DELTA
Energy & Environment

The Benefits of Micro-CHP:
A Delta-ee report produced on behalf of COGEN Europe.

COGEN EUROPE

Balancing renewables

Micro-CHP can play an important role in supporting renewables and meeting the challenges of the modern electricity grid.

- Micro-CHP is able to support renewables at the system level in Europe
- Micro-CHP can realise multiple benefits as a form of demand response, enabling buildings to change their electricity production and demand to suit grid conditions

Micro-CHP is able to support renewables at the system level in Europe.

The journey towards renewable targets

The EU Renewable Energy Directive (RED) of 2009 mandates that 20% of the EU's total energy needs should be derived from renewable energy by 2020.

Today's share of renewable energy already exceeds 14% in Europe, a doubling since 2004, and is on course to meet the 20% target.

Some renewable energy sources are described by the European network operators group (ENTSO-E) as "inflexible and highly variable".

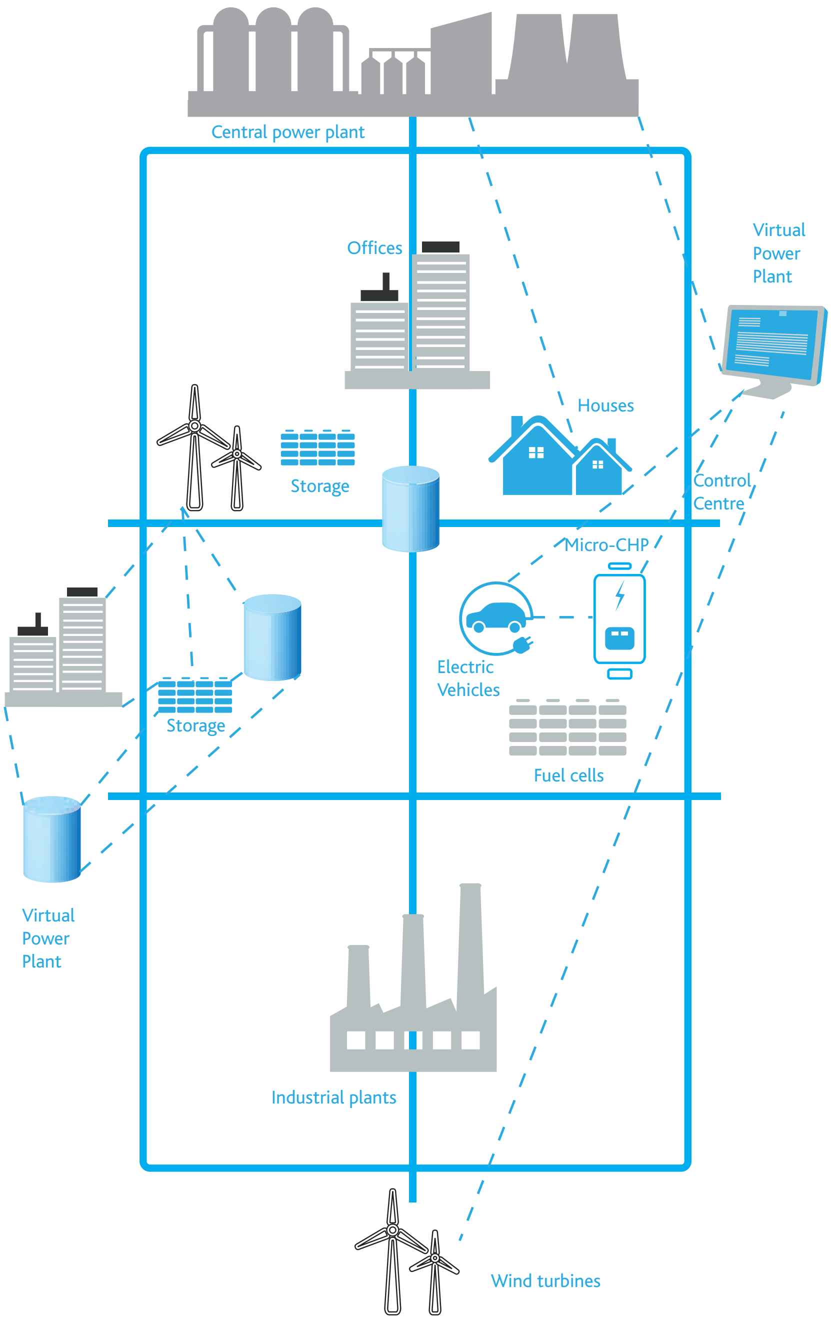
Relevant policy documents:
Renewable Energy Directive (RED) - 2009/28/EC

As a flexible and controllable technology, micro-CHP can support the integration of variable renewable energies such as wind and solar power

Because of the way micro-CHP uses natural gas and typically generates electricity at times of peak power demand or capacity shortages, it can 'step in' when the wind is not blowing or the sun not shining.

In addition, as part of a future 'smart grid', micro-CHP units can be aggregated together as a 'virtual power plant' which can be dispatched when the intermittent renewables are not generating.
The start up speed for micro-CHP is high compared to much larger baseload power plants, offering additional advantages to flexibility.

The future smart grid



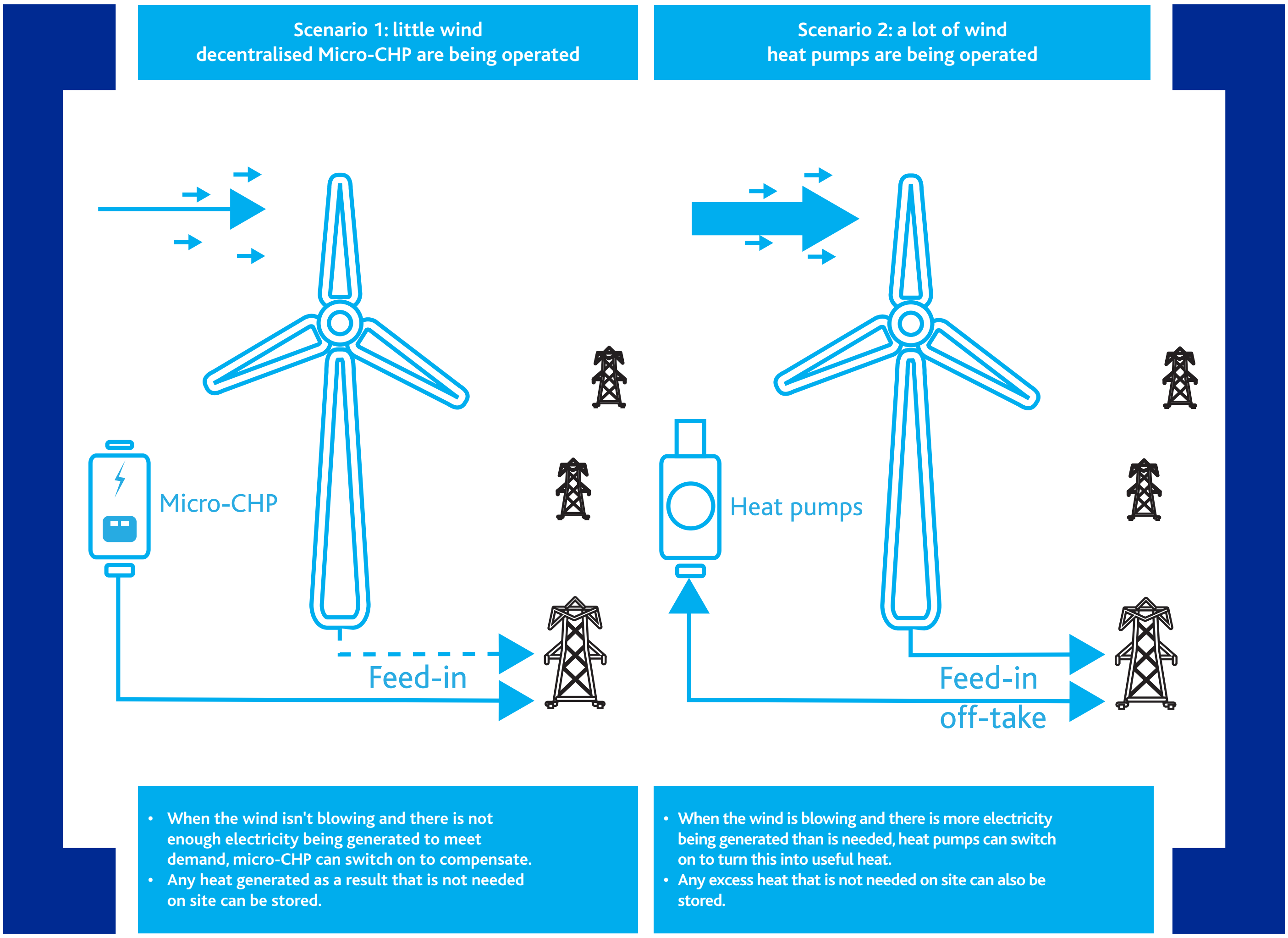
Case study:
The synergy of micro-CHP with renewable energy

Vattenfall – 'Virtual power plant' (VPP) with a heat pump and micro-CHP

European utility Vattenfall is working on a project that will support an increasing level of grid integrated renewable energy technologies. The aim is to manage the fluctuating supply of electricity being generated by wind generators and help mitigate their impact on the grid. Overall, the trials find that, with different levels of wind output at different times, micro-CHP and heat pumps can help balance the grid.

Scenario 1: when the wind isn't blowing and there is a demand for power (e.g. a cold, still evening in December), the micro-CHPs operate and help provide the electricity to meet the load. If there is no demand for the heat generated from the cogeneration process, this is stored in hot water buffer tanks to be drawn as hot water when needed.

Scenario 2: when the wind is blowing and there is only a low demand for electricity (e.g. windy day at lunchtime in midweek), heat pumps will use the excess electricity to generate heat for the building or store it in a hot water buffer tank to be drawn when it is needed.



Micro-CHP can realise multiple benefits as a form of demand response, enabling buildings to change their electricity production and demand to suit grid conditions

'Demand response' refers to the integrated approach of influencing the amount – and timing – of electricity consumption and production.

By participating in demand response, consumers and businesses are able to adapt their energy consumption from times of high demand (low availability and higher price) to times of low demand (high availability and lower price).

Demand side participation is specified in the EU's Electricity Directive (2009/72/EC) and the Energy Efficiency Directive (2012/27/EU). Both refer to its importance in balancing the energy market and in helping meet the EU's environmental and renewable goals.

Micro-CHP can be used as a form of demand response

Micro-CHP can play a major role in demand response through its ability to flex and respond to electricity price signals. It can offer a number of options:

- Send electricity back to the grid when needed at a grid level but when it's not needed on-site.
- Use the electricity it generates on-site when there is local demand.
- Can be enabled though energy storage (a heat buffer or even a hot water tank) for use later on-site when not needed at grid level.

Case study:
Greenlys - improving grid operation via demand response

Greenlys is a development project that aims to develop and test innovative solutions for the smart grid, located in Lyon and Grenoble in France. The project is driven primarily by ERDF, GDF Suez GEG, GINP and Schneider Electric.

Micro-CHP is one of a range of technologies that is being used to showcase how new technologies (including solar PV, electric vehicles, smart meters and micro-CHP) can work together to form an intelligent power grid. The project involves 1,000 residential customers and 40 commercial sites.

One part of the project is testing demand response with commercial electricity users, through tariff management and restricting consumption. Early results from one site show:

- Electricity usage restrictions did not impact comfort.
- A 16% reduction in electricity bills is possible from just moving demand to off-peak hours.
- A potential return on investment of less than 7 years.

GreenLys

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