



Interim Standard Guideline Clearances for Solar Farm to DSO Overhead Network

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Section 1 – Governance

Introduction

The following guidelines are applicable to Clients, Designers, Planners, Project Supervisors Design Process (PSDP), Project Supervisors Construction Stage (PSCS), Contractors, Safety Representatives as defined in the Construction Regulations (Safety, Health and Welfare at Work (Construction) Regulations 2013) and in addition any personnel who are involved in carrying out work, construction, maintenance, operation, cleaning or other activities on solar farm developments where they are at risk from overhead electricity lines.

This guideline document describes some of the risks and hazards associated with overhead electricity lines in the vicinity of overhead network and the requirement to engage with ESB Networks during design stage in the event the solar farm is to encroach on the horizontal and vertical clearance distances to overhead network stated in this document.

i. Scope

This document applies to the erection, operation and maintenance of solar farm plant and equipment near overhead electricity lines.

This document does not address safety issues for underground electricity cables or other underground services.

ii. Mandatory references

The following documents are referenced in this document and should be read in conjunction with this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

Document No.	Document Title
DOC-230910-BBA	ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines
18147	Functional Design Specification for MV Overhead Lines
18145	Functional Design Specification for 38kV Overhead Lines
HSA0447 -ISBN 978-1-84496-226-6	Code of Practice for Avoiding Danger from Underground Services
S.I. No. 291 of 2013	Construction Regulations (Safety, Health and Welfare at Work (Construction) Regulations 2013),
	The applicable Connection Agreement signed between the Client and ESB Networks.

Table 1: Mandatory References

iii. Superseded Documents

This document supersedes the following document(s):

Document No.	Title	Full / Partial
DOC-190116-CDA	Standard Clearances for Solar Panel Farms from Overhead Power Lines	Full

Table 2: Superseded Documents

iv. Accountabilities, Roles and Responsibilities

Responsible Person	Responsibility
Issuing Authority	<ul style="list-style-type: none">• The body responsible for issuing and maintaining the Document.
Content Owner	<ul style="list-style-type: none">• Maintenance and Ownership of this Document.• Monitoring and review of processes and recommendations arising from feedback from End Users and incidents.
End User of this Document	<ul style="list-style-type: none">• Follow the guidelines stated in the document.• Report suggestions for improvement, as they arise, to the document owner.

Table 3: Roles and Responsibilities

v. Terms & Definitions

For the purposes of this document, the following terms and definitions apply.

Term	Definition
Corridor	The corridor is a lateral area near an overhead electricity line which must normally be isolated from the work site by physical barriers to minimise the risk of accidental contact or near contact with the overhead line by plant and machinery, equipment, scaffolding or other materials.
DSO	Distribution System Operator
EO	Engineering Officer in ESB Networks
ESB E&MP	ESB Engineering and Major Projects, a business unit within ESB
ESB Networks	A business unit within ESB
LV	Low Voltage
MV	Medium Voltage (10 kV or 20 kV)

Table 4: Terms & Definitions

vi. Symbols & Abbreviations

For the purposes of this document, the following symbols & abbreviations apply.



Symbol	Abbreviation
	Caution. Used to give the end user of the document information on what can happen, why, and the consequences of ignoring the caution. It does not contain rules.
	An information box provides additional information intended to assist the understanding or use of the document. It does not contain rules.

Table 5: Symbols & Abbreviations

vii. Terminology

For the purposes of this document, the following terminology applies;

Should Designates a company recommendation where conformance is not mandatory.

May Designates a Permissive Statement - an option that is neither mandatory nor specifically recommended.

viii. Compliance

Monitoring of compliance with this Document may be carried out by the various staff in ESNB who are responsible for maintaining Overhead Power Lines, Cables, ground mounted Substations and Stations.

Section 2 – Provisions

1. Overhead Power Line Guideline Corridors

Table 1 below states the guideline corridors for LV, MV, 38 kV and 110 kV Overhead ESNB Power Lines for solar farms. Where a solar farm development respects these distances, no notification of ESB Networks is required.

Where a requirement to encroach on the corridor continues to exist for a solar farm development, it is strongly recommended that the Designer and Owner of the proposed Solar Farm engages with ESB Networks at the earliest possible stage of his/her development, i.e. project initiative stage to discuss mitigation measures that can be employed to mitigate against the dangers posed by the construction, operation and maintenance of plant and equipment close to overhead electricity lines.

1.1 110 kV Distribution Overhead Lines

Should a Client wish to encroach within a horizontal distance of 10 metres from the outer conductor of a 110 kV distribution line, the Client should notify ESB at the earliest possible stage, i.e. pre-planning application.

Should a Client wish to encroach within a horizontal distance of 5 metres from the outer conductor of a 110 kV Distribution line, an obligation exists on the Client to notify ESB.

Solar farms located within a 50-metre radius of the centre of a 110 kV angle / tension type structure should have panels which are demountable to ground level to enable the operation of vehicular traffic in this area and the placement of temporary stays for structure support.

Solar farms should not encroach within 10 metres of a stay wire for a support structure.

1.2 38 kV / MV/ LV Overhead Lines

In accordance with the Code of Practice for avoiding danger from overhead electricity lines, second edition, May 2019, solar farms should not encroach within 6 metres of the outer conductor of a 38 kV, MV or LV distribution line.

Should a Client wish to encroach within a horizontal distance of 6 metres from the outer conductor of a 38 kV, MV or LV distribution line, the Client should notify ESB at the earliest possible stage, i.e. pre-planning application.

Should a Client wish to encroach within a horizontal distance of 5 metres from the outer conductor of a 38 kV, MV or LV Distribution line, an obligation exists on the Client to notify ESB.

Solar farms located within a 23 metre radius of the centre of a 38 kV angle / tension type structure should have demountable type panels installed in this area to allow for quick dismantling so that conductor restringing and mast repair can be undertaken.

Solar farms should not encroach within 6 metres of a stay wire for a support structure.

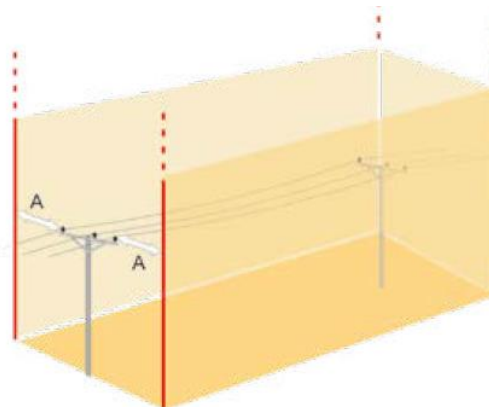


Figure 1 – Hazard Zone

Voltage of Overhead Power Line:	Minimum horizontal distance (A) from the outer most conductor in metres encroachment on which a statutory requirement to notify ESB exists:	Maximum height of Solar Panels above original ground level that will be located at the extremities of the minimum corridor:
LV, 10 kV, 20 kV and 38 kV	5.0	4m*
110 kV DSO Lines	5.0	4m*

In certain circumstances the Solar Panel Farm Designer or Owner should leave extra clearances from Wind Stay wires which are required to support the poles they are fixed to. Removal of Wind Stays are strictly forbidden without prior agreement in writing from the local EO or E&MP consultant as removal of Wind Stays need to be designed out prior to their removal.

The Solar farm Client should take account of any touch and step potential issues arising as a result of a fault on the adjacent overhead network. If a Solar Panel Farm is proposed near ESBN earthing systems, the onus should be on the Solar Panel Designer and Owner to ensure potentials are not transferred via their underground services.

The Solar Panel Farm Designer and Owner should ensure that a conflict will not arise between the existing ESBN earthing system and the proposed earthing system for the proposed Solar Panel Farm. This should be signed off on by both ESBN, and the Solar Panel Farm Owner and designer before planning is submitted.

The onus should be on the Solar Farm Designer / Owner to ensure that any metallic / conductive fencing erected should:

1. Not be located within a 23m radius of steel tower legs. *
2. Should have mitigation measures to prevent the transfer of potentials in the event of an earth fault occurring on its system.

* This distance may be reduced depending on tower height and line direction, contact should be made with the local Engineering Officer where a conflict arises with the Overhead line.

Cleaning of Solar Panels:

The Solar Panel Farm Owner/operator should agree the safe method of cleaning the panels with the EO at design stage. This safe method must be agreed in writing and the EO or its Consultant should keep a copy of this agreement on file.

The EO or its Consultant will explain the dangers associated with using jet water or liquids in close proximity to Overhead Power Lines. It is strongly recommended that adequate large signage be erected in appropriate places along the width of the required corridors mentioned above. The machine operator should be briefed of such dangers and a method statement should be agreed and issued to the EO before the cleaning work commences on site.

Note:

4m* this is a guide for height of solar panels above original ground level. If proposed vertical type solar panels are to be installed on the site adjacent to ESB Live Overhead Power Lines then a separate study will be required by Asset Management Section ESBN, Leopardstown Road, Foxrock, Dublin 18 in advance of the Solar Panel Farm Owner/Designer applying for planning permission.

Table 1: Overhead Line corridors for LV, MV, 38 kV and 110 kV Overhead ESBN Power Lines for Solar Panel Farms

2. Access to Overhead Power Lines

ESBN and or its Contractors will require fast access routes to the Overhead Power Lines at all times.

The Solar Panel Farm Owner and Designer should ensure that ESBN and or its Contractors have fast direct access to ESBN's Overhead Power Lines at all times. The Designer and Owner of the Solar Panel Farm should design the required access routes into their proposed scheme. Their proposal should be agreed with ESB Networks prior to planning submissions.

Adequate gate site entrance should be provided so that trucks and cranes can access the site with ease. It is prudent that the Solar Panel Farm Owner/Designer consults with ESB Networks on such access routes throughout the design stage of the project and at the earliest opportunity. The access routes should be kept as short as possible and should be 4 m in width, avoiding sharp bends to permit trucks, track machines and cranes access to the lines without difficulty.

The local EO will record these access routes on a suitable scaled map. These maps will be of great help to ESB crews or its Contracts that require access to the Networks in order to carry out emergency repair works, maintenance or diversions. The maps and routes will also be of help to the EO in the event of future planning of multiple Solar Panel Farms in the surrounding area.

3. Solar Panel Precautions

All Solar Panels and their associated cables should be adequately anchored onto their frames and the frames onto the ground so that they cannot be blown up onto the Overhead Power Lines or into the corridors mentioned above.

For safety reasons the Client of the Solar Panel Farm should discuss the proposed construction of the Solar Panel Farm with the local EO in advance of work commencement on site. During construction of the Solar Panel Farm it is imperative that all machinery used to construct the Solar Panel Farm maintain the clearances specified above. Ideally this discussion should take place during the design stage and just before work commencement on site. Furthermore, safety barriers and restriction zones along with safety signs/notices should be erected before work commencement on site, see also ESBN and HSA Website "ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines".

4. Solar Farm Developments that are unable to comply with the Guideline Corridors

Where existing ESB Overhead Lines, Underground Cables or Stations are located on or adjacent to the site the Client/Designer is planning to develop, the Client is required under the 1927 Electricity Supply Act and Subsequent Amendments to contact ESB in advance of their proposed design layout.

Where a solar farm development wishes to encroach on to the horizontal corridor, contact with ESB Networks should be made to discuss the safest way forward. The following guidelines only apply when solar farm equipment encroaches on the horizontal corridors stated in section 1 of this document.

For Low Voltage (LV), Medium Voltage Lines (10/20 KV Lines) and 38 kV and 110 kV DSO Overhead Power Lines the Owner/Designer of the proposed Solar Panel Farm should contact the relevant EO in ESBN's local office where the Solar Panel Farm will be located. The EO will brief the Client in relation to ESBN's horizontal and vertical clearance distances as stipulated in this document and convey the statutory requirements in writing to the Client. The EO will keep a copy of all relevant correspondence with the Client on file. Where the Client finds it necessary to encroach on the horizontal distances stated in this document, the Client should contact, in writing, the relevant person in The Conflicts Manager, Overhead Lines Asset Management, Leopardstown Road, Dublin 18.

A single point of contact with the local ESB Networks (ESBN) Design Office prior to designing the layout of the proposed Solar Panel Farm, should be established in relation to proposed Solar Panel Farms adjacent to existing:

- Underground cables
- Ground mounted substations
- HV Stations

Ground Potential Rise studies and mitigation measures may also be required if the Client is planning to develop a Solar Panel Farm adjacent to a substation or Overhead line towers. In such cases the EO, will contact the relevant person in Stations Section, Asset Management, Leopardstown Road, Foxrock, Dublin 18 or for Overhead Towers, Overhead Lines Section, Asset Management, Leopardstown Road, Foxrock, Dublin 18. Any and all such mitigations measures are the sole responsibility of the Solar Farm Designer / Owner.

This document is not a guide to connect the Solar Panel Farm to the ESNB Distribution and or to the Transmission Network system.

5. Dangers from Overhead Electricity specific to Solar Farms

People are killed and injured each year by accidental contact or near contact with overhead electricity lines. The following non-exhaustive list of dangers related to the construction and operation of solar farm plant close to electricity lines involves:

- Cranes or excavators;
- Tipping trucks or truck mounted cranes;
- Mobile extendable machinery;
- Solar panel erection equipment;
- Solar panels themselves;
- Falling conductor / line drop;
- Contact with stays;
- Ground potential rise due to faults;
- Arcing due to reduced clearances and salt storms;
- Electrical storms / arcing (or jumping) from overhead electricity lines;
- Transfer potential;
- Arcing (or jumping) due to power washing of panels in the vicinity of overhead electricity lines;
- Maintaining, replacing and washing

Where solar farm development encroaches into the corridors stated in section 1, the Client will be required to engage with ESB Networks to reduce /eliminate the risks associated with the dangers listed above. Such mitigation measures may include:

- Isolation of plant and equipment,
- Isolation of other services,
- Diversion /undergrounding of spans / sections of network,
- Operation of exclusion zones,
- Insulation of conductors,
- Safe cleaning methods /procedures
- Rack out solar panels

Electric shock can cause burns and damage to the heart which can be fatal.

Line drop incidents can occur from time to time (particularly in storm events, i.e. storm Ophelia October 2017) in the event an overhead line conductor drop occurred over solar farm plant, there is a high risk of an earth fault or ground potential rise incident. Such incidents are not only dangerous and damaging to solar farm plant, equipment and staff but could also affect local services resulting in potential injuries and potential damage over a widespread area from the point of failure, for example, a line drop on an insufficiently earthed system could cause a rise in potential in neighbouring development resulting in dangerous touch voltages on local domestic appliances.

Transfer potential incidents can also involve other services and utilities such as telecoms and cable tv services, water and gas services.

Please note that engagement with ESB Networks on any particular measure(s) does not infer transfer of liability for accidents/ incidents to ESB.

For any electrical emergencies or contact with overhead network, contact ESB Networks immediately at 1800 372 999 (24 hours).

6. Induction on the Solar Panels from Overhead Power Lines

Overhead Power Lines may cause electrical induction on Solar Panels and support frames and the onus is on the Designer and Owner of the Solar Panel Farm to ensure that they mitigate against this from happening. Solutions offered by the Designer to mitigate against this problem should be agreed in writing with ESN before such solutions are implemented. This will help to ensure that the solutions on offer do not impact on ESN protection systems.

During the consultation process between ESN and the Solar Panel Farm Owner/Designer, ESN and or its Consultants should inform the Designer and Owner of the Solar Panel Farm in writing of the current earthing system installed/used on the adjacent Overhead ESB Network. The onus is on the solar panel farm Owner to request this information from ESN, e.g. simple earthing techniques, potential control rings, counterpoises, Faulty Phase Earthing System, reclosing, radials, etc.

The Solar Panel Client/Owner should not interfere with ESN earthing systems during the construction stages of the Solar Panel Farm for safety reasons. If the Client accidentally damages an ESN earthing system, he/she shall stop work immediately and contact ESB Networks immediately at 1800 372 999 (24 hours) and the local Engineering Office.

7. Cabling of Overhead Lines

In relation to undergrounding/cabling of existing Overhead Networks refer to existing ESB documents. These can be obtained and discussed through a single point of contact with the local Engineering Officer prior to designing the layout of the proposed Solar Panel Farm.

8. Document Review

This document and safety clearance standard will be kept under review, and please always consult ESN website for the latest version before planning your Solar Panel Farm.

Derogations

No Derogations are recorded against the Requirements of this document

Document Control

Policy Base

Policy No.	Policy Title
DOC-230910-BBA	ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines