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Lessons Learned from Building Europe's First Zero-Carbon House

EL SEGUNDO, CA—With western U.S. states developing energy-efficiency standards and even zero net energy targets for new home construction – and other states likely to follow – builders cannot afford not to explore the technologies needed to create residential housing that will achieve zero net energy or carbon neutrality – the ability to produce as much energy as it consumes on an annual basis.

That's the advice of Gerry McCaughey, one of the pioneers of the sustainable building movement in Europe and now CEO of Infineco, a green-building consulting firm headquartered here.

McCaughey, who co-founded and grew Century Homes to become Europe's largest producer of offsite buildings, also strongly believes that builders should view the first of these state-mandated regulations, which passed in California in October 2007 and will require that all new homes be zero net energy by 2020, as an opportunity and not a threat.

He has first-hand experience of the rewards of proactively pursuing sustainable construction. As CEO of Kingspan Century in Ireland he guided the development and launch of Europe's first zero-carbon home in 2007.

The unveiling of the eco-friendly 'Lighthouse' at the Building Research Establishment, Britain's biennial showcase for sustainable buildings, represented the realization of McCaughey's driving vision for his former company: to create higher quality, more energy-efficient structures and not just components using modern methods of construction within a controlled factory environment.

The offsite-built Lighthouse, designed for lifestyles that are inherently 'light' on the world's resources, was the only zero-carbon structure featured at the 2007 event as well as the only one that met the 'Level 6' building standard – the highest level of the Code for Sustainable Homes which the British government aims to achieve by 2016.

"With the Lighthouse builders in the U.S. market and other parts of the world now have a proven roadmap for how they can effectively and efficiently use offsite construction to create structures that are guaranteed to perform to the highest quality and environmental standards," said McCaughey.

"This transition, however, will require that the construction industry change its mindset about offsite construction, because it will become exponentially more difficult, expensive and riskier to meet energy-efficient performance codes without the precision and quality control that can only be accomplished by using manufacturing, engineering and technology under factory-controlled conditions," he added.

The two-story, two-bedroom Lighthouse was constructed with sustainable materials in a six-week period using Kingspan Off-Site's TEK building system, a high-



Gerry McCaughey, CEO of Infineco, stands next to a replica model of the firm's zero net energy home built for the recent Building Research Establishment in the United Kingdom.

performance structural insulated panel based system. This technology helped to create a high level of thermal insulation and performance in the airtight structure in order to reduce heat loss by potentially two-thirds of a standard house. The estimated annual cost to heat Lighthouse in the temperate maritime climate of the United Kingdom is approximately \$80.

Lighthouse was also designed to produce its own electricity with photovoltaic solar panels from Japan placed on the roof. The roof's dramatic-curved shape was not just for design or aesthetic reasons - it was required to provide enough surface area for the installation of 430 sq. ft. of the panels.

The electrical needs of the house were minimized by installing energy-efficient appliances and low-energy lighting fixtures. In addition, the layout of the house was turned upside down from conventional homes to maximize the use of natural lighting called daylighting. The living areas were placed upstairs for natural light and ventilation while the bedrooms, which require less daylight, were located on the first floor.

Other sustainable features of Lighthouse include a passive natural ventilation system from a 'windcatcher' on the chimney; a biomass boiler to provide hot water and space heating during the winter; solar thermal panels to provide all hot water in the summer and some in spring and fall; greywater (bath water) recycling with a UV light filtering system to kill germs; and a rainwater recycling tank to capture water for gardening irrigation and toilet flushing.

According to McCaughey, the technologies and systems required to mass produce zero net energy buildings already exist and many of those utilized in Lighthouse are over-specified for warm-weather markets such as Southern California, a region that is primed with many environmentally-conscious consumers who have already embraced the concept of sustainable living.

"The timing is now to begin to building energy-efficient homes and fortunately for U.S. builders the R&D has already been done and the technology already exists," said McCaughey.

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