www.housingfinance.org

Autumn 2023

HOUSING FINANCE INTERNATIONAL

The Quarterly Journal of the International Union for Housing Finance

- The housing affordability crisis in Australia in a context of high interest rates
- Japan: tackling the problem of vacant houses
- New changes in China's housing market and policy orientations
- The Italian residential mortgage market and the possible effects of the future green transition
- Coupling of the real estate and energy sectors

International Union for Housing Finance

Housing Finance International

Housing Finance International is published four times a year by the International Union for Housing Finance (IUHF). The views expressed by authors are their own and do not necessarily represent those of the Editor or of the International Union.

ISSN: 2078-6328
Vol. XXXVIII No. 1

Contents:

4........ Editor's introduction

5........ Contributors' biographies

REGIONAL NEWS ROUND-UPS

7 ....**Africa**
Thandiwe Dhlamini

10............**Asia Pacific**
Zaigham Mahmood Rizvi

18............**Europe**
Mark Weinrich

19............**Latin America & the Caribbean**
Claudia Magalhães Eloy

22 ....**North America**
Alex J. Pollock

ARTICLES

24 ....**The housing affordability crisis in Australia in a context of high interest rates**
Alan Morris

33 ....**Japan: tackling the problem of vacant houses**
Yoshiyuki Toyoshima

35 ....**New changes in China's housing market and policy orientations**
Yusong DENG and Haoran JIN

40 ....**The Italian residential mortgage market and the possible effects of the future green transition**
Angelo Peppetti and Raffaele Rinaldi

45 ....**Coupling of the real estate and energy sectors**
Wolfgang Amann and Guntram Pressmair

➔ **Subscriptions:**
Individual Regular Annual Rate €135;
Individual Three-Year Discounted Rate €360.
Institutional Regular Annual Rate €155;
Institutional Three-Year Discounted Rate €420.

For further details, please contact Mark Weinrich
(weinrich@housingfinance.org)

International Union for Housing Finance
Rue Montoyer 25, B-1000 Brussels – Belgium
Tel: +32 2 231 03 71
Fax: +32 2 230 82 45
www.housingfinance.org
Secretary General: Mark Weinrich

the energy efficiency of the housing stock, including the role of green mortgages.

Our final article this time also focusses on the subject of energy efficiency and of reaching Net Zero by 2050. The article is by Wolfgang Amann and Guntram Pressmair and is titled Coupling of the real estate and energy sectors. Looking at the need to smooth the volatility of some energy sources the article describes some radical solutions that this writer at least, had not previously considered. Well worth reading.

We hope you find the latest issue of Housing Finance International rewarding; please send us your feedback.

Contributors' biographies

Wolfgang Amann, as Director of IIBW, the Institute of Real Estate, Construction and Housing Ltd., Vienna/ has executed more than 300 research and consulting projects on housing decarbonisation, housing finance, housing policy and housing legislation. He is consultant to international organisations, national governments and the private sector and teaches real estate economics on several graduate programmes in Austria.
CONTACT: *IIBW – Institute of Real Estate, Construction and Housing Ltd., Vienna /Austria*
www.iibw.at – amann@iibw.at
+43 1 9686008 [1.21]

Yusong Deng is the Deputy-Director-General and research fellow of the Institute of Market Economy at the Development Research Center of the State Council of China. He has published 5 academic works in the field of real estate and urbanization.

Thandiwe Dhlamini is the AUHF Coordinator within the Centre for Affordable Housing Finance in Africa. She holds a BA in History and Development Studies and completed the Housing Finance Course for Sub-Saharan Africa in 2018. She has experience in project management which she has gained through working with local and International Non-Governmental Organisations. She is passionate about community development and curbing injustices and inequalities affecting the underprivileged.
EMAIL: *thandiwe@housingfinanceafrica.org*

Claudia Magalhães Eloy is a consultant on housing finance and subsidy policy in Brazil, who currently works for FIPE [Fundação Instituto de Pesquisas Econômicas] and has worked for the World Bank (TA) and for the Brazilian Ministry of Cities and Companhia de Desenvolvimento Urbano e Habitacional of São Paulo (CDHU). Claudia has also participated in the development of the National Housing Plan, in the analysis of the Housing Finance System. She holds a PHD in Urban Planning at the University of São Paulo (USP), a Master's in City Planning at the University of Pennsylvania, a Master's in Public Administration at Bahia's Federal University (UFBA) and a BA in Architecture and Urban Planning (UFBA), with a specialization in Real Estate Finance at the Brazilian Economists Order (OEB). She also attended Wharton's International Housing Finance Program.

Andrew Heywood is an independent consultant specialising in research and analysis of housing and mortgage markets, regulation and policy with both a UK and international focus. He is a visiting fellow of the Cambridge Centre for Housing and Planning Research [CCHPR] and a research fellow with the Smith Institute. He is also Editor of the journal Housing Finance International. Andrew writes for a number of publications on housing and lending issues and publishes reports commissioned by a wide range of clients.
EMAIL: *a.heywood53@btinternet.com*

Haoran Jin is an associate researcher at the Development Research Center of the State Council of China, mainly working in the field of housing policy.

Alan Morris is a professor at the Institute for Public Policy and Governance at the University of Technology Sydney. He works mainly in the areas of housing and marginality. His most recent book is The Private Rental Sector in Australia: Living with Uncertainty, co-authored with Kath Hulse and Hal Pawson.

Angelo Peppetti, 50 years old, has a degree in Economics. He has worked at the Italian Banking Association since 2000 and is currently the head of the Credit and Development Unit. He is also a member of the Executive Committee of the European Mortgage Federation and of the working groups of the European Banking Federation. He has written articles and participated in radio and television programs on the credit topics.

Alex J. Pollock is a senior fellow at the Mises Institute, a past-president of the IUHF, the author of Finance and Philosophy – Why We're Always Surprised, and co-author of Surprised Again! The Covid Crisis and the New Market Bubble.

Guntram Pressmair. As a researcher and consultant at e7 energy innovation and engineering, Guntram Pressmair has a focus on energy economy and the energy transition, especially regarding flexibility in the electricity markets. In this area, he also pursues a PhD at the University of Life Sciences and Natural Resources in Vienna.
CONTACT: *e7 energy innovation & engineering, Walcherstrasse 11, 1020 Vienna*
guntram.pressmair@e-sieben.at
www.e-sieben.at/en

Raffaele Rinaldi, 58 years old, has a degree in Economics and an MBA. He has worked at the Italian Banking Association since 1991 and is currently the Head of the Credit and Finance Department. He is author of several articles on credit and financial topics in Italian and international magazines.

Zaigham M. Rizvi is currently serving as Secretary General of the Asia-Pacific Union of Housing Finance and is an expert consultant on housing and housing finance to international agencies including the World Bank/IFC. He is a career development finance banker with extensive experience in the field of housing and housing finance spread over more than 25 countries in Africa, the Middle East, South-Asia, East-Asia and the Pacific. He has a passion for low-cost affordable housing for economically weaker sections.

Coupling of the real estate and energy sectors

↳ By Wolfgang Amann and Guntram Pressmair

1. Energy transition and buildings

The complete transition of electricity generation to renewable sources entails many chal-lenges. At the top of the list is coping with the massively increased volatility on the electricity markets. Existing technical systems and market mechanisms for the synchronisation of electricity generation and electricity consumption are strongly challenged. So far, flexible (but mainly fossil) generation capacities, pumped hydro storage power plants and a variety of demand response measures (e.g., the use of existing batteries or the production of hydrogen: "power to gas") are available. Still hardly on the radar of the electricity industry is the use of the building sector as a resource offering flexibility (sector coupling).

For Austria, the authors conducted a study to change this situation and assess the potential of the building stock to support the stability of energy grids in times of most volatile renewable energy generation. In this context, thermally activated building structures (TABS) seem to become a game changer as a storage medium for the energy transition.

When evaluating the potential of such a sector coupling measure, the focus is on the one hand on the benefits and integrability in existing control mechanisms of electricity systems and on the other hand on possible advantages for the real estate industry as well as a possible contribution to the affordability of housing.

2. What are TABS?

Thermally activated building structures can be explained by the fact that the concrete ceiling becomes a radiator. The large radiation surface enables low flow temperatures, high living comfort and low energy costs. In addition to heating, cost-effective and low-emission cooling is also possible. There are no major technical barriers for the installation and the costs are almost the same as for other heat distribution systems (underfloor heating, radiators). Also, no major problems have been reported with regards to the technical service life or reparability. TABS are typically operated by heat pumps (Arthur Krupp et al., 2022).

Heat pumps are the technology behind refrigerators, and they can be used equally for heating and cooling of buildings. They have the great advantage that a multiple of heating or cooling energy can be obtained from one part of electrical energy. For heat generation in the low-temperature range, they are therefore much more effective than fossil energy sources and, with the corresponding electricity supply, are greenhouse gas neutral. The benefit for the energy system results from the inertia of TABS. It takes many hours and days for the concrete ceilings to reach the right temperature and just as long for them to cool down. Therefore, there is a great flexibility potential in terms of load shifting. The control algorithm can thus operate the heat pumps according to the framework conditions in the electricity grid or on the electricity market. With Smart-Ready heat pumps, this is already possible today, which also goes for predictive consideration of the weather forecast.

After many years of use for cooling office buildings, building component activation has also been in use in residential buildings for several years. However, it is only now coming into scale. On the one hand, it has been proven that its use as a sole system for heating and cooling is possible and thus cost-efficient (Erber&Roßkopf-Nachbaur, 2021). On the other hand, the precast concrete industry has started to produce prefabricated system ceilings with integrated TABS. The concrete and cement industries are strongly committed to scaling up this technology, given their high greenhouse gas emissions.

In view of the convincing advantages of TABS in terms of energy efficiency in heating and cooling, comfort, economy and grid efficiency, it is assumed that there will be rapid market penetration in new construction, but also considerable quantities in renovation.

3. Estimates for building construction and renovation

In order to answer the research question of this study about the future significance of TABS for the energy industry, an estimation model was developed for the expected new construction of residential and service buildings in Austria until 2040 as well as the renovation of existing buildings. Based on previous new construction rates and the forecast of household formation, a variety of input variables were taken into account, such as the development of vacancy rates, the development of demolition and replacement construction, the trend towards renovation of existing buildings, investment trends, and many more. With the support of a network of experts, a plausible penetration of the new technology of TABS and (also activated) underfloor heating was assigned to the estimated values for new construction and renovation, and on this basis a market trend for thermally activated building area was estimated until 2040. The results were subjected to multiple plausibility checks and sensitivity tests.

Under the assumptions made in the model, it is estimated that the market penetration of TABS in Austria will increase rapidly in view of the many advantages of the system. From about 500,000m² of newly installed space today, the annual output is expected to increase to over 2.5 million m² by 2040. Cumulatively, this is then close to 30 million m² (residential and service buildings, new construction and renovation combined), whereby not the entire potential is operated with heat pumps. Underfloor heating (which can be activated to a lesser extent to serve the grid) will start with a significantly higher volume of currently about 2.5 million m², which will increase to about 4 million m². Cumulatively, this will be over 50 million m² (without existing stock). Together, this will be almost 12% of the building stock in

2040. In view of the rapidly spreading smart-ready heat pumps, a significant volume of thermally activated space will be available in Austria in the foreseeable future. This forms the basis for the following model of the flexibility potential.

4. Framework conditions in electricity market regulations

Essential framework conditions for the flexible use of heat pumps have already been implemented legally and by means of standards in Austria. One milestone is the "smart grid ready" interface, which will be mandatory from 2024 and will enable the interruption of heat pump operation by the distribution grid operator, but also the energy suppliers and other service providers. It is also planned to be able to offer a reduced tariff for this grid-friendly function. With the Smart Grid Ready label, an industry standard has been created for German-speaking countries that also allows for complex controls, such as the consideration of weather forecast data for the optimised control of heat pumps. The development of energy control systems is making progress recently with regard to the optimised use of different energy sources, the optimisation of smart grids and the exchange of energy within energy communities.

International research projects are providing some results on the suitability of buildings as energy storage. According to these, buildings with a slow heat transfer system, high storage mass and good insulation are particularly suitable. However, due to their susceptibility to overheating, they require complex control systems (Hausladen et al., 2014; Le Dréau & Heiselberg, 2016; Artecoin et al., 2014).
The mechanisms for balancing electricity generation and consumption are complex. They can be divided into different sub-markets. The balancing market is used for very short-term balancing (a few seconds to an hour). Here, relatively high electricity prices can be achieved, but the demands on power and reaction speed are correspondingly high, so that today only about 10% of the capacities are covered on the demand side, with the large remainder being covered by hydro storage and gas-fired power plants. In order to prevent overloads in the electricity grid, services for the so-called Austrian grid reserve are procured, but so far only in the high-voltage grid. In several northern European countries this is also done in the medium and low-voltage grid. However, most of the energy trading takes place via exchanges (e.g., spot markets), via long-term contracts and also outside organised markets (Lehmann et al., 2019; JRC, 2022).

The flexibility possible with TABS on a large scale can play a role in portfolio optimisation by means of arbitrage effects (utilisation of price volatility up to negative prices) or minimisation of balancing energy costs, which affect every market player within the framework of his balance group. From the consumer's point of view, there is great potential for cost savings by maximising the self-consumption of PV electricity generated on site. Cost savings for consumers require a temporal differentiated energy tariff structure, which is only used in part today.

5. Building simulation for thermal inertia

A complex methodology was set up with a dynamic building simulation for a large number of reference buildings in Austria. For this purpose, single-family houses, multi-family houses, offices and industrial buildings were simulated separately according to area, room height, number of floors, typical U-values, window areas, infiltration, room occupancy and operating data, including a room temperature band for the comfort range. For individual building types, the installation of PV modules and corresponding self-consumption rates of electricity generation were taken into account. PV self-consumption has a major impact on the amount of electricity obtained from the grid during the cooling phases, but also in spring and autumn.

As a next step, a mathematical optimisation model was developed, to control heat pumps to make the best possible use of the fluctuations in the electricity price. From the comparison of the uncontrolled scenario (business as usual) with a price-optimised scenario (prices on the day-ahead market with forecast prices and volatilities until 2040; Prognos/vbw, 2022), the monetary benefit of flexibility was then calculated.

6. Results

On average for the different building types, the cost savings for price-optimised operation of the heat pumps is approx. 22% in 2025, but 50-75% in 2040, depending on the building type. The savings are greater for air-source heat pumps than for ground-source heat pumps, which is due to the greater efficiency of ground-source heat pumps over the course of the year. One's own electricity from PV brings the user a lot, but reduces the benefit from price-optimised electricity purchase from the grid. There is more to be gained in service buildings than in residential buildings, and here more in multi-apartment buildings than in single-family homes.

The cost savings and the benefits of price-optimised operation of the heat pumps for energy suppliers and grid operators are concentrated in the winter months, because the assumed equipping of the buildings with PV means that in summer, despite cooling and in spring/autumn, only comparatively little electricity needs to be drawn from the grid for the heat pumps.

As a final step, the simulation of the reference buildings was linked with the extrapolation of the building stock with surface heating (TABS and underfloor heating). The achievable cost savings grow with the expansion of the activated areas and, according to the calculations, reach about a modest € 23 million per year by 2040 for all Austria.

In order to understand the moderate cost savings, it should be added that only the energy for heating and cooling was taken into account, but not for hot water, which accounts for up to 40% of the total energy demand in modern, well-insulated houses. Only the pure energy costs are included, but not grid charges, taxes and levies. The prices used are those at which an energy supplier would buy on the electricity exchange (day-ahead market). The prices for end users and thus the savings potential from the consumer's point of view are much higher. Price volatility is expected to increase in the longer term, which offers further advantages for optimisation towards dynamic energy prices.

Beyond this immediate cost advantage, there are many other benefits of optimised control of heat pumps for building conditioning for energy suppliers and grid operators, but they are difficult to assess in terms of cash savings. Sector coupling can contribute to grid stability and grid security. Cost advantages result if the grid expansion can be more modest in scale and one or the other new transformer can be dispensed with. Aggregated participation of many small heat pumps in the balancing market is also conceivable. Tying up such packages is technically complex, but could be lucrative. Finally, load shifting in low-price periods contributes to better utilisation of existing renewable resources and thus to achieving climate targets.

The real estate industry can benefit in many ways from the new technology: The elimination of radiators provides more usable floor space, the radiant heat of TABS is more pleasant than the convection heat of radiators, it offers uncomplicated, comfortable and cost-effective cooling, and it is maintenance-friendly and durable. The emission-free operation contributes to an ESG- and taxonomy-compliant valuation of the properties. The minimised energy costs allow for a higher net yield. All this increases the value of the property.

The increased usable space, pleasant radiant heat, favourable cooling, ease of maintenance and durability, better value retention and maximised PV self-consumption benefit residents and owner-occupiers alike.

However, the monetary benefit of a price-optimised operation of the heat pumps for the residents depends on the availability of dynamic electricity tariffs. Although prescribed in the EU Electricity Market Directive, no dynamic contracts have been offered by the major Austrian energy suppliers to date. The study "Evaluation of Thermally Activated Building Strucutres as an Option for Flexibility in the Electricity Market" was commissioned by the Ministry of Climate Protection and supported by research funding from the Austrian Research Promotion Agency (FFG). It was carried out by the project partners IIBW and e7, Austria's leading know-how providers in the housing and real estate industry on the one hand and in energy research on the other (see https://nachhaltigwirtschaften.at/en/sdz/).

Sources

Arteconi, A., Costola, D., Hoes, P., Hensen, J.L.M. (2014): Analysis of control strategies for thermally activated building systems under demand side management mechanisms. Energy and Buildings, Volume 80, Pages 384-393.

Arthur Krupp GmbH, IIBW et al. (2022): Low Tech Wohnbau - Leistbarkeit im Lebenszyklus. Pilotprojekt in Theresienfeld, Tonpfeifengasse (Wien: Arthur Krupp GmbH & IIBW, NÖ Wohnbauforschung F 2266) [http://www.iibw.at/de/projekte/forschungsdatenbank/search/results].

Erber, S., Roßkopf-Nachbaur, T. (2021): Low-Tech Gebäude. Prozess Planung Umsetzung (Energieinstitut Vorarlberg und Partner des Interreg Alpenrhein-Podensee-Hochrhein Projekts).

Hausladen, G., Auer, T., Schneegans, J., Klimke, K., Riemer, H., Trojer, B., Qian, L., de Borja Torrejón, M. (2014): Lastverhalten von Gebäuden unter Berücksichtigung unterschiedlicher Bauweisen und technischer Systeme. Endbericht. Technische Universität München.

JRC – Joint Research Center der Europäischen Kommission (2022): Local electricity flexibility markets in Europe [https://data.europa.eu/doi/10.2760/9977].

Le Dréau J., Heiselberg P. (2016): Energy flexibility of residential buildings using short term heat storage in the thermal mass. Energy, Volume 111.

Lehmann, N., Kraft, E., Duepmeier, C., Mauser, I., Förderer, K., Sauer, D. (2019): Definition von Flexibilität in einem zellulär geprägten Energiesystem [https://publikationen.bibliothek.kit.edu/1000090455].

Prognos/vbw (2022): Strompreisprognose. [https://www.vbw-bayern.de/vbw/Themen-und-Services/Energie-Klima/Energie/Neue-Strompreisprognose-bis-2040.jsp].