibreboards.

Session 10:	Room K 1 (Level 0)
Supply Concepts and Renewable Energies	
10:30 AM Krick, Benjamin	455
Opportunities presented by Germany's energy transition for buildings supplied with electricity	
In Germany, more renewable power is currently produced in winter than in summer. Highly energy-efficient retrofits, a transition towards electric heat generators and a move towards e-mobility by the transport industry mean that it would take around an additional 3 years for a 100% renewable energy supply to be achieved than it would in the baseline scenario.	
10:55 AM Schnieders, Jürgen	463
Energy balancing at district level	
With the aid of an example, this article demonstrates that the best results are attained by improving all building components to a high energetic standard at the point when they are due to be renewed. In this case, a district heat network is not advisable. A tool recently developed at the PHI was used.	
11:20 AM Mühlhaus, Jens; Vallentin, Rainer	469
PER investment model with a sustainability component	
In 2018, Munich-based provider Green City Energy AG will begin offering a model for investing in a European pool of power plants. The model is specifically tailored to the requirements of PER calculations for Passive Houses and has been designed to give building owners an alternative to constructing their own plants.	
11:45 AM Grove-Smith, Jessica	477
Active cooling in the context of a renewable energy supply	
An analysis of active cooling in the context of a renewable energy supply. An example is used to show that active cooling is much less significant than heating for primary energy when the seasonal availability of renewable resources is taken into account.	
12:10 PM Vallentin, Rainer; Schröferl, Martin	483
Energy autonomous Passive House	
The conditions of living with a 100% renewable energy supply are experienced directly in energy autonomous houses, just like being in an open air laboratory. This report presents a concept, operating methods and experiences, as well as suggestions for improvement.	

12:35 PM **Reinwald, Martina; Hochhuber, Josef**

489

Energy storage and grid regulation for highly efficient buildings – wind heating 2.0

The aim of the “Windheizung 2.0” (“Wind Heating 2.0”) project is to develop an innovative heating and storage system based on the concept of power-to-heat for highly efficient residential buildings. Consuming electricity in a way that is beneficial to the electric power system improves the integration of volatile renewable energy into the power grid.

Session 11:	Room D 111 (Level 1)
Passive House in Asia	
10:30 AM Rongen, Ludwig; Wirtz, Reiner	497
SAYYAS Passive House window factory in Harbin (Northern China)	
10:55 AM Deng, Bingtao	503
The development and mode exploration of passive ultra-low energy buildings in China	
<p>Passive building technology is a revolution in the construction industry and has already been widely promoted in Europe. In recent years, Passive House technology has been introduced into China, and by October 2017 more than 100 projects have been completed or are under construction. But it also takes a long time to fully promote passive building technology in China. This paper, through the practice of China in recent years, summarizes the challenge of popularizing Passive House in China and puts forward the basic methods to promote a healthy development of the Passive House.</p>	
11:20 AM Lu, Mingzhe	509
Practical experiments and implementation of the Passive House concept in China	
Practical experiments and implementation of the Passive House concept in China	
<ul style="list-style-type: none"> • About LUTHER Design • Current situation and development trends in China's Passive House sector • Challenges facing localisation in China and approaches to overcoming them • Our successful experience and expertise in Passive Houses in China 	
11:45 AM Lee, Myoungju; Lee, Eungshin; Lim, Inhyok; Kim, Jeongun	515
Application of Passive House Standard Techniques on the First Zero Energy Housing Complex in Nowon District, Korea	
<p>The Nowon Zero Energy Housing complex leaves net zero energy by supplying the energy using renewable energy. It could reduce up to 77~80% of energy cost including the cost for plug and public amenities, compared to the other multi-unit dwellings designed by 2008 Energy Saving Building Act.</p>	
12:10 PM Zou, Aijuan; Hu, Yiheng; Liu, Julin	521
Passive House HVAC System Design Case Study	
<p>This paper, studying on the HVAC system design of an apartment in Beijing, introduces the design requirements and optimization measures of HVAC system in Passive House different from traditional HVAC system design in China.</p>	

Zhicai, Han

527

The Application of GEPS in Chinese Passive Houses

Passive low-energy buildings have developed rapidly in China. Based on the comparison of 4 kinds of common thermal insulation materials in China, it is concluded that GEPS is the preferred insulation material for Chinese passive house.

Session 12: Projects in Europe	Room C 112 (Level 1)
10:30 AM Mitchell, Rachel; Natarajan, Sukumar	531
Providing Passivhaus: Post occupancy evaluation of certified Passivhaus homes in the UK	
850 homes have been certified to the Passivhaus standard in the UK. A systematic evaluation of the energy and comfort performance of post occupancy data from 69 dwellings shows that overall mean space heating demand is below the Passivhaus standard of 15 kWh/m ² TFA and internal temperatures are within the limits of Passivhaus.	
10:55 AM Jarvis, Andy; Clarke, Alan; Grant, Nick	537
Next Generation Passivhaus Archives	
The success of the first Passivhaus Archive in the UK has led to the development of an even simpler approach combining the passive Danish approach with lessons from Passivhaus construction.	
11:20 AM Menendez, Jesus	543
A Passivhaus Photo Set Studio: Project and User Experiences	
The case study presented in this publication shows the capabilities of the Passivhaus standard in the Mediterranean region and for a multi-purpose building. The finished project focused on the design, material, prefabrication and simplicity building strategies to deliver an affordable and comfortable place to work. Positive feedback has been reported by the final building user.	
11:45 AM Dixon, Bertie; Fordham, Max	549
Efficient heat system design in large PassivHaus multifamily buildings; UK experience	
Energy policy favours multifamily buildings to be heated with communal heating. It is difficult to achieve efficient distribution and low internal heat gains. This creates a risk of summer overheating. The primary energy impact is large. We present a technical report on efficient communal heating.	
12:10 PM Bradshaw, Frances	555
Moisture, embodied energy & other qualities of natural materials.	
'High performance' in buildings often means sophisticated technology and complex manufacturing. The intention of this research is to demonstrate that some of the most effective performance in buildings, in terms of both energy and wellbeing, can be achieved with minimally processed natural materials	

- Stephens, Mark** 557
Designing with the vernacular in relation to planning & Passivhaus - An Irish perspective
This paper gives an historical background to Irish vernacular design in the context of the Irish cottage; the design, heat loss form factor and details for this and current rural house planning guidelines are examined and then reconciled so that the design meets the Passivhaus criteria.
- Sutherland, Julian** 563
Hampshire Passivhaus – Site Sensitive design for health, wellbeing and low carbon living
- Miščević, Ljubomir; Kačića Miošića, Andrije** 571
First ECO-SANDWICH® House – Aesthetics of Social Housing Passive House with prefabricated wall panels
First ECO-SANDWICH® House showed that the concept of a passive house, even in the social housing programme and with the application of a prefabricated façade system, does not necessary need to dictate simple and boring aesthetics.
- 12:35 PM **Tresidder, Esmond** 577
Scottish Passive Houses as wind-energy buffers
Using dynamic simulation, strategies to shift heating demand to periods of excess wind energy are investigated for a Passive House on the west coast of Scotland. Up to 97% of heating demand can be shifted to periods of over-supply of wind energy for a small increase in total heating demand.
- Dehlin, Stefan** 579
Passive house construction in sub-arctic climate
NCC Sweden has built the passive house Sjunde Huset, a full-scale demonstration of a low-energy semi-detached. The building serves as a test bed for the design, material choices and technical solutions associated with energy-efficient construction in a sub-arctic climate.
- Monteyne, Hugo; Lazova, Marija; Laverge, Jelle; De Paepe, Michel** 581
Remaining energy requirement of a residential passive house in Belgium using PV and energy storage.
The remaining energy requirement of non-passive houses can be brought to the same level as a passive house but will demand severe financial efforts. Improving the building envelop to the passive house standard is more affordable than compensating extra energy demand with PV and energy storage systems.
- Riis Dietz, Søren** 583
Passive and active cooling in 3 PH rowhouses in DK.
In PH houses criteria for user friendly summer comfort can be met using PH cooling. Shading systems cannot stand alone. But shading design and natural ventilation during nightin combination provides enough cooling effect. Active cooling is not necessary in northern Europe.

Session 13:		Hall 2 (Level 0)
Cost-effective ventilation solutions for residential construction		
2:15 PM	Bräunlich, Kristin Component Award 2018 – ventilation can be affordable The winners of the Component Award 2016 have already proven that it is possible to design affordable residential ventilation solutions. Cost-effective home ventilation solutions are once again forming the focus of the Component Award in 2018. This time around, the task is to devise a solution for a multi-storey residential building comprising 2-room and 4-room flats that is currently in the planning stage.	587
2:40 PM	Stärz, Norbert Ventilation in housing – centralised, decentralised or somewhere in between? Ventilation systems in a multi-family house can be fitted according to a centralised or decentralised design. Every building is unique, just like its ventilation system. Solutions from 5 different houses ranging in size from 800 to 3,000 m ² are presented together with the costs. Information is provided and advice offered on finding solutions for ventilation.	593
3:05 PM	Schulz, Tanja; Kah, Oliver; Bräunlich, Kristin New concepts for controlled ventilation: component-integrated ventilation in residential construction	601
3:30 PM	Wirnsberger, Markus; Strobl, Thomas; Krause, Harald Simple ventilation systems for residential buildings – investigations in a research apartment Extremely simple ventilation systems are important nowadays, most notably for retrofits. Numerous series of measurements confirmed that the system using central air induction distributed by active overflow elements demonstrated adequate functionality in terms of contaminant removal and the resultant air quality.	609
3:55 PM	Kah, Oliver Summer comfort in residential buildings: additional cooling potential/new assessment approach Summer-time measures were assessed that exploit additional cooling potential in residential buildings in return for modest outlay. A calculation approach was also presented which enables summer-time assessments of individual building areas to be performed using a simple two zone model.	615

- 4:20 PM **Rojas, Gabriel; Delp, Woody; Singer, Brett C.** 623
Testing recirculating cooker hoods – Can their filter reduce (ultra)fine particle loads during cooking?
Recirculating cooker hoods are often installed in Passive House projects. Open questions remain on their effectiveness to reduce exposure to particulate matter (PM). We present preliminary results from an experimental study to characterise the filter efficiency for various cooking events.
- Fuge, Gerold; Goebel, Matthias** 627
Air heating and comfort – can new system designs make this possible?
- Feist, Mirko** 629
System optimisation: from minimal monitoring to precision measuring
The Passive House offers many possibilities as well as the necessary conditions for creating a very high level of residential comfort, because the temperature stratifications created by the heat losses are very small. Air stratification measurements can be used to investigate the effect of different sources on the level of comfort.

Session 14:
Ecology and Passive House

Room K 1 (Level 0)

- 2:15 PM **Opitsch, Wolf; Vallentin, Gernot; Leroni, Margarita** 633
Ecological model housing development in Prinz Eugen Park Urban development plan of the city of Munich showing the implementation of the Passive House residential complex of the joint building venture TEAM³
The ecological model housing development acts as a role model for Munich, focusing for the first time on the use of renewable resources. The Passive House standard can, however, be very effectively implemented here as is shown by the example of the residential complex of the joint building venture TEAM³.
- 2:40 PM **Leitschuh, Stephan** 639
Life cycle analysis of residential buildings
- 3:05 PM **Sutter, Christoph; Hatt, Tobias** 651
The HEROES ecobalance – simplified data recording and holistic assessment for residential buildings
The HEROES research project clearly demonstrates that Passive Houses are worthwhile even considering the energy used in building them. It shows how to compile overall energy balances and ecobalances for an entire building, and illustrates which building parts have a major influence on this overall assessment.
- 3:30 PM **Speigner, Simon** 657
Hummelkaserne timber housing complex, Graz, Austria
The Hummelkaserne timber housing complex is a sustainable and exemplary contribution to inner-city urban development which takes timber residential buildings to new (vertical) dimensions and ensures high resident satisfaction thanks to comfort and quality.
- 3:55 PM **Lütkemeyer, Ingo; Salbeck, Mathias; Korhammer, Susanne** 663
Stadtwerke Neustadt – a zero-emission building completed using sustainable construction
The new build by the Neustadt in Holstein municipal utilities involves a comprehensive sustainability concept. The impact of the construction, operation and demolition of the building will be minimised, taking into account its lifecycle. Special attention has been given to the energy demand (CO₂ neutral) and the environmental indicators.

4:20 PM **Vallentin, Gernot**

669

The aesthetics aspects of indoor climate control

An aesthetics of indoor climate can no longer generate its power from visual and mental images alone. It should also take into account aspects of indoor climate control, thereby incorporating the Passive House standard. The aim of this contribution is to show how aesthetic considerations can be taken into account using examples of projects that have been successfully implemented.

Session 15:		Room D 111 (Level 1)
Retrofits international		
2:15 PM	Archer, Dan-Eric; Norwood, Zack; Theoboldt, Ingo	677
	Evaluation of a step-by-step million program deep retrofit to passive house with building integrated PV roof and façade	
2:40 PM	Ingui, Michael	685
	Game Changing Realities	
3:05 PM	Style, Oliver; Fulcarà, Vicenç	691
	Step-by-step or one big jump? A multi-story residential EnerPHit project in Girona, Spain	
	The paper presents a Passivhaus retrofit project that sets a new standard in Spain: the first multi-story residential EnerPHit building. Constructed in 1978 with a gross floor area of 1038 m ² over 6 floors, this terraced building is situated in the historic centre of Girona.	
3:30 PM	Steiger, Jan; Yetsuh, Frank	697
	A New York high-rise retrofit study	
	The New York building stock will require considerable modernization. Therefore, an example building in Brooklyn was chosen representing more than 15% of the City's multifamily buildings. Five different efficiency standards, from EnerPHit up to the Passive House heated by supply air, were modelled and evaluated.	
3:55 PM	Pardo Calderón, Esteban	703
	Pilot Office Building from the National Government of Spain meets Passive House and BREEAM	
	In 2014, the Ministry of Finance and Public Administration called a tender to refurbish a 74-year-old building in order to house administrative uses of the State. Play Arquitectura won the contest with a proposal for rehabilitation that met the Passive House standard, and in the project phase the BREEAM seal was incorporated, becoming a pilot project for the State in terms of efficiency and sustainability. Due to the complexity of the standards to be met, during the design and construction phase, unusual building agents in Spanish Construction have been incorporated, such as the Ecologist, the Airtightness Director and the Start-up Manager, in addition to the corresponding Passive House Certifier and the BREEAM advisor. As measurement requirements and monitoring of compliance with the Passive House standard and the BREEAM seal, the project includes a centralized management system to measure all parameters of indoor air quality, consumption and water recycling and consumption and power generation, serving as a laboratory for the administration of the state in future interventions.	

- 4:20 PM **Vicente, Romeu; Oliveira, Rui; Melo, Bernardo; Varum, Artur** 709
Running after the Passive House Concept: Adaption of a three storey building in execution
The PH concept when assumed during the design phase is the most efficient and easiest manner to comply with the exigent requirements. This paper evaluates the later redesign solutions and the main constraints of a multi-residential building, namely the minimisation of thermal bridges, high relative humidity issues, introduction of technical systems, training of quality workmanship.
- Rodrigues, Fernanda; Dinis Alves, Ana; Costa, Aníbal; Álvares, Manuela** 711
Energy retrofit of a historic heritage building in Oporto
In the UNESCO World Heritage site in the historic centre of Oporto in Portugal, a building was selected to be refurbished according EnerPHit. As the project aims the eco-retrofit of heritage buildings, insulation solutions with sustainable and traditional materials were considered, being possible to achieve EnerPHit.
- Petran, Horia; Varga, Szabolcs** 713
Renovation of a 1977 experimental house to the Passive House and national nZEB standards
This paper presents the preliminary planning of a demonstration pilot for exemplary renovation of an existing building towards nZEB level using Passive House principles and technologies. The analysis shows that both EnerPHit standard and the national nZEB levels can be achieved by implementing the proposed package of renovation measures.

Session 16:

Room C 112 (Level 1)

Components international

- 2:15 PM **Meyer-Olbersleben, Michael** 717
Passive House museum, quality assurance, PH model houses and 1 million m² of building land
An airtight building envelope, as attested by the appropriate certification, is a prerequisite both in Germany and in Asia for the construction of energy-efficient buildings. This can only be done by providing targeted training to everybody involved in the construction process. The FLiB with its members can provide valuable assistance in the field of airtightness.
- 2:40 PM **Langenkamp, Olav** 721
A system facade integrating heating, ventilation and energy production. This paper retraces the analytical approach used to find the most suitable combination of components (window, solar shading, decentral ventilation, load bearing massive wood element, high strength concrete radiator for cooling and heating). The result is a mock-up model in scale 1:1.
- 3:05 PM **Mikeska, Tomas; Feist, Mirko** 723
Measurement and certification of air-to-air heat pumps based on realistic operating conditions
Innovative developments in air-to-air heat pumps could help to them being used considerably more frequently for air conditioning buildings even in moderate and cool climate zones. As tests on three single split units have shown, the part load operation and the fan stage of the internal unit have a considerable effect on the resulting EERs. The Passive House Institute has developed a certification procedure in order to make available the real life performance of air-to-air heat pumps as well as energy balance calculations.
- 3:30 PM **Bonilauri, Enrico** 729
External vs internal air tightness: understanding risks and potential savings in climate-specific solutions
Best practice advises installing the airtight layer on the warm side of assemblies. However, in North America the outer waterproof layer is often used for this function. The study uses international standards to compare two hypothetical models, "internal" and "external" air tightness, and to assess their suitability in different climates of the US

- 3:55 PM **Ševela, Pavel; Schulze, Michael** 735
Drain Water Heat Recovery - technology principles and planning recommendations
This paper combines the insight into the technology principles, economics and legislations with planning recommendations on how to integrate the local “drain water heat recovery” system into the HVAC concept of renovated and newly build houses.
- 4:20 PM **Petran, Horia; Varga, Szabolcs** 741
Life cycle cost assessment of a small cost-effective passive house in Eastern Europe
An existing cost-effective Passive House situated in East-Europe has been analysed with respect to a norm-based house with same geometry and location. Despite the relatively low energy prices, the net present value for 30 years is less for the Passive Houses, while the primary energy demand is reduced by 77%.
- Leigh, Seung-Bok; Shin, Jooyun** 743
Energy Consumption Analysis of Ventilation Cooling Applied in an Office Building in Korea
The article evaluated the energy-saving potential of ventilation cooling in an office building in Korea. The whole-building energy simulation results indicated that ventilation cooling could save 25.40% of the energy use consumed by mechanical ventilation currently applied in a case study building.

Panel discussion 17:15 – 18:00

Hall 2 (Level 0)

„Passive House – it’s worth it!
How to effectively implement high energy efficiency at the
regional level“

Chairman: Helmut Krapmeier

Wolfgang Feist

University of Innsbruck and Passive House Institute

Josef Hochhuber

Bavarian Ministry of Economic Affairs and Media, Energy and
Technology

Simone Kreuzer

IG Passivhus Sverige

Franz Freundorfer

Passivhauskreis Rosenheim-Traunstein

Micheel Wassouf

Energiehaus Edificios Pasivos