

31% dwellings in Spain are single-family homes

Spain has the 5th highest residential electricity prices in Europe (H2 2018)

27% of single-family homes in Mediterranean Spain use heating oil

41% of energy consumption in Mediterranean Spain is attributed to space heating

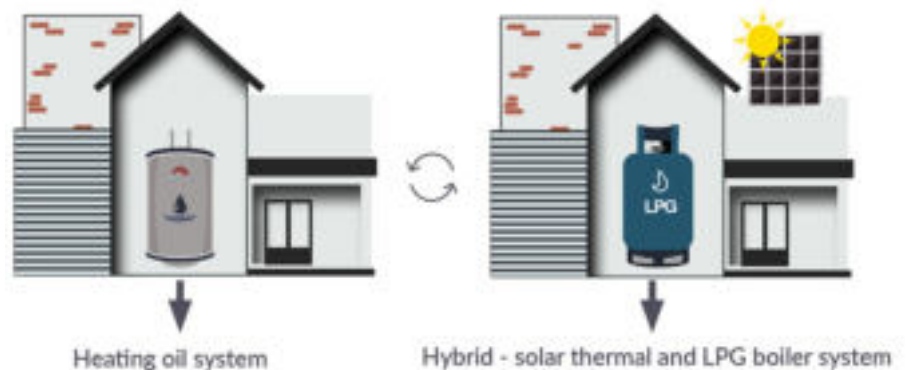
# SPAIN

Case study: residential heating  
#BeyondTheGasGrid

There are 25.2 million dwellings in Spain, with around one-third being single-family homes.

Their energy consumption is dominated by petroleum products (35%) and renewable heating (34.5%), followed by natural gas (25%) and electric heating (6%).

This analysis takes a typical single-family home in Mediterranean Spain and quantifies the impact of switching from an old oil boiler to a hybrid combination of a solar thermal system and a new LPG boiler.



LPG annual CO<sub>2</sub> savings: 43%  
BioLPG annual CO<sub>2</sub> savings: 85%

51% NO<sub>x</sub> emissions savings

47% Lifetime PM emissions savings

€120 Annual energy bill savings

Capital cost payback = 20+ years

From 2030 onwards, it is assumed that the boiler is fuelled by bioLPG.

Liquid Gas  
Europe



@LiquidGasEurope  
info@liquidgaseurope.eu  
[www.liquidgaseurope.eu](http://www.liquidgaseurope.eu)

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## Alternative technology options available:

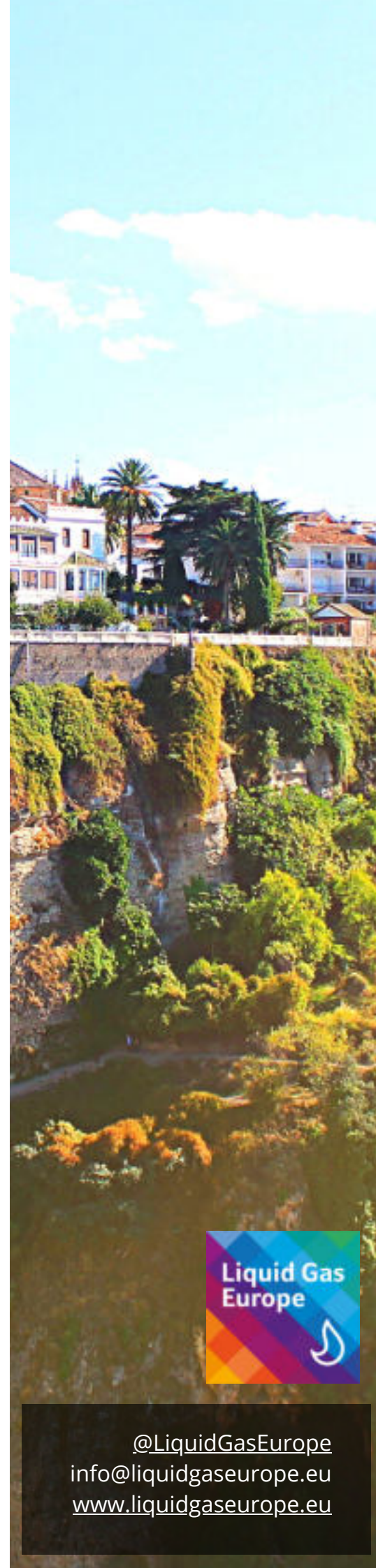
The table below compares how alternative technology options compare to an existing oil boiler. The different heating systems include a new solar thermal system with an LPG boiler, an air source heat pump and a biomass boiler.

 performs worse than old oil boiler

 performs better than old oil boiler

Technology Options	Upfront cost*	Running cost	Lifetime CO <sub>2</sub> reduction	Lifetime air pollution reduction
<b>Hybrid system:</b> LPG boiler + solar thermal	More expensive than old oil boiler	Lower than oil boiler, assuming that solar thermal system can meet hot water demand	Lower than current oil boiler (more than 40% using LPG, up to 90% using bioLPG)	Lower than current oil boiler (40% - 50%)
<b>Air Source Heat Pump</b>	4-5 times more expensive than an oil boiler	Higher fuel bill than oil boiler - electricity price is high in Spain	Substantially lower than current oil boiler (up to 60%)	Substantially lower than current oil boiler (up to 99% lower)
<b>Biomass boiler:</b> New, automatic (pellet or log fuelled)	7-8 times more expensive than an oil boiler	Lower than oil boiler	Substantially lower than current oil boiler (more than 90%)	Both NO <sub>x</sub> and PM emissions higher than oil boiler (more than 100%)

\*Upfront cost differences are case-specific; in this case the upfront cost for a heating system is modelled for an energy demand of 9,000kWh/annual. The hybrid system is more expensive because the solar thermal system has a high upfront cost. Desk-based research found that the specific cost of a solar thermal (FPC) system is around €1,500-2,000/kW (including installation). Sources: Fraunhofer, Eurostat, Covenant of Mayors, VHK, European Environment Agency, European Commission, European Pellet Council, Statista, TABULA Webtool, Secretaria de Estado de Infraestructuras, Transporte y Vivienda, SECH Project (SPAHOUSEC), Eco Solar Spain and Instituto para la Diversificación y Ahorro de la Energía (IDAE)



@LiquidGasEurope  
info@liquidgaseurope.eu  
www.liquidgaseurope.eu