

Annexe A – Stokesley Case Study

CATAPULT
Energy Systems



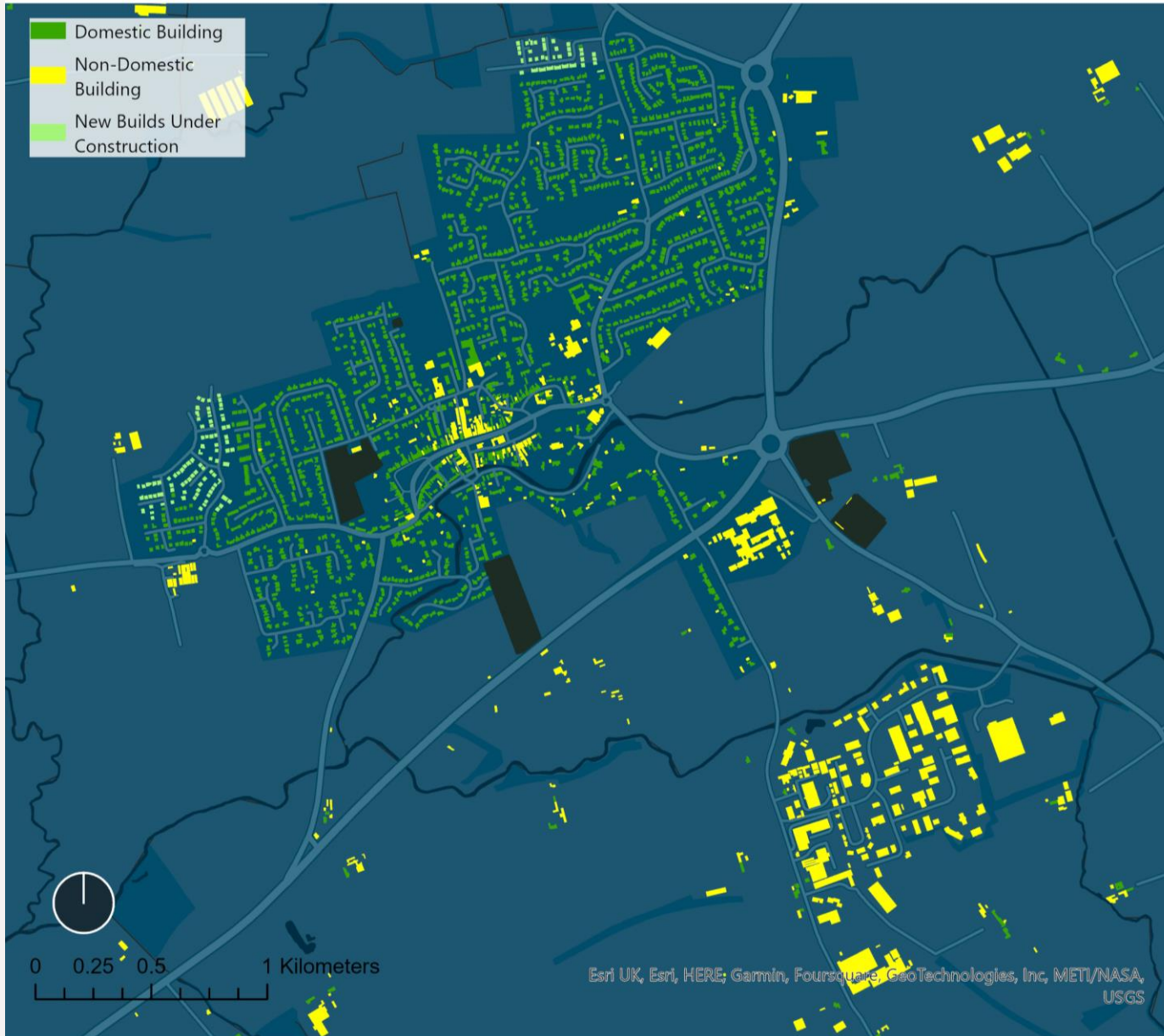
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Overview



Overview of Stokesley



As part of the LAEP, ESC agreed to take a closer look at one area in particular to draw out further conclusions in a single location. The chosen area was Stokesley which lies within the A1 Corridor analysis zone.

The town of Stokesley is located in the Hambleton District of North Yorkshire and is home to approximately 6,000 people.

Stokesley is interesting for a number of reasons, including that the town itself is split into two main areas: the north is predominantly domestic dwellings, and the south is predominantly commercial and industrial buildings.

There is also a small cluster of non-domestic buildings in the north part of the town, along the High Street.

Buildings and Heating



Domestic Efficiency

Stokesley has a significant number of dwellings that would benefit from the installation of some insulation measures. The areas shown in the map within Stokesley require energy efficiency measures. The measures are split into two categories:

- 'Basic' energy efficiency measures include loft insulation and cavity wall insulation.
- 'Deep' energy efficiency measures include solid wall insulation (where cavity wall insulation isn't possible) and triple glazing.

Clusters of basic upgrades can be seen in both the west of Stokesley and to the north-east. Given their proximity to one another, a roll-out could be designed to take advantage of this and potentially reduce the cost of installation.

Equally, there are some dwellings which require deeper upgrades which may be in addition to some basic measures. These dwellings tend to be older and more difficult to decarbonise. In Stokesley, they are clustered near to the High Street and could be considered at the same time as some of the non-domestic units in this area. Clusters of deep retrofit in the east of the town could be combined into a single large project to create a more viable financial proposition.



These measures would reduce the outgoings of individual households on their energy bills and likely provide them with a more comfortable standard of living. The west of the town has a higher level of fuel poverty; roll-out of measures could start there and tackle multiple issues simultaneously.

A local business (Titan Energy Solutions) may be able to deliver this work.

Domestic Heating



Currently the majority of dwellings in Stokesley are heated using fossil fuels. This would need to change if Stokesley is to achieve net zero. The predominant heating system in a net zero Stokesley is expected to be heat pumps: both ground source and air source. This is based on reaching net zero by 2040 however this means that some non-domestic buildings will remain on gas, since hydrogen is unlikely to be available in significant quantities. These buildings could be decarbonised by using biogas as an alternative to fossil gas.

For the majority, heat pumps will be used but the exact split between ground-source and air-source heat pumps is unknown and further work is needed to ascertain which heat pump is most suitable. The map, left, shows the domestic dwellings and the most cost-effective heating technology. Ground source heat pumps typically have a higher efficiency than air source and have been suggested where the dwelling is detached, since these are more likely to have the available external space.

Highlighted on the map are parts of Stokesley with clusters of the same technology where initial roll-out could be considered.

Domestic Solar

Domestic solar PV is known to be one of the most cost-effective ways of generating low carbon electricity.

Whilst solar PV is an effective technology to decarbonise electricity usage now, it becomes increasingly important once dwellings transition to heat pumps and require electricity for home charging of electric vehicles.

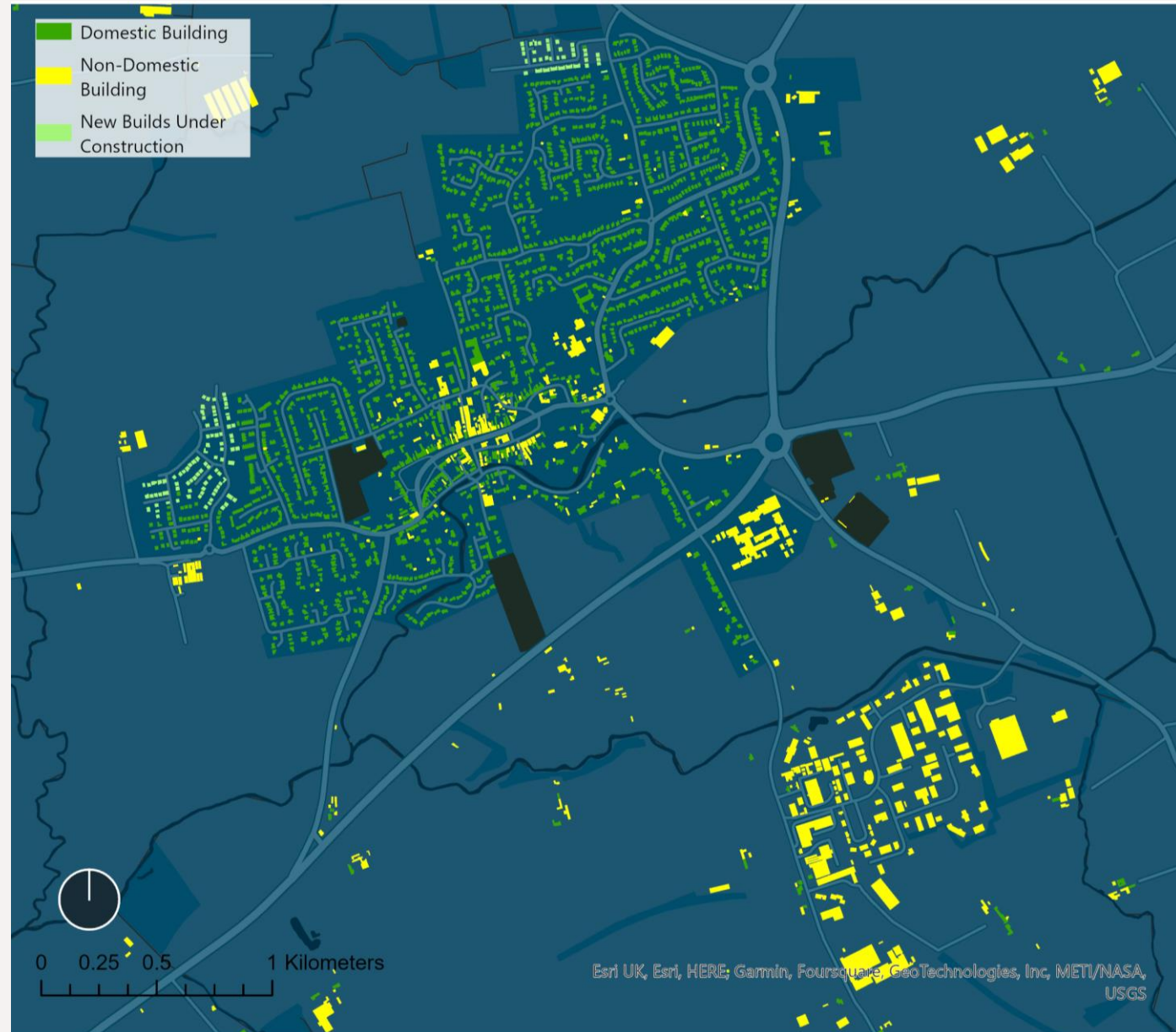
Note: Although individual dwellings are highlighted in the map to the right, they are used to show which areas are most suitable based on typical characteristics such as orientation and roof size (a part of town is more suitable if more dwellings are highlighted, rather than denoting exactly which dwellings should have PV). Site visits should be undertaken by suitably qualified experts before installation.



Non-Domestic Buildings

In the south of Stokesley there is a large area of light industrial and commercial buildings, shown in the map in yellow.

In the main, these buildings are expected to transition to electric heating via heat pumps as the area moves towards net zero. Some of the non-domestic buildings will need to consider alternative sources where their manufacturing processes require high-temperatures. Ideally, these would transition onto 'green', or zero carbon hydrogen, however this is unlikely to be available in significant quantities in the short-to-medium term from the national gas network. One solution that could be considered would be to generate 'green' hydrogen locally by using an electrolyser coupled to renewable electricity generation. The cost-effectiveness of such a solution would need to be carefully considered.



Transport



Off-Street Parking



After 2030, no new petrol and diesel cars will be sold in the UK, meaning a switch to battery powered electric vehicles and an increased requirement for charge points. This transition is also required to meet net zero as the emissions from road transport are typically a significant proportion of an area's overall emissions.

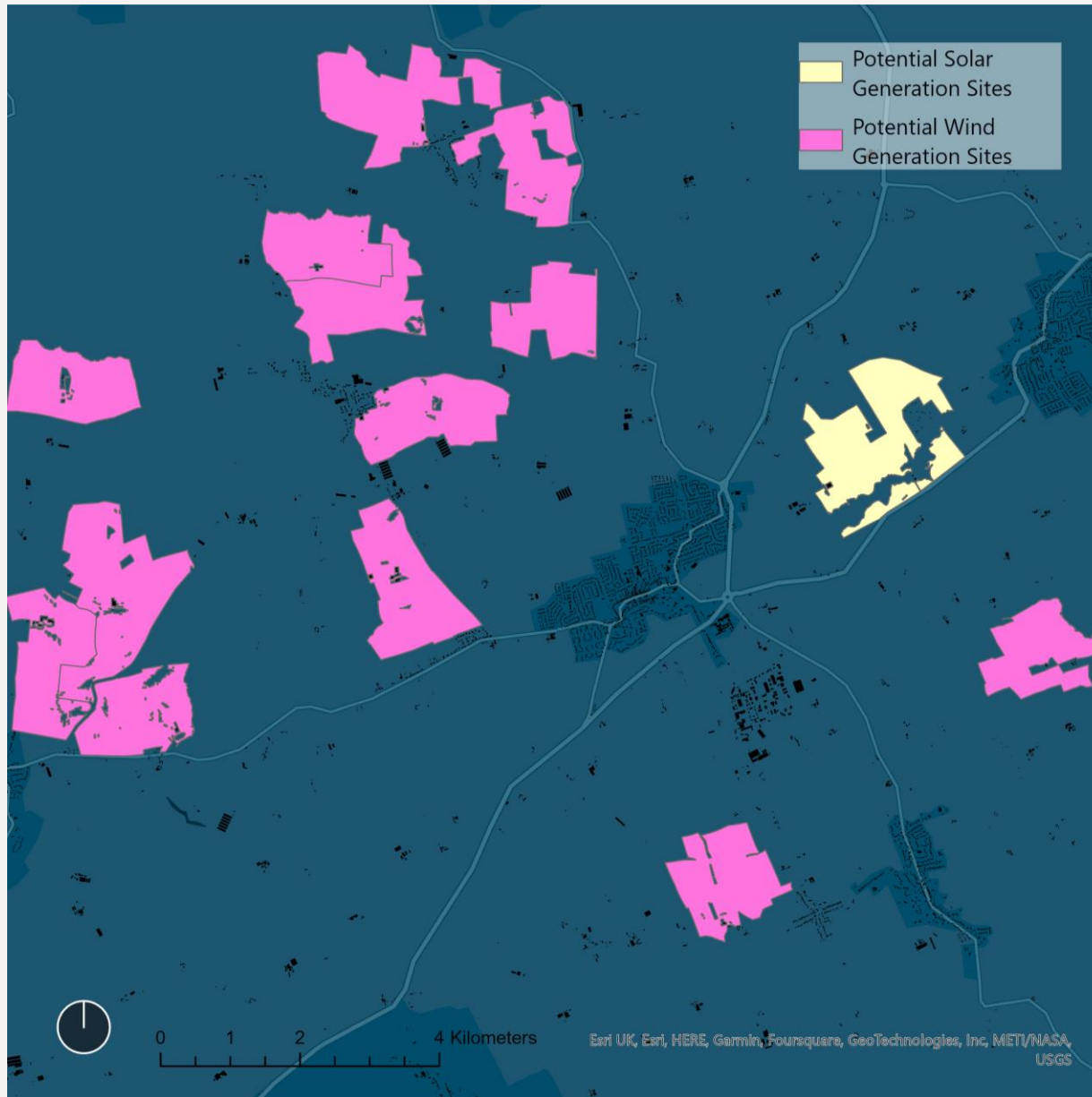
The map, left, shows the proportion of dwellings per street with off-street parking. For dwellings with off-street parking, it is expected that EVs will be charged at home where available to keep recharging costs as low as possible.

In areas where dwellings do not have access to off-street parking, public charge points will be required. These will also need to be located to serve visitors to the area. Therefore, these charge points are likely to be in the centre of Stokesley, around the High Street for example in the High Street Car Park which has space for around 80 vehicles. Plans are already afoot for installing charge points in the town.

Local Generation



Large-Scale Solar & Onshore Wind



Although Stokesley is a relatively rural area with plenty of available land space that could be used for local generation, sites that have been deemed as suitable* tend to be in neighbouring areas.

The map, left, shows areas of land that could be considered for the installation of ground-mounted solar (yellow) or onshore wind (pink) generation. Land parcels nearer to the town have been discounted mainly due to their proximity to buildings – for onshore wind – or their susceptibility to flooding – for ground-mounted solar.

There are many benefits to generating electricity locally. The installation and maintenance can benefit the economy if local labour and maintenance teams are used, also providing high-skilled jobs. The generated electricity could be utilised by the industrial and commercial buildings located in the south of the town through a power purchase agreement (PPA) to give low/reduced cost electricity which is also zero carbon. The land around wind turbine and solar panel installations can still be used for grazing or simply improving the biodiversity of the area.

* Note: The criteria used can be found in the accompanying documents in this series. (Annexe B) Suitability has been considered at a high-level and any installation/investment should be based on expert surveys and reports.

Networks, Storage & Flexibility



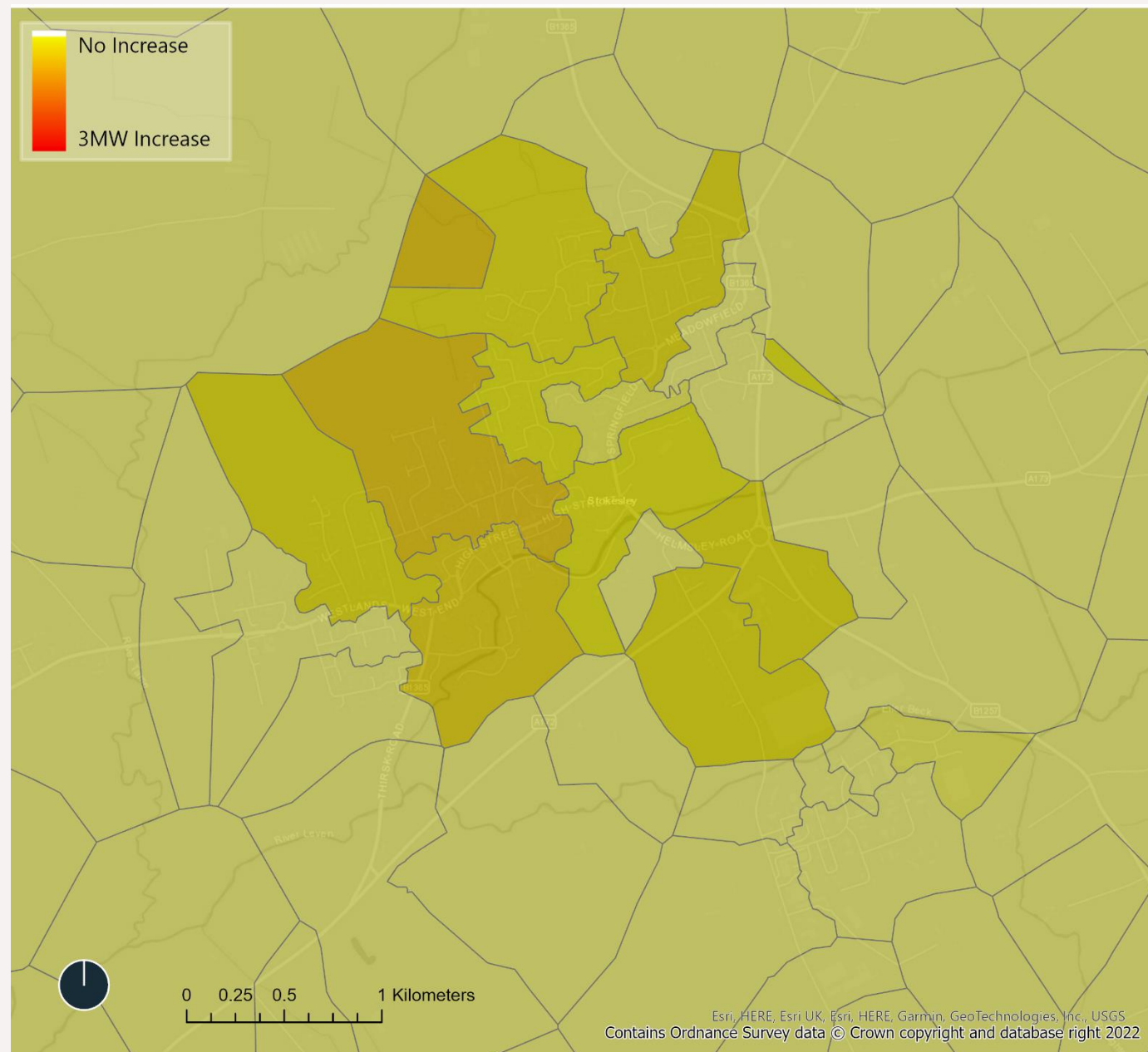
Electricity Network

The map, right, shows where there is an expected increase in the electrical peak demand in Stokesley due to the switch of heating systems to heat pumps (predominantly) and the increased use of electric vehicles. Each of the segments in the map represents an area covered by a low voltage substation, with darker polygons likely to have a more substantial increase in peak demand than lighter or unshaded segments.

The electricity network operator (Northern Powergrid) may use information like this to identify areas which could require future network reinforcement. However, reinforcement – and therefore the costs – could be avoided by using storage and flexibility.

Battery storage could be installed at an individual building level to make better use of rooftop solar PV, which can generate zero carbon electricity during the day to be stored and used when required. Battery storage could also be installed at a substation level to truncate the peak demands on the wider network.

Flexibility provided by demand side response and storage could help to shift demand from peak times, reducing the need for network upgrades. Demand shifting provided by charging EVs overnight and using large thermal stores in dwellings with heat pumps could be considered.



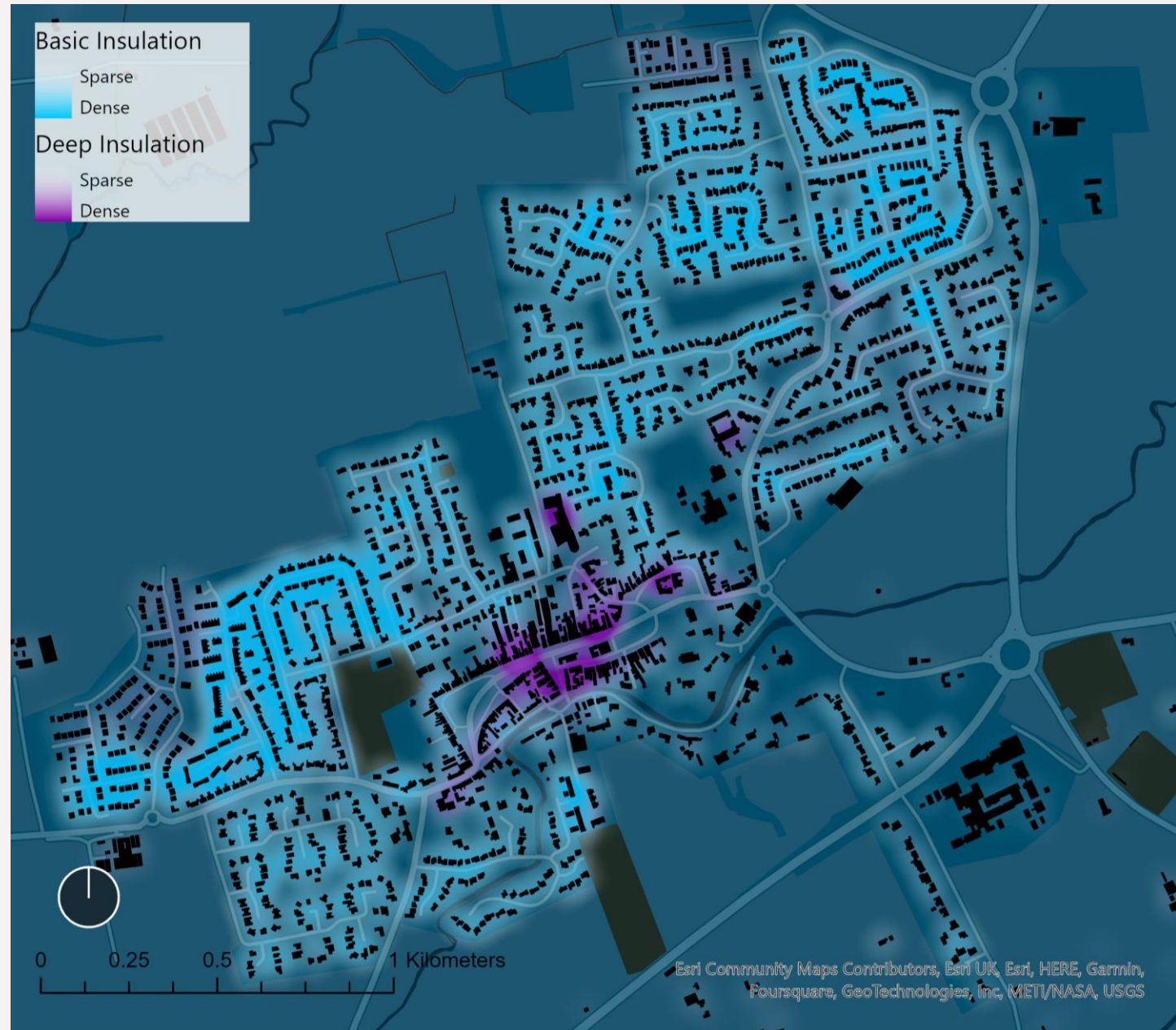
Outline Priority Projects



Energy Efficiency Upgrades

Around 1,400 semi-detached dwellings across Stokesley have been identified as requiring a basic level of energy efficiency upgrade. These could include cavity wall insulation, loft insulation, draughtproofing, and other less invasive measures to insulate dwellings.

The dwellings are clustered in the west and north-east of Stokesley and could be considered together as a starting point of a roll-out. The west however has higher fuel poverty levels and therefore could be a higher priority.



Number of Dwellings	c.1,400
Dwellings Type	Semi-detached
Energy Upgrade Type	Basic
Estimated Cost	£1.2m

Heating

In many areas across York and North Yorkshire, the predominant expected future heating technology is a heat pump. Highlighted in the map, right, are the locations that have a high number of dwellings which are both semi-detached and expected to have an air source heat pump as their future heating system.

These dwellings have been highlighted for future study, as it may be possible to standardise an installation approach if the dwellings are deemed to be of a similar type, size and condition.

These areas have also been highlighted previously as areas of basic energy efficiency upgrades and therefore these two projects could be combined to fully improve the dwellings and significantly reduce their collective CO₂ emissions.



Number of homes	c.500 in Stokesley
Building Type	Semi-detached
Estimated Cost	£3.0m



Semi-detached dwellings in the north-east of Stokesley. Image from Google StreetView.

Domestic Solar

Most dwellings in Stokesley are owner-occupied. This means that residents themselves will be required to take action to decarbonise their dwellings. Rooftop solar PV can allow for generation and self-consumption, reducing reliance on the electricity network and therefore reducing their electricity bills.

Local authorities can support uptake in able-to-pay dwellings through schemes such as Solar Together, a mass purchasing scheme, allowing residents to pay lower fees for procuring and installing rooftop solar by taking advantage of economies of scale.

Other potential business models for solar PV roll-out are discussed in the main LAEP document.

Number of Dwellings	c.850
Total Cost	£5.25m



If there are any questions about the method or outputs in this LAEP Annexe, then please feel free to contact the Energy Systems Catapult team on:

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