Viking Energy Network, Jarrow (VENJ)

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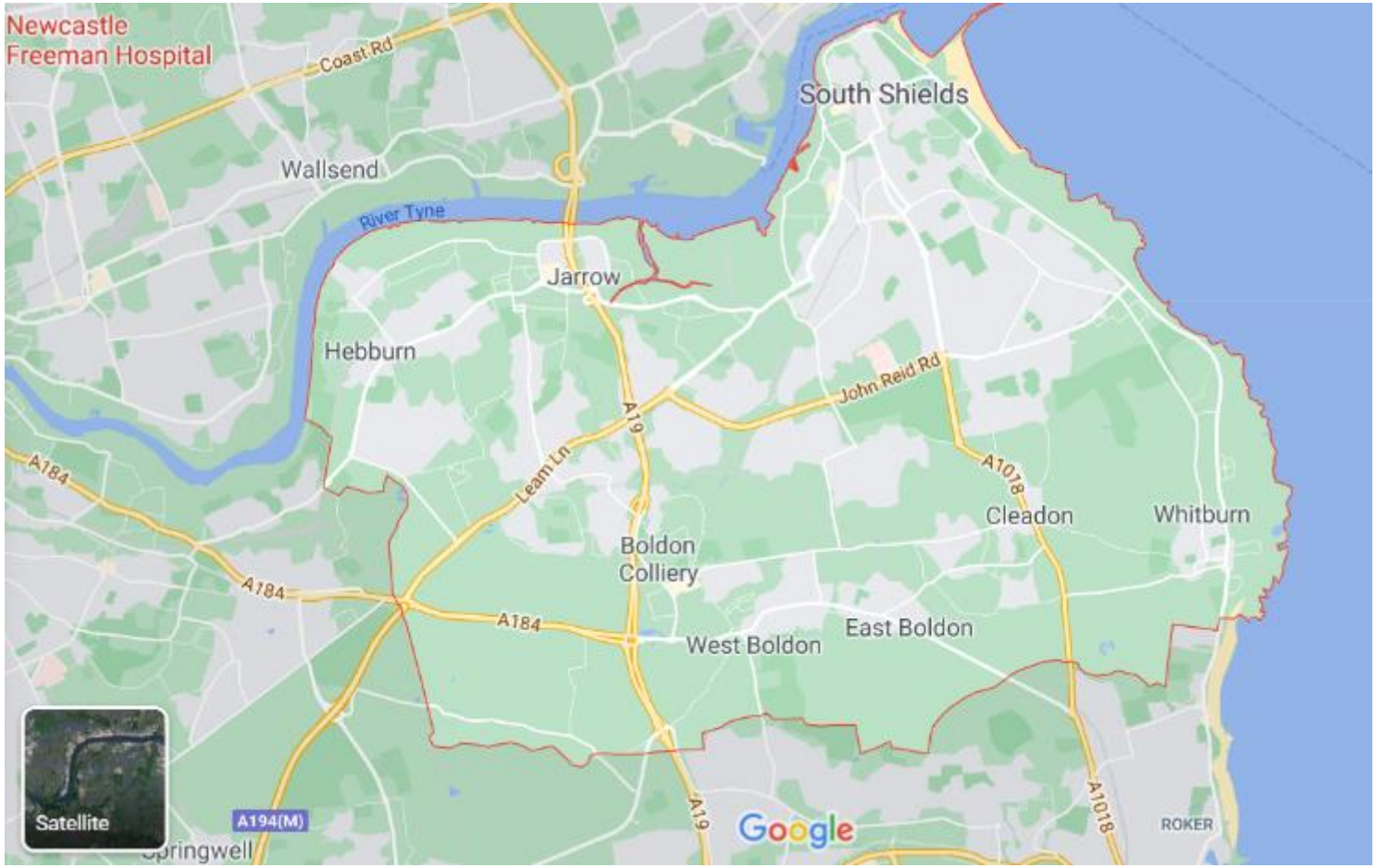
- North East England coast
- 64.43 km^2
- population 147,700 (2021)
- Towns: South Shields, Hebburn and Jarrow
- Villages: Boldon, Cleadon and Whitburn
- 2010 Covenant of Mayors
- Declared climate emergency July 2019



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2015 heat mapping

- Map is annual heat demand for all sectors
- 3 clear Town district heat opportunities
- Jarrow largest public sector (STC) load concentration

VENJ Project Overview

- First major energy scheme for STC
- Innovative combination of renewable technologies, generating electricity and harnessing heat from the River Tyne to feed into 8 buildings in Jarrow
- Serving Jarrow Business Centre, Jarrow Town Hall, Ellen Court, Wilkinson Court, Monastery Court, Jarrow Focus, Mid Tyne Building, Phab Club
- CO2 reduction of 726t p.a. for STC (ERDF C34 output)
- 11% of our 2030 zero carbon target
- Primary Energy reduction of 6,134MWh (ERDF C32 output)
- Project currently under construction, expected completion Mar / April 2023
- Scope to expand to 16 or 20 buildings if & when funding is available

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Timeline

- 2016 internal feasibility, concept design, grant application
- 2018 grant offer
- March 2019 appoint scheme design consultant (tender)
- Late 2019/ early 2020 main contract tender & heat pump tender
- July 2020 planning submitted
- Autumn 2020 cabinet, tender review, contract signed Dec 2020
- Site start April 2021 (at planning award)
- Completion March 2023

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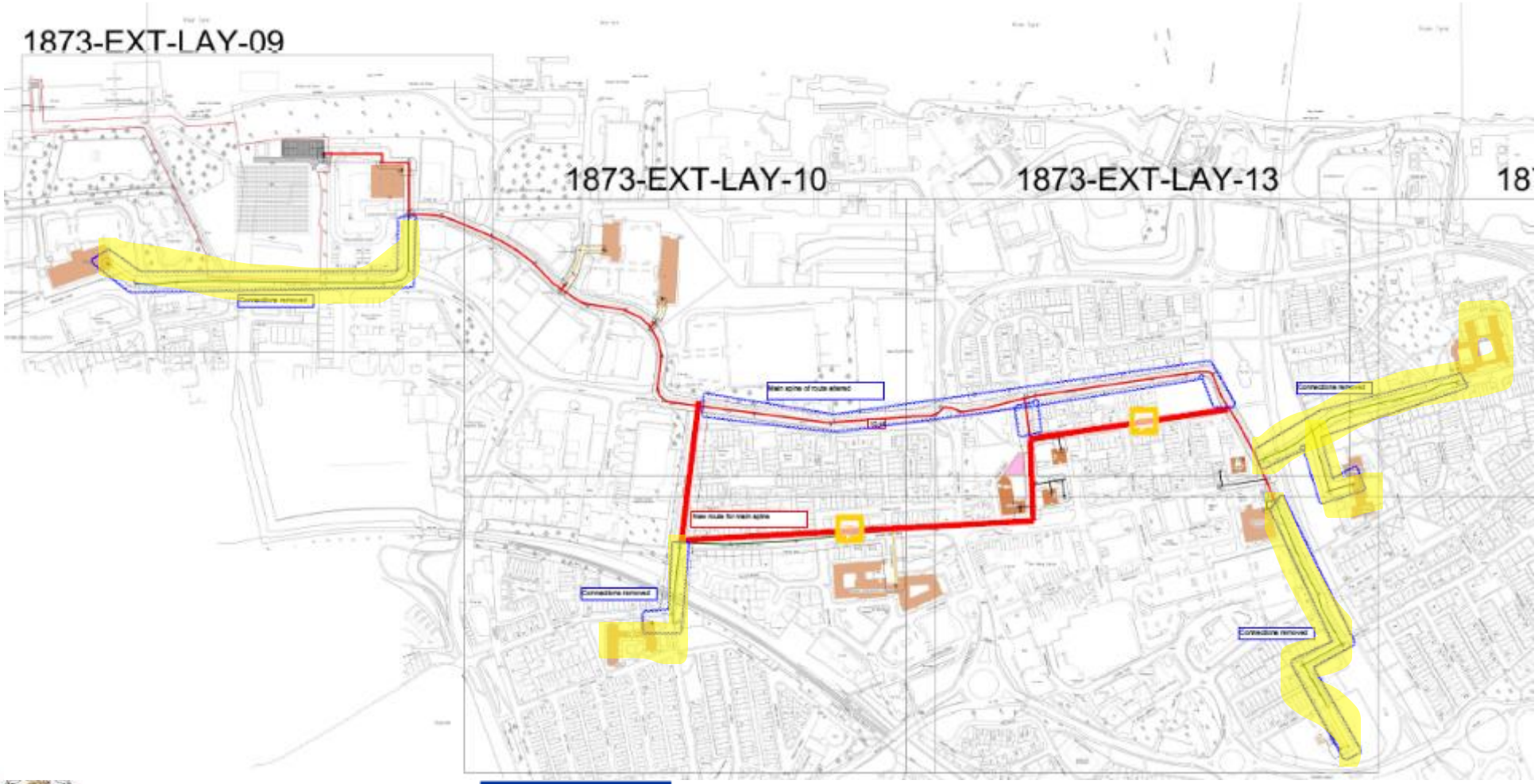
2020 network (& budget trims)



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2022 connected buildings

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A mixture of plant displaced…

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VENJ Scheme Technologies

- Ground breaking scheme, UK first to combine 3 techs HP, CHP, PV
- River source heat pump, filtration system at former coal staithes
- 1000 kW Solar PV and 100m3 thermal storage for summer operation
- 500kW battery store and CHP for shoulder periods, peak shaving & winter
- New proposal for 200m^2 solar thermal (UK first):
  - In summer to heat thermal stores for night time use (when PV is zero)
  - In winter to preheat the river water input to raise heat pump performance
  - significant cost saving over retrofit cost
  - Additional 39 tonnes CO2 saving

Ammonia Heat Pump

- non-ozone depleting refrigerant, zero global warming potential
- The Drammen district heating scheme is 85% Heat pump
- Up to 90ºC flow temperature
- COP 3.09 @ 65/55’C network, 10/7’C source (EN14511)
- 696kWth output
- Made in Glasgow, service depot in Hebburn

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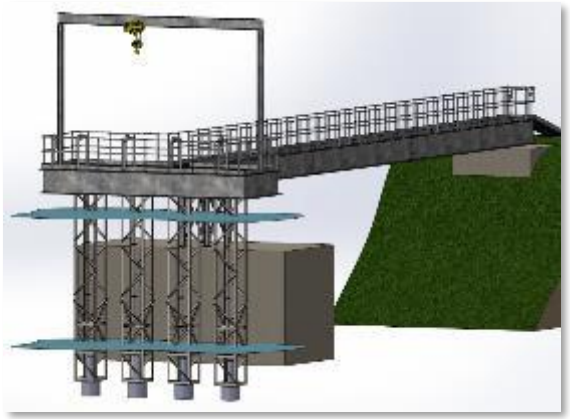
Construction Challenges – River Abstraction

- Range of options considered including floating pontoon / bridge
- Opted to procced with bridge, benefits include:
  - Retaining Staithes
  - Reduce risk of crash and subsequent damage
  - Feedback from tender process
- Repurposes a historic “carbon exporter” as a low carbon source AND preserves future heritage possibilities



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Abstraction bridge August 2022

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Construction Challenges – EC Foundations

- Original design assumed standard ground bearing concrete floor slab
- Site Investigation delayed by Covid until May 2021
- Results showed buried refuse on EC site
- Presence of slag required fully piled solution through to bedrock (18m down)
- Presence of methane (from decaying matter) requires suspended structural floor capable of supporting 22 tonne HP, 50 tonne thermal stores
- 3 to 5 months delay

EC May /August / October / November 2022

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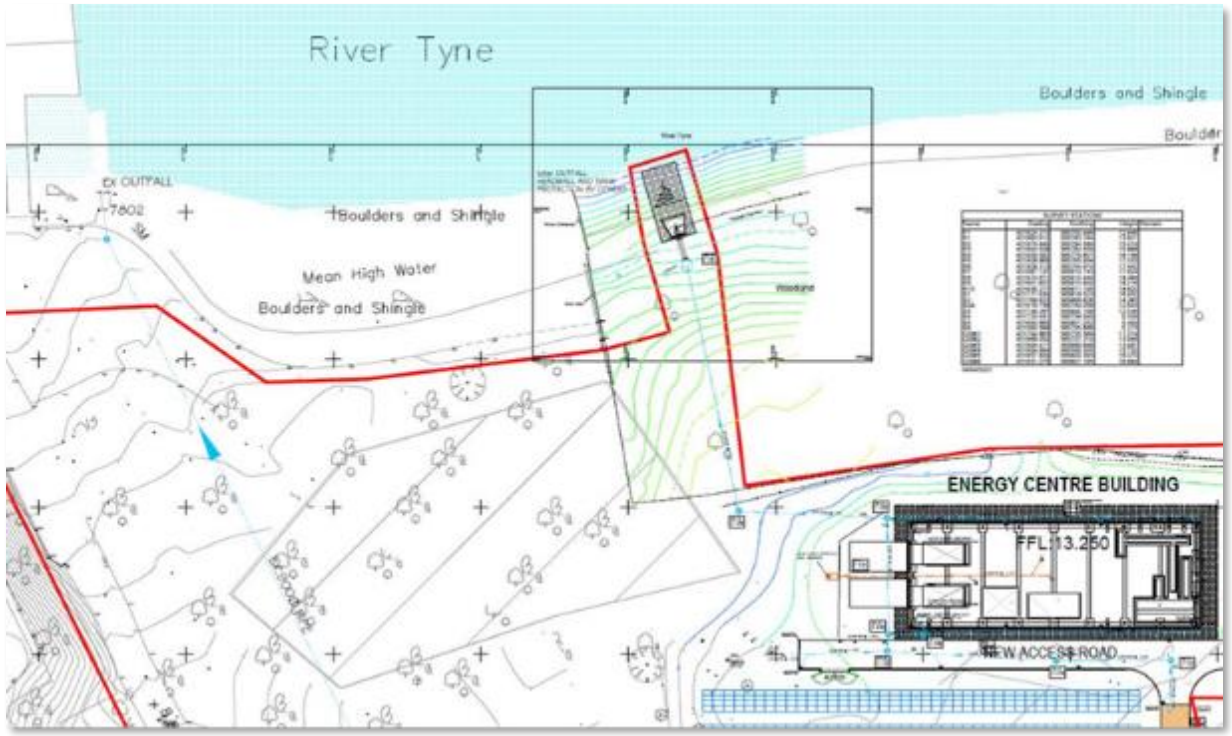
Construction Challenges – New Outfall

- Original design to use obsolete sewer outfall
- NWL no objections at planning consultation
- As we sought water supply quotation for EC, question of roof and surface water drainage
- NWL claimed the outfall as their asset – significant charges per day (~£2.5k!)
- New outfall requires substantial civils
- EA permit, Flood risk permit, planning app, MMO permit etc
- Approx +£400k



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New outfall August 2022

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Construction challenges; Civils, trenching, disruption

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‘Cuddly renewables’ .v. Civils – omelettes & eggs

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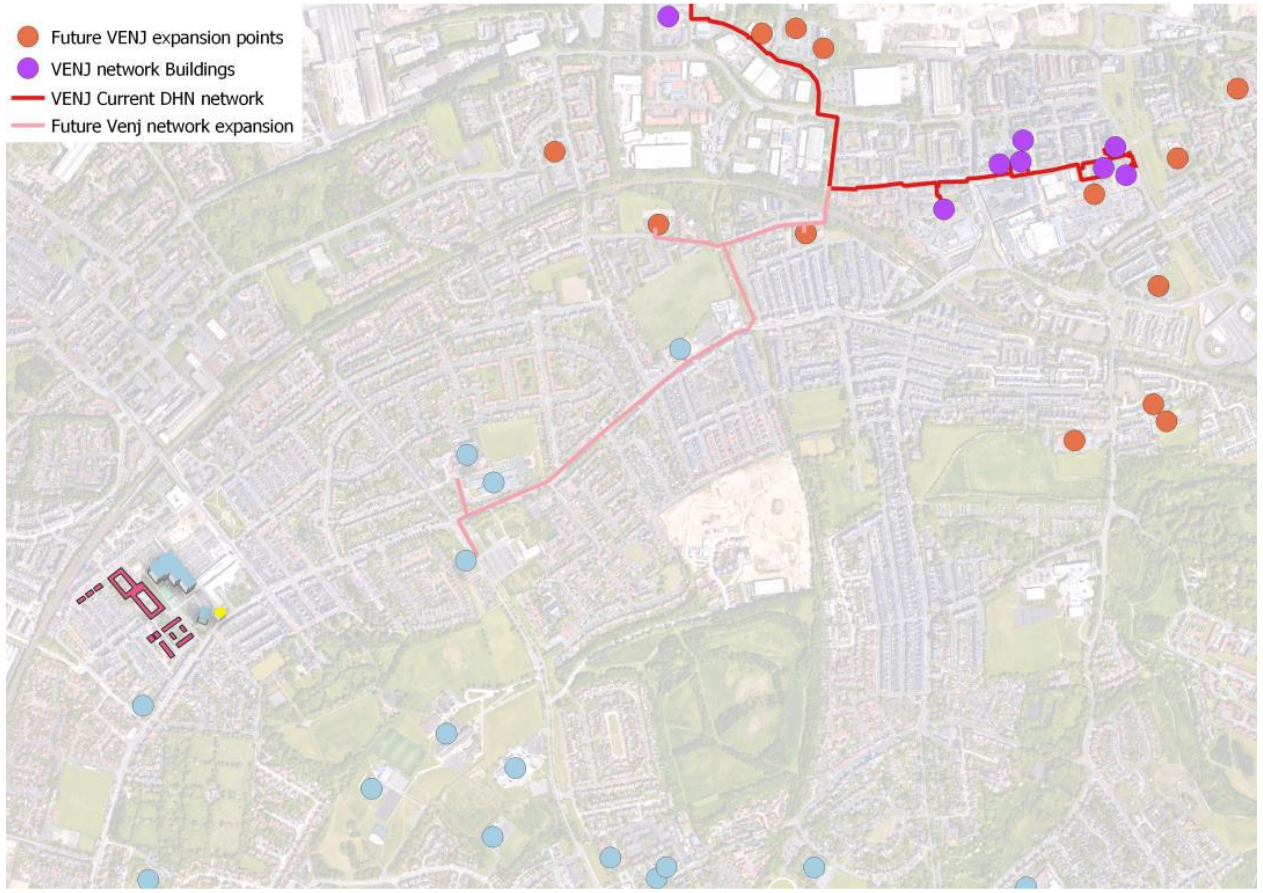
Possible expansion West

- Birch Grove sheltered housing flats
- St Oswald's C Of E Primary School
- Keelman's School
- South Tyneside Early Excellence Centre
- Land at former Father James Walsh

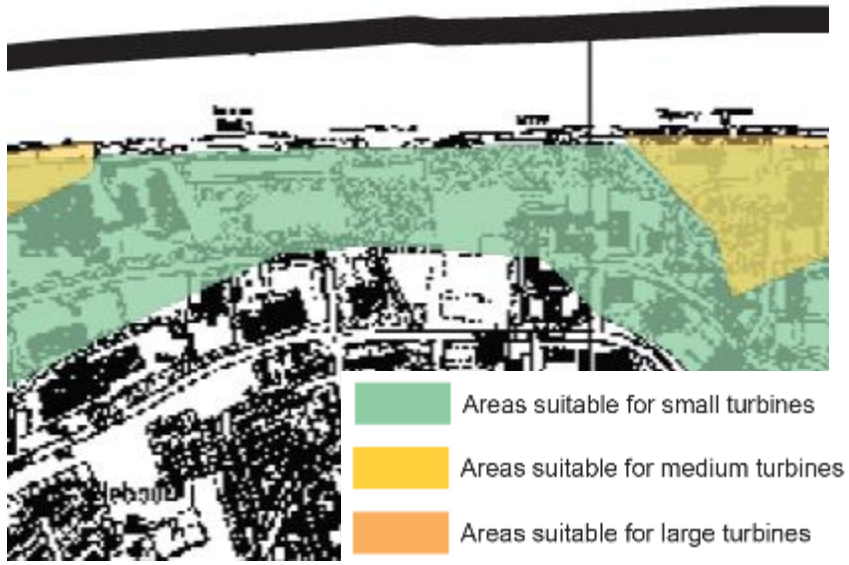
Non STC loads:

- Windsor Nursing Home
- Bedewell Grange Care Home



Wind turbine at Staithes

- June 2021 wind constraints mapping to identify areas to feed into planning guidance
- May be possible to include VENJ as identified as *"potentially suitable for wind energy development Policy 6"*
- Potential 520 tonnes additional carbon saving (if modelled on Middlefields proposal)
- **Awaiting change in NPPF footnote 54!**



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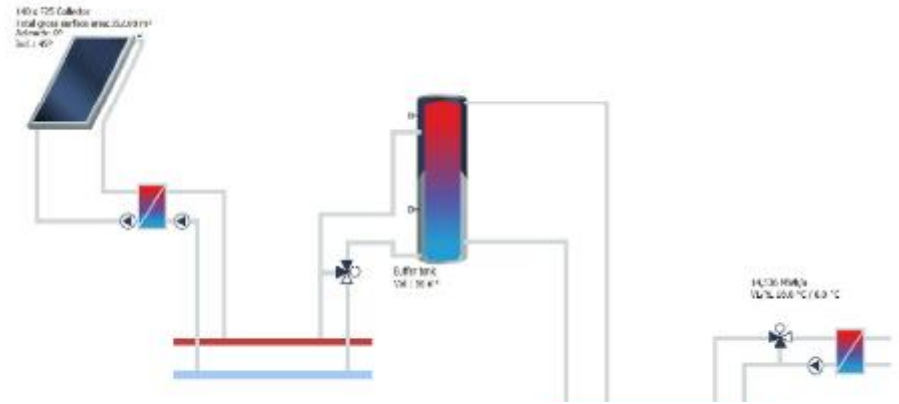
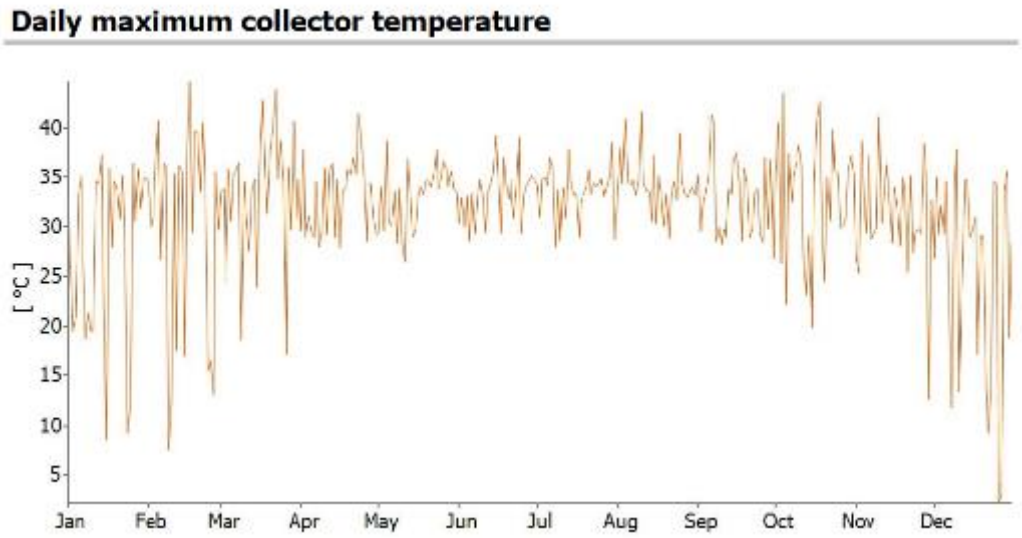
Solar Thermal

- Additional 200m2 of solar thermal collectors
- Scope to further enhance summer carbon zero operation
- Awarded additional ERDF monies
- Additional carbon saving 39 tonnes
- Designs being developed; all looks good
- Genuine UK first





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Lessons learnt

- Ensure policies up to date
  - CEEQUAL points, smooths transition through planning, top level support ensures co-operation, resourcing, finance
- Design stages; RIBA Stage 4 <> BSRIA stage 4A
- IDNO no cost saving, significant delays with easements & engagement on site
- Do detailed ground Site Investigation as early as possible
- Engage all stakeholders early on NWL, NPG, NHS, suppliers, etc
- State Aid, Easements, grants, legals take months (years)
- Never assume
- Keep your head & ***focus on the end result***!

Questions / Discussion

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