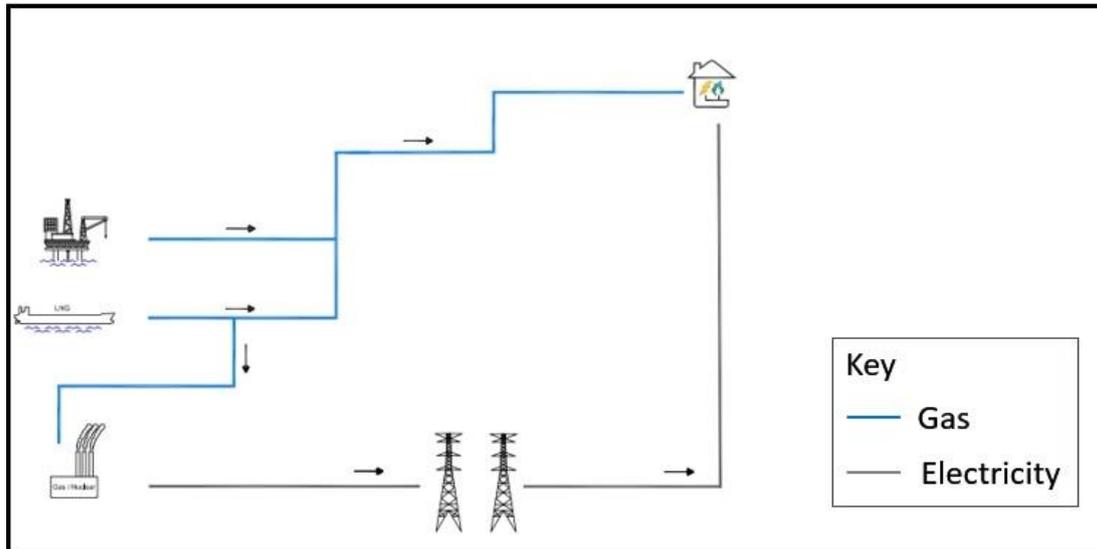


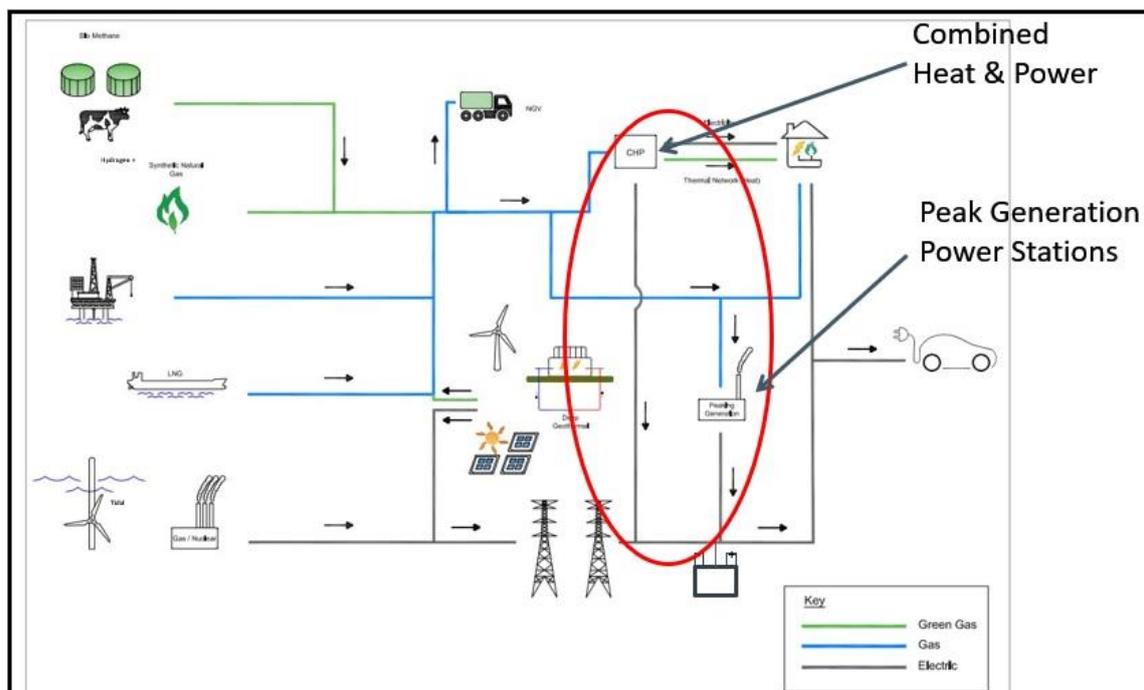
Modelling the demand for and supply of combined low-carbon power and heat in the West of England region

The energy grid is changing. For 120 years the gas & electric grid was only connected at big power stations and at homes and businesses:



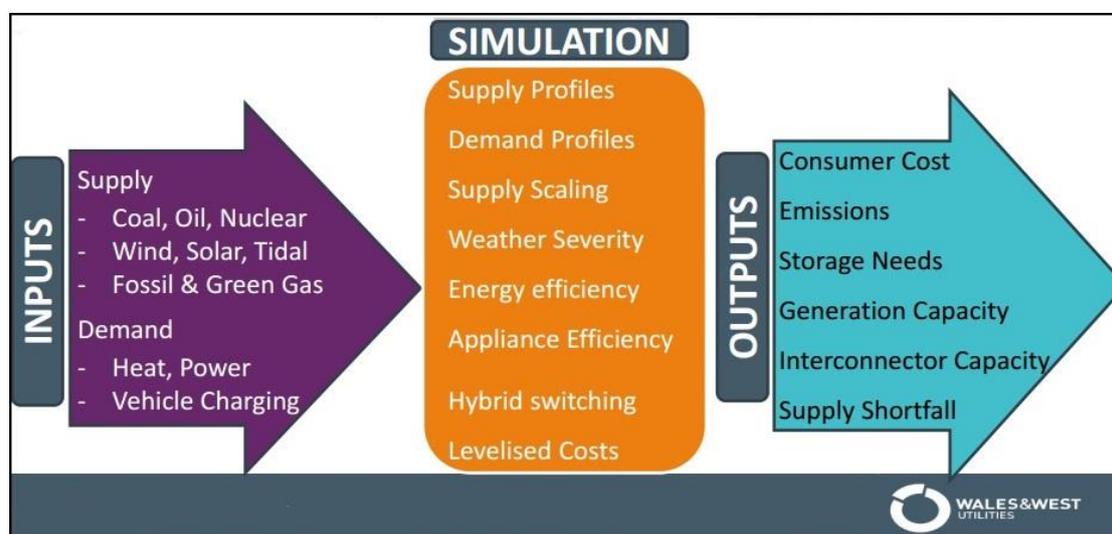
In the last five years this has changed:

- Renewables – green gas and electricity – have made the grid more complex
- Combined Heat & Power (CHP) and peak power generation have joined the grids at distribution level



Building our low carbon future

Wales and West Utilities (WWU) has built a unique, “combined heat and electric model”. This simulates heat, power and transport demand, and balances this across a whole range of low-carbon supply options.



In October 2017 members of the Zero West data group visited the WWU team that has developed this model.

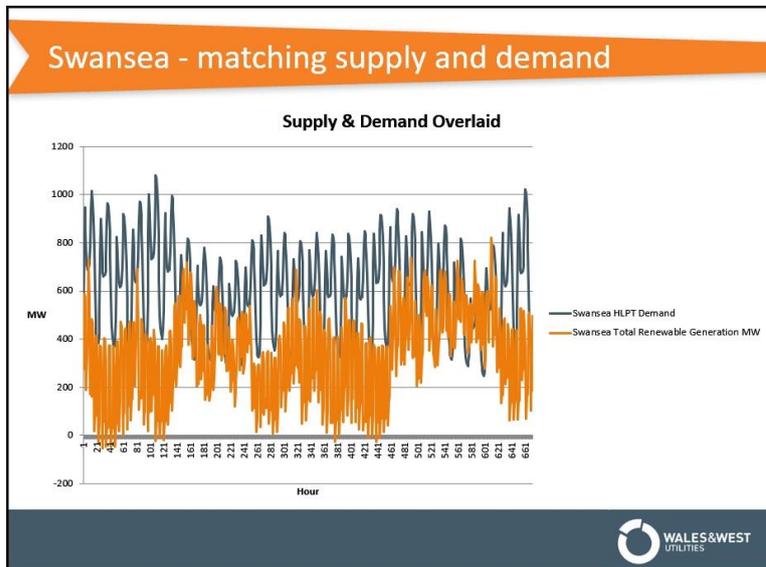
How the model works

WWU takes existing data for heat and power demand for homes and businesses, then adds new demand, such as electric vehicles.

Low-carbon supply profiles such as wind, tidal, and solar are then added to the simulator. A recent simulation for Swansea, for example, used a combination of tidal lagoon, wind and solar.

What were the results?

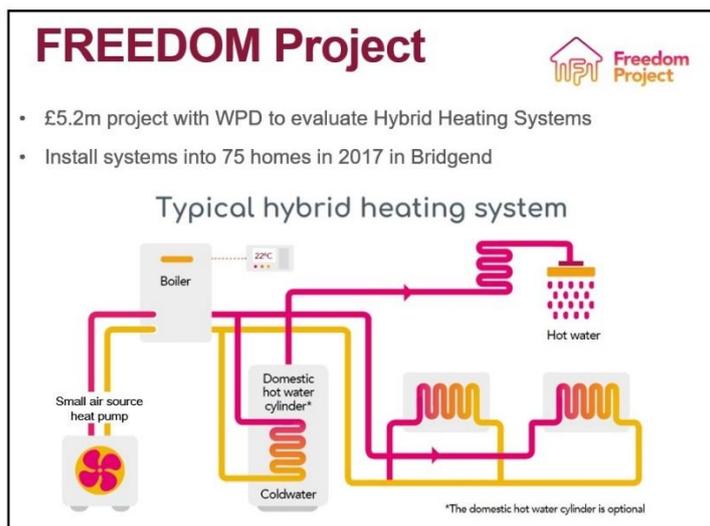
In the Swansea model, even with the tidal lagoon, there was little match between supply and demand. Demand is rarely satisfied, and the combined supply profile had big peaks and troughs, which creates problems for system operators.



Running the model with input data for Cornwall produces similar results, leading to the conclusion that our low carbon future requires significant seasonal storage to make up the supply shortfall. (The past year has seen significant advances in this area, with battery storage costs following similar cost curve reductions to those for solar PV).

Low-carbon heating

WWU believes a recent innovation can provide low-carbon heat - smart hybrid heating. In this a small heat pump is retro-fitted to an existing central heating system. WWU has run a pilot project (the FREEDOM project) on this in partnership with Western Power Distribution.



Early results from the pilot demonstrate that renewable electricity can be the dominant energy source in this heating system, with gas topping up when demand is highest. The principle is to use electricity when it is cheap and green, then gas.

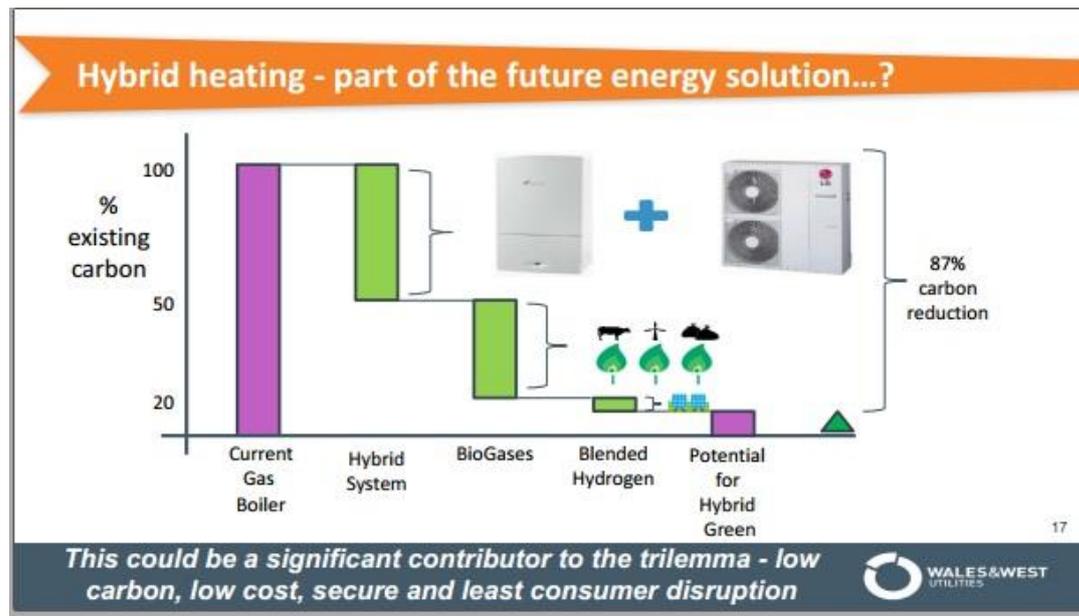
Could the gas in this system be green gas?

South West England is a hot spot for green gas, and 1.5 TWh is already connected to date, three times that projected for the Swansea Tidal Lagoon. National Grid believe a realistic level of 120 TWh of green gas could be produced - a third of domestic gas usage.

The initial results from the FREEDOM pilot show a 50% carbon reduction coming from hybrid heating, with another 30% coming from the green gas element, giving an 80% reduction in carbon overall.

Adding hydrogen to the mix

Hydrogen (produced through hydrolysis using excess renewable electricity) can additionally be blended into the gas supply, thereby further reducing the carbon content of the heating system.



Next steps

WWU has agreed to create a version of the model which uses West of England data inputs provided by the Zero West data team. This will then be shared with the West of England energy community.

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