Capabilities on project:
Energy
Environment

Section H

Examines the potential impact of a district wide tri-generation system on the existing infrastructure i.e. considers the impact of increased loading on infrastructure where energy centres are located and reduced local demand for gas and electrical energy where buildings are supplied with heat and cooling from a district wide energy scheme.

The introduction of CHP to supply the Croydon town centre area will have an impact on both the gas and electricity distribution systems. We discuss these under the three options which we have analysed.

Base Case

Gas network

The demand for gas will increase as a result of the new developments planned. This will be offset by some expected improvements over time of the energy efficiency of the existing retained buildings. Where buildings are demolished and rebuilt a significant decrease in heat demand and therefore gas consumption would be expected. Overall however we would still expect a net increase in gas demand of the area as the new developments include areas currently undeveloped (e.g. Ruskin Square).

Electricity network

Similarly the electricity demand is expected to increase and there is already evidence that substantial reinforcement costs will be needed to service the new developments with a new primary substation being planned.

Option 1 – Gas-engine CHP in three locations

Gas network

In this case the total gas demand of the area will increase beyond that of the base case as both electricity and heat will be produced from the gas supplied. The increase will however be concentrated at the three Energy Centres and there will be progressively less gas used across the network as more buildings are connected to the DH network. This will have implications for the revenues to support the maintenance of the local gas network, however the increase in gas sales overall would provide a compensatory factor. Initially at least, buildings which have a gas connection may wish to maintain this gas supply for back-up purposes.

The response of the gas network company to the reduction in gas sales from smaller gas customers would be to increase costs for gas transmission but as these costs would be shared across the region any impact on local customers would be small.

Electricity network

In this case there would be a reduction in the amount of electricity delivered into the town centre area from the national grid as the CHP units would be generating part of the demand. The peak capacity needed to be provided may not decrease however given that the CHP units are likely to be sized for optimum energy efficiency and not for providing a firm supply, i.e. it would be more efficient to have a one or two CHP units rather than the larger numbers that would be needed to provide a firm supply.

The CHP units will require regular maintenance and in this downtime it would be assumed that the national supply will provide back-up power. The effect of this will be that the distribution costs will be supported by fewer electricity units sold and therefore these costs will increase. As the distribution area is much larger than the town centre though these increases will be small.

Option 2 – One large CHP plant

Gas network

In this case the additional gas use will be concentrated at one point and although the overall gas use will increase the concentration may result in the need for a new dedicated pipeline or additional reinforcement costs combined with lower revenues to support the local network. Overall this option is likely to impact more on the gas network than for Option 1.

Electricity network

In this case the large CHP electrical output in one location would be significant in the local network and a specific connection to a new high voltage substation is likely to be needed. This would require additional costs however the downstream electricity system would be relatively unaffected. Again there would be less electricity supplied to the area from outside over the year but the capacity of the network would not be able to be reduced. Distribution costs would rise but this rise would be spread over a wide area of the network and the impact would be very small.

Option 3 – Existing Rolls Royce

Gas network

The existing Rolls Royce gas turbine may be used more over the year than before but with limited impact on the gas network as the gas supply to this power station will be unaltered. Within the town centre the gas demand would be expected to fall as existing buildings are connected however the back-up boilers would still need to have sufficient capacity to meet the peak demands. So although there will be no change in the overall capacity of the network the annual gas consumption will be lower and more concentrated in a few locations.

Electricity network

In this case all of the electricity generated is at an existing plant and so there would be no significant impact on the electricity distribution system. This may prove to be a significant advantage for this option.

Conclusion

It is clear from the above that the impacts of the CHP/DH are potentially negative for the gas and electricity network operators and that discussions with the electricity and the gas networks businesses are needed to establish the impacts, the way in which CHP plant could be connected to gas and electricity and the need for reinforcement.