

457,000 tonnes of oil was consumed by the industrial sector in 2017

The top three largest consumers of oil in the industrial sector:

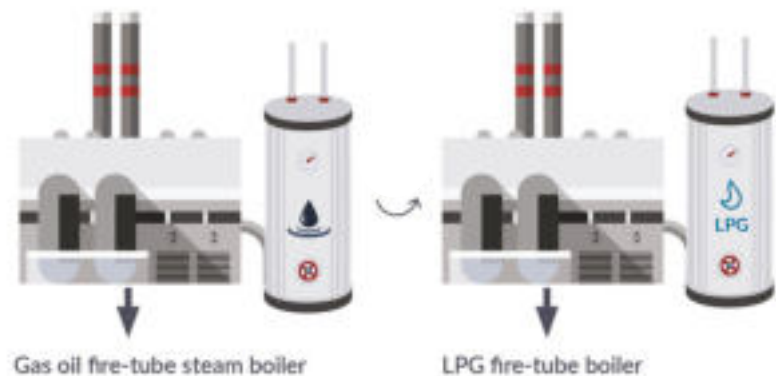
- Paper, pulp & printing
- Mining & quarrying
- Iron & steel



# SWEDEN

Case study: industrial heating  
#BeyondTheGasGrid

In the Swedish industrial sector, manufacturing processes require the largest share of energy to operate. Over the past few years, the consumption of energy has started to decrease, but fuel-switching is still required in the most energy-intensive industries. This case study analyses the monetary and health impact of a typical mining and quarrying site that switches from using a fire-tube steam boiler fuelled by gas oil to a fire-tube boiler fuelled by LPG.



LPG annual CO2 savings: 15%

BioLPG annual CO2 savings: 78%

76% NOx emissions savings

96% Lifetime PM emissions savings

€383,730 Annual energy bill savings

Capital cost payback = < 2 years



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

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## Alternative technology options available:

The table below compares how alternative technology options compare to an existing fire-tube boiler that is fueled by oil. The different heating systems include a fire-tube fueled by LPG, a water-tube boiler fueled by coal and a biomass-fueled CHP system.

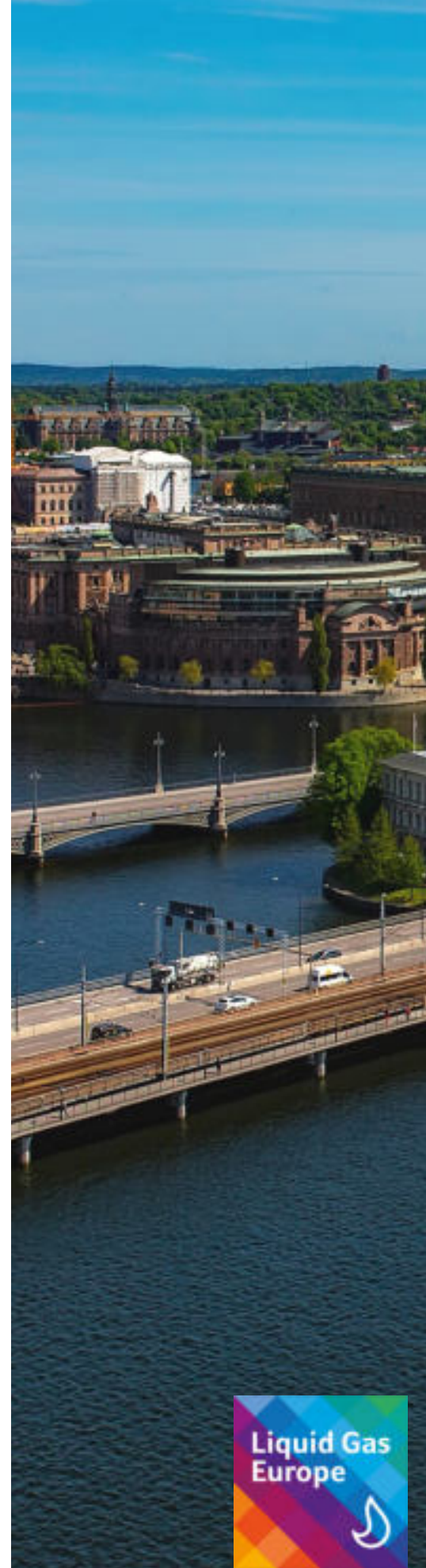
■ performs worse than existing oil-fueled fire tube boiler

■ performs better than existing oil-fueled fire tube boiler

Technology Options	Upfront cost*	Running cost	Lifetime CO <sub>2</sub> reduction	Lifetime air pollution reduction
<b>Fire-tube boiler:</b> (LPG fuelled)	Same	Lower than oil-fuelled system, assuming efficiency improvements are achieved	Lower than existing oil-fired system (up to 20% if using LPG, up to 80% if using bioLPG)	Substantially lower than existing oil-fuelled system (more than 70%)
<b>Water-tube boiler:</b> (Coal-fuelled)	1-2 times more expensive than an oil-fuelled system	Substantially lower than oil-fuelled system. Price of industrial coal is extremely cheap	Substantially higher than oil-fuelled system. Coal has a relatively higher carbon intensity (up to 50%)	Lower NOx emissions (up to 40%) but higher PM emissions (up to 300%)
<b>Back pressure CHP:</b> (fuelled by wood pellets)	3-4 times more expensive than oil-fuelled system	Substantially lower than oil-fuelled system. Price of wood pellets is low	Substantially lower than current oil-fuelled system (more than 90%)	Lower NOx emissions (up to 20%) but higher PM emissions (up to 100%)

\*Upfront cost differences are case-specific; in this case the upfront cost for a heating system is modelled for an energy demand of ~25,000MWh/annual.

Sources: PwC, European Commission, Fraunhofer, US Department of Energy, Covenant of Mayors, European Commission Oil Bulletin and Argus Media



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