Defence Infrastructure Organisation

Future Defence Storage and Redistribution Programme,

Redevelopment of MOD Bicester

Energy Strategy

BIC/OPA/DOC/11

September 2011

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Report for

Ms Ellen O'Grady
Senior Planning Officer
Professional and Technical Services
DIO Operations North
Kingston Road
Sutton Coldfield
B75 7RL

Main Contributors

David Fovargue

Issued by

David Fovargue

Approved by

Nick Layton

AMEC Environment & Infrastructure UK Limited

Gables House
Kenilworth Road
Leamington Spa
Warwickshire CV32 6JX
England
Tel: +44 (0) 1926 439000
Fax: +44 (0) 1926 439010

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Future Defence Storage and Distribution Programme - Redevelopment of MOD Bicester

Energy Strategy
(BIC/OPA/DOC/11)

September 2011

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881

Certificate No. EMS 69090

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Executive Summary

Purpose of Report

AMEC was appointed by Defence Infrastructure Organisation (DIO) to develop an Energy Strategy for proposed development sites on MOD land south of Bicester, at Graven Hill and C Site. The Energy Strategy is in response to national and local policy requirements which require the use of renewable energy to be considered in new developments, in order to reduce carbon dioxide (CO_2) emissions. The Energy Strategy has informed the masterplans and supports the content of the outline planning application for redevelopment of Graven Hill and C Site.

Context

The Government has a target for all new homes to be 'zero carbon' from 2016 and for all other developments to be zero carbon from 2019. Based on work undertaken by the Zero Carbon Hub, the Government is consulting on a definition of zero carbon whereby carbon reductions are maximised through changes to Building Regulations complemented by on-site renewable energy and/or developer contributions to a community energy fund or other off-site carbon reduction measures[1]. At the local level policies in the Cherwell Core Strategy (draft published in February 2010) require new developments to comply with the principles of an energy hierarchy, using less energy in the first instance and then using renewable energy to meet the remaining demand (it is noted that a revised Core Strategy is to be published shortly).

Development on DIO's sites at Bicester needs to reflect these national and local policy priorities for delivering low and zero carbon developments. The purpose of this Energy Strategy is to set out how renewable and low carbon energy technologies could be incorporated within the masterplans if required. Whilst the Energy Strategy does not prescribe a specific approach at this stage, it is possible to set out what potential exists to build in flexibility to the masterplans. At detailed design stage the site developer(s) will need to agree the final composition of the energy strategy to be pursued, including any contributions towards off-site measures, informed by feasibility and viability testing.

[1] Statement by Housing Minister, Grant Shapps, 17 May 2011

Energy Strategy by Development Site

Graven Hill: Mixed Use Scheme (1,900 Dwellings and Employment)

Energy efficiency has been planned for at the outset of the scheme, both in the overall layout of the masterplan (e.g. passive solar design principles) and its individual buildings. There are then a range of opportunities for incorporating renewable and low carbon energy systems to reduce CO_2 emissions.

As a mixed use scheme comprising employment, homes and community uses, a district heating network presents the biggest opportunity for delivering CO_2 reductions. A biomass based (heat only) or gas Combined Heat and Power (CHP) network could deliver reductions in baseline emissions of around 30%, with biomass CHP achieving significantly more. The upfront costs associated with the installation of a heating network are likely to be the biggest constraint. It is recommended that this would need to be tested as part of a detailed feasibility study in partnership with an Energy Services Company (ESCO) who could take on responsibility for delivering the scheme. Where a heating network is a commercially attractive proposition to an ESCO they would take on some or all of the costs and risks associated with delivering a scheme - the benefit for them is the longer term revenue associated with energy sales and government financial incentives. In future proofing the masterplan land is safeguarded for potential 'energy centres' (to the north and south of the site) to supply such a network if this was seen as a technically feasible and financially viable option.

There is also potential for wind development on DIO's landholding which could have a role to play as part of an overall energy strategy. A single 2.5MW rated turbine could meet over one third of the Graven Hill development's electricity demands for example, with the upfront capital costs associated with this technology likely to be significantly less than for a district heating network. Although this report identifies a potential location for wind development, the feasibility of bringing this forward would need to be considered in more detail, including consultation with the Council, local communities and other key stakeholders (see main report for details). The implications for wider MOD activity in this area will also need to be considered (e.g. potential impact on radar) as part of this detailed feasibility work.

At a smaller scale, the use of micro-generation such as solar thermal, solar photovoltaics and ground source heat pumps connected to individual buildings should also be considered (with solar options one consideration will be potential 'glare' and its impact on aircrews however). In particular, micro-generation could be deployed on lower density parts of the development where, for example, connecting to a district heating network may not be viable.

There are therefore a range of opportunities for incorporating renewable and low carbon technologies as part of the Graven Hill scheme, which can be appraised in more detail as the proposals develop. In addition, the potential for contributions towards 'off-site' measures needs to be considered in line with emerging national policy.

C Site: circa 70,000m^2 Distribution Warehouse plus offices and ancillary uses

Opportunities to consider as part of this development include solar PV, given the level of roof space which is likely to be available on the warehouse buildings. Ground source heat pumps may also have a role to play alongside development proposals for this site.

Overall Conclusions

This Energy Strategy has considered the opportunities for incorporating renewable and low carbon energy as part of the proposed development of Graven Hill and C Site, MOD Bicester, in response to national and emerging local policy. It is clear that there are a range of opportunities to plan for renewable and low carbon energy technologies within the masterplans for the respective schemes which can be tested further at detailed design stage. The implications of emerging policy in the next version of the Cherwell Core Strategy and national policy regarding zero carbon development will be fundamental to the overall strategy pursued.

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Contents

1. Introduction

1.1 Aim of the Report

1.1.1 AMEC was appointed by Defence Infrastructure Organisation (DIO) to develop an Energy Strategy for proposed development sites on MOD land south of Bicester, at Graven Hill and C Site. Appendix A provides a breakdown of the mix and quantum of development relating to these sites.

1.1.2 The Energy Strategy is in response to national and local policy requirements which require the use of renewable energy to be considered in new developments in order to reduce carbon dioxide (CO_2) emissions.

1.2 Scope of the Energy Strategy

1.2.1 Cherwell District Council (CDC) does not specifically require an 'Energy Strategy' to be submitted in support of planning applications[2], however DIO needs to demonstrate how it has responded to energy-related planning policies (see chapter 2) as part of the overall planning application submission. This Energy Strategy therefore forms the basis for DIO's response, demonstrating to the CDC how the use of renewable and low carbon technologies has been taken into account as part of the respective schemes.

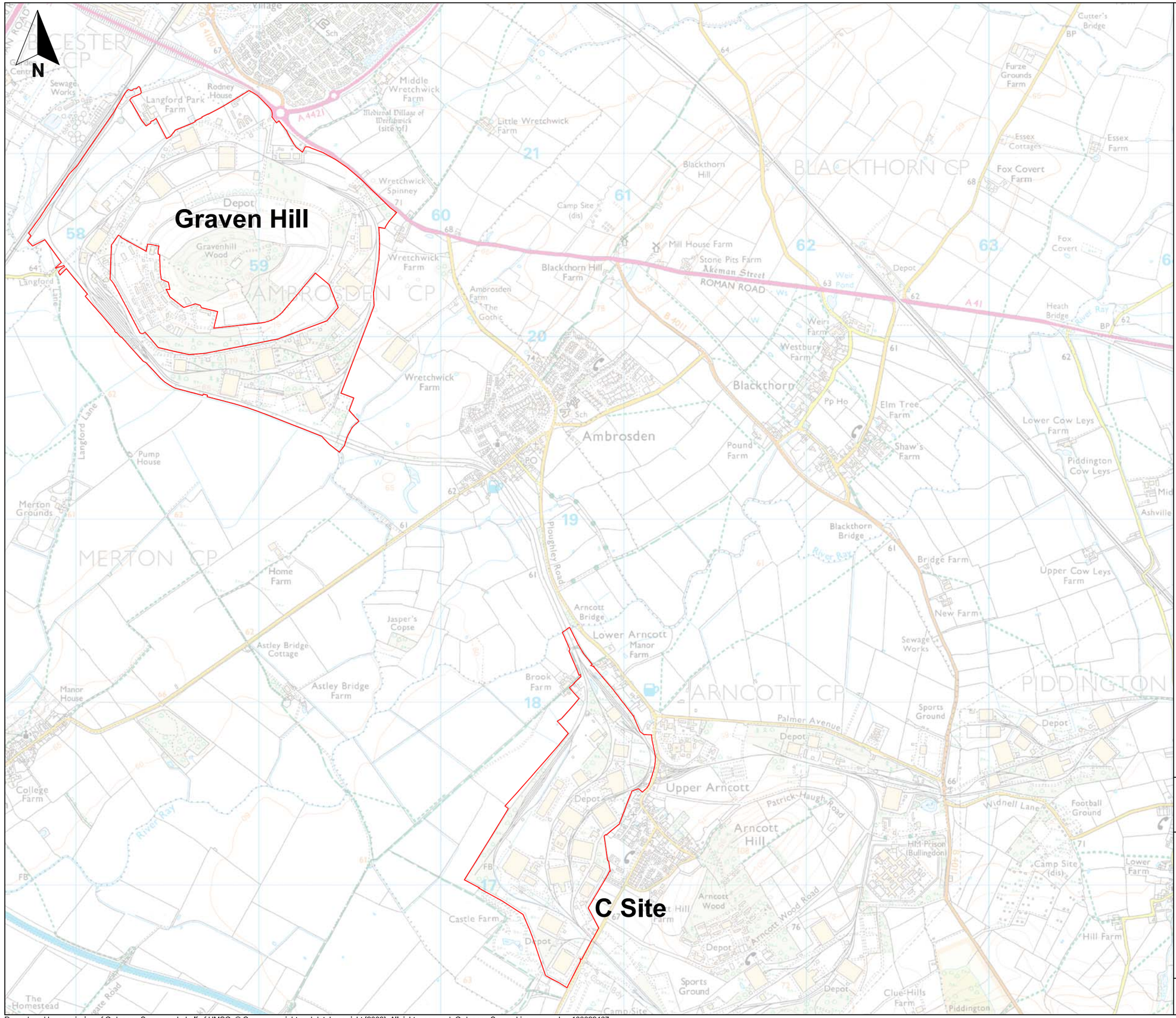
1.2.2 The Energy Strategy is based on outline development proposals as at September 2011; the findings and subsequent recommendations may therefore need to be updated in the context of future, detailed design proposals. Further feasibility and viability testing of the components of the Energy Strategy will need to undertaken at detailed design stage - involving the developer - in order to agree the overall approach to delivery.

1.3 Structure

1.3.1 The Energy Strategy is structured as follows:

- chapter 2 sets the context for the Strategy in response to both planning policy and Building Regulations;
- chapter 3 sets out the key components of an energy strategy for each development site in response to the policy context; and
- chapter 4 presents overall conclusions and recommendations.

[2] See Planning Application Validation Checklist, Cherwell District Council.



Key

Approximate Site Boundaries

0 m — 1000 m

Scale 1:20,000 @ A3

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Figure 1.1
Site Locations

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2. Context

2.1 Planning Policy

2.1.1 Cherwell District Council's *draft* policy requirements for renewable energy alongside new developments are presented below in Box 1. Although not yet adopted policy, it is important to consider the potential implications when developing an Energy Strategy for DIO's sites at Bicester.

2.1.2 The policies are included in the Council's Draft Core Strategy - published in February 2010 - in response to the Planning Policy Statement: Planning and Climate Change (the Climate Change PPS) and Policy CC4 in the South East Plan (the Regional Spatial Strategy [RSS]). These policies all sit within a wider context which includes the Planning and Energy Act 2008, Climate Change Act 2008 and UK Renewable Energy Strategy 2009.

Box 1	**Draft Core Strategy Policy Requirements for Renewables and Sustainable Construction**
Policy SD2 Energy Hierarchy: sets out the principles to be lean (use less energy), be clean (supplying energy efficiently) and be green (use renewable energy) **Policy SD4 Combined Heat and Power (CHP) and District Heating (DH):** all major applications to include a feasibility assessment for CHP and DH **Policy SD5 Sustainable Construction:** all new homes to be CSH3 with immediate effect, CSH4 from 2012 and CSH6 from 2016. Where CHP/DH is feasible CSH4 is required. In addition, all non-residential development over 1,000m^2 is required to meet BREEAM 'very good' rating.	

2.1.3 To support the implementation of the policies presented in Box 1, the Council intends to prepare a Supplementary Planning Document (SPD).

2.2 Building Regulations

2.2.1 Alongside planning policy drivers there are clear overlaps with planned changes to Building Regulations, particularly for homes, where a target for all new homes to be 'zero carbon' from 2016 is proposed by the Government. This is an important consideration because achieving the 2016 target is likely to require the use of on-site renewable or low carbon energy. Given the lead-in times and likely phasing of DIO's developments at Bicester, this 2016 target therefore needs to be taken into account now in order to 'future proof' development proposals.

2.2.2 For reference, Table 2.1 summarises the timetable for delivering zero carbon homes, which links with the energy aspects of the Code for Sustainable Homes (CSH). In addition, Table 2.1 references the standards to which a number of organisations,

including the Homes and Communities Agency (HCA), corresponding to all aspects of the CSH (i.e. energy, water, biodiversity, etc.) and BREEAM.

Table 2.1 National Timetable for Increasing Sustainable Building Standards

	Milestones	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CODE FOR SUSTAINABLE HOMES	HOUSING: MANDATORY REQUIREMENTS (PRIVATE SECTOR)													
	Code for Sustainable Homes replaces 'EcoHomes' as voluntary assessment rating for houses in England	April												
	Rating against Code for Sustainable Homes becomes mandatory		May											
	Period of Stamp Duty Land Tax Relief for Zero Carbon Homes	1st October 2007 – 30th September 2012												
	Building Regulations (see Building a Greener Future, Policy Statement, 2007). Sets minimum energy standards, which can be related to energy standards in Code for Sustainable Homes (CSH). Note: no government timetable for achieving CSH Levels *overall*. Timetable just relates to energy standards				25% reduction in carbon emissions from 2006 Building Regulations from October 2010 Energy standard *equivalent* to CSH3			44% reduction in carbon emissions from 2006 Building Regulations from 2013 Energy standard *equivalent* to CSH4			Zero carbon in relation to 2006 Building Regulations from 2016 Energy standard *equivalent* to CSH6			
	HOUSING: MANDATORY REQUIREMENTS (PUBLIC SECTOR – HOMES AND COMMUNITIES AGENCY [HCA] FUNDED)													
	English Partnerships Quality Standards, 2007. Requires *whole* levels of CSH for all EP/HCA owned sites		Require CSH3 2008-2009		Require CSH4 2010-2012			Require CSH6 2013+						
	Housing Corporation Design and Quality Strategy 2007. Requires *whole* levels of CSH to secure funding for affordable housing		Funding stream requires CSH3 2008-2010			Funding stream likely to require CSH4 2011-2013			Funding stream likely to require CSH4 2014+					
BREEAM	NON-RESIDENTIAL													
	2008 Budget Report. No equivalent BREEAM standard or targets set nationally. Cannot directly relate energy performance measures to BREEAM standards alone										Zero carbon schools & colleges		Zero carbon public sector buildings	Zero carbon non-domestic buildings
	English Partnerships Quality Standards, 2007 (applicable to HCA schemes)	BREEAM 'Very Good' for offices and industrial buildings (no compulsory timetable for planned improvements, though note wider timetable for zero carbon non-domestic by 2019												
	Department for Children, Schools and Families (DCSF)	BREEAM 'Very Good' for new schools (rating required to secure capital funding). Note timetable for zero carbon schools by 2016.												
	Department of Health (DoH)	BREEAM 'Excellent' rating required for new buildings seeking Outline Business Case approval ('Very Good' required for refurbishment projects)												

Source: AMEC

2.3 Implications for the Energy Strategy

2.3.1 The implications of draft Core Strategy policy for the Energy Strategy are:

- the need to set out how the principles of the energy hierarchy will be delivered for the proposed development at MOD Bicester (be lean, be clean and be green);
- an initial assessment of the potential for CHP and DH needs to be undertaken, which can form the basis for a more detailed feasibility study in support of future planning applications; and
- achievement of the minimum standards of Code for Sustainable Homes Level 3 (CSH3) and CSH4 (where CHP/DH is viable) needs to be considered.

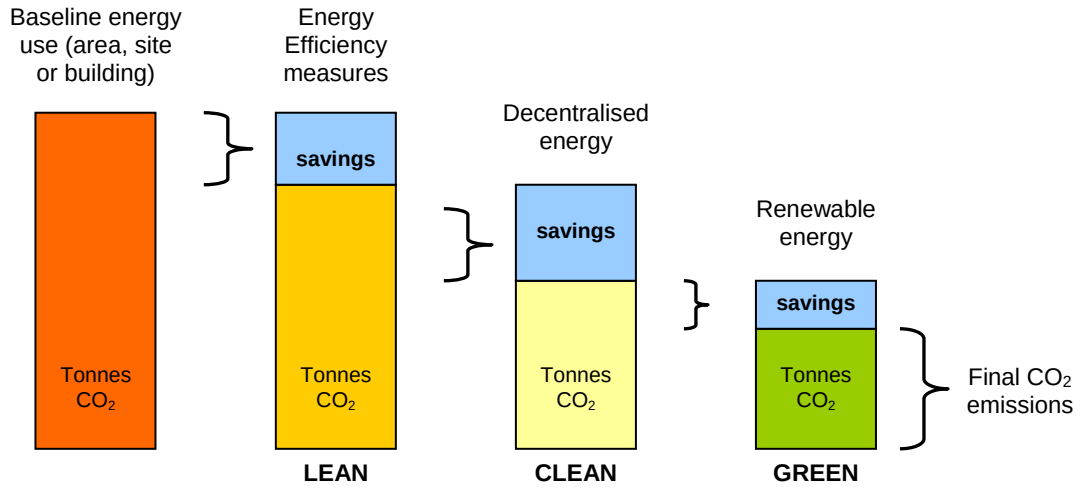
2.3.2 With respect to Building Regulations one of the key considerations for the Energy Strategy is the Government target to achieve 'zero carbon' homes from 2016 and non-residential development by 2019, since meeting these targets is likely to require the use of renewable and low carbon technologies. It should be noted however that the potential for 'off-site' solutions such as financial contributions towards a community energy fund is a complementary approach that is now being suggested by the Government.

3. Energy Strategy by Development Site

3.1 Introduction

3.1.1 This section sets out how the principles of the energy hierarchy (be lean, be clean and be green - see Figure 3.1) can be taken into account in the masterplanning of DIO's respective sites. Responding to this hierarchy will form the basis for the preparation of detailed energy strategies for these developments.

Figure 3.1 Energy Hierarchy



Source: GLA and London Climate Change Agency

3.2 Graven Hill Mixed Use Scheme

How the Development Will Use Less Energy (Being Lean)

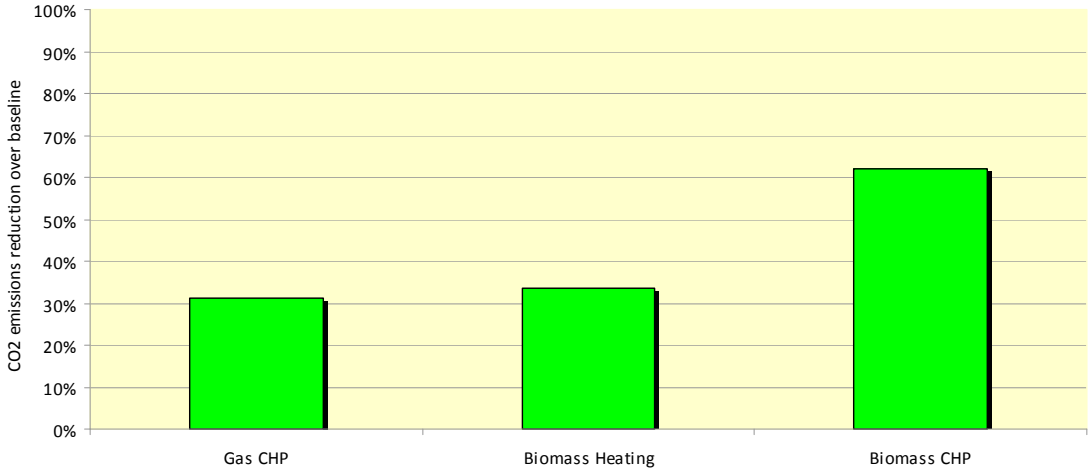
3.2.1 There are a range of design measures that can be taken into account as part of the overall masterplan (e.g. passive solar design and use of green infrastructure) and via the thermal performance of the scheme's individual buildings, all of which can help to reduce the development's overall energy demands.

How the Development Will Use Energy Efficiently (Being Clean)

3.2.2 Energy efficiency measures through the design and layout of the scheme and its individual buildings will form a fundamental part of the overall energy strategy for the development and be central to using less energy. In addition, the potential for a district heating scheme as an 'efficient' source of decentralised energy (utilising heat that would otherwise be wasted) can be considered.

3.2.3 As Figure 3.2 demonstrates, a district heating network serving the Graven Hill scheme could deliver reductions in CO_2 emissions of circa 30% (biomass heat only or gas CHP) and significantly beyond this if biomass CHP is used.

Figure 3.2 Graven Hill Scheme: Achievable CO_2 Reductions via District Heating



3.2.4 The overall mix of residential, commercial and employment uses proposed for the Graven Hill scheme means that a district heating network is a potentially attractive option. An initial assessment shows that the scheme could have an overall baseline demand for 39GW heat and 13GW electricity per annum (assuming that it is built to current Building Regulations - refer to Appendix A).

3.2.5 Because biomass CHP is a relatively unproven (and expensive) technology at present, gas CHP and biomass heating are considered to have the most potential in the short term. Box 2 sets out the key planning and design considerations for incorporating this technology within the masterplan.

Box 2 Design and Planning Considerations: District Heating Network

Assuming that the full potential of biomass was exploited across the whole scheme, at total of 4MW installed capacity could be delivered, comprising **two** 'energy centres' - one within the residential neighbourhood, close to the hotel/community uses and one to the south of the scheme associated with the commercial uses. Once the whole scheme has been built out, these two systems would be connected to provide a comprehensive network serving the whole site.

Each energy centre would accommodate two 1MW biomass boilers (one operating the summer, both in the winter) plus large thermal store and gas top up boiler.

The total land-take for each energy centre is estimated at 0.06-0.1ha (circa 300m^2 for the boiler house, including fuel store and thermal store, plus allowance for access and servicing of this facility).

For a biomass based option the key consideration will be where fuel can be supplied from, though in AMEC's experience if the demand exists then the market will respond.

Common constraints to district heating networks that would need to be explored as part of a detailed feasibility appraisal include: capital and operating costs (and payback), design and access, air quality, noise and impacts on local amenity and a mechanism for delivery.

3.2.6 The main barrier to bringing forward a district heating network alongside the proposed development at Graven Hill is likely to be the significant capital costs required for the plant(s) and supporting infrastructure. Further work would need to be progressed at detailed design stage, including discussions with an Energy Services Company (ESCO) who may be able to take such a project on if it is seen as a commercially attractive option.

3.2.7 With respect to potential links to the proposed Energy from Waste (EfW) plant at Ardley we note that the developer (Viridor) has identified the potential for heat and power to supply development at Bicester, specifically NW Bicester Eco-town proposals. The feasibility and viability of securing a wider connection to development at Graven Hill would need to be tested, though the main constraints are likely to be distance and cost.

How the Development Can Use Renewable Energy

3.2.8 There are a range of options for incorporating renewable energy as part of the Graven Hill scheme alongside or instead of CHP, including wind and micro-generation. Whilst wind would be unsuited as part of the overall Graven Hill scheme (i.e. due to the proximity of turbines to residential areas) there is some potential on DIO's wider landholding based on the screening exercise presented in Appendix B. The screening exercise shows that a single 2.5MW rated turbine could meet over one third of the development's electricity demands.

Table 3.1 Summary of Wind Potential on DIO's Landholding

Scale	Number of Turbines	Installed Capacity (MW)	Yield (GWh/yr)	Contribution to Graven Hill's Electricity Demands (~14GW per annum)
Large-scale (2.5MW)	1	2.5	4.9	35%
Medium-scale (1.3MW)	2	2.6	5.2	37%
Small-scale (600kW)	12	3.96	10.9	78%

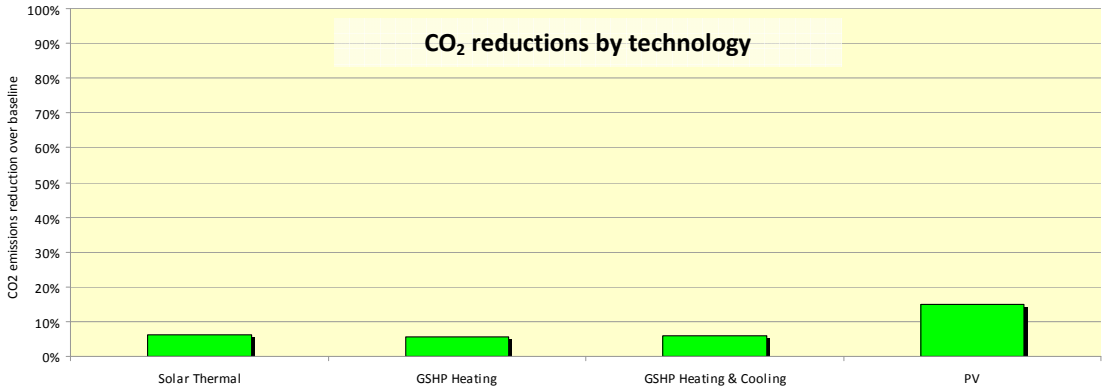
3.2.9 One of the key issues with wind however, is the potential for opposition to wider development proposals (onshore wind projects are typically controversial across the UK). The promotion of wind development in this area would need to be considered in close consultation with the local community and key stakeholders. Discussions with CDC would also be required, and it is important to highlight the planning guidance that the Council is currently preparing, to deal with wind turbine development in the District[3]. The impact of wind on wider MOD activity in this area (e.g. on radar) would also need to be considered in more detail.

3.2.10 As well as strategic scale technologies such as district heating and wind, an initial assessment into the emissions reductions that could be achieved by using different micro-generation technologies has been undertaken. The assessment has considered solar thermal, ground source heat pumps (GSHP) for heating or heating and cooling and solar photovoltaics. One possible constraint with solar options that would need to be assessed more closely is the impact of 'glare' on aircrews in the area.

3.2.11 Figure 3.3 demonstrates that the potential of these technologies in reducing overall emissions within the scheme is not as significant as wind or district heating, with solar thermal or ground source heat pumps able to deliver savings of between 5% and 10%, and solar PV between 10% and 15%.

[3] Draft Planning Guidance on the Residential Amenity Impacts of Wind Turbine Development, Cherwell District Council, November 2010.

Figure 3.3 Role of Micro-generation in Reducing CO2 Emissions



3.3 C Site: circa 70,000m^2 Distribution Warehouse

3.3.1 The proposed development on this site, which is predominantly planned for distribution warehouses (see Appendix A), could be linked to building integrated technologies such as solar PV and ground source heat pumps. Solar PV may be a particularly attractive option to consider given the available roof space and financial incentives such as the Feed-in-Tarrif.

4. Conclusions

4.1 Conclusions

4.1.1 This Energy Strategy has considered the opportunities for incorporating renewable and low carbon energy as part of the proposed development of Graven Hill and C Site, MOD Bicester, in response to national and emerging local policy. It is clear that there are a range of opportunities to plan for renewable and low carbon energy technologies within the masterplans for the respective schemes which can be tested further at detailed design stage. The implications of emerging policy in the next version of the Cherwell Core Strategy and national policy regarding zero carbon development will be fundamental to the overall strategy pursued.

Appendix A
Baseline Energy Demand and CO_2 Emissions

Introduction

In order to estimate the development's likely energy demand and related CO_2 emissions, a number of assumptions have been made with respect to the quantum and mix of development for each of the sites. These assumptions are summarised in Table A1.

Table A1 Quantum of Development and Mix

Site	Development mix
Graven Hill Site	1,900 dwellings 2,160m^2 B1 Office 20,520m^2 B1(c) and B2 Light Industrial 66,980m^2 B8 Warehouse 2,322m^2 Retail 2 FE school and Community Hall (600m^2) Hotel/Pub/Restaurant
C Site	70,400m^2 distribution warehouse Offices (224m^2) and ancillary facilities (918m^2)

Baseline Energy Demand and CO_2 emissions

Using the baseline building performance and levels of development presented in section 3.1 we have estimated the energy demand and related CO_2 emissions associated with the different options. To establish the 'baseline' energy demand and related CO_2 emissions we have assessed the individual components of the scheme (Table A1) as if built to current standards as at 2010. The results of this analysis are presented in Table A2.

Table A2 Estimated Baseline Energy Demand and CO_2 Emissions by Development Site

Development Site	Gas (Megawatt hours per year)	Electricity (Megawatt hours per year)	Estimated tonnes CO_2 per annum
Graven Hill Mixed Use Scheme	39,000	13,000	15,000
C Site	13,000	3,000	4,000

Source: AMEC

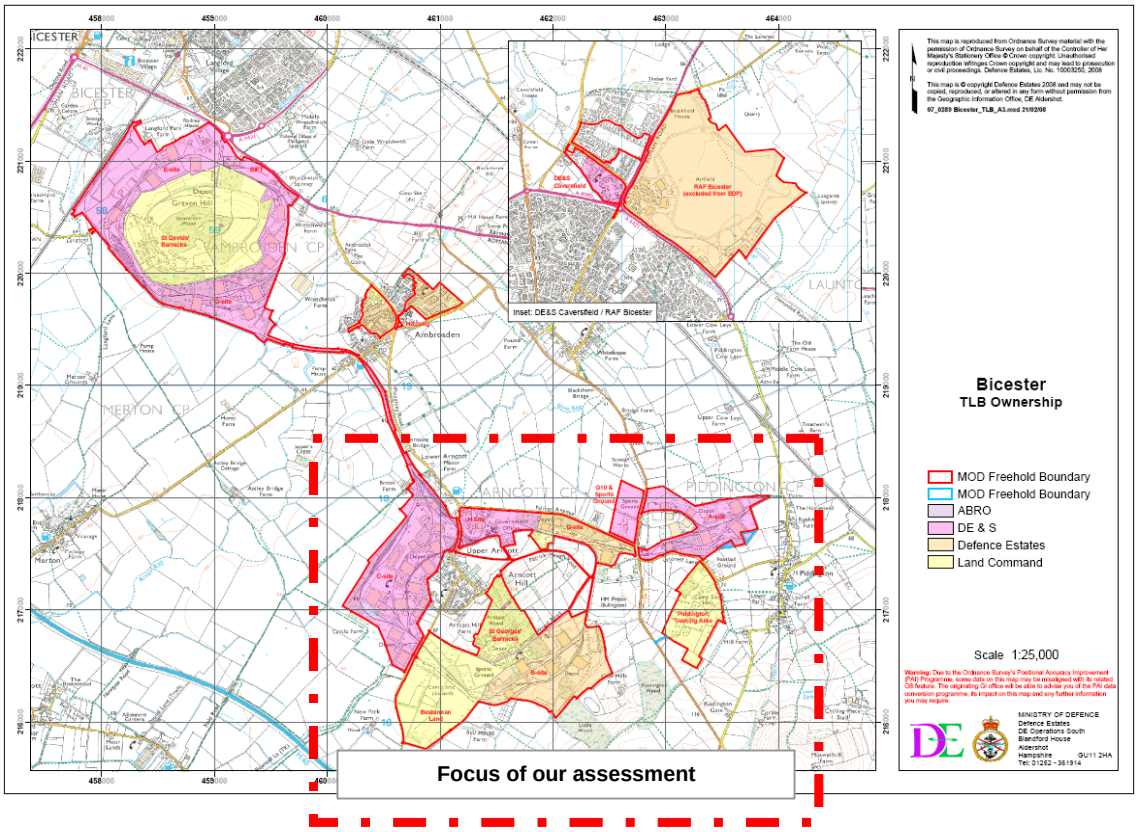
It is clear that it is the mixed use scheme at Graven Hill that will have the most demand for heating and power and produce the most emissions per annum; approximately 15,000 tonnes CO_2 if built to 2010 Building Regulations. C Site will have some demand, but it should be noted that the level and proportion will ultimately depend on the nature of the use within the distribution warehouse proposed, particularly in relation to the demand for heating or cooling.

Appendix B
Wind Site Screening

B1 Introduction

This Appendix presents the results of a desktop review of the potential for wind turbines on DIO's land at Bicester (Figure B1) based on Geographic Information System (GIS) mapping of the key constraints. Because Graven Hill is proposed for mixed use development, with limited space available to accommodate wind turbines, the focus of our assessment is on land to the south.

Figure B1 MOD Freehold Land at Bicester



B2 Approach

Estimating the 'Accessible Wind Resource'

Our approach is based on a robust, tried and tested methodology employed in our work with clients including local planning authorities and wind farm developers.

The aim of the assessment is to identify the 'accessible wind resource'. The accessible wind resource is that which could come forward pending site specific work reflecting:

- the detailed application of PPS 22 *Renewable Energy* and any local policy criteria;
- the statutory planning process, including requirements for Environmental Impact Assessment, reflecting ecology, landscape and visual and community effects for example (also considering the potential for 'cumulative' effects);
- stakeholder consultation including with the local planning authority, community groups, town and parish councils, Local airports, Ministry of Defence, NATS En Route Radar Ltd;
- further modelling and monitoring of wind speeds; and
- physical constraints and barriers to development including topography and vehicular access for example.

The constraints which we apply to estimate the total accessible wind resource are based on established technical judgements based on AMEC's view of good practice.

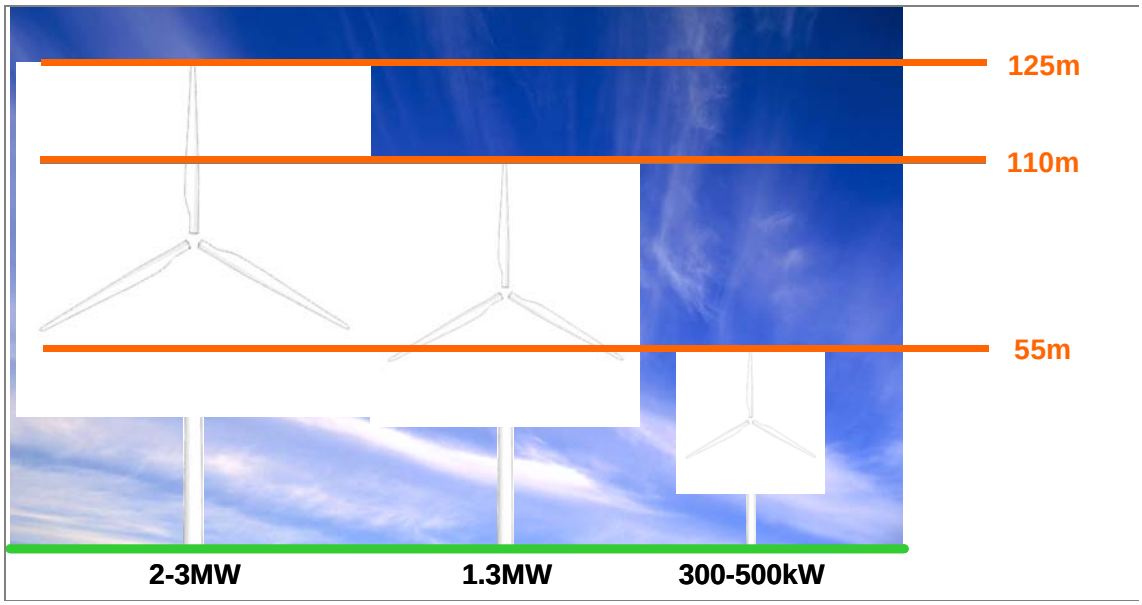
B3 Land Included in the Assessment

Our assessment focuses on land to the south of DIO's Estate (see Figure B1).

B4 Size of Turbines Considered

For this assessment three sizes of turbine were considered: large-scale; medium-scale; and small-scale. Figure B2 shows the relative sizes of the turbines considered.

Figure B2 Turbine Sizes Considered



B5 Identifying Wind Speeds

NoABL, the UK's wind speed database, is used for an initial view of wind speeds in the area. At least 6m per second at 45m is seen as necessary for a viable wind turbine. More detailed data is available to assess viability further (e.g. Carbon Trust Model). To progress a specific project the developer would need to undertake local modelling to assess wind speeds and viability further.

B6 Constraints Mapping

Table B1 summarises the constraints that have been considered when assessing the potential for wind, together with how the constraints are treated for the different sizes of turbine (small turbines can have less of an effect than larger ones). Appendix A provides an overview of our approach to estimating the accessible wind resource, focussing specifically on large scale wind (2.5-3MW turbines). The buffer distances simply need to be adjusted for medium and small scale wind.

Table B1 Constraints Considered and their Treatment by Turbine Size

Constraint	Large Wind (2-3MW)	Medium Wind (1.3MW)	Small Wind (300-500kW)
Nationally designated environmental sites[4] (landscape and ecological) Designated land identified as constrained for wind	Identified area only (no buffer)	Identified area only (no buffer)	Identified area only (no buffer)
Locally designated environmental sites (landscape and ecological) Designated land identified as constrained for wind	Identified area only (no buffer)	Identified area only (no buffer)	Identified area only (no buffer)
Noise (proximity to existing and proposed houses/settlements/developments for example) Land within this buffer identified as constrained for wind	500m	400m	200m
Existing infrastructure (Roads/Railways/Power lines) Land within this buffer identified as constrained for wind	140m	120m	60m
Topographical features Land within this buffer identified as constrained for wind	30m	30m	0m
Airports	Noted if within 30km (15km for non-safeguarded)	Noted if within 30km (15km for non-safeguarded)	None
MOD sites	Noted if within 30km regardless of operations	Noted if within 30km regardless of operations	None
Radar	Noted level of likely interference	Noted level of likely interference	None
Microwave communication links Land within this buffer identified as constrained for wind	100m	100m	None

[4] Including National Parks, Areas of Outstanding Natural Beauty, Special Areas of Conservation, Special Protection Areas, RAMSAR sites, National Nature Reserves and Sites of Special Scientific Interest for example.

B7 Development Plan Policy

The majority of the land that we have considered (Figure B1) lies within Cherwell District, though parts fall into Aylesbury Vale District and South Oxfordshire District. The PPS on Climate Change (2007) is clear that local planning authorities should provide a positive framework to support and encourage the take-up of renewable energy. Focussing specifically on policy in Cherwell, their draft Core Strategy (February 2010) provides the following policy:

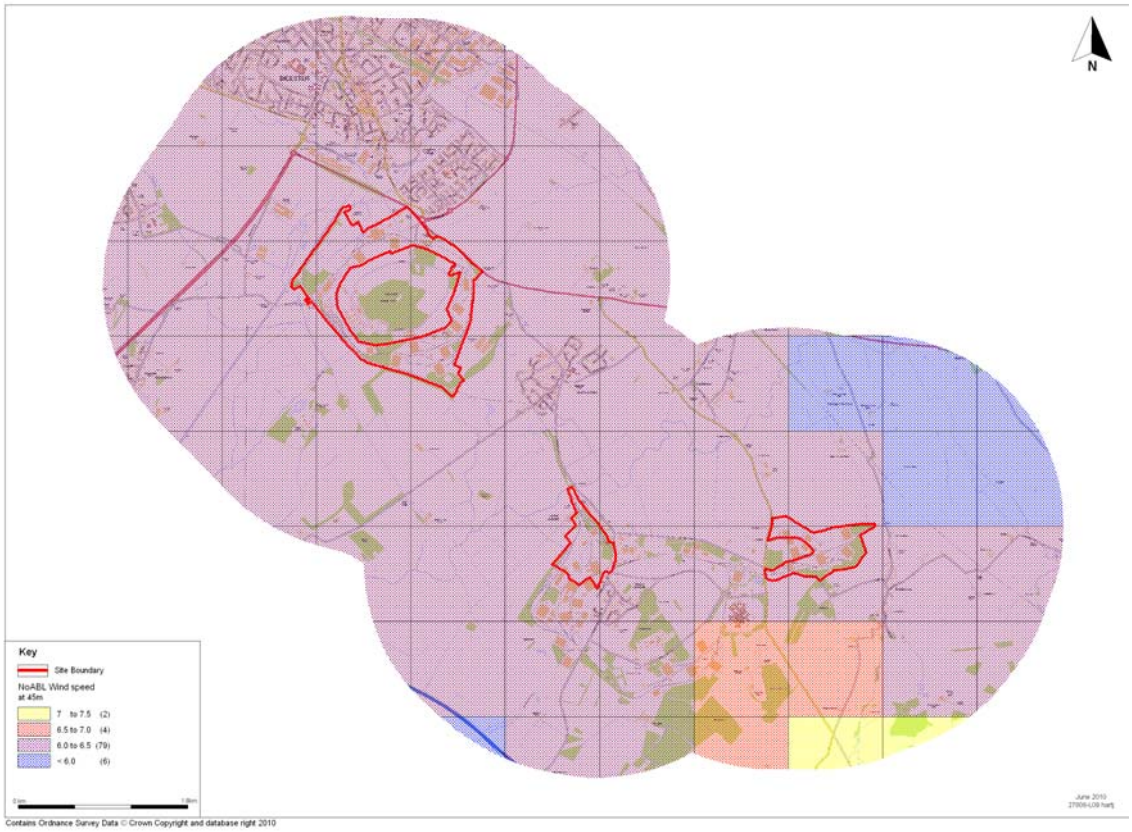
> *"Policy SD 3 Assessing Renewable Energy Proposals*
>
> *The Council supports renewable and low carbon energy where appropriate, and the potential local environmental, economic and community benefits of renewable energy schemes (including the contribution to national and regional targets for carbon emissions reduction/renewable energy generation) will be a material consideration in determining planning applications.*
>
> *In assessing planning applications, the South East Plan's 'Development Criteria' policy (NRM16) will be considered as well as the following issues which are of particular local significance in Cherwell:*
>
> - *Impacts on landscape and biodiversity designations (with reference to the South East Plan policy NRM15 on AONB)*
> - *Visual impacts on local landscapes*
> - *Impacts on the historic environment*
> - *Impacts on residential amenity*
> - *Impacts on aviation activities*
> - *Highways and access issues, and*
> - *Impacts on the Green Belt."*

B8 Results

Wind Speeds

Figure B3 demonstrates that most of this area has the minimum 6m/s for wind to be a potentially viable option.

Figure B3 Wind Speeds



Constraints Mapping

Based on GIS mapping of the above constraints we have identified locations for one large-scale turbine, two medium-scale turbines and 12 small-scale turbines across all of the sites. Table B2, below, summarises the potential that exists, with Figures B4, B5 and B6 showing constraints and the potential location for these wind turbines.

Table B2 Potential Number and Yield of Identified Turbines

Scale	Candidate Turbine	Number of Turbines	Installed Capacity (MW)	Yield[5] (GWh/year)
Large-scale	Nordex N80 2.5MW	1	2.5	4.9
Medium-scale	Nordex N60 1.3MW	2	2.6	5.2
Small-scale	Enercon E33 330kW	12	3.96	10.9

It is important to note that the number of turbines and yield is only an estimate of potential. Physical constraints on a site, including access and the heights of existing buildings will have an impact. Planning and environmental considerations may also reduce the eventual number of turbines and therefore yield. These figures should be considered the starting point for more detailed site assessments, including site survey work.

B9 Conclusions and Next Steps

Our assessment demonstrates that there is some potential for a wind development on DIO's land south of Bicester which warrants further investigation. Full feasibility studies would need to be undertaken to assess potential further, including consultation with key stakeholders such as microwave link operators, CAA, HSE, NATS En-route Radar Ltd and the local planning authority. In addition, the provisions of CDC's Planning Guidance on the Residential Amenity Impacts of Wind Turbine Development, currently in draft form, would need to be fully considered once this is adopted.

[5] Note: Although the larger turbines generate more electricity per machine they are fewer in number for a given space. Large wind turbines have a cut-in wind speed of 4-5m/s, smaller turbines (Enercon 330kW) are physically smaller and therefore require less inertia so can generate at lower wind speeds, which results in potentially more energy generated from a higher number of lower rated machines.

N

Upper Arncott

Lower Arncott

Piddington

Key

- Site Boundary
- Existing/Proposed development
- Roads and Railway with 140m buffer
- Noise receptor with 500m buffer
- Overhead power line with 140m buffer
- Microwave link with 100m buffer
- Grade II listed building
- Grade II* listed building
- Large-scale turbine with a 6x4 rotor diameter separation elipse

0 m — 900m

Scale 1:15,000 @ A3

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Figure B4
Potential Large-Scale Turbine Location

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N

Upper Arncott

Piddington

Key

- Site Boundary
- Existing/Proposed development
- Roads and Railway with 120m buffer
- Noise receptor with 400m buffer
- Overhead power line with 120m buffer
- Microwave link with 100m buffer
- Grade II listed building
- Grade II* listed building
- Medium-scale turbine with a 6x4 rotor diameter separation elipse

0 m — 900m

Scale 1:15,000 @ A3

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Figure B5
Potential Medium-Scale Turbine Locations

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N

Lower Arncott

Upper Arncott

Piddington

Piddington Wood

Ide Wood

Oldhouse Spinney

Gulf Course

Pans Hill

Roarstall Decoy

Dakcroft Farm

Muswell Hill

Key

- Site Boundary
- Existing/Proposed development
- Roads and Railway with 60m buffer
- Noise receptor with 200m buffer
- Overhead power line with 60m buffer
- Microwave link
- Grade II listed building
- Grade II* listed building
- Small-scale turbine with a 6x4 separation elipse

0 m — 900m

Scale 1:15,000 @ A3

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Figure B6
Potential Small-Scale Turbine Locations

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