Energy Infrastructure of Cranleigh

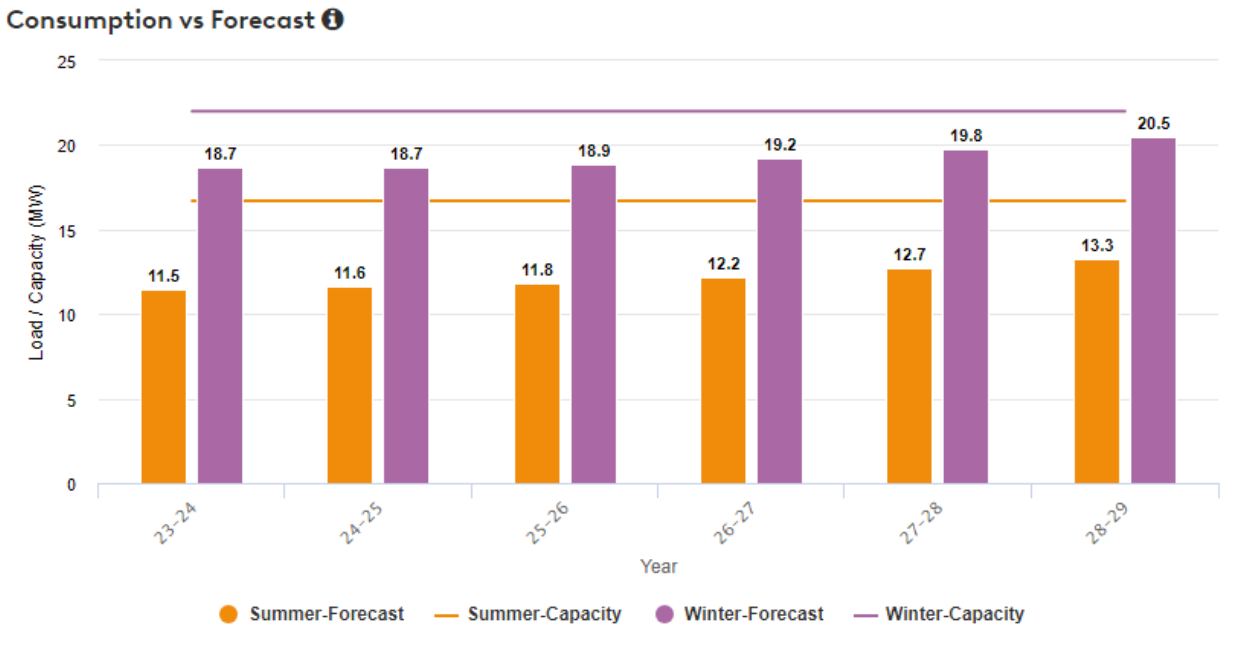
Cranleigh Society stated the below in the past about the energy infrastructure of our village, and in the interest of its residents, has now decided to re-evaluate the situation.

“When all the housing was proposed we all said many things that boiled down to – our infrastructure is NOT up to taking up to 1800 more dwellings!" HERE!

Below is a potential future distribution scenario, it shows adequate capability in the short-term but paints a worrying picture for the long-term. Worsening this is UK Power Network's own summary which states “No forecasted flex/reinforcement in next 5 years". The graph forecasts that in five years there'll be almost no excess capacity.

Future Capacity for Demand graph - UK Power Networks

Current and Forecast Capacity of the Grid

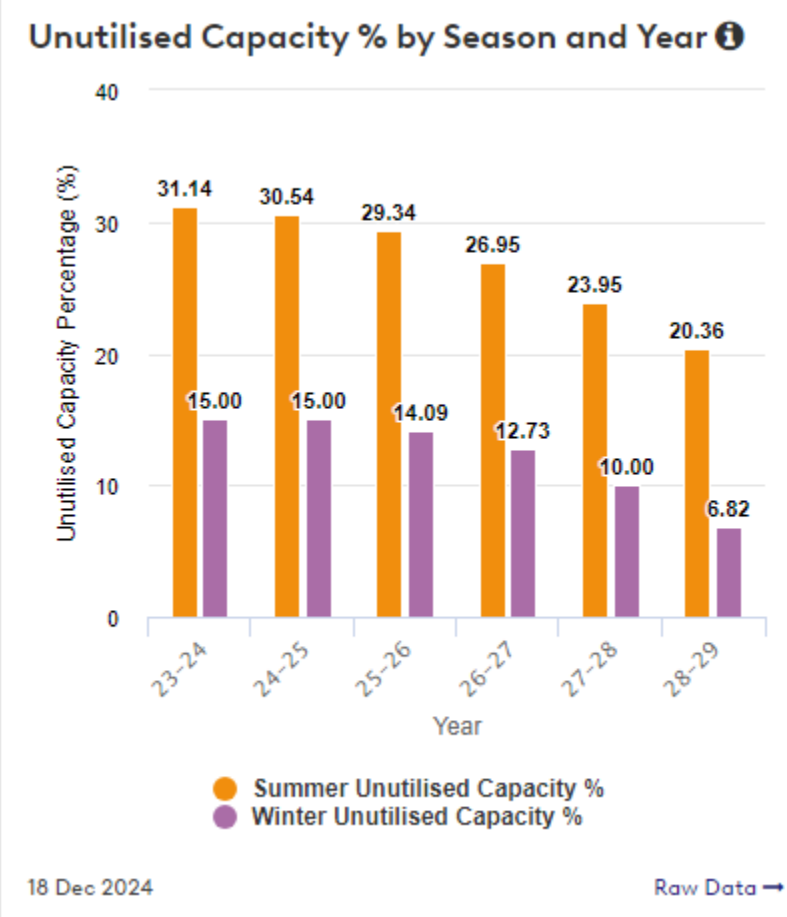


[Consumption vs Forecast graph - UK Power Networks]

The above graph shows the power grid's capacity against the demand forecast in Cranleigh. This power network is in the license area of South Eastern Power Networks, and these are the forecasts for the primary 33/11 substation.

The reason for increased Winter capacity is due to power lines being more efficient in colder temperatures and able to take a greater load, additionally, the UK meets the extra demand through increased generation capacity and importing energy from abroad. Despite this, demand is higher in Winter than in Summer, the biggest cause being the heating of homes.

Found below is the forecast for the future unutilised capacity of the grid.

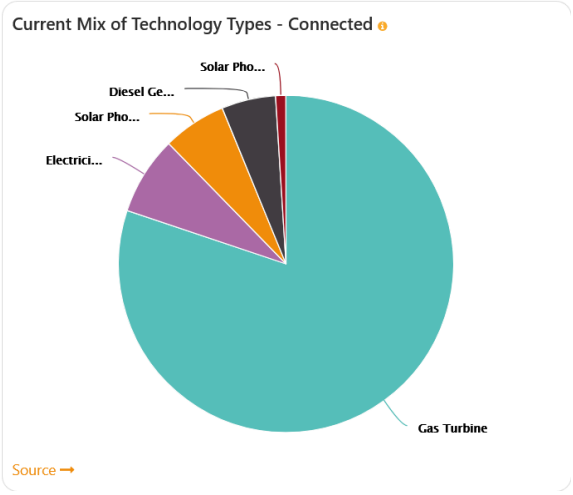


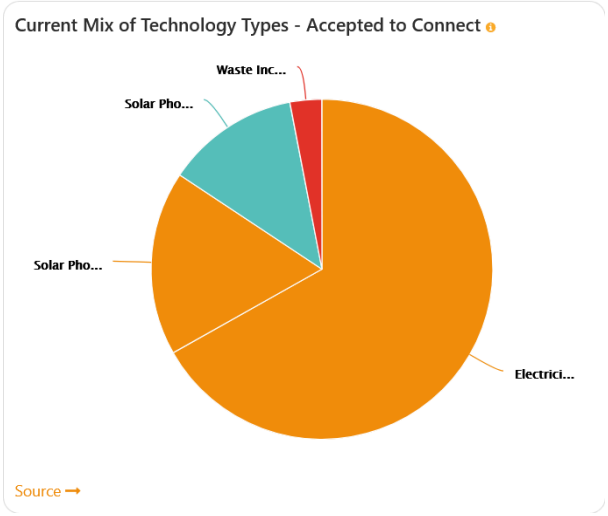
Generation on the Bolney Grid Supply Point

A Grid Supply Point is the point where a transmission system connects to a distribution system. The Bolney Grid Supply Point steps down the high voltage from the National Grid(400kV or 275kV) and connects it to the distribution network(132kV).

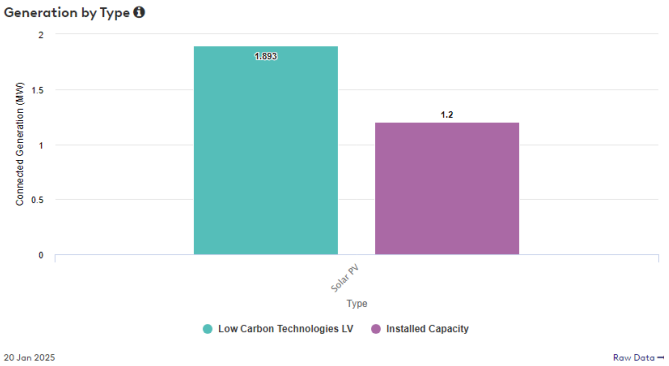
Below, the first of two pie charts shows how gas turbines supply over 80% of the energy on this network. The remaining 20% supplied is by energy storage, solar panels, and diesel generators.

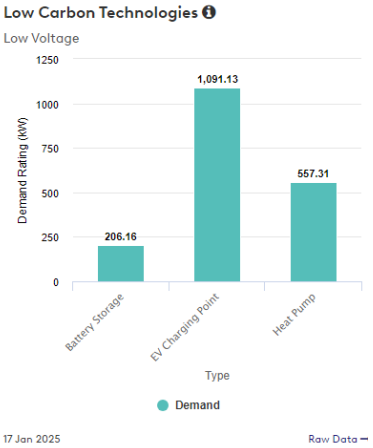
The second of the two pie charts shows the mix of technologies currently proposed to connect to the network. Electricity storage makes up 67% of the new projects in the pipeline to connect to the network. Photovoltaic panels and storage make up the remaining 30% of future projects.





Generation and Demand on Cranleigh's Substation Grid





The graph's above indicate clearly that Cranleigh produces very little energy of its own(1.2MW). The pink/purple column indicates the 1.2MW produced by solar. The blue column shows the demand produced by low carbon technologies. This is broken down further on the right hand

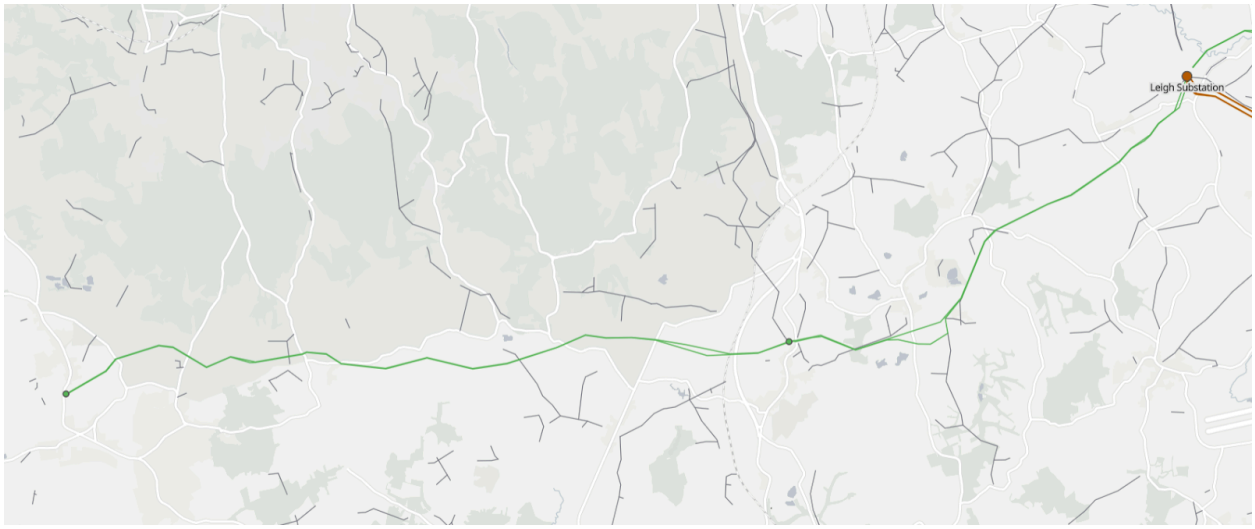
graph. To note - these figures don't include domestic generation such as Solar Panels on homes.

New low carbon technologies have become readily adopted and will, with great likelihood, continue to be so. The most prominent of these are heat pumps, electric cars and electric cooking appliances. Electric cars replace their petro-chemical consuming alternatives, therefore driving up electricity demand. The same is noticeable as alternative electrical heating and cooking systems replace those previously reliant on gas, thus also pushing up energy demand. Dismissing these innovations is counterproductive but electrical distribution infrastructure needs to be capable to allow for this evolution.

Although this article focuses on the load of the distribution networks, we cannot neglect power generation systems. Future thought should turn to this as well, improvement in low-carbon generation on the local system will bolster resilience. However, a long-term strategy is the best option for the future sustainability of our energy supply.

Improvements and Past Forecasts

The image below shows the correct 33kV connection (green line, far left dot to central dot), supplied via the Capel-Cranleigh Line (Green line, Central dot to far orange dot), which in turn supplies the Capel-Leigh line from the Leigh Substation.



As part of the UK Power Networks regional plan, the Capel Switching Station recently has undergone an improvement to its energy capacity.

701: Capel 33/11 kV Substation Reinforcement. Primary Transformers Capacity Increase to meet Load Growth Demand and (N-1).

Limiting factor: Cyclic rating of transformers.

- Transformers' HIs no problem in current period

- Switchgears' HIs show no problem in current period.
- The demand supplied is with 2.85MW (winter) transfer capacity

To date, two transformers of 7.5 MVA have been installed. With these, the firm capacity of the Substation may be exceeded by 2012/2013 (winter). Therefore, it is proposed to replace the existing units with 12/24 MVA units to accommodate for the load increase. After replacement of the two transformers the new firm capacity will be 24MVA."

"8068 Capel Switching Station 33kV Reinforcement: Firm capacity exceeded in 2018."

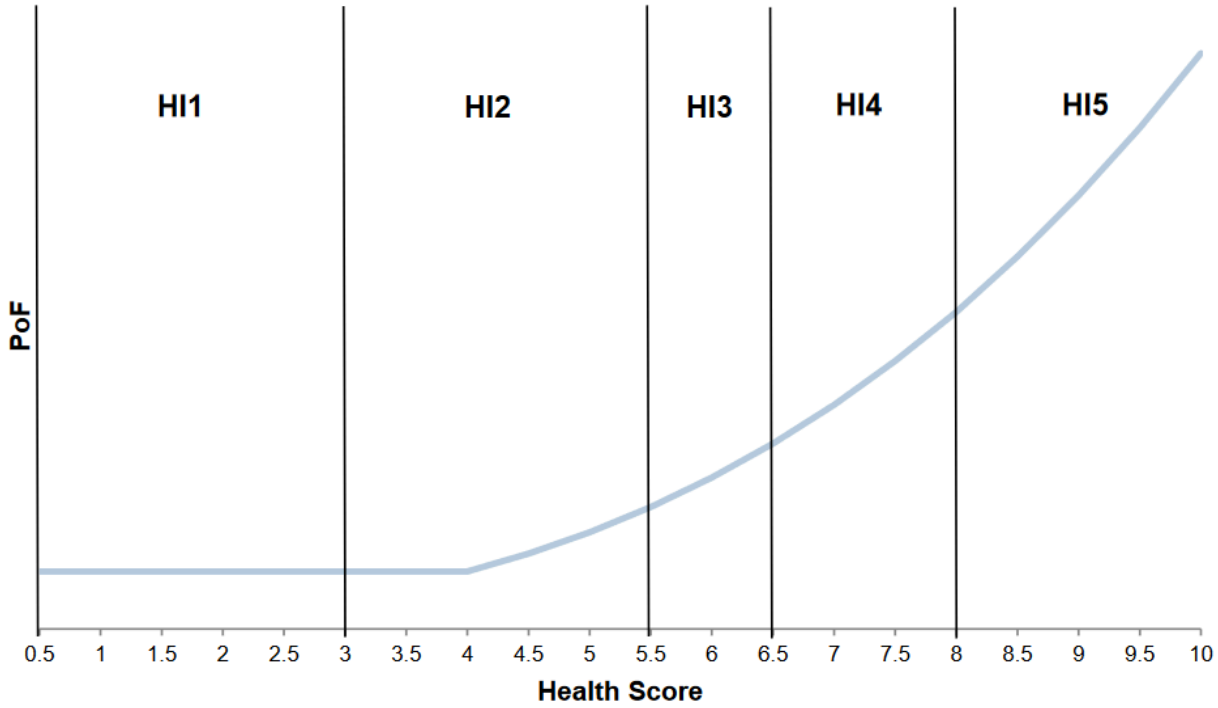
"The predicted load at Capel Switching Station 33kV will exceed the existing rating of the associated feeder circuits. It is not possible to lower the load without compromising operational and planning requirements. Therefore, proposing to replace the conductor on the circuit by replacing 10 km of DC 33kV conductor. Completion of this project will see 10 km of DC phase replaced."

"In relation to the kV substation reinforcement, work was carried out between 2013-2018 at a cost of roughly £1,000,000.

Between 2020 and 2024, work carried out was to increase the Primary Transformer's capacity at a cost of just over £1,000,000. It is unknown to the Society why the work carried out was during this period despite the expectation for reaching capacity to be in 2012/2013.

Further Information about Cranleigh's energy network

HI1 means that an asset is new and HI5 means that it is at the end of its serviceable life. The graph below shows how this rating affects the Point of Failure(PoF). In turn, we might see the current risk to Cranleigh's energy network.



Serving Cranleigh there are 11* 11KV Circuit Breakers. The forecasted health between 2015-2023 estimated that the health of 10 of these would degrade from HI2 to HI3 within this period without intervention.

Additionally serving Cranleigh there are 2* 33/11 primary transformers. The forecasted health between 2015-2023 shows that the health of both of these would remain at HI2, though the health score has likely still decreased.

Cranleigh also relies upon 3 grid transformers on the Leigh Grid. The forecasted health between 2015-2023 estimated that the health of 2 of these would degrade to a rating of HI2 and the other HI3

Although Cranleigh's electrical infrastructure seems to remain healthy for now. These figures were estimates and the society has no indication as to the current health of these assets. The risk of some of the assets failing is clearly increasing and surprisingly a new forecast for the health of these assets has not yet been provided.

Further information can be found in this PDF HERE!