

Appendix 8.1

Climate Data Sources and Assumptions



Rosefield Solar Farm

Preliminary Environmental Information Report

Volume 3
Appendix 8.1: Climate Data Sources and
Assumptions

September 2024



Table 8.1 Delivery Assumptions

| Transport scenario (both road and sea to be used) | Km by road (average rigid HGVs, average laden) | Km by sea (average container ship) | Source |
|---|--|------------------------------------|------------------------|
| European manufactured | 1,500 | 100 | RICS 2023 ¹ |
| Globally manufactured | 500 | 10,000 | RICS 2023 |

Table 8.2 Environmental Product Declarations

| Asset | Emission category | Emission Factor | Unit | Source |
|----------|-------------------|-----------------|------------------------------------|--|
| Solar PV | A1-3 | 217 | kgCO _{2e} /m ² | Average of various EPDs sourced from One Click LCA |
| Solar PV | C1-4 | 4 | kgCO _{2e} /m ² | Average of various EPDs sourced from One Click LCA |
| BESS | A1-3 | 175 | kgCO _{2e} /kwh | Romare and Dahllöf 2017 ² |
| BESS | C3-4 | 8 | kgCO _{2e} /kg | Li et al., 2023 ³ |

¹ RICS (2023) Whole Life Carbon Assessment for the Built Environment. Available online:

https://www.rics.org/content/dam/ricsglobal/documents/standards/whole_life_carbon_assessment_for_the_built_environment_1st_edition_rics.pdf

² Romare, M. and Dahllöf, L., 2017. The life cycle energy consumption and greenhouse gas emissions from lithium-ion batteries.

³ Li, J., Li, L., Yang, R. and Jiao, J., 2023. Assessment of the lifecycle carbon emission and energy consumption of lithium-ion power batteries recycling: A systematic review and meta-analysis. *Journal of Energy Storage*, 65, p.107306.

| Asset | Emission category | Emission Factor | Unit | Source |
|--------------|-------------------|-----------------|--------------------------|------------------------------------|
| Transformers | A1-3 | 705,694 | kgCO ₂ e/unit | Guo et al., 2022 ⁴ |
| Transformers | C1-4 | 6,075 | kgCO ₂ e/unit | EPD Italy 2023 ⁵ |
| Transformers | A1-3 | 221,500 | kgCO ₂ e/unit | EPD Italy ⁶ |
| Transformers | C1-4 | 3,280 | kgCO ₂ e/unit | EPD Italy |
| Inverters | A1-3 | 3,990 | kgCO ₂ e/unit | Huawei 2023 ⁷ |
| Inverters | C3-4 | 30 | kgCO ₂ e/unit | Huawei 2023 |
| Switchgear | A1-3 | 3330 | kgCO ₂ e/unit | EPD unavailable. One Click LCA. |
| Switchgear | C3-4 | 176 | kgCO ₂ e/unit | EPD unavailable. One Click LCA. |

Table 8.3 Emission Factors

| Description | Description | EF | Unit | Source | Notes |
|-------------|---------------------|------|------------------------|-----------------------|--------------------|
| Materials | Weathering steel | 3.28 | kgCO ₂ e/kg | TATA Steel 2020 | Produced in Europe |
| | Aluminium | 5.58 | kgCO ₂ e/kg | ICE 2019 ⁸ | Produced in Europe |
| | Steel - Cold Rolled | 2.73 | kgCO ₂ e/kg | ICE 2019 | World Average |
| | Steel - Plate | 2.46 | kgCO ₂ e/kg | ICE 2019 | World Average |

⁴ Guo, H., Gao, Y. and Li, J., 2022. The greenhouse gas emissions of power transformers based on life cycle analysis. *Energy Reports*, 8, pp.413-419.

⁵ EPD Italy (2023). Available from: <https://www.epditaly.it/en/epd-search/>

⁶ EPD Italy (2023). Available from: https://www.epditaly.it/en/wp-content/uploads/2016/12/EPD_GetraPw_2023-09-12_r1_def.pdf

⁷ Huawei (2023). Available from: <https://www.epditaly.it/en/epd/sun2000-330ktl-h1/>

⁸ University of Bath (2019) Inventory of Carbon and Energy. Available online: <https://greenbuildingencyclopaedia.uk/wp-content/uploads/2014/07/Full-BSRIA-ICE-guide.pdf>

| Description | Description | EF | Unit | Source | Notes |
|-------------|-------------------------|----------------------------------|------------------------------------|-------------------------------|-----------------------------|
| | Insulating paper | 1.76 | kgCO ₂ e/kg | Guo et al., 2022 ⁹ | |
| | Copper | 2.71 | kgCO ₂ e/kg | ICE 2019 | Produced in Europe |
| | Mineral Oil | 1401 | kgCO ₂ e/t | DESNZ 2023 ¹⁰ | Primary material production |
| | Diesel | 2.51 | kgCO ₂ e/l | DESNZ 2023 | Biofuel blend |
| | Concrete | One Click LCA 2024 ¹¹ | kgCO ₂ e/m ³ | One Click LCA 2024 | |
| Transport | All Rigids | 0.18 | kgCO ₂ e/tkm | DESNZ 2023 | Average Laden |
| | Average Container Ship | 0.02 | kgCO ₂ e/tkm | DESNZ 2023 | Average |
| | All Rigids | 0.21 | kgCO ₂ e/tkm | DESNZ 2023 | 50% Laden |
| | Average diesel Van | 0.23 | kgCO ₂ e/km | DESNZ 2023 | |
| | Petrol Car | 0.164 | kgCO ₂ e/km | DESNZ 2023 | Average |
| | Bus | 0.118 | kgCO ₂ e/pkm | DESNZ 2023 | |
| Disposal | Mineral Oil - recycling | 21.28 | kgCO ₂ e/t | DESNZ 2023 | Construction |
| | Other metals recycling | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | e.g., Aluminium recycling |

⁹ Guo, H., Gao, Y. and Li, J., 2022. The greenhouse gas emissions of power transformers based on life cycle analysis. *Energy Reports*, 8, pp.413-419.

¹⁰ Department for Energy Security and Net Zero (2023) Conversion factors. Available online: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023>

¹¹ Unable to share emission factors from One Click LCA due to contractual obligations

| Description | Description | EF | Unit | Source | Notes |
|-----------------|----------------------------------|------------------------|------------------------------------|------------------------|-----------------|
| | Structural steel recycling | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | Steel recycling |
| | Inert materials landfill | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | |
| | Glass recycling | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | |
| | PVC incineration | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | |
| | Recycling of reinforcement steel | One Click 2024 | kgCO ₂ e/kg | One Click 2024 | |
| Water | Consumption | 0.18 | kgCO ₂ e/m ³ | DESNZ 2023 | |
| | Treatment | 0.20 | kgCO ₂ e/m ³ | DESNZ 2023 | |
| Fuel | Gas | 0.35 | kgCO ₂ e/kWh | DESNZ & BEIS2023 | |
| Electricity | China | IEA 2023 ¹² | kgCO ₂ e/kwh | IEA 2023 ¹³ | Location |
| Electricity T&D | China | IEA 2023 | kgCO ₂ e/kwh | IEA 2023 | |

Table 8.4 Key Assumptions

| Category | Assumption | Source |
|---------------------------------------|----------------------|--------------------------|
| Construction worker water use | 45 litres/worker/day | BSRIA 2011 ¹⁴ |
| Construction worker commuter distance | 50 km one-way | RSK Assumption |
| Operational worker commuter distance | 25 km one-way | RSK Assumption |

¹² Unable to share emission factors from IEA due to contractual obligations

¹³ International Energy Agency (2023). Annual GHG emission factors for World countries from electricity and heat generation.

¹⁴ BSRIA (2011) Rules of thumb. Guidelines for building services.

| Category | Assumption | Source |
|-----------------------------|------------------------------|-------------------------|
| PV cleaning water use | 76 litres/MWh | SEIA 2023 ¹⁵ |
| HGVs - deliveries | 43% empty running factor | RICS 2023 |
| Sea - deliveries | 0% empty running factor | RICS 2023 |
| Repair | 25% of maintenance emissions | RICS 2023 |
| Landfill disposal distance | 100 km | RSK Assumption |
| Recycling disposal distance | 100 km | RSK Assumption |
| Service life | 30 years | Client Provided |

¹⁵ SEIA (2024) Water use management. Available online:
<https://www.seia.org/initiatives/water-use-management>



rosefieldsolarfarm.co.uk