A guide to cogeneration unit sizing

Product series
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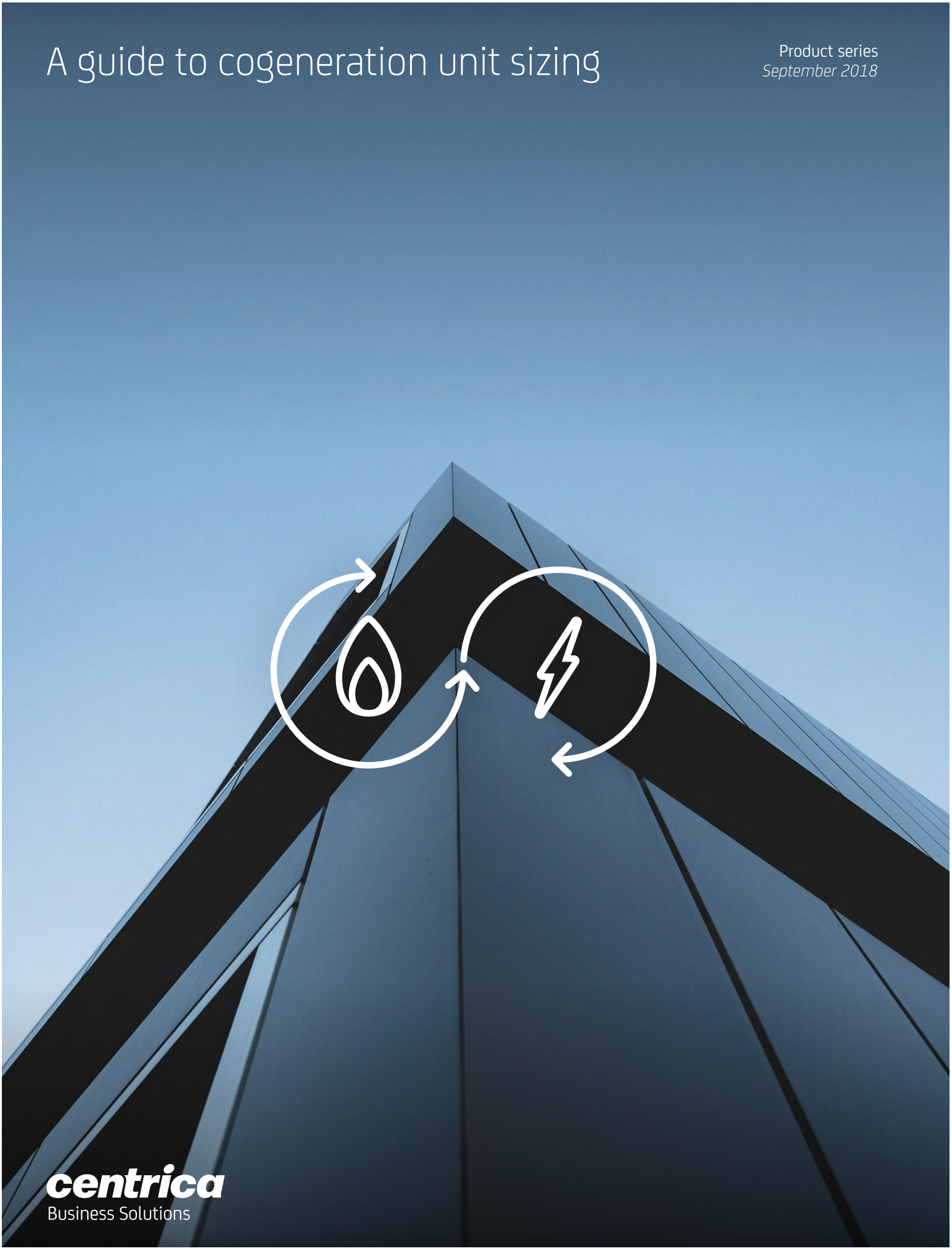

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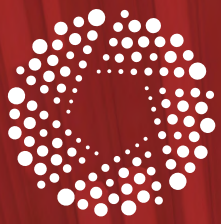
The Power of Cogeneration



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A guide to CHP unit sizing

Get the full benefits from CHP by choosing the best unit size for your needs.

Investing in a cogeneration system is, in some ways, very similar to how you would lease office space – if you lease more than you need, you find yourself paying for space that you don't use. But if you lease too little, you will have to add on or find new space in the near future.

If you install a cogen system that's too small, it will not provide the full cost savings. If it is too large it will struggle to meet its minimum load threshold to operate efficiently. Your CHP needs to operate as many hours as possible, because an idle plant produces no benefits.

Depending on the unit size, the typical cost of installing a CHP varies between $800-$2000 per kWe. This is why the installation of a CHP plant requires consideration and planning to determine the optimal size and achieve the maximum return on your organization's investment.

CHP systems will increase gas consumption while reducing electricity usage, so check for the best tariffs with suppliers and adjust yours accordingly to ensure maximum benefit.

It is worth taking the time to consider other efficiency measures – such as better insulation, staff training, utility buying – before installing CHP into an existing structure, as well as exploring possible changes to your energy requirements in the future.

By optimizing a building's energy envelope first, you will gain data on the true hourly demand for heat and power to the building which can then be used to accurately size your CHP system.

Modelling demand

By establishing a detailed model of the heat and electrical demand, you can then establish the size of your CHP plant based on the following considerations:

1

Baseline

For optimal efficiency, CHP units should be designed to provide baseline electrical or thermal output, with any shortfall being supplemented by electricity from the grid or heat from boilers. In certain cases there is the option to size slightly above the thermal baseline to deliver higher electrical output. Interval utility data can help determine time of day loads which can lead to more accurate equipment sizing. This will also result in more accurate financial modeling

At times when the cogeneration output exceeds the thermal demand there is a need to reject heat. This is achieved through the operation of a dedicated dry air cooler or cooling tower.

2

Load following

CHP units have the ability to modulate, or change their output in order to meet fluctuating demand. These CHP units can be set up to track either the electrical or thermal demand profile. The decision to track thermal or electrical load depends on the heat to power ratio of the site and associated energy costs. When following the electricity demand, the implications of possible heat dumping into the atmosphere via heat trim or heat dump radiators have to be considered.

3

Electricity export

Where utilities allow exporting, another way to deal with excess electricity is to export to the power grid, however this must be carefully evaluated as it can have significantly lower value than electricity consumed on site.

Another strategy is to employ multiple CHP units instead of one larger one. Using this strategy, an operator would set up a series of units that are staged and programmed to operate during times of peak demand. One unit would meet the baseline while smaller plants would provide excess needs.

Calculating spark spread

CHP users also have to take into account the spark spread when producing heat and electricity.

A spark spread of around 3 or more is ideal for CHP applications. This means that the unit price of power is 3 times the unit price of CHP fuel (usually natural gas). The EPA explores how Spark spread can affect the feasibility of a CHP project.

You invest in CHP to save money and reduce environmental impact. Choose the wrong size of unit, and those benefits go out of the window.

The spark spread is the difference between the price at which you can buy gas in relation to the price you can buy power.

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