

D11 Request for further information from the ExA : Dr Edmund Fordham

Dated: 28th March 2023

THE PLANNING INSPECTORATE

EN010106 – Sunnica Energy Farm

**APPLICATION BY SUNNICA Ltd for an Order Granting Development Consent
for the Sunnica Energy Farm Project pursuant to The Planning Act 2008**

To the Examining Authority (ExA)

**Reply to Request for Further Information (at Deadline 11) from
Examining Authority**

**Eurling Dr Edmund John Fordham MA PhD CPhys CEng FInstP
Interested Party – Unique Reference: 20030698**

Please note:

This document is solely in response to the request for further information from the Examining Authority made in their Rule 17 Letter dated 22 March 2023:

NPS EN-1 at 4.12.1 notes that Hazardous Substances Consent can be left until post-consent: however, pre-application consultation with HSE is nevertheless required and details must be included in the DCO (NPS EN-1, footnote 94).

The footnote states: '*However, the guidance in 4.12.1 still applies i.e. the application should consult with HSE at the pre-application stage and include details in their DCO*'.

The implication of the guidance might appear to suggest that full details of hazardous materials and the hazard assessment must be considered in the Examination. Do you agree? Please set out in your response how you believe the guidance and footnote should be interpreted.

Conventions for colour highlighting:

Quotations from legislation are shown in blue

Quotations from policy documents, or competent authorities are shown in magenta

Quotations from Applicant are shown in ochre

Quotations from Government Statements are shown in green

Executive Summary

1. Yes, I do agree, to at least a level providing a sufficient hazard assessment of whether an “establishment” is likely (with only minor adjustments if HSC is to be sought from HSAs subsequently) to present an acceptable degree of risk to other development, or sensitive environments, in the vicinity, outside the site itself, in the event of a major accident. I believe that is the central Planning issue.
2. Footnote 94 recognises a statutory option¹, but is in the context of a parallel “safety assessment”, *including* mitigation measures². In a Policy-compliant application, the ExA would already have scrutinised such a safety assessment *before* reaching a decision on advice to the SoS, *even if* HSC were deferred, and would have advice from HSE specifically on hazardous substances.
3. The reasons in summary (details provided in subsequent paragraphs) are:
 - (i) The long-standing³ policy purpose of HSC is to require, as a Planning control, consideration of such “off-site” risks and mitigation measures, preventive measures presumed to have failed. Logically this must include the consideration that the degree of risk is unacceptable, with consent refused on safety grounds;
 - (ii) Policy in Sect. 4.12 clearly treats “deemed HSC” by Direction⁴ as normal practice⁵;
 - (iii) Deferment of HSC “post-consent” is relegated to a footnote, and still requires consultation with HSE, specifically on hazardous substances;
 - (iv) Safety Policy in Sect 4.11 also presumes a parallel safety assessment by the COMAH CA, explicitly including *mitigation* of major accidents, the focus of HSC;
 - (v) Consenting a DCO without a sufficient hazard assessment would pre-judge the basic safety question. It risks bringing the HSA(s) into conflict with the SoS if a full hazard assessment (with the independent scrutiny by the COMAH CA then required) results in the project being found unacceptable on safety grounds, with HSAs obliged to refuse HSC, for a DCO already granted.
 - (vi) Alternatively, if the HSA(s) found off-site risks acceptable only with significant changes, the proposal might then differ materially from the one for which a DCO had been granted.

¹ Under S.6(1)(a) P(HS)A 1990

² Under Safety policy in Sect. 4.11 NPS EN-1

³ As long ago as P(HS)A 1990, pre-dating Seveso (III) (2012) by over twenty years.

⁴ Under S.12(2B) P(HS)A 1990. Even a Direction of “deemed HSC” may specify conditions. An ExA would need to consider and recommend to the SoS any conditions, consulting the HSE in the process, *per* S.12(3) of the Act.

⁵ PA 2008 inserted S.12(2B) into P(HS)A 1990 for this reason, to allow DCOs to cover all necessary consents, including HSC where required.

Detail on reasons in Executive Summary

(i) Policy purposes of HSC as a Planning control

4. The 2021 DHCLG policy framework document⁶ explains that COMAH emphasises “on-site” controls for *Prevention* of major accidents, whilst HSC was enacted⁷ as a Planning control to address “off-site” risks arising from proximity to other development, or sensitive environments. In the case of Sunnica, these would include (e.g.) the village of Red Lodge, other residents in close proximity, and the protected wetlands of Chippenham Fen.

5. Hence a sufficient degree of detail would be one enabling the ExA to come to a rational assessment of whether the “establishment” is likely (with only minor adjustments expected if HSC is formally sought from HSAs) to present an acceptable degree of risk to other development or sensitive environments in the vicinity, in the event of a major accident. Note that this presumes *failure* of the “on-site”, preventive, controls which are the focus of COMAH. It is the *off-site consequences* of a major accident, along with proposed *Mitigation* measures, that are the focus of HSC. For example, HSC applications must include⁸

(viii) the measures taken or proposed ... to limit the consequences of a major accident and they require⁹ consultation with the COMAH CA.

(ii) – (iii) HSC by Direction vs Footnote 94

6. Sect. 4.12 NPS EN-1 clearly regards “deemed HSC” as the norm. Note that even a S.12(2B) Direction may specify conditions, so is not necessarily a “blank cheque”. Sect. 4.12.2 of NPS EN-1 emphasises that an ExA would need to consider and recommend to the SoS any conditions, consulting the HSE in the process¹⁰.

7. Footnote 94 (“deferred” HSC) is necessary to recognise an available statutory route¹¹ to HSC, but Policy is clear that two conditions are required:

- (a) pre-application consultation with HSE, and
- (b) “details in their DCO”.

The “details” are not specified further. But a DCO that makes no mention of HSC at all, supplies no details at all, hence would not be compliant with footnote 94¹². See also para. 11 below for an alternative reading.

⁶ Annex EF3 REP2-082d. See PHS-ISH1 REP2-082a, para. 6 pp 6 – 7, for summary paragraph.

⁷ P(HS)A 1990

⁸ R.5(1)(d)(viii) P(HS)Regs 2015

⁹ By R.10(1)(a) P(HS)Regs 2015

¹⁰ As required by S.12(3) P(HS)A 1990. Also, after 2015, R.26 P(HS)Regs 2015 covers S.12(2B) Directions and further requires consultation with the COMAH CA to be provided at the time of Application so that affected parties may comment on the consultations in the Examination.

¹¹ S.6(1)(a) P(HS)A 1990

¹² The declaratory clause proposed in my PHS after ISH1 (REP2-082a, Summary Item 4) does not provide any details either, in fact leaves the question of HSC open, and as proposed merely advertises the fact (potentially critical) that HSC may be a required consent additional to the DCO.

8. The requirement of pre-application consultation with HSE¹³ parallels the requirement of consultation with the COMAH CA (HSE plus EA acting jointly) required under the Safety section¹⁴. These clearly expect that the statutory regulators will advise on hazardous substances, as is their role.

9. It should be noted that HSC cannot be decoupled from NPS Safety¹⁵ policy and COMAH notification. The Schedules to the COMAH and P(HS) Regs 2015 are closely aligned, deriving from Annex I of Seveso¹⁶. A site requiring HSC almost always requires COMAH notification¹⁷, and *vice versa*. Per paras. 4 -5 above, the emphasis with HSC is on “off-site” risk and mitigation measures.

10. With Sunnica, the only consultations with HSE were without declaration of either cell chemistry (determining chemical hazards) or BESS capacity¹⁸ (indicating quantities). They did however result in advice to consult further with the HSAs on HSC¹⁹. That advice was dismissed²⁰ as “not relevant to this project”.

11. Regarding the second condition in footnote 94, it is hard to say what “details in their DCO” are meant in general, because no examples are given in the NPS. Because a DCO is a Statutory Instrument, technical details would be inappropriate (unless references to other legislation). The reference could mean “details in their DCO Application”, when the “details” would likely mean the consultations with HSE.

12. Other readings could only be conjectural, for example Requirements designed to ensure adherence to “inherent features of the design” assessed in the parallel safety assessment²¹ from the COMAH CA. The SoS could, in principle, be satisfied on safety even if quantities of hazardous substances were not finalised or variable.

13. In such cases, the consultation with the COMAH CA required in a “deferred” application for HSC to HSA(s)²² would already be available, and would have been considered *within* the Examination.

¹³ Sect. 4.12.1 NPS EN-1: Note the guidance is “if the project is likely to need HSC” (not *certain* to need it).

¹⁴ Sect 4.11 in NPS EN-1

¹⁵ Sect 4.11 in NPS EN-1

¹⁶ See Annex EF4 REP2-082e for the full Directive

¹⁷ Exceptions are the CQs for natural gas, Hydrogen, and LPG, which are more stringent in P(HS)Regs 2015 than for COMAH. Hence it is technically possible for a site to require HSC but not be subject to the COMAH Regs 2015. The reverse is not possible however; COMAH sites always require HSC. This exemplifies a precautionary approach to HSC as a Planning control. A similar situation may arise with the “loss of control” provisions which are worded differently between the P(HS)Regs 2015 and the COMAH Regs 2015, depending on how engineered control measures are assessed in the two sets of Regulations.

¹⁸ See D8 Comments REP8-045

¹⁹ Annex EF54 REP8-045a

²⁰ Applicant’s REP2-025 Ch 16 “Other Environmental Topics”

²¹ Under Sect. 4.11 NPS EN-1

²² By R.10(1)(a) P(HS)Regs 2015. This also allows consultees to decline consultation, which would be a reasonable action by the COMAH CA if their safety assessment had already been provided.

14. It is not clear that any of these situations applies to Sunnica. The consultations with HSE were without disclosure of chemistry or scale, and there is no safety assessment from the COMAH CA, so that important safeguard of the public interest (and evidence for the ExA's advice to the SoS) is not available.

(iv) Safety Policy in Sect. 4.11 NPS EN-1

15. The relationship between Safety policy and HSC policy is noted in para. 9 above. Safety policy²³ requires an “assessment” by the COMAH CA that “the inherent features of the design are sufficient to prevent, control and mitigate major accidents”. The inclusion of Mitigation is important, because the policy purpose of HSC is to consider Mitigation of major accidents, preventive measures presumed to have failed.

16. Hence a properly compliant Application would consider the majority of the HSC issues within the “safety assessment”²⁴ in most cases. There is no provision for its deferral, so the ExA can be presumed to have received it within the Examination even with HSC deferred under footnote 94.

17. In the context of Sunnica (grid-scale Li-ion BESS of unprecedented scale) this would still require a full hazard assessment to be conducted, addressing “worst credible accident” situations. The appraisal made by Atkins for HSE(NI)²⁵ provides, as a starting point, reference case hazard assessments for explosion risk, and toxic emissions of Hydrogen Fluoride, but is not exhaustive and does not address the Sunnica proposal as such. The Applicant's Appendix 16D “Air Quality Assessment” is inadequate even as an illustrative case. There is nothing from the COMAH CA to show that “inherent features of the design” have demonstrated off-site safety at a level making further hazard assessment unnecessary.

(v - vi) DCO decision without full hazard assessment

18. Without such a hazard assessment, the ExA has a very limited basis for recommending that the siting of the Sunnica BESS could be found acceptable, or acceptable with only minor changes, if HSC is considered by the HSA(s). Consenting a DCO without such hazard assessment would pre-judge that basic safety consideration. It could, in the light of a full hazard assessment (and independent appraisal by the COMAH CA not yet available), result in the project being found unacceptable on safety grounds, forcing the HSAs into the conflicted position, against a decision of the SoS, of having to refuse HSC for a project for which an enduring DCO had been granted.

19. Similarly, if found acceptable only with significant changes, these might then result in a scheme differing from that for which the DCO had been granted.

²³ Sect. 4.11.4 NPS EN-1

²⁴ The only exceptions being those hypothetical cases not subject to COMAH but requiring HSC, see footnote 22.

²⁵ Annex EF28, REP2-129p

Summary

20. In summary:

- (i) NPS Policy implies the process will normally include “deemed HSC”. Footnote status implies that “post-consent” HSC is exceptional;
- (ii) A DCO Application that dismisses HSC supplies no “[details in their DCO \[Application\]](#)”, so cannot be compliant with that reading of footnote 94. Neither can a dDCO that makes no mention of HSC at all be compliant with footnote 94 if “[details in their DCO](#)” are understood as Requirements or similar provisions;
- (iii) There are conceivable projects where deferred HSC might be reasonable, but NPS Policy also presumes a “safety assessment” (including mitigation measures) from the COMAH CA being available in parallel;
- (iv) The policy purpose of HSC is to address off-site risks of a major accident where preventive measures have failed. This would require a sufficient hazard assessment to enable the ExA to conclude that the proposed siting results in an acceptable degree of risk to other development or sensitive environments, subject only to minor adjustments that might be found necessary by the HSAs;
- (v) Consenting a DCO without a sufficient hazard assessment could result in the HSAs (or the COMAH CA) later finding the off-site risk unacceptable, obliging them to refuse HSC for a project, in conflict with the SoS, or requiring significant further changes not properly considered in the Examination.

(Appendix overleaf: Post-2015 considerations)

Appendix: Post-2015 considerations: Safety Distances

21. Post-2015 Regulations support these considerations. NPS EN-1 dates from 2011, pre-dating Seveso (III) (2012), which was “transposed” only in 2015. The 2011 NPS may therefore not be fully aligned with current UK law in force (COMAH Regs 2015 and P(HS)Regs 2015).

22. The SoS now has an explicit duty to ensure that “designated”²⁶ Policies take into account²⁷ the “Article 13(2) matters”²⁸ (viz. safety distances from other development and protection of sites of natural sensitivity). This parallels the older UK policy²⁹ that HSC addresses *offsite consequences* of a major accident, to other development, or sensitive environments, in the vicinity. The explicit concept of a “safety distance” in the Directive³⁰ may be new. A duty on the SoS to include these matters in a “designated” NPS implies that consideration of siting appropriateness, given the nature and extent of hazards, should be part of the PA 2008 process, i.e. within the Examination.

23. Article 13(3) of Seveso³¹ provides the “plain English” intention: “*that operators provide sufficient information on the risks arising ... and that technical advice on those risks is available ... when decisions are taken*”. This again emphasises that the “Article 13(2) matters” should be considered within the consenting process.

24. It is hard to see how the Examination can properly consider the “Article 13(2) matters” without sufficient detail on (i) the nature of the chemical hazards (Physical, Health or Environmental), and (ii) the likely consequences in foreseeable accidents. Both are required to make a rational assessment of the appropriateness of siting of a Li-ion BESS of unprecedented size.

25. In the context of the Sunnica BESS, the chemical hazards should at least be identified. This is scarcely possible whilst the cell electrochemistry remains undecided. If a choice between NMC or LFP cells remains to be made, then the hazards of *both* are needed. My submissions³² have in fact addressed this question so far as the technical literature allows, although the Applicant has not.

26. After identifying the chemical hazards, some quantification of their likely extent in foreseeable accidents is needed to consider the “Article 13(2) matters”. This requires consideration of how far accidents are likely to proceed, together with engineering modelling of consequences, i.e. a sufficient hazard assessment.

(2,006 words excl. ExA question)

EJF, 28/03/2023

²⁶ Under S.5 PA 2008

²⁷ R.24(1)(b) P(HS)Regs 2015

²⁸ See Annex EF4 REP2-082e for the Directive itself.

²⁹ Annex EF3 REP2-082d and PHS-ISH1 REP2-082a, para. 6 pp 6 – 7.

³⁰ And now UK law in force in R.24(1)(b) P(HS)Regs 2015

³¹ Transposed in the context of PA 2008 by R.26 P(HS)Regs 2015 which is UK law in force.

³² e.g. Annex EF16 REP2-129e, WR REP2-129, D6 REP6-084, D7 REP7-094 and D8 REP8-045

List of Annexes referred to: – Comments at Deadline 11: Dr Edmund Fordham
(dated 28th March 2023)

EF1 – Personal details

EF2 – “Safety of Grid Scale Lithium-ion Battery Energy Storage Systems”
by E J Fordham (Interested Party), with
Professor Wade Allison DPhil and
Professor Sir David Melville CBE CPhys FInstP

EF3 – “Hazardous substances (Planning) Common Framework”
CP 508 Presented to Parliament by the SoS for DHCLG August 2021

EF4 – Directive 2012/18/EU of the European Parliament and of the Council
on the Control of Major-Accident Hazards involving dangerous substances
commonly known as the “Seveso III Directive”

EF5 – The Planning (Hazardous Substances) Regulations 2015

EF6 – Explanatory Memorandum to the P(HS)Regs 2015

EF7 – The Planning (Hazardous Substances) Act 1990

EF8 – Overarching National Policy Statement for Energy (NPS EN-1)

EF9 – Speech of Dame Maria Miller MP, House of Commons, 7 September 2022
Hansard, (House of Commons) Volume 719, Columns 275-277

EF10 – Battery Storage Guidance Note 1: Battery Storage Planning. Energy
Institute, August 2019, ISBN 978 1 78725 122 9

EF11 – D. Hill (2020).
“McMicken BESS event: Technical Analysis and Recommendations”
Technical support for APS related to McMicken thermal runaway and
explosion.
Arizona Public Service. Document 10209302-HOU-R-01
Report by DNV-GL to Arizona Public Service, 18 July 2020.

EF12 – Underwriters Laboratories incident report into McMicken explosion

EF13 – (5 items) News items and English translation from Chinese of official
accident investigation into April 2021 BESS fire and explosion in Beijing

EF14 – (3 items) Reports from Merseyside Fire and Rescue Service into September
2020 BESS fire and explosion in urban Liverpool

EF15 – Larsson *et al.* (2017), *Scientific Reports*, **7**, 10018,
DOI 10.1038/s41598-017-09784-z

- EF16 – Paper with Professor Sir David Melville CBE: “Hazardous Substances potentially generated in “loss of control” accidents in Li-ion Battery Energy Storage systems (BESS): storage capacities implying Hazardous Substances Consent obligations.
- In public domain on *Research Gate* preprint server
DOI 10.13140/RG.2.2.35893.76005
- EF17 – Golubkov *et al* (2014) *RSC Advances* DOI 10.1039/c3ra4578f
- EF18 – Research Technical Report by *FM Global*: Flammability characterization of Li-ion batteries in bulk storage”
- EF19 – Bergström *et al* (2015) Vented Gases and Aerosol of Automotive Li-ion LFP and NMC Batteries in Humidified Nitrogen under Thermal Load
- EF20 – (2 items) Victorian Big Battery Fire, July 2021. Report of technical findings. Also compendium of news items with aerial photography.
- EF21 – (2 items) Letter from Commissioner Sandra D. Kennedy, Arizona Public Service Company, August 2019, regarding McMicken explosion.
- Also letter with Fire Department report into earlier 2012 BESS fire with eye-witness reports on flame length.
- EF22 – Technical Memorandum from Golder Associates re composition of BESS at Kells, Northern Ireland
- EF23 – Ouyang *et al.* (2018), *J. Thermal Analysis and Calorimetry*, DOI: 10.1007/s10973-018-7891-6
- EF24 – Essl *et al.* (2020), *Batteries*, **6**, 30 DOI: 10.3390/batteries6020030
- EF25 – Chen *et al.* (2020), *J. Hazardous Materials*, **400**, 123169
DOI: 10.1016/j.jhazmat.2020.123169 (Citation only: article copyright)
- EF26 – Held *et al.* (2022) *Renewable and Sustainable Energy Reviews*, **165**, 112474
DOI: 10.1016/j.rser.2022.112474
- EF27 – Wang *et al.* (2019) *Energy Science and Engineering*, **7**, 411-419
DOI: 10.1002/ese3.283
- EF28 – Hazard Assessment of BESS, Technical Report by Atkins (Consulting Engineers) for Health and Safety Executive for Northern Ireland HSE(NI)
- EF29 – Letter 13/05/2022 from HSE(NI) to Ards and North Down Borough Council
- EF30 – Letter 22/09/2022 from HSE(NI) to Derry City and Strabane District Council
- EF31 – Letter 10/09/2021 from HSE(NI) to Armagh City, Banbridge & Craigavon Local Planning Office
- EF32 – Letter 18/07/2022 from HSE(NI) to Derry City and Strabane District Council
- EF33 – Letter 20/05/2021 from HSE(NI) to to Armagh City, Banbridge & Craigavon Local Planning Office

EF34 – Research Technical Report by *FM Global*: “Development of sprinkler protection guidance for Lithium-ion based energy storage systems”

EF35 – P. Andersson *et alia*, “Investigation of fire emissions from Li-ion batteries”, SP Technical Research Institute of Sweden, 2013.

EF36 – Barron-Gafford *et al.* (2016). The photovoltaic heat island effect: Larger solar power plants increase local temperatures. *Scientific Reports* **6**, 35070, DOI: 10.1038/srep35070

EF37 – Armstrong *et al.* (2016). Solar park microclimate and vegetation management effects on grassland carbon cycling. *Environmental Research Letters* **11**(7) 074016 DOI: 10.1088/1748-9326/11/7/074016

EF38 – Parliamentary answer

EF39 – BAILII case

EF40 – Fordham and Swords (2022). Application of the COMAH and Hazardous Substances Consents Regulations to Battery Energy Storage Systems (BESS): Does classification as “articles” exempt a technology ?

EF41 – Letter 17 December 2015 from Occupational Safety and Health Administration (OSHA) of the USA regarding classification of Li-ion batteries.

EF42 – Paper by Mr Pat Swords (2009) “Implementing EU industrial safety legislation in Central and Eastern Europe” Symposium Series No. 155, Hazards XXI, Institution of Chemical Engineers, 2009 pp 256 – 262.

EF43 – transcript of timed and recorded remarks made at OFH2

EF44 – transcript of final interview with the late Professor Sir David MacKay FRS, April 2016

EF45 – The Control Of Major Accident Hazards Regulations 2015

EF46 – United Nations Manual of Tests and Criteria, 7th edition

EF47 – Letter from DLUHC regarding operation of Part 3 of the P(HS)Regs 2015

EF48 – Letter from HSE(NI) to Armagh City, Banbridge and Craigavon Borough Council regarding application of COMAH and HSC to BESS

EF49 – Buston, J E H *et al.*, (2023) *Energy Advances* **2**, 170

EF50 – Revised Golder Memorandum, 19 Dec 2022

EF51 – Jensen Hughes memorandum, 3 March 2023

EF52 – Advice letter from HSE(NI), 12 January 2023

EF53 – KAS-43 Guidance Notes from German “Commission of Plant Safety” with English translation of Section 3.

EF54 – HSE advice to Applicant at EIA and S.42 stages

EF55 – Guidance Notes “L111” on the COMAH Regs, Health and Safety Executive

EF56 – EC Memorandum to stakeholders transposing the Seveso III Directive

EF57 – exchange of letters with Applicant, November 2020

GLOSSARY

Abbreviations used in the interests of brevity.

Legislation and statutory permissions:

CLP	– the Classification, Labelling and Packaging Regulation
COMAH Regs 2015	– the Control of Major Accident Hazards Regulations 2015
CQ	– Controlled Quantity (of a HS as defined in P(HS)Regs 2015)
DCO	– Development Consent Order
dDCO	– draft Development Consent Order
DS	– Dangerous Substance (as defined in the Schedule to COMAH Regs 2015). Usually synonymous to HS
GHS	– Globally Harmonised System (see UN GHS)
HS	– Hazardous Substance (as defined in the Schedule to P(HS)Regs 2015). Usually synonymous to DS
HCS	– Hazard Communication Standard (USA)
HSC	– Hazardous Substances Consent
PA 2008	– The Planning Act 2008
P(HS)A 1990	– The Planning (Hazardous Substances) Act 1990
P(HS)Regs 2015	– The Planning (Hazardous Substances) Regulations 2015
QQ	– Qualifying Quantity (of a “dangerous” substance) in the COMAH Regs 2015; similar to CQ in the P(HS)Reg 2015
REACH	– Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation
S or “S”	– any “substance used in processes” which on its own or in combination with others may generate HS defined in Parts 1 or 2 of the Schedule to the P(HS)Regs 2015
Seveso	– the “Seveso III Directive” 2012/18/EU of 4 July 2012
UN GHS	– United Nations Globally Harmonised System
UN MTC	– United Nations Manual of Tests and Criteria

Direct quotations from legislation are shown in blue

Policy documents:

NPPF	– National Planning Policy Framework
NPS	– National Policy Statement
EN-1	– Overarching National Policy Statement for Energy (EN-1)

Direct quotations from policy documents are shown in magenta

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GLOSSARY (cont.)

Competent authorities:

CA	– COMAH Competent Authority
DHCLG	– Department for Housing Communities and Local Government
DECC	– Department of Energy and Climate Change
DWP	– Department for Work and Pensions
EA	– Environment Agency
ECDC	– East Cambridgeshire District Council (LPA)
ExA	– Examining Authority
FRS	– Fire and Rescue Service
HSA	– Hazardous Substances Authority
HSE	– Health and Safety Executive
HSE(NI)	– Health and Safety Executive for Northern Ireland
IPC	– Infrastructure Planning Commission (now abolished)
LPA	– Local Planning Authority
NII	– Nuclear Installations Inspectorate
ONR	– Office for Nuclear Regulation
OSHA	– Occupational Safety and Health Administration (USA)
SoS	– Secretary of State
WSC	– West Suffolk Council (LPA)
UKAEA	– United Kingdom Atomic Energy Authority

Parties:

Sunnica	– the Applicant, or the proposal under Examination
SNTSAG	– Say No To Sunnica Action Group Ltd

Documents

OBFSMP	– Outline Battery Fire Safety Management Plan
BFSMP	– Battery Fire Safety Management Plan
LIR	– Local Impact Report

(continued)

GLOSSARY (cont.)

Technical:

AEGL-3	– Acute Exposure Guideline Levels
BESS	– Battery Energy Storage System(s)
CAS	– Chemical Abstracts Service, maintains a catalogue of unique chemical substances with reference numbers
CDFR	– Commercial Demonstration Fast Reactor
EV	– Electric Vehicle
GCMS	– Gas Chromatography Mass Spectrometry
ICHEME	– Institution of Chemical Engineers
IDLH	– Imminent Danger to Life and Health
IUPAC	– International Union of Pure and Applied Chemistry
Li-ion	– Lithium-ion
M-factor	– Multiplying Factor used for certain substances Toxic to the Aquatic Environment in eco-toxicity classifications
NFPA	– National Fire Protection Association (USA)
PPSE	– Professional Process Safety Engineer
PM	– Particulate Matter
PM _{2.5}	– Particulate Matter of diameter less than 2.5 µm
SoC	– State Of Charge of cells, usually given as percentage, between fully charged (100%) and completely discharged (0%)
SLOT	– Specified Level of Toxicity
SLOD	– Significant Likelihood of Death
STEL	– Short Term Exposure Limit, i.e. limiting allowed concentration for short-term exposures (typically 15 minutes)
SVHC	– Substance of Very High Concern
VCE	– Vapour Cloud Explosion
UHI	– Urban Heat Island

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GLOSSARY (cont.)

Chemical substances:

CH ₄	– Methane
C ₂ H ₄	– Ethylene
C ₂ H ₆	– Ethane
CO	– Carbon Monoxide
CO ₂	– Carbon Dioxide
Co	– Cobalt (as metal) (not to be confused with CO)
CoO	– Cobalt (II) Oxide
Cu	– Copper (as metal)
CuO	– Cupric (or Copper (II)) Oxide
Cu ₂ O	– Cuprous (or Copper (I)) Oxide
H ₂	– Hydrogen
HCN	– Hydrogen Cyanide
HF	– Hydrogen Fluoride
Mn	– Manganese (as metal)
MnO	– Manganese (II) Oxide
Ni	– Nickel (as metal)
NiO	– Nickel Monoxide
ONiO	– Nickel Dioxide
Ni ₂ O ₃	– diNickel triOxide
POF ₃	– Phosphoryl Fluoride

Li-ion cell types:

NMC	– Nickel – Manganese – Cobalt; a popular Li-ion cell type, with cathodes based on complex oxides of those elements
LFP	– Lithium – Iron [chemical symbol Fe, hence “F”] – Phosphate; another type of Li-ion cathode chemistry
LCO, NCA, LATP	– other cell cathode chemistries mentioned in text
LMO	– Lithium Manganese Oxide
LNO	– Lithium Nickel Oxide

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GLOSSARY (cont.)

Measurement units:

GW	– gigawatt, or one billion watts, or one thousand megawatts 1000 MW
MW	– megawatt, or one million watts, a unit of <i>power</i> , i.e. <i>rate</i> of transfer of <i>energy</i>
MWh	– megawatt- <i>hour</i> , or one million watt-hours, a unit of <i>energy</i> e.g. the <i>energy</i> transferred by a <i>power</i> of 1 MW acting for 1 <i>hour</i>
m ²	– square metre (area)
ha	– 1 hectare = 10,000 m ²
MWh ha ⁻¹	– energy storage density (on the land) in the BESS compounds, as MWh energy storage capacity, per hectare of land allocated
MWh / tonne or MWh tonne ⁻¹	– energy density of the BESS cells themselves, as MWh energy storage capacity, per tonne of cells
Wh / kg or Wh kg ⁻¹	– energy density of the BESS cells themselves, as Wh energy storage capacity, per kg of cells 1 MWh / tonne = 1000 Wh / kg
mg / Wh or mg (Wh) ⁻¹	– gas generation from cells in failure, in milligrams gas per watt-hours of energy storage capacity
tonne	– 1 metric tonne or 1000 kg or 1 Mg
µg m ⁻³	– trace concentrations of highly toxic gases, in micrograms of toxic contaminant per cubic metre of air
µm	– 1 micrometre or 10 ⁻⁶ metre