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# The city of tomorrow and the fair energy transition: the role of affordable and social housing providers

Report of the Second POWER HOUSE nZEC Symposium  
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## List of Acronyms

AVS	Asociación Española de Promotores Públicos de Vivienda y Suelo
CA	Concerted Action
CLT	Community Land Trust
DEEP Green	Debt for Energy Efficiency Projects Green
EEEF	European Energy Efficiency Fund
EIB	European Investment Bank
ELENA	European Local Energy Assistance
EPBD	Energy Performance of Building Directive
ESCOs	Energy Service Companies
EU	European Union
Federcasa	Federazione Italiana per la Casa
GBV	Austrian Federation of Limited-Profit Housing Associations
nZEB	nearly Zero Energy Building
nZEC	nearly Zero Energy Challenge
SDE	Solar Decathlon Europe
USH	Union Sociale pour l’Habitat
WSW	Social Housing Guarantee Fund

## 1. Introduction

### 1.1 About the POWER HOUSE nearly Zero Energy Challenge



The task of future proofing homes for European citizens is being taken in hand by Housing Europe members – the European Public, Cooperative and Social Housing providers. The POWER HOUSE nearly-Zero Energy Challenge (nZEC), funded by Intelligent Energy Europe and led by Housing Europe, seeks to build capacity and confidence amongst these providers ahead of the requirement, that in 2020, all new buildings should be nearly-zero in terms of their energy consumption and that any energy required is sourced from renewable supplies. The Power House nZEC initiative will help social housing organisations to identify avoidable mistakes and ‘reinvention of the wheel’ to get on track to meet the nearly-Zero 2020 obligations outlined in the Energy Performance of Building Directive<sup>1</sup>.

Housing providers have a key role to play in ensuring the actual delivery of the nearly zero energy building (nZEB) requirements, not only in terms of their new construction but also in the retrofitting of their existing stock to reduce carbon emissions. This is done by taking a close look at the practical experience of four thematic inter-European Taskforces:

- nearly-Zero energy housing experiences in Cold/Continental climates (nZEB Cold)
- nearly-Zero energy housing experiences in Warm/Mediterranean climates (nZEB Med)
- nearly-Zero energy housing in regions characterised by Divided/Cooperative ownership (nZEB Divided Ownership)
- financing of nearly-Zero energy housing renovation and new-build (financing nZEB)

### 1.2 About the Solar Decathlon Europe



Solar Decathlon is an international academic architectural competition initiated by the U.S. Department of Energy in 2002. The competition is open to universities and institutions of higher education worldwide and gives students an opportunity to compete by meeting a challenge: to conceive, design and build a full-scale, entirely functional house, using only the sun as its power source. It aims to improve education and research in the fields of sustainable architecture and solar energy. The competition also represents an opportunity to increase public awareness of the houses of tomorrow and to present the materials, products and technologies that could be used to build them.

A European edition of the Solar Decathlon (SDE) now takes place every two years. It was first held in 2010 and then in 2012, both hosted by the city of Madrid, Spain. In 2014 the Solar Decathlon Europe was held in the city of Versailles, France. The French organisers of the SDE 2014 decided to focus on

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<sup>1</sup> For further info on the Energy Performance of Building Directive (EPBD), visit <http://www.epbd-ca.eu>

six specific points, all of which were intended to address the fundamentals of energy transitions: **density** to minimise environmental impacts; **mobility** which merges urban design, housing and transportation systems; **moderation** or the ability to ensure renewable energy supply and yet limit the energy demand; **innovation** in architecture and house appliances; **affordability** of applicable sustainable architectural and urban solutions; and a quality response to the **local context** of each team's region. Twenty of the best projects from 16 countries and three continents were selected, transported and built in a temporary, sustainable micro-city called 'La Cité du Soleil' in Versailles from 28 June – 11 July 2014.

### 1.3 About the Second POWER HOUSE nZEC Symposium



European public, cooperative and social housing providers are working together to meet the challenge of balancing social and ecological goals. Whilst the situation varies throughout the European Union (EU), in some cases, the cost of constructing housing which meets ambitious energy performance requirements exceeds the standard cost price in the sector. Higher costs are a result of more complex building concepts and systems, the use of alternative materials and procurement procedures. In order to meet these

challenges, the social housing sector must innovate and identify ways to keep costs down during the construction or rebuilding process and to look for innovative approaches, concepts and building techniques that make the realisation of nearly-Zero Energy Buildings simpler and more affordable. Bringing together technical and economic feasibility and securing affordable housing is key to the fair energy transition towards nearly-Zero Energy Buildings. For this reason Housing Europe, in the framework of the POWER HOUSE nZEC initiative, has teamed up with SDE 2012 in Madrid and SDE 2014 in Versailles in order to tap into the inspiration and motivation of the world's best architectural schools in its quest to shape this focus on innovation within the social housing sector.

Housing Europe and l'Union Sociale pour l'Habitat (USH) organised a symposium at the SDE 2014 in Versailles entitled "The City of Tomorrow and the fair energy transition: the role of affordable and social housing providers" to discuss and better understand the urban challenges that different European cities will face in the years ahead and the role of social and affordable housing providers in addressing them. Having a better understanding of these challenges and the possible ways forward will aid the sector to innovate and find solutions in delivering a fair energy transition.

The morning session of the symposium was dedicated to a discussion on the urban challenges for the cities of tomorrow and what European cities and social and affordable housing providers can do to tackle them. The afternoon session was focused on the work carried out by the POWER HOUSE nearly-Zero Taskforces and the "Affordable and Social Housing Award" ceremony organised by Housing Europe to recognise outstanding Solar Decathlon 2014 entries.

Copies of the speakers' presentations and photos of the event are available online at the POWER HOUSE Europe website<sup>2</sup>.

#### 1.4 About this report

This report highlights the discussions and outcomes from the Second POWER HOUSE nZEC Symposium held at the SDE 2014 in Versailles, France on 3 July 2014. It includes a brief description of the presentations by and roundtable discussions amongst invited speakers, Housing Europe members, POWER HOUSE nZEC project partners and Solar Decathlon Europe representatives on addressing urban challenges for the cities of tomorrow and the role of affordable and social housing providers. The work and progress of the POWER HOUSE nearly-Zero Taskforces on nZEB developments are also briefly presented in this report. Additionally, the report summarises the key features of the winning Solar Decathlon Europe 2014 entries that were recognised during the event. The report concludes with some recommendations for the housing sector and urban stakeholders to help address the challenges of affordable housing and fair energy transition that the European cities of tomorrow face.

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<sup>2</sup> POWER HOUSE and Solar Decathlon Europe 2014 website  
([http://www.powerhouseeurope.eu/solar\\_decathlon\\_2014/the\\_second\\_power\\_house\\_nzec\\_symposium](http://www.powerhouseeurope.eu/solar_decathlon_2014/the_second_power_house_nzec_symposium))

## 2. Setting the scene: Urban challenges facing the cities of tomorrow and social housing providers

The first part of the POWER HOUSE nZEC Symposium was dedicated to the role of local authorities and social and affordable housing providers within the urban context. The aim of the morning session was to assess the issues that cities of tomorrow will be facing in the near future and discuss with representatives of local government and social housing experts how to address the four challenges identified below:

- **Growing populations:** tackling the shortage of land and urban sprawl;
- **Energy efficiency:** reaching nearly-Zero Energy Building standards and fighting fuel poverty;
- **Social cohesion:** adapting to new lifestyles, new needs, new services and technologies and promoting social integration and inclusion in communities and society at large;
- **New governance strategies:** the role of inhabitants in managing and shaping the cities of tomorrow.

### 2.1 Opening remarks

*Mr Kurt Eliasson, President, Housing Europe*

Mr Eliasson welcomed all participants to the symposium and highlighted the role of the social housing sector in future-proofing homes. Housing of the future should be low-energy, sustainable and able to respond to future climatic, technological, social or regulatory changes or be 'future proofed'. Improving the energy efficiency of buildings and renewable energy production are key to making that happen. This is vital in order for communities and cities to be resilient and adapt to upcoming changes. The POWER HOUSE nearly Zero Energy Challenge provides a platform for the social housing sector to be a leader of fair, sustainable energy transition in Europe. As a place to see solar-powered housing ideas come to life, the partnership between Housing Europe and Solar Decathlon Europe helps pave the way for the housing sector in the future and encourages social housing providers to innovate further in their work in order to future-proof homes.

### 2.2 The European urban agenda, the energy jump and affordable housing

*Mr Mark Frequin, Director General for Housing and Building, Ministry of the Interior and Kingdom Relations in the Netherlands*

More than two-thirds of the population of Europe live in urban areas and this figure will further increase in the years to come.<sup>3</sup>

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<sup>3</sup> European Commission, Directorate General for Regional Policy (2011) 'Cities of tomorrow: Challenges, visions, ways forward' [http://ec.europa.eu/regional\\_policy/sources/docgener/studies/pdf/citiesoftomorrow/citiesoftomorrow\\_final.pdf](http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/citiesoftomorrow/citiesoftomorrow_final.pdf)



Mr Frequin pointed out that cities have a key role to play in meeting the economic, social and environmental issues facing Europe. In order to achieve Europe's 2020<sup>4</sup> objectives, EU policies need to be more responsive to the needs of cities regarding issues such as unemployment, climate action and social inclusion. In July 2014, the European Commission launched a consultation on the need for an 'EU urban agenda' in order to improve coordination and coherence of EU policies to reflect the needs of cities and for cities to have stronger and more direct involvement in EU policy-making. The target topics of the urban agenda include urban poverty, intra EU migration, youth employment, deprived urban areas, smart cities<sup>5</sup>, affordable housing and energy efficiency. Mr Frequin indicated that due to the pressing issue of climate change, energy efficiency has been put high up on the agenda as it is one method to reduce human greenhouse gas emissions.

In order to significantly reduce energy consumption and related CO<sub>2</sub> emissions, the Dutch government is currently working with a number of organisations from various sectors to implement an innovative programme called Energiesprong (energy jump or energy leap), which aims to stimulate the building sector and kick-start innovation in the built environment. Energiesprong brokered a deal between housing associations and builders to refurbish 111,000 houses (including terrace houses, three to four storey blocks of flats and 'corridor flats') to net zero energy levels using a building envelope manufactured off-site. The renovation is funded by savings delivered via contractor-guaranteed energy performance. The works are completed within a week and are non-intrusive so residents do not need to move out. Moreover, the programme allows residents to have an attractive refurbishment package which both improves the residents' quality of life and the aesthetics of the house. Energiesprong has already renovated a lot of social housing stock in The Netherlands and now plans to scale up the innovation to the United Kingdom and France.

The average estimated living costs of households in 2020 indicate that energy costs will be higher than rent in inefficient buildings.<sup>6</sup> Hence, improving energy efficiency of buildings can provide solutions to the issue of affordable housing. Mr Frequin highlighted that what makes improving the energy efficiency of buildings a good business case is that it not only provides good thermal comfort for residents but it is also an affordable investment for housing associations and residents alike. Through

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<sup>4</sup> Europe 2020 is the European Union's main strategy to become a smart, sustainable and inclusive economy. The EU has set five ambitious objectives in the fields of employment, innovation, education, social inclusion and climate/energy which are to be achieved by 2020. Each Member State has adopted its own national targets in each of these areas and concrete actions at EU and all levels of governance underpin the strategy. (Source: [http://ec.europa.eu/europe2020/index\\_en.htm](http://ec.europa.eu/europe2020/index_en.htm))

<sup>5</sup> The smart city concept goes beyond the use of digital and telecommunication technologies for better resource use, less emission and for the benefit of its inhabitants. It means a more holistic concept of intelligent, integrated working among inhabitants to achieve better mobility, cleaner urban environment and energy efficiency. (Source: <http://ec.europa.eu/digital-agenda/en/smart-cities>)

<sup>6</sup> Please refer to Mr Frequin's presentation slide no. 29 which can be accessed at [http://www.powerhouseeurope.eu/solar\\_decathlon\\_2014/the\\_second\\_power\\_house\\_nzec\\_symposium/](http://www.powerhouseeurope.eu/solar_decathlon_2014/the_second_power_house_nzec_symposium/)

exchanges of best practices, partnerships and collaboration among EU agencies, cities, research institutions and urban networks, the European urban agenda will serve as a platform for innovative solutions to energy efficiency and affordable housing issues.

### **2.3 The City of Tomorrow for all: What are the challenges at stake?**

*Speaker: Mr Jean Haëntjens, Founder, Urbatopie*

Mr Haëntjens described the four challenges that the cities of tomorrow will face: mobility, densification, urbanisation and social inclusion. He also mentioned that there are opportunities and ways forward to respond to these challenges. What is needed is an integrated, holistic approach to sustainable urban development. The development of sustainable mobility, for instance, goes beyond providing transportation solutions. It does not only mean having accessible, energy efficient and affordable public transport systems/networks or promoting cycling, walking and other alternative forms of transport but it is also about creating mobility solutions that promote social cohesion and consider future needs and urban development.

The implications of these issues on the social housing sector and its role in tackling them were also highlighted in this presentation. In terms of promoting quality of life, affordable housing and a city for all, the sector needs to work together with communities and other stakeholders to find innovative solutions. It is essential for the sector to offer more opportunities for people to travel short distances and in city centres and help shape urban spaces through appropriate and diverse building typologies, open green spaces and tenure interventions that can accommodate residents' needs and lifestyles.

Cities are places where both problems emerge and solutions are found. The real challenge for cities is to respond with equally integrated environmental, economic, social and culturally sensitive responses to these urban issues. Mr Haëntjens suggested that an integrated, collective strategy is needed across sectors and governance levels where all urban citizens/dwellers are involved in working towards sustainable urban development.

### **2.4 Roundtable 1: Dialogue with local government representatives**

#### **Addressing urban challenges: Experiences of European cities**

*Speakers: Mr Marcos Muro Nájera of the Basque Country, Spain; Mr Morten Kabell of Copenhagen, Denmark; Mr Christos Doulkeridis of Brussels, Belgium; and Mr Pierre Calame of Fondation Léopold Mayer*

The first roundtable was a discussion among representatives of local authorities on the experiences of European cities in addressing urban challenges. The discussion started with a viewing of a short film produced by USH, the French Federation of Social Housing Providers, which featured children's awareness of the problems in today's cities and their perspectives on the cities of tomorrow. Through drawings, children shared their ideas on how to address densification and urban sprawl by maximising height and space in the built environment and their desire that the cities of tomorrow have a strong sense of community spirit. The film inspired the speakers to share experiences in addressing such issues in their cities.

Mr Muro Nájera spoke about the Basque government's initiative to address the issues of economic growth and competitiveness as part of their Europe 2020 agenda. More than 30 per cent of residential housing in the Basque country in Spain is older than 50 years old and therefore requires renovation. In 2014, the government allocated over EUR 6 million to support the comprehensive renovation of 690 apartments in 16 buildings.<sup>7</sup> The government not only aims to improve the energy efficiency of housing but also to create attractive and balanced neighbourhoods through an urban regeneration programme. The Renewal Plan is one of the Basque government's strategies to promote sustainability, revive the economy, create employment and develop small and medium enterprises in the construction industry.

Mr Kabell acknowledged that the cities of tomorrow need to overcome the challenges posed by high densification. As more people live in cities, competition for resources will be high with increasing housing and land prices due to high demand. Availability and access to land will be a challenge for the housing sector as would the challenge of building a compact city with green public spaces and sustainable, liveable neighbourhoods. The city of Copenhagen in Denmark aims to become a greener city with a higher level of liveability. Aspiring to be the first carbon-neutral capital in the world by 2025, Copenhagen is now focusing on reducing energy consumption and carbon emissions through promoting sustainable urban mobility and an increased use of renewable energy sources.

Mr Doukeridis added that one of the main challenges in urban areas is building greater social cohesion in an increasingly diverse population. Due to unaffordable housing and demographic pressures, people are forced to leave cities, which reinforces inner city decline exacerbating the exclusion and isolation of the poorest in less developed parts of urban areas. In the city of Brussels in Belgium, housing prices more than doubled in the last 10 years and with only eight per cent of housing stock in public ownership, most low-income households have to find accommodation in the private rental sector, mostly in low-priced neighbourhoods. To address this issue, a Community Land Trust (CLT) project has been initiated in Brussels, which aims to build houses that are affordable to low income people by selling the flats and not the land on which they are built. The land remains property of the CLT, which is a non-profit, community-based organisation committed to the stewardship and affordability of land, housing and other buildings used for community benefit in perpetuity. The Brussels government has financially supported this new scheme and integrated it into the national housing code. By managing land for the common good, the CLT model not only addresses the issues of housing affordability and gentrification but also contributes to sustainable land management and creating a more equitable and cohesive city.

Mr Calame likened cities to living systems which have inputs of energy and materials and with dynamic and complex components that interact and influence each other. Looking at the city as a whole ecosystem, which includes both nature and people, allows us the possibility of creating integrated solutions that would help maximise energy efficiency, reduce waste and improve liveability. Mr Calame also asserted the importance of fostering relationships among various stakeholders at different levels of governance. Cities are essential stakeholders and therefore the end users need to

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<sup>7</sup> Visesa website ([http://www.visesa.com/noticias\\_det.asp?id\\_contenido=9393&origen=index](http://www.visesa.com/noticias_det.asp?id_contenido=9393&origen=index))

be involved in discussions and policy making at local and national levels to holistically address urban issues.

## 2.5 Roundtable 2: Dialogue with social housing experts

### The role of affordable and social housing providers

*Speakers: Mr Steve Cole of National Housing Federation, England; Mr Sebastien Garnier of Aedes, The Netherlands; Mr Özgür Öner of GdW, Germany; Mr Stéphane Dambrine of Paris Habitat, France*

In the second roundtable, social housing experts discussed the role of affordable and social housing providers in addressing the urban challenges of the cities of tomorrow. A short film by USH also invited the experts to discuss how social housing and services can benefit all social groups in urban areas.

Mr Garnier of Aedes, the Dutch national association of social housing organisations, stated that good coordination and engagement of all levels of governance – European, national, regional and local – must be strengthened in order to facilitate the implementation of the European urban agenda. He highlighted the role of local authorities in shaping local housing strategies and in working with housing providers to ensure that everybody has access to affordable, decent housing and that timely assistance is provided to those with urgent needs. Mr Garnier also identified the role of social housing providers in driving innovation in the housing sector through understanding urban trends and impacts, listening to residents and involving them at all stages of their work and looking for more flexible construction systems and supply, based on household needs.

Mr Cole of the National Housing Federation, the umbrella body representing independent non-profit housing associations in the United Kingdom (UK), pointed out that a major problem in the UK is the lack of affordable housing supply, despite the soaring demand. This is partly due to a ‘top-down’ planning system, the compartmentalisation of functions within local authorities and a culture of homeownership, which affects housing affordability. Moreover, a large amount of social housing stock had been sold via the right-to-buy scheme<sup>8</sup> but has not been replaced by new affordable homes. There is, therefore, a need for incentive schemes and enabling policies to meet the demand for social housing accommodation, which is likely to increase in the coming years. Mr Cole also indicated the need for social housing providers to diversify their housing types and financial sources in order to invest into affordable housing provision. Additionally, they have a role in improving the existing housing stock so that it meets the needs of tenants and the wider community.

Mr Dambrine of Paris Habitat, the largest public housing agency in France, echoed the shortage of affordable decent housing across the country. Limited land availability and high property prices, particularly in the area of Paris, not only impede the production of affordable homes for low-income households but also bring about a rise in the number of rough sleepers and people living in substandard housing. Mr Dambrine stated that housing policies can address this issue through increased housing development as part of urban planning measures or urban renewal programmes and by increasing the proportion of affordable housing in new housing developments. The speakers

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<sup>8</sup> Right to Buy is a UK government scheme which allows local authority tenants to buy the house they are currently renting at a discounted rate.

further expanded on the importance of having social housing in a mixed neighbourhood. They agreed that social housing needs to be part of mixed neighbourhoods in new development or urban renewal programmes in order to prevent the concentration of social tenants in the most disadvantaged areas, which often leads to communities being polarised by income or spatial segregation.

Mr Öner of GdW (the Federal Union of German Housing and Real Estate Associations), the biggest nationwide umbrella organisation for housing, stated that there is an increasing demand for refurbishment in Germany driven by energy saving regulations and demographic change. The latter in particular requires measures for structural adaptations to buildings in order to accommodate the needs of an increasingly ageing population in the country. Innovation and a holistic approach are a must to lower costs and meet energy efficiency and age-adapted living standards. Mr Öner also highlighted the challenge of growing cities due to migration. These cities will soon become new metropolitan areas with an increasing need for urban development. In turn, the outskirts or surrounding regions are experiencing depopulation and declining levels of development – often called ‘shrinking cities’<sup>9</sup>.

The speakers then discussed the role of social housing providers in addressing the phenomenon of shrinking cities. The social housing sector, together with other local organisations, has the task of supporting these depopulated areas and improving the quality of life of residents through housing and services which cater to their needs. However, local political leaders also need to deploy the right incentives and policies to limit depopulation through urban planning and by creating opportunities for the residents to stay in the area and achieve a good quality of life.

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<sup>9</sup> Shrinking cities are cities that are experiencing acute population loss commonly caused by factors such as deindustrialization, suburbanization and demographic change.

### 3. The POWER HOUSE nearly Zero Energy Challenge Taskforces: Contributions to the fair energy transition and lessons learned

The second part of the day focused on the work carried out by the POWER HOUSE nearly-Zero Taskforces. The four Taskforces were set up in order to make POWER HOUSE project partners work together according to the different climate zones they are operating in, also taking into account the different types of tenure. Financing energy efficient retrofitting and new build are issues of common interest among the Taskforces.

Mr Marco Corradi, the Chair of Housing Europe Energy Experts Network and President of ACER Reggio Emilia in Italy, opened the afternoon session and raised the issue of energy poverty, which has been a growing phenomenon in the EU since 2008. Ten per cent of the European population are currently unable to keep their homes adequately warm. Energy poverty is caused by low household income, rises in energy prices and low levels of energy efficiency in homes. Mr Corradi underlined that whilst European public, cooperative and social housing providers recognise the crucial importance of the energy saving agenda, they are also particularly keen to ensure that the transition to nearly zero energy is a fair and equitable one for their current and future residents, who often are drawn from amongst the more vulnerable and marginalised groups in society. Hence, housing providers have a key role to play in delivering a fair energy transition to nearly zero energy building.

#### 3.1 Warm/Mediterranean climates TaskForce



Ms Anna Maria Pozzo of the Italian Federation of Public Housing Companies (Federcasa) and Mr Carlos Astorza of the Spanish Social Housing Association (AVS), lead representatives of the nZEB Warm/Mediterranean climates Taskforce, shared some of the Taskforce's key learning in adapting nearly-Zero Energy principles to their climate conditions. Ms Pozzo pointed out that the implementation of the European Directives on energy efficiency in Mediterranean countries has led to the introduction of northern European construction models and techniques such as deep insulation and the control of ventilation. However, this approach could create health and comfort-related risks for residents, especially during the warm summer period, which meant that some of these techniques or installations may not be suitable for the warm/Mediterranean type of housing or climate. Hence, the members of the Warm/Mediterranean Climates Taskforce had drafted a 10 point document – the Mediterranean House Manifesto<sup>10</sup> – describing a nearly-Zero Energy Building designed for Mediterranean climates.

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<sup>10</sup> The Mediterranean House Manifesto is available in Italian, French and Spanish and can be accessed at [http://www.powerhouseeurope.eu/nearly\\_zero\\_taskforces/nzeb\\_in\\_warmmediterranean\\_climates/key\\_resources\\_and\\_outputs/](http://www.powerhouseeurope.eu/nearly_zero_taskforces/nzeb_in_warmmediterranean_climates/key_resources_and_outputs/)

Mr Astorza also emphasised the issues of fuel poverty and access to renewable energy as the most important issues for tackling energy efficiency. He stated that in Spain around four million people are struggling to pay their energy bills. The decentralised production of energy which stimulated the renewable energy market in the country was seen as an economic threat by major energy producers. Hence a new law was proposed to reform the energy market which would impose a tax on those who use renewable energies as well as penalise those who do not connect their solar panels to the grid. These new requirements will not make it economically feasible for residents to produce their own energy but will make it cheaper to keep buying energy from current providers. Mr Astorza asserted that access to clean energy is a right and called on civil society to push for fair policies by raising people's awareness and mobilising them to initiate and lobby for changes.

### 3.2 Cold/Continental climates TaskForce



Ms Eva Bauer of the Austrian Federation of Limited-Profit Housing Associations (GBV), the nZEB Cold/Continental Taskforce lead, briefly shared the key findings of the Taskforce's assessment of the cost optimal<sup>11</sup> level of investments between low energy buildings and Passive houses. A crucial question regarding cost-optimal building standards and the cost-efficiency of nearly zero energy buildings is whether calculated energy demand and costs assumptions correspond with measured energy consumption and real cost data from buildings when in use. Only a few empirical studies have been done on cost optimality, even in those countries where a considerable number of nZEB have already been built. A broad empirical survey collecting energy consumption and cost data from 90 multi-family, residential, nearly zero energy buildings was undertaken by e7 and GBV in order to analyse the cost-effectiveness of the buildings.<sup>12</sup>

The results showed that maintenance costs vary widely and those buildings with ventilation systems tend to have higher maintenance costs. The lower energy costs of Passive house and lowest-energy building types tend to be partly compensated for by higher maintenance costs. In general, the lower costs for heating energy do not compensate for the higher investment costs for the Passive house standard of building. This makes the Passive house standard not cost optimal for residential buildings. According to Ms Bauer, in the context of Austria it seems that a low energy building (energy heating demand of 55 kWh and 30 kWh in hot water) with an automated ventilation system is within the range of cost-optimal building standards. However, this may not be the case in other cold/continental countries, which may show different results when calculating cost optimal levels of investments in nearly zero energy buildings.

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<sup>11</sup> Cost-optimal level is defined as the "energy performance level which leads to the lowest cost during the estimated economic lifecycle" of a building or building element. The level is determined by taking into account a range of costs such as investments, maintenance, operating costs, energy savings. (Source: [http://www.epbd-ca.org/Medias/Pdf/Cost\\_optimal\\_summary\\_document\\_final.pdf](http://www.epbd-ca.org/Medias/Pdf/Cost_optimal_summary_document_final.pdf))

<sup>12</sup> Huettler, W and Rammerstorfer, J. (2013) 'Cost optimal building standards – evidence based! The case of Austria' [http://www.irbnet.de/daten/iconda/CIB\\_DC26262.pdf](http://www.irbnet.de/daten/iconda/CIB_DC26262.pdf)

Mr Walter Huettler of e7 Energie Markt Analyse GmbH, an Austrian consulting and research company, also added that in improving the energy performance of buildings, the quality of the work is more important and that tenants benefit from low energy costs of the refurbishment. Continuous, adequate monitoring of a building's operation must be done to ensure that buildings are functioning according to the criteria and performance targets set during the start of refurbishment or construction works. There is still so much to learn to further improve the energy efficiency of buildings as well as their cost-effectiveness and a step-by-step approach is beneficial in this learning process. Knowledge exchange and collaboration among the stakeholders in the building chain can greatly facilitate that.

### 3.3 Divided/Cooperative ownership TaskForce



Ms Sara Zoni of Finabita, an agency of Legacoop Abitanti (Italian National Federation of Housing Cooperatives), imparted some of the challenges and main lessons learned by the nZEB Divided/Cooperative Ownership Taskforce members. Decision making regarding energy efficient renovation in divided and cooperative property buildings is more complex as owners are dependent on each other to reach a decision. In these multifamily buildings, the role of owners or tenants is crucial as they have the final decision and financial responsibility for the building's overall maintenance and energy efficiency investment. However, decisions to invest in energy efficiency in multifamily buildings are linked to other decisions concerning the building and its users. These are also influenced by other factors such as legal and regulatory contexts and the organisational or decision making process used to manage and renovate the building. Hence, working with the residents and involving them in all stages of the refurbishment process is crucial. Moreover, training and engaging the residents help the monitoring and quality assurance of the refurbishment works, i.e. the design has been implemented properly and performance targets are met through monitoring results and feedback. Lastly, Ms Zoni called for a need to develop financing schemes that are adapted to the large-scale comprehensive renovation of buildings. For instance, Energy Performance Contracting through energy service companies (ESCOs) or public, third-party, investment operators has the potential to develop and stimulate the market for the deep renovation of buildings. Housing providers need to further explore the use of this financial mechanism in combination with other possible finance instruments.

### 3.4 Financing of nearly zero energy housing renovation and new-build

#### Energiesprong programme in Netherlands

*Speaker: Mr Ron van Erck, Platform31*



Mr van Erck introduced Energiesprong (Energy Leap), an energy programme commissioned by the Dutch Ministry of the Interior and Kingdom Relations that aims to deliver social housing with net zero energy consumption, i.e. no energy bill, at zero cost to the tenant and with no subsidies to the builder. Energiesprong has brokered a deal between housing associations and builders to refurbish 111,000 houses to energy neutral (E=0) levels in the Netherlands. E=0 means that annually a house does not consume more energy for heating, hot water, lights and



appliances than it produces. The five-year programme, which started in 2010, initially focused on social housing but is also now working with public and commercial office buildings.

Housing associations can take out a bank loan from the Social Housing Guarantee Fund (WSW), which has provided EUR €6 billion to underwrite government-backed 40-year loans to housing associations. Tenants are charged the same amount they had previously paid for rent and energy bills together, until the debt is repaid. The housing associations pay building companies to retrofit the houses, which after renovation have net zero energy costs. The refurbishment is executed within 10 days and comes with a 30-year energy performance warranty from the builder. The technology used for refurbishment is based on prefabricated panels that are made to fit existing houses in order to save time and costs. Insulated roofs are installed with high-efficiency solar panels whilst heat pumps, hot water storage tanks and ventilation units are stored in garden sheds. Building on the same methodology, a similar approach will be facilitated in the United Kingdom and France through the Transition Zero programme, which aims to make affordable E=0 retrofit packages a market reality using frontrunner social housing organisations in each country.

### **Financing energy efficiency improvements in buildings**

*Speaker: Mr Juan Alario, European Investment Bank*

Mr Alario highlighted the need to scale up and expand investments in energy efficiency in buildings in order to achieve Europe's 2020 objectives. This can be achieved through policies that address non-financial barriers such as limited access to information on energy efficiency and the issue of split incentives in the rental sector. Moreover, facilitating access to finance, including grants as well as developing and testing new models of financing, can further encourage investments in energy efficiency. The European Investment Bank (EIB) works to develop and promote the energy efficiency market in the EU. It funds around €1 - €2 billion a year in energy efficiency projects on buildings and renewable energy technologies in various sectors. EIB also supports financial intermediaries to develop their own energy efficiency projects and contributes to the EU's finance schemes in energy efficiency.

One of these finance schemes is ELENA (European Local ENergy Assistance), which covers up to 90 per cent of the technical support cost for local authorities to implement large energy efficiency and renewable energy projects. Another finance scheme is the European Energy Efficiency Fund (EEEF), a public-private partnership dedicated to mitigating climate change through market-based financing in the EU Member States. It is based on the ELENA model and finances energy efficiency and renewable energy projects in the public sector at a local level and offers a technical assistance facility of €20 million in total grant for project development phase. EIB is currently developing a new financial instrument to support energy efficiency investments, called Debt for Energy Efficiency Projects Green (DEEP Green). DEEP Green Initiative aims to develop a suite of new financial products for four key groups of players in the energy efficiency market – banks, public sector, energy service companies and utilities. Having new financial products will further stimulate the energy efficiency market as the debt financing availability will increase for energy efficiency projects. However, Mr Alario noted the importance of having the right policies in place and that for finance schemes to further develop energy efficiency investments, a right mix of technical support, regulation and financial incentives is necessary.

### 3.5 The Hive database: Tracking real energy consumption in buildings

Speaker: Ms Sorcha Edwards, Housing Europe



Around thirty test cases of low and nearly-Zero Energy Buildings in different climate zones and types of tenure are being monitored by the POWER HOUSE nZEC project in order to get actual and reliable data to work on and feed the debate on cost-optimality and the rational use of financial resources. This is done through Hive, a tool which helps to map, monitor, compare and understand energy consumption in buildings. Monitoring and comparing energy consumption is a vital step in order to raise awareness and design an action strategy to reduce energy consumption in a building. The Hive platform shows the real energy performance of buildings, rather than the values estimated by designers during the planning phase. Monitoring covers heating and cooling, the production of hot water and technical services such as ventilation and lighting. The production of in-situ renewable energy systems is also monitored. All data are publicly accessible and the first results are already available online on the Hive project database at <http://panel.hiveproject.net>.

### 3.6 Recommendations on effective Renovation roadmaps



#### Concerted Action EPBD: Core Theme 5 "Towards 2020 - Nearly zero-energy buildings"

Speaker: Mrs Heike Erhorn-Kluttig, Fraunhofer Institute for Building Physics

To support EU Member States in the task of implementing the Energy Performance of Buildings Directive (Directive 2002/91/EC, EPBD) the Concerted Action (CA) EPBD was launched by the European Commission in 2002.<sup>13</sup> The key aim was to promote dialogue and enhance the sharing of information and experiences among member states in order to find common approaches to the most effective implementation of this EU legislation at national level. The adoption of the recast Energy Performance of Building Directive (EPBD) in 2010 required member states to move towards new and retrofitted nearly-zero energy buildings by 2020 (2018 in the case of public buildings) and the application of a cost-optimal methodology for setting minimum requirements for both the envelope and the technical systems. In order to address these challenges, the current Concerted Action, which runs from 2011 until 2015, covers activities focusing on moving 'Towards 2020 - nearly Zero Energy Buildings' (Core Theme 5) for the transposition and implementation of the EPBD recast.

Mrs Erhorn-Kluttig presented the key achievements and issues of CA EPBD based on an interim report published by Fraunhofer Institute for Building Physics in November 2012. Regarding Core Theme 5 on nearly Zero Energy Buildings, it was found that many details of the nZEB definition are still under development in some member states and that a major issue is the convergence between the concepts of nZEB and the cost-optimal energy performance requirements. The latter is due to the uncertainties

<sup>13</sup> Erhorn, H and Erhorn-Kluttig, H (2012) 'Towards Nearly Zero Energy Buildings: Overview and outcomes' (<http://www.epbd-ca.org/Medias/Pdf/CA3-2012-NZEB-ei.pdf>)

in predicting factors such as energy prices, component costs and technical innovations. However, the information exchange among stakeholders in the CA EPBD platform has been found to be very helpful for the member states. Moreover, pilot and demonstration projects of nZEBs have been implemented and subsidy programmes support their application in the market. These projects and schemes need to be sustained in order to generate employment and further stimulate the energy efficiency market.

### Concluding remarks

*Speaker: Ms Evelyne Htymbroeck, Brussels Minister of Environment, Energy and Urban Renewal*

Ms Htymbroeck presented a few examples of ‘exemplary buildings’<sup>14</sup> in Brussels and offered some concluding remarks on the theme of the symposium. She stated that the main challenge for the cities of tomorrow and social housing providers is building a compact and sustainable city. There is a need for political leaders and citizens to work together on a number of issues in the sectors of housing, mobility, waste, employment, energy and others. In order to protect tenants/residents from high prices of energy, the social housing sector must act as a catalyst in delivering a fair energy transition. Ms Htymbroeck called on everyone to work together to be innovative and have the audacity to tackle these challenges.

### 3.7 Experience of the Solar Decathlon Europe 2012 Winner “Canopéa-Rhône Alpes project”

*Speaker: Mr Maxime Bonneive, Canopéa-Rhône Alpes*



The Solar Decathlon Europe 2012 winning team from Rhône Alpes sought to provide a solution to densification problems in cities through Canopéa, a habitat which combines qualities of individual houses and the availability of urban services. Canopéa is a collective of small buildings called “nanotowers”, which are situated within a neighbourhood. The nanotowers are less than

10 stories high and each floor is a home. The space on the top floor is shared and provides laundry and cooking facilities, as well as a small recreation area for residents. Clusters of nanotowers are linked with passageways filled with gardens, storage areas and recycling facilities. Each of the nanotowers is connected to smart grids, which manage all of the heating and cooling systems.

After winning the SDE 2012 competition, Team Rhône Alpes rebuilt the prototype in the city of Grenoble and have been using it as an information house in order to monitor its operation through a

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<sup>14</sup> Since 2007, the Brussels-Capital Region has organised “Exemplary Buildings” calls for proposals with the aim of encouraging initiatives in eco-construction and integrated renovation. To be selected, winners must demonstrate that it is possible to achieve very good energy and environmental performance in buildings, with a reasonable budget. (Source: <http://www.sustainablecity.be/brusselsgreencapital/case-stories/batex-midi-suede-exemplary-building?context=31>)

feedback system. Aside from disseminating information about the prototype, the team is currently working on developing several prototypes to apply and link each of them into a network. They are also seeking to improve their business model in order to finance the innovation. This includes working on how the school can support this start-up project in the long-term. Moreover, they are collaborating with other architectural schools with start-up experience to learn about the process and further develop their project.

## 4. Housing Europe meets Solar Decathlon Europe 2014: The Affordable and Social Housing Award



Housing Europe coordinated a team of jurors composed of social housing experts from national federations and local housing companies as well as technical and built environment specialists who assessed 20 competing projects originating from 16 countries at the Solar Decathlon Europe 2014 for the “Affordable and Social Housing Award”. The Award aims to identify and recognise the ideal home for social housing which fulfils the following four criteria:

- Adaptable and replicable in the social housing sector;
- With user-friendly energy efficient technologies;
- Affordability of operational expenses;
- A home that reflects the evolution of lifestyles and needs including services towards older adults.

The project profiles were diverse, with each team coming up with a zero-energy housing solution that fits the local context and specificities of its region. The jury mentioned that this year’s competing entries had all been innovative not only at the technical level but also in trying to provide solutions to major environmental and social issues in the built environment. The jury also noted the following observations on a number of projects:

- Some projects looked into solutions for low-income households to access rental housing;
- There was a broad understanding of social housing to accommodate all families that were excluded from the housing market;
- Respecting the principle of social diversity to fight suburban gentrification;
- Several projects proposed solutions for rehabilitation and densification;
- There were multiple digital solutions to facilitate the use of energy efficient technologies and so residents could easily adjust the equipment.

Mr George Bullion, the President of the Housing Europe Jury and Chair of the Housing Europe Sustainable Urban Working Group, led the awards ceremony and presented the Affordable and Social Housing Award to four projects.

### First classified – OnTop, Germany



OnTop is situated in Frankfurt, Germany where post-war buildings have an architecture which has resulted in many unused spaces – rooftops, terraces and other elevated areas. The core principle of the concept is to reinterpret the roof shapes and build quality housing spaces with solar solutions on top of existing buildings in order to address the issue of densification. This symbiotic concept is called ‘Symbiont’. The elevated and shadowfree position of the envelope is perfectly compatible with active solar technologies. The energy surplus produced will be given to the host building – the buildings on which the ‘Symbiont’ is situated. The old building serves as a carrier while the new envelope on top supplies both with energy. The symbiosis acts as an innovative and intelligent link to support the issues of demographic change and energy transformation. Further details on the winning entry are available at [www.ontop2014.de](http://www.ontop2014.de).

### Second classified – RhOME, Italy



Team RhOME (Rome and Home) chose to study the urban context of the outskirts of Rome. This is where housing, country, archeology and illegal buildings are interwoven. The project revolves around the whole metropolitan area and includes the facets of density, climate change, protection of nature and energy savings. RhOME seeks to re-densify and re-qualify the boundaries of the city by reinforcing urban settlements and making a more holistic contribution to low-energy city living through a consideration of passive solar design, the mobility of occupants and urban connectivity. The ultimate goal is to strengthen the sense of belonging of inhabitants by establishing a strong relationship between people and nature while providing buildings with clean active energy systems. Additional information about the RhoMe project can be accessed at [www.rhomefordensity.it/intro/index.html](http://www.rhomefordensity.it/intro/index.html).

### Third classified *ex aequo* - RECIPROCITY, USA/France and YOUR+, Switzerland



Project Reciprocity stems from the desire to design a house with perfect balance between reciprocal elements such as privacy versus interaction, aesthetics versus performance, design versus construction and spaces versus systems. The Maison Reciprocity concept is about creating an open and adjustable environment which can evolve to fulfil the inhabitants’ needs over time. Density, flexibility and mass customisation are key elements of the prototype, which mainly aims to achieve regional universality through smarter, adaptable, affordable and energy-efficient social housing solutions. Further information on the project is available at <http://reciprocity2014.com>.

The project Your+ focuses on the urban context of Lucerne in Switzerland, which has several dynamic residential and business areas around a strong core and old town zone. Your+ is presented as a pavilion which aims to be implemented on a larger scale and become a solution for an entire system. There are three main areas in the house, each having a specific role – public entrance, semi-public area with a kitchen, and a private bedroom space with washing facilities. All these zones are independent volumes that can be connected through a buffer zone – a transitional corridor which also performs other roles such as climate control, daylight control and social interactivity. Team Luc believes that the world is geared toward a future where seamless connectivity to sequential spaces and ideal access to rooms, spaces, objects, services, mobility and energy will be paramount. To know more about Your+ project, please visit <http://solardecathlon.ch/en>.

The Housing Europe Jury also gave recognition to projects that addressed disaster risk reduction and permanent shelter solutions after natural disasters. The following projects were:

#### **RenaiHouse by Chiba University Japan**

The project aimed to create an energy efficient habitat in the context of rebuilding Rikuzentakata city in the Tohoku region in Japan, which was devastated by the earthquake and the tsunami of 2011.<sup>15</sup> RenaiHouse consists of a land with mixed private and public areas – offices, schools, health centres, and communal spaces – in order to facilitate the rebuilding of communities. The housing prototype is made of wood with prefabricated insulated panels, equipped with adjustable sensors and supplied with renewable energy.

#### **Casa Fenix by Team Fenix Chile**

Motivated by the reality of Chile's devastating earthquakes, Casa Fenix offers modular and flexible habitats which can be built by victims in emergency situations.<sup>16</sup> The modules are designed with a wooden frame and are prefabricated to be easily assembled by teams of volunteers dispatched to disaster sites. With the use of solar power, nearly half of the production of electricity can be self-supplied without using another storage device, while surplus energy can be fed back into the network.

#### **Baan Chaan Adaptive House by Team Kmutt Thailand**

Adaptive House takes the traditional Thai terrace house known as "Baan Chaan" and modernises it to feature modular construction, passive cooling, devices to provide shade from the sun and solar power.<sup>17</sup> The design is adapted for floodplain areas such as those found in central Thailand. Baan Chaan Adaptive House is an open terrace house with two floors and is made of local materials with water resistant properties (steel structure and bamboo planks) in order to withstand flooding. The house is elevated to 60 cm above the ground and if the ground floor becomes flooded, the inhabitants can take refuge upstairs and have a self-sufficient electric supply for three days using photovoltaic systems.

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<sup>15</sup> <http://i54643.wix.com/renaihouse>

<sup>16</sup> <http://casafenix.cl/>

<sup>17</sup> [http://www.kmutt.ac.th/kmutt\\_sde2014/](http://www.kmutt.ac.th/kmutt_sde2014/)

## 5. Conclusions

Cities have a key role to play in addressing the economic, social and environmental issues facing Europe. Urbanisation, affordable housing, energy efficiency, social inclusion and governance strategies are some of the many challenges that the cities of tomorrow and their inhabitants will be facing. The discussions among Housing Europe members, project partners and government representatives at the Second POWER HOUSE nZEC Symposium showed that these challenges are interlinked and offer opportunities for stakeholders across all sectors and governance levels to work together and join up solutions to address these urban issues. There is a general consensus on the need for an integrated, collaborative approach towards achieving sustainable and people-centred urban development in European cities.

Affordable housing plays a key part to sustainable urban development. The presence of decent affordable housing involves important social and civic values and helps create and maintain communities which are socially, economically and environmentally sustainable and where everyone is enabled to reach their full potential. Ensuring that all the residents equally share the benefits of city life and urban growth is especially crucial to making a city successful. This echoes the common vision that the participants at the symposium expressed regarding the kind of city they want to live in – a city for all that is affordable, smart, thriving, compact and with easily accessible facilities, healthy and green, with safe and active neighbourhoods.

The City of Tomorrow is a city that is not only socially inclusive and economically vibrant but also efficient, sustainable and resilient. Improving the energy efficiency of buildings and retrofitting existing stock at an affordable cost raises the level of resilience of communities and cities as it helps reduce their economic and energy vulnerability and helps them to be ‘future-proofed’. The task of future proofing homes and buildings for European citizens is being taken in hand by European affordable and social housing providers. The POWER HOUSE nearly Zero Energy Challenge initiative offers a platform that enables these providers to share good practices and lessons learned with all the stakeholders involved in improving the energy efficiency of buildings, making them ‘future-proofed’ for residents and ensuring a fair energy transition to nearly Zero Energy Building standard.

However, social housing providers cannot do this task single-handedly as a sector. Future-proofing homes and buildings in cities also entails taking into account the wider urban environment. The whole urban system, including nature, services, people, spatial development, built environment, etc would need to be prepared for, able to respond to and withstand impacts from future climatic, social, technological or regulatory changes. This is a much bigger challenge and task that all inhabitants need to face and solve together through strategic planning and good governance across different sectors and levels. A balance must be struck between the need to improve economic growth and competitiveness, affordable housing provision, environmental sustainability and social cohesion in order to actively shape tomorrow's cities. The EU urban agenda provides a platform for cities and local stakeholders to participate in the definition and implementation of EU policies that address their needs at a local level. The housing sector and other stakeholders should further engage in this process and contribute to creating a stable environment and recognition where housing is key to growth and equal societies.



POWER HOUSE nearly-Zero Energy Challenge partners are:



[www.powerhouseeurope.eu](http://www.powerhouseeurope.eu)

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