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Luxury real estate goes off-grid

Once a niche interest, the top end of the market is embracing the greener home

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In southern Spain, among the sprawling terracotta-roofed villas that line the Costa del Sol, plans for Villa Noon at Sotogrande stand as a symbol of the future. The work of architect Fran Silvestre, it will consist of five large marble-clad cylinders connected like a Jenga puzzle, providing 2,000sq m of living space. The villa, for sale off-plan at €11.4mn with a projected two-year build, is designed to be Spain's first zero-emission luxury house with the Bisol solar panels alone reducing energy consumption by one fifth. It has everything high-end homebuyers expect: a quiet luxury footprint carved into the hillside with six bedroom suites, an expansive spa and wellness centre with internal lifts, along with a cinema, wine cellar and swimming pools, indoor and out.

Behind the scenes, water will be collected efficiently to serve the household. Rainwater will supply non-potable uses, alongside greywater irrigation and atmospheric water generation, powered by surplus electricity generated by on-site solar panels, that will deliver high-quality water for cooking and drinking. The latter is a system that, according to [Silvestre](#), has never been used in real estate in this way before. Villa Noon meets much of the "stringent criteria of a passive house", says Silvestre, fulfilling the five principles of high-quality insulation, superior windows, airtight construction, heat-recovery ventilation and thermal bridge-free design, eliminating weak points in a building where heat can easily escape.



The internal olive tree at Barcelona House adds a biophilic flourish to its interiors



A render of the interior of Villa Noon at Sotogrande on the Costa del Sol

“With these systems we can collect 300,000-plus litres of water per year and remove the need to take it from the mains,” Silvestre continues. “Heat pumps provide geothermal energy for heating, hot water and cooling using ground heat at 19°C, achieving an efficiency rate of over 500 per cent. This revolutionary design, the combination of geothermal, solar and Sonnen battery storage, stands out for its ability to operate completely self-sufficiently, independent of conventional utility networks.”

Market shifts support the desire for mindful luxury living. The latest [Luxury Real Estate Report](#) by American commercial real estate services and investment firm CBRE noted that the significant growth in the global luxury residential market was, in part, “spurred by an increasing base of HNWI and affluent millennials seeking unique and personalised living experiences”. Accompanying this, the report detailed “a strong trend... towards eco-luxury homes that combine sustainability and luxury”.



Folly Mojave, built for Hillary Flur in the Mojave National Preserve © Johnny Prehn





At Folly Mojave, a second well had to be dug that was 700ft deep © Johnny Prehn

Hillary Flur from Vermont in the US is one early adopter. In 2016, while living in LA and straight out of college, she paid \$15,000 for 2.5 acres of land in Twentynine Palms, an entry point to the Mojave Desert, and partnered with architect Malek Alqadi to build Folly Joshua Tree. Alqadi designed a striking and entirely off-grid property: two cabins clad in corten steel that appear like hardy, weathered sheds and open to reveal enticing, comfortable and minimal interiors.

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We dug two wells; the first was dry and the second involved going down around 700ft

Hillary Flur

“When we started, it was relatively early days for many of the off-grid systems so there was lots of testing and adjusting to do,” says Flur. “After one year we realised the AC didn’t work well enough at night and that was important in the desert, so we added more batteries and solar panels and we have a back-up generator for

emergency use. At first, we had water delivered, but about two years ago we dug a well. Our neighbour had plenty of trees on their land, which was promising, and sure enough we found water. At our second off-grid desert property, Folly Mojave, finding water was much harder. We dug two wells; the first was dry and the second involved going down around 700ft.”



Folly Joshua Tree, designed by architect Malek Alqadi, consists of two cabins clad in corten steel that conceal comfortable and minimal interiors © Caleb Jones



The outdoor shower at Folly Joshua Tree © Caleb Jones





A render of Villa Noon at Sotogrande



A desire to be sustainable was a key driver for Flur but she also saw this style of living as an inspirational way to experience the isolation and natural beauty of the desert. "I travelled for work and found it depressing that hotels said they were sustainable by asking you to recycle your towel or not change your sheets. I felt we could do so much better, that we could redefine what sustainability looks like," she says. "Now, from the property, the stargazing is out of this world. There's no light pollution at all and being so remote adds to the experience of being off-grid."

Folly Mojave is her second, even more ambitious project with Alqadi: 200 acres in Twentynine Palms crossing both the Mojave National Preserve and Joshua Tree National Park. Four years in the making and still ongoing, it will have five buildings, four of them two-bedroom suites and one a communal area, each with their own "solar tree" separate from the property with back-up Enphase IQ batteries.

"Imagine saving \$1,000 a month just by harnessing the power of the sun," says Allan O'Neil, owner of Solar Power Palm Desert, who equipped both projects. "In the desert's scorching summer heat, air-conditioning can drive energy costs through the roof. With a high-efficiency solar system you can turn the relentless sun into free, renewable power. Let the desert work for you, not against you."



A render of Archipelago House by Ström Architects, to be built east of Helsinki





Barcelona House by Ström Architects, completed in 2023

In Spain, UK-based Swedish architect [Magnus Ström](#)'s approach connects wellness, health and nature. The result is shown in Ström's Barcelona House, completed in 2023, a contemporary hybrid off-grid property 30km from the Catalan capital. Photovoltaic roof panels offset electricity consumption, with systems often oversized to export excess energy to the grid in summer. Large batteries store energy for night-time use, lowering carbon footprints and cutting annual CO₂ emissions by "several tons".

Expansive glass, a Ström hallmark, is essential to ensure a connection with nature, while a 6m cantilevered overhang, supported by a single column, shades the interior without detracting from the wide sea view. An internal olive tree adds a silver-grey biophilic flourish. "A new idea of luxury is developing based on spaces and not objects," Ström says. "It's about time, connection with nature, elevating what is most important."

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It's easy to put solar panels on but if you don't insulate, it's basically greenwashing

Magnus Ström

One hour east of Helsinki, construction is about to start on Ström's latest design, a totally off-grid house for an American client with Finnish heritage. The location appears unforgiving, a remote peninsula covered with dense blueberry bushes and several outsized, beached boulders, relics

from the Ice Age. His design, as in the Barcelona House, starts with a fabric-first approach, ensuring high levels of insulation. "It's easy to put solar panels on but if you don't insulate, then it's basically greenwashing," he says. He then makes the house airtight. Ventilation is controlled with heat exchange and the residual heating needs are very low, supplied through ground heat-pumps powered by photovoltaic panels.

"We use both air-source and ground-source heat pumps for residual heating needs," says Ström. "Air-source are easier to install but less efficient, while ground-source, very much the norm in Finland, require more work through horizontal collectors or boreholes but deliver better efficiency. Heat pumps transfer heat rather than generate it, providing three to four times more energy than they consume and reducing household CO₂ output by up to 70 per cent compared with traditional gas or oil heating."

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S+A Architects has built a collection of apartments and villas for rent and purchase at Verdelago in the Algarve © Marcelo Lopes

But where to buy? In the eastern Algarve close to the Spanish border, [S+A Architects](#) has designed Verdelago, a collection of apartments and villas for rent and purchase that it believes set a "new standard in eco-friendly

hospitality". It is being constructed using a concept based on the ancient principle of Portuguese *taipa* in which compacted earth is used to create solid walls with excellent thermal insulation. Properties start from €660,000 for one-bedroom apartments and €980,000 for two-bedroom townhouses.

"Verdelago is not technically off-grid but is designed to be self-sufficient, equipped with a photovoltaic plant that generates more energy than it consumes," says Miguel Saraiva from S+A Architects. "There's a comprehensive water-management system that includes rainwater recovery and wastewater recycling. These measures, combined with energy-efficient design and high-quality materials, ensure a low ecological footprint."



This finca in Mallorca will have its solar panels replaced with a photovoltaic system © Rali Photography

For self-sufficiency and partial off-grid living, a traditional Mallorquin finca is for sale through [Engel & Völkers](#) for €4.6mn. The owners plan to replace the solar panels with a photovoltaic system with lithium batteries. They say this would cost €40,000 to install and save between €350 and €650 a month on electricity bills. The property already has its own well supplying all water requirements, a vineyard and 600 olive trees.

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