

The Eggborough CCGT Project

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The Eggborough CCGT (Generating Station) Order

Land at and in the vicinity of the Eggborough Power Station site,
near Selby, North Yorkshire, DN14 0BS

Indicative Lighting Strategy

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Regulation 5(2)(q)



Applicant: Eggborough Power Limited

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GLOSSARY

Abbreviation	Description
AGI	Above Ground Installation
ANO	Air Navigation Order
BS	British Standard
CAA	Civil Aviation Authority
CCGT	Combined Cycle Gas Turbine – a highly efficient form of energy generation technology. An assembly of heat engines work in tandem using the same source of heat to convert it into mechanical energy which drives electrical generators and consequently generates electricity.
CEMP	Construction Environmental Management Plan – a plan to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area.
CIBSE	The Chartered Institute of Building Services Engineers
CIE	Commission Internationale de L'Eclairage
curfew	The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
E	Illuminance – The quantity of light, or luminous flux falling on a unit area of a surface in Lux (lx). One Lux is equivalent to one lumen per square metre
Eh	Horizontal Illuminance in Lux (lx)
EIA	Environmental Impact Assessment. The assessment of the likely significant environmental effects of a development undertaken in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulation 2009.
EN	European
EPA	Environmental Protection Act
EPH	Energetický A Prumyslový Holding – the holding company of EP UK. EPH owns and operates assets in the Czech Republic, Slovak Republic, Germany, Italy, Hungary, Poland and the United Kingdom.
EPL	Eggborough Power Limited (The Applicant)
ES	Environmental Statement – A report in which the process and results of an Environment Impact Assessment are documented.
Ev	Ev = Vertical Illuminance in Lux (lx)
Glare	A sensation that is produced by bright areas within the field of vision and may

Abbreviation	Description
	be experienced either as discomfort glare or disability glare. Glare caused by reflections in specular surfaces is usually known as veiling reflections or reflected glare
I	Light Intensity in Candelas (cd)
ILP	The Institute of Lighting Professionals
L	Luminance in Candelas per square metre (cdm-2)
LG	Lighting Guide
Lv	Veiling Luminance – A measure of the loss of visibility caused by the disability glare from the obtrusive light installation
NPPF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Project – defined by the Planning Act 2008 and cover projects relating to energy (including generating stations, electric lines and pipelines); transport (including trunk roads and motorways, airports, harbour facilities, railways and rail freight interchanges); water (dams and reservoirs, and the transfer of water resources); waste water treatment plants and hazardous waste facilities. These projects are only defined as nationally significant if they satisfy a statutory threshold in terms of their scale or effect.
NYCC	North Yorkshire County Council
Photocell	A light sensing device used for switching/controlling luminaires
PINS	Planning Inspectorate
PA	Planning Act
RGL	Glare Rating Limit – A metric used for the assessment of glare
SDC	Selby District Council
SLL	Society of Light and Lighting
TI	Threshold Increment
ULR	Upward Lighting Ratio of the installation – the maximum permitted percentage of luminaire flux that goes directly into the sky. This metric is often used as a measure of ‘sky-glow’

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SUMMARY

1. This Indicative Lighting Strategy document discusses the type and level of lighting requirements of a proposed gas-fired electricity generating station in Eggborough, North Yorkshire. An overview of the Proposed Development and site location is included in Section 1.
2. Section 2 provides a review of the relevant light standards and guidance. It discusses the legislative background on light pollution, the planning policy context in national policy statements and the National Planning Policy Framework, before discussing international and national guidance available on limiting light pollution, with reference to the Institute of Lighting Professionals lighting limits.
3. Section 3 discusses the lighting standards and guidance on limiting light levels, with reference to the lighting requirements outlined in British Standards Institute BS EN 12464-2:2014. A summary of other guidance and reference documents is also discussed, along with the Civil Aviation Authority aviation lighting requirements for tall structures.
4. Section 4 outlines the sensitive receptors to light at the site and surrounding area, including residential, road, rail and ecological – these are mapped on Figure 1 for ease of reference.
5. Section 5 provides an overview of the obtrusive light level limits that will be followed to minimise light spill to each of the receptor categories outlined in Section 4. Sections 6 and 7 then discuss the site lighting requirements for the operational and construction phase of the generating station site, respectively. This includes the provision of aviation warning lighting on the proposed stack (during operation) and on cranes above 150 m in height above ground (during construction). A number of indicative impact avoidance measures are outlined in Section 8, which are to be adopted as good lighting design practice, but will be confirmed at the detailed design stage.
6. It is concluded in Section 8 that detailed information on the lighting to be used at the Proposed Development is currently unknown; however the document provides an outline of the lighting requirements and identifies potential measures to control obtrusive light through detailed design of the lighting scheme.

1.0 INTRODUCTION

Overview

- 1.1 This Indicative Lighting Strategy has been prepared on behalf of Eggborough Power Limited ('EPL' or the 'Applicant'). It forms part of the application (the 'Application') for a Development Consent Order (a 'DCO'), that has been submitted to the Secretary of State (the 'SoS') for Business, Energy and Industrial Strategy, under section 37 of 'The Planning Act 2008' (the 'PA 2008').
- 1.2 EPL is seeking development consent for the construction, operation and maintenance of a new gas-fired electricity generating station with a gross output capacity of up to 2,500 megawatts ('MW'), including electrical and water connections, a new gas supply pipeline and other associated development (the 'Project' or 'Proposed Development') on land at and in the vicinity of the existing Eggborough coal-fired power station, near Selby, North Yorkshire.
- 1.3 A DCO is required for the Proposed Development as it falls within the definition and thresholds for a 'Nationally Significant Infrastructure Project' (a 'NSIP') under sections 14 and 15(2) of the PA 2008.
- 1.4 The DCO, if made by the SoS, would be known as the 'Eggborough CCGT (Generating Station) Order' (the 'Order').

EPL

- 1.5 EPL owns and operates the existing Eggborough coal-fired power station (the 'existing coal-fired power station'), near Selby, including a significant proportion of the land required for the Proposed Development.
- 1.6 EPL was acquired by EP UK Investments Ltd (EP UK) in late 2014; a subsidiary of Energetický A Průmyslový Holding ('EPH'). EPH owns and operates energy generation assets in the Czech Republic, Slovak Republic, Germany, Italy, Hungary, Poland and the United Kingdom.

The Proposed Development Site

- 1.7 The Proposed Development Site (the 'Site' or the 'Order limits') is located at and in the vicinity of the existing coal-fired power station approximately 8 kilometres south of Selby.
- 1.8 The existing coal-fired power station is bound to the north by Wand Lane, with the River Aire located approximately 650 metres ('m') further to the north and the A19 Selby Road immediately to the west. Eggborough Village is located approximately 750 m to the south-west.
- 1.9 The entire Site lies within the administrative boundaries of Selby District Council ('SDC') and North Yorkshire County Council ('NYCC').
- 1.10 The existing coal-fired power station was officially opened in 1970 and comprises four coal-fired boilers units, which together are capable of generating up to 2,000 MW of electricity. The existing coal-fired power station also includes a turbine hall and boiler house, an emissions stack (chimney) of approximately 198 m in height, eight concrete cooling towers of approximately 115 m in height, an administration and control block, a coal stockyard and a dedicated rail line for the delivery of coal, in addition to ancillary buildings, structures and infrastructure and utility connections.

- 1.11 The Site itself extends to approximately 102 hectares and comprises land within the operational area of the existing coal-fired power station for the new gas-fired generating station and electrical and groundwater supply connections; corridors of land to the north of the existing coal-fired power station for the cooling water connections and gas supply pipeline; an area of land to the south-east of the main coal stockyard for surface water discharge connections; and corridors of land to the west and south of the operational area of the existing coal-fired power station for ground and towns water supply connections and access.
- 1.12 The land required for the generating station and electrical and groundwater connections is owned by EPL, as well as the majority of the land for the cooling and towns water and surface water discharge connections. The majority of the land required for the gas supply pipeline is not owned by EPL.
- 1.13 The area surrounding the Site is predominantly flat and for the most part comprises agricultural land interspersed with small settlements and farmsteads. The area is however crossed by transport infrastructure, notably the A19 and railway lines, including the East Coast Mainline, in addition to overhead electricity lines associated with the existing coal-fired power station and other power stations within the wider area.
- 1.14 A more detailed description of the Site is provided at Chapter 3 'Description of the Site' of the Environmental Statement ('ES') Volume I (Application Document Ref. 6.2).

The Proposed Development

- 1.15 The main components of the Proposed Development are summarised below:
- The **'Proposed Power Plant'** (Work No. 1) - an electricity generating station with a gross output capacity of up to 2,500 MW located on the main coal stockyard area of the existing coal-fired power station, comprising:
 - Work No. 1A - a combined cycle gas turbine ('CCGT') plant, comprising up to three CCGT units, including turbine hall and heat recovery steam generator buildings, emissions stacks and administration/control buildings;
 - Work No. 1B - a peaking plant and black start plant fuelled by natural gas with a combined gross output capacity of up to 299 MW, comprising a peaking plant consisting of up to two open cycle gas turbine units or up to ten reciprocating engines and a black start plant consisting of one open cycle gas turbine unit or up to three reciprocating gas engines, including turbine buildings, diesel generators and storage tanks for black start start-up prior to gas-firing and emissions stacks;
 - Work No. 1C - combined cycle gas turbine plant cooling infrastructure, comprising up to three banks of cooling towers, cooling water pump house buildings and cooling water dosing plant buildings; and
 - ancillary buildings, enclosures, plant, equipment and infrastructure connections and works.
 - The **'Proposed Electricity Connection'** (Work No. 3) - electrical connection works, comprising:
 - Work No. 3A - up to 400 kilovolt ('kV') underground electrical cables to and from the existing National Grid ('NG') 400 kV substation;

- Work No. 3B - works within the NG substation, including underground and over electrical cables, connection to busbars and upgraded or replacement equipment.
- The **'Proposed Cooling Water Connections'** (Work No. 4) - cooling water connection works, comprising works to the existing cooling water supply and discharge pipelines and intake and outfall structures within the River Aire, including, as necessary, upgraded or replacement pipelines, buildings, enclosures and structures, and underground electrical supply cables, transformers and control systems cables.
- The **'Proposed Ground and Towns Water Connections'** (Work No. 5) - ground and towns water supply connection works, comprising works to the existing groundwater boreholes and pipelines, existing towns water pipelines, replacement and new pipelines, plant, buildings, enclosures and structures, and underground electrical supply cables, transformers and control systems cables.
- The **'Proposed Access and Rail Works'** (Work No. 10) - rail infrastructure and access works, comprising alterations to or replacement of the existing private rail line serving the existing coal-fired power station site, including new rail lines, installation of replacement crossover points and ancillary equipment and vehicular and pedestrian access and facilities.
- The **'Proposed Surface Water Discharge Connection'** (Work No. 9) - surface water drainage connection works to Hensall Dyke to the south-east of the main coal stockyard, comprising works to install or upgrade drainage pipes and works to Hensall Dyke.
- The **'Proposed Gas Connection'** (Work No. 6) - gas supply pipeline connection works for the transport of natural gas to Work No. 1, comprising an underground high pressure steel pipeline of up to 1,000 millimetres (nominal bore) in diameter and approximately 4.6 kilometres in length, including cathodic protection posts, marker posts and underground electrical supply cables, transformers and control systems cables, running from Work No. 1 under the River Aire to a connection point with the National Transmission System ('NTS') for gas No. 29 Feeder pipeline west of Burn Village.
- The **'Proposed AGI'** (Work No. 7) - an Above Ground Installation ('AGI') west of Burn Village, connecting the gas supply pipeline (Work No. 6) to the NTS No. 29 Feeder pipeline, comprising:
 - Work No. 7A - a compound for National Grid's apparatus; and
 - Work No. 7B - a compound for EPL's apparatus.
- The **'Proposed Construction Laydown Area'** (Work No. 2A) - an area for temporary construction and laydown during the construction phase, including contractor compounds and facilities.
- The **'Proposed Carbon Capture Readiness ('CCR') Land'** (Work No. 2B) - an area of land to be reserved for carbon capture plant should such technology become viable in the future. It is proposed that this 'reserve' land is provided on part of the area to be used for temporary construction and laydown.
- The **'Proposed Retained Landscaping'** (Work No. 8) - encompassing the existing mature tree and shrub planting along the northern side of Wand Lane and to the eastern boundary of the existing coal-fired power station site, including that on the embankment around the eastern, southern and western boundaries of the main coal stockyard.

1.16 The 'associated development', for the purposes of section 115 of the PA 2008 comprises Work Nos. 2 to 10 of the Proposed Development.

- 1.17 It is anticipated that subject to the DCO having been made by the SoS (and a final investment decision by EPL), construction work on the Proposed Development would commence in early 2019. The overall construction programme is expected to last approximately three years, although the duration of the electrical and water connection and gas supply pipeline connection works would be significantly less. The construction phase is therefore anticipated to be completed in 2022 with the Proposed Development entering commercial operation later that year.
- 1.18 A more detailed description of the Proposed Development is provided at Schedule 1 'Authorised Development' of the draft DCO and Chapter 4 'The Proposed Development' of the ES Volume I (Application Document Ref. 6.2) and the areas within which each of the main components of the Proposed Development are to be built is shown by the coloured and hatched areas on the Works Plans (Application Document Ref. 4.4).

The Purpose and Structure of this Document

- 1.19 The Proposed Development will require the installation of a number of luminaires to provide visual comfort, safety and operational performance, which in turn will have the potential to result in obtrusive light at receptor locations.
- 1.20 At the time of submission of the DCO application, the contractor has not been appointed and detailed design work for the Proposed Development has not been completed. Therefore, detailed information on the lighting to be used at the Proposed Development is currently unknown. Nevertheless, it is recognised that potential nuisance from lighting of the Proposed Development may be a concern for some members of the public. Therefore, the Applicant has commissioned this strategy in order to provide some definition to the type and level of lighting that will be employed at the Proposed Development.
- 1.21 The following stages have therefore been undertaken in order to consider and define potential constraints on the lighting scheme associated with the Proposed Development:
- a review of pertinent standards and guidance;
 - identification of the type and location of the light sensitive receptors;
 - classification of the surrounding area with regard to the Environmental Zones as set out in the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light;
 - setting obtrusive light limits for the exterior lighting installation;
 - providing a general lighting strategy that is capable of providing visual comfort and performance for various tasks undertaken by site personnel within exterior areas;
 - providing a general lighting strategy for the exterior lighting installation that is capable of achieving the obtrusive light limits;
 - providing a general lighting control strategy that enables part lighting to be used at specific locations and at set times in order to facilitate the use of infrared CCTV in lieu of security lighting; and
 - providing a general strategy for mitigation measures to adequately control obtrusive light.
- 1.22 At the detailed design stage, a computational light modelling exercise will be undertaken. This will ensure that the Site is adequately lit and also that obtrusive light is suitably controlled, in

accordance with this Strategy. Requirements in Schedule 2 to the draft DCO (Application Document Ref. 2.1) secure compliance with the principles of this Strategy.

2.0 OBTRUSIVE LIGHT STANDARDS AND GUIDANCE

Legislative Background

- 2.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act 2005 as a form of statutory nuisance under the Environmental Protection Act 1990 (the 'EPA') which was amended in 2006 to include the following nuisance definition:

“(fb) artificial light emitted from premises so as to be prejudicial to health or nuisance”

- 2.2 Although light was described as having the potential to cause statutory nuisance, no prescriptive limits or rules were set for impact assessment purposes. Guidance notes for the Reduction of Obtrusive Light produced by the Institute of Lighting Professionals (ILP, 2012) have, therefore, been referred to for the purposes of this assessment.
- 2.3 Guidance produced on Section 101 to Section 103 of the Clean Neighbourhoods and Environment Act (2005) has also been referred to, which places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances – including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or reoccur, local authorities must issue an abatement notice (in accordance with Section 80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

Planning Policy Context

National Policy Statements

- 2.4 The Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change, 2011) states:

“The applicant should assess the potential for...artificial light to have a detrimental impact on amenity, as part of the Environmental Statement.

In particular, the assessment provided by the applicant should describe:

- *the type, quantity and timing of emissions;*
- *aspects of the development which may give rise to emissions;*
- *premises or locations that may be affected by the emissions;*
- *effects of the emission on identified premises or locations; and*
- *measures to be employed in preventing or mitigating the emissions.”*

and

“The IPC should satisfy itself that:

- *an assessment of the potential for artificial light...to have a detrimental impact on amenity has been carried out; and*

- *that all reasonable steps have been taken, and will be taken, to minimise any such detrimental impacts.”*

2.5 This Indicative Lighting Strategy for the Proposed Development considers the lighting requirements with reference to relevant standards and guidance, and measures to avoid adverse effects on sensitive receptors, as required by NPS EN-1.

National Planning Policy Framework

2.6 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government (DCLG), 2012) states that the purpose of the planning system is to contribute to the achievement of sustainable development and constitute the Government’s view on what sustainable development in England means in practice for the planning system. A principal concept contained within the NPPF is the presumption in favour of sustainable development and with regard to artificial lighting, the NPPF states:

“...By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation...”

International Guidance

2.7 The purpose of Commission Internationale De L’Eclairage (CIE) 150: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (the ‘CIE 150’) (CIE, 2003) is to aid in formulating guidelines for assessing the environmental effects of exterior lighting and to provide limits for relevant lighting parameters to control the obtrusive effects of exterior lighting to tolerable levels. CIE 150 refers to the potentially adverse effects of exterior lighting on both natural and man-made environments.

2.8 CIE 126: Guidelines for Minimising Sky Glow (CIE, 1997) gives general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for exterior lighting installations. These values are regarded as limiting values. Lighting designers should strive to meet the lowest criteria for the design. Practical implementation of the general guidance is left to national regulations.

National Guidance

2.9 The ILP Guidance Notes (ILP, 2012) propose lighting guidance and criteria for local authorities with a recommendation that these are incorporated at the local plan level. The ILP Guidance Notes define various forms of light pollution and describe a series of environmental zones. The ILP Guidance Notes provide suitable criteria against which the effects of artificial lighting can be assessed. This assessment has been based upon these criteria.

ILP Criteria (General Observers)

2.10 The obtrusive lighting constraints for the Site are based on statutory guidance issued by the Department for the Environment, Food and Rural Affairs (Defra, 2006) to support the implementation of the Clean Neighbourhoods and Environment Act 2005 and non-statutory guidance on obtrusive light limits published by the ILP. The limits are set out in the ILP Guidance Notes (ILP, 2012).

2.11 The ILP has developed an Environmental Zone classification system for the categorisation of receptor locations. This is summarised in Table 2.1 below.

Table 2.1 - ILP Environmental Zone Classifications

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark landscapes	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness areas	Rural, small village, or relatively dark urban locations
E3	Suburban	Medium district brightness	Small town centres or urban locations
E4	Urban	High district brightness areas	Town/city centres with high levels of night-time activity

2.12 For each Environmental Zone, obtrusive light limits for exterior lighting installations are specified (see Table 2.2). These are intended to support decision makers in establishing whether obtrusive lighting is detrimental to local amenity or a potential statutory nuisance.

Table 2.2 - ILP Obtrusive Light Limits for Exterior Lighting Installations

Environmental Zone	Max Sky Glow ULR %	Light Trespass (into windows) E_v (lx)		Source Intensity I (kcd)	
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew
E0	0	0	0	0	0
E1	0	2	1	2.5	0
E2	2.5	5	1	7.5	0.5
E3	5.0	10	2	10	1.0
E4	15.0	25	5	25	2.5

2.13 Unlike some categories of artificially lit exterior areas, for example a retail car park, for which post-store closure may only have requirements for security lighting, at the Site there is no definite time for beyond which the lighting needs will reduce for the remainder of the night, as the plant will operate 24 hours a day. At the Site, there will therefore be the need to provide visual comfort and performance throughout an entire period of darkness or reduced daylighting. For this reason it is considered that imposing a lighting curfew for obtrusive lighting would be unreasonable and would have the potential to conflict with achieving the required visual performance at the Site for safety and operational reasons. This is in line with the ILP Obtrusive Light Guidance, which states, 'the notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced'. BS EN 12464-2: 2014 (BSI, 2014) states the following with regard to obtrusive illuminance pre and post curfew regulations, "In case no curfew regulations are available, the higher values shall not be exceeded and the lower values should be taken as preferable limits".

- 2.14 However, it is considered that a part-lighting strategy would be suitable for the Site. This will not only result in reduced impact of obtrusive lighting due to a reduced on-time, but will also serve to reduce energy costs.
- 2.15 There are also criteria within the ILP Guidance Notes (ILP, 2012) relating to limiting levels of luminance to buildings i.e. controlling how brightly they are luminated. However, the Site does not have any buildings which are intentionally lit by design and so the luminance criteria are not applicable in this case. As a matter of good lighting design practice however, lighting will be selected, positioned and aimed such that any building luminance is limited.

ILP Criteria (Road Users)

- 2.16 Disability and discomfort glare arising from obtrusive light affecting road users is also addressed within the ILP Guidance Notes (ILP, 2012). Table 2.3 sets out the threshold increment requirements and the veiling luminance limits.

Table 2.3 - ILP Glare Limits for Exterior Lighting Installations (road users)

Obtrusive Light Limits for Exterior Lighting Installations - Road Users		
Road Classification	Threshold Increment (TI)	Veiling Luminance (L_v)
No road lighting	15% based on adaptation luminance of 0.1 cd/m ²	0.04
ME6 / ME5	15% based on adaptation luminance of 1 cd/m ²	0.25
ME4 / ME3	15% based on adaptation luminance of 2 cd/m ²	0.40
ME2 / ME1	15% based on adaptation luminance of 5 cd/m ²	0.84

BS EN 12464-2: 2014 Glare Criteria (Railways)

- 2.17 Disability and discomfort glare affecting railway users is addressed in BS EN 12464-2: 2014 (BSI, 2014). It is considered a reasonable approach to adopt the lighting scheme glare limits as suitable obtrusive light limits. Table 2.4 sets out the glare rating limits for the railways.

Table 2.4 - BS EN 12464-2: 2014 Glare Rating Limits for railways and tramways

Type of area, task or activity	R_{GL}
Freight track, short duration operations	50
Walkways in railway areas, open footbridges	50
Freight track, continuous operation	50
Open platforms in freight areas	50
Railway yards handling areas	50
Coupling area	45

3.0 LIGHTING DESIGN STANDARDS AND GUIDANCE

British Standards

BS EN 12464-2: 2014 'Light and lighting – Lighting of workplaces. Part 2: Outdoor work places' (British Standards Institute, 2014)

- 3.1 This standard specifies lighting requirements for outdoor work places, which meet the needs for visual comfort and performance. All usual visual tasks are considered. Criteria that are potentially relevant to the Site are given in Tables 3.1 to 3.6 below.

Table 3.1 - BS EN 12464-2: 2014 General requirements for areas and for cleaning at outdoor work places

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Walkways exclusively for pedestrians	5	0.25	50	20
Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0.40	50	20
Regular vehicle traffic (max. 40 km/h)	20	0.40	45	20
Pedestrian passages, vehicle turning, loading and unloading points	50	0.40	50	20
Cleaning and servicing	50	0.25	50	20

Table 3.2 - BS EN 12464-2: 2014 General requirements for building sites

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Clearance, excavation and loading	20	0.25	55	20
Construction areas, drain pipes mounting, transport, auxiliary and storage tasks	50	0.40	50	20
Framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling	100	0.40	45	40
Element jointing, demanding electrical, machine and pipe mountings	200	0.50	45	40

Table 3.3 - BS EN 12464-2: 2014 General requirements for industrial sites and storage areas

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Short-term handling of large units and raw materials, loading and unloading of solid bulk goods	20	0.25	55	20
Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms	50	0.40	50	20
Reading of addresses, covered loading platforms, use of tools, ordinary reinforcement and casting	100	0.50	45	20

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
tasks in concrete plants				
Demanding electrical, machine and piping installations, inspection	200	0.50	45	60

Table 3.4 - BS EN 12464-2: 2014 General requirements for parking areas

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks	5	0.25	55	20
Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0.25	50	20
Heavy traffic, e.g. parking areas of major shopping centres	20	0.25	50	20

Table 3.5 - BS EN 12464-2: 2014 General requirements for power, electricity, gas and heat plants

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Pedestrian movements within electrically safe areas	5	0.25	50	20
Handling of servicing tools, coal	20	0.25	55	20
Overall inspection	50	0.40	50	20
General servicing work and reading of instruments	100	0.40	45	40
Repair of electric devices	200	0.50	45	60

Table 3.6 - BS EN 12464-2: 2014 General requirements for railways and tramways

Type of area, task or activity	Average E_m lx	U_o	R_{GL}	R_a
Freight track, short duration operations	10	0.25	50	20
Walkways in railway areas, open footbridges	10	0.25	50	20
Freight track, continuous operation	20	0.40	50	20
Open platforms in freight areas	20	0.40	50	20
Railway yards handling areas	30	0.40	50	20
Coupling area	30	0.40	45	20

Guidance and Reference Documents

[The Society of Light & Lighting \(SLL\) Handbook \(SLL, 2009\)](#)

- 3.2 Aimed at lighting practitioners, specifiers and students of lighting, this handbook summarises the fundamentals of light and vision, the technology of lighting and guidance on a wide range of applications, both interior and exterior. It is intended to act as a link between the SLL's 'Code for Lighting' and the Lighting Guides (LG). The handbook also includes a chapter dedicated to exterior

workplace lighting (Chapter 17) which has been referred to in the production of this report. Criteria that are potentially relevant to the Site are given in Tables 3.7 and 3.8 below.

Table 3.7 - SLL Handbook illuminance recommendations for exterior workplaces

Activity	Minimum maintained illuminance (lx)	Illuminance uniformity
Safe pedestrian movement in low risk areas	5	0.15
Safe movement of slow vehicles	10	0.25
Safe movement in medium risk areas	20	0.25
Normal traffic	20	0.4
Very rough work	20	0.25
Rough work	50	0.25
Safe movement in high risk areas	50	0.4
Normal work	100	0.4
Fine work	200	0.5

Table 3.8 - SLL Handbook recommendations for loading

Application	Horizontal illuminance (lx)	Horizontal illuminance uniformity	Maximum glare rating	Minimum colour rendering index
Loading bay	150	-	-	40
Outdoor loading area	100	0.5	45	20

[The SLL Code for Lighting: 2012 \(SLL, 2012\)](#)

- 3.3 The SLL Code for Lighting provides information on three areas of lighting practice: 1) a summary of the effects of lighting on task performance, behaviour, safety, perception, health, and its financial and environmental costs; 2) a compendium of lighting recommendations relevant to the UK, and 3) detailed descriptions of the calculations required for quantitative lighting design.
- 3.4 The lighting requirements for workplaces as set out in the SLL Code are very much aligned with those as set out in BS EN 12464-2: 2014 and so are not expanded on in this section.

Civil Aviation Authority Requirements

[Civil Aviation Authority \(CAA\) Policy Statement 'Lighting of En-Route Obstacles and Onshore Wind Turbines' \(CAA, 2010\)](#)

- 3.5 This Policy Statement provides an overview of the more generic need for aviation warning lighting on 'tall structures' and onshore wind turbines as set out at Article 219 of the UK Air Navigation Order (ANO) 2009. The CAA Policy Statement clarifies, '*Notwithstanding the Article 219 requirements, some structures of a height of less than 150 metres might need aviation warning lights*'. Whilst structures of such heights are not routinely lit for civil aviation purposes, it is possible that aviation stakeholders, including the CAA, may make a case for aviation warning lighting where a structure is considered, by virtue of its location and nature, a significant navigational hazard.

[Air Navigation: The Order and the Regulations CAP 393 \(CAA, 2014a\)](#)

3.6 Article 219 of the Air Navigation Order sets out the requirements for the lighting of en-route obstacles and is reproduced below:

- “(1) The person in charge of an en-route obstacle must ensure that it is fitted with medium intensity steady red lights positioned as close as possible to the top of the obstacle and at intermediate levels spaced so far as practicable equally between the top lights and ground level with an interval of not more than 52 metres.*
- (2) The person in charge of an en-route obstacle must, subject to paragraph (3), ensure that by night the lights required to be fitted by this article are displayed.*
- (3) In the event of the failure of any light which is required by this article to be displayed by night the person in charge must repair or replace the light as soon as reasonably practicable.*
- (4) At each level on the obstacle where lights are required to be fitted, sufficient lights must be fitted and arranged so as to show when displayed in all directions.*
- (5) In any particular case the CAA may direct that an en-route obstacle must be fitted with and must display such additional lights in such positions and at such times as it may specify.*
- (6) A permission may be granted for the purposes of this article for a particular case or class of cases or generally.*
- (7) This article does not apply to any en-route obstacle for which the CAA has granted a permission to the person in charge permitting that person not to fit and display lights in accordance with this article.*
- (8) In this article, an ‘en-route obstacle’ means any building, structure or erection, the height of which is 150 metres or more above ground level, but it does not include a building, structure or erection:*
- (a) Which is in the vicinity of a licensed aerodrome; and*
- (b) to which section 47 of the Civil Aviation Act 1982(a) (warning of presence of obstructions near licensed aerodromes) applies.”*

3.7 Article 221 of the Air Navigation Order sets out the restrictions on lights liable to endanger and is reproduced below:

- “(1) A person must not exhibit in the United Kingdom and light which:*
- (a) by reason of its glare is liable to endanger aircraft taking off from or landing at an aerodrome; or landing at an aerodrome; or*
- (b) by reason of its liability to be mistaken for an aeronautical ground light is liable to endanger aircraft.*
- (2) If any light which appears to the CAA to be a light described in paragraph (1) is exhibited, the CAA may direct the person who is the occupier of the place where the light is exhibited or who has charge of the light, to take such steps within reasonable time as are specified in the direction:*
- (a) to extinguish or screen the light; and*

(b) to prevent in the future, the exhibition of any other light which may similarly endanger aircraft.

(3) The direction may be served either personally or by post, or by affixing it in some conspicuous place near to the light to which it relates.”

[CAP 1096: Guidance to Crane Operators on Aviation Lighting and Notification \(CAA, 2014b\)](#)

3.8 This briefing sets out the requirements for aviation warning lighting to cranes and sets out the potential requirement for crane activity to be notified to the aviation community.

4.0 OBTRUSIVE LIGHT RECEPTORS

Introduction

4.1 There are several 'categories' of potentially light sensitive receptors: these being, residential, ecological, road and rail. As the Proposed Development design progresses it will be necessary to undertake a computational light modelling exercise in order to ensure that obtrusive light is suitably controlled. This section sets out indicative light-sensitive receptor locations for consideration when undertaking such an obtrusive light assessment. The indicative light-sensitive receptors are set out in Figure 1 of this report.

Residential Receptors

- 4.2 Residential light-sensitive receptor locations have been identified at the following locations:
- Chapel Haddlesey approximately 50 m to the north of Site, near the Proposed Cooling Water Connection's abstraction point;
 - two properties off the A19 near Roall Water Works opposite the Tranmore Lane entrance;
 - Eggborough Sports and Social Club, approximately 50 m north-west of the Site, near the northern Proposed Borehole Connection;
 - Manor Cottages, approximately 80 m east of the Proposed Gas Connection corridor;
 - Haddlesey Manor approximately 150 m to the east of the Proposed Gas Connection corridor;
 - Lodge Farm adjacent to a proposed temporary construction access point from the A19 and Fox Lane to the Proposed Gas Connection corridor;
 - Burn Lodge Farm to the north of the temporary construction access point from the A19 to the Proposed Gas Connection corridor and 90 m to the south and south-west of the Proposed Gas Connection corridor;
 - a property at Gateforth Grange, approximately 200 m south-west of the Proposed Above Ground Installation (AGI); and
 - properties in Gallows Hill, approximately 200 m east of the Proposed Construction Laydown Area.

Road Receptors

- 4.3 Road user receptor locations have been identified at the following locations:
- at three points along the A19 - along the western boundary of the existing coal-fired power station, in the vicinity of the abstraction point for the Proposed Cooling Water Connection at Chapel Haddlesey, and in the vicinity of Burn Lodge Farm, where the Proposed Gas Connection corridor crosses under the A19.;
 - along Wand Lane to the north and east of the Proposed Construction Laydown Area;
 - along Hazel Old Lane to the south-east of the Proposed Power Plant site;
 - along Millfield Road to the east of Chapel Haddlesey;

- along Fox Lane adjacent to a proposed temporary construction access point from the A19 to the Proposed Gas Connection corridor; and
- along West Lane in the vicinity of the AGI.

Ecological Receptors

4.4 Ecological receptors have been identified at the following locations:

- the River Aire – located adjacent to the Proposed Cooling Water Connection points, and crossed by the Proposed Gas Connection at Eggborough Ings;
- Ings and Tetherings Drain – located approximately 360 m to the north of the Proposed Construction Laydown area and is crossed by the Proposed Cooling Water Connections and Proposed Gas Connection corridor south of Eggborough Ings; and
- Hensall Dyke – located approximately 80 m south-east of the Proposed Construction Laydown area and Proposed Power Plant Site.

Rail Receptors

4.5 Rail receptors have been identified at the following locations.

- the East Coast Main Line, which crosses the A19 approximately 400 m north-east of Burn Lodge Farm; and
- private railway lines that cross Tranmore Lane and continue into the Site.

5.0 OPERATIONAL OBTRUSIVE LIGHT LIMITS

Proposed Obtrusive Light Limits (Residential Receptors)

- 5.1 It is considered appropriate for the purposes of controlling obtrusive light affecting residential receptors that suitable obtrusive lighting level limits with regard to the ILP Environmental Zone for the areas surrounding the Site would be those as set out in Zone E3 i.e. a suburban area of medium district brightness.
- 5.2 Therefore, the proposed permitted obtrusive light level limits for residential receptors are as follows:
- an on-site Upward Lighting Ratio of 5%;
 - a light trespass limit at residential windows of 10 lx. If the ILP curfew levels were imposed then this limit would reduce to 2 lx post-curfew; and
 - a source intensity limit when viewed from receptor locations of 10 kcd. If the ILP curfew levels were imposed then this limit would reduce to 1 kcd post-curfew.

Proposed Obtrusive Light Limits (Road Users)

- 5.3 There are roads that have the potential to be affected by disability glare and veiling luminance associated with the Proposed Development lighting scheme. The constraints criteria to be adopted will be confirmed at a later date upon further analysis that considers the lighting classes already in place. It is important that a suitably segmented analysis is undertaken that accounts for variations in lighting class along the various stretches of road.
- 5.4 The proposed permitted obtrusive light level limits for road users are as follows:
- no road lighting: threshold increment of 15% based on adaptation luminance of 0.1 cd/m² and veiling luminance of 0.04;
 - ME6/ ME5: threshold increment of 15% based on adaptation luminance of 1 cd/m² and veiling luminance of 0.25;
 - ME4/ ME3: Threshold increment of 15% based on adaptation luminance of 2 cd/m² and veiling luminance of 0.40; and
 - ME2/ ME1: Threshold increment of 15% based on adaptation luminance of 5 cd/m² and veiling luminance of 0.84.

Proposed Obtrusive Light Limits (Railway)

- 5.5 The existing railway has the potential to be affected by glare associated with the Site lighting scheme. The proposed permitted obtrusive light level limits for the railway are as follows:
- glare rating limit of $R_{GL} = 50$ to general railway areas; and
 - glare rating limit of $R_{GL} = 45$ to coupling areas.

Proposed Obtrusive Light Limits (Ecological Receptors)

- 5.6 The Site lighting scheme will be designed to generally minimise any impact on ecological receptors by means of minimising illuminance at the receptors, along with the 'viewed' source

intensity. The permitted obtrusive light level limits for the ecological receptors will be reviewed at detailed design stage and updated if necessary following pre-construction ecological surveys. As indicative constraints for the Proposed Development's lighting design, the following criteria are suggested as being reasonable at this stage, given the relatively low sensitivity of the identified ecological receptors:

- target illuminance levels of less than 1 lx;
- an upper limit illuminance level of 3 lx; and
- source intensity values not to exceed ILP human receptor criteria.

6.0 SITE LIGHTING REQUIREMENTS (OPERATIONAL PHASE)

Introduction

- 6.1 The Proposed Development will require the installation of a number of luminaires to provide visual comfort, safety and performance. This section sets out the general strategy for the operational site lighting.

Recommended Lighting Values (Operational)

- 6.2 The lighting strategy for the Site when operational is given in the form of a lighting requirements specification below. This is intended to be an outline design strategy only rather than a detailed design solution.

Site Lighting Levels (Operational)

- Designated walkways - walkways exclusively for pedestrians: 5 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
 - site roads - regular vehicle traffic (max. 40 km/h): 20 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 20;
 - pedestrian routes intersecting and bounding site roads, lorry parking area - pedestrian passages, vehicle turning, loading and unloading points: 50 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
 - car park, possible car parking - car parks: 10 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
 - container storage area - short-term handling of large units and raw materials, loading and unloading of solid bulk goods: 20 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 55, minimum colour rendering index of Ra 20; and
 - gatehouse, weighbridges – normal work: 100 lx maintained average horizontal illuminance, 0.4 minimum uniformity.
- 6.3 It is considered that a part-lighting strategy could be suitable for the Site. This will not only result in reduced impact of obtrusive lighting due to a reduced on-time, but will also serve to reduce energy costs. The lighting could be split into two circuits: 1) security lighting and 2) amenity lighting. Amenity lighting could be split further into amenity for deliveries and amenity for staff. This would allow a part lighting strategy to be adopted across the Site, thus minimising the light impact on the surrounding receptors.
- 6.4 Between hours of darkness, a minimum 40% reduction in total lumen output from the lighting scheme is likely to be achieved. The exact luminaires to be switched off during these times will be carefully considered once staff working patterns and areas to be accessed have been finalised to ensure that suitable lighting levels are maintained.

- 6.5 Photocells are to be used as a primary control on all exterior lighting so that no luminaires will remain switched on during hours of daylight. In addition, several programmable 7 day time clocks will be included so that amenity lighting circuits can be programmed to turn on/off as and when needed to suit the delivery times and staff working patterns.
- 6.6 A manual override switch shall be provided to override all control of exterior lighting in the event of an emergency.

Aviation Warning Lighting (Operational)

- 6.7 Provision will be made for the necessary infrastructure to facilitate the installation of aviation warning lighting to the Proposed Development stack. This will be operated after demolition of the adjacent coal-fired power station, since at that point the Proposed Development stack would be the 'tallest building' structure on the Site. The aviation warning lighting shall be commissioned in accordance with the CAA's requirements. This will likely comprise 'medium intensity' (2 kcd) steady 'red lights', mounted as close as possible to the top of the structure and also at two further heights at equidistant spacing between the ground and top datums; such that the vertical spacing interval is no more than 52 m. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise. Requirements in Schedule 2 to the draft DCO (Application Document Ref. 2.1) secure the aviation warning lighting.

7.0 SITE LIGHTING REQUIREMENTS (CONSTRUCTION PHASE)

Introduction

- 7.1 Construction site lighting will be required as part of on-site security and health and safety requirements. The associated potential obtrusive light effects towards surrounding receptors would be minimised through the controlled application of lighting in accordance with current best practice. It is anticipated that the key temporary lighting sources during the construction phase will be the following:
- general floodlighting and security lighting associated with meeting health & safety and security requirements in temporary parking areas;
 - security and health & safety lighting associated with specific on-going working areas, where equipment is stored and safety hazards may be present; and
 - lighting required for operational purposes associated with any construction work around and after sunset.
- 7.2 Artificial site lighting is capable of resulting in obtrusive light if poorly controlled. However, when careful consideration is given to the type, location and aiming of construction lighting, its impact, in considering magnitude and duration can be considerably reduced.
- 7.3 Some night-time construction work may be required, and lighting during normal working hours will be necessary during winter months.
- 7.4 Obtrusive lighting can be suitably controlled by adopting the general mitigation measures as set out in this report. The control of obtrusive construction lighting will be dealt with by the Construction Environmental Management Plan (CEMP), a framework of which is included within Appendix 5A of ES Volume II (Application Document Ref No. 6.3).

Recommended Lighting Values (Construction)

- 7.5 The lighting strategy for the Site during construction is given in the form of a lighting requirements specification below. This is intended to be an outline design strategy only rather than a detailed design solution for the reasons presented in Section 2.

Site Lighting Levels (Construction)

- Clearance, excavation and loading: 20 lx maintained average horizontal illuminance, 0.25 minimum uniformity, glare rating limit of RGL 55, minimum colour rendering index of Ra 20;
- construction areas, drain pipes mounting, transport, auxiliary and storage tasks: 50 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 50, minimum colour rendering index of Ra 20;
- framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling: 100 lx maintained average horizontal illuminance, 0.40 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 40; and

- element jointing, demanding electrical, machine and pipe mountings: 200 lx maintained average horizontal illuminance, 0.50 minimum uniformity, glare rating limit of RGL 45, minimum colour rendering index of Ra 40.

Aviation Warning Lighting (Construction)

- 7.6 Cranes in excess of 150 m high above local ground level will be fitted with 'medium intensity' (2 kcd) steady 'red lights', mounted as close as possible to the top of the structure, the extremes of the jib, and also at intermediate levels not exceeding 52 m apart. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise.
- 7.7 Cranes that are between 90 m and 150 m high above local ground level will be fitted with 'medium intensity' (2 kcd) steady 'red lights', mounted as close as possible to the top of the structure and the extremes of the jib. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise.
- 7.8 Cranes that are between 60 m and 90 m high above local ground level will be fitted with 'low intensity' steady 'red lights', mounted as close as possible to the top of the structure and the extremes of the jib. For tower cranes the lighting will be fixed to the top of the fixed structure. The installed lighting will be selected and arranged such that it is suitably viewable from all directions. The lighting will operate from half an hour after sunset until half an hour before sunrise.
- 7.9 The contractor will be responsible for informing the CAA and the Defence Geographic Agency as required by CAA CAP 1096 (CAA, 2014b).

8.0 GENERAL OBTRUSIVE LIGHT IMPACT AVOIDANCE MEASURES

8.1 Through the adoption of good lighting design practice, incorporating general obtrusive lighting impact avoidance measures such as those described below, obtrusive light will be suitably controlled. It should be noted that the measures listed below are indicative only, and the final measures will be subject to detailed design.

8.2 General obtrusive lighting impact avoidance measures may include:

- adopting a part lighting strategy;
- using photocells as a primary means of control;
- where possible, adopting LED luminaires to control obtrusive light due to its high directionality and accordingly the achievable ratio of useful to spill light;
- careful consideration to column locations and luminaire positioning;
- adopting luminaires with minimal upward lighting ratio;
- not tilting luminaires to have uplift above the horizontal;
- optimising column heights;
- minimising building mounted luminaire heights;
- angling building mounted luminaires to limit the level of building luminance;
- adopting lamps with similar correlated colour temperatures;
- using shields and baffles to luminaires; and
- lighting the site boundaries with low power periphery lighting with an asymmetric forward optic having good rear spill cut-off characteristics.

9.0 CONCLUSIONS

- 9.1 This Indicative Lighting Strategy document has been prepared in order to support the DCO application for the Proposed Development.
- 9.2 At the time of submission of the DCO application, the contractor has not been appointed and detailed design work for the Proposed Development has not been completed. Therefore, detailed information on the lighting to be used at the Proposed Development is currently unknown. Nevertheless, it is recognised that potential nuisance from lighting of the Proposed Development may be a concern for local communities and certain statutory consultees. Therefore, the Applicant has commissioned this strategy in order to provide some definition to the type and level of lighting that will be employed at the Proposed Development.
- 9.3 This document therefore sets out the lighting strategy in the form of an outline lighting requirements specification for site lighting. It also addresses obtrusive lighting by means of specifying off-site obtrusive lighting constraints.
- 9.4 The report also identified potential measures that may be taken to control obtrusive light through the detailed design of the Proposed Development lighting scheme.

10.0 REFERENCES

- British Standards Institute (2014) *BS EN 12464-2: 2014 'Light and lighting – Lighting of workplaces. Part 2: Outdoor work places'*.
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- Department for Communities and Local Government (2012) *National Planning Policy Framework*.
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- Society of Light and Lighting (2012) *The Society of Light & Lighting Code for Lighting*.

Figure 1 - Lighting Strategy Plan

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- THE ORDER LIMITS
- ROAD RECEPTORS
- RESIDENTIAL RECEPTORS
- RAIL RECEPTORS
- ECOLOGICAL RECEPTORS

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Purpose of Issue
DCO APPLICATION

Client
EGGBOROUGH POWER LTD

Project Title
EGGBOROUGH CCGT DCO

Drawing Title
**FIGURE 1
 LIGHTING STRATEGY PLAN**

Drawn PB	Checked RW	Approved KC	Date 08/03/2017
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