Resource assessment for wind and solar in North Somerset and opportunities to support the wider sustainable energy sector

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Avonmouth turbine construction. Image courtesy of Ecotricity

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Executive summary

Introduction

Regen SW was commissioned to produce this report in spring 2014 to inform the evidence base for North Somerset Council's approach to planning for renewables, the potential for installing renewables on its own estate and other potential actions that the Council could take to support the delivery of renewables in the area.

Significant wind, solar and other renewable resources mean a 15% 2020 target could be achieved locally

This report has identified significant potential resources for wind and large scale solar in North Somerset, and analysed this potential against a possible renewable energy target. The results demonstrate that there is more than enough potential resource from a combination of wind, large scale solar and other renewable energy resources for the North Somerset area to meet 15% of its 2020 total energy demand from renewables.

Site identification

The Council has limited land ownings with most land being kept for a particular purpose and therefore there is little 'free' land. Five sites for solar arrays were identified using Regen's site finding process. It is, of course, up to the Council to consider the best use of this land from all the potential options. In some circumstances, an array could be deployed in the interim period prior to other potential uses or developments. There may also be potential for solar arrays to be included within other development opportunities as a small proportion of the available land. As part of North Somerset Council's trial membership (which runs until 17 August 2014), we are happy to comment on any sites that are being considered for solar development.

Appropriate business models

We have summarised three main categories of potential business models: local authority as developer; partnering with a commercial developer; and partnering with a community developer. Case studies of approaches taken by other local authorities in the south west are set out as inspiration for the Council. If an appropriate site is found, the Council should consider its objectives for a renewables project at an early stage to inform its choice of business model, alongside other factors such as the availability of finance and staff resources and the Council's attitude to risk.

Strengths, weaknesses, opportunities and threats (SWOT)

The SWOT analysis sets out the key features of the North Somerset area in relation to sustainable energy and then draws from these strengths and weakness to highlight the opportunities for sustainable energy across North Somerset. There are opportunities for each of the main sustainable energy sectors (energy efficiency, onshore electricity, microgeneration, renewable heat and offshore renewables) to achieve greater levels of deployment in the area with the right support. There are also opportunities for community energy groups to deliver projects and for economic development from the expansion of the sustainable energy supply chain.

Threats are listed in brief and discussed in more detail in the following section on potential changes to the renewables industry.

Potential changes to the renewables industry

Potential changes to the renewables industry to 2026 include:

- changes caused by a lack of long term political clarity, meaning that government policy could change direction
- expected and unexpected changes to the subsidy regime
- new expectations from government of community involvement and community ownership in renewable energy projects
- greater deployment of renewables affecting public perceptions, the capacity of the conventional grid and the roll out of smart grids.

Potential actions for the Council to consider to support the deployment of renewables

North Somerset Council can play a key role in facilitating the deployment of renewables and energy efficiency measures in its area. Potential actions discussed in detail are:

- Set a target and strategy to achieve that target
- Develop renewables on the Council's own estate
- Further examination of other technologies
- Energy efficiency support
- Low carbon development support
- Support for community energy
- Promoting opportunities to commercial organisations
- Supply chain development support.

Next steps

Section 10 sets out a range of potential actions for the Council to support sustainable energy, with the aim of maximising the benefits and minimising the impacts. The Council should consider these actions and prioritise them according to its own objectives.

Regen SW would like to work with North Somerset Council to support the sustainable energy industry in North Somerset. We could facilitate further discussion of the Council's potential actions. We are happy to discuss any of the issues raised in this report in detail or other issues that arise in future.

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1 Introduction

Regen SW was commissioned to produce this report in spring 2014 to inform the evidence base for North Somerset Council's approach to planning for renewables, renewables on its own estate and other potential actions that the Council could take to support the delivery of renewables in the area.

For the resource assessments, we have drawn on our GIS expertise, links with renewables developers and knowledge of national and local resource methodologies. The business model analysis has been developed using in-house knowledge of the development process, as well as through discussions with other local authorities and renewables developers. The SWOT analysis and potential actions for the Council have drawn on insights from Regen's sector experts, as well as discussions with industry stakeholders.

We recommend that the Council reviews the evidence and opportunities in this report and uses it to shape its future activity on renewables, including:

- informing potential business models for projects
- prioritisation of opportunities for development on its own estate
- the Council's approach to planning for renewables
- and potential support for the industry.

Regen SW is happy to provide further insights and support as appropriate.

2 Wind resource assessment

2.1 Method

Regen SW undertook a desktop based resource assessment for medium and large scale wind, using MapInfo GIS software. The resource assessment was carried out for three different scales of wind turbines: 2+ MW turbines, 1 MW turbines and 500 kW turbines. 2+ MW turbines and 1 MW turbines are large scale turbines and 500 kW turbines are medium scale. Hub height varies depending on the model of turbine. Average heights might be:

- 80 to 100m for 2 MW turbine
- 60 to 70m for 1 MW turbine
- 45 to 60m for 500 kW turbine

To find the area of unconstrained land with potential to host wind turbines in North Somerset, we applied the assumptions from the national resource assessment methodology commissioned by the Department for Energy and Climate Change in 2010. We followed this methodology for the assessment of large scale potential, with some additional considerations to take into account features of the North Somerset area. The assumptions were then adjusted for the medium scale assessments.

2.2 Assumptions

A number of assumptions were made for the three scales of turbines, which are primarily based on the SQWenergy methodology. The assumptions are set out below.

2.2.1 2+ MW scale resource assessment

Table 1: Assumptions for 2+ MW wind resource assessment

Assumption	Explanation
An exclusion area was applied to the following key features: • **Roads (Motorway, Primary, A & B): 150m = turbine topple height + 10 %** • **Railway: 150m = turbine topple height + 10 %** • **Airports: 5km (safeguarding mitigation)** • **Rivers: 50m**	For roads and railway: safeguarding against the unlikely event of a turbine falling over For airports: safeguarding from low flying traffic For rivers: avoiding blades extending over the waterway
The following types of historic area were removed: • **ancient semi-natural woodland** • **Registered Parks and Gardens**	Protecting the historic environment in line with national policy

Areas with the following environmental designations were excluded: • **SPAs** • **SACs** • **NNRs** • **SSSIs** • **Ramsars**	Protecting the natural environment
Areas with landscape designations were excluded: • **National Parks** • **Areas of Outstanding Natural Beauty**	Protecting designated landscapes
Green belt area excluded	National Planning Policy Framework paragraph 91 states "When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed." Only exceptional sites demonstrating "very special circumstances" would gain planning permission.
Wind speed below 6 m/s at 80m excluded	Minimum wind speed considered necessary for turbines to be economically viable
600m dwelling noise mitigation buffer	600m is an estimated distance to protect homes from noise from wind turbines. Specific sites could be closer than 600m to housing if the site conditions allow it – e.g. there are hills between the turbines and the homes. Additional analysis was carried out to remove miscellaneous buildings such as barns from the buffering and to add any houses that were missed using Google Earth.
Unavailable areas removed	With local knowledge of North Somerset, aided by North Somerset council, areas where wind turbine development is unavailable were removed, such as those where housing development is planned.
Unfeasible areas removed	Small areas of land that are, for example, inaccessible or on steep slopes were removed from the unconstrained area at the end of the process
Miscellaneous sites	The docks area has the potential for wind turbine development but is not picked up through the wider resource assessment. An estimate was made for the potential capacity of the area based on the specific site conditions. In addition, another site is very small and so a separate assessment of its capacity was made.

Installed capacity per km^2 - Benchmark figure 9 MW per km²	The national methodology assumes a figure of 9 MW per km² based on relatively widely spaced turbines

Other environmental and landscape constraints were considered; however, these were found to not affect North Somerset, so are not listed.

Additional potential manmade constraints were mapped, but it was decided that they would have no impact on the resource assessment as they are very site specific. These were:

- battlefields
- scheduled monuments
- listed buildings.

Whereas for the solar resource assessment a 1.5 km buffer to the electricity grid was presumed (see section 3), this was not applied for the wind assessment as wind projects are more financially viable and tend to be able to afford a lengthier connection distance to the grid.

2.2.2 1 MW scale wind resource assessment

For the 1 MW scale resource assessment, the 2 MW resource constraints were applied as above with the following constraints adjusted (Table 2).

Table 2: Assumptions for 1 MW wind resource assessment

Assumption	Explanation
Wind speed below 6 m/s at 45m excluded	45m is approximately the hub height of a 1 MW turbine and 6 m/s the wind speed at which developments become economically feasible
500m dwelling noise mitigation buffer	500m was considered to be appropriate noise mitigation buffering for this smaller scale of wind turbine
Unfeasible areas removed	As above. In addition, areas that were more than 1.5 km from a substation, 33 kV or 132 kV electricity line were removed, as the cost of connection to the grid at a greater distance than this becomes unviable at this scale of turbine.
100m main road and railway buffer	Approximate turbine topple height plus 10 percent. Adjusted from 150m for 2 MW+ turbines
Installed capacity per km^2 - Benchmark figure 8 MW per km²	Modelling of the space requirements of 1 MW turbines produced an estimate of 8 MW per km².

2.2.3 500 kW scale wind resource assessment

For the 500 kW scale resource assessment, the 2 MW resource constraints were applied as above with the constraints in Table 3 adjusted.

Table 3: Assumptions for 500 kW wind resource assessment

Assumption	Explanation
Wind speed below 6 m/s at 45m excluded	500 kW turbine hub heights vary greatly, so this was considered an appropriate assumption on the basis that wind speeds below 6 m/s would not be economically viable
400m dwelling noise mitigation buffer	400m was considered to be appropriate noise mitigation buffering for this scale of wind turbine
Unfeasible areas removed	As above. In addition, areas that were more than 1.5 km from a substation, 33 kV or 132 kV electricity line were removed as the cost of connection to the grid at a greater distance than this becomes unviable at this scale of turbine.
100m road and railway buffer	Given 500 kW hub heights vary greatly, approximate turbine topple height plus 10 percent. Adjusted from 150m for 2 MW+ turbines
Installed capacity per km^2 – one turbine per area identified	It is unrealistic on a large scale to have a wind farm of 500 kW turbines; higher capacity turbines are more likely to be used. 500 kW turbines are more appropriate for small sites with one or possibly two turbines.

2.3 Landscape consideration

Cumulative and landscape impact can only truly be assessed on a site by site basis and both are key factors in the assessment of a planning application. Cumulative and landscape impact are not usually considered in a resource assessment; however, they are important considerations for the deployment of wind turbines in any area.

2.3.1 Cornish resource assessment

For the purposes of this resource assessment, assumptions on cumulative and landscape impacts are based on work undertaken by Cornwall Council on this issue (Cornwall Council's Renewable Energy Resource Potential - March 2013)[1].

The Cornish resource assessment drew on a Landscape Character Assessment for Cornwall, which sets out the specific features of each type of landscape within Cornwall. The Assessment then set out a landscape strategy for wind for each of Cornwall's 40 Landscape Character Areas (LCAs) based on the sensitivity of the LCA. The following four landscape strategy types were developed for Cornwall as part of the assessment:

- Wind farm landscapes
- Landscapes with wind energy development
- Landscapes with occasional wind energy development
- Landscapes without wind energy development.

One of the four strategy types was applied to each of Cornwall's LCAs to reflect the level of sensitivity of the landscape at each area. The study found that there were no 'wind farm landscapes' in Cornwall. Within Cornwall 'landscapes without wind energy development' generally consist of moor land and those areas designated as Areas of Outstanding Natural Beauty, or Heritage Coast.

A density factor was applied to each landscape strategy type to represent the spread of turbines across the LCA (e.g. landscapes with wind energy development would be 80%, those with occasional wind energy development would be 50%). The more the landscape is disposed to accommodating wind turbines, the higher the density factor that is applied.

On top of this, for each LCA the appropriate scale of wind development was then determined, ranging from very small to large. A further density factor was then applied to reflect the size of the clusters considered appropriate for each LCA. The density factors are set out in Table 4 below.

[1] Technical Paper E2: An Assessment of the Renewable Energy Resource Potential in Cornwall, Cornwall Council, (March 2013) http://www.cornwall.gov.uk/media/3626590/E2-Renwable-Energy-Resource-Potential-_March-2013_.pdf

Table 4: Cornish Resource Assessment wind cumulative impact assumptions

Landscape strategy type	Density factor (%)	Cluster size	Density factor (%)
Landscape with turbines	80	Single turbines	20
		Small clusters	40
		Medium clusters	60
		Large clusters	80
		Very large clusters	100
Landscape with occasional turbines	50	Single turbines	20
		Small clusters	40
		Medium clusters	60
		Large clusters	80
		Very large clusters	100

2.3.2 Applying the Cornish landscape work to North Somerset

The character of North Somerset's landscapes has been assessed in the North Somerset Landscape Character Assessment (2005)[2]. However, the potential impact of wind on these areas has not been identified. In order to apply more accurate landscape impact assumptions, a Landscape Character Area assessment for wind could be carried out for North Somerset. This would identify the suitability of each of North Somerset's Landscape Character Areas for hosting wind turbines based on the potential impact of the turbines on each individual type of landscape.

In the absence of a Landscape Character Area assessment for wind for North Somerset, we have drawn assumptions from the Cornwall Resource Assessment. For each area identified as most suitable for large turbines in this assessment, a "landscape with turbines" assumption was used and we assumed the cluster size was "large clusters".

The landscape strategy, "landscape with turbines", has been applied for all the areas with potential for large scale wind, but has not been applied as an assumption for the whole of North Somerset. The assumptions of a "landscape with turbines" and "large clusters" were applied only for those areas that were left once all the constraints for large turbines had already been applied. These assumptions are appropriate when applied to those areas deemed to have potential for large wind through this large scale wind resource assessment.

[2] https://www.n-somerset.gov.uk/Environment/Planning_policy_and-research/Documents/Supplementary%20planning%20documents/North%20Somerset%20landscape%20character%20assessment%20supplementary%20planning%20document%20(pdf).pdf

2.4 Limitations of this method

The method employed in this resource assessment is not a site finding method. Instead, it is about trying to estimate the potential for wind turbines across the North Somerset area. In order to estimate the potential, locations were identified that might be suitable for turbines using coarse criteria applied uniformly across the area. There is no guarantee that more detailed site searches will bring forward sites in these locations.

Sites might also exist outside of these areas as specific site conditions may allow for constraints to be relaxed. For example, 2 MW turbines could be located closer than 600m to homes if topography means that noise will not be an issue at that distance. The turbines due to be built by Smartsystems in Yatton do not fall within one of the locations identified within this resource assessment – probably as they are located closer to housing than the buffer used in the resource assessment allows.

The results can be used to understand the potential for turbines in North Somerset and to draw from this an understanding of the contribution that onshore wind can make to renewable energy generation in North Somerset. The results are used to set out a reasonable maximum potential – there is no implication that the total number of turbines will be developed in the area. The number of turbines that come forward will be determined by wind developers, landowners and communities proposing projects.

2.5 Results

The table below shows the results of the resource assessment for 1 MW turbines and turbines 2 MW and over. The total area is the area of all potential sites, with the resulting installed capacity. Also demonstrated is the number of turbines that this installed capacity relates to. The 1 MW and 2 MW figures are not cumulative; we have assumed either all the turbines in those areas would be 1 MW turbines or all would be 2 MW turbines. In reality, a mixture of scales could be deployed.

Table 5: Results of 1 and 2 MW wind resource assessment

Size of turbine	Total unconstrained area	Total unconstrained area with landscape consideration	Installed capacity per km²	Installed capacity for unconstrained area with landscape consideration	Number of turbines
	km²	km²	MW/ km²	MW	
1 MW	10.86	6.95	8.0	55.6	56
2+ MW	10.54	6.75	9.0	60.7	25-30

The table below outlines how many small additional individual areas of land there are suitable for a 500 kW turbine. It is assumed that one 500 kW turbine could be sited on each.

Table 6: Results of additional 500 kW wind resource assessment

Size of turbine	Number of additional areas of land	Number of turbines in each area	Installed capacity
			MW
500 kW	11	1	5.5

2.6 Energy and carbon saving results for wind assessment

Table 7 sets out the energy that each scale of turbine could generate if the maximum number of turbines were deployed, with the resulting carbon savings estimated and the equivalent number of households' electricity use that could be generated. The 1 MW and 2 MW figures are not cumulative; we have assumed either all the turbines in those areas would be 1 MW turbines or all would be 2 MW turbines. In reality, a mixture of scales could be deployed. The 500 kW resource is for additional areas not suitable for larger turbines so can be added to either the 1 or 2 MW resource.

Table 7: Annual energy generation and carbon savings potential from potential wind resource

Size of turbine	Maximum potential installed capacity	Annual energy generation	Annual CO_2 saving	Number of households' electricity use
	MW	MWh	tonnes	homes
1 MW	55.6	136,384	68,192	32,951
2+ MW	60.7	148,910	74,455	35,977
500 kW	5.5	13,490	6,745	3,259

Variables		
Capacity factor	28	percent
Carbon dioxide produced per unit of grid electricity consumed (kg CO_2 /kWh)	0.5	kg
N Somerset average annual household electricity demand (2012 DECC)	4,139	kWh

2.7 Areas identified with greatest potential to accommodate large scale wind

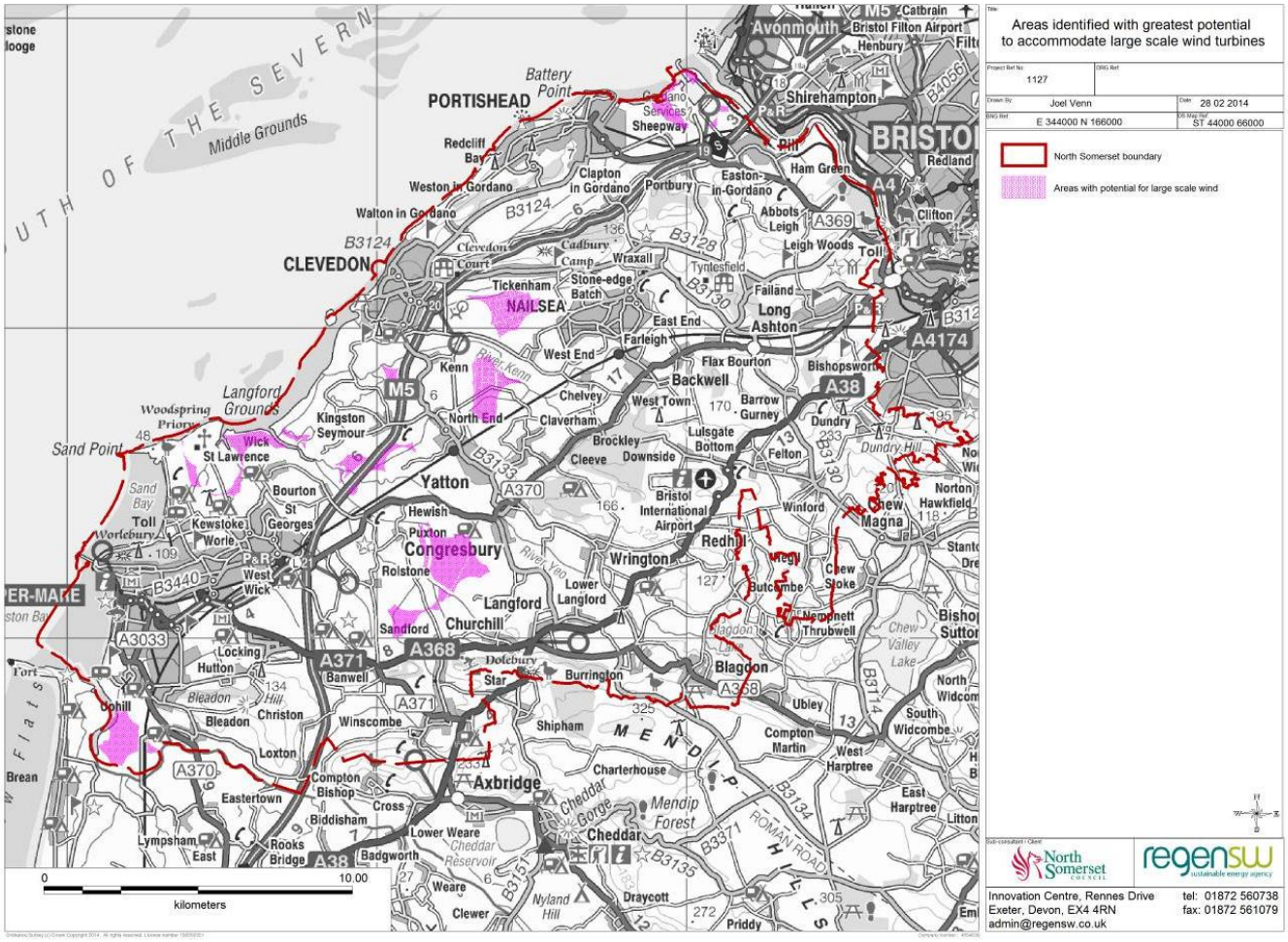
Seven locations were identified as those with the greatest potential to accommodate 1 or 2+ MW turbines, plus an additional 11 areas with potential for 500 kW turbines. These areas are mapped in Figure 1 to Figure 8 below. The electricity grid is also shown as, whilst proximity to the network is not a constraint applied in this resource assessment, it is an important factor to consider in siting projects. The areas identified are those that are left once all the constraints listed in section 2.2 have been applied.

These areas are not definitive: due to the relatively coarse nature of a resource assessment, some sites with potential may come forward outside of the areas and wind development in the areas themselves will depend

on wind developers, landowners or communities identifying potential projects following more detailed site specific analysis.

The features of the seven large scale locations are set out below in pink. These locations have been mapped on a GIS layer that has been transferred to the Council's GIS.

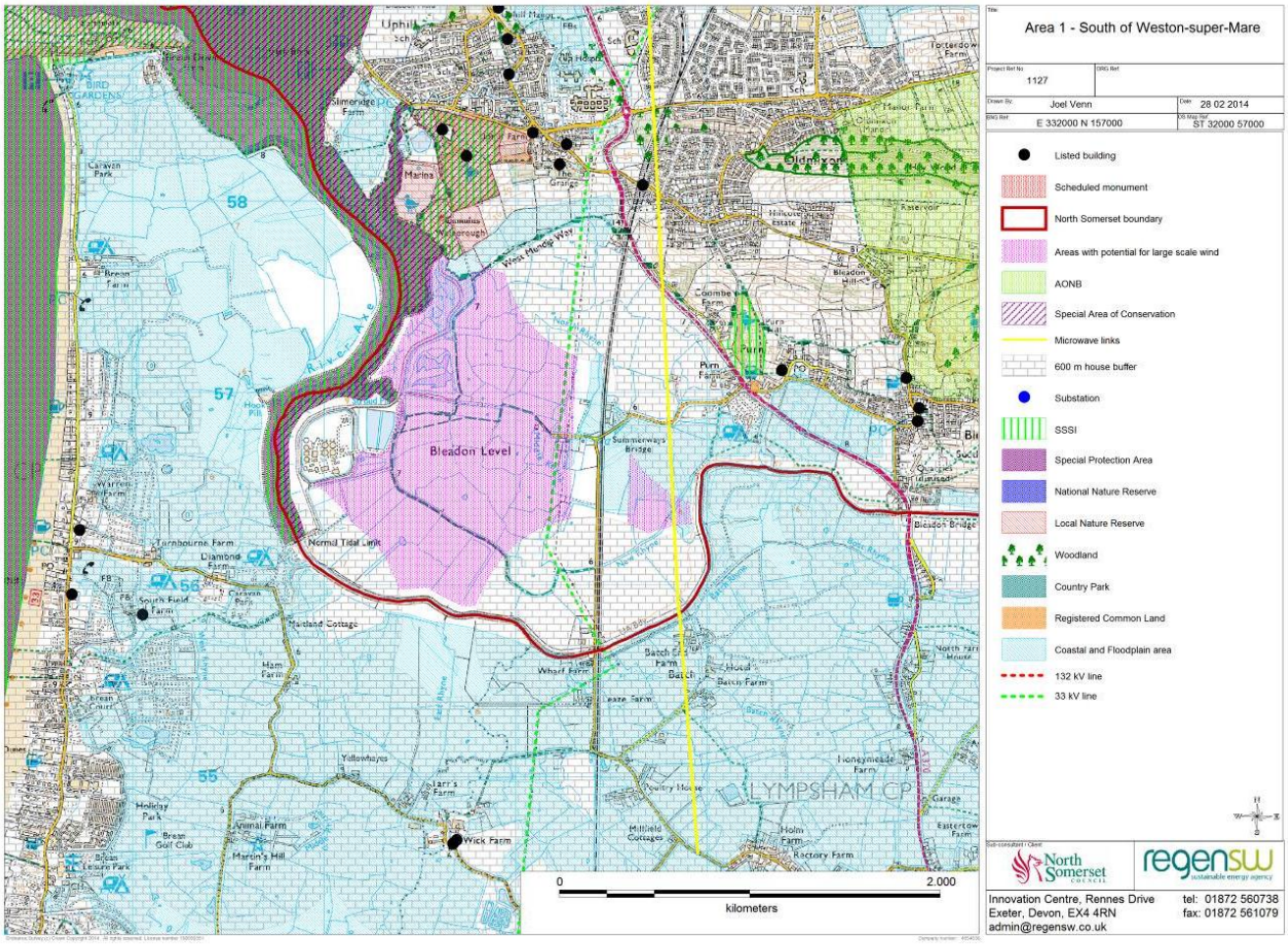
Figure 1: Areas identified with greatest potential to accommodate large scale wind turbines



Each of the identified areas are set out in more detail below.

2.7.1 Area 1 – South of Weston-super-Mare

Figure 2: Area 1 – South of Weston-super-Mare



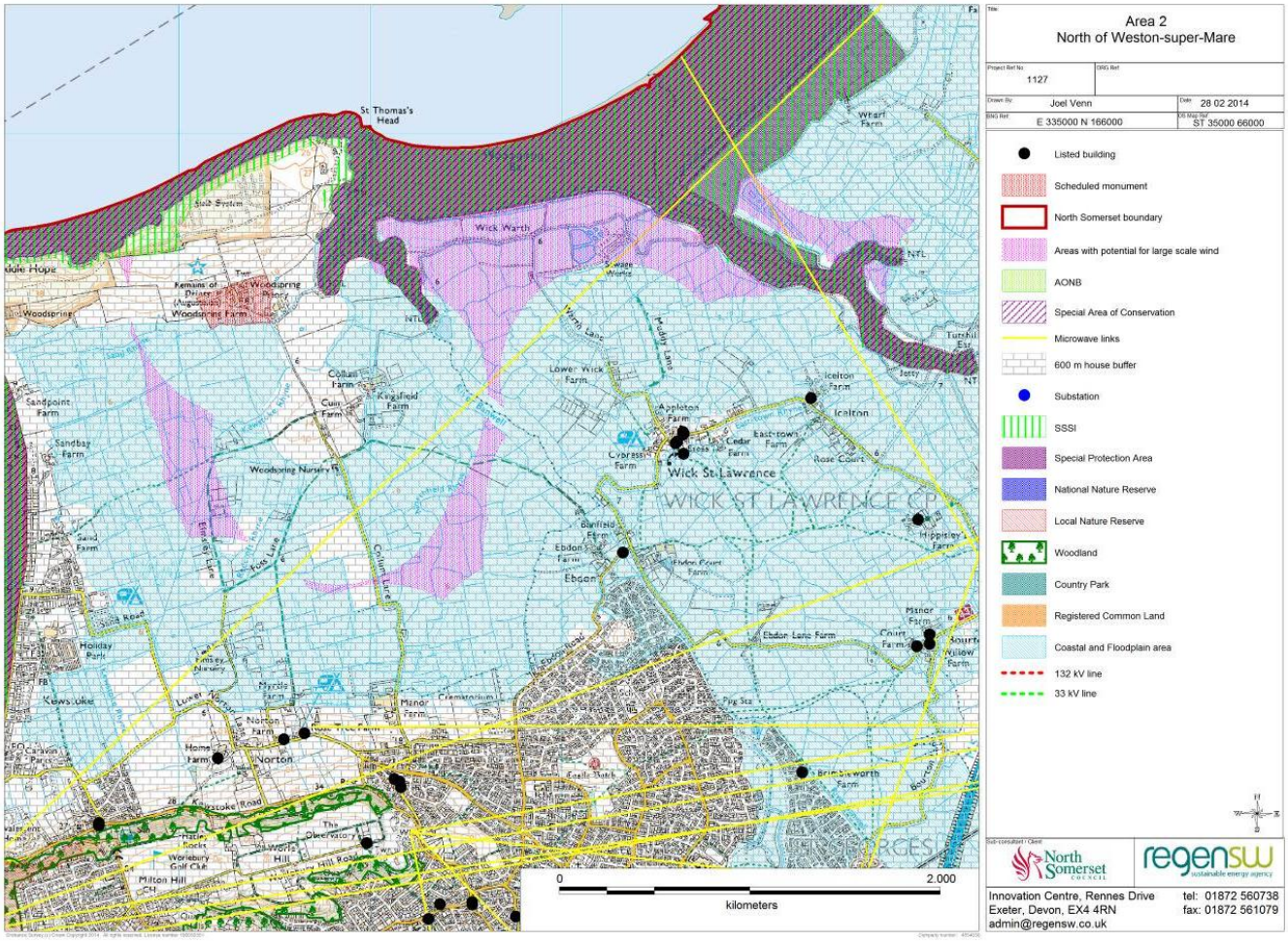
Factors that would require further investigation:

- Several opportunities for turbine access during construction
- Bridleways run through the area and the West Mendip Way runs next to it
- Location is surrounded by several environmental protections:
    - Local nature reserves
    - Special Areas of Conservation
    - SSSI
- Location is ½ km from several listed buildings
- Appear to be only minor potential microwave link issues
- Visual impact could be significant to surrounding area given flat topography, particularly to south and east
- Scheduled monuments nearby

- On floodplain
- 33 kV line runs through the location allowing good grid connection potential.

2.7.2 Area 2 – North of Weston-super-Mare

Figure 3: Area 2 – North of Weston-super-Mare



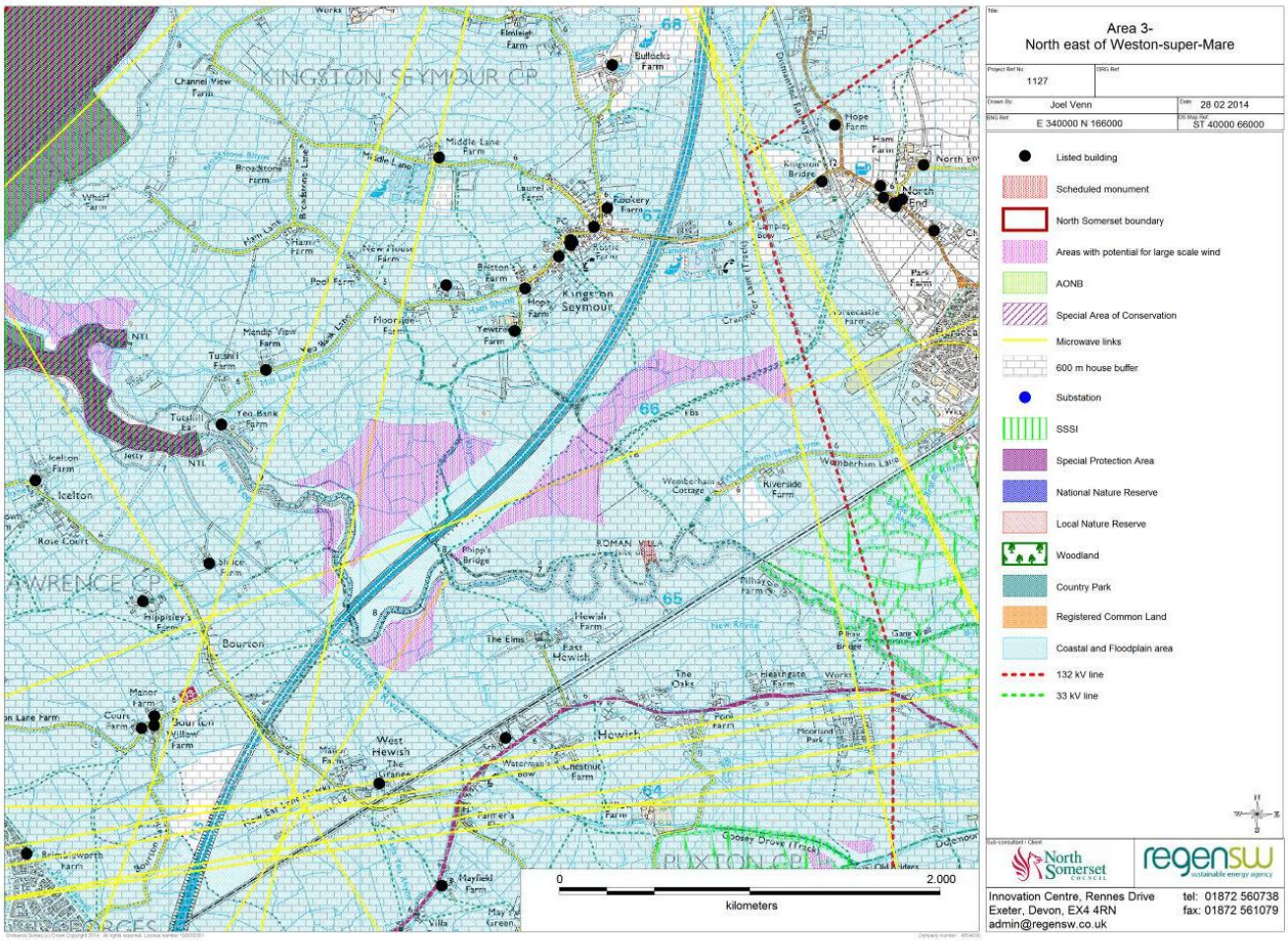
Factors that would require further investigation:

- Potentially difficult access for large turbines during construction
- Bridleways run near the location
- Close to several environmental protections
    - Woodspring Priory
    - Scheduled monuments
    - SSSI and Special Area of Conservation
- Several listed buildings nearby
- Possible microwave link runs through the location

- Location is spread over several small areas, making positioning of turbines difficult
- Significant visual impacts likely due to proximity to Weston-super-Mare
- Major issue for this location is grid connection. There is no immediately feasible connection within 3-4 km, possibly making development uneconomical
- On floodplain.

2.7.3 Area 3 – North east of Weston-super-Mare

Figure 4: Area 3 – North east of Weston-super-Mare



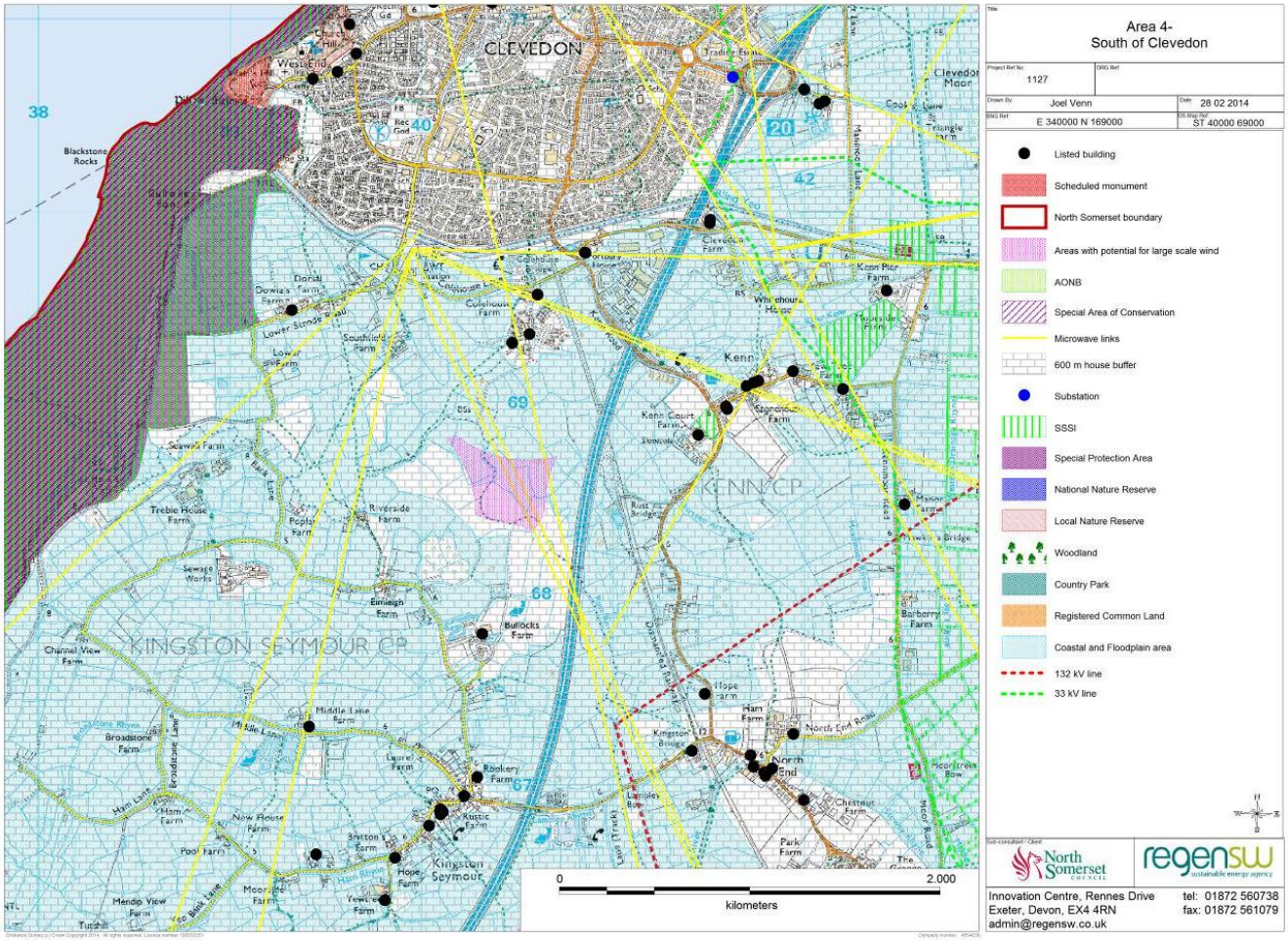
Factors that would require further investigation:

- Access issues for turbines during construction to parts of the location
- Near a scheduled monument
- Near environmental designations, although none appear significant
- Potentially microwave links running across the location
- Numerous listed buildings within a km
- Significant visual impacts likely given flat topography

- Grid connection issues to part of the location
- On floodplain.

2.7.4 Area 4 – South of Clevedon

Figure 5: Area 4 – South of Clevedon

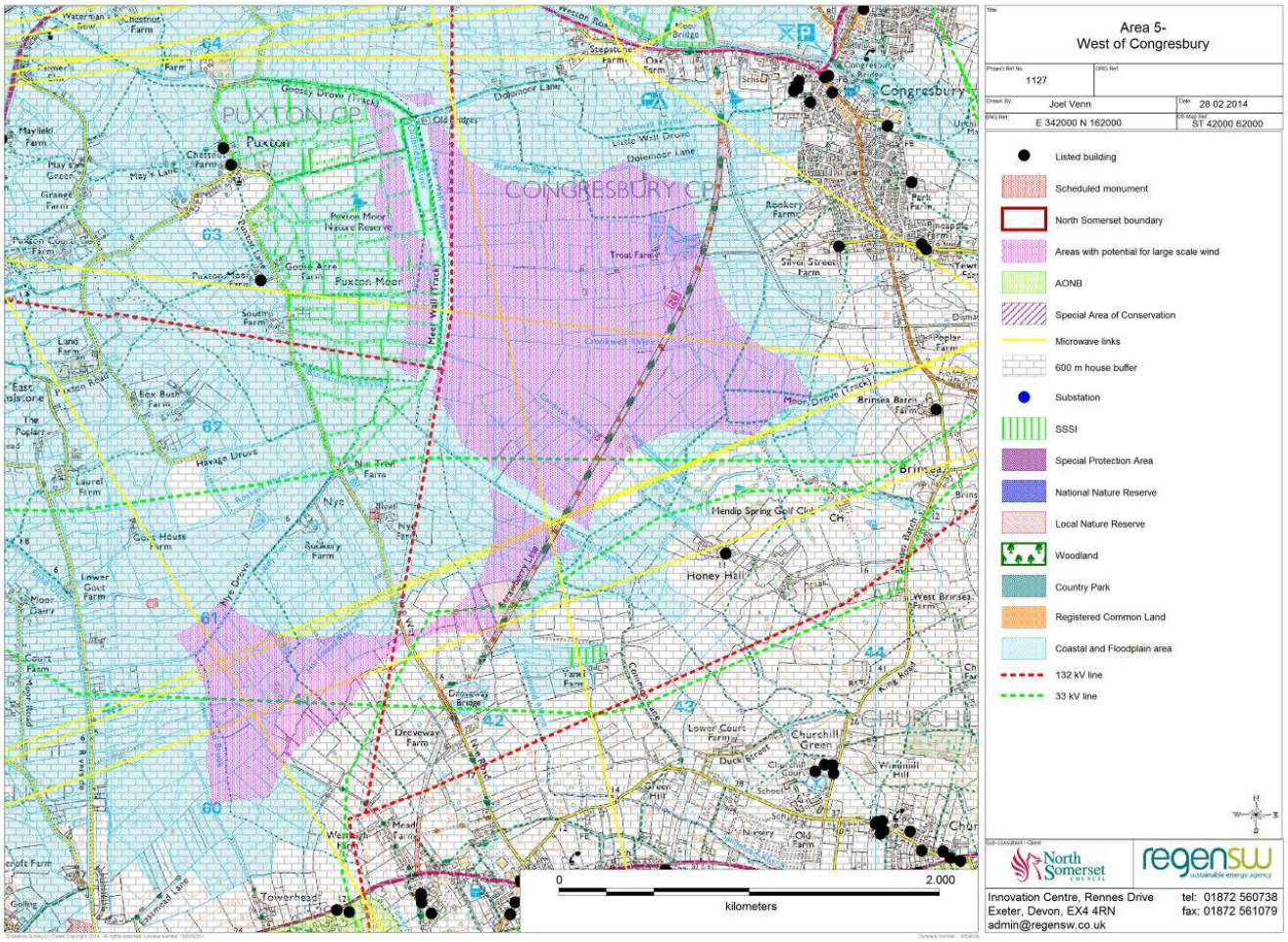


Factors that would require further investigation:

- Very small location, only suitable for a maximum of two large turbines
- Grid connection must be made over a motorway which could be a problem
- Potentially microwave links intersecting the area with a transmission station 1 km away
- Various listed buildings nearby
- Visual impacts potentially significant
- No major environmental designations nearby
- Potentially difficult access during construction phase
- Near floodplain.

2.7.5 Area 5 – West of Congresbury

Figure 6: Area 5 – West of Congresbury



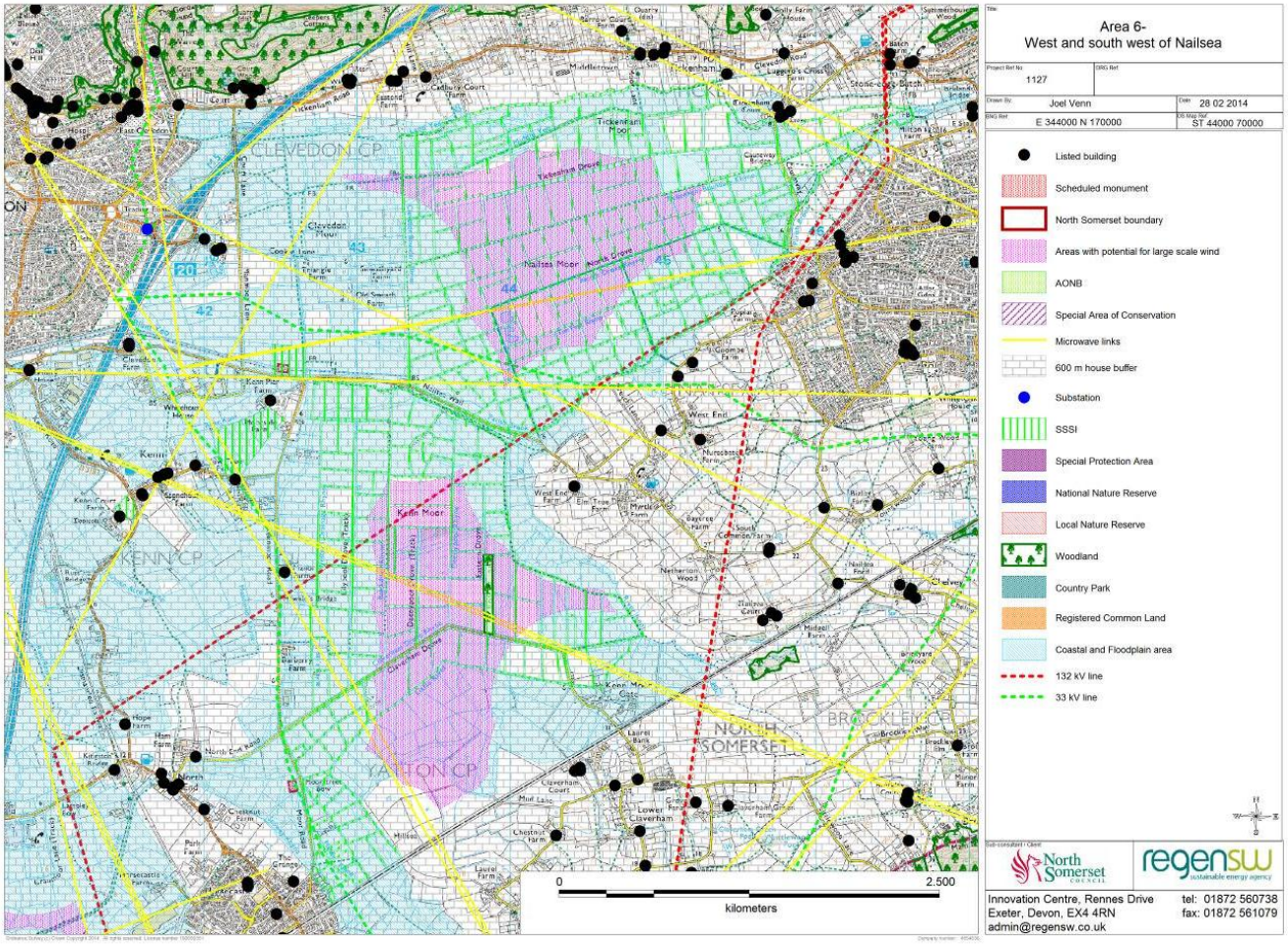
Factors that would require further investigation:

- Large area but with several possible major constraints
- Numerous possible microwave links across the location
- Location is next to various environmental designations:
    - SSSIs
    - Puxton Moor Nature Reserve
    - Local Nature reserve - Strawberry Line intersects the location
- On floodplain
- Bridleway on and near the location
- Visual impacts likely given flat topography
- Grid connection potentially good all over the location
- Access to some parts of the location may be difficult

- Scheduled monuments 200m – 600m from area
- Various listed buildings nearby.

2.7.6 Area 6 – West and south west of Nailsea

Figure 7: Area 6 – West and south west of Nailsea

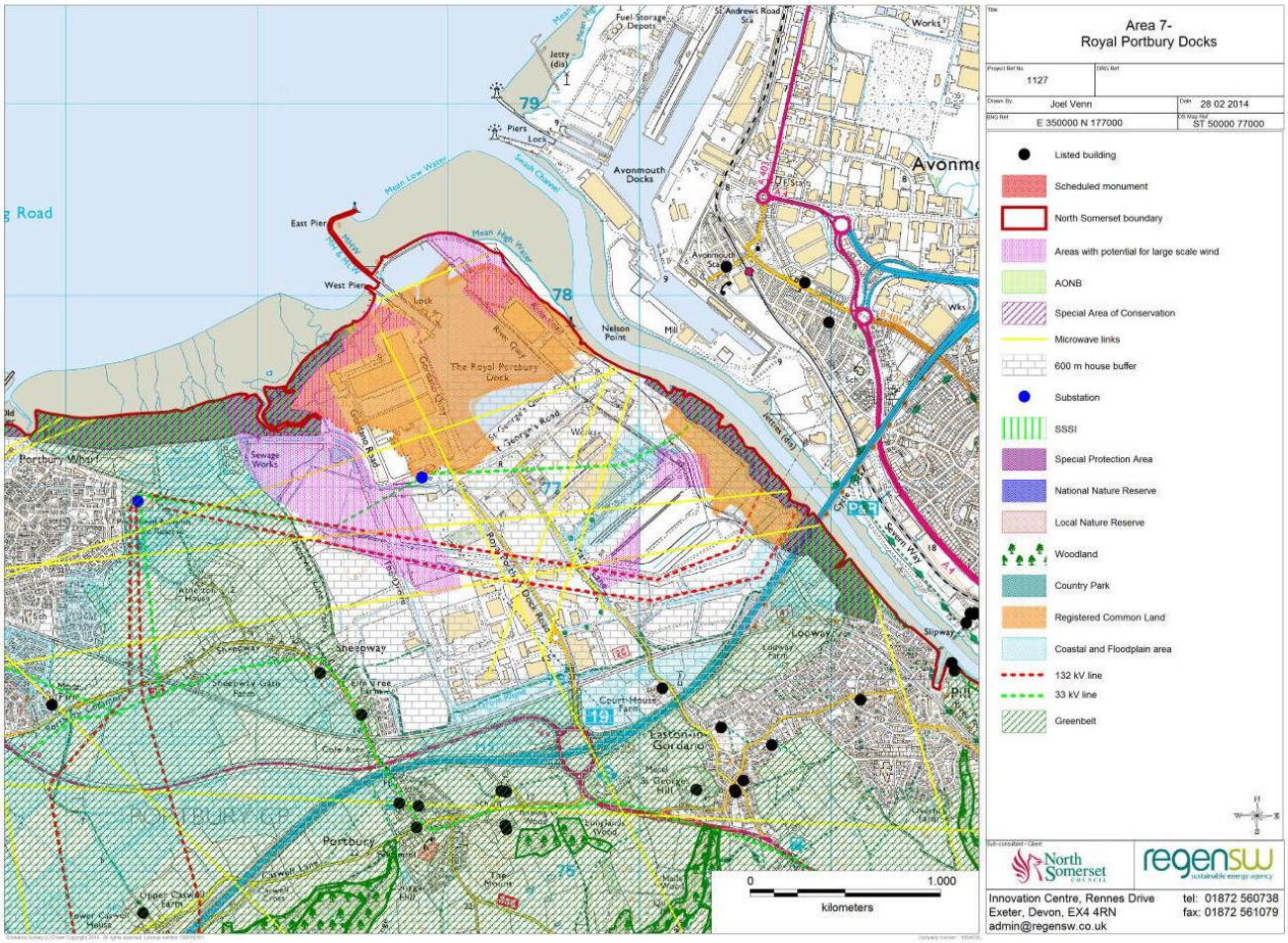


Factors that would require further investigation:

- Large location in two distinct areas
- Location has streams and ditches designated as SSSIs running all across it
- On a floodplain
- Potential microwave links intersect the area
- Listed buildings 600m away in numerous locations
- Grid connection potential looks good
- Hill fort located 1.3 km away may incur some visual impacts.

2.7.7 Area 7 – Royal Portbury Docks

Figure 8: Area 7 – Royal Portbury Docks



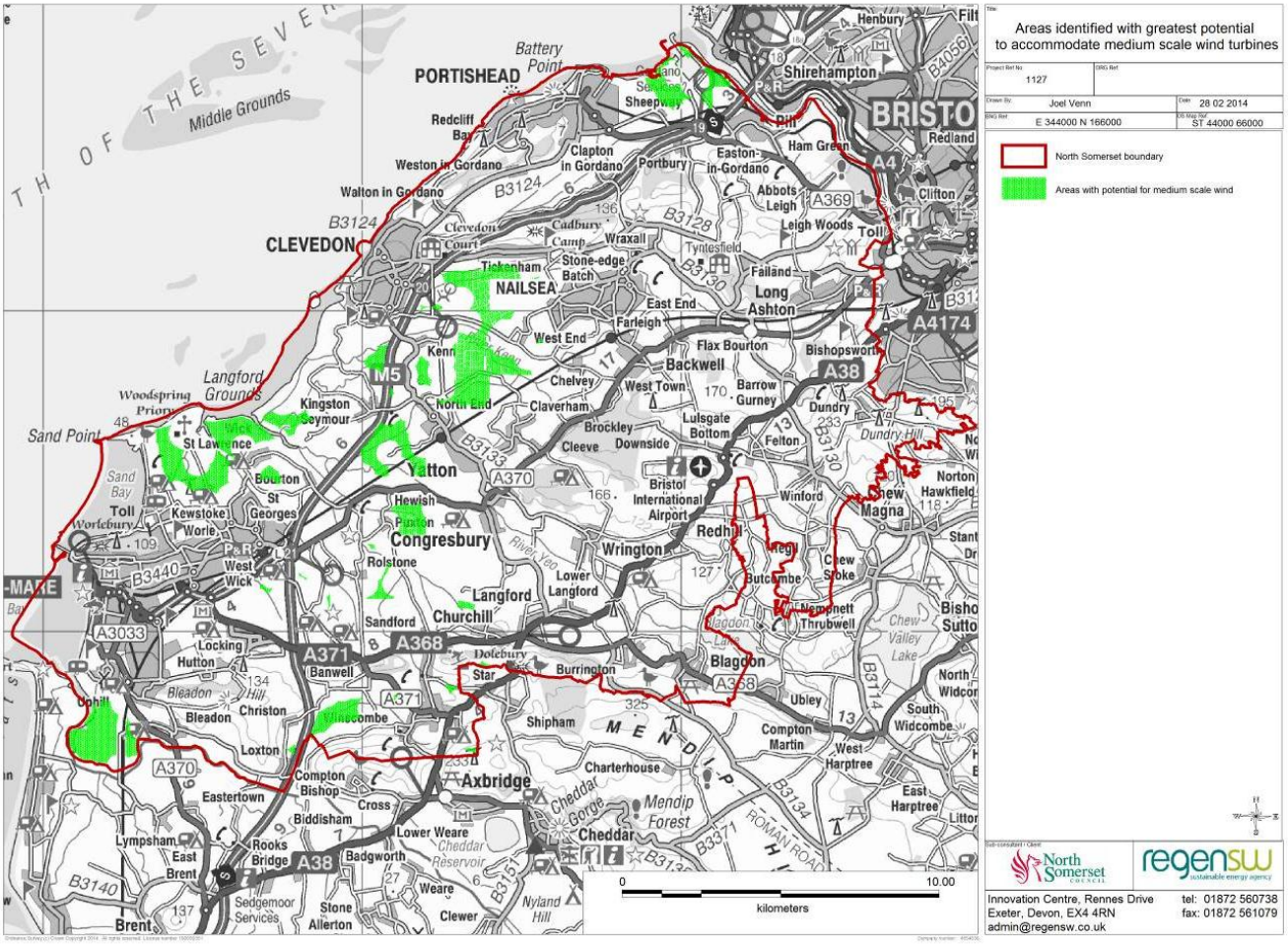
Factors that would require further investigation:

- Excellent potential for grid connection as there is a substation on the docks
- Local environmental designations in close proximity
- Wind turbines in very similar situation on the other side of the River Avon (Bristol Port Company, Wessex Water and Bristol City Council turbines)
- Turbines could potentially affect airflow to turbines on Avonmouth Docks
- Potentially space for two large scale turbines
- Microwave links intersect potential turbine locations
- Only major land designation is Registered Common Land which covers a large proportion of the site.

2.8 500 kW map

The map below shows areas that have been identified with the greatest potential for medium scale (500 kW) wind turbine developments. It highlights how smaller parcels of land begin to appear largely due to the smaller noise constraint distance associated with smaller turbines.

Figure 9: Areas identified with greatest potential to accommodate medium scale wind turbines



2.9 Next steps

This resource assessment is useful to inform debate on the potential for wind in North Somerset. It demonstrates that locations with potential for medium or large scale wind are relatively limited and applications that are submitted should be viewed in this context. Planning officers working on policy or assessing wind applications should have access to the maps to inform their thinking, although planning applications will not necessarily be located within the areas identified.

The maximum resource potential is used in the analysis in section 5.2 to understand whether North Somerset has sufficient resources to meet a local renewable target.

The mapped areas are also useful to prompt landowners and communities to think about whether there are opportunities for wind on their land or in their area. Increasing numbers of community-led wind projects are being developed across the UK and the information in these maps could inspire local communities to look in more detail for opportunities in their area. The Council could actively promote the results to landowners and communities for this purpose.

The results of this assessment could also be refined through consultation with wind developers who would swiftly be able to evaluate the potential for sites at these locations, by applying their own site finding processes. This would provide the Council with an even more informed assessment of the potential for large scale wind in the area. Regen SW would be happy to facilitate this discussion with developers.

3 Large scale solar resource assessment

3.1 Constraints applied

We assumed that large scale in the context of solar meant schemes over 250 kW in scale, in line with the Feed-in Tariff bandings, and that due to the space required for projects of this size these would be ground-mounted rather than building-mounted.

The potential large scale solar resource in North Somerset was assessed by mapping a number of constraints to identify areas with potential for solar parks. These constraints are listed in Table 8 and were compiled through discussions with solar developers at Regen's Solar Developers' Forum in March 2014.

Table 8: Constraints for solar assessment

Assumption	Explanation
Only areas within 1.5 km from the 33 kV and 132 kV electricity grid lines included	Proximity to the grid reduces the cost of grid connection. High grid connection costs tend to make solar projects economically unviable.
50m buffer to houses applied	To allow for the space taken by gardens and access roads and to reduce immediate visual impact
AONB and environmental designations removed	Solar projects can and have been built within both designated landscapes and environmental designations. For the purpose of this resource assessment, these areas have been removed as the majority of these areas would not normally be suitable.
Green Belt removed	National Planning Policy Framework paragraph 91 states "When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed." Only exceptional sites demonstrating "very special circumstances" would gain planning permission.
Agricultural land grades 1 and 2 excluded	Grades 1 and 2 are the best and most versatile for food production.
Urban and other developed land (housing and industrial areas) removed	Unlikely to be space for ground-mounted solar.
Flood zone 3 areas removed.	Those areas with greatest potential for flooding are unlikely to be suitable for solar development as it is low to the ground.

Land that was known by the Council to be unavailable removed e.g. areas already allocated for developments	Unlikely to be space for ground-mounted solar.
Unfeasible land such as very steep slopes was removed	Solar farms are most suitable where topography is relatively flat to minimise visual impact and access issues.

3.2 Results

If areas within the Green Belt and AONB are included in the analysis, 57.81 km^2 of area with potential for solar parks would be available. Figure 10 shows the extent of the potential area available if the Green Belt and AONB are included. The areas identified are those that are left as unconstrained once all the constraints listed in section 3.1 have been applied (except Green Belt and AONB). Solar parks can and have been approved and built in both AONBs and Green Belt areas in the south west and across the UK. However, these areas are excluded from the analysis in the next step as sites in these areas tend to be the exception. It is useful to include Figure 10 to show just how much potential solar resource lies within either the Green Belt or the AONB.

Figure 10: Area with potential for solar parks if Green Belt and AONB included

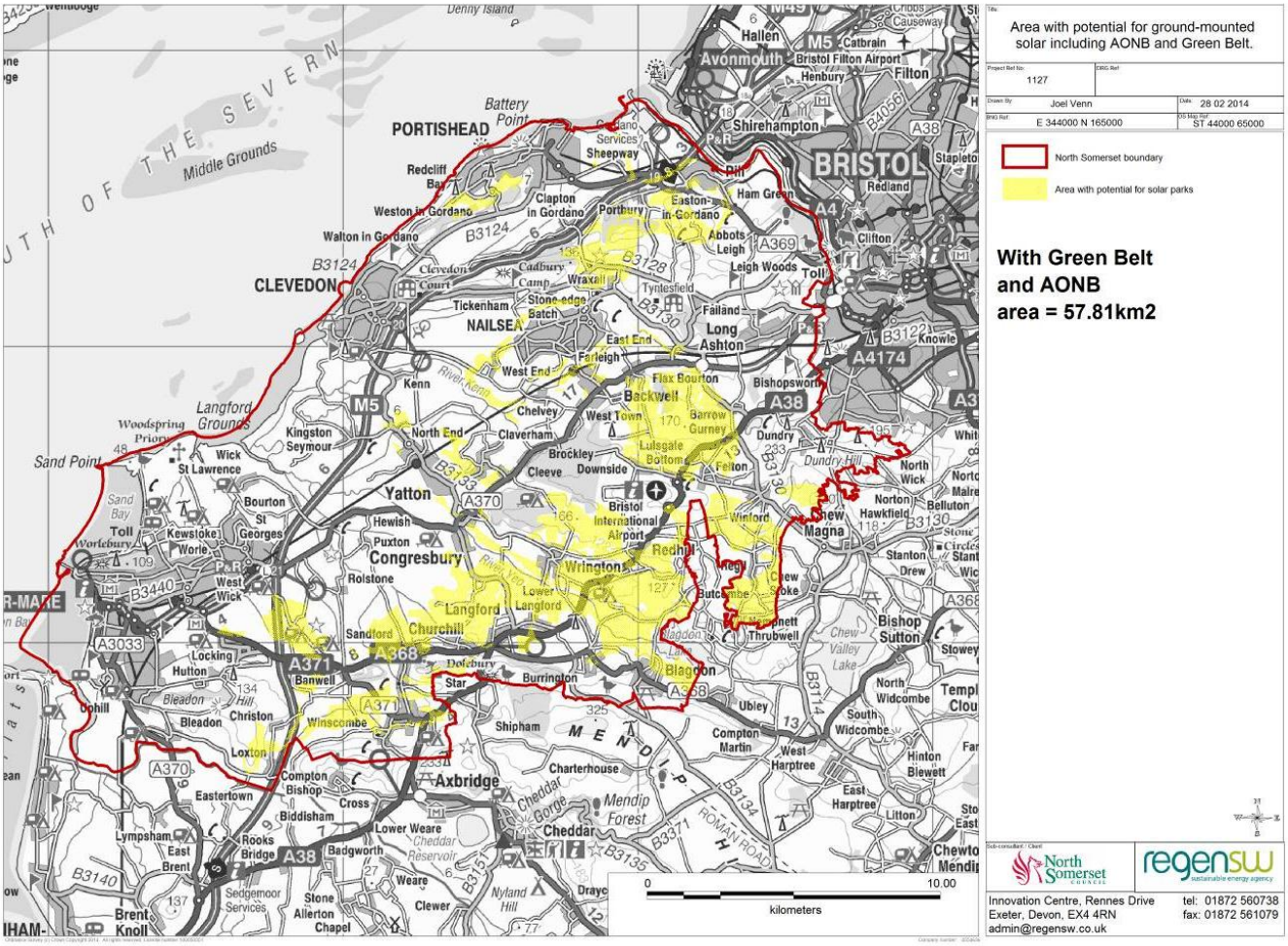
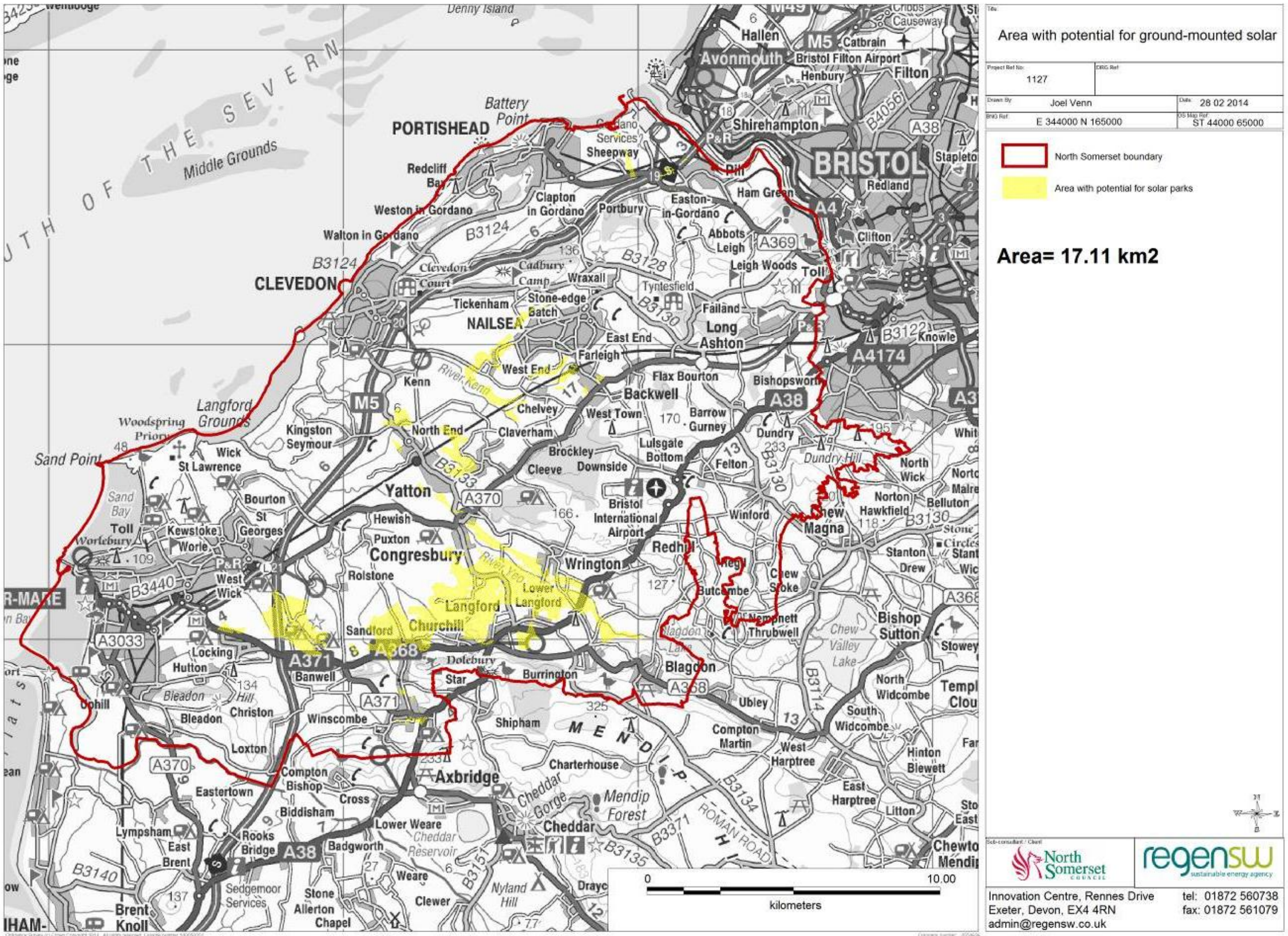


Figure 11 shows the unconstrained area once the Green Belt and AONB are excluded, with the area totalling 17.11 km².

The areas identified are not definitive: due to the relatively coarse nature of a resource assessment, some sites with potential may come forward outside of the areas and solar development in the areas themselves will depend on solar developers, landowners or communities identifying potential projects following more detailed site specific analysis.

Figure 11: Areas with potential for solar parks



3.2.1 Orientation assumption and landscape strategy density factor

An orientation assumption was applied to the unconstrained area. We assumed that 40 percent of the area with potential for solar would be orientated in a south east to south west area. This assumption is higher than the 25 percent that might readily be expected as it takes into account the relatively flat topography of North Somerset that means solar parks could be located on gentle slopes that face in a northerly direction. Applying this orientation assumption gave a total remaining area of 6.84 km^2.

A landscape strategy density factor was then applied to take into account cumulative impact considerations. As with wind, cumulative impact can only truly be considered on a case by case basis.

For the purposes of estimating the potential maximum ground-mounted solar for this assessment, we have drawn on the Cornish resource assessment - *Technical Paper E2: An Assessment of the Renewable Energy Resource Potential in Cornwall* produced by Cornwall Council in 2013[3].

The Cornish resource assessment assumed areas were either "landscapes with occasional PV development" or "landscapes without solar PV development (except occasionally)." In assessing the cumulative impact, the Cornish assessment assumed that landscapes with occasional PV developments had a density factor of 25 percent.

For North Somerset, the unconstrained area is already small, due in particular to a large proportion of North Somerset being Green Belt area. Consequently, in order to calculate the maximum possible resource, relatively favourable conditions were assumed in the limited unconstrained area. We chose a density factor of 35 percent, assuming the density would be slightly higher than landscapes with "occasional PV developments".

The result of applying this landscape strategy density factor is a final unconstrained land area of 2.4 km², equivalent to 592 acres and 0.64 percent of North Somerset total area. This is considered a reasonable percentage given the Cornish resource assessment calculates 0.59 percent of Cornwall has potential for ground-mounted solar.

An installed capacity density factor of approximately 0.13 MW per acre was assumed based on discussions with the solar industry specialists at Regen's Solar Developers' Forum. This equates to one MW requiring 7.5 acres of land.

Based on the method applied, a total potential resource for ground-mounted solar in North Somerset was estimated as 76.95 MW. This is equivalent to 10 to 20 typical solar parks of varying sizes or 15 to 16 solar parks that are 5 MW. This installed capacity would generate approximately 67 GWh annually, or power for 16,285 homes. If all of this potential were to be installed, it would cover approximately 0.64% of the total area of North Somerset with ground-mounted solar.

Table 9: Results of ground-mounted solar resource assessment

Unconstrained area	With orientation consideration	With Landscape Strategy applied	With Landscape Strategy applied	Percentage of North Somerset	Final potential capacity
km²	**km²**	**km²**	**Acre**	**%**	**MW**
17.11	6.84	2.40	592	0.64	76.95

[3] http://www.cornwall.gov.uk/media/3626590/E2-Renwable-Energy-Resource-Potential-_March-2013_.pdf

3.3 Next steps

This resource assessment is useful to understand, and inform debate on, the potential for ground-mounted solar in North Somerset. It demonstrates that there are significant areas of land with potential for solar that have not yet been developed.

The maximum resource potential is used in the analysis in section 5.2 to understand whether North Somerset has sufficient resources to meet a local renewable energy target.

The mapped areas are also useful to prompt landowners and communities to think about whether there are opportunities for solar on their land or in their area. Increasing numbers of community-led energy projects are being developed across the UK and the information in these maps could inspire local communities to look in more detail for opportunities in their area. The Council could actively promote the results to landowners and communities for this purpose. Other sites may still come forward outside these areas.

The results of this assessment could also be refined through consultation with solar developers who would swiftly be able to evaluate the potential for sites at these locations, by evaluating the areas with potential against their own site finding criteria. This would offer the Council a more accurate picture of the potential for solar in the area, which could be used to better understand the potential for a local target and to underpin discussions with landowners and communities. Regen SW would be happy to facilitate this discussion with solar developers.

The Council could consider introducing a Local Development Order (LDO) to grant permitted development rights for solar arrays in certain areas; this would mean solar arrays in those areas would not need to apply for planning permission. The areas identified within this study as having potential could be used as the evidence base for developing an LDO. Swindon Borough Council is currently preparing to trial this approach. Regen SW can keep the Council informed of Swindon's progress.

4 Building-mounted solar resource assessment

4.1 Method

The building-mounted solar resource assessment for North Somerset is taken from the regional assessment undertaken in 2010 by AEA for Regen SW, following the national methodology set out by SQWEnergy for DECC.

The following assumptions were used:

- 25% of existing homes could host a 2 kW PV system (or a 2 kW solar thermal installation)
- 50% of new homes could host a 2 kW PV system (or a 2 kW solar thermal installation)
- 40% of commercial buildings could host a 5 kW PV system (or a 5 kW solar thermal installation)
- 80% of industrial buildings could host a 10 kW PV system
- A load factor of 10% was used to estimate the generation potential.

4.2 Results

Table 10 sets out the results of the building-mounted solar resource assessment. It should be noted that this is based only on assumptions about the proportion of buildings that could host solar and is not a detailed geographically specific assessment. For this level of deployment to be achieved, there needs to be ongoing financial support for solar as well as additional support to drive demand in the area.

Table 10: Results of building-mounted solar resource assessment

	Total	Annual generation	Number of homes electricity use equivalent
	MW	GWh	
Domestic	62.2	54.5	17,035
Commercial	7.2	6.3	1,960
Industrial	13.2	11.6	3,614

4.3 Next steps

The maximum resource potential is used in the analysis in section 5.2 to understand whether North Somerset has sufficient resources to meet a local renewable target.

The UK Solar Strategy Part 2 was published in April 2014. There is a clear focus in the strategy on “mid-scale solar on top of factories, supermarkets, warehouses, car parks and other commercial and industrial buildings”

with a pledge from DECC that they “will work with developers, commercial property owners, planning authorities, and the solar industry to cut red tape and sweep away barriers”.

A key commitment is that “DECC will work with the Department for Communities and Local Government on extending permitted development rights in England for building-mounted solar PV to rooftop systems up to 1 MW. CLG expects to consult on this over the summer.” The strategy also sets out clear ambitions around solar on the public estate and a specific programme on schools.

The Council could use its links with local businesses, for example using economic development officers’ knowledge of local companies, to promote the opportunities for solar to the commercial sector, especially if permitted development rights are extended.

5 Target setting

5.1 Why have a target?

Setting a local renewable energy target communicates to renewable developers, communities and those involved in submitting and assessing planning applications that the Council is committed to supporting the delivery of renewable energy and to playing its part in achieving the national target.

5.2 Assessing whether North Somerset could meet a 15% target locally

Under the European Renewable Energy Directive, the UK now has a legally binding target to generate 15% of the UK's total energy needs (electricity, heat and transport) from renewable sources by 2020. This is a UK wide target and although no local targets have been set by government, it is clear that the government expects local authority areas to play their part in meeting the national 2020 renewable energy target.

In order to assess whether North Somerset could meet a similar target locally, there are a number of assumptions that need to be made:

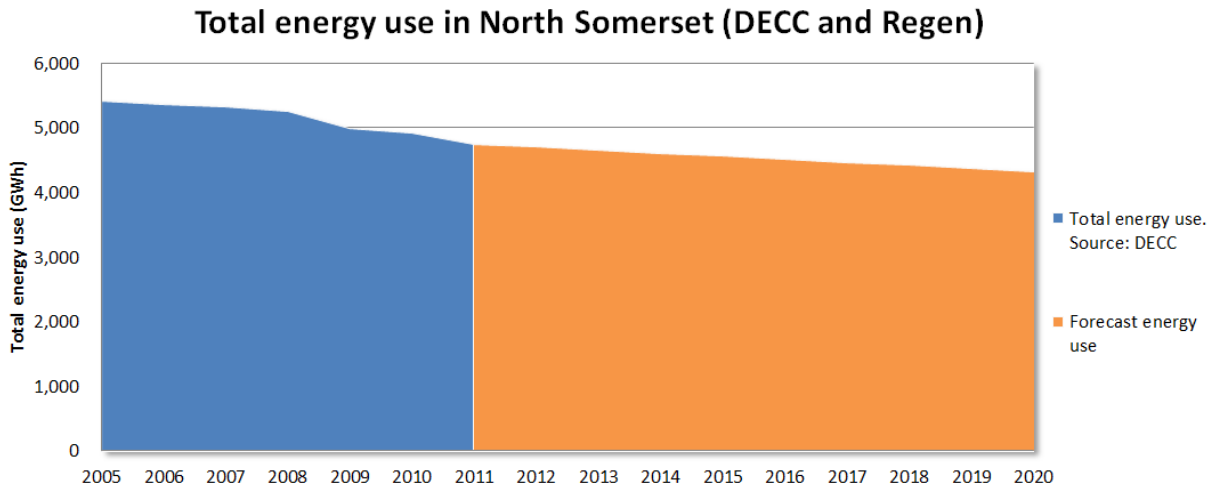
- What will energy demand be in North Somerset in 2020 and what is 15% of that figure?
- What proportion of renewable energy will come from local projects compared with national resources?
- What resources are available in North Somerset?

5.2.1 Energy demand in North Somerset in 2020

We have forecast energy demand in North Somerset in 2020 by extrapolating energy use from 2005 to 2011. The financial crash in 2008 had a major impact on energy demand, with the recession that followed decreasing demand in North Somerset by 5% between 2008 and 2009. We have assumed that this is an anomaly and excluded 2008 to 2011 from our analysis.

We have used the average annual decrease (1.04%) for the years from 2005 to 2008 as the basis for extrapolating energy use to 2020. It may seem unusual that energy demand decreased year on year despite the economy growing and housing developments being built in this period. In fact, decreasing energy demand is a national trend caused by more energy efficiency measures being installed, more efficient processes and behavioral change. The decrease in demand year on year is deeper than the increase from economic growth and new developments, and so a net decrease occurs and is expected to continue in the future.

Figure 12: Forecast total demand use in North Somerset



Based on an assumed annual decrease of 1.04% from 2011 figures (the latest published figures from DECC) onwards, 2020 total energy demand for North Somerset is 4,321 GWh per year, compared with 4,746 in 2011.

15% of this estimated total demand equates to 648 GWh of energy.

5.2.2 Understanding the national contribution

The UK has a target for 15% of its total energy consumption (electricity, heat and transport) to come from renewables by 2020. In July 2011, the Department of Energy and Climate Change (DECC) published a Renewable Energy Roadmap for the UK to 2020[4] that set out how the government expected the national target to be achieved and how much of the contribution will be generated from 'national' rather than local resources. DECC's analysis proposed that at least half of the UK's 2020 renewable energy target would be met from 'national level' renewable energy deployment, such as off-shore wind, biomass electricity (with a large contribution from centralised biomass power stations, most burning imported wood chips or liquid biofuels) and renewable transport (the latter mainly based on liquid biofuels, also likely to be imported).

For North Somerset, it would therefore be reasonable to assume that even if no action were taken locally about half of a local 15% target might be contributed from national projects over which there would be limited local control. While the Road Map does not absolve local areas of their responsibilities to promote renewable energy, it does help clarify the areas on which local areas might usefully focus by helping to differentiate between national resources, which might be expected to be deployed regardless of local action, and the remainder, over which local areas have more influence and control.

If the 'national' contribution is taken as a given, North Somerset could focus on meeting the remaining half of a 15% target , equating to roughly 324 GWh, from its own preferred mix of technologies.

[4] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48128/2167-uk-renewable-energy-roadmap.pdf

5.2.3 Renewable energy resources in North Somerset

The potential renewable energy resource in North Somerset has been estimated using the wind and solar resource assessments in this report, together with resource assessments that Regen SW holds for the region for other technologies. These resource assessments were commissioned by Regen SW in accordance with the national methodology for renewable energy resource assessments by SQWEnergy on behalf of DECC. The regional resource assessment reports can be downloaded from the Regen SW website[5]. The reports give details of the assumptions used.

Table 11 gives details of the estimated maximum renewable energy resources available in terms of installed capacity and energy generation. The capacity factors used to convert installed capacity into energy generation are also listed. The maximum available resource is listed alongside the current (2013) generation from each technology type.

Table 11: Maximum renewable energy resource potential in North Somerset[6]

Renewable energy generation potential	2013 renewable generation	Total maximum available resources	Maximum electricity installed capacity	Maximum heat installed capacity	Electricity capacity factor	Heat capacity factor
	GWh	GWh	MWe	MWth		
Onshore wind	0.12	156.60	66.21		0.27	-
Solar PV	11.93	72.35	82.59		0.10	-
Solar parks	0.06	67.41	76.95		0.10	-
Hydro	0.06	0.68	0.16		0.50	-
Heat pumps	0.62	67.13		76.63	-	0.10
Solar thermal	0.30	33.04		37.71	-	0.10
Clean wood	3.92	52.74		30.11	-	0.20
Anaerobic digestion	0.00	20.45	-	-	0.90	0.90
Energy from waste	0.00	111.16	4.70	9.40	0.70	0.70
Energy crops	0.00	141.91	5.00	10.00	-	0.50
Landfill gas	9.23	9.23	1.76		0.60	-
Total	**26.24**	**732.70**	**237.36**	**163.85**		

It is clear that onshore wind appears to be the largest potential renewable energy resource with solar PV (solar parks and building-mounted solar PV combined) having the second largest potential. The extent to which each

[5] http://www.regensw.co.uk/projects/building-renewables-in-the-sw/resources-and-progress/resource-assessments

[6] See glossary for explanation of terms

resource is actually delivered in practice in the area will depend on viable projects being identified, (where necessary) gaining planning permission and being successfully built.

5.2.4 Comparing resource potential to a 15% target

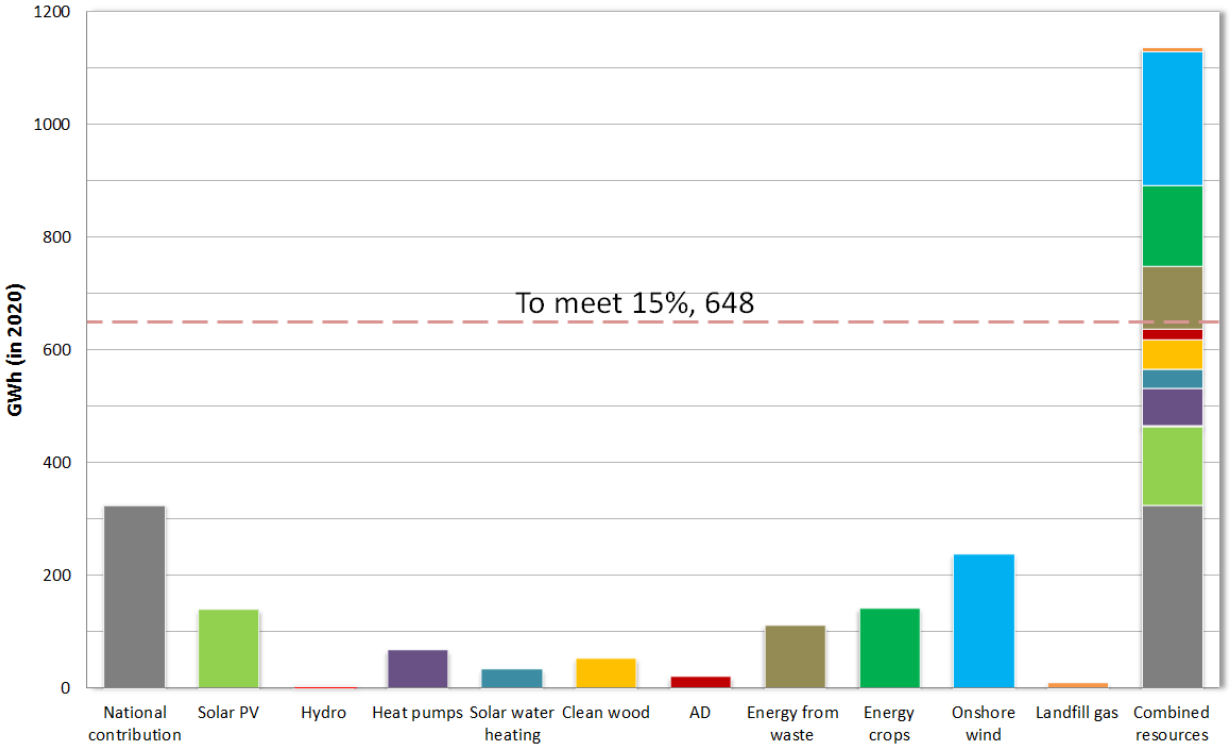
The estimates show that there is considerable maximum potential renewable energy resource in North Somerset. The potential resource totals 813 GWh of potential, which far exceeds the 324 GWh needed to meet half of a 15% target locally.

Table 12: Summary of steps to calculating a local 15% target

Factor	Result (GWh)
Total 2011 energy consumption (DECC)	4,746
Demand prediction 2020 (based on 1.04% annual reduction)	4,321
Current renewable energy generation	26
Total renewable energy potential	813
15% of energy demand prediction	648
National contribution to 15% renewables target	324
Local contribution to 15% renewables target	324

Figure 13 compares total maximum renewable energy resources in North Somerset with a 15% local target, demonstrating that there are ample renewable energy resources locally to meet a local target.

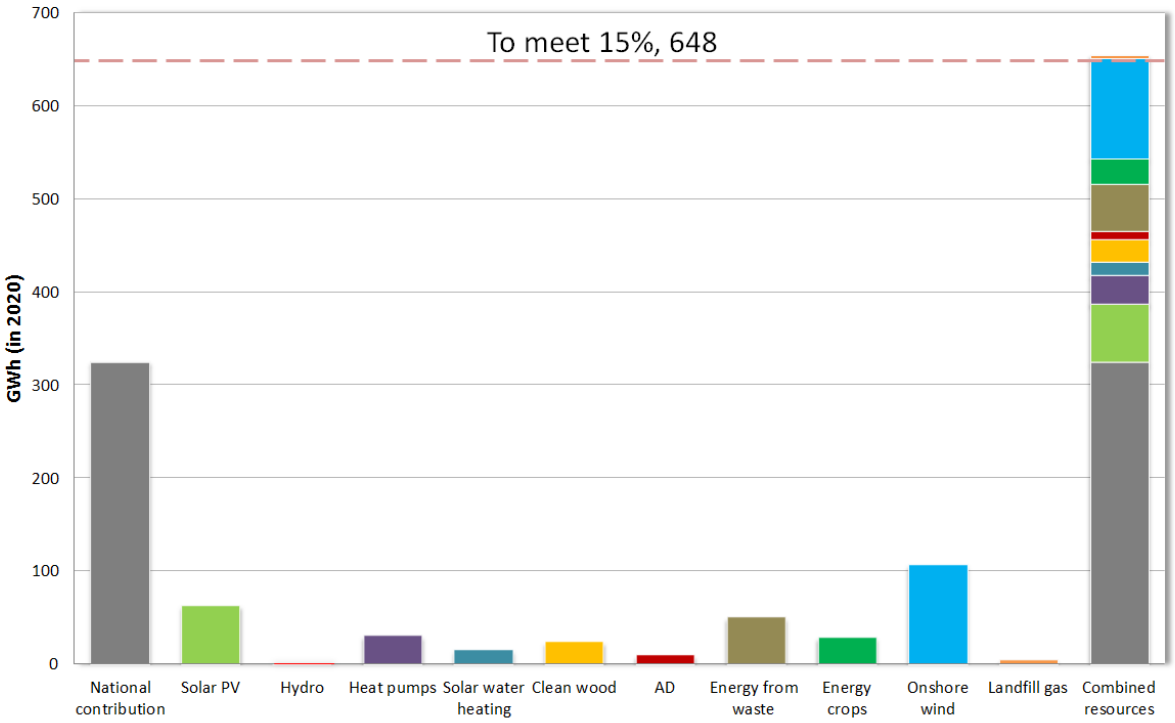
Figure 13: Comparing maximum potential resources to a 15% local target



However, the resource assessments are about technical maximum resources. Actual deployment, which depends on site conditions, market factors as well as planning permissions and other local issues, will be far lower than the theoretical maximum.

Figure 14 sets out how a 15% target could be met locally based on renewables deployment at 45% of the maximum potential for each of the technologies (except energy crops which we have limited to 20% deployment due to the large estimated potential and current very low levels of deployment).

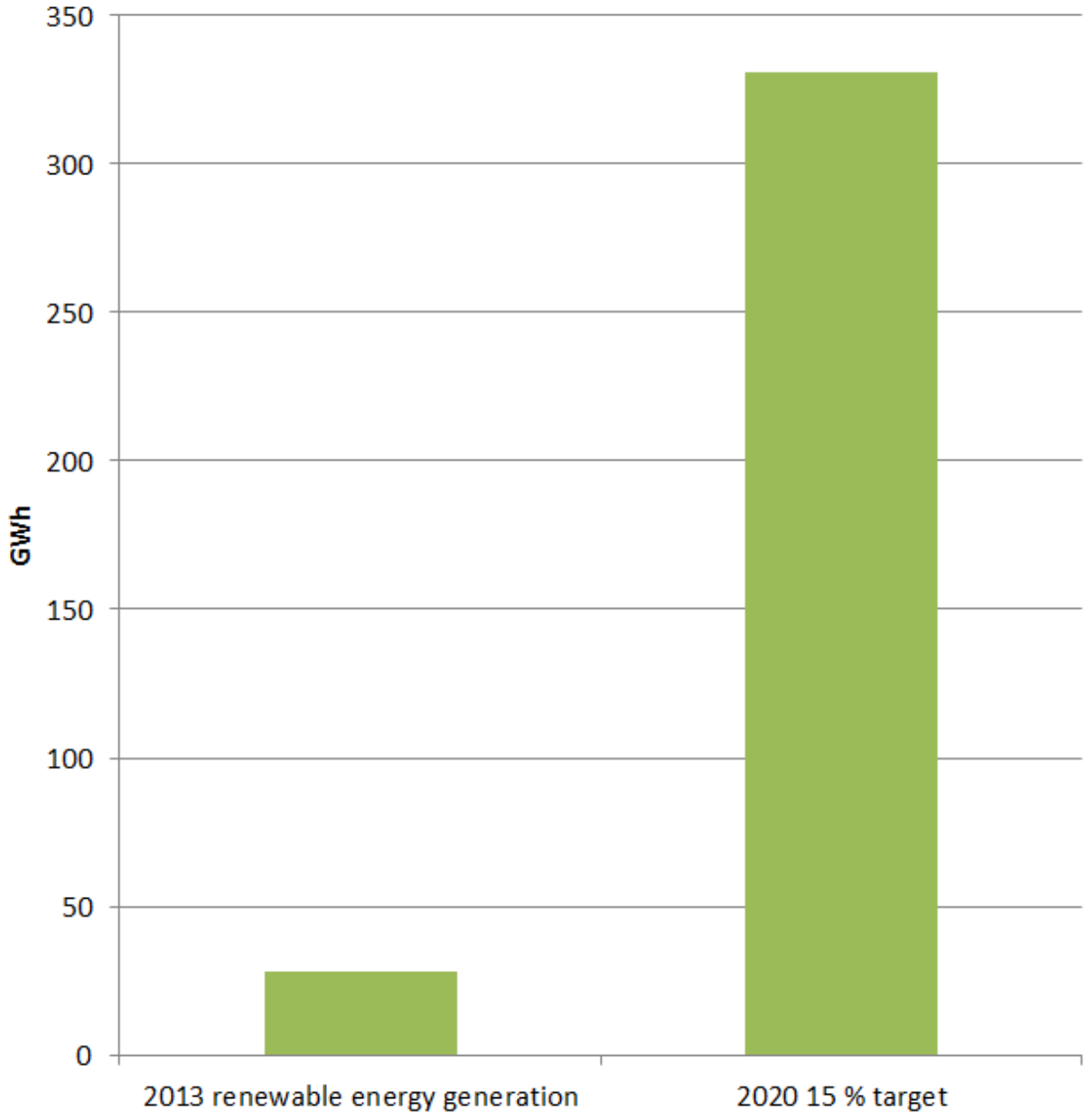
Figure 14: How a 15% local target could be met



In 2013, North Somerset generated an estimated 26 GWh of renewable energy, so achieving 324 GWh of local renewable energy generation by 2020, just six years' time, would represent a huge challenge. Figure 15 compares the two figures.

However, just because a target is stretching does not mean that it would not serve a useful purpose. A local target would show a commitment to renewables in North Somerset.

Figure 15: Comparing 2013 renewable energy generation to a potential local 2020 target



6 Assessment of potential large scale solar on land controlled or owned by North Somerset Council

6.1 Site assessment

The Council has limited land ownings with most land being kept for a particular purpose and therefore there is little 'free' land. It is, of course, up to the Council to consider the best use of this land from all the potential options. To assist the Council's assessment of the options, we identified sites with the potential for ground-mounted solar. Our site finding process did not find any sites with potential for medium or large scale wind on North Somerset land.

Five sites were identified with the potential for ground-mounted solar. Table 13 sets out the potential installed capacity, energy generation and CO_2 savings possible at these sites.

Table 13: Summary of potential for solar PV on North Somerset Council sites

	Size	Size	Installed capacity	Energy generation	Number of households' electricity use	CO_2 saving
	km^2	**Acre**	**MW**	**MWh**		**tonnes**
Site 1: Weston tip	0.296	73.2	9.52	8,339.3	2,015	1,303
Site 2: Frost Hill, Yatton	0.016	4.1	0.53	462.6	112	72
Site 3: South of Nailsea	0.023	5.8	0.76	662.2	160	103
Site 4: South of Nailsea & Backwell station	0.014	3.6	0.47	415.1	100	65
Site 5: North of Nailsea & Backwell station	0.005	1.3	0.17	152.5	37	24
Total	**0.356**	**88.1**	**11.45**	**10,031**	**2,424**	**1,567**

6.2 Next steps

The Council should consider whether these sites could be used for ground-mounted solar, against other potential uses. In some circumstances, an array could be deployed in the interim period prior to other potential uses. A well-sited array funded through low cost finance could pay-back in around 10 to 12 years. If the power could be used by the Council, the pay-back would be improved. It is unlikely that third party

financiers would back a shorter-term project, but if the Council financed the project this approach might be possible.

There may also be potential for solar arrays to be included within other development opportunities (e.g. alongside housing) as a small proportion of the available land. As part of North Somerset Council's trial membership (which runs until 17 August 2014), we are happy to comment on any sites that are being considered for solar development.

7 Potential business models for renewable energy projects on the Council's estate

7.1 North Somerset Council's objectives

The appropriate business model for renewable energy projects on the Council's own estate will depend on what it is seeking to achieve through developing a project. It may also vary depending on the type of renewable energy technology and the site conditions.

North Somerset Council must decide what its main objectives are in undertaking a renewables project. These might be:

- Investing capital to get a long term income stream for the local authority
- Generating renewable energy and so achieving carbon reductions
- Reducing the risk of rising real energy costs for the local authority
- Unlocking renewable energy for the benefit of the local community and economy.

Other issues to consider are the level of risk that the local authority is willing to take. Risks to be considered are financial risks, especially at feasibility stage, policy risks (the risk that government policy and subsidies change) and reputational risk to the authority. The Council also needs to determine whether it is willing to invest capital in the project, if it is feasible. Finally there is the issue of approach – whether the local authority commits its own staff resources which may involve training costs, as well as time. A discussion about the Council's attitudes to these issues and objectives must be had at an early stage in determining the approach to be taken.

7.2 Outline of business models

Business models exist on a spectrum from the local authority acting as sole developer with little external support through partnerships with either commercial or community developers to contracting out the resource to a standalone developer. This report sets out the key features of three main classes of model:

1. The local authority acting as developer
2. Partnering with a commercial developer
3. Partnering with a community developer

In addition, hybrid models are discussed.

7.2.1 Local authority as developer

Best for maximising profit but greatest financial risk

When the local authority is the developer, all the project finance and project management is undertaken by the local authority. Table 14 below summarises the costs and benefits of this type of approach. Red boxes stand

for the most negative aspects of the approaches, green for the most positive and orange are those that are at the middle of the scale or depend on the approach taken.

Table 14: Summary of costs and benefits of the "local authority as developer" approach

Approach	Costs	Benefits
LA provides at-risk feasibility funding and construction investment	LA assumes all the financial risk	Has the potential to maximise investment return (development profit retained)
	LA needs access to risk finance for feasibility assessments and construction capital	
LA project manages whole process	In-house skills and time required for project management and specialist knowledge (specialists can be hired in)	Full control of project
	In-house approach means greater risk of errors and longer timescales leading to greater threat from subsidy regime change	Staff capacity built
	Approach taken with communities may influence planning decision (level of local engagement/benefit affects local support/opposition for a scheme)	
LA controls relationship of project with community	LA assumes reputational risk	LA can offer community benefit fund, community share offer and engage with community to extent that LA wants
	Community engagement expertise needed	

The main benefit is that the local authority has the potential to receive the development profit and maximise its investment return, if the project is successful. Returns are potentially higher because it is the local authority that has borne the risk through the project development phase. Whether this return is used to offer community benefits depends on the objectives of the local authority. The extent to which the community is involved in the project can be determined by the local authority.

The main risk is financial. If the project fails, the local authority loses all of the money it has spent up to that point. If non-specialist staff without experience are managing the process, the risk of failure will be greater than working with a professional developer.

The authority also needs access to funds for feasibility assessments to consider taking this type of approach. Revenue budgets are usually used for this step. Construction finance will also be needed. This could be borrowed against the assets being constructed e.g. from public loans board finance, or reserves could be used.

This approach also involves the need to train staff and to be able to commit considerable staff time to do the work. This can lead to a slower project development process compared to working with a professional project developer, as training will take time and inexperienced staff may make errors. As with any type of development, delays to the process can be costly but this is even more of a threat currently due to a possibly changing policy environment – see section 9.

Bristol City Council is an example of an authority that has pursued this approach. The project management for their wind turbine project was undertaken in-house with very little of the process outsourced to contractors. Swindon Borough Council has a wholly owned company, Swindon Commercial Services, which acts as a developer on renewables projects for it.

Bristol City Council wind turbines [7]

Bristol City Council is the first local authority in the UK to develop and own wind turbines. The two 2.5MW N100 turbines are predicted to generate 14.4 gigawatt hours (GWh) annually. The estimated set-up cost is £9.4 million. However, that is described by the Council as a generous estimate to cover all contingencies. The funding has come from prudential borrowing.

It is estimated that the turbines will make £1 million each year from Feed-In Tariff (FITs), Levy Exemption Certificates[8] and selling the electricity. This means it will recoup costs quicker than the normal 20 year borrowing period.

All the work leading up to the build has been funded by profits from the council's Energy Management Unit. The Unit procures energy for the council properties. The Unit then recharges their clients internally with a percentage to manage the procurement, bills and any supply issues. The internal client gets a better deal on their energy costs and the Unit's profits are used to fund sustainable energy projects.

Motivation

The council wants to meet national and local carbon reduction targets and to reduce its reliance on uncertain energy markets. Councillor Neil Harrison, Assistant Executive Member for Sustainability at Bristol City Council, added:

"The recent Government decision to permit local authorities to sell renewable electricity is a massive opportunity, both financial and environmental. It gives them the chance to build a strong and secure local production capacity that will help to protect the local authority and their taxpayers from future energy crises,

[7] Source: http://www.local.gov.uk/web/guest/home/-/journal_content/56/10180/3511241/ARTICLE#sthash.8CqMkH0i.dpuf

[8] Levy Exemption Certificates (LECs) are evidence of electricity supply generated from qualifying renewable sources that is exempt from the Climate Change Levy. The LECs can be redeemed to suppliers, and then in turn to Ofgem, to demonstrate the amount of electricity supplied to non-domestic customers that is exempt from the Levy.

as well as making a useful contribution to renewables on a national scale.

"However, it also makes good financial sense too, creating a lucrative new income stream that can be used to finance other energy or environment projects, support core services or keep council tax low."

Barriers

It took three years to get from the original impact assessment to submitting the planning application, as the Council took a very detailed approach to ensure it got the application right first time.

The most serious objection to the project was from Natural England. The council worked very closely with this statutory body to make sure all of their monitoring requirements were met. Bristol City Council employed specialists to study the potential effects of the turbines on bird populations.

The community is extremely supportive of the wind energy plans. In an online survey, 253 out of 255 respondents were in favour of the development. This was in part because a private scheme had already been installed nearby by Bristol Port Authority. Initially, there was opposition to the construction of three turbines by Bristol Port Authority. But once they were installed, local people felt that their initial concerns about visual amenity were unfounded and in fact residents were proud to have green technology in their area. This meant that local people considered that Bristol City Council's scheme would also be something to be proud of. Community support was bolstered by a dedicated council communications team.

Lessons learned

It is important to cover every angle when submitting the planning application. Councils applying to their own planning committee for permission must be prepared for every kind of challenge because they cannot appeal the decision.

Under the current Carbon Reduction Commitment Energy Efficiency Scheme, organisations cannot claim the carbon credits for generating renewable electricity if ROCs or the feed-in tariffs are claimed. Bristol City Council decided to own the turbines and claim FITs as that worked out better financially.

Bristol City Council is the first local authority to own wind turbines, and this has made the community proud to be involved in such a ground-breaking scheme. One resident described it as ‘putting Bristol on the map' in terms of sustainable energy.

Swindon Commercial Services[9]

Swindon Commercial Services, a wholly owned company of Swindon Borough Council, has planning permission (subject to review by the Secretary of State) to install a 40 MW solar farm at a 80 hectare disused airfield at Wroughton. The site is owned and used by the Science Museum for storing its collection that is not on display. If built, the project will enable the Museum to effectively become carbon neutral.

The capital for the project will come mainly from the commercial sector, with investment returns set at an appropriate level to attract investment. In addition, 5 MW of the capacity will be offered to the community for investment through a share offer. A community benefit fund of £40,000 per year is also being offered.

As the landowner, the Science Museum will receive rent from the project. Swindon Commercial Services as the developer will receive development fees. Swindon Borough Council owns land that the grid connection will need to cross and will receive rent payments for this.

Swindon Borough Council is also looking to install solar on a number of its own estate roofs through Swindon Commercial Services. The finance for these projects will come in part from the local authority, with a community share offer and private investors making up the remainder.

7.2.2 Partnering with a commercial developer

Best for those looking for low financial risk and without access to capital, but least potential for return on investment and community benefit

The commercial developer will assume the financial risk for the project and so receives the development profit if it is successful. The developer may allow the local authority to invest in the project at construction phase, generating a return on investment for the local authority but this will be in line with normal investment returns of 5 to 10%, rather than the higher development profits available when investing at-risk.

Under this model, the developer takes responsibility for managing the whole project. This means that decisions on community engagement and community benefits will sit with the developer and are likely to be minimised, unless they have been negotiated by the local authority at an early stage.

Timeframes are likely to be swifter but there is a risk that there is greater public opposition to this model as benefits to the community may be reduced. As a result, securing planning permission could be more difficult.

9 http://www.solarpowerportal.co.uk/news/science_museum_and_swindon_council_win_planning_consent_for_uks_largest_653

Table 15: Summary of costs and benefits of partnering with a commercial developer

Approach	Costs	Benefits
Developer provides at-risk investment and arranges construction investment and pays rent for leasing site from LA. Potential opportunity for LA to invest depending on developer	Financial return mainly through rent for leasing site: • No development profit • Investment return only if LA is allowed to invest	Developer assumes all the financial risk
		LA does not need access to capital
Developer project manages whole process	Limited control of project . LA needs capacity to tender project and act as informed client	Limited need to invest in in-house skills
	Local support likely to be reduced if local engagement and benefits minimised, potentially influencing planning decision	Professional approach means lower risk of errors and tighter timescales leading to lower threat from subsidy regime change
Developer controls project relationship with local communities	Community benefit and engagement approach likely to be minimal (depending on developer) as commercial developers tend to try to minimise costs	Developer assumes some of reputational risk

Gloucestershire public sector framework

As of March 2014 Gloucestershire County Council is negotiating a tender for a four year framework agreement to provide solar PV on public authority sites at no upfront cost to the site owner.

Under the proposed agreement, the site owner will receive free electricity from the PV and a share of the FIT. The Framework covers Gloucestershire County Council, GCC Schools, Academies, District, Borough, Town and Parish Councils, Community and Voluntary sectors, Gloucestershire NHS Trusts and Gloucestershire Police Authority & Emergency Services. The estimated value of the contract is £14 million to £20 million.

The tender documents are available to read here: http://www.government-online.net/solar-energy-tender-gloucestershire/

Partnerships for Renewables[10]

Partnerships for Renewables is a developer and operator of commercial-scale onshore wind projects, set up by the Carbon Trust in 2007 to develop, construct and operate wind energy schemes primarily on public sector land.

[10] http://www.pfr.co.uk/pfr/2/About-Us/

Partnerships for Renewables takes control of potential projects on local authority land through an option agreement. It provides the at-risk finance and so receives the development profits. The local authority as the landowner receives a rent as an agreed share of the project gross revenues. Private wire arrangements may be considered whereby electricity is delivered directly to the end user without going via the electricity grid. Local authorities can invest in projects if they wish. Community benefits are offered in line with the Renewables UK community benefit protocol at £5,000 per MW per year. A community share offer could also be issued.

Partnerships for Renewables currently has planning permission for three projects and a number of others in development or with submitted planning applications.

7.2.3 Partnering with a community developer

Best for offering community benefit and involvement and so reducing planning risk; gives medium financial return and risk

Under this model, we assume that either the community group has the skills in-house to develop a project (e.g. Bath & West Community Energy) or works in partnership with a community developer, such as Communities for Renewables CIC, whose aim is to maximise community benefits and involvement.

The financial reward for the local authority will depend on whether the at-risk investment comes from the local authority or from the community developer and the extent to which the local authority invests in the project. Community benefits will be maximised, with a community benefit fund normally offered and the potential for the community to own the project post-construction through a community share issue.

Planning risk should be reduced through the close involvement of the community, although renewable energy projects can create divisions within communities between those for and those against a project. However, the need to work with the community tends to involve longer timescales and as a result the policy risk of the project is greater – that is the risk that the policy and subsidy regime changes before the project is constructed.

A community scheme can apply to the DECC Rural Community Renewable Energy Fund, which can provide some of the at-risk development funding, reducing the project risk. If the Council were to partner with or a community body, it could potentially access funding through this route.

Table 16: Summary of costs and benefits of partnering with a community developer

Approach	Costs	Benefits
Community developer or LA provide at-risk investment LA receives rent for leasing site Opportunity for LA to invest	Medium financial return: • Development profit depends on whether LA invests at risk • Investment return if LA invests • Rent for leasing site	Financial risk shared with community developer LA does not need access to 100% of capital
Experienced, professional community developer manages project in liaison with LA	Limited control of project . LA needs capacity to tender project and act as informed client	Lower planning risk as project only progressed with community support Reduced need to invest in in-house skills Professional approach means lower risk of errors and tighter timescales, leading to lower threat from subsidy regime change
Community developer controls project relationship with local communities	Process can take longer due to extent of engagement – though community engagement needed for all models	Maximises community benefit, investment potential and engagement Community developer assumes some of reputational risk

Plymouth Energy Community[11]

Plymouth City Council supported the founding of Plymouth Energy Community in 2013. Plymouth Energy Community is a members co-operative run by local people. A board has been set up to steer the Co-op and 100 founder members have signed up. Plymouth Energy Community and Plymouth City Council are working together through PEC Renewables Limited to develop a portfolio of up to £1 million worth of solar projects. The projects are expected to be on up to 23 schools and some commercial buildings, totaling in excess of 900 kW. To date, 9 schools have signed up.

Projects will be owned by Plymouth Energy Community Co-op and financed by a £500k loan from the local authority (from prudential borrowing) and up to £500k from a share offer. The loan will be repaid with interest. The share offer opened to the public at the end of February 2014. Shares cost £1 with a minimum investment of £50 and a maximum of £20,000. Returns of up to 6 percent are expected with potential for 9% return for investors who qualify for tax relief through the Government's Enterprise Investment Scheme.

Income from exported electricity and the FIT will be used to pay capital and interest to community

[11] http://www.regensw.co.uk/news/2014/2/27/media-release-communities-for-renewables-cic-supports-plymouths-first-solar-investment-scheme
www.plymouthenergycommunity.com

shareholders and the Council and to fund Plymouth Energy Community Cooperative's initiatives to tackle fuel poverty and climate change.

Communities for Renewables (CfR) CIC assisted with the business planning and procurement strategy for the scheme. CfR CIC is a not-for-profit founded by Regen SW and Green Trust CIC with the objective to assist communities to directly participate in the renewable energy infrastructure they host.

Communities for Renewables (CfR)[12]

CfR is a social enterprise that helps proactive communities harness the value of their renewable energy resources, and retain that value within the local economy. Regen SW established CfR and has non-executive representation on its board. CfR helps local energy co-operatives and landowners to develop community wind, solar and other renewable generation technology projects, typically between 250 kW and 10 MW. The projects that CfR helps to develop are owned by the local community through a community benefit society or suitable alternative not-for-profit company.

CfR can work with local authorities to develop projects on their land for the benefit of the local community. Local authorities working with CfR have the option to invest in the project, as well as receiving a landowner rent.

Expertise and project management

CfR can provide all the expertise and project management capacity required to deliver projects through the development process including: site identification and landowner engagement; feasibility and business case; planning; grid connection; and community engagement. Once all permits are secured, CfR helps to raise the finance to build the project through a co-operative share offer and supplementary finance if needed. CfR can manage procurement, preconstruction and operation of the project if required. CfR works in partnership with local expertise where available.

Funding

CfR has funds to provide pre-planning risk investment for suitable community energy generation projects. CfR recovers this investment through contingent fees that are only charged where projects are successful. CfR can also help with applications to the Rural Community Energy Fund (which provides up to £150,000 of risk investment per project) and other community energy loan sources.

Business model for community energy projects

Each project is set up and run as a community enterprise, typically a Community Benefit Society; a form of co-operative whose primary purpose is benefit for the community rather than members. Collective ownership is through a co-operative share offer that provides a good rate of return (the target return typically being around 7% per year).

[12] www.cfrcic.co.uk

Any profit remaining once host payments, operating costs and investors have been paid will be transferred to a local community organisation and used to re-invest in further community energy generation locally, and to provide grant funding for local community initiatives. The surplus profit generated is likely to be substantially higher than community funds typically paid by commercial wind projects.

Where possible, CfR will help establish business models that enable local homes and businesses to purchase the energy generated through local supply arrangements that reduce bills and/or provide protection against future price rises.

Bath & North East Somerset Council cooperation agreement with Bath & West Community Energy[13]
In 2011, Bath & North East Somerset Council established a formal Cooperation Agreement with a local community energy cooperative, Bath & West Community Energy (BWCE). BWCE is an award-winning community enterprise that operates solely through third-party site leasing arrangements.

The Cooperation Agreement created a framework for the local authority to support and work with BWCE on projects that help to achieve the local authority's aims to reduce carbon emissions and increase community capacity and resilience. Under the Cooperation Agreement, the local authority and BWCE agreed to work together to identify: energy projects within the district; opportunities for joint research about community-based projects; opportunities for people in the area to invest and secure a return from projects; and other funding opportunities.

BWCE develops, finances and manages community-owned renewable energy projects through a variety of arrangements with property owners and community groups. It has hundreds of local shareholders and grant a portion of its revenues into further low carbon projects via a community fund.

The local authority has worked with BWCE on setting up a third party delivery lease for PV panels on Bath and North East Somerset schools. The panels are now reducing energy bills for the schools and providing an educational resource.

7.2.4 Hybrid approaches

There are hybrid approaches that take in elements of the other approaches. For example, the local authority could fund a project wholly but employ a developer to project manage the process. These approaches tend to fall in the middle in terms of costs and benefits. For example, if investment is shared between the local authority and the developer, risk will be shared but so will financial benefits.

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http://democracy.bathnes.gov.uk/documents/s7976/E2318%20Bath%20Community%20Energy%20Cooperation%20Agreement.pdf
http://www.bwce.coop/

Table 17: Summary of costs and benefits of hybrid approaches

Approach	Costs	Benefits
At-risk investment and construction investment may be shared between LA and developer	LA assumes some financial risk	Investment return depends on extent of LA investment
	LA may need access to risk and construction capital	
	Development fee or profit paid to developer	
Developer project manages but LA retains oversight	Some control of project handed to developer	Some need to invest in in-house skills
	Approach taken with communities may influence planning decision (level of local engagement/benefit affects local support/opposition for a scheme)	Professional approach means lower risk of errors and tighter timescales leading to lower threat from subsidy regime change
LA retains some control of relationship with community	LA assumes some reputational risk	LA can offer community benefit fund, community share offer and engage with community to extent that LA wants
	Community engagement expertise may be needed	

Bristol City Council Solar PV Investment Programme[14]

Between September 2011 and July 2012, Bristol City Council installed a total of 568 kW of solar photovoltaic (PV) panels, varying in size from 4 kW to 50 kW, on 36 primary and secondary schools in the city. The installations generate nearly 500,000 kWh per year – equivalent to over 100 typical south west homes. They save £60,000 and 280 tonnes of carbon dioxide a year.

The local authority met all development and capital costs and will receive all FIT and export payments while the schools benefit from free on-site use of the electricity generated. Fitting panels on schools has also provided the opportunity to educate more children and young people about the benefits of renewable energy.

South west company Solarsense installed all of the roof mounted systems on the schools, with project sizes varying depending on roof space and orientation.

Following the success of its programme of PV on schools, Bristol City Council has gone out to tender on a

[14] https://www.bristol.gov.uk/committee/2013/ua/ua000/1003_6.pdf

framework contract for an extensive solar PV investment programme. The finance is being provided by the local authority via the Public Works Loan Board (PWLB) into the General Fund at much better rates than bank project finance.

This four year framework will offer PV for different types of property:

- Social housing – between 300 and 7,000 Bristol City Council domestic properties with an investment of up to £24 million. The tenants would benefit from bill savings and the local authority would receive the FIT in full
- Blocks of flats – 300 low rise blocks with an investment of up to £3.5 million. PV would be connected to the communal supply rather than individual flats
- Public sector buildings, including the University and Hospital. Bristol City Council will earn an income from the generation tariff plus from the export tariff plus from a Power Purchase Agreement (PPA). A PPA is a long-term contract between the system owner (Bristol City Council) and the building occupier that guarantees a payment for on-site use of the solar units. Total investment estimated at between £0.5m and £3m
- Corporate properties – 120 buildings with an investment of up to £3m required for this. The local authority would receive investment return through the FIT, reduced energy bills and reduction in carbon emissions
- Demonstration projects - showcasing new or untested applications for PV, for example, SOLA – electricity storage project – with investment of £0.5 to £1 million.
- Grounted-mounted PV – 5 to 15 MW, investment of £5 to £15 million. Return on investment would be through the Renewables Obligation and PPAs.

The Framework will be available for use by other local authorities in the West of England.
Work packages will be tendered through mini-competitions to the Framework contractors of the appropriate Lot. Bristol City Council work packages will be project managed by Landlord Service or Energy Service teams as appropriate, with the winning Contractor managing the programming, customer liaison, design, supply and installation of the solar PV systems.

On-going Operation & Maintenance will be provided by the contractor for 2 years following installation, with the option for training of Bristol City Council operatives in the longer term. A number of new posts will be created as a result of this programme.

Cornwall Council Solar Park [15]

Cornwall Council has invested over £5 million in small scale solar on local authority owned assets. In addition, it has built the first local authority run solar farm in the country, the 5 MW Kernow Solar Park at Newquay airport. The Government's review of the FIT for large scale solar in 2011 led to the project being postponed at that stage. The drop in the price of large scale solar panels in 2012 meant that the project again became viable.

EC Harris were Project Managers on Kernow Solar Park, working on Cornwall Council's behalf. The developer is part of the Solar Framework that Cornwall Council procured and was engaged to undertake detailed design, construction and maintenance of the solar farm.

The local community were invited to a consultation event and benefit from a community benefit fund. A website is also being developed, which is linked to the solar farm, providing an educational tool for schools wishing to use it.

The project produces an initial income of around £700,000 per year and enough electricity for the equivalent of 1,000 homes. Power is supplied directly to the local authority-owned Airport, reducing bills, as well as to the grid. The project generates renewable electricity that displaces fossil fuel equivalent to almost 5% of the local authority's carbon footprint.

7.3 Summary of different business models

Table 18 summarises the different business models in relation to potential local authority objectives for a project, as well as in relation to the resources required and risk involved. Approaches that achieve an objective well are marked as green, orange for average and red for poor achievement of an objective. For the risk and resourcing issues, green stands for the least risk or least resource investment, orange for medium, and red for greatest risk or resource investment.

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http://www.thisisthewestcountry.co.uk/news/cornwall_news/9912970.Kernow_Solar_Park_goes_ahead_near_Newquay_Airport/

Table 18: Summary of different business models in relation to local authority objectives, risk and resources

	LA as developer	Partnering with commercial	Partnering with community	Hybrid
Income generation for LA				
Generating RE and carbon reductions	Depends on technology rather than approach			
Reducing energy costs for LA	Depends whether energy is used by local authority or sold to the grid			
Maximising community and local economy benefits				
Financial risk				
Reputational risk				
Staff resources required				
Capital required				

7.4 Financing options

Both at-risk and capital finance are needed to deliver renewables projects and working capital is needed to operate them especially in the early years.

Finance could be accessed from the following sources:

- Local authority sources: Prudential borrowing or reserves
- Partnering with a commercial developer or community developer that takes the development risk (and development profit)
- Commercial/social investors
- Community share offers (usually not at-risk finance).

Projects can also be sold post-construction to crystalise the development profit. This is the approach taken by many developers.

Alternatively, it is possible to securitise the revenues from a renewables project by selling them for an upfront lump sum. For example, a north east housing association, the Sunderland-based Gentoo Group, recently took this approach by selling the FiT revenues from solar PV on 2,327 homes and six corporate properties to Empower Community, an institutional investor for a lump sum of £10.1 million. This has allowed the housing association to recapitalise and so use the capital for further investments in solar PV. At the end of the 20 year lifetime of the FIT, the ownership of the panels will revert to the housing association. [16]

[16] http://www.insidehousing.co.uk/finance/social-landlord-in-%C2%A310m-solar-deal/7002452.article

7.5 Choosing the appropriate approach

There are trade-offs inherent in each of the three approaches described in this paper:

- Maximising income potential by providing 100 percent of the at-risk and construction capital will also mean that the financial risk is maximised.
- Maximising community benefit and involvement and minimising reputational and planning risk through a thorough community led approach can take time and so presents a trade-off against speedy project delivery, which may create issues for the financial viability of projects if the subsidy regime changes.
- In-house project management means that control of all aspects of the project can be retained but can cause issues with non-specialist staff delaying the process as they have to up-skill, which also has resource implications.

As stated in section 7.1, the right approach will depend on the local authority's main objectives for a renewables project. Decision makers must discuss and agree the objectives at an early stage in the project planning so that the right approach is chosen.

Regen SW can provide support to the Council in developing its approach to renewables on its estate. For example, we can offer a critical friend service through tender processes, support through internal workshops, undertake site searches, promote opportunities to our members or peer-review proposals.

8 SWOT assessment of the potential for renewables in North Somerset

This section analyses the strengths, weaknesses, opportunities and threats for the development of renewables in North Somerset.

Opportunities for the deployment of renewables and for economic development are set out, with section 10 setting out potential actions for the Council to support the realisation of these opportunities. Threats are listed in brief in the table and discussed in more detail in section 9.

Strengths

Planning environment

- Low carbon development policies are in place (although the implementation of the Housing Standards Review may remove the ability to include local energy efficiency standards and unwind the Code for Sustainable Homes)
- Solar SPD in place offering clarity to developers
- Draft wind SPD will offer some clarity to developers

Undeveloped area for free-standing renewables

- Limited issues of cumulative impact as few projects in place
- Grid capacity almost completely unconstrained at present

Geography

- Transport links - excellent for biomass and construction

Experience of building-mounted solar

- North Somerset is ranked the 3rd area for installed FIT capacity in the UK

Community energy

- Active community energy groups e.g. Low Carbon Gordano, Sustainable Backwell, Sustainable Weston

Economy and pioneering projects

- West of England LEP lists environmental technologies and marine renewables as one of five key sectors
- West of England marine projects
- Alliance Homes' commitment to retrofitting renewables
- 4 installers, 5 consultancies, 7 marine engineering/components companies, 5 energy services companies currently in North Somerset on Regen SW company directory
- Weston college delivering renewables training for installers

Weaknesses

Planning environment

- Lack of a local target for renewables
- No Core Strategy policy on renewables means for renewables developers there is a lack of clarity
- Draft Wind SPD does not give clarity on information requirements by size of turbine (see Cornwall Council's SPD for best example of this)

Undeveloped area for free-standing renewables

- Lack of precedents going through the planning process
- Lack of public experience of living near to large scale renewables

Geography

- Extensive flood plain a potential issue for solar parks
- Extensive Green Belt
- Bristol Airport's radars an issue for wind
- Flat topography means views are very open so landscape impacts can be greater
- Relatively densely populated area means less space for renewables
- There are a number of SACs for bats with potential implications for wind turbines

Opportunities

Own estate potential

- Local authorities can sell electricity and subsidies including the FiT, the RHI and the RO mean that there are new business models for renewable energy projects for local authorities
- Partnerships with community groups or developers possible.

Energy efficiency: ECO and Green Deal (see section 10.4 below)

- Opportunities for the Council to work with energy companies and other partners to maximise delivery of ECO and Green Deal within North Somerset
- In particular, 11 of the Lower Level Super Output Areas in North Somerset currently applicable for Carbon Saving Community Obligation
- Potential for the Council to lever in additional finance to combine with ECO.

Onshore electricity

- This study has identified a number of wind and solar sites/areas – areas could be communicated to landowners and communities to assist in identifying projects
- There is significant potential for commercial organisations to invest in renewables – e.g. those with large roofs or high energy use, as well as potential at Portbury Docks for turbines.

Microgeneration

- North Somerset already has a large number of microgeneration installations (3rd in the UK for FIT installations). This can be built on to achieve even greater numbers by encouraging private householders and supporting Alliance Homes and others in their projects
- The Council has low carbon development policies in place and more homes still to be built – resources could be focused to negotiate with housing developers to ensure renewables measures are included where possible.

Offshore renewables

- There is the potential for small tidal lagoons on the coast of North Somerset and for tidal lagoons, tidal stream turbines, and tidal fences in the Bristol channel
- There is an economic opportunity to build on the Marine Energy Park and Bristol Offshore Energy Programme, including opportunities for turbine assembly in the port.

Renewable heat

- The Renewable Heat Incentive (RHI) is currently offering good returns especially for non-domestic biomass
- Renewable heat in North Somerset is currently underdeployed with less than 5 RHI accredited non-domestic installations and 72 Renewable Heat Premium Payment vouchers for domestic installations, totalling 0.5 MW. As a result, with a number of off-gas areas, the potential is considerable for renewable heat in North Somerset
- There are a number of drivers for exploring district heat potential at present: funding is available for Councils to undertake investigations and feasibility assessments through the Heat Network Distribution Unit; district heating is expected to become a primary measure under ECO funding; and district heat networks can claim the non-domestic RHI
- The south west has a high proportion of unmanaged woodlands. Support is currently available from the Forestry Commission to bring community woodland into management, which can provide a local source of biomass.

Community energy

- Government is driving local authorities to support communities. The 2014 Community Energy Strategy states: “Local Authorities must back community energy projects in their areas”
- Community energy groups already exist in North Somerset and there are further opportunities for communities to include energy in their Neighbourhood Plans, building on the work done by Backwell.

Economic development

- Weston College’s renewables’ courses could be widely promoted
- Junction 21 Enterprise Area could be used to attract green industry to the area
- Further investigation into the potential for jobs and GVA creation would point to opportunities for economic development.

Threats

Lack of long term political clarity

- Renewables as political football e.g. Secretary of State introducing call-ins for renewable energy planning applications
- No 2030 national target for renewables.

Subsidy regime set to change

- State aid review may limit FIT to 1 MW and below, unclear impact on RHI
- Renewables Obligation to close for new installations from 2017, projects will go through Contracts for Difference with auctions for mature technologies
- Consultation out on whether to close Renewables Obligation for all solar projects from April 2015
- Changes to the ECO have reduced availability of funding.

Greater deployment of renewables creates issues

- Grid capacity will become a constraint as more renewables come on-line
- Cumulative impact and poor installations could damage public perceptions.

9 Potential changes to the renewables industry to 2026

A number of factors are likely to affect the renewables industry in the near future, many of which will be steered by national politics. These are set out below.

9.1 Lack of long term political clarity

Changing politics remain the biggest threat to the renewables industry in the UK to 2026 and beyond. The UK is signed up to an EU target for 15% of its energy to come from renewable sources by 2020. However, beyond 2020 there is no specific renewable energy target and the UK has been instrumental in campaigning against further EU renewables targets beyond 2020.

Recent planning policy guidance and statements from ministers have highlighted that the need for renewables does not automatically override other environmental or community concerns. Renewables applications are currently potentially open to call-in by the Secretary of State who can overturn local or planning inspector decisions. This national intervention in the planning process demonstrates the political nature of renewables. Lack of political clarity could undermine investor and developer confidence, result in further reductions to subsidies and add further uncertainty to the planning regime.

9.2 Changes to subsidy regimes

9.2.1 EU state aid review

The EU has recently published new state aid rules for renewable energy subsidies. The clear direction of these rules is away from administratively set subsidy rates such as the Renewables Obligation and the FiT towards competitive auctioning of support for 'mature' technologies – including onshore wind, solar PV and hydro. There will be exemptions for smaller projects to enable a simple approach like the UK's Feed-in Tariff (FiT) to continue. However, the current 5 MW threshold for the FiT will need to be significantly reduced to 1 MW. This change will kick in if DECC makes substantial changes to the FiT. DECC is currently (to July 2014) consulting on changes to the FiT for community energy projects, including extending the FiT to 10 MW for community projects. DECC believes these changes will not trigger the need to reduce the overall FiT threshold under the EU rules.

9.2.2 Electricity market reform

The subsidy regime for larger projects is going through radical change which will be phased in from 2014 to 2017 under Electricity Market Reform. Contracts for Difference (CfDs) will be available from April 2015 and the Renewables Obligation closes 2 years later. The overlap is to allow a transition to the new system.

The Electricity Market Reform Delivery Plan was published in late December 2013 and confirms that 'mature' technologies – onshore wind, solar PV, energy from waste, hydro, landfill and sewage gas – will have to compete in auctions to access CfDs from the outset of the regime. Developers will have to invest significant

risk capital to obtain planning permission and a grid connection offer prior to bidding for a CfD, with no certainty of being successful. Developers are now likely to see allocation risk (that is, the risk of not being allocated a CfD) as the key risk for them following the Electricity Market Reform.

9.2.3 Feed-in Tariff

The FiT for solar PV installations is subject to quarterly degressions, depending on the level of deployment (if there is low deployment there may be no degression for up to two quarters in a row). The FiT for non-solar renewable technologies is subject to annual degressions each April, depending on the level of deployment. For example, in April 2014 the FiT was cut by 20% for all wind projects. There tends to be a rush to deploy before each tariff degression.

As stated above, the current EU state aid review may introduce changes to the scope of the FiT.

9.2.4 Renewable heat incentive

The Renewable Heat Incentive (RHI) offers revenue support for renewable heat projects for both the domestic and non-domestic sectors. The RHI is due to be open to new applications until 2021; however, there is currently only budget set aside to support the scheme until the 2015/2016 financial year. There is a review of the non-domestic RHI due in 2014, which may result in some changes to the detail of the scheme. To date, take-up of the scheme has been slower than predicted. More support is required to ensure the full potential of the scheme is realised, particularly to inspire customer confidence in renewable heat technologies and develop new funding models.

9.2.5 Changes to ECO and the Green Deal

DECC launched a consultation on the Energy Company Obligation (ECO) and Green Deal, which ran until 16 April 2014. The main impact of the proposed changes is a reduction in energy efficiency funding due to the political wish to reduce energy bills, but the consultation also offers some opportunities around the inclusion of additional measures e.g. district heating schemes, loft insulation.

9.3 Community energy requirements

9.3.1 Community share offers

DECC's Community Energy Strategy (2014) states that it should be the norm by 2015 for all onshore renewable projects to offer a proportion of the project to the local community to purchase. Government has a strong preference for a voluntary, industry-led approach to increasing shared ownership. However, they are considering introducing legislation, as soon as Parliamentary processes allow, to set up an enabling framework for a 'Community Right to Buy In to Renewable Electricity Generation Developments', which will introduce a legal requirement on developers to be activated if the voluntary approach is not successful.

At present, the industry is uncertain about how to make community share offers on all projects work. As a result, if the Council goes ahead with a renewable energy project on its estate, there may be issues to contend with on offering a post-construction share issue.

9.3.2 Community engagement

In a similar vein, under rules introduced in 2013, all wind projects over 15m in height (all except the very smallest turbines) have to engage the community in the development process. Regen SW rewrote the national guidance for DECC for community engagement for wind projects, which will be published in Summer 2014. For solar projects, community engagement is not required but we would recommend it forms part of any project that is medium or large scale.

9.4 Greater deployment of renewables

9.4.1 Grid capacity will become a constraint as more renewables come on line

The grid is generally considered to be nearing capacity in Devon and Cornwall already. The cost of grid reinforcement is making some projects unviable in the south west. At present, there are no significant grid constraints in North Somerset but as more projects are built in the area, grid constraints could become an issue. The new connection at Hinkley Point will not affect the distribution network as it bypasses it, connecting straight to the National Grid. Regen SW is working with the District Network Operators, Western Power Distribution and SSE, on innovative approaches to addressing grid constraints. For example, Regen is trialling a collaborative approach to grid upgrades around one substation in the south west.

9.4.2 Smart grids and smart meter roll out

A smart grid is a grid that has integrated information and communication technologies (ICT) that enable better visibility and control of energy generation and consumption. From 2015 to 2020, all domestic and all SMEs will be fitted with a smart meter. Smart grids, incorporating smart meters, will enable better monitoring and control of consumption, helping to overcome grid constraint issues.

9.4.3 Roll out of renewables alters public perceptions

Public acceptance of renewables in the UK is generally high, with 77% of UK adults supporting the use of renewable energy sources to generate the UK's electricity, fuel and heat in DECC's February 2014 Public Attitudes Tracker – Wave 8[17]. The roll out of well planned renewable energy projects that offer significant community benefits can increase public acceptance of renewables. This can be seen in Cornwall which hosted the first wind farms in the 1990s and where acceptance of wind turbines is relatively high. However, if renewables projects are deployed with unacceptable negative impacts and without community benefits attached, public opinion could turn against renewables in the future.

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277080/summary_wave_8_findings_decc_public_attitudes_tracker.pdf

10 Potential Council actions

There are a number of actions that the Council could take to support the delivery of renewables in the area, helping to manage the impacts and maximise the benefits. Renewables offer some significant opportunities for North Somerset, as set out in the SWOT analysis above. Developing supportive planning policy is the key action that North Somerset Council could take to facilitate the deployment of renewables in North Somerset. In particular, the Council could set out clear requirements for planning applications for different scales of wind turbines, set a target in planning for renewables and include a dedicated policy on renewables in its next Local Plan.

Good pre-application support for those developing renewables projects and particularly for community energy projects would also support the delivery of high quality renewable energy projects.

Potential actions for the Council outside of planning are set out in the sections that follow.

10.1 Set a target and strategy to achieve target

North Somerset has considerable renewable energy resources and setting a target would help to support renewables in the planning system as it demonstrates a commitment to a goal. It is important that a target is bought into both by the Council and by the wider community in the area – thorough consultation on any proposed target is an essential step. Through consultation the Council can determine whether it and the wider community feels that a target should be more or less stretching than or in line with the national 15% target. The analysis in this document could be used as the evidence base for discussions.

The majority of south west upper tier authorities have now set a target for the delivery of renewables. Some of these are for installed capacity (i.e. in MW), such as Swindon's target of 200 MWe by 2020 and some are in relation to the national 15% of energy demand by 2020 to be from renewable sources. Dorset, Bournemouth and Poole have set an aspirational target to meet half of the national 15 percent target locally.

Once a target is set there needs to be a strategy in place to achieve the target, with actions supporting the delivery of renewables. Regen SW undertook the refresh of the Dorset, Bournemouth and Poole renewable energy strategy which sets out priority areas for action to support renewables and to maximise the benefits for the area. Swindon Borough Council is aiming to deliver half of its 200 MWe target through solar projects led by the Council, with the remainder from other solar and biomass or energy from waste CHP installations, which the Council are supporting where possible, e.g. through a Local Development Order for solar arrays. As a result, the Council is taking significant steps to ensure delivery of its target.

Recommended action: Consult on setting a local renewable energy target for North Somerset

10.2 Develop renewables on the Council's own estate

North Somerset Council is already considering renewables on its own estate and this report aims to support the identification of the way forward.

Recommended action: Consider the best potential uses of the sites identified in this report as having potential for ground-mounted solar.

10.3 Further examination of other technologies

This report has examined the wind and solar resource in North Somerset. Other technologies have considerable potential in the area and we recommend these are examined in more detail. For example, the Renewable Heat Incentive (RHI) is currently offering substantial returns for renewable heat installations. The non-domestic RHI in particular currently offers excellent financial rewards for commercial installations. Renewable heat is most financially lucrative where technologies replace oil or electric heating, that is in buildings that are off-gas. There are a number of off-gas postcodes in North Somerset. Investigation of off-gas postcodes and an awareness raising programme in these areas is one potential avenue for further work.

In addition, there is currently funding and support available for local authorities investigating district heat networks through government's Heat Energy Delivery Network Unit (HNDU) and heat networks are eligible for the Renewable Heat Incentive and as a measure under ECO. Regen SW would be happy to assist the Council to review opportunities for heat networks and to support the Council to access support from the HNDU.

Recommended action: Investigate the potential for other renewable energy technologies, particularly renewable heat, and actions that could support their delivery.

10.4 Energy efficiency support

The Green Deal is a new finance mechanism allowing householders to take out a long term loan for improvements which is then repaid through their electricity bill. The Energy Company Obligation (ECO) will provide grant funding for retrofit measures for vulnerable households and hard-to-treat homes. ECO is split into three elements: i) Affordable Warmth (AW) for eligible vulnerable households; ii) Carbon Saving Communities Obligation (CSCO) for deprived communities and iii) Carbon Saving Obligation (CSO) for hard to treat homes.

Local authorities can undertake actions to support the roll out of ECO and the Green Deal in their area. By supporting these national energy efficiency schemes locally, the Council can ensure that North Somerset pulls in a larger share of the available funding and makes the most of the opportunity as an area. 11 of the Lower Level Super Output Areas (LLSOAs) in North Somerset are currently able to access Carbon Saving Community Obligation funding.

North Somerset Council could team up with an energy company that is looking to deliver ECO funded measures in the area. This type of partnership helps to maximise local delivery of the funding as the council can act as a trusted point of contact to deliver information about the scheme to local people.

Some Councils have gone further than this and are playing a very active role in the delivery of energy efficiency in their area. Bath & North East Somerset Council are working through their Energy@Home partnership to procure a local advice service and Green Deal Provider and ECO providers. Councils can also lever in further funding to complement ECO, such as through credit unions or micro-finance. Understanding which finance measure or blend is right for a household is an important role for a trusted, third-party such as a local authority.

Through the ERDF funded Ready for Retrofit programme, Regen SW has supported a number of councils across the south west to develop their strategic plans and procurement processes to deliver energy efficiency at scale across local housing stock. The programme included providing capital funding for retrofit works, and matching this with a supply chain development programme, which has supported over 410 businesses to grow.

Regen's Ready for Retrofit team are available to discuss the opportunities for the Council in more detail.

Recommended action: Investigate opportunities to maximise the delivery of energy efficiency measures in North Somerset.

10.5 Low carbon development

The Council has policies in place that set local requirements for low carbon development. These may need to be reviewed in light of changes to national policy set out in the Housing Standards Review, which stated that local authorities cannot set local energy efficiency standards for housing developments and that the Code for Sustainable Homes will be wound up.

Whether the Council can keep local energy efficiency and Code requirements or not, it could also work proactively with housing developers in the area to encourage site-wide renewable energy solutions. Actions might include: workshops with developers to raise awareness of the opportunities for income generation that renewables create; training for officers and councilors in negotiating with developers; or investment in specialist support for officers working with developers to provide them with the technical expertise to backup negotiations.

In addition, once national policy is set on Allowable Solutions, the Council could set local policy to steer the funding created to local projects.

Recommended action: Consider actions to promote the delivery of low-carbon development and monitor progress on national Allowable Solutions policy.

10.6 Support for community energy

Community energy is a growing sector. Nationally, communities have already invested around £17 million in community renewable electricity through 40 community share offers. DECC have highlighted that if the current growth rate is maintained, independent modelling estimates this could rise to more than £320 million by 2020, or as much as £1.5 billion under the most optimistic scenario. At least 60 MW of community-owned renewable electricity generation capacity is currently in operation.

Government is very supportive of community energy schemes at present and issued the Community Energy Strategy in January 2014. The Strategy states:

> "Local Authorities must back community energy projects in their areas. Their support can make a big difference to the success of community energy projects by providing them with support at key stages in their development."

North Somerset has a number of active community groups including Low Carbon Gordano, Sustainable Backwell and Sustainable Weston. In order to fulfil the potential for community energy in North Somerset, there are a number of enabling actions that the council could take:

- Share the findings from this report with community groups, in particular the evidence on areas with potential for wind and solar. Access to detailed GIS information about potential areas for renewables will enable local communities to identify possible sites.
- Encourage and support more communities to include sustainable energy in their Neighbourhood Plans. Backwell are including encouragement for sustainable energy in their Neighbourhood Plan. The Council could build on the learning from Backwell and encourage other groups to include it.
- Consider whether community energy could constitute a "very special circumstance" for developing renewables in the Green Belt. Roughly a third of North Somerset is covered by the Green Belt. The National Planning Policy Framework paragraph 91 states "When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources." There is no further national guidance on what constitutes very special circumstances. The Council could write guidance setting out criteria for community energy projects to be considered "very special circumstances" and so allow certain types of community energy projects in the Green Belt. Bath & North East Somerset Council used their membership time with Regen SW to commission an informal guidance note that sets out what could be used to demonstrate very special circumstances in their Green Belt[18]. North Somerset Council could consider a similar approach.

[18] http://regensw.s3.amazonaws.com/regb_draft_advice_note_march_2013_57558eb7d8c6bd26.pdf

- Provide training for councillors on the social and economic benefits of community energy. Informing councillors about the potential benefits of community energy will help to ensure that projects can be properly supported both within and outside of the planning process.
- Offer support to communities on negotiating community benefit funds with developers and setting up appropriate governance structures. Communities often lack the skills and knowledge to negotiate successfully with renewable developers. The Council could offer them support with this process. It could also set up a local protocol to require developers to negotiate with communities and set recommended minimum levels of benefit.
- Offer training, events and tailored support for community energy groups. Regen SW runs a Community Energy Network and community champions' programme across the south west. We would be happy to deliver targeted support locally in partnership with the Council.
- Offer access to a revolving loan fund. Community groups often lack access to both at-risk and capital finance. Some local authorities, such as Cornwall Council, are offering loans to bridge the funding gap.
- Help communities to evaluate the social impacts of their activities. More evidence is needed on the potential benefits of community energy projects. The Council could gather this evidence locally.

Recommended action: Develop a local community energy strategy with a range of actions aimed at supporting and enabling the local development of community energy.

10.7 Promoting opportunities to commercial organisations

Commercial organisations use 28 percent of energy in North Somerset. As significant energy users, there are opportunities for commercial and industrial organisations to install renewables and energy efficiency measures. An example in North Somerset is SmartSystems in Yatton, which has planning permission for a 79m turbine.

Many organisations are not aware of the money saving and income generating opportunities that renewables and energy efficiency can offer, as energy is not their core business. It is difficult for national organisations like the Carbon Trust to reach local businesses. The Council's economic development team have good links with local business and can use these links to promote the opportunities on offer.

In addition, the resource assessments undertaken within this project could be made publicly available for use by commercial organisations looking for sites on their own land.

Recommended action: Consider whether there are opportunities for the economic development team to further promote renewables to local businesses.

10.8 Supply chain development support

Sustainable energy has the potential to deliver real local economic benefits and development if the right support is offered. Regen SW estimates in our Renewable Energy Manifesto that 34,000 jobs could be created

in the south west by 2020, building on the 10,000 jobs already created by 2012. The Council could support the development of local supply chains through a number of approaches.

10.8.1 Engaging with marine support opportunities

Regen SW currently works closely with Bristol City Council to assist in the development of the offshore renewable energy sector in the city, with a specific focus on tidal range and tidal stream technology. The tidal energy sector has grown significantly and now employs over 100 highly-skilled workers directly in the development of tidal energy technology. The programme has included 5 Bristol Tidal Energy Forum events to date, the development of a prospectus to highlight the city's offering to the sector, assistance in the strategic development of the tidal resource in the Severn Estuary and Bristol Channel and productive inward investment work. There are opportunities for North Somerset Council to become more deeply involved with development of the marine sector in the area, through the Local Enterprise Partnership and by engaging with the work that Regen is delivering with Bristol City Council.

10.8.2 Supply chain analysis

Outside of the marine sector, the Council could develop further initiatives to support the development of the renewables supply chain. The first stage would be to undertake a supply chain analysis to understand what businesses are currently operating in the renewables supply chain locally and what potential there is for others to enter the supply chain. This should include an analysis of the current and potential job opportunities. A supply chain review can be used to understand the full spectrum of components and services involved in the development of a renewable energy projects from site selection, component manufacture, and construction through to decommissioning. Mapping supply chains by area or sector highlights strengths and weaknesses, which can be highly instructive in planning economic development activity to address weaknesses, as well as marketing and developing existing strengths. Regen SW has undertaken supply chain analysis for Invest Northern Ireland and for a south west Local Enterprise Partnership.

10.8.3 Business support and inward investment

Once an understanding of the supply chain has been created, the Council could offer support services to existing businesses and encourage further inward investment in specific sectors. Business support might include creating guidance tools, mentor support, events or sharing best practice. Regen's Ready for Retrofit programme has offered support to businesses interested in working on energy efficiency and microgeneration. There are opportunities for the Council to make use of the Invest in Bristol and Bath initiative to encourage inward investment in sustainable energy at the Junction 21 site.

Recommended action: Consider the range of opportunities to support the renewable energy supply chain in North Somerset and develop a plan for potential support activities.

10.9 Next steps

Key officers and Members should discuss all these opportunities and prioritise them according to the Council's own objectives. Not all the opportunities will fit with these objectives and to resource all of them would be extensive; therefore, prioritisation is needed.

11 Conclusions

11.1 Significant wind and solar resources mean a local 15% 2020 target could be achieved

This report has identified significant potential resources for wind and large scale solar in North Somerset, and analysed this potential against a possible target, demonstrating that there is ample resource from these and other renewable energy resources for North Somerset to meet 15% of its total energy demand from renewables.

11.2 Site identification

The Council has limited land ownings with most land being kept for a particular purpose and therefore there is little 'free' land. Five sites for solar arrays were identified using Regen's site finding process. It is, of course, up to the Council to consider the best use of this land from all the potential options. In some circumstances, an array could be deployed in the interim period prior to other potential uses or developments. There may also be potential for solar arrays to be included within other development opportunities as a small proportion of the available land. As part of North Somerset Council's trial membership (which runs until 17 August 2014), we are happy to comment on any sites that are being considered for solar development.

11.3 Appropriate business models

We have summarised three main categories of potential business models: local authority as developer; partnering with a commercial developer; and partnering with a community developer. Case studies of approaches taken by other local authorities in the south west are set out as inspiration for the Council. If an appropriate site is found, the Council should consider its objectives for a renewables project at an early stage to inform its choice of business model, alongside other factors such as the availability of finance and staff resources and the Council's attitude to risk.

11.4 Strengths, weaknesses, opportunities and threats (SWOT)

The SWOT analysis sets out the key features of the North Somerset area in relation to sustainable energy and then draws from these strengths and weakness to highlight the opportunities for renewables across North Somerset. There are opportunities for each of the main sustainable energy sectors (energy efficiency, onshore electricity, microgeneration, renewable heat and offshore renewables) to achieve greater levels of deployment in the area with the right support. There are also opportunities for community energy groups to deliver projects and for economic development from the expansion of the sustainable energy supply chain. Threats are listed in brief and discussed in more detail in the following section on potential changes to the renewables industry.

11.5 Potential changes to the renewables industry

Potential changes to the renewables industry to 2026 include:

- changes caused by a lack of long term political clarity, meaning that government policy could change direction
- expected and unexpected changes to the subsidy regime
- new expectations from government of community involvement and community ownership in renewable energy projects
- greater deployment of renewables affecting public perceptions, and the capacity of the conventional grid and the roll out of smart grids.

11.6 Potential actions for the Council to consider to support the deployment of renewables

North Somerset Council can play a key role in facilitating the deployment of renewables and energy efficiency measures in its area. Potential actions discussed in detail are:

- Set a target and strategy to achieve that target
- Develop renewables on the Council's own estate
- Further examination of other technologies
- Energy efficiency support
- Low carbon development support
- Support for community energy
- Promoting opportunities to commercial organisations
- Supply chain development support.

11.7 Next steps

Section 10 sets out a range of potential actions for the Council to support sustainable energy, with the aim of maximising the benefits and minimising the impacts. The Council should consider these actions and prioritise them according to its own objectives.

Regen SW would like to work with North Somerset Council to support the sustainable energy industry in North Somerset. We could facilitate further discussion of the Council's potential actions. We are happy to discuss any of the issues raised in this report in detail or other issues that arise in future.

12 Glossary

Allowable solutions	Used in the government's definition of Zero Carbon Homes to describe a range of off or near site solutions that can deal with remaining building emissions once onsite measures have been employed to a certain (yet to be determined) level, to ensure a home is zero carbon. Government's response to the recent consultation on Allowable Solutions is due in early Summer 2014 and should provide greater clarity on the definition.
Air source heat pump (ASHP)	A heat pump technology that absorb heat from the outside air, which can then be used to warm water for radiators or underfloor heating systems, or to warm the air in your building.
Anaerobic Digestion (AD)	A process in which organic matter broken down by bacteria in the absence of air, produces a gas (methane) and a solid (digestate) product. The by-products, for example biogas, can be used in a furnace, gas engine, turbine or gas-powered vehicles, and digestates can be re-used on farms as a fertiliser.
Biomass	**L**iving matter within an environmental area, for example plant material, vegetation, or agricultural waste used as a fuel or energy source. This is a 'carbon neutral' energy source because CO_2 is absorbed during the life of the crop, which is then released during combustion.
Capacity factor	The "capacity factor" of a particular technology, is an approximate way of estimating how much energy per year a certain installed capacity of generation will produce. The figures used for different capacity factors are based on experience from existing installations. Because capacity factors are in effect just a guide they can cause confusion among non-specialists about the length of time over which a particular technology is generating. For example, a capacity factor of 0.1 or 10% for PV does not mean that a PV system in the UK will only generate electricity for 10% of the year. What it means is that all of the energy generated by the PV system over the course of a year is equivalent to the PV system generating at its full installed capacity for 10% of the year. Similarly, wind power technology has a capacity factor of around 0.25 to 0.3, or 25 to 30%, but a wind turbine will typically be generating electricity for 80% of the time. It will only be generating at full power for a smaller percentage of time, say 10- 15%. The rest of the time it is operating, the turbine is generating somewhere between full power and "cut-in", when it first starts to generate.

	Another example would be a gas boiler or heat pump which may only operate at full capacity for 20% of the year, as no central heating is required in summer or during the night in winter. Renewable energy technologies with low capacity factors are referred to as "intermittent", and this includes wind, PV and hydro. They are intermittent because the wind does not always blow, the sun does not always shine, and so on. Technologies with high capacity factors are referred to as "reliable", and these include biomass CHP, landfill gas and CAD. No energy technology, renewable or non-renewable has a 100% capacity factor, as there will always be a certain amount of downtime for maintenance, and for faults.
Contracts for Difference (CfD)	A long term contract that will be introduced from April 2015 to provide financial incentives for companies to invest in large scale (5 MW +) low carbon generation. CfDs will replace the Renewables Obligation from April 2017.
Community energy	Any sustainable energy project that is led by, initiated by or has heavy involvement and benefit to the local community that is hosting it.
DECC	The Department of Energy and Climate Change is responsible for setting and delivering the UK's energy and climate change policy
District Heating Network	A system where a centralised heat generating plant (using any one of a range of technologies) provides heat to surrounding buildings in the area by means of a network of pipes.
Electricity Market Reform (EMR)	The current wide ranging policy initiative from the government to reform the UK electricity market to attract the investment needed to replace ageing energy infrastructure and meet the projected future increases in electricity demand from the electrification of sectors such as transport and heat.
Energy from Waste (EfW)	The conversion of waste into a useable form of energy, often heat or electricity.
Feed in Tariffs (FiT)	A scheme to incentivise renewable electricity installations (currently) up to a maximum capacity of 5 MW through a revenue payment.
Ground source heat pump (GSHP)	A heat pump technology using stored thermal energy in the ground to heat or cool a building.
Hydroelectricity	A technology generating electricity from running water, usually a small stream. Small or "micro" hydroelectricity systems can produce enough electricity for lighting and electrical appliances in an average home. Hydroelectricity systems are also called hydropower systems or just hydro systems.

Installed capacity	The maximum rated output of an energy installation (electricity or heat) under specific conditions designated by the manufacturer e.g. a solar PV system with an installed capacity of 4 kW can produce a maximum of 4 kWh at any moment if the conditions are perfect. Installed capacity is commonly expressed in kilowatts (kW) or megawatts (MW) depending on the scale of an installation.
kW, MW, GW **kWe, MWe, GWe** **kWth, MWth, GWth**	A kilowatt (kW), megawatt (MW) or gigawatt (GW) is a common unit of installed capacity which is a measure of large a power or heat plant is. Where kWe, MWe or GWe is written this refers to electrical plant. Where kWth, MWth or GWth is written it refers to heat producing plant.
kWh, MWh, GWh	A kilowatt-hour (kWh), megawatt-hour (MWh) or gigawatt-hour (GWh) is a common unit of electricity generation. It represents how much electricity is produced or consumed over some time period such as a day or year.
Landfill gas	The gas generated in any landfill site accepting biodegradable material. It consists of a mixture of gases, mainly methane and carbon dioxide. The gas can be used to drive a turbine to generate electricity.
Levy Exemption Certificates (LECs)	Levy Exemption Certificates (LECs) are evidence of electricity supply generated from qualifying renewable sources that is exempt from the Climate Change Levy. The LECs can be redeemed to suppliers, and then in turn to Ofgem, to demonstrate the amount of electricity supplied to non-domestic customers that is exempt from the Levy.
Local Development Orders (LDO)	An order made by a local planning authority extending permitted development rights for certain forms of development, with regard to a relevant Local Development Document.
Marine Energy	Two main sources, waves (originating from solar energy) and tides (resulting from the gravitational pull of the moon and sun). Wave and tidal energy devices convert the oceans' movement into electricity that is carried to shore using undersea cables and connected to the electricity grid.
Microgeneration	This refers to the use of on-site technologies to generate heat and/or electricity from low or zero carbon sources.
Off gas areas	Refers to areas of buildings which are not on the mains gas network.
Renewable Heat Incentive (RHI)	The non-domestic and domestic RHI provide revenue payments for renewable heat production to incentivise the take up of renewable heat.

Renewables Obligation (RO)	The Renewables Obligation (RO) is the main current financial support scheme for renewable electricity in the UK, and is administered by Ofgem. It obliges electricity suppliers in the UK to source a proportion of their electricity from renewable supplies. They demonstrate this has been achieved by showing they have the required quantity of Renewable Obligation Certificates (ROCs), which renewable electricity generators are awarded for their output. The Renewables Obligation will be replaced by Contracts for Difference (CfDs) from 2017.
Solar Hot Water	This is primarily a hot-water technology. It works by absorbing energy from the sun and then heating water (using heat exchangers). It can be used to provide hot water at temperatures of 55-65^{o}C.
Solar photovoltaics (PV)	A renewable system converting sunlight into electricity, which can be used to power (or partially power) electrical equipment and appliances.
Zero Carbon Building	Over a year, the net carbon emissions from energy use in a zero carbon building are zero. The original definition included energy use from unregulated appliances (cooking, washing, electronics) as well as space heating, cooling, ventilation, lighting and hot water. Government has recently revised the definition so that it refers only to emissions from regulated emissions (space heating, cooling, ventilation, lighting and hot water) The UK Government has set out plans for all new homes to be zero carbon from 2016; new schools to be zero carbon from 2016; and all new non-domestic to be zero carbon from 2019.