

# **Environmental Statement**

**Volume 3, Appendix 20-5:** High-Level **Electromagnetic Field Assessment** 

September 2025
Revision 1

**Planning Inspectorate Reference: EN010168** 

**Document Reference: APP/6.3** 

**APFP** Regulation 5(2)(a)



# High-Level Electromagnetic Field Assessment

Lime Down Solar Park

September 2025

# **PLANNING SOLUTIONS FOR:**

- Solar
- Defence
- Telecoms
- Buildings
- Railways
- Wind
- Airports
- Radar
- Mitigation

www.pagerpower.com





# **EXECUTIVE SUMMARY**

# **Report Purpose**

Pager Power has been retained to assess the potential electromagnetic fields generated by electrical equipment within a fixed ground-mounted solar photovoltaic development with respect to safe levels for human exposure.

The Scheme comprises a solar photovoltaic (PV) electricity generating station of over 50 megawatts (MW) and 'associated development' comprising up to 500 MW export capacity Battery Energy Storage System (BESS), grid connection infrastructure (including underground cables) and other infrastructure integral to the construction, operation and maintenance, and decommissioning phases. The equipment of specific note to EMF comprises underground power cables (the Grid Connection Cables), transformers, inverters, distribution substations (new 132kV and 400 kV substations are proposed) and Battery Energy Storage System (BESS)<sup>1</sup>.

# **Emissions**

All electrical equipment emits electric and magnetic radiation. Power cables produce both electric and magnetic fields which can potentially affect human health. Radiation from underground cables is generally less than radiation from overhead powerlines because emissions from adjacent conductors within a cable tend to cancel each other out. When assessing the impacts of overhead power lines, it is important to consider the impact of both electric and magnetic fields. Underground cables generally cause a negligible electric field above ground - because of the attenuation provided by the cable sheathing and ground - but can cause a significant magnetic field which is dependent on the current in the conductors.

# Standards in the UK

The UK Policy on public exposure limits to EMF radiation is designed to comply with the 1998 ICNIRP (International Commission on the Non-Ionizing Radiation Protection) guidelines<sup>2</sup>. In 2010 ICNIRP produced new guidelines but these have not yet been incorporated into UK Policy.<sup>3</sup> The public exposure limits in UK policy define reference levels for electric and magnetic fields. Where field levels exceed these reference levels in significantly occupied spaces, further investigation is warranted. Further information can be found in Section 3 of the report.

<sup>&</sup>lt;sup>1</sup> The maximum voltages and potential locations for all underground cables, transformers/PV inverters and BESS have been considered to account for a worst-case scenario in the absence of a finalised electrical design of the site.

<sup>&</sup>lt;sup>2</sup> 1998 International Commission on the Non-Ionizing Radiation Protection (ICNIRP) guidelines. Available at

<sup>&</sup>lt;sup>3</sup> 2010 International Commission on the Non-Ionizing Radiation Protection (ICNIRP) guidelines. Available at



### **Overall Conclusion**

Maximum levels of electromagnetic radiation from the 400kV Grid Connection Cables which represent the worst case for all Scheme cabling are predicted to be below ICNIRP reference levels for magnetic fields directly above the cables.

Radiation from the transformers and inverters will be even less significant because the equipment is typically housed in protective containers and will be CE marked ("Conformité Européene" or "European Conformity"), meaning they should not generate or be affected by electromagnetic disturbance.

Additionally, radiation from the substations and BESS Area will not be significant as the infrastructure is at a safe distance from surrounding dwellings.

# **Conclusions - 400kV Grid Connection Cables**

The maximum magnetic field produced by the Grid Connection Cables is predicted to be 96.17 micro-Tesla. The magnetic field levels are therefore below the reference level from the public exposure limits in UK policy (100 micro-Tesla for magnetic fields). External electric fields are not produced from underground cables so have not been considered. As the cables are underground, no setback distances are required for any underground grid connection cables.

Other cables, including the On-Site and Interconnecting Cables are of a lower voltage and will therefore produce lower levels of EMFs that are negligible compared to 400kV cables, and would not require any setback distances from environmental receptors (PRoWs, permissive paths, and place of work).

# **Conclusions - Transformers and Inverters**

Notable sources of radiation other than the cables will be the transformers and inverters positioned across the Scheme.

The transformers and inverters should be 'CE' marked. CE marking indicates that a product has been assessed by the manufacturer and deemed to meet European Union safety, health and environmental protection requirements. CE marking requirements have been adopted and extended indefinitely in Great Britain.

The CE marking should ensure that electrical and electronic equipment does not generate, or is not unintentionally affected by, electromagnetic disturbance.

The transformers and inverters are also predicted to produce fields at a lower level than that of underground cables because the equipment will be housed in protective containers.



# **Conclusions - Substations and BESS**

The Scheme will connect to the Existing National Grid Melksham Substation. According to UK regulation<sup>4</sup>, the substation conforms with the applicable exposure limitations for the general public, and the electromagnetic field from the equipment inside a substation does not extend far, if at all, outside the perimeter fence.

New 132kV and 400kV substations are also proposed and will also conform to UK regulation and no significant EMFs are predicted to extend beyond the Scheme boundary or exceed applicable exposure limits. The closest PRoW is approximately 250m away, and the closest dwelling or place of work is 540m away.

The BESS Area will contribute to the electromagnetic radiation produced by the Scheme. However, when evaluating the proposed BESS Area, the closest PRoW is approximately 350m away, and the closest dwelling or place of work is 800m away. As electromagnetic radiation levels reduce with increased distance, all nearby dwellings, PRoWs, and places of work are situated at a safe distance from the BESS installations.

Source: <a href="https://www.gov.uk/government/publications/electromagnetic-compatibility-regulations-2016/electromagnetic-compatibility-regulations-2016-great-britain">https://www.gov.uk/government/publications/electromagnetic-compatibility-regulations-2016/electromagnetic-compatibility-regulations-2016-great-britain</a>



# **LIST OF CONTENTS**

Execu	tive Su	ımmary	2
	Repo	rt Purpose	2
	Emiss	ions	2
	Stand	ards in the UK	2
	Overa	all Conclusion	3
	Conc	usions - 400kV Grid Connection Cables	3
	Conc	usions - Transformers and Inverters	3
	Conc	usions - Substations and BESS	4
List of	Conte	ents	5
List of	Figure	es	7
List of	Table	S	7
About	Pager	Power	8
1	Intro	duction	9
	1.1	Purpose of the Study	9
	1.2	Assessed Infrastructure	9
2	Tech	nical Background	11
	2.1	Emissions	11
	2.2	Electromagnetism	11
	2.3	Health Concerns - Potential Effects	11
	2.4	Radiation from Home Electrical Equipment	12
	2.5	Radiation Reduction with Distance	12
3	Overview of Electromagnetic Fields		
	3.1	Overview	13
	3.2	Exposure limits in the UK	13
	3.3	Height Above Ground Used for Testing Compliance	14
	3.4	Safe Levels – Summary	14
4	Tech	nical Assessment	15
	4.1	Field Levels - 400kV Grid Connection Cables	15



	4.2	Recommended Minimum Clearance Distances	16
	4.3	Radiation from Other Sources	17
	4.4	Comparative Assessment	20
	4.5	Cumulative Effects	20
5	Cond	lusions	. 22
	5.1	400kV Grid Connection Cables	22
	5.2	Transformers and Inverters	22
	53	Substations and RESS	22



# **LIST OF FIGURES**

Figure 1 The Order Limits - Assessed infrastructure locations	10
Figure 2 Typical magnetic fields associated with 400kV Grid Connection Ca	ables 15
Figure 3 Location of Existing National Grid Melksham Substation	18
Figure 4 BESS Area and 400kV Substation at Lime Down D	18
Figure 5 Minimum distance between the BESS Area and 400kV Substat Down D and the nearest dwelling	

# **LIST OF TABLES**

Table 1 Typical emissions from home electrical equipment	12
Table 2 ICNIRP Exposure Limits 1998	14
Table 3 Typical magnetic field levels for an underground 400kV c EMFS.info)	•
Table 4 Recommended minimum clearance distances for the 400kV Grid Cables	



# **ABOUT PAGER POWER**

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 62 countries internationally.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable, and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.



# 1 INTRODUCTION

# 1.1 Purpose of the Study

Pager Power has been retained to assess the potential electromagnetic fields generated by electrical equipment within a fixed ground-mounted solar photovoltaic development with respect to safe levels for human exposure.

The Scheme, located in Wiltshire and South Gloucestershire, comprises a solar photovoltaic (PV) electricity generating station of over 50 megawatts (MW) and associated development comprising up to 500 MW export capacity Battery Energy Storage System (BESS), grid connection infrastructure (including underground cables) and other infrastructure integral to the construction, operation and maintenance, and decommissioning phases. The equipment of specific note to EMF comprises underground power cables, transformers, inverters, distribution substation and Battery Energy Storage System (BESS)<sup>5</sup>.

# 1.2 Assessed Infrastructure

Figure 1 on the following page shows the Order Limits for the Scheme, which is the maximum extent of the land required for the Scheme and includes including the Solar PV Sites, the Cable Route Corridor, and Highways Improvement Areas. More detailed sections are shown within the technical assessment sections of this report. Figure 1 is intended to provide an overview of the environment and infrastructure.

<sup>&</sup>lt;sup>5</sup> The maximum voltages and potential locations for all underground cables, transformers/PV inverters and BESS have been considered to account for a worst-case scenario in the absence of a finalised electrical design of the site.





Figure 1 The Order Limits - Assessed infrastructure locations



# 2 TECHNICAL BACKGROUND

#### 2.1 Emissions

All electrical equipment emits electric and magnetic radiation. Power cables produce both electric and magnetic fields which can potentially affect human health. Radiation from underground cables is generally less than radiation from overhead lines because emissions from adjacent conductors within a cable tend to cancel each other out. When assessing the impacts of overhead powerlines, it is important to consider the impact of both electric and magnetic fields.

Underground cables generally cause a negligible electric field above ground – because the cable sheathing and soil filter most or all of the electrical field - but can cause a significant magnetic field which is dependent on the current in the conductors.

# 2.2 Electromagnetism

The movement of electric charge causes electric and magnetic fields to be produced in the space surrounding the charge. Human exposure to such fields can cause health problems if persistent and/or they are of high strength. The magnitude of the effects is dependent on both the field strength and the exposure time.

# 2.3 Health Concerns - Potential Effects

The potential effects on human health caused by time-varying magnetic fields, such as those generated by AC<sup>6</sup> cables, are due to induced current on functions of the central nervous system. There are various international bodies which provide maximum safe exposure levels to time varying electromagnetic fields.

Various sources of information relating to safe exposure levels have been reviewed as part of this study.

The UK Policy on public exposure limits to EMF radiation is designed to comply with the 1998 ICNIRP (International Commission on the Non-Ionizing Radiation Protection) guidelines<sup>7</sup>. In 2010 ICNIRP produced new guidelines but these have not yet been incorporated into UK Policy.<sup>8</sup> The public exposure limits in UK policy define reference levels for electric and magnetic fields. Where field levels exceed these reference levels in significantly occupied spaces, further investigation is warranted.

<sup>&</sup>lt;sup>6</sup> Alternating Current

<sup>&</sup>lt;sup>7</sup> 1998 International Commission on the Non-Ionizing Radiation Protection (ICNIRP) guidelines. Available at

<sup>&</sup>lt;sup>8</sup> 2010 International Commission on the Non-Ionizing Radiation Protection (ICNIRP) guidelines. Available at



Another relevant resource consulted is the EMFs.info webpage<sup>9</sup>, where the UK electricity industry have collected the relevant studies pertaining to safe limits on exposure in the UK and elsewhere in the world. The relevant sections are analysed in the next chapter.

# 2.4 Radiation from Home Electrical Equipment

The World Health Organization (WHO) publishes data regarding electromagnetic fields including the following typical levels for home electrical equipment, shown in Table 1 below.

Appliance	Electric field strength (Volts per metre)	Magnetic field strength (micro-Tesla) (at 1 metre)	
Hair Dryer	80	0.01 - 7	
Iron	120	0.12 - 0.3	
Vacuum Cleaner	50	2 - 20	
Refrigerator	120	0.01 - 0.25	
Television	60	0.04 - 2	

Table 1 Typical emissions from home electrical equipment

# 2.5 Radiation Reduction with Distance

Radiation levels reduce with distance which means, for example, the typical magnetic field from a vacuum cleaner reduces from 800 micro-Tesla to 2 micro-Tesla when the separation distance increases from 3 centimetres to 1 metre.

Likewise, radiation levels from the On-Site Cables, Interconnecting Cables, Grid Connection Cables, transformers, inverters, and BESS Area will reduce with distance in any direction – including towards a receptor.



# 3 OVERVIEW OF ELECTROMAGNETIC FIELDS

### 3.1 Overview

The Electricity Networks Association<sup>10</sup> provides a comprehensive overview of electromagnetic fields (EMFs) and the issues associated with these on their webpage. Regarding health issues caused by EMFs they state the following:

'However, there are suggestions that magnetic fields may cause other diseases, principally childhood leukaemia, at levels below these limits. The evidence for this comes from epidemiology studies, which have found a statistical association - an apparent two-fold increase in leukaemia incidence, from about 1 in 24,000 per year up to 1 in 12,000 per year, for the children with the top half percent of exposures. The evidence is strong enough for magnetic fields to be classified by the World Health Organization as "possibly carcinogenic". But because these studies only show statistical associations and do not demonstrate causation, and because the evidence from the laboratory is against, the risk is not established, it remains only a possibility.'

# 3.2 Exposure limits in the UK

As set out in the previous section, the limits in the UK come from the 1998 ICNIRP guidelines. The original guidance in 1998 specified:

- i) Basic Restrictions
  - These are the levels at which radiation is potentially harmful to humans. This is a current density<sup>11</sup> given in mA m<sup>-2</sup> (milliamps per metre squared).
- ii) Reference Level (Investigation Level)
  - Provided for practical exposure assessment purposes to determine whether the basic restrictions are likely to be exceeded. Compliance with the reference level will ensure compliance with the relevant basic restriction.
- iii) Field Actually Required

This is the field strength at which the basic restriction is likely to be exceeded.

The values for the above stated in the ICNIRP 1998 paper are shown in Table 2 on the following page. These are the public exposure values, not the occupational exposure values – the former is more conservative than the latter by a factor of five.

 $<sup>^{10}</sup>$  This is an industry body for the companies which run the UK and Ireland's energy networks. The group comprises 14 members including National Grid.

<sup>&</sup>lt;sup>11</sup> Current density is the amount of electric current flowing through a unit area.



ICNIRP 1998 - Public Exposure Limits					
Basic Restriction (mA m <sup>-2</sup> )	Magnetic Fields Reference Level (μΤ)	Electric Fields Reference Level (kV m <sup>-1</sup> )	Magnetic Field Actually Required (μΤ)	Electric Field Actually Required (kV m <sup>-1</sup> )	
2	100	5	360	9	

Table 2 ICNIRP Exposure Limits 1998

The levels in Table 2 will be considered within this analysis.

# 3.3 Height Above Ground Used for Testing Compliance

EMFs.info specifically states the following with regard to the height to be used to test compliance:

'The standard height for measuring fields, especially from power lines, is 1 m above ground level ... This isn't just because it's a convenient round number, it's because roughly half way up the height of a standing person is actually the height that gives the best approximation to the induced current in the body.'

# 3.4 Safe Levels - Summary

The values of interest are those shown in Table 2 above. Effectively, this means that in locations of significant exposure time, such as residences, levels should be below:

- 100μT (magnetic fields); and
- 5kV m<sup>-1</sup> (electric fields).

Values exceeding the limits above, at one metre above ground level, would suggest that further investigation is required.



# 4 TECHNICAL ASSESSMENT

# 4.1 Field Levels - 400kV Grid Connection Cables

Field level data from various cable configurations have been sourced from EMFS.info. The data below and on the following page shows the magnetic fields for 400kV Grid Connection Cables, which represent the maximum assumed voltage for underground cables in the Scheme, considering a worst-case scenario. Typical values for magnetic fields are approximately a third of these maximum values because for most of the time they are not operated at maximum load<sup>12</sup>. The assessment accounts for varying cable voltages in the Scheme, with the analysis based on the maximum and shallowest depths to adopt a conservative approach. Maximum field data has been used where possible to provide a more conservative assessment. It's important to note that there are no electric fields associated with underground cables, as the ground provides shielding from electric fields. The relevant chart is shown in Figure 2 below. Table 3 on the following page provides the associated indicative numerical values at set distances.

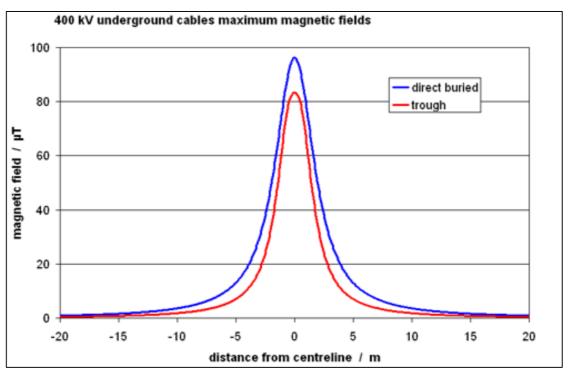


Figure 2 Typical magnetic fields associated with 400kV Grid Connection Cables

<sup>12</sup> Source:



Distance from Centreline (m)	Magnetic Field (trough double circuit cable with 0.13m spacing and 0.3m depth)	Magnetic Field (direct buried single cable with 0.5m spacing and 0.9m depth) <sup>13</sup>
0	83.30 micro Teslas	96.17 micro Teslas
5	7.01 micro Teslas	13.05 micro Teslas
10	1.82 micro Teslas	3.58 micro Teslas
20	0.46 micro Teslas	0.92 micro Teslas

Table 3 Typical magnetic field levels for an underground 400kV cable (source: EMFS.info)

# 4.2 Recommended Minimum Clearance Distances

The recommended minimum clearance distances for 400kV Grid Connection Cables based on the public exposure limits previously referenced in this report for magnetic and electric fields are presented in Table 4 below.

The dataset provided maximum values and typical values for the configurations that have been evaluated – in all cases the 'maximum' option has been chosen where possible in order to remain conservative.

Type of Line	Recommended minimum Clearance Distance (m)	Estimated Maximum Magnetic Field (micro- Tesla)	Estimated Maximum Electric Field (kV/m)	
400kV Grid Connection Cable	None	96.17 (below 100 limit)	-	

Table 4 Recommended minimum clearance distances for the 400kV Grid Connection Cables

This shows that clearance distances (setbacks) are not required for any Grid Connection Cables. The table highlights that the maximum fields produced by the 400kV Grid Connection Cables are below the acceptable exposure limit even when directly above the cable circuit and significant effects upon human health are not predicted.

All other cables within the Scheme (including Interconnecting and On-Site cables) will be of a lower voltage than the Grid Connection Cables and will therefore produce lower levels of magnetic fields. These EMFs will not be significant and as no clearances are required for 400kV cables, no setbacks would be required for any other cables within the Scheme.

<sup>&</sup>lt;sup>13</sup> This cable was used for the assessment in the following sections.



# 4.3 Radiation from Other Sources

#### 4.3.1 Transformers and Inverters

Notable sources of radiation, other than the 400kV Grid Connection Cables, will include the transformers and inverters positioned across the Solar PV Sites.

The PV inverters should be CE marked (Conformité Européene, or European Conformity marking), and/or 'UKCA' marked (UK Conformity Assessed). CE and UKCA marking indicates that a product has been assessed by the manufacturer and deemed to meet the safety, health and environmental protection requirements of the European Union<sup>[1]</sup> and the United Kingdom<sup>[2]</sup>, respectively. CE marking requirements have been adopted and extended indefinitely in Great Britain until the UK left the EU in 2020. From 1 January 2021, the UKCA mark started to replace the CE mark for goods sold within Great Britain, and the CE mark has continued to be required for goods sold in Northern Ireland. This will be confirmed prior to installation.

The relevant EU Directive for CE marking is<sup>[3]</sup> Electromagnetic Compatibility Directive 2014/30/EU, and the relevant UK Statutory guidance for UKCA marking is the Electromagnetic Compatibility Regulations 2016<sup>[4]</sup>. This legislation should ensure that electrical and electronic equipment should not generate or be affected by electromagnetic disturbance

Additionally, the transformers and PV inverters are also predicted to produce fields at a lower level than that of Grid Connection Cables as the equipment will be housed in protective containers.

Therefore, the transformers and inverters may be located anywhere within the Scheme perimeter without exceeding applicable exposure limits.

# 4.3.2 Substations and BESS Area

Other notable sources of radiation associated with the Scheme include the substations and BESS Area. The BESS Area is proposed to be located at Lime Down D and five new substations are proposed (one 400kV and four 132kV) as well as upgrading works to the existing National Grid Melksham Substation. In terms of the new substations the 400kV substation is assumed to represent the worst case and therefore the others have not been explicitly assessed. The locations of these are shown in Figure 3 and Figure 4 below and on the following page, with the purple polygons in Figure 3 and Figure 4 representing the substations and the green polygon in Figure 4 representing the BESS Area.

<sup>[1]</sup> Source:

[2] Source: https://www.gov.uk/guidance/using-the-ukca-marking.

[3] Source:

[4] Source: https://www.gov.uk/government/publications/electromagnetic-compatibility-regulations-2016/electromagnetic-compatibility-regulations-2016-great-britain.



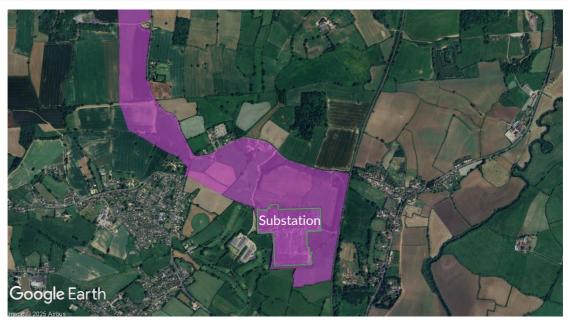


Figure 3 Location of Existing National Grid Melksham Substation



Figure 4 BESS Area and 400kV Substation at Lime Down D

The minimum horizontal distance between the BESS Area at Lime Down D and any dwelling is approximately 800m, whilst the distance between the 400kV Substation and any dwelling is approximately 540m. This is illustrated in Figure 5 below.





Figure 5 Minimum distance between the BESS Area and 400kV Substation at Lime Down D and the nearest dwelling

Significant radiation is not predicted from the substations and BESS because:

- Melksham Substation is more than 300 metres from any dwelling and would be required to comply with the relevant exposure limits for the general public, and the electromagnetic fields from the equipment inside a substation do not extend far if at all outside the perimeter fence;
- The proposed BESS Area is approximately 800 metres from any dwelling, meaning that all dwellings are at a safe distance as electromagnetic radiation levels reduce as the separation distance increases;
- The proposed BESS Area is approximately 350m from any PRoW, meaning that all
  members of the public are at a safe distance as electromagnetic radiation levels reduce
  as the separation distance increase;
- The 400kV substation is located approximately 540m from any dwelling, meaning that all dwellings are at a safe distance as electromagnetic radiation levels reduce as the separation distance increases;
- The 400kV substation is located approximately 250m from any PRoW, meaning that all members of the public are at a safe distance as electromagnetic radiation levels reduce as the separation distance increases; and
- Other 132kV substations will produce lower levels of EMF compared to the Existing National Grid Melksham Substation and the 400kV Substation. None of the 132kV substations are located within 100m of dwellings.

The distances between the PRoW and residential dwellings and the locations of the proposed substation and BESS have been measured as the worst-case that the substation and BESS are located in the south-west corners of the identified areas in Figure 5.



Therefore, this infrastructure may be located anywhere within the marked area (purple and yellow in Figure 5) without exceeding applicable exposure limits.

# 4.4 Comparative Assessment

The maximum magnetic field produced by household appliances can reach up to 50 micro-Tesla<sup>14</sup>. It would follow that appliances with higher voltages would generate stronger magnetic fields. For instance, the 400kV Grid Connection Cables are projected to produce a maximum magnetic field of 96.17 micro-Tesla at 1m above ground level. While this value is slightly higher than that of household appliances, it remains within acceptable exposure limits. Notably, the magnetic field strength is expected to drop to approximately 13 micro-Tesla just 5 meters from the source for 400kV cables less than 1 meter deep; a value even less than that of a vacuum cleaner. With the confirmed depth of the high voltage 400kV Grid Connection Cables being up to 2 meters for the Scheme, a likely reduction in the strength of the magnetic field is predicted.

Moreover, the transformers and inverters will produce magnetic fields at levels lower than the Grid Connection Cables. Although these will be above ground, they will be housed in protective containers and be CE and/or UKCA marked.

The existing National Grid Melksham Substation conforms with the applicable exposure limitations for the general public and the electromagnetic field from the equipment inside a substation does not extend far, if at all, outside the perimeter fence. The new 132kV and 400kV substations will also conform to the UK regulation and no significant EMFs are predicted to extend beyond the Scheme boundary or exceed order limits.

The BESS Area will contribute to the electromagnetic radiation produced by the Scheme. However, when evaluating the proposed BESS Area, the closest dwelling is approximately 800m away in a worst case scenario. As electromagnetic radiation levels reduce with increased distance, all nearby dwellings are situated at a safe distance from the BESS installations.

### 4.5 Cumulative Effects

When assessing the cumulative effects of electromagnetic fields, the worst case is based upon the addition of source a and source b; however, it is important to note that this is only true for magnetic fields that are exactly in line on the same axis, moving in the same direction. When the electromagnetic fields are not in line, the sum of these is less than 'a+b'.

For the purpose of this assessment the worst case has been calculated i.e. based upon 'a+b'. As there are no proposed overhead powerlines to consider for the Scheme, there are no cumulative effects to assess. As discussed in Section 4.3, the transformers, inverters, substations, and BESS produce smaller magnetic fields than that of the underground Grid Connection Cables, thus, considering all sources of radiation and their relative locations, the cumulative magnetic and electric fields are predicted to be below the acceptable exposure limits.

14 S	ource:			
		I		



The cumulative effects are not significantly impacted by the use of household items. Electrical household appliances will add to the overall exposure of electromagnetic fields; however, these levels will still remain below the recommended exposure limit, due to the lower voltages of the appliances, and are not used constantly, providing only a temporary addition to the resultant electromagnetic field levels.



# 5 CONCLUSIONS

# 5.1 400kV Grid Connection Cables

The maximum magnetic field produced by the Grid Connection Cables is predicted to be 96.17 micro-Tesla. The magnetic field levels are therefore below the reference level from the public exposure limits in UK policy (100 micro-Tesla for magnetic fields). External electric fields are not produced from underground cables so have not been considered. As the cables are underground, no setback distances are required for any underground grid connection cables.

Other cables, including the On-Site and Interconnecting Cables are of a lower voltage and will therefore produce lower levels of EMFs that are negligible compared to 400kV cables, and would not require any setback distances from environmental receptors (PRoWs, permissive paths, and place of work).

# 5.2 Transformers and Inverters

Notable sources of radiation other than the cables will be the transformers and inverters positioned across the Scheme.

The transformers and inverters should be 'CE' marked. CE marking indicates that a product has been assessed by the manufacturer and deemed to meet European Union safety, health and environmental protection requirements. CE marking requirements have been adopted and extended indefinitely in Great Britain.

The CE marking should ensure that electrical and electronic equipment does not generate, or is not unintentionally affected by, electromagnetic disturbance.

The transformers and inverters are also predicted to produce fields at a lower level than that of underground cables because the equipment will be housed in protective containers.

# 5.3 Substations and BESS

The Scheme will connect to the Existing National Grid Melksham Substation. According to UK regulation<sup>15</sup>, the substation conforms with the applicable exposure limitations for the general public, and the electromagnetic field from the equipment inside a substation does not extend far, if at all, outside the perimeter fence.

New 132kV and 400kV substations are also proposed, and will also conform to UK regulation and no significant EMFs are predicted to extend beyond the Scheme boundary or exceed applicable exposure limits. The closest PRoW is approximately 250m away, and the closest dwelling or place of work is 540m away.

The BESS Area will contribute to the electromagnetic radiation produced by the Scheme. However, when evaluating the proposed BESS Area, the closest PRoW is approximately 350m

Source: <a href="https://www.gov.uk/government/publications/electromagnetic-compatibility-regulations-2016/electromagnetic-compatibility-regulations-2016-great-britain">https://www.gov.uk/government/publications/electromagnetic-compatibility-regulations-2016/electromagnetic-compatibility-regulations-2016-great-britain</a>



away, and the closest dwelling or place of work is 800m away. As electromagnetic radiation levels reduce with increased distance, all nearby dwellings, PRoWs, and places of work are situated at a safe distance from the BESS installations.



Pager Power Limited
Stour Valley Business Centre
Sudbury
Suffolk
CO10 7GB

Tel: +44 1787 319001 Email: info@pagerpower.com Web: www.pagerpower.com