

Energy Valley

ESIA Nagaa Hammadi Battery Energy Storage System and OHTL - Energy Valley

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July 2026

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List of Acronyms

Acronym	Definition
AC	Alternating Current
ACSR	Aluminium Conductor Steel Reinforced
AoI	Area of Influence
BESS	Battery Energy Storage System
BMS	Battery Management System
CESMP	Construction Environmental and Social Management Plan
E&S	Environmental and Social
EBRD	European Bank for Reconstruction and Development
EEAA	Egyptian Environmental Affairs Agency
EHS	Environment, Health and Safety
EMF	Electromagnetic Field
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender-Based Violence
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
HSE	Health, Safety and Environment
HV	High Voltage
IFC	International Finance Corporation
ILO	International Labour Organization
IUCN	International Union for Conservation of Nature
LILO	Loop-In Loop-Out
MV	Medium Voltage
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHTL	Overhead Transmission Line
PCS	Power Conversion System
PPE	Personal Protective Equipment
PV	Photovoltaic
RoW	Right-of-Way
SEP	Stakeholder Engagement Plan
SF ₆	Sulfur Hexafluoride
UPS	Uninterruptible Power Supply

List of Abbreviations

List of Abbreviations, Units and Technical Terms (Alphabetical)

Abbreviation	Definition
°C	Degree Celsius
AC	Alternating Current
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
dB(A)	A-weighted Decibel
EGP	Egyptian Pound
EU	European Union
ha	Hectare
Hz	Hertz
km	Kilometre
km/h	Kilometres per Hour
kV	Kilovolt
kWh	Kilowatt-hour
m	Metre
mm	Millimetre
m ²	Square Metre
m ³	Cubic Metre
MVA	Mega Volt Ampere
MW	Megawatt
MWh	Megawatt-hour
NO _x	Nitrogen Oxides
PM	Particulate Matter
PM _{2.5}	Particulate Matter ≤ 2.5 µm
PM ₁₀	Particulate Matter ≤ 10 µm
SO _x	Sulfur Oxides
S/S	Substation
t	Tonnes
UPS	Uninterruptible Power Supply
USD	United States Dollar
V	Volt

الملخص التنفيذي

المقدمة

يهدف المشروع إلى المساهمة في تحقيق أهداف مصر الخاصة بالطاقة المتجددة واستقرار الشبكة من خلال توفير سعة تخزين طاقة بالبطاريات على نطاق المرافق، بما يدعم دمج الطاقة المتجددة، ونقل الأحمال، وإدارة الطاقة.

يتمثل الهدف العام لدراسة تقييم الأثر البيئي والاجتماعي (ESIA) في تزويد متخذي القرار والجهات التنظيمية والممولين ومطور المشروع بالمعلومات المتعلقة بالمخاطر والتأثيرات البيئية والاجتماعية المحتملة المرتبطة بالمكونات المقترحة، والتي تشمل نظام تخزين الطاقة بالبطاريات (BESS)، ومحطة المحولات المشتركة، وخطوط النقل الهوائية (OHTL).

وتتمثل الأهداف المحددة فيما يلي:

- تحديد التأثيرات البيئية والاجتماعية الإيجابية والسلبية المحتملة للمشروع المقترح؛
- تقييم أهمية التأثيرات المحتملة خلال مراحل الإنشاء والتشغيل وإزالة / تفكيك المشروع؛
- تحديد تدابير التخفيف والإدارة والتحسين الخاصة بالتأثيرات السلبية والإيجابية؛
- إعداد خطة إدارة بيئية واجتماعية (ESMP)، بما في ذلك إجراءات الرصد والمسؤوليات؛
- دعم إشراك أصحاب المصلحة والإفصاح بطريقة متناسبة وذات معنى؛
- التأكد من التزام المشروع باللوائح البيئية المصرية ومتطلبات مؤسسات التمويل الدولية ذات الصلة.

الإطار المؤسسي والقانوني

الإطار القانوني يشمل كلاً من التشريعات الوطنية والمعايير والإرشادات الدولية.

التشريعات الوطنية

يجب أن يلتزم المشروع بالقوانين واللوائح البيئية والاجتماعية المصرية، بما في ذلك ما يلي:

تقييم الأثر البيئي: يتطلب قانون البيئة المصري رقم ٤ لسنة ١٩٩٤، وتعديلاته بالقوانين رقم ٩ لسنة ٢٠٠٩ ورقم ١٠٥ لسنة ٢٠١٥، ولائحته التنفيذية، إعداد دراسة تقييم أثر بيئي للمشروعات الجديدة. ويتم تقديم دراسة تقييم الأثر البيئي إلى الجهة البيئية المختصة للمراجعة والاعتماد. ووفقاً للوائح الوطنية، يُصنف هذا المشروع ضمن مشروعات الفئة ب محددة.

جودة الهواء والانبعاثات الجوية: يحدد القانون رقم ٤ لسنة ١٩٩٤ واللوائح المرتبطة به الحدود القصوى لملوثات الهواء المحيط وغازات العادم. وسيكون على المشروع الالتزام بهذه الحدود خلال مرحلتي الإنشاء والتشغيل.

الضوضاء والاهتزازات: يحدد قانون البيئة رقم ٤ لسنة ١٩٩٤ الحدود القصوى المسموح بها لمستويات الضوضاء في بيئة العمل والبيئة المحيطة.

إدارة المخلفات: يحدد قانون تنظيم إدارة المخلفات رقم ٢٠٢ لسنة ٢٠٢٠ ولائحته التنفيذية متطلبات إدارة المخلفات غير الخطرة والخطرة الناتجة عن الأنشطة المختلفة.

حماية التنوع البيولوجي والحفاظ على الطبيعة: تحظر المادة ٢٨ من قانون البيئة رقم ٤ لسنة ١٩٩٤ الأنشطة التي تضر بأنواع محددة من الحيوانات والنباتات البرية وموائلها. كما يضم الملحق ٤ من هذا القانون قائمة بالأنواع المحمية. يقع موقع المشروع في بيئة صحراوية ذات حساسية بيئية منخفضة نسبياً؛ ومع ذلك سيتم تنفيذ تدابير حماية التنوع البيولوجي عند الحاجة.

التراث الثقافي: يحمي قانون حماية الآثار رقم ١١٧ لسنة ١٩٨٣، المعدل بالقانون رقم ٣ لسنة ٢٠١٠، الموارد الأثرية والثقافية. وسيتم تنفيذ إجراءات المصادفات الأثرية خلال مرحلة الإنشاء، مع الحفاظ على التنسيق مع وزارة السياحة والآثار عند الضرورة.

السلامة والصحة المهنية: يحدد قانون العمل رقم ١٤ لسنة ٢٠٢٥ والقرارات الوزارية المرتبطة به متطلبات رفاه العاملين والسلامة والصحة المهنية وساعات العمل والاستعداد للطوارئ والوقاية من المخاطر المهنية. وتتنطبق هذه المتطلبات على جميع مقاولي المشروع ومقاولي الباطن.

تخصيص الأراضي وتطوير الطاقة المتجددة: يتم تطوير المشروع على أرض مخصصة من هيئة الطاقة الجديدة والمتجددة (NREA)، وفقاً للوائح الوطنية المنظمة لمشروعات الطاقة المتجددة واستخدامات الأراضي في المناطق الصحراوية.

الصحة والسلامة المجتمعية: تضع الأحكام ذات الصلة في قانون البيئة رقم ٤ لسنة ١٩٩٤ وقانون العمل رقم ١٤ لسنة ٢٠٢٥ والتشريعات الأخرى المعمول بها متطلبات حماية المجتمعات القريبة ومستخدمي الطرق من المخاطر المرتبطة بأعمال الإنشاء، وتأثيرات المرور، والأتربة، والضوضاء، وحالات الطوارئ.

الإطار المؤسسي

تتمتع عدة جهات حكومية بمسؤوليات تنظيمية ورقابية فيما يتعلق بالمشروع، وتشمل:

جهاز شؤون البيئة المصري مسؤول عن مراجعة واعتماد دراسة تقييم الأثر البيئي والاجتماعي ومراقبة الالتزام البيئي.

هيئة الطاقة الجديدة والمتجددة مسؤولة عن تخصيص الأراضي والإشراف على مشروعات الطاقة المتجددة.

الشركة المصرية لنقل الكهرباء مسؤولة عن ترتيبات الربط بالشبكة والبنية التحتية لنقل الكهرباء.

وزارة الكهرباء والطاقة المتجددة توفر الإشراف الاستراتيجي على قطاع الكهرباء وتطوير الطاقة المتجددة.

وزارة العمل مسؤولة عن تطبيق متطلبات العمل والسلامة والصحة المهنية.

جهاز تنظيم إدارة المخلفات مسؤول عن تنظيم وترخيص أنشطة إدارة المخلفات.

الحماية المدنية ومقدمو خدمات الطوارئ مسؤولون عن التنسيق بشأن السلامة من الحرائق والاستجابة للطوارئ.

محافظة قنا والوحدات المحلية مسؤولة عن التنسيق الإداري المحلي ومتطلبات التصاريح. وزارة السياحة والآثار مسؤولة عن حماية الموارد الأثرية والتراث الثقافي.

المعايير والإرشادات الدولية

بالإضافة إلى التشريعات الوطنية، سيلتزم المشروع بالمعايير والإرشادات الدولية، ولا سيما متطلبات مؤسسات التمويل الدولية:

- معايير أداء مؤسسة التمويل الدولية سيلتزم المشروع بمعايير أداء مؤسسة التمويل الدولية بشأن الاستدامة البيئية والاجتماعية، والتي تغطي التقييم والإدارة البيئية والاجتماعية، والعمل وظروف العمل، وكفاءة استخدام الموارد، والصحة والسلامة المجتمعية، والاستحواذ على الأراضي، وحفظ التنوع البيولوجي، والتراث الثقافي، وإشراك أصحاب المصلحة.
- متطلبات الأداء للبنك الأوروبي لإعادة الإعمار والتنمية سيلتزم المشروع بسياسة البنك الأوروبي لإعادة الإعمار والتنمية البيئية والاجتماعية ومتطلبات الأداء المرتبطة بها، والتي تنظم الإدارة البيئية والاجتماعية، والعمل، وكفاءة استخدام الموارد، والتنوع البيولوجي، والتراث الثقافي، وإشراك أصحاب المصلحة.
- نظام الإجراءات الوقائية المتكامل الخاص بمجموعة بنك التنمية الأفريقي سيلتزم المشروع بالضمانات التشغيلية وإجراءات التقييم البيئي والاجتماعي لبنك التنمية الأفريقي، بما في ذلك المتطلبات المتعلقة بإدارة المخاطر البيئية والاجتماعية، وظروف العمل، وحفظ التنوع البيولوجي، ومنع التلوث، والصحة والسلامة المجتمعية، وإشراك أصحاب المصلحة.
- المعايير البيئية والاجتماعية لبنك الاستثمار الأوروبي سيتم تصميم وتنفيذ المشروع وفقاً للمعايير البيئية والاجتماعية المعمول بها لدى بنك الاستثمار الأوروبي، بما في ذلك المعايير المتعلقة بالتقييم البيئي، والتنوع البيولوجي، والعمل المناخي، ومعايير العمل، والصحة والسلامة المجتمعية.
- إرشادات البيئة والصحة والسلامة لمجموعة البنك الدولي: سيتم تطبيق الإرشادات العامة للبيئة والصحة والسلامة والإرشادات القطاعية ذات الصلة باعتبارها ممارسة صناعية دولية جيدة (GIIP) طوال دورة حياة المشروع.
- اتفاقيات منظمة العمل الدولية سيحترم المشروع اتفاقيات منظمة العمل الدولية التي صدقت عليها مصر، بما في ذلك الاتفاقيات المتعلقة بالسلامة والصحة المهنية، وعدم التمييز، والعمل الجبري، وعمل الأطفال، وحرية تكوين الجمعيات، والمفاوضة الجماعية.

وصف المشروع

يقع مشروع نظام تخزين الطاقة بالبطاريات في نجع حمادي بمحافظة قنا، داخل الظهير الصحراوي لنجع حمادي، على بعد حوالي ١٦ كم جنوب شرق مدينة نجع حمادي. وسيتم تطوير المشروع داخل / بجوار منطقة مشروع محطة دندرة للطاقة الشمسية، وفي سياق قائم لتطوير الطاقة المتجددة والبنية التحتية للمرافق.

أقرب تجمع سكني هو قرية البركة، الواقعة على بعد حوالي ٢.٨ كم شمال غرب موقع المشروع. وتشمل المعالم المحيطة الأخرى مشروع أولبيسك للطاقة الشمسية، الواقع على بعد حوالي ٢ كم جنوب غرب الموقع؛ ومشروع دندرة للطاقة الشمسية، الذي يحد موقع المشروع من الشمال والشرق؛ ووادي النيل، على بعد حوالي ١١ كم شمالاً؛ ومدينة قنا، على بعد حوالي ٤٥ كم شمال شرق الموقع.

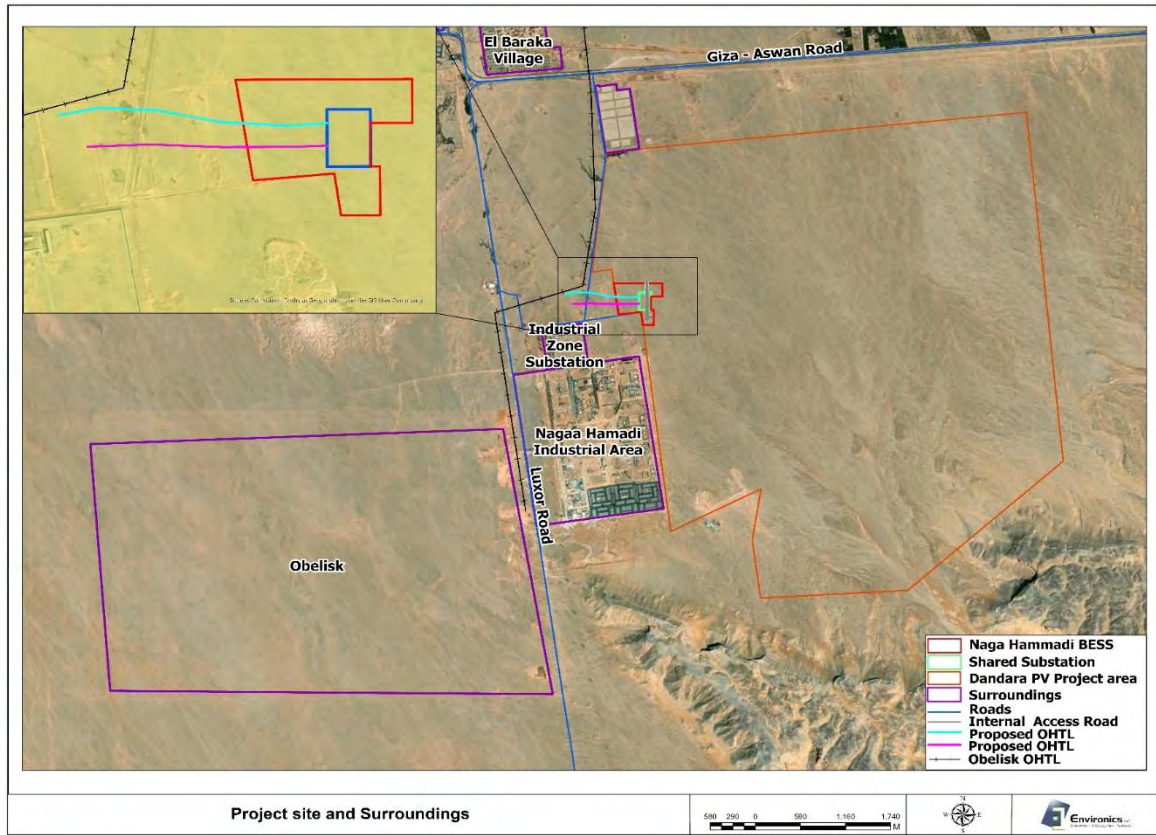
تبلغ متطلبات الأراضي الخاصة بالمشروع حوالي ١٩٤,٢٨٨ م^٢، وتشمل حوالي ٢٥,٤٦٨ م^٢ لنظام تخزين الطاقة بالبطاريات، و ٢٩,٨٨٥ م^٢ لمحطة المحولات المشتركة، و ١٢٠,٨٠٠ م^٢ لحرم حق المرور الخاص بخطوط النقل الهوائية، و ١٨,١٣٥ م^٢ لمناطق التشوين والطرق.

جدول إحداثيات موقع المشروع — نظام Africa_Lambert_Conformal_Conic

النقطة	خط العرض	خط الطول
نظام تخزين الطاقة بالبطاريات — نجع حمادي		
1	2783461.394616753	769680.2875735309
2	2783288.608535677	769680.5736761187
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.380414486	769572.0346908272
6	2782925.301310003	769572.354213905
7	2782925.0819173753	769440.8904367206
8	2783090.392588258	769419.0912364512
9	2783064.17148301	769147.1504593793
10	2783460.50069052	769089.6132877459
محطة المحولات المشتركة		
1	2783342.5772506595	769395.074916218
2	2783342.8208433986	769540.7650960417
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.231103331	769395.452907633
خط النقل الهوائي — فتح خط أولبيسك القائم		
1	2783322.8126595914	768497.4499838825
2	2783351.7612946033	768630.8980950158
3	2783340.526999265	768830.6919441563
4	2783293.9203641415	769038.9087141189
5	2783279.735473752	769268.2176393371
6	2783288.707302332	769394.4987259954
خط النقل الهوائي — فتح خط نجع حمادي الصناعي القائم		
1	2783198.9771317244	768593.0058898054
2	2783206.5204039514	768806.5511225817
3	2783195.613176942	769045.9467630284
4	2783195.8623732626	769280.7430346524
5	2783200.6241021454	769396.1315332904

يوضح الشكل ١ أدناه استخدامات الأراضي والأنشطة المحيطة بموقع المشروع المقترح.

يوضح الشكل ١ أدناه استخدامات الأراضي والأنشطة المحيطة بموقع المشروع المقترح.



الشكل ١ : الأنشطة / استخدامات الأراضي المحيطة بالموقع المقترح

مكونات المشروع والأنشطة الرئيسية

يتكون مشروع نظام تخزين الطاقة بالبطاريات المقترح في نجع حمادي من ثلاثة مكونات رئيسية:

نظام تخزين الطاقة بالبطاريات: (BESS)

سيكون للنظام سعة تخزين مركبة تبلغ حوالي ١,٠٠٠ ميغاوات ساعة، وقدرة تفريغ تيار متردد تبلغ حوالي ٢١٠ ميغاوات لمدة ٤ ساعات. وسيكون من وحدات بطاريات ليثيوم أيون، من المتوقع أن تعتمد على فوسفات الحديد الليثيوم (LFP)، داخل حاويات مسبقة التجهيز ومقاومة للعوامل الجوية. ويشمل النظام أنظمة إدارة البطاريات (BMS)، وأنظمة تحويل الطاقة (PCS)، وأنظمة التبريد والتهوية، ونظام SCADA، وأنظمة الكشف عن الحريق والإطفاء، والتحكم في الدخول، والأنظمة المساعدة.

محطة محولات مشتركة جهد ٢٢٠/٣٣ كيلو فولت:

سيستخدم المشروع محطة محولات مشتركة جهد ٢٢٠/٣٣ كيلو فولت تخدم كلاً من مشروع دندرة للطاقة الشمسية ومشروع إنرجي فالي لتخزين الطاقة بالبطاريات. وتشمل المحطة ثلاثة محولات قدرة بسعة إجمالية مركبة تبلغ حوالي ٨٥٠ ميغا

فولت أمبير، بما في ذلك محول واحد بسعة ٢٥٠ ميجا فولت أمبير لخدمة إنرجي فالي. كما ستشمل المحطة المحولات، والمفاتيح الكهربائية، وقواطع الدائرة، وأنظمة الحماية والتحكم، والاتصالات، والقياس، وأنظمة التيار المتردد / المستمر المساعدة، ومبنى التحكم.

خطوط النقل الهوائية جهد ٢٢٠ كيلو فولت:

سيتم ربط المشروع بالشبكة القومية القائمة من خلال خطوط نقل هوائية مزدوجة الدائرة جهد ٢٢٠ كيلو فولت بطول يقارب ١ كم، باستخدام نظام دخول وخروج (LILLO) على خط النقل القائم جهد ٢٢٠ كيلو فولت بين محطة محولات المنطقة الصناعية بنجع حمادي ومحطة محولات أو بليسك. وستشمل خطوط النقل أبراجاً شبكية، وموصلات، وعوازل، وفواصل، ومخمدات، وأنظمة تأريض، وحرر حق مرور بعرض ٢٥ متراً على كل جانب من خط النقل.

مرافق الإنشاء والتشغيل

ستشمل أنشطة الإنشاء تجهيز الموقع، والتسوية، والحفر، وتنفيذ الأساسات، وتركيب حاويات نظام تخزين الطاقة بالبطاريات، وتركيب محطة المحولات، وتنفيذ قواعد وأبراج خطوط النقل الهوائية، والأعمال الكهربائية، والاختبارات والتشغيل التجريبي. وستشمل مرافق الإنشاء المؤقتة مكاتب الموقع، ومناطق التشوين، ومناطق التخزين، والمرافق الصحية، ومرافق رفاه العاملين. خلال مرحلة التشغيل، ستتم مراقبة المنشأة من خلال أنظمة BMS و SCADA، مع الحاجة إلى عدد محدود من العاملين للتشغيل والصيانة. وسيستخدم نظام تبريد البطاريات دائرة تبريد سائل مغلقة مع تبديد حراري هوائي من خلال مبردات جافة. وسيتم إدارة سائل التبريد ضمن إجراءات إدارة المواد الخطرة بالمشروع، بما في ذلك توفير صحيفة بيانات السلامة، والاستجابة للانسكابات، والتخلص المرخص من أي سائل تبريد مستهلك أو ملوث.

الظروف البيئية والاجتماعية الأساسية

المناخ والأرصاد الجوية

تتميز منطقة المشروع بمناخ حار جاف نموذجي لمحافظة قنا، حيث يكون الصيف شديد الحرارة والشتاء معتدلاً، مع انخفاض معدلات الأمطار وارتفاع الإشعاع الشمسي. يبلغ متوسط درجة الحرارة السنوية المسجل بمحطة أرصاد قنا حوالي ٢٣.٩ درجة مئوية، مع متوسط درجات حرارة عظمى يصل إلى حوالي ٣٧.٩ درجة مئوية في يوليو. ويبلغ متوسط الأمطار السنوي حوالي ١.٦ مم/سنة، وهو منخفض للغاية.

جودة الهواء:

يقع موقع المشروع في بيئة صحراوية / مرفقية ذات مصادر انبعاث محلية محدودة. ومن المتوقع أن تكون جودة الهواء المحيط جيدة بوجه عام فيما يتعلق بالملوثات الناتجة عن الأنشطة البشرية. ومع ذلك، قد ترتفع الأتربة المحمولة بالرياح والجسيمات العالقة طبيعياً بسبب البيئة الصحراوية، والأسطح المكشوفة، والطرق غير الممهدة.

الضوضاء المحيطة:

تتأثر بيئة الضوضاء الحالية أساساً بالحركة المرورية العرضية على طريق الجيزة-الأقصر، وحركة المركبات المحلية، والمنطقة الصناعية القريبة بنجع حمادي، والبنية التحتية الكهربائية القائمة، والأنشطة المرتبطة بمشروع دندرة وأوبليسك. ويقع أقرب مستقبل سكني، وهو قرية البركة، على بعد حوالي ٢.٨ كم شمال غرب الموقع، ولا يتوقع وجود حساسية مجتمعية كبيرة للضوضاء داخل النطاق المباشر للمشروع.

الجيولوجيا والجيومورفولوجيا والطبوغرافيا:

يقع موقع المشروع ضمن رواسب الأودية والبلايا الرباعية بين رواسب وادي النيل والتكوينات الجيرية الإيوسينية. ويتسم الموقع بطبيعة صحراوية وتربة طميية رملية وتربة ضحلة حصوية تكونت أساساً من الحجر الجيري. وترتفع المناسيب عموماً باتجاه الجنوب وتتراوح تقريباً بين ١٣٠ و ١٧٠ متراً فوق مستوى سطح البحر، مع وجود مناسيب أعلى في المنطقة المحيطة الأوسع.

الهيدرولوجيا والهيدروجيولوجيا:

لا توجد مسطحات مائية سطحية داخل نطاق المشروع. وتقع أقرب المسطحات المائية إلى الشمال داخل وادي النيل، بما في ذلك قنوات الري ونهر النيل. وتوجد المياه الجوفية أساساً ضمن الخزان الجوفي الرباعي في منطقة وادي النيل الأوسع. ولا يقترح المشروع سحب مياه جوفية أو تصريف مياه صرف إلى الأرض.

البيئة البيولوجية

يقع موقع المشروع في بيئة صحراوية / مرفقية ذات قيمة موائل محدودة. ويتكون نطاق المشروع أساساً من أراضٍ صحراوية عارية ومناطق مرتبطة ببنية تحتية قائمة ومخططة للطاقة المتجددة والكهرباء.

لا توجد محميات طبيعية أو مناطق تنوع بيولوجي رئيسية أو مناطق مهمة للطيور أو مناطق مهمة للنباتات داخل نطاق المشروع. وتقع منطقة الطيور المهمة بوادي النيل الأعلى على بعد حوالي ٣٣ كم شرق موقع المشروع، بينما تقع محمية الدبابية على بعد حوالي ٤٥.٦ كم جنوب شرق الموقع، ويفصلها عن منطقة المشروع وادي النيل.

لا يحتوي موقع المشروع على أراضٍ رطبة أو مسطحات مائية أو غطاء نباتي كثيف أو مواقع مبيت أو مواقع توقف أو أي سمات أخرى يُحتمل أن تجذب نشاطاً كبيراً للحياة البرية أو الطيور المهاجرة. وتُقيّم مخاطر اصطدام الطيور وصعقها المرتبطة بخط النقل الهوائي القصير على أنها منخفضة، وسيتم إدارتها من خلال مراعاة التصميم الآمن للطيور، ورصد نفوق الطيور أثناء التشغيل، والإدارة التكيفية عند الحاجة.

البيئة الاجتماعية والاقتصادية

يقع المشروع داخل الظهير الصحراوي لمركز نجع حمادي بمحافظة قنا. ولا توجد تجمعات سكنية أو مجتمعات محلية داخل نطاق المشروع. وأقرب تجمع سكني هو قرية البركة، على بعد حوالي ٢.٨ كم شمال غرب الموقع.

يبلغ إجمالي سكان محافظة قنا حوالي ٣.١٦ مليون نسمة، بينما يبلغ عدد سكان مركز نجع حمادي حوالي ٥٧٨,٢٣٧ نسمة، مع توزيع متوازن نسبياً بين الجنسين. ويبلغ حجم قوة العمل في محافظة قنا حوالي ٩٢٧,١٠٢، بينما تبلغ قوة العمل في مركز نجع حمادي حوالي ١٨٢,٤٤٩. وتعد مشاركة الذكور في قوة العمل أعلى من مشاركة الإناث.

يقع موقع المشروع ضمن أرض صحراوية / مرفقية، ولا يُستخدم لأغراض سكنية أو زراعية أو تجارية أو ترفيهية أو أي استخدامات إنتاجية أخرى. ولا يُتوقع حدوث أي إزاحة مادية أو اقتصادية أو فقدان لسبل العيش أو فقدان للوصول إلى أراضي منتجة. لذلك تم استبعاد التأثيرات المرتبطة بالاستحواذ على الأراضي وإعادة التوطين غير الطوعي من التقييم التفصيلي.

التراث الثقافي

لا توجد آثار مسجلة أو مواقع تراث ثقافي داخل نطاق المشروع. ومع ذلك، وبما أن أعمال الإنشاء ستشتمل على أعمال حفر وأساسات، سيتم تنفيذ إجراء المصادقات الأثرية. وفي حال العثور على أي شيء يُشتبه في أنه ذو قيمة تراثية، سيتم إيقاف الأعمال في المنطقة المعنية، وتأمين الموقع، وإخطار وزارة السياحة والآثار.

تحليل البدائل

يقيم تحليل البدائل الخيارات الممكنة للمشروع بما يتوافق مع التشريعات المصرية والمعايير الدولية المعمول بها.

أ. بديل عدم تنفيذ المشروع:

في إطار بديل عدم تنفيذ المشروع، لن يتم تطوير نظام تخزين الطاقة بالبطاريات أو محطة المحولات المشتركة أو خط النقل الهوائي. وسيؤدي ذلك إلى تجنب التأثيرات الموضعية المرتبطة بالإنشاء والتشغيل، إلا أنه سيؤدي أيضاً إلى فقدان فوائد مرونة الشبكة، وتحسين دمج الطاقة المتجددة، وتقليل الاعتماد على التوليد الأحفوري في فترات الذروة، وفرص العمل والتوريد المحلي. لذلك لا يُعتبر بديل عدم تنفيذ المشروع مناسباً.

ب. بديل موقع المشروع:

يقع الموقع المختار داخل / بجوار منطقة مشروع دندرة للطاقة الشمسية، بما يسمح بالاستخدام المشترك لمحطة المحولات جهد ٢٢٠/٣٣ كيلوفولت والربط بالبنية التحتية القائمة لنقل الكهرباء. أما المواقع البديلة الأبعد عن دندرة فستتطلب ربطاً كهربائياً أطول، واضطراباً إضافياً للأراضي، وتكراراً للبنية التحتية الكهربائية. ومن ثم يُعتبر الموقع المختار هو الخيار المفضل.

ج. بدائل تصميم المشروع:

تم تقييم بدائل تصميم المشروع خلال مراحل التصور والدراسات المبدئية لتحديد التكوين الذي يحقق على أفضل وجه الأهداف الفنية والتشغيلية والبيئية وأهداف السلامة للمشروع. وقد أخذ التقييم في الاعتبار ترتيب نظام تخزين الطاقة بالبطاريات،

وأنظمة تحويل الطاقة، والمحولات، والبنية التحتية الداخلية، وأنظمة الحماية من الحريق، والواجهة مع محطة المحولات المشتركة جهد ٢٢٠/٣٣ كيلوفولت.

تم اختيار تصميم معياري حاوي لنظام تخزين الطاقة بالبطاريات باستخدام تكنولوجيا بطاريات فوسفات الحديد الليثيوم (LFP) كخيار مفضل، لأنه يوفر موثوقية تشغيلية عالية، وسلامة محسنة، وسهولة في الإنشاء والصيانة، ومرونة للتوسع المستقبلي. ولم يتم اختيار التخطيطات البديلة أو التكوينات غير القياسية لأنها قد تزيد تعقيد أعمال الإنشاء، أو تقلل المرونة التشغيلية، أو تطرح مخاطر تشغيلية أعلى.

د. البدائل على مستوى النظام:

تم تقييم البدائل على مستوى النظام لتحديد النهج الأنسب لتحقيق أهداف المشروع. وشملت الخيارات التي تم النظر فيها تعزيز الشبكة دون تخزين، وتقليل إنتاج الطاقة المتجددة، والتوليد التقليدي القابل للتشغيل عند الطلب، وإدارة جانب الطلب، وتخزين الطاقة.

تم اختيار نظام تخزين الطاقة بالبطاريات على نطاق المرافق كخيار مفضل لأنه يوفر استجابة سريعة، ويدعم دمج الطاقة المتجددة، ويعزز استقرار الشبكة، ويحسن المرونة التشغيلية مع تجنب انبعاثات غازات الاحتباس الحراري واستهلاك الوقود المرتبط بالتوليد التقليدي. وبالمقارنة مع البدائل الأخرى، يوفر الحل المختار أفضل توازن بين الأداء الفني والاستدامة البيئية والموثوقية التشغيلية.

هـ. بدائل الربط بالشبكة / خطوط النقل الهوائية:

يتمثل خيار الربط المختار في ترتيب دخول وخروج (LILLO) قصير يربط محطة المحولات المشتركة بالخط القائم جهد ٢٢٠ كيلوفولت بين محطة محولات المنطقة الصناعية بنجع حمادي ومحطة محولات أو بليسك. أما الخيارات البديلة، بما في ذلك مسارات أطول لخطوط النقل الهوائية، أو الربط المباشر بمحطات أبعد، أو الكابلات الأرضية، فستزيد طول المسار والتكلفة واضطرابات الإنشاء وتعقيدات الصيانة. ولذلك يُعد خيار خط النقل الهوائي المختار هو الخيار المفضل.

و. بدائل تكنولوجيا نظام تخزين الطاقة بالبطاريات:

تم النظر في عدة تقنيات لنظام تخزين الطاقة بالبطاريات، بما في ذلك بطاريات الليثيوم أيون، وبطاريات التدفق الفاناديومية، والبطاريات المعدنية المنصهرة، وبطاريات الصوديوم / الصوديوم عالية الحرارة. وتم اختيار نظام تخزين حاوي ببطاريات ليثيوم أيون باستخدام كيمياء LFP نظراً لنضجه التقني، وثباته الحراري العالي، وانخفاض مخاطر الانفلات الحراري، وطول عمره التشغيلي، وصغر بصمته الأرضية، وملاءمته لتطبيقات التخزين على نطاق المرافق.

ز. بدائل نظام التبريد:

شملت بدائل التبريد التبريد الهوائي القسري، والتبريد السائل المفتوح، والتبريد السائل المغلق مع تبديد حراري مائي، والتبريد السائل المغلق مع تبديد حراري هوائي. وتم اختيار التبريد السائل المغلق مع التبديد الحراري الهوائي / المبردات الجافة لأنه

يوفر إدارة حرارية موثوقة لأنظمة التخزين على نطاق المرافق في الظروف المناخية الحارة، مع تجنب استهلاك مياه العمليات وتوليد مياه صرف خلال التشغيل العادي.

تقييم التأثيرات البيئية والاجتماعية

يقيم هذا الفصل المخاطر والتأثيرات البيئية والاجتماعية المحتملة للمشروع. ويتضمن تحليلاً تفصيلياً لمخاطر وتأثيرات المشروع، مع التأكيد على تسلسل التخفيف، والذي يشمل تجنب التأثيرات، وتقليلها، والتخفيف منها.

التأثيرات الإيجابية

من المتوقع أن يحقق المشروع عدة تأثيرات إيجابية، تشمل:

- دعم دمج الطاقة المتجددة في الشبكة القومية؛
- تحسين مرونة الشبكة وموثوقيتها واستقرارها التشغيلي؛
- تمكين تخزين الكهرباء المتجددة وإعادة ضخها عند الحاجة من قبل الشبكة؛
- تقليل الانبعاثات غير المباشرة لغازات الاحتباس الحراري من خلال دعم تقليل الاعتماد على التوليد الأحفوري خلال فترات الذروة؛
- تجنب تكرار البنية التحتية الكهربائية من خلال استخدام محطة محولات مشتركة؛
- توفير فرص عمل مؤقتة خلال مرحلة الإنشاء؛
- دعم التوريد المحلي حيثما أمكن؛
- بناء مهارات فنية محلية في تقنيات تخزين الطاقة بالبطاريات ومحطات المحولات والربط بالشبكة.

يوضح الجدول التالي ملخصاً للتأثيرات السلبية المحتملة على البيئة والمجتمع خلال مراحل الإنشاء والتشغيل وإزالة / تفكيك المشروع، بينما يقدم الجدول الثاني عرضاً عاماً لخطط الإدارة البيئية والاجتماعية الخاصة بالمشروع.

جدول ٢ : الآثار السلبية المحتملة على البيئة والمجتمع خلال مراحل الإنشاء والتشغيل للمشروع

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
مرحلة الإنشاء			
جودة الهواء			
لا توجد تأثيرات متبقية	• تطبيق سياسات وإجراءات للحد من فترات تشغيل المركبات والمعدات دون حاجة (idling). • صيانة المعدات والمركبات بانتظام لضمان عملها بكفاءة. • تغطية الشاحنات التي تنقل المواد الدقيقة أو السائبة. • تطبيق ممارسات النظافة العامة الجيدة داخل موقع الإنشاء	غير ملحوظة	• انبعاثات العادم من مركبات ومعدات الإنشاء المتحركة العاملة داخل الموقع
الضوضاء المحيطة			
لا توجد تأثيرات متبقية	• ضمان الصيانة الدورية لمعدات وآلات البناء لتقليل انبعاثات الضوضاء . • استخدام الآلات والمعدات منخفضة الضوضاء حيثما أمكن. • جدولة الأنشطة ذات الضوضاء العالية لتجنب العمليات المتزامنة التي يمكن أن تزيد من مستويات الضوضاء . • توفير واقيات الأذن للعمال المعرضين لمستويات ضوضاء عالية.	غير ملحوظة	• الآلات والمعدات • حركة المركبات • مولدات الطاقة
التأثيرات علي التربة			
غير ملحوظة	• إجراء الصيانة خارج الموقع لتقليل الانسكابات والمخلفات السائلة؛ • اعتماد تدابير منع الانسكابات وتوفير أطقم معالجة الانسكابات في الموقع؛ • جمع الانسكابات والتخلص منها من خلال مقاولين مرخصين؛ • إعداد وتنفيذ خطة إدارة الانسكابات ضمن خطة الإدارة البيئية والاجتماعية؛ • تطبيق ممارسات النظافة العامة الجيدة في الموقع؛ • توفير خزانات محكمة لتجميع مياه الصرف الصحي المنزلية والتخلص منها خارج الموقع من خلال مقاولين مرخصين؛ • تجميع المخلفات الصلبة في مواقع محددة وضمان تطبيق عمليات الفرز؛ • ضمان التعامل السليم مع المواد والمخلفات الخطرة وتوفير احتواء ثانوي لمناطق تخزين المواد / المخلفات الخطرة؛ • استخدام مقاولين مرخصين فقط للتخلص من المخلفات والمخلفات الخطرة؛ • إنشاء مناطق تخزين محددة ومفضولة فعلياً للمخلفات الخطرة	طفيف	• أعمال الحفر، أنشطة الحفر والتسوية، إدارة مياه الصرف الصحي المنزلية، التعامل مع مخلفات الإنشاء.

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
التأثيرات والمخاطر على البيئة البيولوجية			
لا توجد تأثيرات متبقية	- إعداد وتنفيذ وتحديث خطة إدارة المخلفات الصلبة والمخلفات الخطرة ومياه الصرف لتجنب جذب القوارض واحتمالية استهلاك المخلفات من الأنواع الانتهازية؛ - توعية العاملين لمنع إزعاج الحياة البرية التي قد توجد في المحيط الأوسع، - تقديم تدريب على تحديد وتجنب عناصر التنوع البيولوجي الحساسة؛ - ضمان اتباع ممارسات النظافة العامة الجيدة؛ - ضمان الصيانة السليمة لمعدات الإنشاء وأي معدات أخرى ذات احتمالية عالية للضوضاء والاهتزاز	غير ملحوظة	اضطراب الحياة البرية
غير ملحوظ	- حصر أنشطة الإنشاء بشكل صارم داخل مواقع قواعد أبراج خطوط النقل الهوائية ومناطق العمل المعتمدة؛ - استخدام المسارات القائمة والممرات المتأثرة سابقاً حيثما أمكن؛ - حظر القيادة العشوائية خارج الطرق وتقييد حركة المركبات إلى مسارات الوصول المحددة، مع تجنب أي رقع نباتية يتم تحديدها أثناء التفتيشات السابقة للإنشاء؛ - تحديد حدود الإنشاء بوضوح قبل بدء العمل لمنع أي اضطراب غير ضروري للتربة.	طفيف	فقدان الموائل
لا توجد تأثيرات متبقية	- إعداد وتنفيذ وتحديث خطة إدارة المخلفات الصلبة والمخلفات الخطرة ومياه الصرف، بما يشمل جمع المخلفات وتخزينها ونقلها والتخلص منها بطريقة مستدامة بيئياً لتجنب جذب القوارض واحتمالية استهلاك المخلفات من الأنواع الانتهازية؛ - ضمان اتباع ممارسات النظافة العامة الجيدة؛ - توعية العاملين بالآثار السلبية لسوء إدارة المخلفات الصلبة ومياه الصرف	غير ملحوظة	جذب الآفات وانتشار الأنواع الغازية
التأثيرات على البيئة الاجتماعية والاقتصادية			
لا توجد تأثيرات متبقية	- إعطاء الأولوية لتوظيف العمالة المحلية حيثما أمكن؛ - حظر التوظيف غير الرسمي أو التوظيف عند بوابة الموقع؛ - تنفيذ خطة إدارة العمالة ومدونة سلوك العاملين؛ - توعية العاملين بالعادات والتقاليد المحلية والمعايير الاجتماعية والسلوك المناسب؛ - إنشاء آلية تظلمات للعاملين؛	غير ملحوظة	تدفق العمالة

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
	• إنشاء آلية تظلمات مجتمعية متاحة لأصحاب المصلحة المتأثرين وقادرة على التعامل مع التظلمات المتعلقة بالعنف القائم على النوع الاجتماعي (GBV) والاستغلال والانتهاك والتحرش الجنسي (SEAH)؛ • ضمان إعداد وتنفيذ خطة إشراك أصحاب المصلحة؛ • توفير تدريب على GBV و SEAH؛ • التأكد من أن خطط إدارة المقاولين تتضمن أحكاماً خاصة بسكن العمال وتدفق العمالة وآليات التظلمات، ومتابعة هذه المتطلبات للالتزام بمدونة السلوك للعمال وتوفير الوعي حول القضايا المتعلقة بالعنف القائم على الجنس (GBV) والاستغلال والاعتداء الجنسي		
غير ملحوظ	• ضمان تدريب أفراد الأمن تدريباً كافياً على مدونة السلوك، ومبادئ حقوق الإنسان، ومتطلبات استخدام القوة، وتقنيات خفض التصعيد، والوعي الثقافي، وتعريفهم بآلية التظلمات؛ • ضمان الالتزام بالقوانين الوطنية ومبادئ حقوق الإنسان؛ • تنفيذ والحفاظ على آلية تظلمات متاحة للعاملين وأفراد المجتمع؛ وضع وتنفيذ إجراءات موثقة للإبلاغ عن جميع الحوادث أو الشكاوى الأمنية وتسجيلها والتحقيق فيها والاستجابة لها، بما في ذلك ادعاءات سوء السلوك أو استخدام القوة أو شكاوى المجتمع؛ • تحديد الأدوار والمسؤوليات وخطوط الإبلاغ وآليات المساءلة الخاصة بأفراد الأمن والمقاولين؛ • ضمان إتاحة آلية التظلمات للعاملين والمقاولين والمجتمعات المحلية وأصحاب المصلحة الآخرين، بما في ذلك الفئات الضعيفة؛ • نشر قنوات التظلم من خلال وسائل تواصل متعددة وباللغة المحلية المناسبة؛ • تضمين إجراءات محددة لتلقي التظلمات الأمنية وتوثيقها والتحقيق فيها وحلها بسرية ودون انتقام.	طفيف	• تأمين الموقع
لا توجد تأثيرات متبقية	• تقع مسارات خطوط النقل الهوائية ومواقع نظام تخزين الطاقة ومحطة المحولات في أراضي صحراوية غير مشغولة ولا توجد بها زراعة أو استخدامات سكنية أو تجارية أو أي استخدامات إنتاجية أخرى. لذلك لا يُتوقع وجود خطر في هذا الشأن	غير ملحوظة	• تغيير استخدام الأرض
غير ملحوظ	• إعداد وتنفيذ خطة إدارة المرور؛ • تنسيق تسليم المواد لتجنب ساعات الذروة المرورية حيثما أمكن؛ • ضمان التشغيل الآمن للمركبات وتطبيق حدود السرعة داخل الموقع وبالقرب منه	طفيف	• حركة المرور أثناء الإنشاء
التأثيرات على الصحة والسلامة المهنية			

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
ضئيلة	- ضمان إدراج التزامات تعاقدية على المقاولين لإعداد وتنفيذ خطة إدارة بيئية واجتماعية للإنشاء (CESMP) واعتمادها قبل بدء أعمال الإنشاء؛ - تنفيذ خطة إدارة السلامة والصحة المهنية كجزء من CESMP؛ - توفير مهمات الوقاية الشخصية المناسبة؛ تنفيذ تدريبات السلامة واجتماعات التوعية اليومية؛ - تطبيق حدود السرعة وفحص المعدات؛ ضمان اعتماد خطط العمل على ارتفاع، خاصة لخطوط النقل الهوائية، وخطط الرفع الخاصة بتركيب نظام BESS، مع تطبيق تدابير HSSE قوية خلال هذه الأنشطة؛ - إنشاء مناطق عزل لأعمال الرفع / الرفع؛ - الحفاظ على ممرات وصول آمنة والسيطرة على مخاطر الانزلاق / التعثر؛ - توفير مناطق استراحة مظلة وتطبيق تدابير الإجهاد الحراري؛ تقييد الدخول إلى مناطق العمل ووضع علامات على أماكن الحفر؛ - تطبيق إجراءات العزل والقفول ووضع البطاقات (LOTO) وقصر الأعمال الكهربائية على كهربائيين مؤهلين.	متوسطة	التأثيرات على صحة وسلامة القوي العاملة
غير ملحوظ	- الالتزام بالقانون رقم ٤ لسنة ١٩٩٤ بشأن حدود التعرض للضوضاء؛ - إجراء صيانة دورية للمعدات لتقليل الضوضاء؛ جدولة الأنشطة عالية الضوضاء لتجنب التداخل؛ - توفير واستخدام مهمات حماية السمع، مثل سدادات الأذن.	طفيف	ضوضاء مكان العمل
التراث الثقافي			
غير ملحوظ	- إعداد وتنفيذ إجراءات الاكتشافات العرضية التي توضح الإجراءات الواجب اتخاذها في حال العثور على أي لقي أو شواهد أثرية مهمة أثناء أعمال تسوية الموقع أو مرحلة الإنشاء . - إخطار وزارة السياحة والآثار في حال اكتشاف أي أثر أثناء الحفر	طفيف	التأثير على التراث الثقافي
مرحلة التشغيل			
جودة الهواء المحيط			
غير ملحوظة	إذا تم استخدام SF6 كغاز عازل بدلاً من العزل الهوائي، فستشمل تدابير التخفيف كشف التسربات وإصلاحها، واستخدام معدات تبريد مناسبة أثناء تعبئة SF6 في GIS، وتوعية / تدريب العاملين.	طفيف	- نقل الأشخاص والمستلزمات لأغراض الصيانة؛ - انبعاثات SF6 المحتملة إذا تم استخدامه كغاز عازل للمفاتيح الكهرب
الضوضاء المحيطة			

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
غير ملحوظة	لا يلزم اتخاذ تدابير تخفيف؛ ومع ذلك، تُقترح إجراءات إدارية تشمل الصيانة الدورية للمحولات ومراوح التبريد لمنع تجاوز مستويات الضوضاء، والإصلاح أو الاستبدال الفوري للمكونات المعطلة التي تسبب طينياً أو اهتزازاً مفرطاً.	طفيف	- الضوضاء الناتجة عن أزيز أو طنين خطوط الجهد العالي بسبب الكورونا؛ - تشغيل المحول ومكونات محطة المحولات الأخرى
ضوضاء بيئة العمل			
غير ملحوظة	- الصيانة الدورية لأنظمة التبريد والمحولات والمعدات الكهربائية لضمان التشغيل السليم وتقليل انبعاثات الضوضاء؛ - استخدام معدات ذات أغلفة عازلة للصوت مصممة خصيصاً للتشغيل الصناعي المستمر، حيثما كان ذلك مناسباً، لتقليل مستويات الضوضاء التشغيلية؛ - تنفيذ إجراءات السلامة والصحة المهنية، بما في ذلك توفير حماية السمع أثناء أنشطة الصيانة.	طفيف	- التشغيل، - التفتيش الروتيني - الصيانة الدورية
المجالات الكهرومغناطيسية			
غير ملحوظة	- تصميم وإنشاء وتشغيل خط النقل الهوائي ومحطة المحولات المشتركة وفقاً للوائح المصرية المعمول بها والممارسات الدولية الجيدة المعترف بها، بما في ذلك إرشادات التعرض ذات الصلة للمجالات الكهرومغناطيسية؛ - تقييد الوصول إلى المعدات الكهربائية المجعدة ومناطق الجهد العالي على الأفراد المصرح لهم فقط؛ - تركيب لافتات تحذيرية والحفاظ على حواجز مادية مناسبة حول التركيبات الكهربائية؛ - تطبيق إجراءات العزل والقفل ووضع البطاقات وأنظمة العمل الآمن لأعمال الصيانة التي تتضمن معدات مجعدة؛ - تدريب العاملين على المخاطر الكهربائية والوعي بالمجالات الكهرومغناطيسية ومسافات العمل الآمنة؛ - صيانة المعدات الكهربائية وفقاً لمواصفات المصنع وجدول الصيانة الوقائية.	طفيف	تشغيل محطة المحولات المشتركة وخط النقل الهوائي
التربة			
غير ملحوظة	- تنفيذ إجراءات التخزين والتعامل السليمة للزيوت ومواد التشحيم؛ - إجراء أنشطة الصيانة في مناطق مخصصة؛ - توفير مواد الاستجابة للانسكابات وتدريب العاملين على إدارة الانسكابات.	طفيف	احتمالية الانسكابات

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
غير ملحوظة	- لا يلزم اتخاذ تدابير، باستثناء الصيانة الروتينية وإعداد خطط إدارة المخلفات. - إعداد وتنفيذ خطة وقف التشغيل.	طفيف	المخلفات الصلبة
المياه الجوفية			
غير ملحوظة	- تخزين الوقود والزيوت ومواد التشحيم والمواد الخطرة الأخرى في مناطق مخصصة مزودة باحتواء ثانوي مناسب قادر على استيعاب ما لا يقل عن ١١٠٪ من حجم أكبر حاوية؛ - تركيب المحولات داخل مناطق مزودة بأحواض احتواء مصممة لاحتواء أي تسربات أو انسكابات زيت محتملة؛ - إعداد وتنفيذ خطة منع الانسكابات والاستجابة لها كجزء من خطة الإدارة البيئية والاجتماعية؛ - توفير معدات وأطقم الاستجابة للانسكابات في المواقع التي يتم فيها تخزين أو مناولة المواد الخطرة؛ - تدريب العاملين على منع الانسكابات والاستجابة للطوارئ وإجراءات الإبلاغ؛ - فحص مناطق تخزين المواد الخطرة بانتظام لتحديد أي تسربات أو تدهور؛ جمع التربة الملوثة ومواد الامتصاص ومخلفات الانسكابات الأخرى والتخلص منها من خلال مقاولي مخلفات مرخصين؛ - حظر التصريف غير المنضبط لمياه الصرف أو الزيوت أو المواد الكيميائية إلى سطح الأرض؛ - التنظيف والمعالجة الفورية لأي حوادث انسكاب.	طفيف	مصادر تلوث محتملة
التأثيرات والمخاطر على البيئة البيولوجية			
لا توجد تأثيرات متبقية	- إعداد وتنفيذ وتحديث خطة إدارة المخلفات الصلبة والمخلفات الخطرة ومياه الصرف، بما يشمل جمع المخلفات وتخزينها ونقلها والتخلص منها بطريقة مستدامة بيئياً لتجنب جذب القوارض واحتمالية استهلاك المخلفات من الأنواع الانتهازية؛ - ضمان اتباع ممارسات النظافة العامة الجيدة؛ - توعية العاملين بالآثار السلبية للتخلص غير السليم من المخلفات الصلبة.	غير ملحوظة	جذب الآفات وانتشار الأنواع الغازية
غير ملحوظة	زيادة عدد العوازل في مواضع اتصال الموصلات بكل برج لزيادة المسافة بين الموصل والبرج، واستخدام عوازل تمنع الطيور من الهبوط عليها؛	طفيف	مخاطر صق الطيور

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
	• تغطية الأذرع العرضية بمواد عازلة مثل شرائط PVC لضمان عدم تأريض الطيور عند وقوفها.		
غير ملحوظة	• لا يُوصى بتدابير تخفيف خاصة لمخاطر اصطدام الطيور. ومع ذلك، سيجري المشروع تفتيشات دورية لخط النقل الهوائي أثناء أنشطة الصيانة الروتينية، وتسجيل أي دليل على نفوق الطيور. وإذا تم تحديد حوادث اصطدام غير متوقعة، فسيتم تقييم وتنفيذ تدابير تخفيف إضافية، مثل تركيب عواكس أو موجّهات طيران للطيور، حسب الضرورة.	طفيف	• مخاطر اصطدام الطيور
التأثيرات على البيئة الاجتماعية			
لا توجد تأثيرات متبقية	• تدريب أفراد الأمن على السلوك المناسب تجاه العاملين والمجتمع، وفقاً للقوانين المحلية ومتطلبات أداء الممولين وإرشادات منظمة العمل الدولية؛ • إعداد والحفاظ على آلية تظلمات للمجتمع للإبلاغ عن المخاوف المتعلقة بالترتيبات الأمنية وتصرفات أفراد الأمن.	غير ملحوظة	• أمن الموقع
لا توجد تأثيرات متبقية	• لا يلزم اتخاذ تدابير تخفيف.	غير ملحوظة	• حركة المرور خلال التشغيل
احتمال الحريق والانفلات الحراري			
غير ملحوظة	• تنفيذ أنظمة إدارة البطاريات والرصد؛ • الحفاظ على أنظمة الكشف عن الحريق والإطفاء وفقاً لمتطلبات المصنع؛ • إعداد وتنفيذ إجراءات الاستعداد والاستجابة للطوارئ؛ إجراء تفتيش وصيانة دورية لأنظمة البطاريات ومعدات السلامة المرتبطة بها.	طفيف	• احتمال نشوب حريق في نظام BESS نتيجة فشل النظام، بما في ذلك أحداث الانفلات الحراري
المخلفات الخطرة			
غير ملحوظة	• تجميع المخلفات غير الخطرة في نقاط مخصصة داخل حاويات مناسبة والتخلص منها من خلال مقاولين مرخصين؛ • إنشاء تخزين منفصل وواضح للمخلفات الخطرة، مع جمعها والتخلص منها من خلال مقاولين مرخصين؛ • إعادة البطاريات في نهاية عمرها إلى الموردين أو إرسالها إلى مرافق إعادة تدوير معتمدة، وفقاً لاستراتيجيات إعادة التدوير المستدامة حيثما كانت متاحة.	طفيف	• زيوت المخلفات، المكونات الكهربائية، المواد الكيميائية المستهلكة، وبطاريات الليثيوم أيون في نهاية عمرها
السلامة والصحة المهنية			

التأثيرات المتبقية	ملخص تدابير التخفيف	التأثيرات المتوقعة	الجانب البيئي
غير ملحوظة	- تطبيق سياسة للصحة والسلامة؛ الالتزام بجميع اللوائح الوطنية للصحة المهنية وقانون العمل رقم ١٤ لسنة ٢٠٢٥؛ - توفير مهمات الوقاية الشخصية المناسبة وتطبيق نظام قوي لتصاريح العمل؛ - ضمان تدريب عمال الصيانة بشكل مناسب، خاصة على العمل على ارتفاعات؛ - إنشاء وتحديد مناطق أمان للتمييز بين مناطق العمل المتوقع أن تكون بها مستويات مرتفعة من المجالات الكهرومغناطيسية مقارنة بالمستويات المقبولة للتعرض العام، مع قصر الدخول على العاملين المدربين تدريباً مناسباً.	طفيف	المخاطر الكهربائية وأنشطة الصيانة
الصحة والسلامة المجتمعية			
غير ملحوظة	- تقييد وصول الجمهور إلى مناطق الإنشاء من خلال الأسوار والحواجز واللافتات التحذيرية؛ - تنفيذ خطة إدارة مرور تغطي مسارات المركبات وحدود السرعة ومتطلبات السائقين وتدابير السلامة المرورية؛ - ضمان ترخيص السائقين وتدريبهم بشكل مناسب؛ - الحفاظ على التواصل مع أصحاب المصلحة المحليين بشأن أنشطة الإنشاء وأي اضطرابات مؤقتة؛ - تنفيذ وتطبيق مدونة سلوك العاملين؛ - ضمان تدريب أفراد الأمن على العلاقات المجتمعية والاستخدام المناسب للقوة؛ - إنشاء والحفاظ على آلية تظلمات مجتمعية؛ - الحفاظ على أمن الموقع والتحكم في الوصول طوال فترة الإنشاء.	طفيف	حركة المرور والسلامة على الطرق أثناء الإنشاء، الدخول غير المصرح به إلى مواقع الإنشاء، التفاعل بين المجتمع والعاملين، ترتيبات أمن الموقع

جدول ٣ إجراءات الإدارة البيئية والاجتماعية والتكلفة التقديرية

الجانب	القضايا محل الاهتمام	الإجراءات	الجهة المنفذة للإجراء	مؤشر الإكمال	التكلفة التقديرية	تاريخ الإكمال المطلوب
جودة الهواء	انبعاثات الأتربة	تقليل فترات تشغيل المركبات والمعدات دون حركة؛ الحفاظ على المعدات والمركبات في حالة تشغيل جيدة؛ تقييد السرعة داخل المواقع؛ التأكد من وعي العاملين بالقيادة الآمنة والممارسات الجيدة لاستخدام المعدات؛ إجراء قياسات دورية لمداخل المولدات.	مقاوم الإنشاء	خطة الرصد؛ قياسات جودة الهواء	3,000-4,000 دولار/سنة	طوال فترة مرحلة الإنشاء

الجانب	القضايا محل الاهتمام	الإجراءات	الجهة المنفذة للإجراء	مؤشر الإكمال	التكلفة التقديرية	تاريخ الإكمال المطلوب
جودة الهواء	حالة تشغيل المعدات	ضمان حالة تشغيل جيدة من خلال التفتيش المتكرر على جميع معدات الإنشاء؛ تنفيذ خطط السلامة والصحة المهنية.	مقاول الإنشاء	سجلات الصيانة؛ خطة OHS	10,000-14,000 دولار، مدرجة ضمن مخصصات EPC و O&M	طوال فترة مرحلة الإنشاء
مستويات الضوضاء	حالة تشغيل المعدات	الصيانة الدورية لمعدات الإنشاء؛ استخدام معدات منخفضة الضوضاء حيثما أمكن؛ جدولة الأنشطة عالية الضوضاء لتجنب التداخل؛ جدولة الأنشطة عالية الضوضاء خلال ساعات الصباح؛ تنفيذ خطط OHS.	مقاول الإنشاء	خطة OHS؛ قياسات الضوضاء؛ سجلات الصيانة	2,000-3,000 دولار/سنة	طوال فترة مرحلة الإنشاء
مستويات الضوضاء	توفير مهمات الوقاية الشخصية	توفير مهمات الوقاية الشخصية اللازمة للعاملين.	مقاول الإنشاء	—	4,000-8,000 دولار، إجمالي فترة المشروع لتوريد PPE	طوال فترة مرحلة الإنشاء
التربة	ممارسات النظافة العامة	إعداد وتنفيذ خطة إدارة الموقع، وخطط إدارة المخلفات الصلبة ومياه الصرف، وخطة منع الانسكابات؛ التجميع والاحتواء والتخلص السليم من مياه الصرف الصحي؛ تخزين ومناولة المواد الخطرة وفقاً لإرشادات WBG العامة للبيئة والصحة والسلامة؛ النقل والتخلص من خلال مقاولي مخلفات معتمدين.	مقاول الإنشاء / المطور، من خلال تضمين الأحكام في عقود الإنشاء ومتابعة التزام المقاولين	خطط إدارة المخلفات ومياه الصرف؛ عقود إدارة المخلفات الصلبة / الخطرة ومياه الصرف؛ مستندات متابعة المقاول؛ عقود مع مقاولي مخلفات معتمدين	1,000-16,000 دولار، بحسب حجم المخلفات	طوال فترة مرحلة الإنشاء
التربة	إدارة المخلفات / مياه الصرف	نفس الإجراءات أعلاه.	مقاول الإنشاء / المطور	نفس مؤشرات الإكمال أعلاه	1,000-16,000 دولار، بحسب حجم المخلفات	طوال فترة مرحلة الإنشاء

الجانب	القضايا محل الاهتمام	الإجراءات	الجهة المنفذة للإجراء	مؤشر الإكمال	التكلفة التقديرية	تاريخ الإكمال المطلوب
السلامة والصحة المهنية	سلامة العاملين ومكان العمل	إعداد خطة OHS وإجراءات HSE وفقاً للمتطلبات الوطنية والمعايير الدولية.	المقاول	خطة وإجراءات OHS؛ أحكام HSE في عقود الإنشاء	12,000-14,000 دولار	قبل أنشطة الإنشاء
خطط الاستجابة للطوارئ	سلامة العاملين ومكان العمل	إعداد إجراءات التحكم في حالات الطوارئ.	المقاول	خطة الاستجابة للطوارئ	6,000-14,000 دولار	قبل تشغيل المشروع
إدارة المخلفات	صحة العاملين	إعداد خطط إدارة المخلفات الصلبة والخطرة بما يتماشى مع إرشادات WBG العامة للبيئة والصحة والسلامة؛ إعداد خطط OHS؛ تخزين أنواع المخلفات المختلفة في مناطق مخصصة ونقلها بواسطة مقاولين مرخصين.	مقاول الإنشاء	عقد إدارة المخلفات الصلبة مع مقاولين معتمدين؛ بيان تتبع المخلفات؛ خطة OHS	200-600 يورو/طن للمخلفات الخطرة؛ ٨٠-١٥٠ يورو/طن للمخلفات غير الخطرة	طوال فترة مرحلة الإنشاء
البيئة البيولوجية	الآفات والأنواع الغازية	النظافة العامة الجيدة والإدارة السليمة للمخلفات.	مقاول الإنشاء	عقد إدارة المخلفات	2,000-5,000 دولار، لمرة واحدة	طوال مرحلة الإنشاء
البيئة البيولوجية	إزعاج الحياة البرية	التوعية من خلال محادثات السلامة اليومية ولقاءات التوعية؛ تنفيذ تدابير التخفيف؛ الإشراف وتنفيذ تدابير الردع.	مقاول الإنشاء	المتطلبات المحددة في العقود	—	طوال مرحلة الإنشاء
البيئة الاجتماعية	تدفق العمالة	إعطاء الأولوية لتوظيف العمالة المحلية؛ تنفيذ والحفاظ على آلية تظلمات مجتمعية؛ اختيار أماكن إقامة العمال بعيداً عن المجتمعات القائمة قدر الإمكان؛ إعداد سياسات الموارد البشرية بما في ذلك خطط GBV و SEAH.	المطور / مقاولو الإنشاء	خطة إدارة العمالة؛ قائمة فحص سكن العمال؛ سياسات SEAH و GBV؛ توعية العاملين	10,000-30,000 دولار/سنة	طوال فترة مرحلة الإنشاء
البيئة الاجتماعية	الصحة والسلامة والأمن المجتمعي — مخاطر حوادث المرور	إعداد خطة إدارة المرور (TMP) والإجراءات المرتبطة بها.	مقاولو الإنشاء	خطة TMP والإجراءات	8,000-20,000 دولار	طوال فترة مرحلة الإنشاء

الجانب	القضايا محل الاهتمام	الإجراءات	الجهة المنفذة للإجراء	مؤشر الإكمال	التكلفة التقديرية	تاريخ الإكمال المطلوب
البيئة الاجتماعية	التراث الثقافي	إعداد إجراء المصادقات الأثرية.	المطور / مقاولو الإنشاء	الإجراءات المطورة	1,000-5,000 دولار	قبل أنشطة الإنشاء
إجمالي التكلفة التقديرية	دولار أمريكي	—	—	—	حوالي ١٣٠,٠٠٠ دولار أمريكي	—
إجمالي التكلفة التقديرية	جنيه مصري	—	—	—	حوالي ٦,٥٠٠,٠٠٠ جنيه مصري	—

إشراك أصحاب المصلحة

تم تنفيذ أنشطة إشراك أصحاب المصلحة بطريقة متناسبة، تعكس محدودية البصمة الأرضية وصغر حجم العمالة والتأثيرات الخاصة بموقع مكون نجع حمادي مقارنة بالمكونات الأكبر ضمن برنامج إنرجي فالي. ولم يتم عقد اجتماع تشاور عام واسع النطاق منفصل لهذا المكون، ويُعد ذلك متناسباً مع الطبيعة محدودة النطاق للمشروع، وعدم وجود تأثيرات إزاحة، ووجود واجهة مجتمعية مستمرة من خلال الحضور القائم لسكاتك / إنرجي فالي وترتيبات الاتصال الخاصة بمشروع أوبليسك وندرة القريين.

تم تنفيذ أنشطة إشراك أصحاب المصلحة مع ممثلي المجتمع، والعمد المحليين، والمسؤولين الحكوميين، وممثلي المنطقة الصناعية، ورؤساء العائلات، وأصحاب المصلحة الآخرين ذوي الصلة في منطقة نجع حمادي خلال يومي ١٧-١٨ يونيو ٢٠٢٦.

عبر أصحاب المصلحة عموماً عن تصور إيجابي تجاه سكاتك / إنرجي فالي، ورحبوا باستمرار الاستثمار في المنطقة. ونظراً لمحدودية نطاق مكون نجع حمادي، كان اهتمام أصحاب المصلحة منخفضاً نسبياً مقارنة بمشروعات الطاقة المتجددة الأكبر. وكانت فرص العمل هي الموضوع الرئيسي محل الاهتمام، حيث أكد أصحاب المصلحة أهمية توفير فرص عادلة وشفافة للمرشحين المؤهلين من المجتمعات المحيطة. ولم يتم تسجيل أي مخاوف جوهرية أو اعتراضات أو تظلمات مرتبطة بالمشروع.

تم دمج ملاحظات أصحاب المصلحة في دراسة تقييم الأثر البيئي والاجتماعي وخطة الإدارة البيئية والاجتماعية من خلال الالتزامات المتعلقة بالتوظيف المحلي، والتوظيف الشفاف، وحظر التوظيف غير الرسمي عند بوابة الموقع، ومدونة سلوك العاملين، وخطة إدارة العمالة، وآليات تظلمات العاملين والمجتمع، ومنع GBV/SEA/SH، وسلوك الأمن، والتنسيق مع المشروعات والمرافق المجاورة.

وسيستمر الإفصاح وإشراك أصحاب المصلحة خلال مراحل ما قبل الإنشاء والإنشاء والتشغيل، وعند الاقتضاء إزالة / تفكيك المشروع، وفقاً لخطة إشراك أصحاب المصلحة على مستوى المشروع (SEP).

خطة الإدارة البيئية والاجتماعية

- تتوافق خطة الإدارة البيئية والاجتماعية للمشروع مع قانون البيئة المصري والمعايير الدولية، وتشمل مجموعة من الإجراءات لضمان التحكم في التأثيرات المحتملة خلال مرحلتَي الإنشاء والتشغيل. وتتضمن الخطة ما يلي:
- خطة الصحة والسلامة المهنية
 - خطة إدارة المرور والنقل
 - خطة إدارة الضوضاء
 - خطة إدارة المخلفات الصلبة والخطرة

- خطة إدارة المياه ومياه الصرف الصحي
- خطة الاكتشافات الأثرية بالصدف
- خطة النظافة العامة والتنظيم
- خطة الإدارة الاجتماعية بما في ذلك الإجراءات المتعلقة بالنوع الاجتماعي (GBV/SEA)
- خطة الصيانة الوقائية والتصحيحية

الترتيبات المؤسسية

يحدد التقرير أدوار ومسؤوليات شركة دندرة والمقاولين والجهات الحكومية، لضمان تنفيذ خطة ESMP بفاعلية ومتابعة جميع الالتزامات البيئية والاجتماعية.

بناء القدرات

يشمل التقرير برامج تدريب للعاملين والمقاولين حول الصحة والسلامة، وإدارة البيئة، والتوعية المجتمعية.

خطة الرصد البيئي والاجتماعي

سيقوم المشروع بإعداد وتنفيذ خطة إدارة بيئية واجتماعية (ESMP) تتضمن تدابير تخفيف ورصد محددة لضمان الالتزام بجميع المتطلبات القانونية والمؤسسية المعمول بها. وتشمل الخطة تدابير التخفيف والرصد اللازمة لضمان الأداء البيئي والاجتماعي.

تتضمن خطة الإدارة البيئية والاجتماعية المكونات الرئيسية التالية:

- ملخص التأثيرات وتدابير التخفيف؛
- خطط الإدارة البيئية والاجتماعية، وتشمل ما يلي:
- خطة الصحة والسلامة والبيئة (HSE) ؛
- خطة إدارة النقل؛
- خطة إدارة الضوضاء؛
- خطة إدارة المخلفات الخطرة وغير الخطرة؛
- إدارة المياه ومياه الصرف؛
- إجراء المصادقات الأثرية؛
- الصيانة الوقائية والتصحيحية؛
- خطة إدارة مياه الصرف؛ النظافة العامة والترتيب؛
- تدابير الإدارة الاجتماعية الخاصة بالعمالة، وتدفق العمالة، وسلوك العاملين، و GBV/SEA/SH، والأمن، وإدارة التظلمات؛ تدابير سلامة نظام تخزين الطاقة بالبطاريات والاستجابة للطوارئ؛
- رصد اصطدام وصعق الطيور المرتبط بخطوط النقل الهوائية؛
- متطلبات العناية الواجبة لسلسلة التوريد؛
- متطلبات إدارة مخلفات البطاريات ونهاية عمرها؛

- متطلبات إدارة إزالة / تفكيك المشروع؛
- خطط الرصد البيئي والاجتماعي.

الترتيبات المؤسسية

- تم تحديد الأدوار والمسؤوليات الخاصة بتنفيذ خطة الإدارة البيئية والاجتماعية، بما يشمل مطور المشروع والمقاولين والجهات الحكومية ذات الصلة، لضمان المساءلة والتنسيق الفعال بين أصحاب المصلحة.
- ستحتفظ إنرجي فالي بالمسؤولية العامة عن الإشراف على تنفيذ دراسة تقييم الأثر البيئي والاجتماعي وخطة الإدارة البيئية والاجتماعية، وإعداد التقارير للممولين، وإشراك أصحاب المصلحة، ورصد أداء المقاولين في الجوانب البيئية والاجتماعية. وسيكون مقاول الهندسة والتوريد والإنشاء (EPC) مسؤولاً عن تنفيذ تدابير التخفيف خلال مرحلة الإنشاء من خلال خطة إدارة بيئية واجتماعية للإنشاء (CESMP)، بينما سيكون مقاول التشغيل والصيانة / مشغل المشروع مسؤولاً عن ضوابط مرحلة التشغيل.
- تم إعداد ميزانية استرشادية لتنفيذ خطة الإدارة البيئية والاجتماعية، لتغطية التخفيف والرصد البيئي والاجتماعي، والتدريب، وتنفيذ آلية التظلمات، والمراجعات البيئية والاجتماعية المستقلة. وتُعد هذه الميزانية مبدئية وسيتم تحديثها لاحقاً بناءً على التخطيط التفصيلي للتنفيذ.

بناء القدرات

- تضمن الخطة أحكاماً للتدريب وبناء القدرات لموظفي المشروع والمقاولين بشأن أفضل الممارسات في الإدارة البيئية والاجتماعية، بما يعزز قدرتهم على تنفيذ خطة الإدارة البيئية والاجتماعية بفعالية.

الخلاصة

سيدعم مشروع إنرجي فالي لنظام تخزين الطاقة بالبطاريات في نجع حمادي تحول مصر نحو الطاقة النظيفة، واستقرار الشبكة، ودمج الطاقة المتجددة من خلال تطوير نظام تخزين طاقة بالبطاريات بسعة ١,٠٠٠ ميغاوات ساعة، ومحطة محولات مشتركة جهد ٢٢٠/٣٣ كيلوفولت، وربط قصير بخط نقل هوائي جهد ٢٢٠ كيلوفولت. ولذلك لا يُعد بديل عدم تنفيذ المشروع خياراً مناسباً، لأنه سيؤدي إلى فقدان هذه الفوائد الاستراتيجية المتعلقة بالطاقة والمنافع الاجتماعية والاقتصادية.

وقد قُيِّمت دراسة تقييم الأثر البيئي والاجتماعي والتأثيرات البيئية والاجتماعية المحتملة خلال مراحل الإنشاء والتشغيل وإزالة / تفكيك المشروع، وخلصت إلى أنه، بالنظر إلى البصمة المحدودة للمشروع، ووقوعه في بيئة صحراوية / مرفقية، وغياب تأثيرات الإزاحة، وتنفيذ خطة الإدارة البيئية والاجتماعية المقترحة وتدابير الرصد، فمن المتوقع أن تظل التأثيرات المتبقية ضمن الحدود المقبولة. وتبلغ التكلفة التقديرية الإجمالية لتنفيذ التدابير البيئية والاجتماعية، كما تم تطويرها في خطة الإدارة البيئية والاجتماعية، حوالي ١٣٠,٠٠٠ دولار أمريكي.

وعليه، يُعتبر المشروع مجدياً بيئياً واجتماعياً، شريطة تنفيذ جميع التزامات دراسة تقييم الأثر البيئي والاجتماعي وخطة الإدارة البيئية والاجتماعية ورصدها طوال دورة حياة المشروع.

Executive Summery

The Project aims to contribute to Egypt's renewable energy and grid stability objectives by providing utility-scale battery storage capacity capable of supporting renewable energy integration, load shifting and energy management.

The broad goal of the ESIA is to provide decision-makers, regulators, lenders and the Project proponent with information on the potential environmental and social risks and impacts associated with the proposed BESS, shared substation and OHTL components.

The specific objectives are:

- To identify potential positive and negative environmental and social impacts of the proposed Project;
- To assess the significance of potential impacts during construction, operation and decommissioning;
- To identify mitigation, management and enhancement measures for adverse and beneficial impacts;
- To provide an Environmental and Social Management Plan (ESMP), including monitoring measures and responsibilities;
- To support stakeholder engagement and disclosure in a proportionate and meaningful manner; and
- To ensure that the proposed Project complies with Egyptian environmental regulations and applicable international financing institution requirements.

1. Institutional and Legal frameworks

This framework includes both national legislation and international standards and guidelines.

National Legislation

The project must comply with Egyptian environmental and social laws and regulations, including:

Environmental Impact Assessment (EIA): The national Environmental Law 4/1994 (as amended by Laws 9/2009 and 105/2015) and its Executive Regulations require an EIA study for new projects. The EIA is to be submitted to the environmental authority for review and approval. According to the national regulations, this project is categorised as a Category Scoped-B projects.

Air Quality and Atmospheric Emissions: Law 4/1994 and its associated regulations set maximum limits for ambient air pollutants and exhaust gases. The project will need to comply with these limits during both construction and operation.

Noise and Vibration: Environmental Law No. 4/1994 specifies maximum permissible noise levels for occupational and ambient environments.

Waste Management: The Waste Management Law 202/2020 and its Executive Regulations set requirements for managing non-hazardous and hazardous waste generated from the different activities.

Biodiversity Protection and Nature Conservation: Article 28 of Environmental Law 4/1994 prohibits activities that harm specific wild animals and plants and their habitats. Annex 4 of this law lists protected species. The project site is located within a desert environment of relatively low ecological sensitivity; however, biodiversity protection measures will be implemented where required.

Cultural Heritage: Law No. 117 of 1983 for the Protection of Antiquities, as amended by Law No. 3 of 2010, protects archaeological and cultural heritage resources. Chance-find procedures will be implemented during construction, and coordination with the Ministry of Tourism and Antiquities will be maintained where necessary.

Occupational Health and Safety: Labour Law No. 14 of 2025 and its associated ministerial decrees establish requirements for worker welfare, occupational health and safety, working hours, emergency preparedness, and the prevention of occupational hazards. These requirements apply to all project contractors and subcontractors.

Land Allocation and Renewable Energy Development: The project is being developed on land allocated by the New and Renewable Energy Authority (NREA) in accordance with national regulations governing renewable energy projects and land use in desert areas.

Community Health and Safety: Relevant provisions of Environmental Law No. 4/1994, Labour Law No. 14/2025, and other applicable legislation establish requirements for protecting nearby communities and road users from construction-related risks, traffic impacts, dust, noise, and emergency situations.

Institutional Framework

Several governmental entities have regulatory and oversight responsibilities for the project, including:

- **Egyptian Environmental Affairs Agency (EEAA):** Responsible for reviewing and approving the ESIA and monitoring environmental compliance.
- **New and Renewable Energy Authority (NREA):** Responsible for land allocation and oversight of renewable energy developments.
- **Egyptian Electricity Transmission Company (EETC):** Responsible for grid connection arrangements and electricity transmission infrastructure.
- **Ministry of Electricity and Renewable Energy (MoERE):** Provides strategic oversight of the electricity sector and renewable energy development.
- **Ministry of Labour:** Responsible for enforcement of labour and occupational health and safety requirements.
- **Waste Management Regulatory Authority (WMRA):** responsible for regulation and permitting of waste management activities.
- **Civil Defence and Emergency Responders:** responsible for fire safety and emergency response coordination.
- **Qena Governorate and Local Authorities:** Responsible for local administrative coordination and permitting requirements.

- **Ministry of Tourism and Antiquities (MOTA):** Responsible for the protection of archaeological and cultural heritage resources.

International Standards and Guidelines

In addition to national legislation, the project will align with international standards and guidelines, particularly those of international financing institutions:

IFC Performance Standards (PS): The project will align with the International Finance Corporation's Performance Standards on Environmental and Social Sustainability, covering environmental and social assessment and management, labour and working conditions, resource efficiency, community health and safety, land acquisition, biodiversity conservation, cultural heritage, and stakeholder engagement.

EBRD Performance Requirements: The project will adhere to the EBRD Environmental and Social Policy and associated Performance Requirements governing environmental and social management, labour, resource efficiency, biodiversity, cultural heritage, and stakeholder engagement.

African Development Bank Group's Operational Safeguards (AFDB OS): The project will comply with the African Development Bank's Operational Safeguards and Environmental and Social Assessment Procedures, including requirements relating to environmental and social risk management, labour conditions, biodiversity conservation, pollution prevention, community health and safety, and stakeholder engagement.

European Investment Bank (EIB) Environmental and Social Standards: The project will be designed and implemented in accordance with applicable EIB Environmental and Social Standards, including those relating to environmental assessment, biodiversity, climate action, labour standards, and community health and safety.

World Bank EHS Guidelines: The General EHS Guidelines and relevant sector-specific guidance will be applied as Good International Industry Practice (GIIP) throughout the project lifecycle.

International Labour Organization (ILO) Conventions: The project will respect applicable ILO conventions ratified by Egypt, including those relating to occupational health and safety, non-discrimination, forced labour, child labour, freedom of association, and collective bargaining.

2. Project Description

Project location

The Nagaa Hammadi BESS Project is located in Qena Governorate, within the desert hinterland of Nagaa Hammadi, approximately 16 km southeast of Nagaa Hammadi town. The Project will be developed within / adjacent to the Dandara PV Power Plant Project area and within an existing renewable energy / utility development context.

The nearest residential settlement is Baraka Village, located approximately 2.8 km northwest of the Project Site. Other surrounding features include the Obelisk PV Project, located approximately 2 km southwest; the Dandara PV Project, bordering the Project Site to the

north and east; the Nile Valley, approximately 11 km north; and Qena City, approximately 45 km northeast.

The Project land requirement is approximately 194,288 m², comprising approximately 25,468 m² for the BESS, 29,885 m² for the shared substation, 120,800 m² for the OHTL right-of-way, and 18,135 m² for laydown areas and roads.

Table 1: Coordinates of the Project Site (Africa_Lambert_Conformal_Conic)

Points	Latitude (N)	Longitude (E)
Naga Hammadi BESS		
1	2783461.394616753	769680.2875735309
2	2783288.608535677	769680.5736761187
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.380414486	769572.0346908272
6	2782925.301310003	769572.354213905
7	2782925.0819173753	769440.8904367206
8	2783090.392588258	769419.0912364512
9	2783064.17148301	769147.1504593793
10	2783460.50069052	769089.6132877459
Shared Substation		
1	2783342.5772506595	769395.074916218
2	2783342.8208433986	769540.7650960417
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.231103331	769395.452907633
OHTL (opening existing Obelisk OHTL)		
1	2783322.8126595914	768497.4499838825
2	2783351.7612946033	768630.8980950158
3	2783340.526999265	768830.6919441563
4	2783293.9203641415	769038.9087141189
5	2783279.735473752	769268.2176393371
6	2783288.707302332	769394.4987259954
OHTL (opening existing Naga Hammadi Industrial OHTL)		
1	2783198.9771317244	768593.0058898054
2	2783206.5204039514	768806.5511225817
3	2783195.613176942	769045.9467630284
4	2783195.8623732626	769280.7430346524
5	2783200.6241021454	769396.1315332904

Figure 1 below illustrates the surrounding land uses and activities in the vicinity of the proposed Project Site.

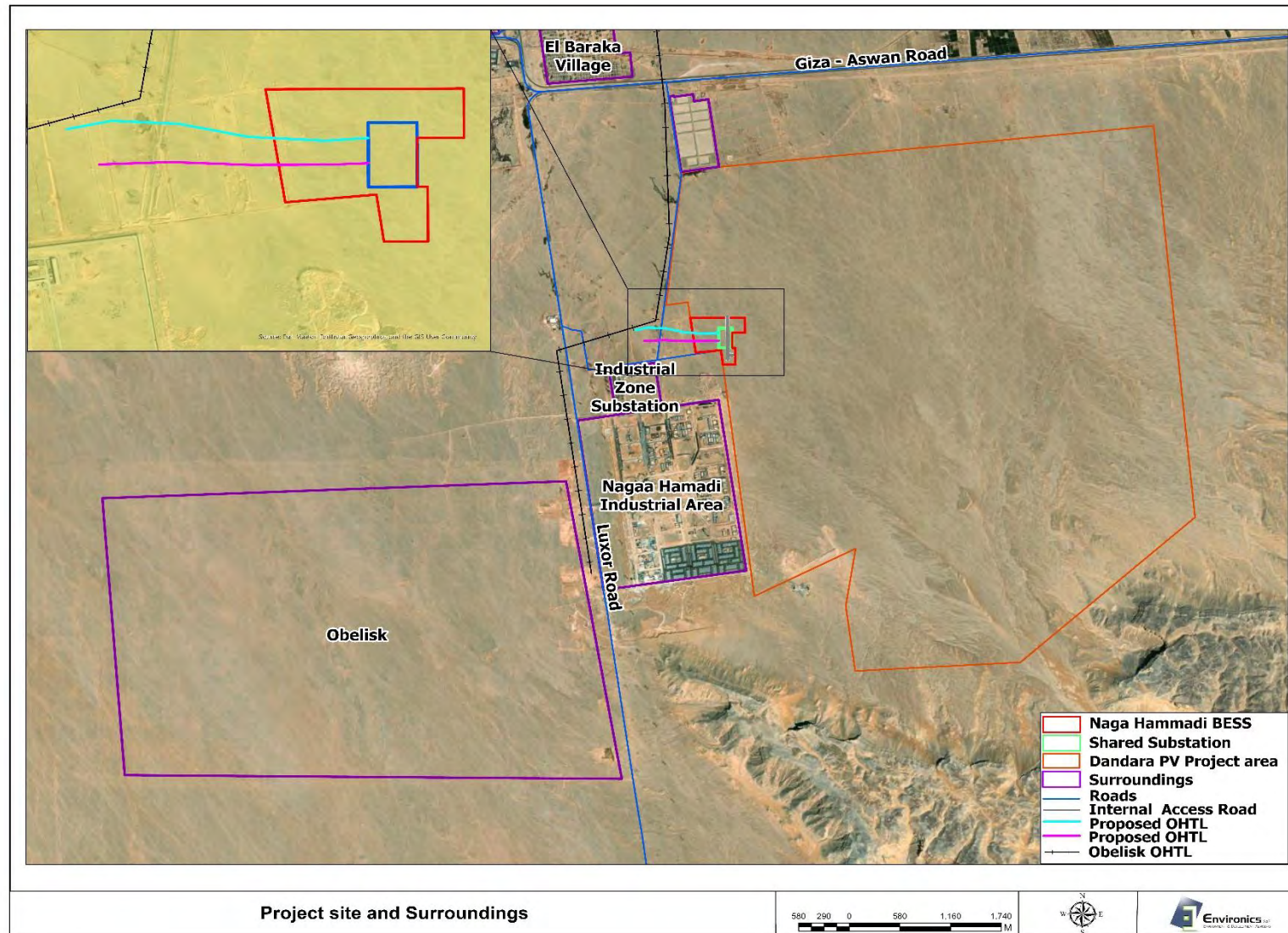


Figure 1: Activities/land uses surrounding the proposed site

Project components and main activities

The proposed Nagaa Hammadi BESS Project comprises three main components:

Battery Energy Storage System (BESS):

The BESS will have an installed storage capacity of approximately 1,000 MWh and a dispatchable AC capacity of approximately 210 MW for 4 hours. It will comprise lithium-ion battery modules, expected to be based on LFP chemistry, housed in prefabricated weatherproof containers. The system will include Battery Management Systems (BMS), Power Conversion Systems (PCS), cooling and ventilation systems, SCADA, fire detection and suppression, access control and auxiliary systems.

Shared 33/220 kV Step-Up Substation:

The Project will utilize a shared 33/220 kV step-up substation serving both the Dandara PV Project and Energy Valley BESS Project. The substation will include three power transformers with a total installed capacity of approximately 850 MVA, including one 250 MVA transformer serving Energy Valley. The substation will include transformers, switchgear, circuit breakers, protection and control systems, telecommunications, metering, auxiliary AC/DC systems and a control building.

220 kV Overhead Transmission Lines:

The Project will connect to the existing national transmission network through approximately 1 km of 220 kV double-circuit OHTLs using a LILO arrangement on the existing Nagaa Hammadi Industrial Zone Substation – Obelisk Substation 220 kV line. The OHTL will include lattice towers, conductors, insulators, spacers, dampers, grounding systems and a right-of-way of 25 m on each side of the transmission line.

Construction and Operational Facilities

Construction activities will include site preparation, grading, excavation, foundations, BESS container installation, substation installation, OHTL tower foundations and erection, electrical installation, testing and commissioning. Temporary construction facilities will include site offices, laydown areas, storage areas, sanitary facilities and worker welfare facilities.

During operation, the facility will be monitored through BMS and SCADA systems, with limited personnel required for operation and maintenance. The BESS cooling system will use a closed-loop liquid cooling circuit with air-based heat rejection through dry coolers. The coolant will be managed under the Project hazardous materials management procedures, including Safety Data Sheet availability, spill response and licensed disposal of any spent or contaminated coolant.

3. Baseline conditions**Physical Environment****Climate and Meteorology:**

The Project area is characterized by a hot, arid climate typical of Qena Governorate, with very hot summers, mild winters, low rainfall and high solar radiation. The annual average temperature recorded at Qena meteorological station is approximately 23.9°C, with average

highs reaching approximately 37.9°C in July. Average annual rainfall is very low, approximately 1.6 mm/year.

Air Quality:

The Project Site is located within a desert / utility development setting with limited local emission sources. Ambient air quality is expected to be generally good with respect to anthropogenic pollutants. However, windblown dust and particulate matter may be naturally elevated due to the arid desert environment, exposed surfaces and unpaved access roads.

Ambient Noise:

The baseline noise environment is influenced mainly by occasional traffic on the Giza–Luxor Road, local vehicle movements, the nearby Nagaa Hammadi Industrial Zone, existing electrical infrastructure, and activities associated with Dandara and Obelisk project areas. The nearest residential receptor, Baraka Village, is located approximately 2.8 km northwest, and no significant community noise sensitivity is expected within the immediate Project footprint.

Geology, Geomorphology and Topography:

The Project Site is located within Quaternary wadi and playa deposits between Nile alluvial deposits and Eocene limestone formations. The site is characterized by desert terrain, sandy loam and shallow stony soils developed mainly from limestone. Elevations generally increase toward the south and range broadly between approximately 130–170 m above mean sea level, with higher elevations in the wider surrounding area.

Hydrology and Hydrogeology:

There are no surface water bodies within the Project footprint. The nearest water bodies are located to the north within the Nile Valley, including irrigation canals and the River Nile. Groundwater occurs mainly within the Quaternary aquifer of the wider Nile Valley area. The Project does not propose groundwater abstraction or wastewater discharge to ground.

Biological Environment

The Project Site is located in a desert / utility development setting with limited habitat value. The footprint consists mainly of bare desert land and areas associated with existing and planned renewable energy and electrical infrastructure.

No protected areas, Key Biodiversity Areas, Important Bird Areas or Plant Important Areas are located within the Project footprint. The Upper Nile Important Bird Area is located approximately 33 km east of the Project Site, while Dababia Protected Area is located approximately 45.6 km southeast and is separated from the Project area by the Nile Valley.

The Project Site does not contain wetlands, water bodies, dense vegetation, roosting sites, stopover habitats or other features likely to attract significant wildlife or migratory bird activity. Bird collision and electrocution risks associated with the short OHTL are assessed as low and will be managed through bird-safe design considerations, operational bird mortality monitoring and adaptive management where required.

Socio-Economic Environment

The Project is located within the desert hinterland of Markaz Nagaa Hammadi, Qena Governorate. There are no residential settlements or local communities within the Project footprint. The nearest settlement is Baraka Village, approximately 2.8 km northwest.

Qena Governorate has a total population of approximately 3.16 million, while Markaz Nagaa Hammadi has a population of approximately 578,237, with a balanced gender distribution. The labour force in Qena Governorate is approximately 927,102, while Markaz Nagaa Hammadi has a labour force of approximately 182,449. Labour force participation is higher among males than females.

The Project Site is located in desert / utility land and is not used for residential, agricultural, commercial, recreational or other productive purposes. No physical displacement, economic displacement, loss of livelihood or loss of access to productive land is anticipated. Therefore, impacts related to land acquisition and involuntary resettlement are scoped out from further assessment.

Cultural Heritage

No registered antiquities or cultural heritage sites are located within the Project footprint. However, given that construction will involve ground disturbance, excavation and foundation works, a Chance Find Procedure will be implemented. In the event of any suspected cultural heritage find, works will be stopped in the relevant area, the location will be secured, and the Ministry of Tourism and Antiquities will be notified.

4. Analyses of Project Alternatives

The analysis of alternatives evaluates feasible Project options in line with Egyptian legislation and applicable international standards.

A. No Project Alternative:

Under the No Project Alternative, the BESS, shared substation and OHTL would not be developed. This would avoid localized construction and operational impacts, but the benefits of grid flexibility, improved renewable energy integration, reduced reliance on fossil-fuel peak generation, and local employment / procurement opportunities would not be realized. The No Project Alternative is therefore not considered suitable.

B. Alternative Site Location:

The selected site is located within / adjacent to the Dandara PV Project area, allowing shared use of the 33/220 kV substation and connection to existing transmission infrastructure. Alternative sites farther from Dandara would require longer grid connections, additional land disturbance and duplication of electrical infrastructure. The selected location is therefore considered the preferred option.

C. Project Design Alternatives

Project design alternatives were evaluated during the conceptual and pre-feasibility stages to identify the configuration that best meets the project's technical, operational, environmental,

and safety objectives. The assessment considered the arrangement of the Battery Energy Storage System (BESS), power conversion systems, transformers, internal infrastructure, fire protection systems, and the interface with the shared 33/220 kV substation.

A modular containerized BESS using lithium iron phosphate (LFP) battery technology was selected as the preferred design because it provides high operational reliability, improved safety, simplified construction and maintenance, and flexibility for future expansion. Alternative layouts and non-standardized configurations were not selected as they would increase construction complexity, reduce operational flexibility, or present higher operational risks.

D. System-Level Alternatives

System-level alternatives were assessed to determine the most suitable approach for achieving the project objectives. The options considered included grid reinforcement without storage, renewable energy curtailment, conventional dispatchable generation, demand-side management, and battery energy storage.

A utility-scale BESS was selected as the preferred option because it provides rapid response, supports renewable energy integration, enhances grid stability, and improves operational flexibility while avoiding the greenhouse gas emissions and fuel consumption associated with conventional generation. Compared with the other alternatives, the selected solution offers the most effective balance between technical performance, environmental sustainability, and operational reliability.

E. Grid Connection / OHTL Alternatives:

The selected grid connection is a short LILCO arrangement connecting the shared substation to the existing 220 kV line between Nagaa Hammadi Industrial Zone Substation and Obelisk Substation. Alternative options, including longer OHTL routes, direct connection to more distant substations or underground cabling, would increase route length, cost, construction disturbance and maintenance complexity. The selected OHTL option is therefore preferred.

F. BESS Technology Alternatives:

Several BESS technologies were considered, including lithium-ion batteries, vanadium redox flow batteries, molten metal batteries and sodium-ion / high-temperature sodium batteries. Containerized lithium-ion BESS using LFP chemistry was selected due to its technical maturity, high thermal stability, lower thermal runaway risk, long operational life, smaller footprint and suitability for utility-scale applications.

G. Cooling System Alternatives:

Cooling alternatives included forced air cooling, open-loop liquid cooling, closed-loop liquid cooling with water-based heat rejection, and closed-loop liquid cooling with air-based heat rejection. Closed-loop liquid cooling with air-based heat rejection / dry coolers was selected because it provides reliable thermal management for utility-scale BESS under hot climatic conditions while avoiding process water consumption and wastewater discharge during normal operation.

5. Assessment of Environmental and Social Risks and Impacts

This chapter evaluates the potential environmental and social risks and impacts of the project. It includes a detailed analysis of the project's risks and impacts and emphasizing the mitigation hierarchy: avoiding, minimizing, mitigating for impacts.

Positive Impacts

The Project is expected to generate several positive impacts, including:

- Supporting integration of renewable energy into the national grid;
- Improving grid flexibility, reliability and operational stability;
- Enabling storage and dispatch of renewable electricity when required by the grid;
- Reducing indirect greenhouse gas emissions by supporting reduced reliance on fossil-fuel peak generation;
- Avoiding duplication of electrical infrastructure through use of a shared substation;
- Creating temporary employment opportunities during construction;
- Supporting local procurement where feasible; and
- Building local technical skills in BESS, substation and grid integration technologies.

Summary of the potential negative impacts on the environment and society during the construction, operation and decommissioning phases of the project illustrated in table below. While the second table provides an overview of the project environmental and social management plans.

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Construction phase			
Air quality			
exhaust emissions from construction vehicles and mobile equipment operating on-site	Insignificant	- Minimize idling times of construction vehicles and machinery. - Maintain vehicles and construction equipment in good working condition. - Cover trucks transporting fine or loose materials. - Implement good housekeeping practices across the construction site.	No Residual Impact
Ambient noise			
- Equipment and machinery - Vehicle Movement - Power Generators	Insignificant	- Ensure regular maintenance of construction equipment and machinery to minimize noise emissions. - Use low-noise machinery and equipment where possible. - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels. - Provide hearing protection equipment to workers exposed to high noise levels.	No Residual Impact
Soil			
- Earthworks - Excavation activities - Management of domestic wastewater - Construction waste handling	Minor	- Conduct maintenance off-site to minimize spills and effluents. - Adopt spill prevention measures and make on-site spill kits available. - Proper collection of spills and disposal via licensed contractors. - Develop and implement Spill Management Plan (within ESMP). - Apply good housekeeping practices on-site. - Provide sealed tanks for collection of domestic wastewater. Dispose domestic wastewater off -site via licensed contractors.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Collect solid waste at designated locations and ensure segregation processes are applied. - Ensure proper handling of hazardous materials and wastes and provide secondary containment for hazardous material/waste storage areas - Utilize only licensed contractors for waste and hazardous waste disposal. - Establish marked and physically separated storage areas for hazardous waste.	
Biological Environment			
Disturbance to wildlife	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Provide awareness to the workers to prevent disturbance of wildlife that may occur in the wider surroundings. Also provide training on the identification and avoidance of sensitive biodiversity features; - Ensure proper housekeeping practices are followed; - Ensure the proper maintenance of construction equipment and any other equipment with high noise and vibration potential.	No residual Impacts.
Habitat loss	Minor	- Restrict construction activities strictly to the defined OHTL tower footprints and approved working areas. - Utilize existing tracks and previously disturbed corridors wherever possible. - Prohibit uncontrolled off-road driving and restrict vehicle movement to designated access routes, avoiding any vegetation patches identified during pre-construction inspections.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		Clearly demarcate construction boundaries prior to work to prevent unnecessary ground disturbance.	
Attraction of pests and propagation of invasive species	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Ensure proper housekeeping practices are followed; - Provide awareness to the workers on the negative impacts of improper solid waste and wastewater management.	No residual Impacts.
Socio Economic Environment			
Worker Influx*	Insignificant	- Prioritize hiring local workers where possible. - Prohibit informal or speculative hiring (“hiring at the gate”). - Implement a Labour Management Plan and Workers’ Code of Conduct. - Raise awareness among workers regarding local customs, social norms, and appropriate behavior. - Establish a worker grievance mechanism. - Establish a community’ grievance mechanism . accessible to affected stakeholders and capable of handling grievances related to gender based (BGV) violence and sexual exploitation, abuse, and harassment (SEAH) - Ensure the development and implementation of a stakeholder engagement plan that includes - Provide training on GBV and SEAH - Ensure contractor management plans include provisions for worker accommodation and influx, grievance mechanisms, etc and monitor these requirements	No Residual Impact

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Site security	Minor	• Ensure security personnel are adequately trained on on Code of Conduct, human rights principles, use-of-force requirements, conflict de-escalation techniques, cultural awareness and are informed of grievance mechanism. • Ensure compliance with applicable national laws and human rights principles. • Implement and maintain a grievance mechanism accessible to workers and community members. • Establish and implement documented procedures for reporting, recording, investigating, and responding to all security-related incidents or complaints, including allegations of misconduct, use of force, or community complaints. • Clearly define roles, responsibilities, reporting lines, and accountability mechanisms for security personnel and contractors. • Ensure that the project grievance mechanism is accessible to workers, contractors, local communities, and other stakeholders, including vulnerable groups. • Publicize grievance channels through multiple communication methods and in locally appropriate languages. • Include specific procedures for receiving, documenting, investigating, and resolving security-related grievances confidentially and without retaliation.	Insignificant
Change in land use	Insignificant	• The OHTL routes, BESS and substation locations are in desert and unoccupied land with no existing agriculture, residential purposes, commercial activities, or other productive land uses. No risk is anticipated in this regard	No residual Impact
Construction Traffic*	Minor	• Develop and implement a Traffic Management Plan.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Coordinate material deliveries to avoid peak traffic hours where feasible. - Ensure safe vehicle operation and speed limits within and near the site.	
Occupational health and safety			
OHS risks	Moderate	- Ensure that contractual obligations are in place for contractors to include the development and implementation of the construction environmental and social management plan (CESMP) for approval prior to commencement of construction activities - Implement OHS Management Plan, as part of the CESMP. - Provide appropriate PPE. - Conduct safety training and toolbox talks. - Enforce speed limits and equipment inspections. - Ensure that only approved working at height (particularly for OHTL) and lifting plans for BESS installation are adopted. Ensure robust HSSE measures as applied throughout those activities. - Establish crane/lifting exclusion zones. - Maintain safe access and control slip/trip risks. - Provide shaded rest areas and implement heat stress measures. - Restrict access to work zones; mark excavations. - Apply lock-out/tag-out procedures and restrict electrical works to qualified electricians	Minor
Workplace Noise	Minor	- Comply with Law 4/1994 on noise exposure limits. - Conduct regular maintenance of equipment to reduce noise. - Schedule high-noise activities to avoid overlap. - Provide and enforce use of hearing PPE (earplugs).	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Cultural Heritage	Minor	- Develop and implement Chance Find Procedures, indicating the actions to be taken in case of any significant findings during site leveling and construction activities. - Notify the Ministry of Tourism and Antiquities (MOTA) if an archaeological artifact is discovered during excavation.	Insignificant
Operation phase			
Ambient Air			
- Transport of people and supplies for maintenance - Potential emission of SF6, if utilized for insulation of the switchgear.	Minor	If SF6 is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair, use proper chamber vacuums during filling the SF6 into the GIS, and employee education/training.	Insignificant
Ambient noise			
- Noise (buzzing or humming) from high-voltage power lines producing corona - Operation of the transformer and other components of the substation	Insignificant	No mitigation measures are required; however, the following management measures are proposed - Regular maintenance of transformers and cooling fans to prevent incompliant noise levels. - Prompt repair or replacement of faulty components causing excessive hum or vibration.	Insignificant
Workplace noise			
- Operations - routine inspection and periodic maintenance	Minor	Routine maintenance of cooling systems, transformers, and electrical equipment to ensure proper functioning and reduce noise emissions.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Use equipment with sound-insulated housings, specifically designed for continuous industrial operation, as relevant, to lower operational noise levels. - Implement occupational health and safety procedures, including provision of hearing protection during maintenance activities.	
Electromagnetic fields			
Operation of the shared substation and overhead transmission line	Minor	- Design, construct and operate the OHTL and shared substation in accordance with applicable Egyptian regulations and recognized international good practice, including relevant exposure guidelines for EMF. - Restrict access to energized electrical equipment and high-voltage areas to authorized personnel only. - Install warning signs and maintain appropriate physical barriers around electrical installations. - Implement lock-out/tag-out procedures and safe systems of work for maintenance activities involving energized equipment. - Provide training to workers regarding electrical hazards, EMF awareness and safe working distances. - Maintain electrical equipment in accordance with manufacturer specifications and preventive maintenance schedules.	Insignificant
Soil			
Potential spills	Minor	- Implement proper storage and handling procedures for oils, and lubricants. - Conduct maintenance activities in designated areas. - Provide spill response materials and train staff on spill management.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Solid waste	Insignificant	Not required, except for routine maintenance (prepare waste management plans).	No residual impacts
Groundwater			
Potential contamination sources	Minor	- Store fuels, oils, lubricants and other hazardous materials in designated areas with appropriate secondary containment capable of containing at least 110% of the largest container volume. - Ensure transformers are installed within bunded areas designed to contain potential oil leaks and spills. - Develop and implement a Spill Prevention and Response Plan as part of the ESMP. - Maintain spill response equipment and spill kits at locations where hazardous materials are stored or handled. - Train workers in spill prevention, emergency response and reporting procedures. - Inspect hazardous material storage areas regularly to identify leaks or deterioration. - Collect and dispose of contaminated soil, absorbent materials and other spill residues through licensed waste contractors. - Prohibit uncontrolled discharge of wastewater, oils or chemicals to the ground surface. - Ensure prompt clean-up and remediation of any spill incidents.	Insignificant
Biological Environment			
Attraction of pests and propagation of invasive species	Insignificant	Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of	No residual impacts

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		vermin and the potential consumption of waste from opportunistic species; • Ensure proper housekeeping practices are adopted; • Provide awareness to the workers on the negative impacts of improper solid waste disposal.	
• Birds Electrocuton Risks	Minor	• Increase the number of insulators where conductors connect to each tower (to increase the gap between the conductor and the tower), using insulators that prevent birds from landing on them. • Cover the crossarms with insulating materials such as PVC strips to ensure that birds are not earthed when perched.	Insignificant
• Birds Collision Risk	Minor	• For bird collision risk, no mitigation measures are recommended. Nevertheless, the Project will undertake periodic inspections of the OHTL during routine maintenance activities and record any evidence of bird mortality. Should unexpected collision incidents be identified, additional mitigation measures, such as installation of bird flight diverters, will be evaluated and implemented as necessary	Insignificant
Social environment			
• Site security	Insignificant	• Train security personnel on proper conduct toward workers and community, in accordance with local laws, lender performance requirements and ILO guidelines. • Develop and maintain a grievance mechanism for the community to report concerns about security arrangements and personnel actions.	No residual impacts
• Operation-phase Traffic	Insignificant	No mitigation measures are required	No residual impacts

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Potential Fire and Thermal Runaway			
Potential BESS fire from BESS failure, including thermal runaway events	Minor	- Implement battery management and monitoring systems. - Maintain fire detection and suppression systems in accordance with manufacturer requirements. - Develop and implement emergency preparedness and response procedures. - Conduct periodic inspection and maintenance of battery systems and associated safety equipment.	Insignificant
Hazardous Waste			
Waste oils, electrical components, spent chemicals, and end-of-life lithium-ion batteries	Minor	- Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors. - Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors. - End-of-life batteries will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available.	Insignificant
Occupational Health and Safety			
- Electrical hazards - Maintenance activities	Minor	- A health and safety policy will be applied. - Abide by all national occupational health and safety regulations; Labour Law 14/2025. - Provide suitable PPE and apply a robust permit-to-work system. - Ensure that the maintenance workers are properly trained, especially for working at height training - Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers.	Insignificant

Environmental and Social Aspects	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Community Health, and Safety			
- Construction Traffic and Road Safety - Unauthorized Access to Construction Sites - Community–Worker Interactions - Site Security Arrangements	Minor	- Restrict public access to construction areas through fencing, barriers, and warning signage. - Implement a Traffic Management Plan covering vehicle routing, speed limits, driver requirements, and traffic safety measures. - Ensure drivers are appropriately licensed and trained. - Maintain communication with local stakeholders regarding construction activities and temporary disruptions. - Implement and enforce a Worker Code of Conduct. - Ensure security personnel are trained in community relations and appropriate use of force. - Establish and maintain a community grievance mechanism. - Maintain adequate site security and access control throughout the construction period.	Insignificant

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Air Quality	Dust emissions	- Reduce idling times for vehicles and machinery; - Maintaining machinery and vehicles in good working order - Speed restriction on sites; - Ensuring workers are aware of safe driving and maintaining good practices in machinery usage; and	Construction contractor	- Monitoring plan - Air quality measurements	3,000 – 4,000 / year	Throughout the construction phase period

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
		- Periodic measurements for stacks of generators				
	working conditions of machinery	- Ensure good working conditions through frequent inspection of all construction equipment - Implementation of OHS plans	Construction contractor	Maintenance logs OHS plan	10,000 – 14,000 (included in EPC O&M allowance)	
Noise Level	working conditions of machinery	- Regular maintenance of construction equipment - Use low-noise equipment, where possible; - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels; - Schedule high-noise activities to take place in morning hours - Implementation of OHS plans	Construction contractor	OHS plan Noise measurements and Maintenance logs	2,000 – 3,000 / year	Throughout the construction phase period
	Provision of PPEs	- Providing necessary PPE for workers	Construction contractor		4,000 – 8,000 (PPE supply - total project period)	
Soil	housekeeping practices	- Develop and implement site management plan, solid waste management and wastewater management plans and spill prevention plan	Construction contractor Developer (include provisions in the construction contracts. Developers to ensure contractors' compliance)	- Waste and wastewater management plans - Solid/hazardous waste and wastewater management contract - Contractor follow-up documents	1,000 – 16,000 (depends on waste volume)	Throughout the construction phase period
	Waste/wastewater management	- Proper collection, containment, and disposal of sanitary wastewater - Proper collection, containment, and disposal of sanitary wastewater				

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
		- hazardous materials storage and handling according to the WBG General EHS Guidelines, - Transportation and disposal to be carried out through authorized waste contractors		- Contracts with authorized waste contractors		
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing OHS plan and HSE procedures according to national requirements and international standards	Contractor	OHS plan and procedures HSE provisions in the construction contracts	12,000 – 14,000	Before construction activities
Emergency Response plans	Site Staff and Workplace Safety	- Develop procedures for emergency control	Contractor	Emergency response plan	6,000 – 14,000	Before project commissioning
Waste management	Worker's health	- Developing a solid and hazardous waste management plans in line with the WBG General EHS Guidelines." - Developing OHS plans - Different types of waste to be stored in designated waste areas, and transported by licensed contractors	Construction contractor	Solid waste management contract with authorized contractors Waste manifest OHS plan	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)	Throughout the construction phase period
Biological Environment	Pests and invasive species	- Good housekeeping and proper waste management	Construction contractor	Waste management contract	2,000 – 5,000 (one-time)	Throughout the construction phase
	Disturbance to wildlife	- Awareness (toolbox talks and awareness signs) - Implementation of mitigation measures	Construction contractor	Requirements specified in contracts		Throughout the construction phase

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
			- Supervision and implementation of deterring measures				
Social Environment		Workers influx	- Prioritize hiring local workers - Implement and maintain a community grievance mechanism; and, - Selection of labour accommodation, away from existing communities, as possible. - Develop HR policies including GBV and SEAH plans	Developer/Construction contractors	Labour management plan, workers accommodation inspection checklist GBV and SEAH policies Workers Awareness	10,000 – 30,000 / year	Throughout the construction phase period
		Community health, safety and security- risks from road traffic accidents	- Develop Traffic Management Plan (TMP) and associated procedures	Construction contractors	TMP and procedures	8,000 – 20,000	
		Cultural heritage	- develop chance find procedure	Developer/Construction contractors	Developed procedures	1,000 – 5,000	Before construction activities
Total Estimated Cost	(USD)		-			≈ 130,000 USD	
	(EGP)					≈ 6,500,000 EGP	

6. Stakeholders' Consultation

Stakeholder engagement was undertaken in a proportionate manner, reflecting the limited footprint, smaller workforce and site-specific impacts of the Nagaa Hammadi component compared with the larger Energy Valley components. No separate large-scale public scoping meeting was undertaken for this component, which is considered proportionate given the small-scale nature of the Project, absence of displacement impacts, and ongoing community interface through Scatec / Energy Valley's existing presence and nearby Obelisk and Dandara project liaison arrangements.

Stakeholder engagement activities were undertaken with community representatives, local mayors, government officials, representatives of the industrial zone, heads of local families and other relevant stakeholders in the Nagaa Hammadi area during 17–18 June 2026.

Stakeholders generally expressed a positive perception of Scatec / Energy Valley and welcomed continued investment in the area. Given the limited scale of the Nagaa Hammadi component, stakeholder interest was relatively low compared with larger renewable energy projects. Employment opportunities were the main topic of interest, with stakeholders emphasizing the importance of fair and transparent access to job opportunities for qualified candidates from surrounding communities. No major concerns, objections or project-related grievances were raised.

Stakeholder feedback has been incorporated into the ESIA and ESMP through commitments on local employment, transparent recruitment, prohibition of informal hiring at the gate, worker Code of Conduct, Labour Management Plan, worker and community grievance mechanisms, GBV/SEA/SH prevention, security conduct, and coordination with neighbouring projects and facilities.

Disclosure and engagement will continue during pre-construction, construction, operation and, where relevant, decommissioning, in accordance with the Project-wide Stakeholder Engagement Plan (SEP).

7. Environmental and Social Management Plan

The project will develop and implement an Environmental and Social Management Plan (ESMP) outlining specific mitigation and monitoring measures to ensure compliance with all applicable legal and institutional requirements.

It includes mitigation and monitoring measures to ensure environmental and social performance.

The ESMP encompasses the following key components:

- The Summary of Impacts and Mitigation Measures,
- Environmental and Social Management Plans include the following:
- Health, Safety and Environment (HSE) Plan
- Transportation Management Plan
- Noise Management plan

- Hazardous and Non-hazardous waste management plan
- Water and wastewater management
- Chance Find Procedure
- Preventive and corrective maintenance
- Wastewater Management Plan
- Housekeeping and Cleanliness
- Social management measures for labour, worker influx, worker conduct, GBV/SEA/SH, security and grievance management
- BESS safety and emergency response measures;
- OHTL bird collision and electrocution monitoring;
- Supply-chain due diligence requirements;
- Battery waste and end-of-life management requirements;
- Decommissioning management requirements; and
- Environmental and social monitoring plans.
-

Institutional Arrangements:

- Defined roles and responsibilities for implementing the ESMP, involving the project proponent, contractors, and relevant government agencies to ensure accountability and effective coordination among stakeholders.
- Energy Valley will retain overall responsibility for ESIA and ESMP implementation oversight, lender reporting, stakeholder engagement and contractor E&S performance monitoring. The EPC Contractor will be responsible for implementing construction-phase mitigation measures through a Construction Environmental and Social Management Plan (CESMP), while the O&M Contractor / Project Operator will be responsible for operational controls.
- An indicative ESMP implementation budget has been developed for environmental and social mitigation, monitoring, training, GRM implementation and independent E&S audits. The budget is preliminary and will be refined later based on detailed implementation planning.

Capacity Building:

- Provisions for training and capacity building for project staff and contractors on best practices in environmental and social management, enhancing their ability to effectively implement the ESMP.

Conclusion

The Energy Valley Naga Hammadi BESS Project will support Egypt's energy transition, grid stability, and integration of renewable energy through the development of a 1,000 MWh BESS, a shared 33/220 kV step-up substation, and a short 220 kV OHTL connection. The No-Project Alternative is therefore not considered viable, as it would forgo these strategic energy and socio-economic benefits. The ESIA has assessed the potential environmental and social impacts during construction, operation and decommissioning and concludes that, given the Project's limited footprint, desert / utility setting, absence of displacement impacts, and implementation of the proposed ESMP and monitoring measures, residual impacts are

expected to remain within acceptable limits. The total estimated budget for implementation of the environmental and social measures, as developed in the ESMP, is approximately USD 130,000. The Project is therefore considered environmentally and socially feasible, provided that all ESIA and ESMP commitments are implemented and monitored throughout the Project lifecycle.

1. Introduction

1.1 Background

Energy Valley Company intends to develop the Energy Valley Naga Hammadi Battery Energy Storage System (BESS) Project in Qena Governorate. The proposed project comprises the construction and operation of a utility-scale Battery Energy Storage System (BESS) with an installed storage capacity of approximately 1,000 MWh, together with a shared 33/220 kV step-up substation and associated 220 kV overhead transmission lines (OHTLs).

The project will be located within the Dandara PV Power Plant area in the desert hinterland of Nagaa Hammadi, Qena Governorate.

The primary purpose of the project is to store renewable electricity and discharge it to the national electricity grid in accordance with grid operational requirements. The BESS will support grid stability, facilitate load shifting and energy management, enhance the integration of renewable energy sources into the national grid, and contribute to Egypt's renewable energy and decarbonization objectives.

The project includes a shared 33/220 kV step-up substation that will serve both the Dandara PV Power Plant and the Energy Valley BESS Project. The substation will have a total installed transformer capacity of approximately 850 MVA, comprising two 300 MVA transformers serving the Dandara PV Project and one 250 MVA transformer serving the Energy Valley BESS Project. The substation will function as the central interconnection point between the projects and the Egyptian transmission network.

To facilitate grid connection, the project includes approximately 1 km of 220 kV double-circuit overhead transmission lines, which will connect the shared substation to the existing transmission network through a Loop-In-Loop-Out (LILO) arrangement on the existing 220 kV transmission line between the Nagaa Hammadi Industrial Zone Substation and the Obelisk Substation.

This ESIA study covers the Energy Valley Nagaa Hammadi BESS Project, including the following main components:

- i. **Battery Energy Storage System (BESS):** A utility-scale energy storage facility.
- ii. **Shared 33/220 kV Step-Up Substation:** A shared electrical substation serving both the Dandara PV Project and the Energy Valley BESS Project.
- iii. **220 kV Overhead Transmission Lines (OHTLs):** Approximately 1 km of double-circuit transmission lines connecting the shared substation to the existing 220 kV transmission network through a LILO connection.

The project is implemented according to the national requirements, as well as the international financing institutions, including the European Bank for Reconstruction and Development (EBRD), International Finance Corporation (IFC), the African Development Bank (AfDB) and European Investment Bank (EIB).

According to the initial meeting conducted with the Egyptian Environmental Affairs Agency (EEAA) on 6 January 2026, the substation and the OHTLs for Energy Valley Project have been classified as Category Scoped-B projects .

While the project could initially be classified as Category A under EBRD criteria due to potential high E&S risks, the OHTLs are short (0.85 km and 0.76 km) and located in low-sensitivity, state-owned desert areas with no significant biodiversity or social receptors. The substation footprint is also limited, and impacts are site-specific. Therefore, impacts are expected to be localized and easily mitigated, making a Category B classification more appropriate.

The location of the Energy Valley Nagaa Hammadi BESS Project, including the BESS facility, shared 33/220 kV step-up substation, and OHTL route, is presented in Figure 1-1 below.

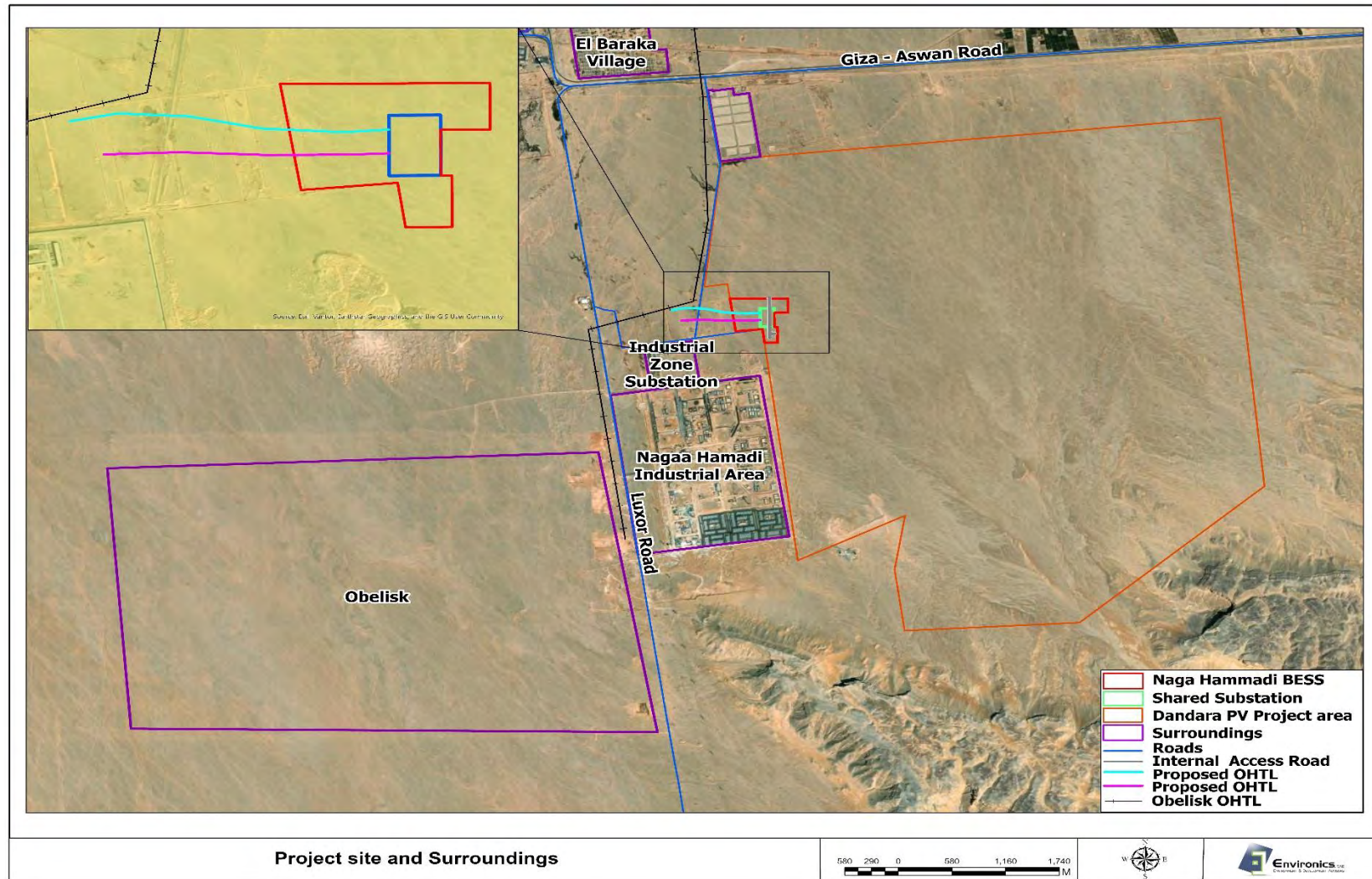


Figure 1-1: location of BESS, Shared Substation, and OHTL

1.2 Objective of the ESIA

The objective of the ESIA is to ensure that the project is environmentally and socially sound and sustainable, and that any potential negative environmental and social (E&S) risks are recognized early in the project cycle and taken into account before project implementation. Furthermore, it is also intended to satisfy the environmental legal requirements of the Egyptian Environmental Law 4 of 1994 and its current executive regulations.

Moreover, the ESIA also intends to satisfy the environmental and social requirements of the international financial institutions, namely the IFC, EBRD, and AfDB.

1.3 Scope of Work

The ESIA of the proposed project would assess the potential environmental and social risks and impacts across all project stages, including construction, operation, and decommissioning. The assessment will establish baseline environmental and social conditions within the project's area of influence, covering air, water, soil, biodiversity, noise, waste, land use, and socio-economic aspects.

The assessment reviews applicable Egyptian legislation, relevant international standards, and lender requirements. Potential impacts will be identified, evaluated, and addressed through mitigation measures documented in an Environmental and Social Management Plan (ESMP), including monitoring and responsibilities.

1.4 Outline of the ESIA Report

This ESIA report includes:

- **Chapter 1 (the current chapter):** Introduction, project background, and the scope and objectives of the ESIA study.
- **Chapter 2:** Description of the Energy Valley Nagaa Hammadi BESS Project, including the Battery Energy Storage System (BESS), the shared 33/220 kV step-up substation, the associated 220 kV overhead transmission lines (OHTLs), and the construction and operation activities and related environmental and social aspects
- **Chapter 3:** Description of the environmental and social baseline conditions within the project area and area of influence.
- **Chapter 4:** Description of the applicable national regulatory framework as well as the International Environmental and Social standards and requirements applicable to the project activities
- **Chapter 5:** Discussion of alternatives for different project components.
- **Chapter 6:** Assessment of the potential environmental and social risks and impacts and their mitigation measures.
- **Chapter 7:** Stakeholders Consultation
- **Chapter 8:** The environmental and social management and monitoring plan for the BESS

2. Project Description

The proposed Energy Valley Naga Hammadi BESS project comprises the construction and operation of a utility-scale BESS with an installed storage capacity of approximately 1,000 MWh as well as step-up substation (S/S). The whole Naga Hammadi BESS and S/S site will be developed on an approximate land area of approximately 194,288 m² (BESS 25,468 m², Shared Substation 29,885 m², OHTL 120,800 m², Laydown area and Roads 18,135 m²), located in the Dandara PV Power Plant Project area in Qena Governorate.

The Project is designed to store electrical energy and discharge it to the national electricity grid in accordance with grid operational requirements. The Project comprises three main components:

- Battery Energy Storage System;
- Shared 33/220 kV step-up substation; and
- 220 kV overhead transmission lines.

Battery Energy Storage System (BESS)

The BESS will comprise battery storage units, power conversion systems (PCS), internal electrical infrastructure, control and monitoring systems, and auxiliary facilities required for safe and reliable operation. The primary functions of the BESS are to:

- *Store renewable electricity generated by the PV Substation located in NREA concession East of Minya through the national grid;*
- *Discharge stored energy in accordance with grid requirements and operational arrangements;*
- *Support grid stability, including load shifting and energy management;*
- *Enhance the integration of renewable energy into the national grid; and*
- *Contribute to national renewable energy targets and decarbonization objectives.*

Shared 33/200 KV step-up substation

The Project will utilize a shared 33/220 kV step-up substation serving both the Dandara PV Power Plant and the Energy Valley BESS Project. The substation will have a total installed transformer capacity of approximately 850 MVA and will comprise two 300 MVA transformers serving the Dandara PV Project and one 250 MVA transformer serving the Energy Valley Project, together with the associated switchgear, protection and control systems, telecommunications systems, and auxiliary facilities.

Overhead Transmission Line (OHTL)

The Project includes approximately 1 km of 220 kV OHTL connecting the shared 33/220 kV substation to the existing national transmission network through the cutting the existing Overhead transmission line (OHTL) connecting the Naga Hammadi industrial zone S/S to Obelisk S/S and installing two 220kV double circuit OHTL from these points to the new shared substation in order to form a Loop-In-Loop-Out (LILO) connection. The OHTL will comprise

transmission towers, conductors, insulators, grounding systems, and associated electrical infrastructure required for grid connection and power evacuation.

2.1 Project Location

The proposed project is located in the Qena Governorate, specifically, within the desert hinterland of the city and Markaz of Nagaa Hammadi and is located around 16 km southeast of the town of Nagaa Hammadi. The Project will be developed within/ adjacent to the Dandara PV Power Plant Project area and comprises the BESS compound, the shared 33/220 kV step-up substation, and the associated 220 kV OHTL LILO connection.

The Project Site is located in an arid desert setting and is not located within any existing residential, agricultural, commercial or recreational land use. The site is surrounded mainly by vacant desert land, the Dandara PV Project area, the existing Naga Hammadi transmission corridor, and the Naga Hammadi Industrial Zone.

Table 2-1 below illustrates the coordinates of the project site.

Table 2-1: Coordinates of the Project Site (Africa_Lambert_Conformal_Conic)

Points	Latitude (N)	Longitude (E)
Naga Hammadi BESS		
1	2783461.394616753	769680.2875735309
2	2783288.608535677	769680.5736761187
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.380414486	769572.0346908272
6	2782925.301310003	769572.354213905
7	2782925.0819173753	769440.8904367206
8	2783090.392588258	769419.0912364512
9	2783064.17148301	769147.1504593793
10	2783460.50069052	769089.6132877459
Shared Substation		
1	2783342.5772506595	769395.074916218
2	2783342.8208433986	769540.7650960417
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.231103331	769395.452907633
OHTL (opening existing Obelisk OHTL)		
1	2783322.8126595914	768497.4499838825
2	2783351.7612946033	768630.8980950158
3	2783340.526999265	768830.6919441563
4	2783293.9203641415	769038.9087141189
5	2783279.735473752	769268.2176393371
6	2783288.707302332	769394.4987259954
OHTL (opening existing Naga Hammadi Industrial OHTL)		
1	2783198.9771317244	768593.0058898054

Points	Latitude (N)	Longitude (E)
2	2783206.5204039514	768806.5511225817
3	2783195.613176942	769045.9467630284
4	2783195.8623732626	769280.7430346524
5	2783200.6241021454	769396.1315332904

The nearest settlement to the Project Site is Baraka Village, located approximately 2.8 km northwest of the Project Site. Other notable features surrounding the Project Site include the Obelisk PV Project, located approximately 2 km southwest of the Project Site; the Dandara PV Project, which borders the Project Site to the north and east; the Nile Valley, located approximately 11 km north of the Project Site; and Qena City, the capital of Qena Governorate, situated approximately 45 km northeast of the Project Site.

The Project Site is surrounded by the following land uses:

- **North:** Dandara PV Project area and vacant desert land.
- **South:** Dandara PV Project area, Nagaa Hammadi Industrial Zone, and vacant desert land.
- **East:** Dandara PV Project area and vacant desert land.
- **West:** Vacant desert land, existing electricity transmission infrastructure, and the Nagaa Hammadi transmission corridor.

Access to the Project Site will be provided through the existing regional and local road network, including the Giza–Luxor Road and the local access road serving the Naga Hammadi Industrial Zone and nearby electricity infrastructure. These roads will be used for transportation of BESS containers, substation equipment, OHTL materials, construction equipment and workers during construction, and for limited maintenance access during operation.

The Project area is characterized by bare desert land with limited ecological value, no surface water bodies within the Project footprint, and no known cultural heritage sites within the Project Site, as discussed in Chapter 3. The nearest surface water and agricultural receptors are located to the north within the Nile Valley and associated agricultural areas.

Figure 2.1 below shows the activities/land uses surrounding the proposed site.

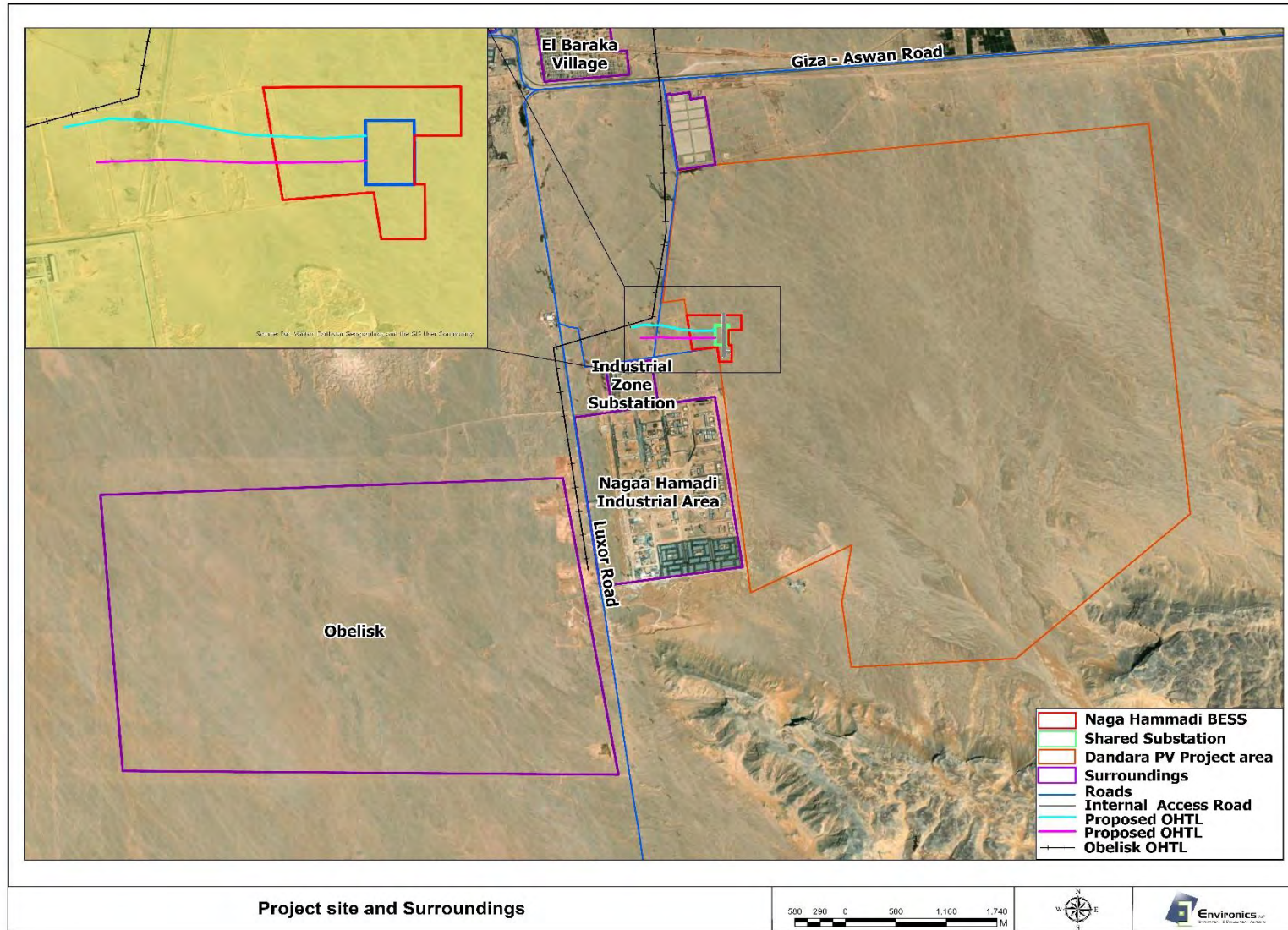


Figure 2-1: Project Component and Surroundings

2.2 Process Description

The project involves the installation and operation of a lithium-ion Battery Energy Storage System that stores electrical energy in chemical form during charging periods and releases it as electrical energy during discharge periods. It will operate automatically through integrated control, protection, and monitoring systems.

2.2.1 Project Components

The BESS consists of a lithium-ion battery energy storage system composed of multiple battery cells assembled into modules, racks, and containerized units. Each battery cell comprises a cathode, an anode, and an electrolyte.

The BESS is expected to utilize lithium iron phosphate (LFP) chemistry, which is widely adopted in utility-scale energy storage projects due to its operational reliability, safety characteristics, and performance.

Battery modules will be housed within prefabricated, weatherproof containers, delivered to the site as pre-assembled units and arranged within the designated BESS compound.

Containers will be installed on engineered and elevated foundations to reduce the risk of water accumulation and ensure long-term structural stability.

The total installed storage capacity of the BESS is approximately 1,000 MWh, distributed across multiple containerized battery units.

A. BESS Battery Modules

- Lithium-ion battery modules with a total nameplate energy capacity of approximately 1,000 MWh and a dispatchable AC capacity of 210 MW for 4 hours.
- Battery modules connected in series and parallel arrangements to achieve the required system voltage and capacity.
- Modules installed within insulated, weatherproof containers designed to withstand local climatic and environmental conditions.
- The BESS is expected to operate at up to one full charge–discharge cycle per day, subject to grid requirements and operational agreements.

Figure 2.2 shows the expected integrated lithium-ion battery storage system.

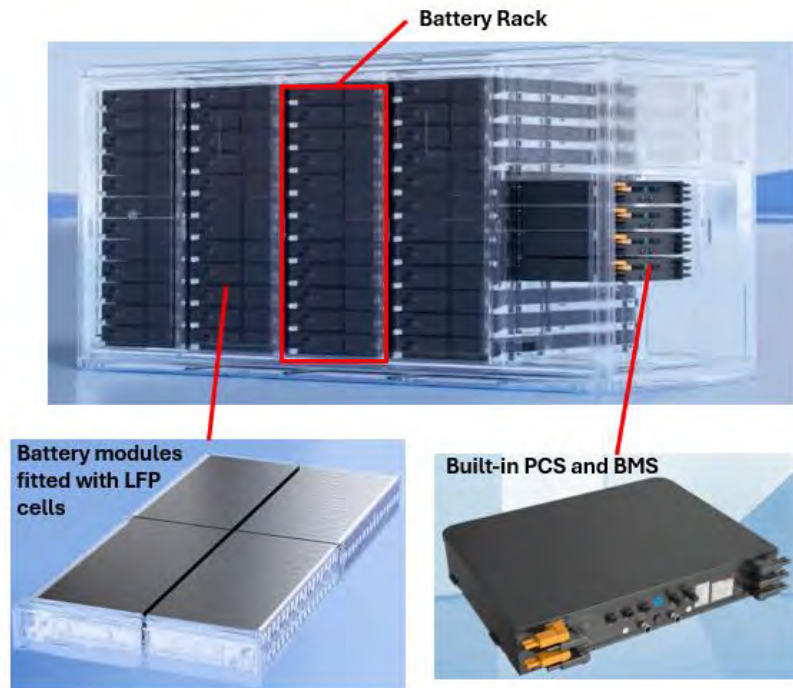


Figure 2-2: Lithium-ion battery storage system

B. Battery Management System (BMS)

The BMS is an essential component of the BESS. This system aims to monitor and manage the performance of batteries, ensuring they operate efficiently and safely. Some of the main tasks performed by the BMS include:

- *Voltage and Current Monitoring: to ensure they operate within safe limits.*
- *Charge Balancing: ensures balanced charging among all cells in the battery, which helps improve performance and extend battery life.*
- *Temperature Monitoring: The BMS monitors the battery temperatures and activates cooling or heating systems as needed to maintain optimal temperatures.*
- *Protection system: It protects against abnormal conditions such as overcharging, over-discharging, and short circuits.*
- *Diagnostics and Maintenance: The BMS provides regular reports on the battery status and helps detect potential faults before they cause significant problems.*

C. Cooling and Ventilation Systems

Lithium-ion battery modules generate heat during normal charging and discharging operations. To maintain battery temperatures within manufacturer-specified safe operating limits, the BESS will be equipped with a closed loop liquid-based primary cooling circuit combined with air-based secondary heat rejection and ventilation.

- **Primary (Liquid) Cooling Circuit**

A liquid coolant (ethylene glycol-based mixture) circulates through integrated cooling plates or heat exchangers installed in close thermal contact with the battery modules. Heat

generated by the battery cells during charging and discharging is transferred from the battery modules to the circulating coolant. The heated coolant is then conveyed through a closed-loop system using electrically driven circulation pumps to an external heat rejection stage for cooling before being returned to the battery modules. The coolant will circulate within a closed-loop system and will not be consumed or discharged during normal operation.

The coolant will be managed under the hazardous materials management procedure, including handling procedures, SDS availability, spill kits, worker training and licensed disposal of any spent or contaminated coolant.

- **Secondary (Air) Cooling and Ventilation**

Heat absorbed by the liquid coolant is dissipated to the ambient environment through air-assisted heat exchangers, commonly referred to as dry coolers. These dry coolers are composed of finned heat exchanger coils equipped with electrically driven fans, which force ambient air across the coil surfaces to remove heat from the coolant.

After passing through the dry coolers, the cooled liquid is recirculated back to the battery modules as part of the same closed-loop cooling system. In addition, ventilation within the battery containers supports internal air circulation, preventing localized heat accumulation and maintaining suitable internal environmental conditions.

All components are monitored and controlled through the Battery Management System (BMS) and the site's Supervisory Control and Data Acquisition (SCADA) system.

Figure 2.3 illustrates closed loop liquid-based cooling system

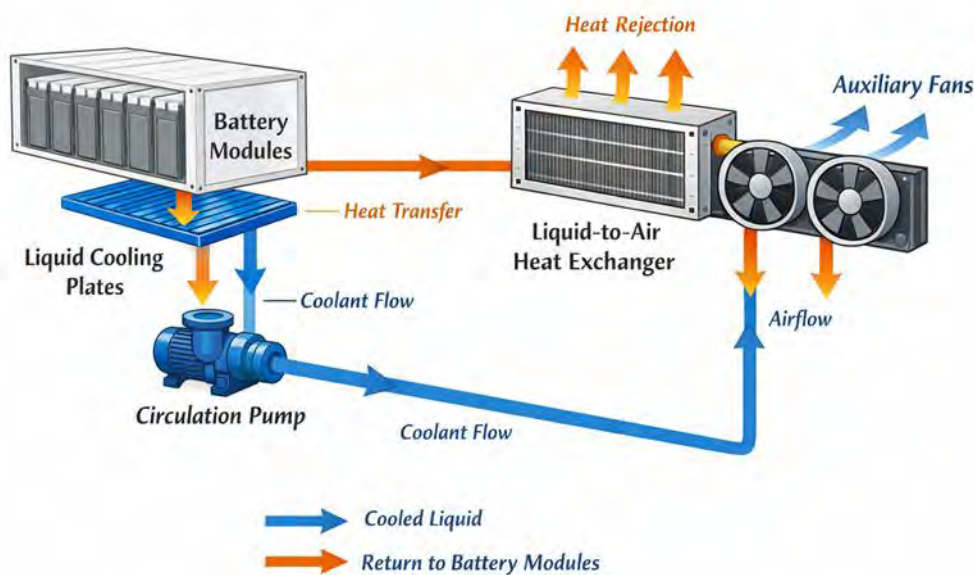


Figure 2-3: closed loop liquid-based cooling system

D. Power Conversion and Medium Voltage Step-Up

- Power Conversion Systems (PCS) convert DC electricity from the batteries to AC electricity for grid export and vice versa during charging.
- PCS's are integrated into the containerized BESS units providing a combined low voltage AC output.
- The low voltage AC output of each BESS unit is connected to a containerized medium voltage step-up station, consisting of an LV/MV *transformer* and switchgear for protection.
- The output of MV step-up stations is reticulated via MV cables to the Project's step-up substation.

E. Control and monitoring systems

- A centralized SCADA-based control and monitoring system provides real-time system operation, performance monitoring, alarm management, and remote control.
- Sensors and communication interfaces with the BMS enables automated and safe operation of the BESS.

F. Shared 33/220 kV Step-Up Substation

The Project will utilize a shared 33/220 kV step-up substation that will serve both the Dandara PV Project and the Energy Valley Project located in the vicinity of the site to facilitate power evacuation to the national transmission network.

The shared substation will be designed to accommodate a total installed transformer capacity of approximately 850 MVA, comprising:

- Two (2) 300 MVA transformers serving the Dandara PV project.
- One (1) 250 MVA transformer serving the Energy Valley project.

Each transformer will be of the Oil Natural Air Forced (ONAF) type, utilizing mineral insulating oil for cooling and insulation purposes.

The shared substation will include a 220 kV high-voltage switchyard equipped with circuit breakers, disconnectors, instrument transformers (CTs and VTs), protection systems, metering systems, telecommunications equipment, and a Substation Automation System (SAS). In addition, the facility will include auxiliary AC and DC power supply systems and a control building.

The shared substation will function as the central interconnection point between the Dandara and Energy Valley facilities and the Egyptian transmission network, enabling the export of up to 710 MW_{ac} of combined generation capacity from both projects through a single integrated grid connection arrangement. The substation will be equipped with three power transformers with a combined installed capacity of approximately 850 MVA. This transformer capacity exceeds the maximum export capacity to provide operational flexibility, enhance grid reliability, and accommodate future system optimization requirements.

G. Electrical Connection to the Grid

The Project will be connected to the Egyptian transmission network through the shared 33/220 kV step-up substation described above. Electricity from the Energy Valley BESS facility will be transmitted to and from the shared substation through a dedicated 33 kV cable network.

The combined substation will be connected to the national 220 kV transmission network through the cutting of the existing Overhead transmission line (OHTL) connecting the Naga Hammadi industrial zone S/S to Obelisk S/S and the installation of two 220kV double circuit OHTLs from these points to the new shared substation in order to form a Loop-In-Loop-Out (LILO) connection.

Project Site (33/220 kV Shared Substation) → 220 kV OHTL → Existing 220 kV OHTL connecting Nagaa Hammadi Industrial Zone Substation and Obelisk 220kV Substation LILO connection with approximately 1km length.

The OHTL will traverse a limited path along government-owned desert land, requiring the installation of transmission towers and the establishment of a right-of-way (ROW) corridor. Although the distance between the existing 220kV OHTL connecting the new shared Substation with the existing OHTL connecting two substations is 1km, the OHTL route is not a direct line and thus will comprise almost total eight towers along the path.

The new OHTL will be routed along a very limited area, which will help minimize visual, land use, and ecological impacts. The proposed OHTL route is illustrated in Figure 2.4 below.

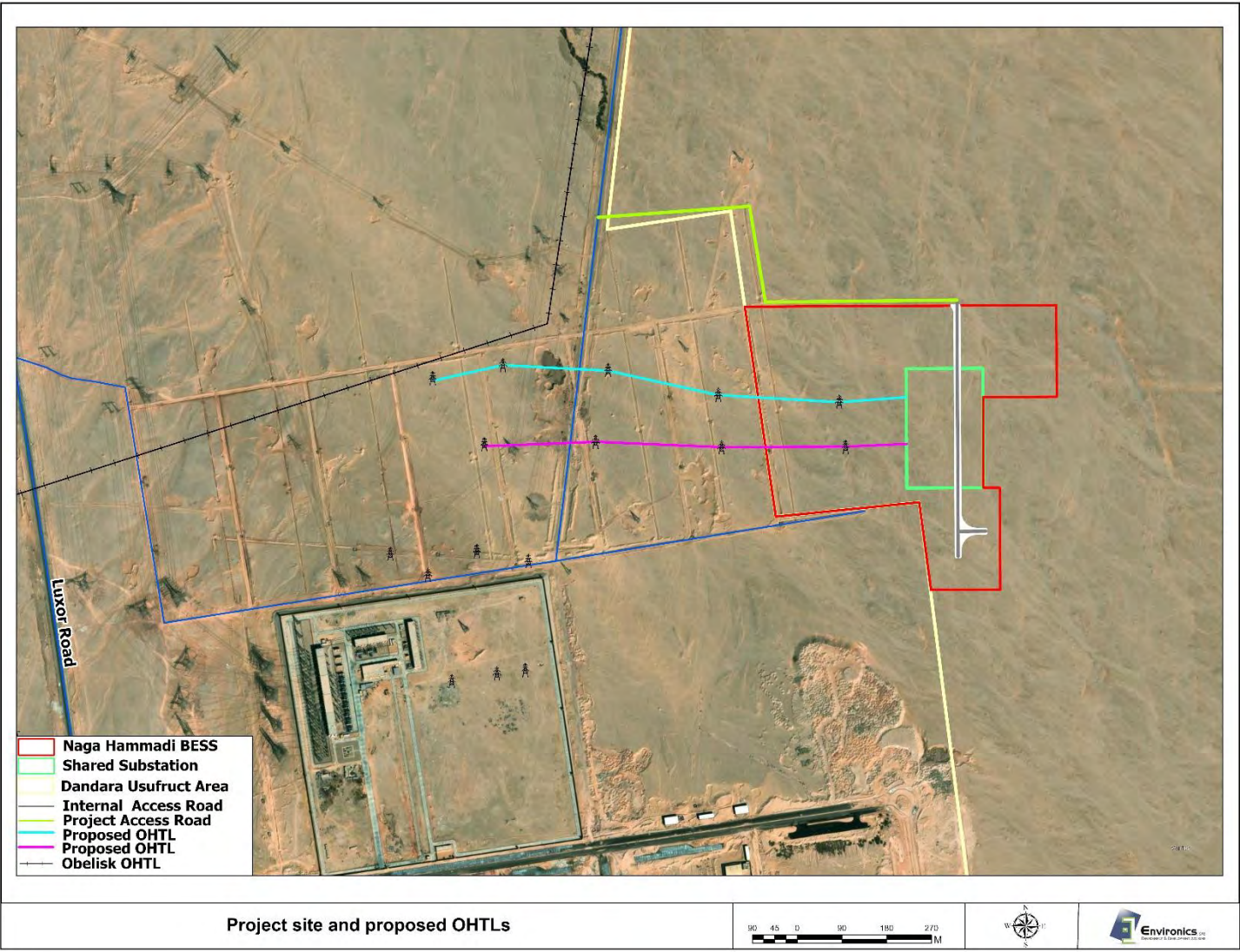


Figure 2-4: proposed OHTLs

H. Auxiliary and Safety Systems

- Fire detection and automatic aerosol suppression and exhaust ventilation systems are integrated within lithium-ion battery units.
- Emergency power supply systems (e.g. UPS and/or small backup power units for safety-critical equipment).
- Site lighting, security systems, and access control.

The installation of the BESS for the proposed project will adhere to the following standards and regulations:

- NFPA 855: Ensuring installations are performed appropriately with vital life safety considerations.
- ISO 45001: Emphasizing occupational health and safety management.
- EN 62485-2: Covering safety requirements for secondary batteries and battery installations.
- Local Building and Fire Codes: Complying with local regulations for safety and construction.

2.3 Construction Activities

2.3.1 BESS

Construction of the BESS will commence following receipt of all required permits and approvals. The construction duration is expected to be approximately 20 months.

Key construction activities include:

- **Site preparation and preliminary works**

Initial activities will focus on preparing the site for construction and ensuring safe working conditions. These activities include:

- Site survey and geotechnical investigations to confirm soil conditions and foundation requirements;
- Clearing of surface obstacles (e.g., rocks) and ground leveling within the project footprint;
- Establishment of temporary warehouses, laydown areas, and material storage zones;
- Concrete works for foundations and equipment bases;
- Installation of temporary water supply and sewage arrangements for construction activities, where required.

- **Ground improvement and foundation works**

Ground improvement and foundation works will include raising and leveling of all BESS infrastructure in accordance with geotechnical requirements and Good International Industry Practice (GIIP).

- **Container installation**

Battery containers will be installed on prepared foundations using cranes and controlled lifting procedures. Adequate spacing between containers will be maintained to facilitate site drainage, fire access, and maintenance activities, consistent with the overall site stormwater management approach.

- **Electrical and mechanical installation**

Electrical and mechanical work, including internal cabling, power conversion systems, switchgear, and auxiliary equipment, will be undertaken on stabilized and dry working platforms.

- **Testing and commissioning**

Testing and commissioning activities, including system integrity checks, electrical testing, and functional commissioning of BESS components and associated electrical systems. These activities will be conducted in accordance with manufacturer requirements and applicable safety procedures.

Installation of the (BESS) will be implemented in accordance with Good International Industry Practice (GIIP).

2.3.2 Share substation

The proposed shared substation will increase the transmission voltage from 33 kV to 220 kV. A typical step-up substation is shown in Figure 2-5 below.

The main electrical substation components are:

- **Transformers:** These are the primary components that increase the voltage.
- **Circuit breakers:** They protect the substation from faults by interrupting the flow of electricity.
- **Switchgear:** This equipment is used to isolate faulty parts of the substation or electrical grid during maintenance.
- **Busbars:** These conduct electricity throughout the substation, distributing power where needed.
- **Protection systems:** These safeguard the substation and the electrical grid from overloads and other issues.

The combination of these components allows the substation to manage power flow, prevent faults, and protect equipment.



Figure 2-5: Typical Step-up Substation

2.3.3 OHTL

The Project includes approximately 1 km of 220 kV OHTL connecting the shared 33/220 kV substation to the existing national transmission network through the cutting the existing Overhead transmission line connecting the Naga Hammadi industrial zone S/S to Obelisk S/S and installing two 220kV double circuit OHTL from these points to the new shared substation in order to form a Loop-In-Loop-Out (LILO) connection. The OHTL composed of the following elements:

i. Structure

• **Towers or poles**

The transmission tower structure is primarily made of lattice bolted steel elements. The Tower shape will be designed for vertical arrangement; Lattice steel self-supporting double circuit towers will be used. Each transmission tower will have steel beam cross arms which connect the conductors with the towers. A typical OHTL tower is shown in Figure 2-6 below.

The exact number of towers and the spacing between the towers will be determined by the construction contractors, during the detailed design phase. Typically, an average distance of 400 to 600 meters is maintained between each tower. In this respect, approximately 9 towers are expected to be constructed to connect the shared substation with the national grid.

• **Foundations**

The tower foundations will be constructed using reinforced concrete pads.

ii. Conductors, insulators, spacers and dampers

These components are installed to serve various purposes:

- **Conductors (cables):** They are the main components that transfer the electrical power generated in the power plant to the transformer substation.
- **Insulators:** Suspension insulators are designed to support the weight of the conductors and to accommodate limited movement due to wind or other external forces. These insulators will typically be made of porcelain or toughened glass. Tension insulators, on the other hand, are used at locations where the transmission line experiences mechanical stress—such as at angle towers or points where the line changes direction. Suitable materials for tension insulators include porcelain, toughened glass, or composite types consisting of a glass-fiber core with silicone rubber sheds, providing both mechanical strength and effective electrical insulation.
- **Spacers:** They are installed to keep partial conductors of the bundle line spaced to prevent their damage. The spacer is designed to maintain the bundle spacing of 450mm under all normal operating conditions and to effectively control aeolian vibrations as well as sub span oscillations.
- **Dampers:** They reduce oscillations and vibrations caused by wind.



Figure 2-6: Main Tower Components

iii. Rights-of-Way (RoW)

Overhead transmission requires designated right of way area to safeguard the system from hazards that may result in damage to the system, power failures, or fires and protect the public from the electro-magnetic field emitted by OHTLs. Rights-of-way are also utilized to access, service, and inspect transmission system. The RoW for high voltage overhead transmission line will be 25m from each side of the transmission line.

Main Construction Activities

The preconstruction activities can be summarized as follows:

- Geotechnical investigations;
- Design of tower foundations;

- design, including number and types of towers, relevant earthing, sag and tension calculations, creepage distance, etc.
- Detailed survey and finalization of the selection of the HV and MV towers' specific locations.

Construction activities can be summarized as follows:

- Excavation for foundations;
- Construction of tower foundations;
- Assembly of HV and MV transmission line towers;
- Cabling stringing and installations of electrical components;
- Commissioning and testing the OHTL;
- Site restoration.

The construction equipment will include:

- Mobile cranes and crane-mounted trucks;
- Excavators;
- Roller compactors;
- Concrete mixer trucks and vibrators.

OHTL Stringing

Stringing includes all activities associated with the installation of the primary conductors onto the transmission line structures. Wire stringing involves the following operations:

- Looping in/out the 220 kV double-circuit overhead transmission line (naga Hammadi Industrial substation / Obelisk substation) using 2x ACSR 380/50 conductors, with an extension of approximately 2×1 km using the same type of conductor.
- Stringing the pilot line to install the conductor: A light-weight sock line (pilot line) is flown from tower to tower, threading the sock line through wire rollers attached to the insulators on each structure. A device lock is used to secure the sock line in the rollers.
- Pulling: The sock line is attached to a conductor pulling rope or cable, which is connected to a tensioning machine mounted on a truck. The conductors are then pulled through using a pulling machine (Fig 2-6).
- Sagging and dead-ending: Once the conductor is pulled through the length of the line, the tensioner is then used to sag the conductors to the proper tension. As conductors expand and shrink with changes in temperature (they are longest at high temperatures), they need to be installed at the proper tension so that they do not sag too low when temperatures are at a maximum.

Figure 2-7 below presents the process of line stringing².



Figure 2-7: Example of Puller Machine



Figure 2-8: Example for line stringing

2.4 Service Units

- **Temporary structures (during construction phase)**

During the construction phase, only minimal temporary facilities will be provided within the project site, commensurate with the limited workforce size and the short-duration construction activities.

The on-site facilities will be limited to:

- Temporary site office or site cabin, used by the contractor and the Employer's representatives for supervision and coordination.
- Basic sanitary facilities (portable toilets and handwashing units).
- Designated laydown and material storage areas for construction equipment and materials.

The construction workforce is expected to commute daily to and from the site, as nearby urban centers and residential areas, including Al-Baraka Village (approximately 2.8 km northwest).

No permanent mess or catering facilities will be established on site. Workers will rely on off-site food arrangements or personal meal provisions.

All temporary facilities will be installed, operated, and maintained in compliance with applicable international occupational health and safety requirements and relevant Egyptian regulations.

Upon completion of construction activities, all temporary facilities will be removed, and the site will be reinstated to its pre-construction condition, where applicable.

- **Labor and Working Conditions**

The project will strictly adhere to the Egyptian Labor Law 14/2025 and international standards, including the ILO's "Minimum Age Convention, 1973 (No. 138)" and the "Forced Labor Convention, 1930 (No. 29)," to ensure the prevention of child labour and forced labour. The project is also committed to abiding by the national minimum wage rate.

Additionally, the project will respect the workers' right to freedom of association and collective bargaining as per the ILO's "Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)" and the "Right to Organise and Collective Bargaining Convention, 1949 (No. 98)".

- **Permanent Buildings (Operation Phase)**

During the operation phase, limited permanent buildings will be established within the Project Substation to support control, monitoring, security, and routine operation and maintenance (O&M) activities. Given the highly automated nature of the BESS, staffing levels during operation will be low, and facilities will be sized accordingly.

Buildings will be prefabricated modular structures or light permanent constructions, designed in accordance with Good International Industry Practice (GIIP) and relevant Egyptian codes.

2.5 Utilities

2.5.1 Water and Wastewater Tanks

A. Water Supply and Storage

Construction Phase :

Daily water consumption during construction is expected to be approximately 10 m³/day. This demand is expected to cover drinking water (bottled water) and sanitary uses. Water for sanitary purposes will be supplied by tanker trucks sourced from approved suppliers and stored in small prefabricated water tanks installed on site.

Operation Phase:

During operation, water demand will be limited to office sanitary purposes only. Water consumption during the operation phase is expected to be approximately 0.3 m³/day.

The BESS and shared substation does not require process water. Battery thermal management is achieved through a closed-loop liquid cooling system using a circulating coolant, which is not consumed or discharged during normal operation.

Water supply during operation will be provided through a connection to the existing public water network.

B. Wastewater

Construction Phase:

Wastewater generation during construction will be limited to domestic wastewater generated from sanitary facilities serving the construction workforce.

Domestic wastewater will be collected in temporary septic tanks installed on site and will be periodically removed by licensed contractors for treatment and disposal at approved wastewater treatment facilities.

Wastewater volumes during construction (domestic wastewater only) are expected to be approximately 8.5 m³/day.

Operation Phase:

During operation, wastewater generation will be limited to domestic wastewater from offices and sanitary facilities.

Estimated wastewater generation during operation is approximately 0.26 m³/day. Wastewater will be managed through the available wastewater infrastructure, via a connection to the public wastewater network.

C. Electricity supply

Construction Phase:

Electricity required during the construction phase will be supplied through temporary diesel-powered generators.

Temporary electricity supply will be used to serve:

- *Small site offices*
- *Site lighting*
- *Limited construction equipment*

Electricity consumption during construction is expected to be approximately 10–20 MWh.

Operation Phase:

During operation, electricity required for auxiliary loads of the BESS (including control systems, cooling systems, lighting, and offices) and the shared substation will be supplied directly from the national grid and/or internally from the BESS itself, in accordance with the system design.

D. Fuel supply

Construction Phase:

Fuel required for construction vehicles and mobile equipment will be supplied off-site from licensed fuel stations.

- *No fuel storage will be provided within the project site.*

- *No refueling activities will take place on site.*

Operation Phase:

Due to the availability of a reliable grid connection, routine fuel use during operation is not anticipated for power generation.

For safety-critical systems (such as control systems, fire detection, security, and communications), a small emergency power source—such as a compact backup generator or an Uninterruptible Power Supply (UPS)—may be provided, subject to confirmation during detailed design.

E. Labour

The direct labour force required for the project construction could reach 250 workers at peak construction months, including skilled and unskilled labour. The contractors will maximize hiring workers from the local communities.

Permanent employees during operation are expected to be up to 8 workers. According to the company's employment policy, preference will be given to workers from neighboring areas, depending on the availability of suitable qualifications.

2.6 Decommissioning Phase

At the end of the Project's operational life, or in the event of major equipment replacement, decommissioning will be undertaken in accordance with applicable Egyptian requirements, lender requirements, Good International Industry Practice (GIIP), and supplier-specific procedures. A detailed Decommissioning Management Plan will be prepared prior to commencement of decommissioning activities and will address dismantling sequence, HSE requirements, waste management, transport, recycling / disposal arrangements, emergency preparedness and site restoration.

A. BESS Deactivation

- *Controlled discharge and isolation of battery modules.*
- *Methodical disassembly and separation of battery components.*
- *Recycling or proper disposal of battery materials (e.g., lithium-ion) in compliance with environmental regulations and best practice/international and/or EU guidelines.*
- *Follow the standard decommission procedure provided by the BESS equipment supplier, where applicable and available.*

B. Shared 33/220 kV Step-Up Substation Decommissioning

- *Safe isolation, de-energization, and dismantling of transformers, switchgear, protection systems, control buildings, busbars, and associated electrical infrastructure.*
- *Drainage, collection, testing, and management of transformer insulating oils and other operational fluids.*
- *Inspection and assessment of transformers, switchgear, cables, and auxiliary equipment to determine suitability for reuse, refurbishment, recycling, or disposal.*

- *Removal and segregation of metallic components, electrical equipment, cables, and construction materials for recovery and recycling where technically and economically feasible.*
- *Environmentally sound management and disposal of hazardous materials, including oil-contaminated materials and electrical components that cannot be reused or recycled.*
- *Demolition and removal of substation foundations and above-ground structures, where required by regulatory authorities or land restoration commitments.*

C. Overhead Transmission Line (OHTL) Decommissioning

- *Safe isolation and decommissioning of the transmission line in coordination with the relevant transmission system operator.*
- *Removal of conductors, insulators, towers, foundations, and associated hardware, as required.*
- *Segregation and recycling of steel, aluminum, and other recoverable materials.*
- *Restoration of temporarily disturbed areas following completion of dismantling activities..*

Waste management and traceability will be implemented through a waste tracking and chain-of-custody system. All waste consignments will be documented, including waste type, quantity, source, transporter, destination facility, permit / license details and final disposal or recycling evidence. Hazardous and special wastes will only be transported by licensed contractors and treated, recycled or disposed of at authorized facilities.

Health, safety and emergency measures during decommissioning will include task-specific risk assessments, method statements, lock-out/tag-out procedures, lifting plans, electrical safety controls, fire prevention measures, emergency response arrangements, worker training and provision of appropriate PPE. Special attention will be given to risks associated with lithium-ion batteries, including residual energy, thermal runaway, fire, smoke release and handling of damaged or degraded battery modules.

Site restoration will be undertaken following removal of temporary works and decommissioned equipment. Disturbed areas will be cleared of waste, inspected for contamination, and reinstated to a safe and stable condition. Where required, compacted areas will be graded and stabilized to prevent erosion and ensure safe future land use.

2.7 Environmental and Social Aspects

The construction and operation of the BESS, shared 33/220 kV step-up substation, and the 220 kV OHTL will involve specific environmental and social (E&S) aspects arising from project activities. These aspects may lead to potential risks and impacts that need to be identified, assessed, and managed through appropriate mitigation measures to minimize adverse effects and enhance positive outcomes. The key E&S aspects of the project are summarized in Table 2-2 for both construction and operation phases:

Table 2-2: key E&S aspects for construction and operation phases

E&S Aspects	Sources	
	Construction phase	Operation Phase
Air Emissions	– Exhaust Emissions from construction equipment vehicles, such as nitrogen oxides, sulphur oxides, carbon monoxide, and particulate matter. – Greenhouse gas (GHG) emissions from construction vehicles, machinery and transportation activities. – Dust and particulate matter emissions, which may arise intermittently from site preparation activities, handling and stockpiling of excavated or imported materials, and vehicle movement within the site.	No routine air emissions are anticipated during the operation of the BESS, shared substation, and OHTLs, as the Project does not involve any combustion processes or emission-generating industrial activities
Noise and Vibration	– The primary sources are transport vehicles, foundation installation activities, heavy equipment/machinery, cutting machines, and vehicle movement.	– Power Conversion Systems (PCS / inverters) – Cooling systems associated with battery containers. – Transformers and Auxiliary cooling units (hybrid liquid/air cooling system) – Control and auxiliary electrical equipment within the substation.
Waste Generation	– Construction waste including concrete, scrap metal, wood, plastics, cable offcuts, and packaging materials. – Domestic Solid waste is generated from construction workers' daily activities.	– General office and domestic waste generated by operational staff. – Minor quantities of maintenance-related waste materials.
Hazard Material and Waste Generation	– Potentially includes solvents, lubricants, paints, and other chemicals used during construction. – Generation of contaminated materials and empty chemical containers.	Used lubricants and oils, oil-contaminated cleaning materials, empty containers, spent filters, electronic components, and end-of-life battery modules are generated infrequently during maintenance and replacement activities.
Wastewater	Generated from sanitary facilities serving construction workforce, which will be collected in temporary septic tanks and removed by licensed contractors for treatment and disposal at approved wastewater treatment facilities.	Limited sanitary wastewater is generated by operational personnel and managed through the available wastewater infrastructure.
Biodiversity Disturbance	Land disturbance, vehicle movement, noise, dust generation, and temporary habitat disruption within the project footprint and OHTL corridor.	Limited disturbance associated with maintenance activities and operation of the OHTL and substation infrastructure.

E&S Aspects	Sources	
	Construction phase	Operation Phase
Traffic and Transportation demand	Transport of construction materials, equipment, battery containers, and workforce.	Limited vehicle movements associated with operations personnel, inspections, maintenance, and replacement of equipment.
Occupational Health and Safety (OHS)	Exposure of workers to construction-related hazards, including working at height, lifting operations, electrical works, excavation activities, and vehicle movement.	Electrical hazards, battery-related hazards, maintenance activities, and emergency response requirements.
Community Health and Safety	Increased traffic, movement of heavy vehicles, and temporary construction-related disturbances.	Electrical safety risks associated with substation and OHTL infrastructure, as well as emergency situations such as fire events involving battery systems.
Worker Influx and Employment	Temporary workforce mobilization of construction workers and contractor presence.	Limited permanent workforce associated with operation, maintenance, and security activities.

2.8 Area of Influence

The Area of Influence (Aol) includes areas that are likely to be affected by the Project and its directly managed activities. It encompasses areas potentially affected by planned activities during construction and operation, as well as indirect and temporary impacts such as traffic movement and noise. The Aol is defined proportionate to the nature, scale, and characteristics of the Project activities.

During the **construction phase**, the direct Aol includes the BESS and shared substation footprint, OHTL tower locations, OHTL RoW, access roads, laydown areas, temporary site facilities and construction work areas. The indirect Aol includes transport routes used for delivery of BESS containers, substation equipment, OHTL materials, construction equipment and workers; areas used for authorized waste and wastewater disposal; and nearby communities or facilities that may experience temporary construction-related disturbance. Key receptors include Baraka Village, Naga Hammadi Industrial Zone, road users, Dandara PV Project, Obelisk PV Project, nearby utility infrastructure, workers and emergency service providers.

During the **operation phase**, the Aol is generally limited to the BESS and shared substation footprint, the OHTL RoW, access routes used for maintenance, and adjacent areas potentially affected by operational noise, electrical safety requirements, EMF, OHTL safety restrictions, maintenance activities, waste management or emergency scenarios.

During **emergency scenarios**, the Aol may temporarily extend beyond the Project footprint depending on the nature and severity of the incident. Emergency planning will therefore consider coordination with Civil Defence, local authorities, neighbouring projects and facilities, emergency responders and nearby receptors.

The identified environmental and social aspects within the Project's direct and indirect AoI are presented in the tables below. Any indirect or temporary impacts are addressed in the Impact Assessment chapter.

The project site and the surrounding land uses within the defined area of influence, including key environmental and social receptors, are illustrated in Table 2.3.

Table 2-3: Environmental and Social E&S Aspects AoI

Environmental & Social Aspects	Area of Influence (AoI)
construction phase	
Air Emissions	Project footprint, OHTL corridor, access roads, and Immediate surroundings of the Project Site
Noise and Vibration	Project footprint and immediate surroundings
Biodiversity and Habitat Disturbance	Project footprint, substation area, OHTL corridor, and adjacent habitats potentially affected by construction activities. (previously disturbed land)
Traffic and Transportation Demand	Regional and local road network used for material and equipment delivery
Workers Influx	Nearby urban centers and communities from which the workforce commutes
Waste Generation	Project footprint and Transport routes to licensed waste management facilities
Wastewater	Project footprint and Transport routes to approved wastewater treatment facilities
Occupational Health and Safety	Construction work areas, temporary facilities, and access routes.
Community Health and Safety	Access roads and areas adjacent to construction activities
Operation phase	
Noise	Project footprint and immediate surroundings.
Traffic and Transportation Demand	Limited use of access roads for operation and maintenance activities
Waste Generation	Project footprint and transport routes to licensed waste management facilities
Occupational Health and Safety	Project footprint and OHTL corridor.
Community Health and Safety	Project footprint, OHTL corridor, and adjacent areas potentially affected by emergency events or electrical infrastructure.

Based on the above, the AoI during construction extends beyond the Project footprint to include transportation routes, workforce-related interactions, and nearby areas that may experience temporary and localized impacts. During operation, the AoI is limited to the Project footprint and the OHTL corridor and the immediate surrounding areas potentially influenced by routine operation and maintenance activities.

3. Environmental and Social Baseline

3.1 Project Location

The Project comprises a Battery Energy Storage System (BESS), a shared 33/220 kV step-up substation, and 220 kV overhead transmission line (OHTL). The nearest settlement to the Project Area is Baraka Village, located approximately 2.8 km northwest of the Project Site. Other notable features in the wider Project Area include the Obelisk PV Project, located approximately 2 km southwest of the Project Site; the Dandara PV Project, which borders the Project Site to the north and east; the Nile Valley, located approximately 11 km north of the Project Site; and Qena City, the capital of Qena Governorate, situated approximately 45 km northeast of the Project Site. The geographic coordinates of the project site are presented in Table 3-1 and project site location and the surrounding land uses are shown in Figure 3-1. The Project Site occupies an area of approximately 194,288 m².

The Project Site is surrounded by the following land uses:

- **North:** Dandara PV Project area and vacant desert land
- **South:** Dandara PV Project area, Nagaa Hammadi Industrial Zone, and vacant desert land
- **East:** Dandara PV Project area and vacant desert land
- **West:** Vacant desert land, existing electricity transmission infrastructure, and the Nagaa Hammadi transmission corridor

To support accurate spatial referencing of the Project Site, the coordinate system used is Africa_Lambert_Conformal_Conic, as presented below.

Table 3-1: Coordinates of the Project Site (Africa_Lambert_Conformal_Conic)

Points	Latitude (N)	Longitude (E)
Naga Hammadi BESS		
1	2783461.394616753	769680.2875735309
2	2783288.608535677	769680.5736761187
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.380414486	769572.0346908272
6	2782925.301310003	769572.354213905
7	2782925.0819173753	769440.8904367206
8	2783090.392588258	769419.0912364512
9	2783064.17148301	769147.1504593793
10	2783460.50069052	769089.6132877459
Shared Substation		
1	2783342.5772506595	769395.074916218
2	2783342.8208433986	769540.7650960417
3	2783288.3183054626	769540.9864060887
4	2783117.4745749235	769541.140526375
5	2783117.231103331	769395.452907633
OHTL (opening existing Obelisk OHTL)		
1	2783322.8126595914	768497.4499838825
2	2783351.7612946033	768630.8980950158
3	2783340.526999265	768830.6919441563
4	2783293.9203641415	769038.9087141189

Points	Latitude (N)	Longitude (E)
5	2783279.735473752	769268.2176393371
6	2783288.707302332	769394.4987259954
OHTL (opening existing Naga Hammadi Industrial OHTL)		
1	2783198.9771317244	768593.0058898054
2	2783206.5204039514	768806.5511225817
3	2783195.613176942	769045.9467630284
4	2783195.8623732626	769280.7430346524
5	2783200.6241021454	769396.1315332904

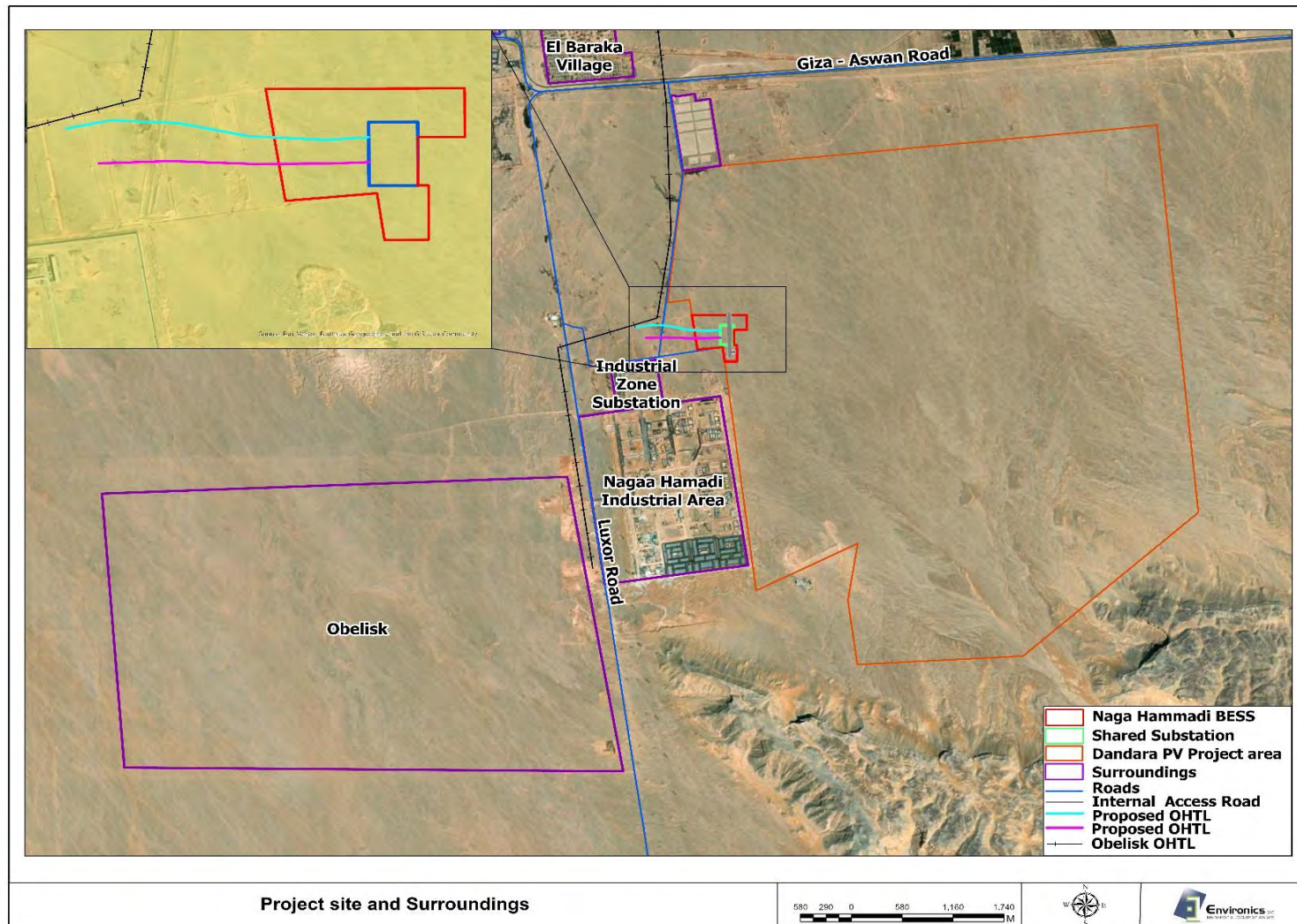


Figure 3-1: Map showing the Project Site and surroundings

3.2 Physical Environment

3.2.1 Climate

The project area is located in Qena Governorate, which is characterized by a great variability of temperature resulting in very hot summer and cold winter with very rare rain, and a broad temperature range between day and night. It receives large quantity of solar radiation, especially in summer.

Detailed climatic features of the Qena Governorate encompassing the project area are provided in the following sections based on historical data recorded from the nearest meteorological stations to the proposed site, namely Qena station. Qena station is located approximately 53 km east of the project site.

Temperature

The Qena meteorological station records indicate that the annual average temperature in Qena is 23.9°C. The highest average temperatures are recorded in July and August, reaching up to 37.9°C and 37.6°C, respectively. Conversely, the lowest average temperatures occur in January and February, with lows of 5.3°C and 6.7°C. This temperature variation throughout the year underscores the significant seasonal changes in Qena, characterized by hot summers and mild winters (Weatherbase, 2024).

Table 3-2: Air temperature recorded from Qena over 112 years

Qena Meteorological Station		Monthly Average Temperature (°C)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual Average Temperature (°C)	23.9	14.4	16.1	19.7	24.6	28.3	30.9	31.2	30.8	29	25.6	20.3	16
Average High (°C)	30.8	21.1	23.3	27	31.8	35.5	37.9	37.6	37.3	35.7	32.6	27.4	22.5
Average Low (°C)	14.9	5.3	6.7	10.3	15	18.9	21.5	22.7	22.3	20.4	16.8	11.5	6.9

Source: Weatherbase (2024)

Wind

Qena experiences a notable variation in wind speeds throughout the year. The annual average wind speed is 12 km/h. Monthly averages reveal that the wind speeds peak in April at 13.7 km/h, while the lowest speeds are observed from October to December, consistently at 9.7 km/h. (Meteoblue, 2024). The prevailing wind directions are North, North Northwest followed by Northwest and North Northeast. Wind have predominantly a Northern component.

Table 3-3: Average wind speeds in Qena

Station	Annual Average Wind Speed (km/h)	Monthly Average Wind Speed (km/h)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Qena	12	12.6	12.6	13	13.7	13	13	12.6	12.2	12.6	9.7	9.7	9.7

Source: Weatherbase (2024)

Qina
26.16°N, 32.73°E (80 m asl).
Model: ERA5T.

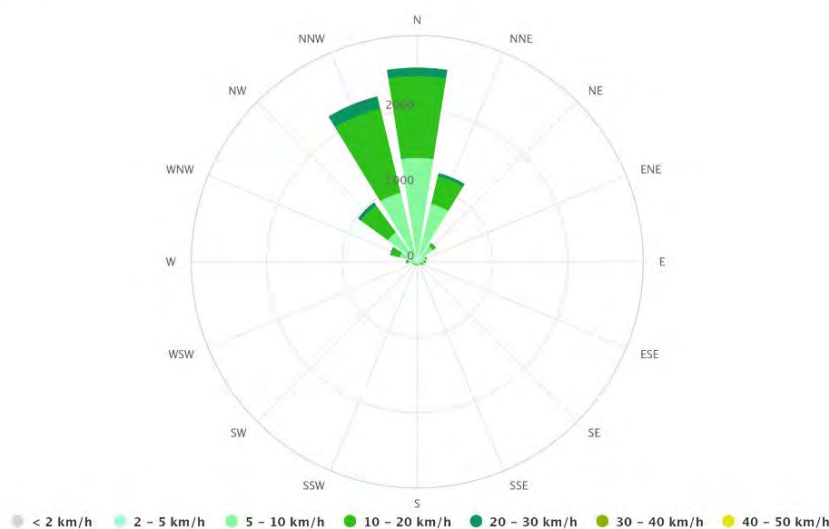


Figure 3-2: Wind rose for Qina

Source: Meteoblue (2024)

Rainfall

Qena Governorate is located in a dry climatic region characterized by heat, drought and scarcity of rain in the summer, with a small amount of rain in winter. Maximum monthly average of rainfall is 0.4 mm in Qena in May, and the lowest monthly average being 0.1 mm during December and January.

Table 3-4: Annual and monthly average rainfall in Qena

Station	Annual Avg. rainfall (mm)	Monthly Average Rainfall (mm)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Qena	1.6	0.1	0.3	0.2	0.3	0.4	0	0	0	0	0.2	0	0.1

Source: Weatherbase (2024)

Ambient Air Quality

The Project Site is located within a desert / utility development setting in the hinterland of Naga Hammadi. The surrounding area is characterized mainly by vacant desert land, the Dandara PV Project area, the Naga Hammadi Industrial Zone, existing electrical transmission infrastructure and the Giza–Luxor Road. No major continuous stationary emission sources are present within the immediate Project footprint. Minor emissions may arise from occasional vehicle use on unpaved access roads. Overall, ambient air quality is expected to be good with respect to anthropogenic pollutants. However, the desert setting leads to naturally high levels of windblown dust and vehicle movements on unpaved roads. Particulate matter (PM₁₀, PM_{2.5}) may peak during storm events.

Potential existing sources of localized air emissions in the wider area include road traffic on the Giza–Luxor Road, activities within the Naga Hammadi Industrial Zone, nearby construction or utility activities, and occasional movement of vehicles along local access

roads. These sources are not expected to materially affect the baseline air quality at the Project Site, given the open desert setting and good atmospheric dispersion conditions.

Ambient Noise

The baseline noise environment is expected to be influenced mainly by occasional traffic on the Giza–Luxor Road, local vehicle movements, the nearby Naga Hammadi Industrial Zone, existing electrical infrastructure and activities associated with the Dandara and Obelisk project areas. The Project Site itself is not located within or immediately adjacent to residential areas. The nearest residential receptor is Baraka Village, located approximately 2.8 km northwest of the Project Site. Accordingly, baseline ambient noise levels at the Project Site are expected to be typical of a remote desert / utility development area, with localized influence from nearby roads and industrial / electrical infrastructure.

No significant community noise sensitivity is expected within the immediate Project footprint. Nevertheless, noise impacts from construction and operation are assessed in Chapter 6, taking into account the nearest receptors, construction equipment, OHTL works, BESS cooling systems, transformers and maintenance activities.

Climate Change Context

The Project area is located in an arid desert environment already characterized by high summer temperatures, very low rainfall, high evaporation rates and periodic dust / wind events. Climate change may intensify some of these existing climatic conditions over the Project lifecycle. The most relevant climate-related trends for the Project area include increased frequency and intensity of extreme heat events, potential changes in the intensity of short-duration rainfall events, increased drought and water stress, and possible increases in dust and sandstorm conditions.

These climate-related factors may influence the Project primarily through increased heat stress risks for workers, higher cooling demand for BESS systems, potential effects on battery thermal management and equipment performance, increased dust accumulation on equipment, and potential erosion or localized runoff risks during rare but intense rainfall events. Although the Project Site is not located within an active surface water body and rainfall is generally very limited, stormwater management and site drainage should consider the potential for short-duration high-intensity rainfall events.

Climate-related risks to the Project, including extreme heat, dust / sandstorms and potential stormwater / flood-related risks, are assessed further in Chapter 6 as part of the assessment of risks and impacts of the environment on the Project. The Project design and ESMP will incorporate appropriate measures such as BESS thermal management, heat stress controls, emergency preparedness, dust management, preventive maintenance and drainage provisions.

3.2.2 Geology and Geomorphology

Geology

According to the Geological Map of Egypt (1981), the project site is located within the Quaternary undivided wadi and playa deposits, situated between the cultivated Nile deposits and the thick Eocene marine limestone formations (see Figure 3-3). The sandy and sandstone deposits at the project site may have originated from the wadi deposits derived from the adjacent Eocene limestone hills.

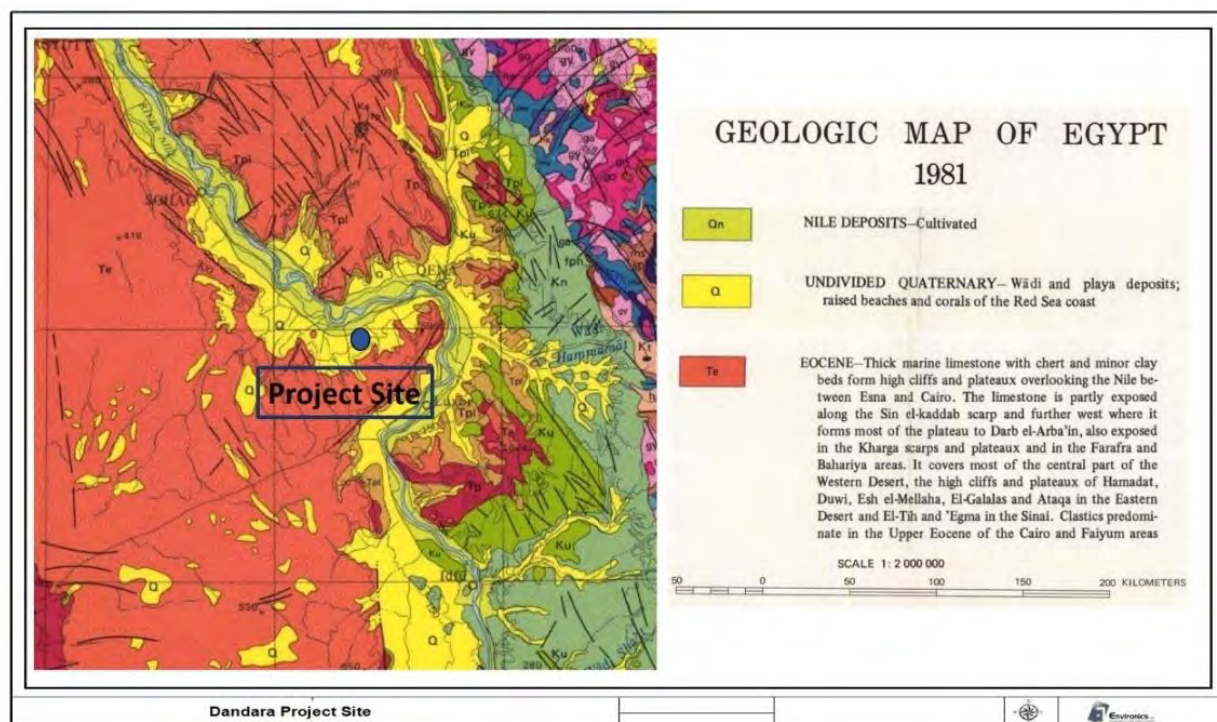


Figure 3-3: Geologic Map of the Project Site

Geomorphology and Soil

The Project Site lies in the ancient alluvial plains between the rugged terrain and the limestone plateau to the south, and the young alluvial plains along the valley to the north. The old alluvial plains are located in the form of terraces at different heights above the level of the young alluvial plains (Figure 3-4) (GAEB, 2003).

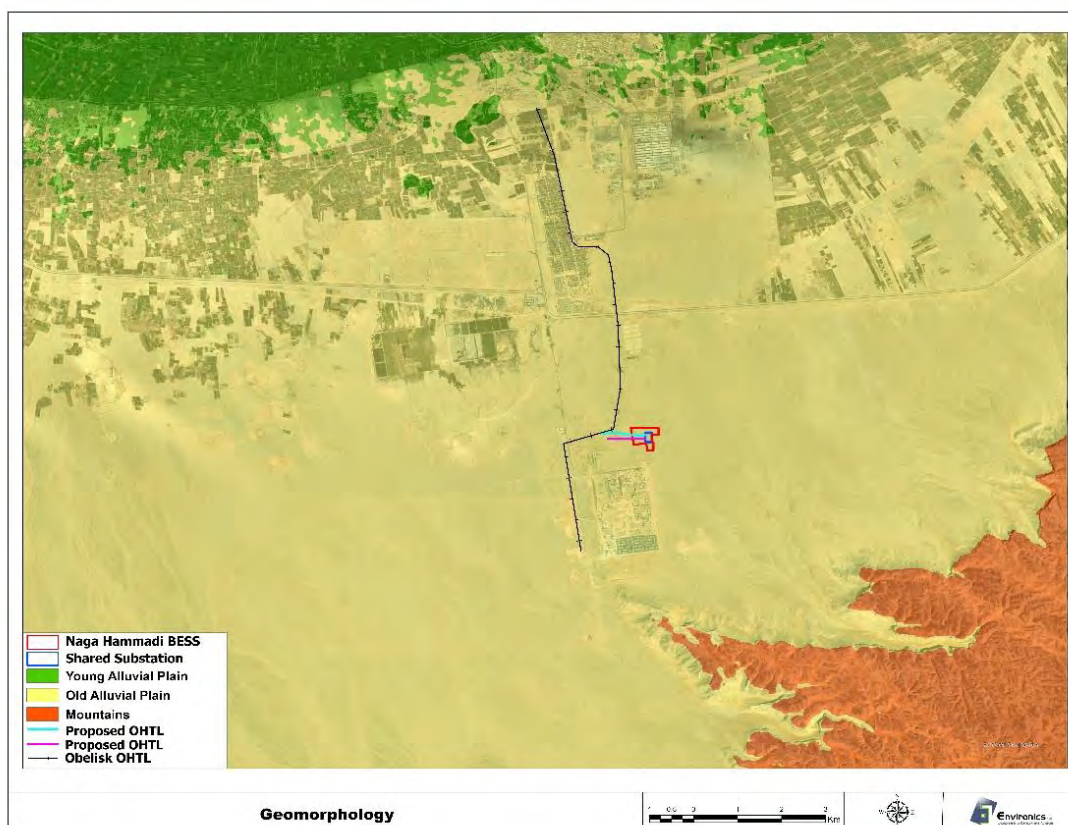


Figure 3-4: Geomorphological features of the Project Site

According to the soil map of Egypt, the soils of the entire Project Site are sandy loam soil that is particularly shallow or stoney and developed mainly from limestone (El-Ramady et al., 2019).

Topography

Elevations at the project site and its surroundings increase towards the south, reaching a maximum of approximately 450–500 m above mean sea level (MSL). Within the project site and the usufruct area, elevations generally range between 130 and 170 m above MSL, except in the southern part, where the elevation rises to a peak of about 220 m above MSL. (Figure 3-5).

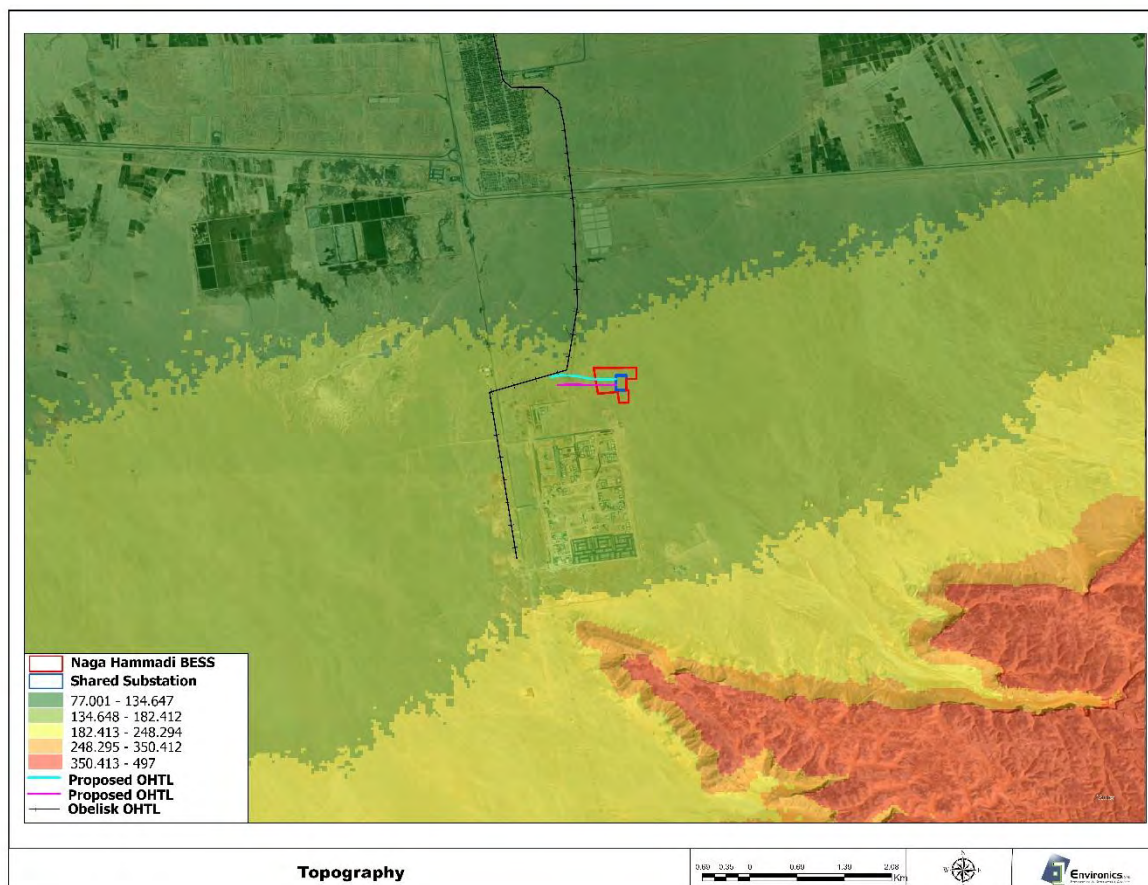


Figure 3-5: Topography of the project area and vicinity

3.2.3 Hydrology and Hydrogeology

Surface Waters

As previously mentioned, the Project Site is situated in the desert hinterland of Markaz Nagaa Hammadi. As such, the Project Site is devoid of any surface water bodies or surface canals within its boundaries. There are three water bodies within the wider area of the Project Site. These are the Alranan Canal, Almarashda Canal, and the river Nile, all of which are located north of the Project Site. The Alranan Canal is the closest water body to the Project Site and is located 9.7 km north of it, the Almarashda Canal (9.2 km away from the project site). (Figure 3-6).

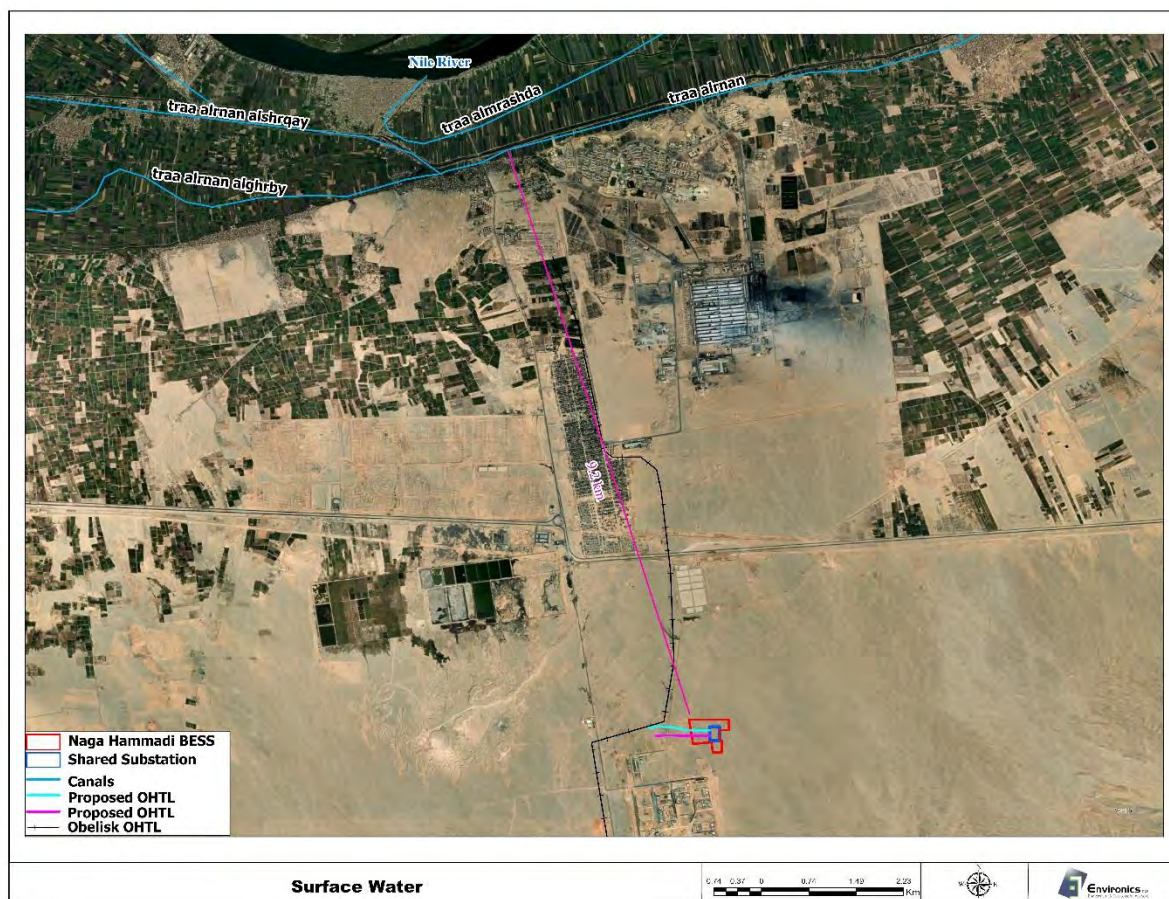


Figure 3-6: Surface water bodies close to the project area

Groundwater

The west Qena area is covered by different alluvial sediments ranging in age from Pliocene to Quaternary. The Quaternary aquifer represents the main groundwater resource in the Nile Valley. It consists mainly of the Pleistocene graded sand and gravel intercalated with clay lenses (Qena Formation) and is underlain by an impermeable layer of Pliocene clays (Muneiha Formation) that prevents its connection with the deeper aquifers. It is covered by a permeable layer of Wadi deposits at the old alluvial floodplain, which means that groundwater occurs under unconfined conditions. The thickness of the aquifer varies from about 200 m at the center of the cultivated floodplain to about 80 m at the desert fringes. It is recharged continuously from the excess irrigation water and occasionally from infrequent rainfalls (Gaber et al., 2020).

The old alluvial floodplain is characterized by moderate to very high recharge potentialities. The project area is located in the area of high recharge groundwater potentiality (Figur).

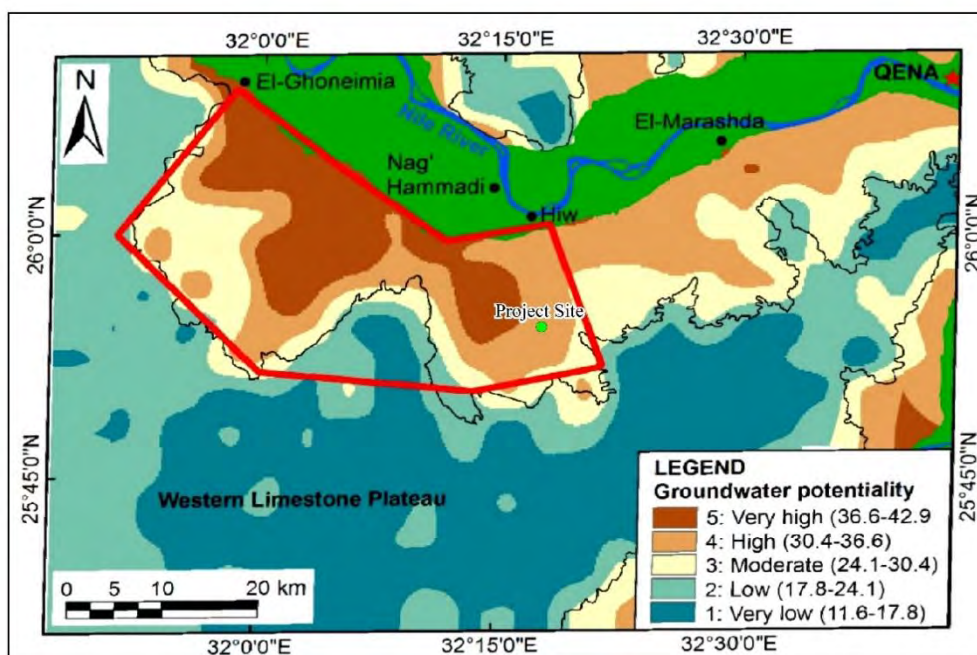


Figure 3-7: Groundwater recharge potentiality map in relation to the project

Source: Gaber et al. (2020)

The groundwater in the project area occurs at shallow depth from 30 to 36 m close to the cultivated lands and the depth increases toward the plateau to reach more than 70 m as shown in Fig (Gaber et al., 2020).

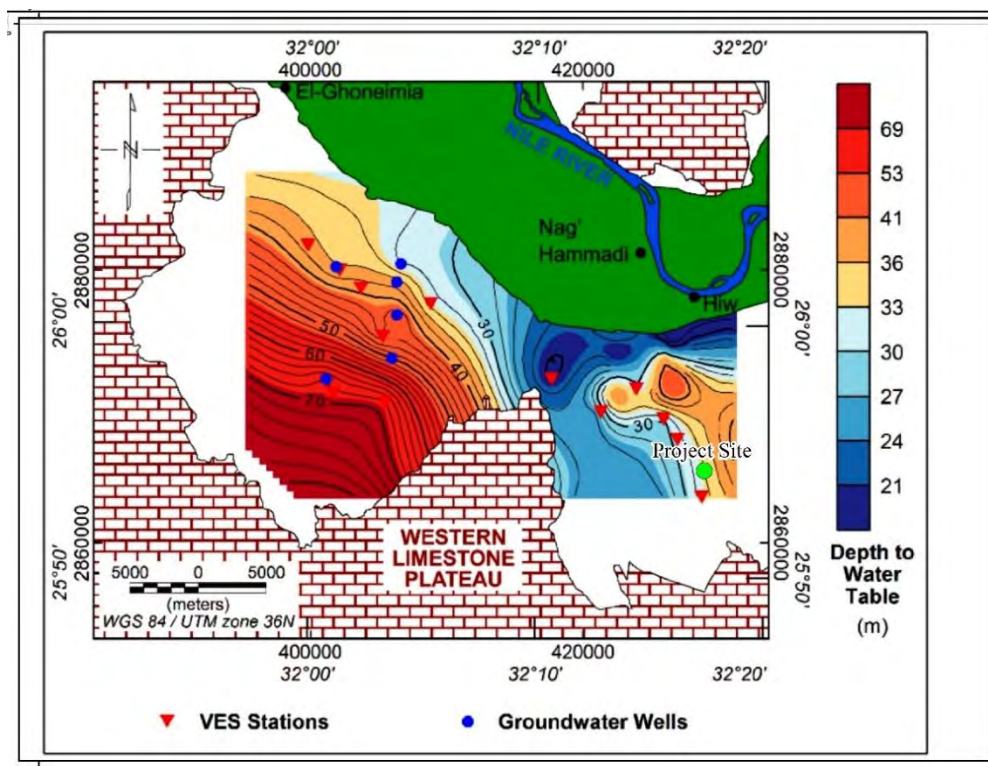


Figure 3-8: Depth to water contour map in relation to the project site

Source: Gaber et al. (2020)

3.3 Biological Environment

The Project Site is located in the vast Egyptian Western Desert (WD), which covers about two-thirds of the total area of Egypt. This desert extends from the Mediterranean coast in the north, to the Egyptian–Sudanese border in the south, the Nile Valley and Delta in the east, and to the Egyptian–Libyan border in the west.

The WD is generally conceived as a barren plain with an apparently internal drainage system (interior basins that are characteristic of depressions and not wadi systems that are typical of the Eastern Desert) and widespread sand bodies.

The WD can be divided from north to south into three principal physiographic regions (Figure 3-9):

- The Miocene Northern Plateau that slopes towards the Mediterranean coast. This plateau embraces the inhabited Siwa Oasis and the Qattara Depression.
- The Middle Limestone Plateau (MLP), extending from approximately latitude 25° N to 29° N. This plateau includes a number of oases and depressions, including Kharga, Dakhla, Farafra, Bahariya, and Fayoum. The Project Site is located within the southeastern part of the MLP and occupies approximately 76,773 m², representing a very small footprint within the extensive Western Desert landscape.
- The Nubian Sandstone Plateau sloping gradually toward the north from Gebel Uweinat and the Gilf Plateau to the fringe of the oases' depressions (EEAA, 1993).

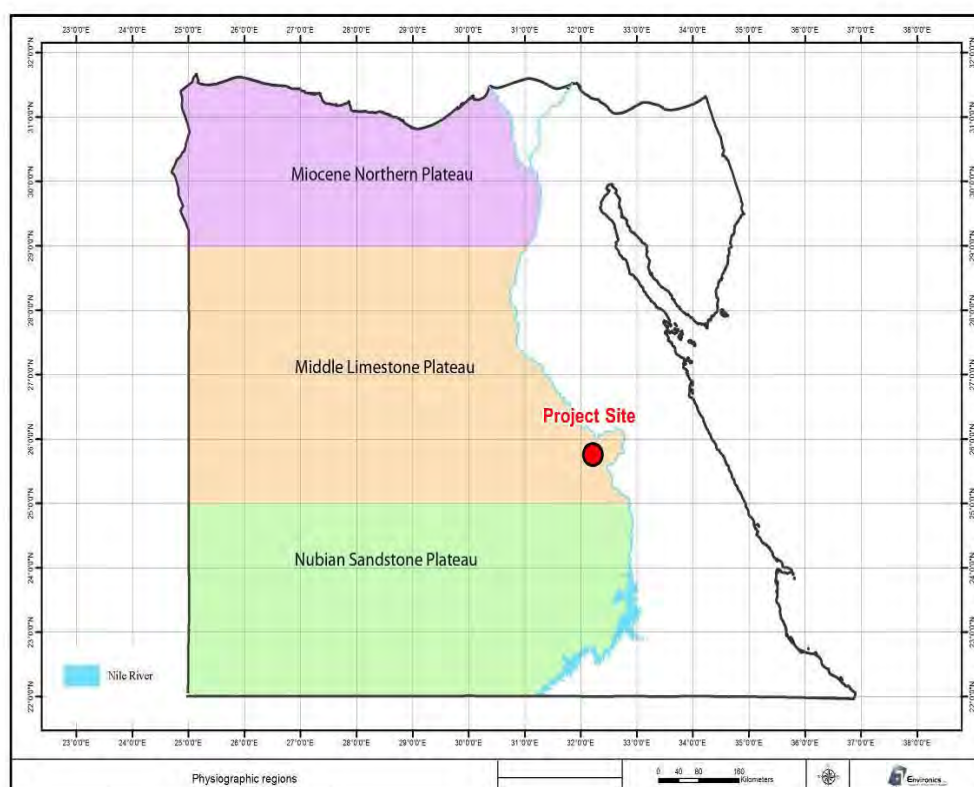


Figure 3-9: Physiographic regions of the Western Desert and location of the Project Site

Project Wider Area

A description of the four main habitats of the wider area and their characteristic biodiversity is provided herein.

The habitat topologies of the ecosystems in close proximity to (i.e., localities situated 18 km or less away from the Project Site) can be broken down into four main habitat types:

Middle Limestone Plateau

The Qena Governorate encompasses a large area of the Middle Limestone Plateau of the Western Desert. The Middle Limestone Plateau is a substantially dry sand plateau with very little or no precipitation, and outside of its depressions and oases, the only other habitats available are bare ground habitats (EEAA, 1993). Due to the plateau's aridity, the majority of it is totally devoid of flora, save for a few desert-adapted floral species distributed as scattered, isolated shrubs throughout the plateau. This scattered distribution of flora is commensurate with the scattered distribution of fauna, which tends to be composed of species adapted to such harsh desert environs. The Project Site is located within the southeastern part of the Middle Limestone Plateau.

Nile Valley Farmlands

The Nile Valley is located at a distance of 11km, and as mentioned above, there are numerous farmlands north of the Project Site, separated from the site by the Giza – Luxor Road¹. These are essentially nearly completely modified habitats; nevertheless, these farmlands provide habitat for a variety of weeds and ruderal plants in the fields, canals, and drain banks.

Reclaimed Agricultural Lands

There are several desert lands reclaimed for agriculture near the Project Site, located approximately 4 km north of the Project Site. The land was fenced with *Conocarpus lancifolius*, an introduced tree native to the coastal and riverine areas of Somalia, Djibouti, and Yemen (Figure 3-10).



Figure 3-10: Reclaimed agricultural land fenced with *Conocarpus lancifolius* located at north of the project site

The presence of water and vegetation cover at these reclaimed agricultural lands is likely to attract species from the Nile Valley that would otherwise avoid the harsh desert habitat. Accordingly, reclaimed agricultural lands host a biodiversity similar to that of the Nile Valley. Recorded avifauna included House Sparrow (*Passer domesticus*), Cattle Egret (*Bubulcus ibis*) (Figure 3-11), and Common Hoopoe (*Upupa epops*) (Figure 3-12).



Figure 3-11: Cattle Egrets (*Bubulcus ibis*) in a reclaimed agricultural land



Figure 3-12: A Common Hoopoe (*Upupa epops*) in a reclaimed agricultural land

Wastelands

Extensive flora forming a vegetated wasteland is present on the Giza – Luxor roadside, probably due to the presence of irrigation water from the nearby reclaimed agricultural lands.



Figure 3-13: Vegetated wasteland on the Giza – Luxor road

Urban Habitats

There are urban habitats scattered throughout the Nile Valley farmlands and reclaimed agricultural lands, such as banks of canals and drains, roadsides, railways and wastelands. These habitats are mainly home to exotic plants and trees introduced for ornamental purposes, as well as opportunistic fauna associated with human activities (e.g., feral dogs and cats, rats, mice, and several species of birds).

Baraka Village is the closest human settlement and is located about 2.8 km northwest of the Project Site. The village also includes an ambulance station.



Figure 3-14: Baraka Village, located about 2.8 km northeast of the Project Site



Figure 3-15: Ambulance station, Baraka Village

Man-made structures also include:

- A power sub-station close to the western borders of the Project Site and
- An industrial area located on the southwestern borders of the Project. The area is not fenced and includes paved roads.

Project Site and Close Surroundings

There is a marked and significant difference between the desert habitat and the other regional habitat types. Moreover, most of the previous biodiversity monitoring activities within the region focused on areas of expected biodiversity value rather than the harsh desert environment characterizing the Project Site. The site visits confirmed the bare nature of the site. The site is generally flat and composed of a sandy soil mostly covered with small stones. No vegetation or indications of wildlife presence were recorded within the Project Site, as the project is entirely located within the boundaries of the power substation.

Flora

Due to the extreme aridity of the southern WD and southeastern MLP, the Project Site is poor in terms of plant diversity and vegetation cover. Perennial plant life in this part of the WD is confined to the oases and depressions of the plateau, of which none extend to the Project Site. Outside of these, plant life is mostly ephemeral (annual) and limited due to its dependence on the low chance of rainfall. This type of vegetation is defined as “accidental vegetation” as it occurs where precipitation is so low and falls so irregularly that no permanent vegetation exists (Abd El-Ghani, 2000).

Fauna

- **Herpetofauna**

Based on species distribution maps for the reptiles of Egypt and each reptilian species' suitable habitat types and preferences, the following species have a likelihood of visiting the Project Site.

Snakes

The Sahara Sand Viper (*Cerastes vipera*) is a true desert species and is particularly widespread throughout Egypt's WD. It is almost exclusively found on sandy soils, including areas with sparse or no vegetation. Similarly, the Horned Viper (*Cerastes cerastes*) is also a widespread desert species found throughout Egypt's WD and found in most desert habitat types. It is more frequently found in patches of loose sandy soils in fairly exposed situations and has a high capacity to tolerate extreme hyper-arid habitats. *C. cerastes* is one of only two snakes to be encountered over almost all of Egypt's deserts, with the other being the Saharan Sand Snake (*Psammophis aegyptius*). The Saharan sand snake is predominantly found in sandy and rocky desert areas and is particularly common in open desert habitats devoid of vegetation, such as in the Project's Site. Lastly, the Diadem Snake (*Spalerosophis diadema*), another common snake species in Egypt, is widely distributed in the WD along the margins of the Nile Valley, such as in localities in the vicinity of the Project Site. This snake is associated with arid and semi-arid areas, particularly sandy deserts with sparse vegetation (Baha El Din, 2006; Saber & Masood, 2011; IUCN, 2025).

Although the Egyptian Catsnake (*Telescopus obtusus*) is a desert-dwelling species, it mainly occurs near cultivated areas, along riparian areas and on the edge of urban areas. This snake prefers vegetated areas with trees in sandy desert, semi-desert, and gravelly areas. Moreover, reclaimed agricultural lands in the vicinity may attract species such as the Striped Sand Snake (*Psammophis sibilans*). This snake is found in cultivated areas and naturally vegetated habitats along the Nile in Egypt; however, subpopulations in Egypt are expanding into areas reclaimed from the desert, as well as into agricultural areas of

the Nile Valley. Furthermore, the Egyptian Cobra (*Naja haje*) is not a species of true desert and is known to prefer semi-desert habitats and mostly occurs in areas with grassy vegetation. Likewise, the Nubian Spitting Cobra (*Naja nubiae*) is a semi-desert species and considered fairly common in Egypt. This cobra's distribution throughout Egypt covers the Upper Nile Valley and has also been recorded from Qena Governorate (Baha El Din, 2006; IUCN, 2025).

Accordingly, *Telescopus obtusus*, *Psammophis sibilans*, *Naja haje* and *Naja nubiae* are present in the Nile Valley and might have expanded their range to reclaimed agricultural lands. However, their occurrence onsite is highly unlikely due to the extreme aridity of the area. Unless suitable conditions are made available by the project such as the provision of water, shelters and sources of food (e.g., rodents attracted by the presence of waste), these species are not expected to extend their presence to the Project Site.

Lizards

The Desert Monitor (*Varanus griseus*) could potentially inhabit the project site, as indicated by its habitat preferences and its species distribution maps for Egypt. This lizard is found in sandy desert spots with some vegetation but has also been recorded throughout the WD in areas completely devoid of vegetation. Moreover, the presence of sandy or loose soils, which characterize the Project Sites substrate, seems to be essential for this lizard's persistence. Another lizard highly likely to occur at the Project Site is the Egyptian subspecies of Bosc's Fringe-toed Lizard (*Acanthodactylus boskianus* subsp. *asper*), which is one of the most common, prominent, and widespread reptiles in Egypt. In the WD, it is found in all of its suitable habitats in the WD, including the "very arid parts" of the WD "but where a minimal amount of vegetation is present".

With regards to geckos, the Elegant Gecko (*Stenodactylus sthenodactylus*) is also a widespread and common reptile in Egypt. It is known to inhabit desert plains; however, it occurs at low population densities in hyper-arid desert regions, but is a very resilient ground-dwelling insectivorous gecko that can tolerate extreme aridity for extended periods. This species is mainly found on hardened ground in such harsh environs (including bare ground habitats), in stony or rocky desert plains. In species-poor parts of the WD, much like the Project Sites locality, it is usually the only vertebrate to be easily found. Anderson's Short-fingered Gecko (*Stenodactylus petrii*) is a highly localised, but widespread lizard of the WD and is typically recorded in Egypt from the sandy habitats of the WD, such as the desert's sandy dry riverbeds (wadi paths). It is also found in the vicinity of these habitats on loose or consolidated sands, often with scarce vegetation (Baha El Din, 2006; Saber & Masood, 2011; IUCN, 2025).

- **Avifauna**

Based on data extracted utilising the Migratory Soaring Bird Tool (MSBT) developed by BirdLife International, species distribution maps and recorded observations of the birds of Egypt, and their preferred habitat types, the following species are likely to inhabit or cross over the Project Site.

Resident Breeding Birds

The Project Site seems to be inhospitable for breeding birds due to its lack of shelter, cover, water, and food sources. However, some desert species might still occur within the site and vicinity, even. If they breed outside of it. Some of the characteristic species of the WD's sandy desert habitats that could occur in the area include the Spotted Sandgrouse (*Pterocles senegallus*), Cream-coloured Courser (*Cursorius cursor*), Bar-tailed Lark (*Ammomanes cinctura*), Desert Lark (*Ammomanes deserti*), Greater Hoopoe-lark (*Alaemon alaudipes*), Temminck's Lark (*Eremophila bilopha*), Desert Wheatear (*Oenanthe deserti*), Isabelline Wheatear (*Oenanthe isabellina*), and the Brown-necked Raven (*Corvus ruficollis*) (EEAA, 1995).

Common breeding birds of the Nile Valley and Delta include 66 species (Goodman et al. 1989) and at least 14 of these are known to breed outside the Nile Valley and Delta. Some of these species include the Cattle Egret (*Bubulcus ibis*), Black-winged Kite (*Elanus caeruleus*), Black Kite (*Milvus migrans*), Common Kestrel (*Falco tinnunculus*), Common Moorhen (*Gallinula chloropus*), Spur-winged Lapwing (*Vanellus spinosus*), Greater Painted-snipe (*Rostratula benghalensis*), Laughing Dove (*Spilopelia senegalensis*)², Senegal Coucal (*Centropus senegalensis*), Barn Owl (*Tyto alba*), Asian green bee-eater (*Merops orientalis*), Crested Lark (*Galerida cristata*), Barn Swallow (*Hirundo rustica*), Western Yellow Wagtail (*Motacilla flava*), Graceful Prinia (*Prinia gracilis*), Hooded Crow (*Corvus cornix*)³ and the House Sparrow (*Passer domesticus*) (Saleh, 1993). Some of these Nile Valley species can be expected to be also present in the reclaimed agricultural lands located in close proximity to the Project Site, however, these are not expected to occur within the Project Site. Opportunistic species might further extend to the project site in case water, food scraps, and other organic waste are made available by project staff.

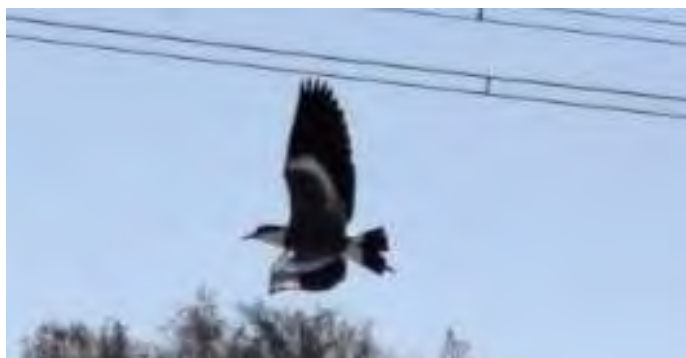


Figure 3-16: Spur-Winged Lapwing (*Vanellus spinosus*) recorded in the modified habitat created by the wastewater treatment plant

As a matter of fact, the nearby wastewater treatment plant attracts several birds, including species typical to the mesic habitats of the Nile Valley, such as the House Sparrow (*Passer domesticus*) and the Spur-Winged Lapwing (*Vanellus spinosus*). In addition, several rodent burrows were noticed within these areas of vegetation.

² Previously placed in the genus *Streptopelia*

³ Considered until recent times a subspecies of *Corvus corone*

Migratory Birds

According to the results of an assessment of the Project Site's importance to migratory birds as a migratory route using the MSBT, there are 16 migratory soaring bird species with a likelihood of crossing over the Project Site. These are the Black Kite (*Milvus migrans*), Black Stork (*Ciconia nigra*), Black-winged Kite (*Elanus caeruleus*), Common Crane (*Grus grus*), Common Kestrel (*Falco tinnunculus*), Eurasian Sparrowhawk (*Accipiter nisus*), Eurasian Spoonbill (*Platalea leucorodia*), Glossy Ibis (*Plegadis falcinellus*), Great White Pelican (*Pelecanus onocrotalus*), Hen Harrier (*Circus cyaneus*), Lanner Falcon (*Falco biarmicus*), Osprey (*Pandion haliaetus*), Pallid Harrier (*Circus macrourus*), Peregrine Falcon (*Falco peregrinus*), Western Marsh-harrier (*Circus aeruginosus*), and White Stork (*Ciconia ciconia*). The Egyptian Vulture (*Neophron percnopterus*) was not included in the results of the present MSBT assessment. However, it was included in a previous assessment carried out for the nearby Obelisk PV Project. Therefore, and given its threatened status, it is included among the potential migratory birds passing over the area, using a precautionary approach (for a total of 17 species).

Despite this, the MSBT assessment denoted that the Project Site is not an important location for migratory birds, as indicated by the site's Sensitivity Index being calculated to be ≤ 0.001 (Figure 3-16). In fact, these birds generally follow the Nile Valley during their migration as it provides sufficient availability of water, food and shelter. On the other hand, the Project Site has a low 'intensity passage', a low number of individuals per species passing over it. This is probably due to the fact that the barren and arid nature of the Project Site does not provide any advantages to migrating avifauna in terms of providing food, shelter, and water required during rest-stops. In addition, most of the 17 migratory birds mentioned above are categorized at the global level as species of Least Concern (LC) in terms of their susceptibility to extinction. There are two exceptions, the Pallid Harrier which is categorized as Near Threatened (NT) at the global level, and the Egyptian Vulture, which is globally Endangered (EN) and listed as a Vulnerable (VU) species at the Mediterranean level (IUCN, 2025; MSBT, 2025; 2025). Moreover, the Lanner Falcon, Hen Harrier, and Osprey are all globally categorized as LC but are respectively NT, VU and EN at the Mediterranean level.

The potential collision risk between migratory birds and the proposed 220 kV OHTL is influenced by several factors, including the frequency of bird passage, flight behaviour, flight height, weather conditions, visibility, topography, availability of food / water / shelter, and the presence of attractive habitats along or near the OHTL corridor. As indicated by the MSBT assessment, the Project Site is not considered an important location for migratory birds and the sensitivity index is very low. The barren desert character of the Project Site also provides no meaningful food, water, shelter, roosting or stopover resources for migratory birds.

Species such as Egyptian Vulture and Pallid Harrier may occur in the wider region during migration; however, their use of the Project footprint is expected to be very limited, if any. Egyptian Vulture is a soaring raptor that generally migrates using thermal uplift and is not expected to regularly fly at OHTL collision-risk height over the Project Site in the absence of suitable foraging or roosting habitats. Pallid Harrier may fly at lower altitudes when hunting; however, the Project Site does not provide suitable foraging habitat, prey

concentration, water, vegetation or shelter that would attract this species. Accordingly, detailed site-specific flight-altitude assessment is not considered proportionate. As a precaution, bird mortality monitoring will be implemented during operation, and adaptive corrective measures will be applied if repeated collision incidents are identified.

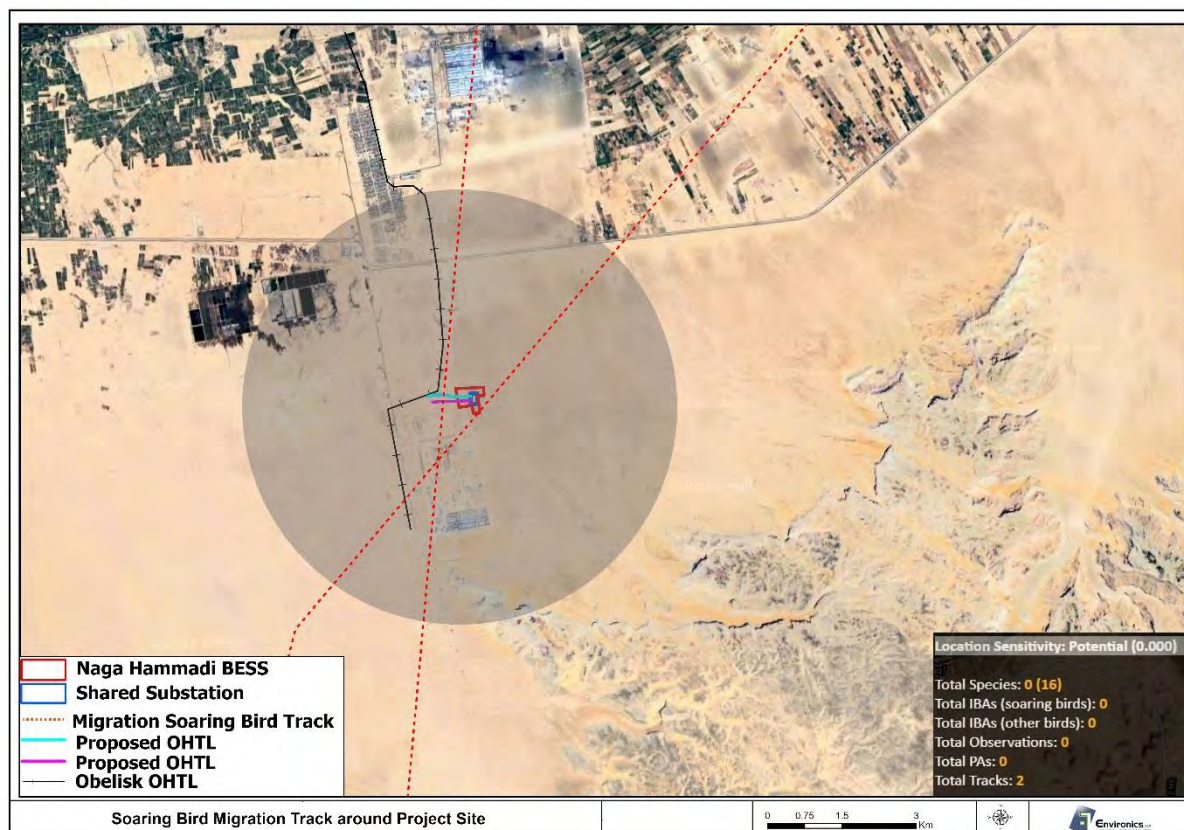


Figure 3-17: Location sensitivity of the Project Site to migratory soaring birds

The migration routes of migratory soaring birds over the Project Site, and the results of the MSBT assessment are provided below (Figure 3-17) (MSBT, 2025).

An additional search was carried out using GBIF, I Naturalist and eBird to identify relevant avifauna and other taxa potentially occurring within the project site's wider area, which resulted in no additional birds potentially occurring in the area.

Moreover, BirdLife International has developed AVISTEP - the Avian Sensitivity Tool for Energy Planning to identify where renewable energy could impact birds and should therefore be avoided. AVISTEP provides users with spatial heat maps depicting potential avian sensitivity in relation to several types of energy infrastructure, including Solar Photovoltaic. Each 5km x 5km cell within the heatmaps has a sensitivity score. These scores have been grouped into four categories of sensitivity, namely: Low, Moderate, High, and Very High.

However, AVISTEP has not been used for the following reasons:

- EnviroNics' Principal Ecologist had personally participated in the AVISTEP presentation workshop organized in Cairo by Nature Conservation Egypt (NCE) and BirdLife International and held on the 26th of June 2024. He discussed with Mr. Tris Allinson,

BirdLife International representative, who agreed that the tool includes inaccuracies and is still not totally reliable for Egypt and requires updates, particularly with concern to the relationship between birds and the terrestrial habitats, which is not taken into consideration.

- The current tool could provide misleading information. For example, it includes resident bird species typical of the wetlands of the Nile Valley that do not occur in desert habitats. For example, it includes the Common Pochard (*Aythya ferina*) and the Marbled Duck (*Marmaronetta angustirostris*), which are wetland species that would never occur in a hyper-arid desert environment.
- AVISTEP classifies any protected area (including geological protectorates) as of High sensitivity, irrespective of its relevance to birds.
- AVISTEP contradicts the results of MSBT and other tools.

Given the arid and inhospitable nature of the desert environment, with almost no vegetation, food and shelter, and due to the proximity of the Nile Valley and very close vicinity of reclaimed agricultural lands and other more “attractive” habitats (such as the habitat created by the wastewater treatment plant), it is highly unlikely that most of the species listed earlier would intentionally land in this location. In fact, the environment of the project area is likely to be a “bird barrier”, where birds would actively avoid flying over or landing in the area due to its harsh conditions.

However, some bird species might still be seen in the wider desert area (and possibly at the Project Site), albeit rarely, and usually under specific circumstances, as follows:

- Accidental landings: Birds migrating or traveling through the area might be forced to make an emergency landing due to exhaustion, bad weather, or injury.
- Stopovers during migration: Some bird species, especially raptors and waders, might use this area as a brief stopover during their migration, even if it's not an ideal habitat.
- Birds blown off course: Strong winds or sandstorms could blow birds off their intended course, leading them to land in this area unintentionally.
- Presence of a man-made habitat suitable for birds’ landing and providing water, shelter, roosting or perching sites, created as a result of waste and/or wastewater mismanagement.

In normal conditions, given the absence of attractive features for birds, such as food sources, water, shelter, or perching and roosting sites, it is reasonable to predict that bird presence in this area will be extremely low. References supporting this prediction include:

- A study on bird migration patterns in the Sahara Desert found that “*birds tend to fly around or over the desert rather than crossing it directly due to the harsh environmental conditions*” (Biebach, 1990);
- A study on the ecology of desert birds found that “*bird density and diversity are typically low in desert environments due to the limited availability of resources*” (MacLean, 2004);
- “Birds and Climate Change” by the IUCN states that “*birds tend to avoid areas with extreme temperatures, lack of water, and poor habitat quality*” (IUCN, 2010); and
- “BirdLife International” website states that “*deserts are generally avoided by birds due to the lack of food, water, and shelter*”.

These references support the idea that birds tend to avoid areas with harsh environmental conditions, such as the arid sandy desert environment of the Project Site.

- **Mammals**

Based on species distribution maps for the mammals of Egypt and their preferred habitat types, the following species are likely to inhabit or visit the Project Site.

Large Mammals

Rüppell's Fox (*Vulpes rueppellii*) is the most widespread desert fox in Egypt, and the most likely to be seen in true desert areas. It is widespread throughout the WD and has been recorded from all desert habitat types, including areas devoid of water, as well as farmlands. Its typical habitat includes open sandy and stony deserts, often with sparse vegetation cover dominated by small brushes. The Fennec Fox (*Vulpes zerda*) could also be present within or around the Project Site, as this fox is mainly recorded in Egypt from the WD, including the harsh environs of the southern WD. This fox actively avoids fertile desert areas, preferring sandy desert spots with some vegetation, and is one of the few carnivores that can survive without water. Lastly, although the Dorcas Gazelle (*Gazella dorcas*) has the capacity to inhabit a wide range of arid and semi-arid habitats, including sparsely vegetated rocky and/or sandy plains, and the margins of sandy desert, it is less likely to frequent or inhabit the project site as its range in Egypt has been drastically reduced due to habitat loss and hunting activities (Hoath, 2009; Basuony et al., 2010; IUCN, 2025). Moreover, the site is almost entirely barren, and has already disturbed by the human presence, namely by the fringing road and the adjacent industrial area.

Small Mammals

There are three rodents with a high likelihood of occurring throughout the Project Site and in its vicinity (i.e., within a 50 km radius of the Project Site), these are the Lesser Egyptian Gerbil (*Gerbillus gerbillus*), Greater Egyptian Gerbil (*Gerbillus pyramidum*) and the Lesser Egyptian Jerboa (*Jaculus jaculus*). *G. gerbillus* is one of the most widespread Egyptian mammals and occurs throughout the WD. It is typically found in dry sandy or rocky areas, sometimes with sparse vegetation, and tends to burrow in sandy areas clear of vegetation. It is also known to be attracted to campsites. *J. jaculus* has been recorded throughout the WD and has been described as “one of the most successful mammalian colonists of the desert peninsula of Arabia”. *G. pyramidum*, is also widespread throughout the WD and along the Nile Valley to the western margins of the Delta. This gerbil is associated with sandy habitats in desert and semi desert areas, however, in the WD, it is associated with the WDs oases. In more barren and arid areas, it is more likely to be found around buildings, deserted buildings, cisterns, or near cultivated areas (Hoath, 2009; Basuony et al., 2010; IUCN, 2025).

According to Basuony et al. (2010), there are three species of bats whose range and records indicate that they may cross over or visit the Project Site and its environs. These are the Cape Long-eared Bat (*Nycteris thebaica*), Trident Leaf-nosed Bat (*Asellia tridens*) and Rüppell's Pipistrelle (*Pipistrellus rueppellii*). The Cape Long-eared Bat has a wide habitat, also ranging into desert. The Trident Leaf-nosed Bat is a desert and semi-desert species which forms large colonies. Rüppell's Pipistrelle is one of the most highly adapted bats to arid conditions and has been recorded from Qena Governorate. In Egypt, *P. rueppellii* is commonly found in desert and semi-desert areas, including desert margins (such as the location of the Project

Site). It is also known to roost under rocks, rather than caves (Hoath, 2009; Basuony et al., 2010; IUCN, 2025).

During the site visit carried out in October 2025, several rodent burrows were noticed within the areas of vegetation around the nearby wastewater treatment plant. However, no tracks, burrows, tracks, dung or other signs were observed within the Project Site.

Key Biodiversity Areas

The Project Site does not encompass any Key Biodiversity Areas (KBAs), Protected Areas (PAs) legally protected by the Egyptian Government, BirdLife International designated Important Bird Area (IBAs), or PlantLife International designated Important Plant Areas (IPAs). The only KBA in the vicinity (i.e., located less than 50 km away from the Project Site) of the Project Site is the Upper Nile IBA, which is located about 33 km east of the Project Site. There is one PA also in the vicinity of the Project Site, the Dababia PA, however this PA is not considered a KBA. The Dababia PA is a geological protectorate and is located approximately 45.6 km southeast of the Project Site and is separated from it by the Nile Valley. There is also one proposed PA, the Wadi Qena proposed PA, located at a distance of about 53.5 km northeast of the Project Site. Similarly, it is separated from the Project Site by the Nile Valley and is located on the fringes of the Eastern Desert.

3.4 Socio-Economic Environment

This section describes the baseline socio-economic and demographic characteristics of the Project Site, and details some general information on the Qena governorate, such as the governorate's existing infrastructure, utilities (e.g., services, roads, etc.), and land use types. The information described below is derived from secondary sources, namely the official website of the Qena Governorate (QG), the Central Agency for Public Mobilisation and Statistics (CAPMAS), and the State Information Service (SIS), the official media and public relations apparatus of the Egyptian state, amongst other sources.

The Project Site is located within the desert hinterland of the city and Markaz Nagaa Hammadi ('Markaz' is the Arabic term for a governorate's second-level hierarchy beneath the governorates, the term loosely translates to the English definition of a 'county') of the Qena governorate. There are no human settlements or local communities within the Project Site, however, there are several villages of Markaz Nagaa Hammadi in close proximity (i.e., situated 15 km away, or less) to the Project Site. Thus, the following sections will primarily describe the socio-economic environment of the Qena governorate, focusing on Markaz Nagaa Hammadi due to its status as being the potential host communities of the project.

The socio-economic baseline has been reviewed in relation to the scale and nature of the Naga Hammadi BESS, shared substation and OHTL components. The Project Site is located in a desert / utility development setting, with no residential settlements, agricultural activities, commercial activities or community facilities within the Project footprint. The nearest settlement is Baraka Village, approximately 2.8 km northwest of the Project Site, while other

communities and social infrastructure are located farther away within the Nile Valley and surrounding villages.

Local population vulnerability is considered moderate at the broader governorate / Markaz level due to factors such as lower female labour force participation, presence of low-income households, unemployment among youth, illiteracy among parts of the population, and the presence of persons with disabilities and elderly persons. However, the direct exposure of these groups to Project impacts is expected to be limited because the Project footprint is remote from residential areas, does not require physical or economic displacement, and has a relatively small construction workforce compared with larger renewable energy projects in the area.

Land-use compatibility is considered high. The BESS and shared substation are located within / adjacent to the Dandara PV Project area and existing utility / electricity infrastructure, while the OHTL corridor is short and located within government-owned desert / utility land. The surrounding setting already includes renewable energy development, electrical transmission infrastructure, the Naga Hammadi Industrial Zone and vacant desert land. The Project is therefore compatible with the existing and planned land-use context.

Existing infrastructure and services in the wider area include regional roads, local industrial access roads, healthcare facilities, ambulance services, potable water networks and wastewater treatment infrastructure. Given the limited footprint and workforce requirements of the Naga Hammadi component, the Project is not expected to place significant pressure on local infrastructure or public services. Nevertheless, the Project will coordinate with relevant local authorities and service providers as required for water supply, wastewater disposal, waste management, emergency response, traffic management and worker recruitment.

3.4.1 Socio-demographic Characteristics

The Qena governorate is one of Egypt's South Upper Egypt's governorates. It is known for its strong agricultural and industrial economic sectors, particularly as the nation's leading producer of sugar cane, tomato, banana, sesame, and hibiscus. The total cultivated area in the Qena governorate is approximately 1,225.14 km², with sugar cane accounting for 64% of this area and contributing to 60% of the nation's sugar production.

The total area of the Qena governorate amounts to 10,798 km², this translates to approximately 1% of the total area of Egypt proper. The inhabited parts of the governorate take up an area covering around 1,740 km², accounting for 16.11% of the governorate's total area (SIS, 2016; QG, 2025).

Administrative Divisions

The Qena governorate is divided into various administrative divisions including one "Kism" (i.e., district), Kism Qena, one new city, 41 main villages, 111 affiliated villages, and 1,466 hamlets and small villages. These villages and hamlets administratively fall under the governorates Marakiz, of which there are 8; Markaz Abu Tesht, Dishna, El-Waqf, Farshut, Naqada, Qena, Qift, and Markaz Qus. There is also one Markaz and city, Markaz Nagaa Hammadi (where the Project Site is located) (Figure 3-18) (SIS, 2016; QG, 2025).

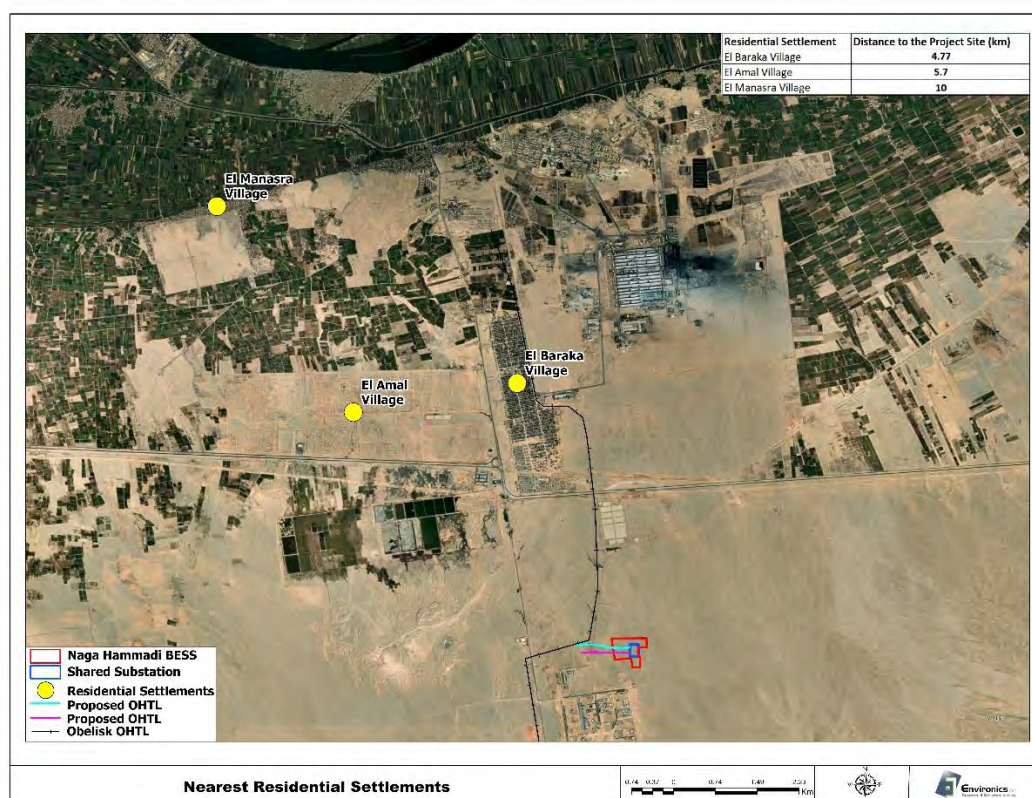


Figure 3-18: Location of residential settlements in close proximity to the Project Site

• Population

The total population size of Qena governorate is 3,164,281 people, with a nearly equal gender distribution, with a population gender ratio of approximately 105 males to 100 females. However, rural residents make up the vast majority of the population (81.21%), while urban areas house the remaining 18.78% of the population. The governorate has 748,990 households and within its inhabited areas, the population density is around 1,827.8 individuals/km². In Markaz Nagaa Hammadi, the total population size amounts to 578,237 individuals, with males accounting for 51.07% (295,357) and females 48.92% (282,880), again a highly balanced population in terms of gender. An overview of the population demographics of the Qena governorate and Markaz Nagaa Hammadi is provided below (Table 3-5) (CAPMAS, 2017).

Table 3-5: Population demographics of the Qena governorate and Markaz Nagaa Hammadi

Demographic Characteristic	Qena Governorate	Markaz Nagaa Hammadi
Total Population Size (TOT)	3,164,281	578,237
Male Population Size	1,623,352	295,357
No. of Male Residents (% of TOT)	51.3	51.07
Female Population Size	1,540,929	282,880
No. of Female Residents (% of TOT)	48.69%	48.92 %
No. of Households	748,990	135,018

3.4.2 Labour Force and Economic Activities

The Qena governorate has a total labour force of 927,102 people; however, labour force participation rates differ greatly by gender, with 75.07% of the governorates total labour force being male workers (compared to only 24.92% being female. In Markaz Nagaa Hammadi, the total labor force size amounts to 182,449 workers, and similarly, male labour force participation rates (72.09%) significantly outweigh female labour force participation rates (27.9%) (CAPMAS, 2017).

Moreover, the labour force of Markaz Nagaa Hammadi makes up 19.67% of that of the Qena governorate. An overview of the labour force population demographics and labour force participation rates by gender of the Qena governorate and Markaz Nagaa Hammadi is provided below (Table 3-6) (CAPMAS, 2017).

Table 3-6: Labour force population (≥15 years) demographics and participation rates at the Qena governorate and Markaz Nagaa Hammadi

Labour Force Demographic Characteristic	Qena Governorate	Labour Force Participation Rate (%)	Markaz Nagaa Hammadi	Labour force Participation Rate (%)
Total Labour Force Size	927,102	N/A	182,449	N/A
Male Workers	696,020	75.07	131,542	72.09
Female Workers	231,082	24.92	50,907	27.90

Economic Activities

The principle economic activities practiced by the labour force of Markaz Nagaa Hammadi are manufacturing, which employs about 7.26% of the labour force and construction, which employs around 7.64%, and accommodation and food service activities, wherein 6.53% of the labour force are engaged. Following that, transportation and storage service activities are practiced by 4.13% of the labour force and about 2.66% of the labour force engage in the human health and social work economic sector. The wholesale and retail trade sector, including motor vehicle and motorcycle repairs, occupies around 1.64% of the labour force, and the electricity, gas, steam, and air conditioning supply services sector and administrative and support services sector closely follow, with 1.30% and 1.17% of the labour force partaking, respectively. On the other hand, the water sewerage, waste management, and remediation service sector only engages 0.57% of the labour force, similar to the information and communications services sector, where only 0.54% of the labour force are active. Lastly, professional, scientific, and technical activities are less practiced, with only 0.33% of the labour force engaging in these activities (Table 3-7) (CAPMAS, 2017)

Table 3-7: Number of workers (≥15 years) from the Qena governorate and the Markaz Nagaa Hammadi labour forces according to main economic activity practiced

Economic Activity	Qena Governorate Labour Force			Markaz Nagaa Hammadi Labour Force		
	Male Workers	Female Workers	Total	Male Workers	Female Workers	Total
Human Health and Social Work	15,039	7,948	22,987	2,762	2,082	4,844

Economic Activity	Qena Governorate Labour Force			Markaz Nagaa Hammadi Labour Force		
	Male Workers	Female Workers	Total	Male Workers	Female Workers	Total
Administrative and support services	7,815	1,244	9,059	1,830	308	2,138
Professional, Scientific and Technical Activities	2,885	498	3,383	472	131	603
Real Estate	2,328	146	2,474	355	20	375
Information and Communication	5,924	336	6,260	884	102	986
Accommodation and Food Service	27,228	20,121	47,349	6,273	5,639	11,912
Transportation and Storage	36,539	2,601	39,140	6,982	560	7,542
Wholesale and Retail Trade: Motor Vehicle and Motorcycle Repairs	11,980	2,335	14,315	2,382	604	2,986
Construction	96,023	679	96,702	13,808	139	13,947
Water Sewerage, Waste Management, and Remediation	5,308	281	5,589	985	59	1,044
Electricity, Gas, Steam, & Air Conditioning Supply	10,762	370	11,132	2,260	105	2,365
Manufacturing	33,052	8,221	41,273	11,087	2,157	13,244

Occupation Types

In the Qena governorate, the economically active population (i.e., workers officially documented in the labour force) working across all occupations practiced in the governorate amount to 927,111 workers. Male workers predominantly take up the plant and machine operator jobs, skilled trades posts, and the roles that fall under the umbrella of 'elementary occupations. On the other hand, female workers have higher participation rates when it comes to service and sales positions and clerical support roles (CAPMAS, 2017).

In Markaz Nagaa Hammadi, the economically active population engaged in all occupation types available at the Markaz amount to 182,451 workers. Again, male workers principally take on skilled trades posts, and the roles that fall under the umbrella of 'elementary occupations', whilst female workers have higher occupation participation rates in service and sales positions and clerical support roles. The labour force participation rates of workers from the Markaz Nagaa Hammadi labour force is highly variable when broken down by occupation types (participation rates range between 9.85% and 23.47% across different occupations) (CAPMAS, 2017).

More comprehensive information on the labour forces of the Qena governorate and Markaz Nagaa Hammadi broken down by gender and occupation type is provided below (Table 3-8) (CAPMAS, 2017).

Table 3-8: Number of workers (≥15 years) from the Qena governorate and the Markaz Nagaa Hammadi labour forces according to the workers main occupation

Occupation Type	Qena Governorate			Markaz Nagaa Hammadi		
	Male Workers	Female Workers	Total Labour Force	Male Workers	Female Workers	Total Labour Force
Elementary Occupations	128,745	9,351	138,096	24,944	1,959	26,903
Plant and Machine Operators	41,571	497	42,068	9,077	112	9,189
Crafts and Related Trades	139,579	16,178	155,757	23,352	4,414	27,766
Skilled Agricultural, Forestry, and Fishery Work	143,466	56,351	199,817	22,310	9,889	32,199
Service and Sales Roles	93,006	113,260	206,266	20,178	25,772	45,950
Clerical Support	28,896	3,618	32,514	6,572	1,060	7,632
Technician	52,786	11,269	64,055	11,791	2,618	14,409
Associate Professional						
Professional	50,871	18,607	69,478	9,841	4,567	14,408
Managerial	17,112	1,948	19,060	3,479	516	3,995

Level of Education

Qena Governorate has a total of 927,108 workers. The highest numbers are seen in the Technical Intermediate education level, totaling 291,793, followed by the illiterate level with 271,015 workers. Following that, University education also has significant numbers, totaling 119,404, and General / Al-Azhar Secondary with 97,114 workers, and the lowest number of workers is found in the intellectual education with 252 workers. In Markaz Nagaa Hammadi, the total number of workers is 182,450. The Technical Intermediate category shows the highest numbers, totaling 61,707, followed by the illiterate level with 51,801 workers. Following that university education, with 24,837 workers, and the lowest number of workers is found in the intellectual education with 48 workers (CAPMAS, 2017).

A more comprehensive breakdown of the economically active populations of Markaz Nagaa Hammadi and the Qena governorate according to level of education and gender is provided below (Table 3-9) (CAPMAS, 2017).

Table 3-9: Number of workers (≥15 years) from the Qena governorate and the Markaz Nagaa Hammadi labour forces according to the workers level of education

Education Level	Qena Governorate			Markaz Nagaa Hammadi		
	Males	Females	Total	Males	Females	Total
Illiterate	168,971	102,044	271,015	30,688	21,113	51,801
Literate (Unqualified)	16,318	5,564	21,882	3,087	11,83	4,270
Literate (Qualified)	4,131	945	5,076	720	235	955
Special Education	223	29	252	38	10	48
Primary Education	23,843	8,571	32,414	4,431	1,758	6,189
Preparatory	31,978	17,309	49,287	5,096	2,401	7,497
General / Al-Azhar Secondary	81,724	15,390	97,114	14,517	2,922	17,439
Technical Intermediate	246,818	44,975	291,793	49,348	12,359	61,707
Above Intermediate	28,625	6,913	35,538	5,809	1,371	7,180
University Degree	91,014	28,390	119,404	17,435	7,402	24,837
Higher Diploma	953	485	1,438	161	105	266

Education Level	Qena Governorate			Markaz Nagaa Hammadi		
	Males	Females	Total	Males	Females	Total
Master's Degree	843	243	1,086	107	0	107
Ph.D.	585	224	809	106	48	154

Vulnerable Groups

Vulnerable groups are individuals or groups who may be disproportionately affected by Project impacts or who may have more limited ability to access Project benefits, information, consultation processes or grievance channels. Based on the socio-economic baseline for Qena Governorate and Markaz Naga Hammadi, potentially vulnerable groups may include women, elderly persons, persons with disabilities, low-income households, unemployed youth, illiterate persons, informal workers, and households with limited access to services.

Female labour force participation in Qena Governorate and Markaz Naga Hammadi is significantly lower than male participation, and women are generally more represented in services support roles than in technical or construction-related occupations. This may limit women's access to direct employment opportunities unless recruitment and disclosure are undertaken through accessible and inclusive channels. Persons with disabilities may also face barriers to employment and participation unless suitable roles and accessible communication methods are considered.

The Project is not expected to cause significant direct adverse impacts on vulnerable groups because the BESS, shared substation and OHTL are located in desert / utility land away from residential settlements and no physical or economic displacement is anticipated. However, vulnerable groups may have an interest in employment opportunities, local benefits, worker conduct, community health and safety, grievance access and emergency preparedness. The SEP for Energy Valley project will therefore ensure that information is disclosed in Arabic, in simple and accessible formats, and through suitable channels, including local authorities, community representatives, NGOs, labour offices and direct CLO engagement where required.

The Project grievance mechanism will be made accessible to vulnerable groups and will allow confidential and anonymous complaints. Sensitive grievances, including those related to Gender-Based Violence, Sexual Exploitation and Abuse, or Sexual Harassment, will be handled through confidential and survivor-centred procedures.

3.4.3 Land Use Types

The Project Site is not currently utilized for any anthropogenic purposes, likely due to the fact that it consists entirely of bare ground (i.e., areas with exposed soil, sand, or rocks). However, land use types in close proximity to the Project Site (Figure 3-18) include the following:

- The Nagaa Hammadi industrial zone (550 m South of the Project Site);
- Reclaimed agricultural lands (3 km northeast of the Project Site);
- Wastewater treatment plant (3.2 km northwest of the Project Site);
- The Giza – Luxor Road (2.5 km north of the Project Site);
- Baraka Village, the nearest residential area, is located 2.8 km north of the Project Site; and
- Other local communities located between 3 km and 9 km northwest of the Project Site.

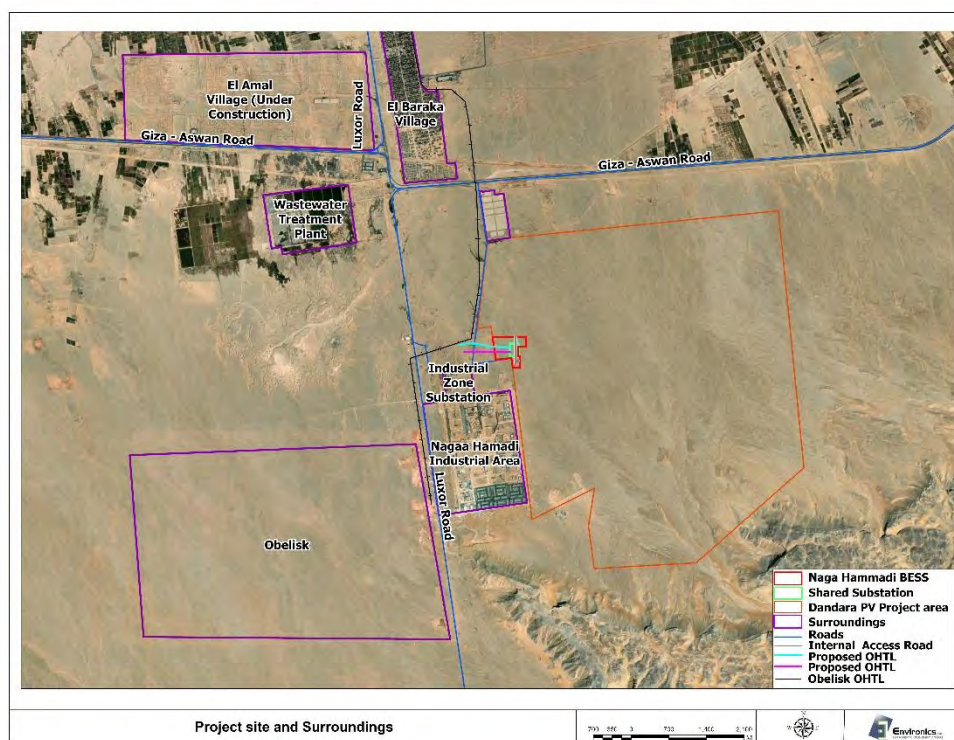


Figure 3-19: Land use types in close proximity to the Project Site

3.4.4 Infrastructure, Utilities and Services

• Health Facilities

The Qena governorate boasts a total of 52 hospitals, 46 ICUs (intensive care units), and over 200 health units. The governorates healthcare infrastructure includes a fleet of 92 ambulances, which are maintained by a well-equipped network of both road ambulance stations and highway ambulance stations (Table 3-10) (QG, 2025).

Table 3-10: Hospitals and other healthcare facilities in the Qena Governorate

Healthcare Facility Type	Quantity
Central Hospitals	11
Specialised Hospitals	11
Private Hospitals	14
Health Insurance Hospitals	1
Educational Hospitals	1
Dialysis Centres	18
Health Units	241
University Hospitals	2
Specialised Medical Centres	1
Military Hospitals	1
Oncology Institutes	1
Ambulance Points and Centres	52
Ambulances	92
Highway Ambulance Units	20
Regional Blood Banks	1
Intensive Care Units	46

Furthermore, there are three healthcare facilities located in close proximity to the Project Site: the El-Baraka Village Health Unit (5.5 km north of the Project Site), the Aluminum City Hospital (located 10 km north of the Project Site), and the How Village Health Unit (12 km northwest of the Project Site) (Figure 3-20).

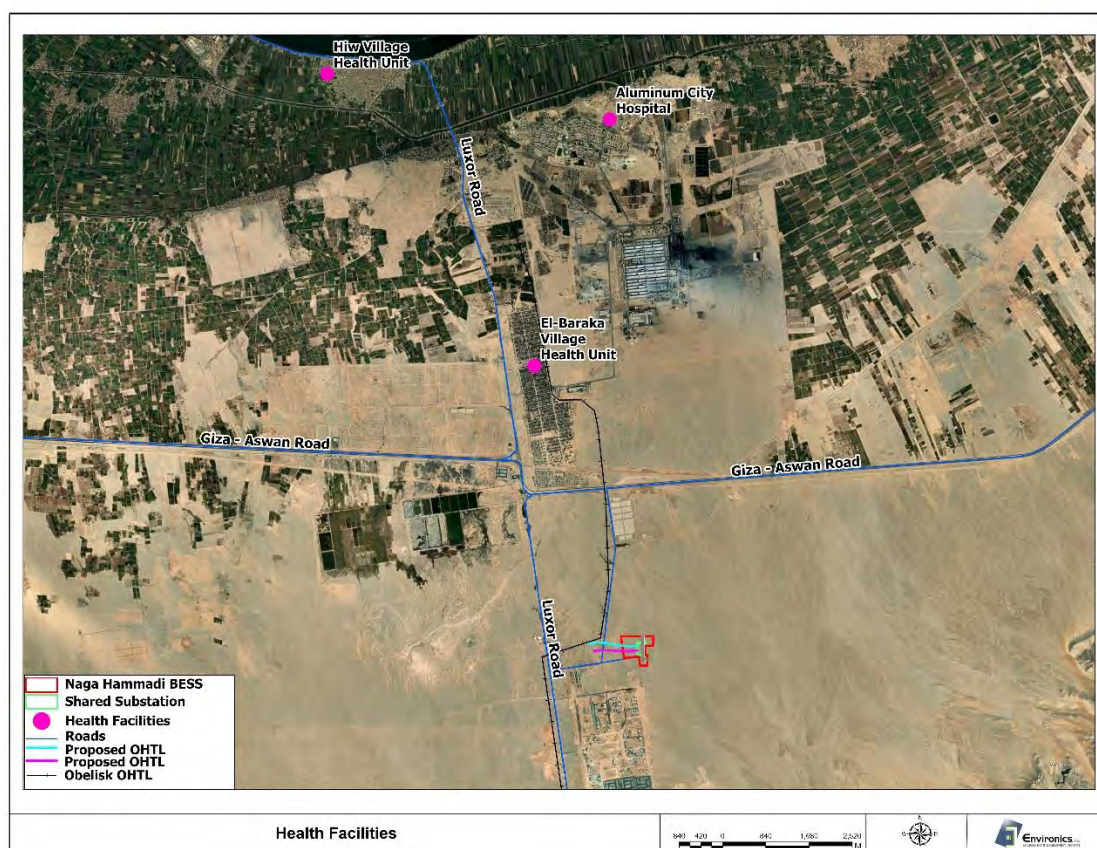


Figure 3-20: Healthcare facilities in close proximity to the Project Site

- **Potable Water**

According to the most recent (2017) national general census for population, housing and establishments, the total number of households in the Qena governorate amounts to 748,990. Out of these, 723,767 households rely on public water supply networks for their potable water. The majority of these are households located in the governorate's rural areas, with 579,064 rural households (out of a total of 603,680 rural households) connected to the public water supply network, and the remaining rural households (4.08% of the total number of rural households) relying on pumps, groundwater wells, and bottled water. With regards to the urban households in the governorate, there are 145,310 households in the governorate's urban areas, out of these, 144,703 use the public water supply network (translating to 99.58% of urban households relying on the public water supply network). The remaining 0.42% of urban households use pumps, groundwater wells, and bottled water (CAPMAS, 2017).

- **Sewage Facilities**

The Qena governorate has a total of 748,990 households. Of these, 115,895 households (15.47%) are connected to public sewage disposal networks, while the remaining 2.01% rely on private sewage disposal systems. A significant proportion of the total number of

households within the governorate, 82.14%, rely on cesspits for sewage disposal. Around 0.35% of the governorate's households use open field drains, and other alternative sewage disposal methods. There are 145,310 households in the governorate's urban areas, of these, 92,961 households (63.97%) are connected to public sewage disposal networks with, whilst only 1.5% of these households are connected to private sewage disposal networks. A large share of the governorate's urban households (34.39%) relies on cesspits, whilst the remaining households in the governorate's rural areas (0.12%) use open field drains and other alternative methods for the disposal of their sewage. In the governorate's rural areas, the majority of households (93.64% of the governorates total number of rural households) rely on cesspits. In stark contrast, only 22,934 rural households (3.79%) are connected to the public sewage disposal network, and 2.13% of rural households solely rely on private sewage disposal systems. Lastly, 0.40% of the governorates rural households depend on open field drains and other alternative methods of sewage disposal (CAPMAS, 2017).

In terms of sewage treatment facility availability, there are 9 sewage treatment stations within the Qena governorate, with a combined total design capacity of 207,000 m³/day. This roughly equates to 48.1 million m³ of sewage being treated per year (Table 3-11) (CAPMAS, 2021).

Table 3-11: Number of sewage treatment facilities in the Qena governorate and other sewage treatment facility metrics (data from July 2019 to June 2020)

Sewage Treatment Facility Metric	Qena Governorate
Number of Stations	9
Total Design Capacity of Sewage Treatment Stations (m ³ /day)	207,000
Sewage Treatment Quantity (Mill.m ³ /year)	48.1

Since the aforementioned national general census for 2017, the government program "Hayah Karima" has invested in multiple wastewater projects in the Qena governorate. As such, it is expected that the percentage of households connected to the public sewage disposal network has currently substantially increased since 2017. In this same context, the figures in the table above, comparing the design capacity to the sewage treated, indicate that in 2021, the governorate had a surplus of design treatment capacity. This was probably in advance of extending the public sewage network to additional beneficiaries.

• Transport Infrastructure

The Giza – Luxor Road runs parallel to the northern boundary of the Project Site, approximately 3.3 km away from this northern boundary. This road connects the city of Qena and the city and Markaz of Nagaa Hammadi to the Project Site. The Giza – Luxor Road consists of two separate lanes, each 9 meters wide. Moreover, there is a paved, single lane road serving the industrial area west of the Project Site, located approximately 0.5 km east of the Project Site. Additionally, there are two bridges leading from the east of the Nile to the Project Site, the Qena – Nagaa Hammadi Bridge, and the Nagaa Hammadi – Deshna Bridge.

The Qena – Nagaa Hammadi Bridge is located within the city of Qena, approximately 55 km east of the Project Site. This bridge provides a direct route from the Qena – Safaga and Qusseir – Qeft roads to the Giza – Luxor Road.

The Nagaa Hammadi – Deshna Bridge is located in the city and Markaz of Nagaa Hammadi and is situated about 20 km north of the Project Site. It wide and connects localities east of the Nile Valley to the Giza – Luxor Road.

3.4.5 Cultural Heritage

• Tangible Cultural Heritage

According to the Egyptian Archeological Map (EAM) (2022) and the UNESCO World Heritage List of Egypt, there are no registered antiquities or cultural heritage sites within the Project Site. However, there are five archaeological sites and monuments located in close proximity to the Project Site, and one world heritage site in the vicinity of the Project Site (Figure 3-21). All six sites are described below (EAM, 2022; CULTNAT, 2022; UNESCO, 2025).

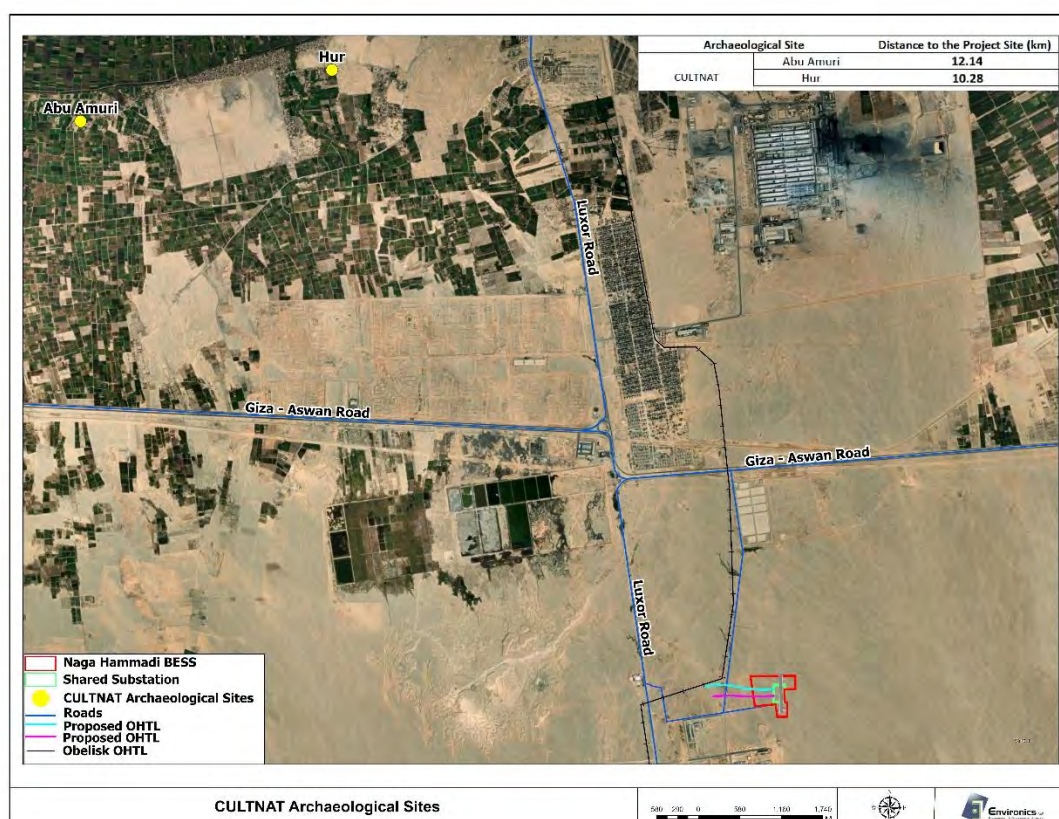


Figure 3-21: Archaeological sites, monuments, and cultural heritage sites in the vicinity of the Project Site

Archaeological Sites and Monuments

- **Abu Amuri:** Abu Amuri is an archaeological mound found in the Qena governorate, but one that has not yet been excavated (CULTNAT, 2023). It is located around 11 km north of the Project Site.
- **Hur:** Hur is a small archaeological site that has been recently excavated by the Supreme Council of Antiquities, revealing several mud-brick tombs dating to the Old Kingdom (CULTNAT, 2023). It is located about 9.5 km northwest of the Project Site.
- **Hiw:** This archaeological site is known for its extensive cemeteries and settlements dating back to the Naqada I-II of the Predynastic Period. Hiw is located in the Qena governorate

and was the capital of the 7th Upper Egyptian Nome. Its significance in the early Middle Kingdom is indicated by its selection as the location for the royal estate named after King Senwosret I. From the Graeco-Roman Period, two temples remain at the site, one by Ptolemy VI Philometor and another by the Roman emperors Nerva and Hadrian. An inscribed Ptolemaic chapel was discovered at Hiw at the end of the 20th century, the site also includes extensive cemeteries of nearly all periods as well as burials of sacred animals (CULTNAT, 2023). The Hiw site is located approximately 11 km northwest of the Project Site.

- **Gebel El-Arqi:** This is a small site that essentially solely contains archaeological remnants. It is well-known only for a hippo-tusk handled knife from the Naqada II or the late Predynastic Period, which was excavated from the site. The handle is carved on both sides, one side depicts several animals, including a man subduing two lions, and the other represents combat scenes between two groups of armed men, and a naval battle. However, this knife has been re-located to the French Louvre Museum (CULTNAT, 2023). The Gebel El-Arqi site is located about 18.8 km northwest of the Project Site.
- **El-Halfaya Qibli:** This archaeological site consists of the prehistoric small village of El-Halfaya Qibli and its associated large Predynastic cemetery. No evidence of permanent architecture was found at the site. It is located about 13.3 km northeast of the Project Site (CULTNAT, 2023).

UNESCO World Heritage Site

- **Ancient Thebes and its Necropolises:** Thebes is the only UNESCO world heritage site located in the vicinity of the Project Site, as it is situated roughly 36 km south of it. Ancient Thebes was the capital of Egypt during the Middle and New Kingdoms. Today, Thebes is a striking testimony to Egyptian civilization at its height, with its temples and palaces at Karnak and Luxor, and the necropolises of the Valley of the Kings and the Valley of the Queens (UNESCO, 2025a).

• Intangible Cultural Heritage

Based on UNESCO's List of Intangible Cultural Heritage (ICH) in Egypt, none of the identified ICH elements are practiced within the Project Site. However, some elements may be practiced by the local communities in the vicinity of the Project Site. Examples include the following.

- **Handmade weaving in Upper Egypt:** This craft tradition is a complex process that requires time, effort, patience and practice. Many steps and techniques are involved in the loom preparation, threading and weaving to achieve the final product. For centuries, men and women have used their inherited knowledge to create embroidered textiles both as a family legacy and as a profession. The basic principles have remained the same as those used in the past, whether for linen, cotton, wool or silk. Handloom weaving is considered as a source of identity and pride for the communities concerned and the persistence of handloom terminology attests to its deep-rooted significance for them. The practice currently faces many threats, however. Weaving is no longer lucrative, weaving at home requires unused space to accommodate the loom, and the working materials are expensive. The craft is therefore neglected and not transmitted as it was in the past. As

such, the practice was inscribed in 2020 on UNESCO's List of Intangible Cultural Heritage in Need of Urgent Safeguarding (UNESCO-ICH, 2022).

- **Tahteeb (Stick Game):** In ancient Egypt, tahteeb was used as a form of martial arts. Its role has since changed to that of a festive game but some of the symbolism and values associated with the practice remain. Performed in front of an audience, it involves a brief, non-violent interchange between two adversaries, each wielding a long stick while folk music plays in the background. Today, it is a traditional martial art and folk dance performed with sticks, symbolising strength and cultural identity. This ICH was inscribed in 2016 on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity (UNESCO-ICH, 2022).
- **Al-Sirah Al-Hilaliyyah Epic:** This oral poem, also known as the Hilali epic, recounts the saga of the Bani Hilal Bedouin tribe and its migration from the Arabian Peninsula to North Africa in the tenth century. This tribe held sway over a vast territory in central North Africa for more than a century before being annihilated by Moroccan rivals. As one of the major epic poems that developed within the Arabic folk tradition, the Hilali is the only epic still performed in its integral musical form. Moreover, once widespread throughout the Middle East, it has disappeared from everywhere except Egypt. It was inscribed in 2008 on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity (UNESCO-ICH, 2025).
- **Date Palm knowledge, skills, traditions, and practices:** This encompasses the cultivation, maintenance, and cultural significance of date palms, integral to the local economy and traditions. For centuries, many populations have been associated with the date palm tree, which has aided them in the construction of their civilizations in arid regions. The ancient historical relationship between the Arab region and date palms has enabled a rich cultural heritage that has been passed on through generations. Similar to the Epic and Stick Game mentioned above, this ICH was Inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity in 2022 (UNESCO-ICH, 2023).

4. Policy, Legal, and Administrative Framework

This section summarizes the environmental and social legislation and regulations relevant to the proposed Battery Energy Storage System (BESS) project. The applicable requirements were identified based on the nature of the proposed activity (described in detail in chapter 2), the geographic location of the project, and the anticipated environmental and social risks and impacts.

Consideration is first given to national environmental legislation, followed by a review of international financial institution (IFI) requirements, particularly those of the International Finance Corporation (IFC), European Bank for Reconstruction and Development (EBRD), the African Development Bank (AfDB), European Investment Bank (EIB). as well as relevant company-level sustainability, environmental, health and safety frameworks, where applicable.

4.1 National Legislation Pertaining to EIA

In accordance with Article 29 of Law of the Environment No. 4/1994, as amended by Laws No. 9/2009 and No. 105/2015, and its Executive Regulations (ERs), the project proponent is required to prepare an Environmental Impact Assessment (EIA) for new projects, as well as expansions or modifications to existing facilities.

The Egyptian Environmental Affairs Agency (EEAA) is the national authority responsible for reviewing and approving Environmental Impact Assessment (EIA) studies and monitoring compliance with applicable environmental legislation and permit conditions throughout project implementation and operation

Pursuant to Law No. 4/1994 and its ERs, the proponent is required to submit the EIA study to the Competent Administrative Authority (CAA) or the licensing authority prior to commencement of project activities. The CAA is responsible for verifying the completeness of the submitted documentation before forwarding the study to the Egyptian Environmental Affairs Agency (EEAA) for technical review.

For the BESS project, the CAA is the New and Renewable Energy Authority (NREA). EEAA may request the project proponent to provide additional data or clarifications once only, and if the requested information is not submitted within 15 working days, EEAA will return the study to the CAA for completion and resubmission.

EEAA will issue its opinion within 30 working days from the date of receipt of all required information.

The CAA shall notify the project proponent of EEAA's decision. The proponent retains the right to submit a written appeal within 30 days from the date of notification, after which non-response constitutes implicit approval, in accordance with the law.

Based on the EEAA projects categorization lists issued in June 2023, projects are classified into four categories according to their environmental impacts:

- Category A: Projects with minor or limited environmental impacts.
- Category B: Projects that may result in moderate environmental impacts.
- Category Scoped B: Projects with potentially significant environmental impacts due to certain components, but not the project type itself. An EIA study is required, focusing on the major component, but without public consultation.
- Category C: Projects with potentially significant environmental impacts This category requires a full-scale EIA study, including public consultation and disclosure as a main component.

According to the initial meeting conducted with the Egyptian Environmental Affairs Agency (EEAA) on 6 January 2026, the substation and the OHTLs for Energy Valley Project have been classified as Category Scoped-B projects.

4.2 Applicable Egyptian Regulations Pertaining to the Project

4.2.1 Air Quality

Article 36 of Law 4/1994 and Article 37 of ER 1095/2011 set the maximum permissible limits for exhaust gases from engines and vehicles.

Article 35 of Law 4/1994, Article 34 of its modified ER 1741/2005, and Annex (5) of modified ER 710/2012 provide the maximum limits for ambient air pollutants. The applicable limits are summarized in Table 4.1 below. Besides emissions of diesel generator are provided in Table 4.2.

Table 4-1: Maximum Limits of Ambient Air Pollutants according to Annex (5) of the Modified ERs of Law 4/1994 as well as the EU Maximum Limits

Pollutant	Area	Maximum Allowable limits			
		1 hr	8 hrs	24 hrs	1 year
Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)	Urban Areas	300	-	125	50
EU ⁵		350	-	125	20
WHO		-	-	125	-
Carbon Monoxide (mg/m^3)	Urban Areas	30	10	-	-
EU		-	10	-	-
WHO		-	-	7	-
Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)	Urban Areas	300	-	150	60
EU		200	-	-	40
WHO		-	-	120	40
Total Suspended Particles ($\mu\text{g}/\text{m}^3$)	Urban Areas	-	-	230	125
EU		-	-	-	-
WHO		-	-	-	-
PM ₁₀ ($\mu\text{g}/\text{m}^3$)	Urban Areas	-	-	150	70
EU		-	-	50	40
WHO		-	-	150	70

* The specified maximum limits of ambient air pollutants outlined above apply mainly to the construction phase of the proposed project.

⁵ <https://www.europarl.europa.eu/factsheets/en/section/193/environment-policy>

** In cases where discrepancies exist between the national regulations and the EU Maximum Limits, projects are required to adhere to the more stringent standards.*

Table 4-2: Maximum limits of air pollutants from generators

Pollutant	IFC Standards			Egyptian Standards	
	Maximum Limit for Emissions (mg/m ³ from exhaust)			Maximum Limit for Exhaust Emissions (mg/m ³)	
	Natural Gas	Diesel		Natural Gas	Diesel
Carbon monoxide (CO)	N/A	N/A		150	250
Sulphur dioxide (SO ₂)	N/A	3%		100	400
Nitrogen oxides (NOx)	200 (spark ignition)	Bore Size Diameter < 400 mm	1,600	600	600
	400 (dual fuel)	Bore Size Diameter ≥ 400 mm	1,850		
	1,600 (pressure ignition)				
Total Particulates	N/A	100%		50	100

The specified maximum limits outlined above are mainly relevant to the construction phase of the proposed Project, during which these air pollutants are expected to be emitted.

This applies only during Construction phase. The BESS operations and do not generate air emissions.

4.2.2 Ambient Noise

Article 42 of Law 9/2009 and Article 44 of its modified ER (1095/2011), provide the maximum permissible limits for noise levels. Table 4.3 below provides the maximum permissible limits for noise intensity in different areas according to Annex 7 of the ER replaced by Decree 2466/2024, and the EU Environmental Noise Directive 2002/49/EC.

Table 4-3: Maximum Limit Permissible for Noise Level in the Different Zones according to Annex (7) of the Modified ERs of Law 4/1994 as well as EU Maximum Limits

Type of zone	The permissible limit for noise level, dB (A)		
	Day time 7 am – 10 pm	Night 10 pm – 7 am	
Areas on roads whose width is 12 m or more, or industrial areas which comprise light industries and other activities	70	60	
EU (Mixed commercial and industrial areas)	Day-time	Evening-time	Night-time
	68	63	58
	During Construction Activities: Up to 70 dBA during the day.		
WB EHS (industrial areas)	70	70	

** The specified maximum limits outlined above apply to the construction phase of the Proposed Project.*

** In cases where discrepancies exist between the national regulations and the EU Maximum Limits, projects are required to adhere to the more stringent standards.*

Noise requirements apply throughout the project lifecycle, from construction through operation and decommissioning phases.

4.2.3 Non-Hazardous Solid Wastes

Chapter 4 of Egypt's Waste Management Law 202/2020 and its ERs 722/2022 and 1113/2024 address the requirements for the solid waste management framework, including collection, transportation, storage, and disposal:

- Article 15: Waste generators must minimize waste, promote reuse, ensure recycling and safe disposal, and manage waste without harming public health or the environment.
- Article 16: Waste generators bear the cost of integrated, safe waste management.
- Article 20: Open burning of waste is prohibited.

Article 36 of the executive regulation addresses construction waste management through contracting licensed contractors and proper storage of construction material/waste.

Additionally, Law 9/2009 and its ERs (Articles 39 and 41) address precautionary measures, ensuring proper waste handling and environmental protection.

Non-hazardous waste management requirements apply throughout the project lifecycle, from construction through operation and decommissioning phases.

4.2.4 Hazardous Materials and Wastes

Law No. 202/2020 and its ERs, Nos. 722/2022 and 1113/2024, introduced specific requirements for hazardous waste management.

Chapter Five of Law No. 202/2020 and Articles 50 to 54 of ERs No. 722/2022, delineates the protocols for hazardous waste management process, including comprehensive record-keeping and disposal methodologies.

Hazardous material management apply throughout the construction, operation phases, and decommissioning of the proposed project.

4.2.5 Registers/ Records

Environmental Register:

According to Article 22 of Law No. 9 of 2009, amending Law No. 4 of 1994, and Article 17 of its modified ER 2466/2024, all establishments are mandated to maintain comprehensive environmental registers. The specific content of these registers is outlined in Article 17 and Annex 3 of the Executive Regulation.

Hazardous Materials & Waste Register:

According to Article 56 of Law No. 202 of 2020 and Article 50 and appendix 7 of its Executive Regulations (Decree No. 722 of 2022), establishments generating hazardous waste are required to maintain a hazardous materials and waste register documenting the types and quantities generated, the methods of storage, treatment, and disposal, and the licensed entities contracted to undertake waste management activities.

The Project shall not procure, install, operate, or reuse any power transformers, capacitors, switchgear, oil-filled electrical equipment, insulating oils, or other project components containing polychlorinated biphenyls (PCBs).

4.2.6 Biodiversity Protection

Article 28 of the Environmental Law No. 4 of 1994 is a crucial provision for wildlife protection. It explicitly prohibits the hunting, killing, or capturing of specific wild animals and plants, particularly those that are endangered or essential for maintaining the natural ecological balance.

This article aims to safeguard biodiversity by preventing the depletion of species at risk of extinction or those playing a critical role in their ecosystems.

The protection measures extend to habitats and ecosystems, ensuring the preservation of both flora and fauna that contribute to environmental stability. Additionally, this article empowers authorities to enforce these prohibitions and take necessary actions to protect wildlife from illegal activities.

Furthermore, Annex 4, as amended by ERs 1095 of 2011 of the Environmental Law No. 4 of 1994, lists the specific species of wild animals and plants protected under the law. These species are prohibited from being hunted, killed, or captured due to their ecological importance and the need for their conservation.

- **First:**

Wild birds, animals, and other terrestrial or aquatic creatures, or any parts or derivatives thereof, are prohibited from being hunted, killed, traded, bred, possessed, transported, exported, or imported, whether alive or dead prohibition specifically includes:

- All wild birds, except those that are permitted under clause (1) of article 28 to be hunted in accordance with their designated seasons and within the allowed quantities.
- The Prohibited Animal Species (Mammals) under clause (1) of Article 28
- The Prohibited Animal Species (Amphibians and Reptiles) under clause (1) of Article 28:

Additionally, it is prohibited to kill or capture wild birds, animals, and aquatic creatures in areas where such actions would result in the destruction or alteration of their natural habitats. This includes areas of significant importance for resident and migratory wild birds, such as wetlands, natural lakes, the Nile River system, migration routes, and movement corridors of resident birds. The prohibition also applies to areas designated under the Ramsar Convention, to which the Arab Republic of Egypt is a party, as well as currently declared nature reserves and those that may be declared in the future by a decision from the Prime Minister under Law No. 102 of 1983.

- **Second:** Flora is forbidden to be collected, imported, exported, cultivated, or commercialized. This includes wild plant species related to trade, specifically those listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to which the Arab Republic of Egypt is a party, according to Article 28.
- **Third:** Endangered Animal or Plant Species or Those Cultivated Outside Their Natural Habitats Without a License.

According to Article 28 of the law, it is prohibited to cultivate or breed endangered animal or plant species, or those that are grown or raised outside their natural habitats, without obtaining a license from the Environmental Affairs Agency. This provision ensures that such activities are regulated to prevent potential harm to the species and their ecosystems.

Furthermore, in accordance with Article 3 of Law 102 of 1983 Concerning Natural Protected Areas, it is strictly prohibited to undertake any activities, actions, practices, or experiments in the zones surrounding a protected area. These zones are designated by a decision from the competent minister, following a proposal from the Environmental Affairs Agency at the Council of Ministers. Such activities are only permissible if a permit has been granted by the relevant administrative authority, particularly if they have the potential to impact the environment of the protected area or its natural features.

In addition, Law 53 of 1966 (the Law of Agriculture) is also concerned with biodiversity. Article 117 prohibits the hunting of birds and other wild animals useful to agriculture. It also bans the trading, killing, and destruction of their nests. Minister of Agriculture Decree 28 of 1967 (amended by Decree 1227 of 1988) specifies the species of birds and other wild animals under protection covered by Article 117 of Law 53/1966.

These requirements are applicable to the proposed Project. However, as described in Chapter 4, the Project area comprises predominantly barren desert land and does not contain protected areas, critical habitats, natural habitats of ecological importance, or notable flora and fauna communities within the Project footprint.

4.2.7 Cultural Heritage

Law 117 of 1983 promulgating the Antiquities' Protection Law, as amended by Law 3/2010, 61/2010, 91/2018, and 20/2020, serves as the cornerstone for safeguarding archaeological and historical sites.

The Ministry of Tourism and Antiquities (MOTA) is the primary authority responsible for overseeing all archaeological activities.

This legislation provides the primary legal framework for the preservation of archaeological and historical sites.

According to Article 5 of the law, MOTA is the designated authority responsible for supervising all archaeological activities and sites within the country.

Additionally, Article 23 assigns the MOTA the responsibility for the discovery and exploration of antiquities across Egyptian territory. It mandates that any person who discovers an unregistered archaeological artifact is obligated to notify the MOTA. The artifact shall be considered state property, and the MOTA must take the necessary measures to preserve it. Within three months, the MOTA must either remove the artifact found on private property or take the necessary procedures to expropriate the land on which it was found or leave it in place and register it following the provisions of this law.

These requirements are relevant to the Project in relation to potential chance finds during construction activities involving excavation, grading, foundation works and OHTL tower foundation construction. No cultural heritage components are expected, as the site is located on previously disturbed land. Moreover, there are no registered archeological sites, and the nearest registered archaeological sites are located at distances of approximately 8–10 km from the project location. However, chance finds plan would be developed for the construction activities.

4.2.8 Work Environment

A. Occupational health and safety

The Egyptian Labor Law 14/2025⁶, alongside Minister of Manpower and Immigration's Decree 211/2003, establish comprehensive guidelines in Egypt for occupational safety, health, and a safe work environment.

Besides, Ministerial Decree 211/2003 of the Ministry of Manpower addresses the requirements to prevent adverse physical, chemical, and mechanical hazards and dynamic electricity hazards in the workplace and requires keeping medical surveillance records for the employees.

B. Work Environment Health and Safety

The Egyptian Labour Law number 14/2025 organizes working conditions and management of worker relationships. The law in its different articles; addresses the individual labour contracts, terms of employment, wages and leaves, collective negotiations and collective labour agreements, and litigations as well as vocational training are addressed in sections one to four. The occupational health and safety requirements are addressed in Book 4 of the Labour Law.

C. Workplace Noise

Law 4 /1994 (amended by Law 105/2015) sets the maximum permissible noise levels within the workplace (in dB) in Annex 7 of the Executive Regulation (amended by decrees 710/2012, 964/2015, and 2466/2024).

Table 4-4 provides the maximum noise levels in the workplace, as indicated in Table 1 in Annex 7 of the ER 710/2012 of Law 4/1994.

Table 4-4: Maximum Noise Levels within Workplace (dB (LAeq))

Type of Place and Activity	Exposure Period (hours)	Maximum Noise Level dB (LAeq)
Workplace (workshops and factories) (licensed starting from 2014)	8	85
Administrative offices - Workrooms for computers, typewriters, and similar equipment	--	65
Workrooms for activities requiring routine mental concentration - control rooms	--	60

⁶ The new labor law 14/2025 is entered into force by 1 September 2025, replacing the previous Law No. 12 of 2003. The updated executive decrees of the law are not issued yet.

If the noise level is more than 85 dB in workplaces with up to 8 working hours, the facility is obliged to reduce the exposure time by half with each increase in noise level by 3 dB with appropriate earplugs.

D. Employment organization

The Egyptian Labour Law 14/2025 organizes employment terms, working conditions, and management in Book 2 and Book 3 of the Labour Law, as follows:

Book 2 – Employment Organization:

- Definition and classification of employment contracts (fixed-term, unlimited-term)
- Conditions for employment and required contract formalities
- Work patterns including emerging/non-traditional forms (e.g., part-time, remote, job-sharing)
- Employer and employee registration obligations, data submission, and record-keeping
- Equal opportunity, non-discrimination, and prohibition of forced labour
- Employee file maintenance, electronic format recognition, retention periods
- Working hours, overtime arrangements, rest periods
- Leave entitlements (annual leave, maternity, paternity, casual)
- Health, safety, and welfare obligations of the employer toward employees
- Provisions concerning disabled groups or “people of determination”

Book 3 – Termination, Disputes & Special Employment Cases:

- Termination of employment contracts: notice periods, severance, end-of-service benefits
- Grounds for summary dismissal (gross misconduct) and procedural safeguards
- Resignation procedures and right of withdrawal
- Treatment of absence without justification (voluntary resignation concept)
- Recognition of work arrangements in the context of termination and rights
- Labour dispute resolution: specialized labour courts, timelines, and processes
- Employment of foreign workers: permits, terms, regulations
- Special employment categories and protections (women, minors, workers with disabilities)
- Employer obligations in organizational changes (downsizing, restructuring)
- Transitional provisions and application of the law to existing contracts

E. Child labour

According to Articles 62, 63, 64, and 65 of the Labour Law 14/2024, Chapter 4 of Book 2: Rules for the Employment and Training of Children, it is prohibited to employ children before the age of 15. However, they may be trained once they reach the age of 14, provided that this does not prevent them from continuing their education. The employment or training of children must be in accordance with a decree issued by the competent minister in coordination with the National Council for Childhood and Motherhood.

It is also prohibited to employ or train children in jobs, professions, and industries that may endanger their physical or psychological health, safety, or morals. These jobs,

professions, and industries, according to different age groups, will be issued by the decree of the competent minister, in coordination with the National Council for Childhood and Motherhood. Until the updated decree is issued, Decree 215/2021 regarding the child employment and training system is implemented.

According to Article 66 of Labour Law 14/2025, It is the responsibility of the employer who employs one or more children to consider the following:

1. To post a copy of the provisions of this chapter in a visible place at the workplace.
2. To prepare a record indicating working hours and rest periods, approved by the relevant administrative authority (labour office).
3. To inform the relevant administrative authority of the names of the working children, the tasks assigned to them, and the names of the individuals responsible for monitoring their work.
4. To provide separate accommodation for children away from adults, in accordance with the regulations and provisions issued by the competent minister, and it is strictly prohibited for the child to stay overnight at the workplace.

F. Persons with Disabilities

Egyptian Law No. 10 of 2018 amended by Law 156/2021 on the Rights of Disabled groups aims to ensure the rights and inclusion of Disabled groups in society. The law mandates non-discrimination, equal opportunities equal employment opportunities based on their qualifications, and accessibility in various aspects of life, including education, employment, and public services. Key provisions of articles 21,22, and 23 from Law No. 10 of 2018, include:

- o Job Placement: The Ministry of Manpower is responsible for creating a registry of job-seeking individuals with disabilities and assisting them in finding suitable employment.
- o Employer Quotas: Employers with 20 or more employees must hire at least 5% of their workforce from people with disabilities.
- o Tax Incentives: it includes a 50% increase in the personal exemption for disabled groups or their caregivers. Employers who hire beyond the 5% quota receive additional tax benefits.

In addition, Article 37 of Labour Law 14/2025 requires facilities to keep a special register of disabled groups and dwarfism and report on their employment and wages. The facility must also notify the authority with a statement that includes the total number of employees, the number of jobs occupied by people with disabilities and dwarfism, and the wages they receive, following a template and schedule set by the minister.

G. Equal opportunities

Article 9 of the Egyptian Constitution stipulates that the country is committed to achieving equal opportunities for all citizens, without any form of discrimination.

Article 35 of Labour law 14/2025 states that it is prohibited to cluster wages based on cultural, religious, or gender.

Law 10/2018 related to the rights of people with disabilities is concerned with provision of equal rights to this group. It includes their rights to have a life insurance, social insurance, freedom in choices, chances of work opportunities that do not surpass their physical disability limit.

H. Women's Workplace Safety and Night Shifts

According to the Labour Law 14/2025:

Article 53: Applies all employment provisions to women without discrimination; mandates equal pay for equal value of work among men and women.

Article 59: Requires employers who employ one or more female workers to post the "Women's Employment Regulations" in the workplace, which must address flexible working hours or remote work for women caring for children with disabilities or dwarfism.

In addition, Decree No. 44 of 2021 issued by Egypt's Ministry of Manpower permits women, upon their request, to work night shifts in any establishment, provided that employers implement appropriate health, safety and transportation measures.

I. Protection from Harassment

Article 254 of Labour Law 14/2025 stipulates that facilities and their branches shall be obligated to provide a safe and non-hostile work environment, free from harassment, bullying, and violence, and to ensure the availability of effective means for prevention against such behaviours.

Anti-harassment Law No. 141/2021: This law, which modifies the 58/1937 Penal Law, strengthens legal protections against sexual harassment. It provides comprehensive safeguards for women against various forms of harassment, including unwanted sexual advances, physical or verbal conduct, online and electronic harassment, stalking behaviours, workplace harassment, and public transportation harassment. It also imposes stricter penalties on perpetrators, reflecting a growing recognition of the seriousness of this issue in Egypt.

J. Grievance**Article 103 of the Environmental law 4/1994**

Grants every citizen and organization concerned with environmental protection the right to report any violations of the provisions of this law.

Article 85 of the Egyptian Constitution

All citizens have the right to address public authorities in writing and signed, but should not address it on behalf of groups, only as juridical persons.

K. Community Investment:

According to the Egyptian Investment Law 72/2017 indicated that towards achieving the goals of the sustainable development, investors may dedicate a percentage of their annual profits for social developments in one or more of the following fields:

- Environmental protection
- Areas of healthcare, social care, or cultural care;
- Support the technical education or the funding of research, studies in cooperation with any of the universities or scientific research institutions; and
- Training and scientific research.

Where investors have undertaken/implemented any community development investments, investors are required to submit to the General Authority for Investment and

Free Zones an annual report supported by documents on community development activities.

4.3 Strategic National Initiatives

▪ **Egypt National Climate Change Strategy (NCCS) 2050**

Egypt launched on 19/5/2022 the National Climate Change Strategy 2050. NCCS is a comprehensive roadmap designed to guide Egypt's efforts in addressing climate change. The strategy lays out five overarching goals, encompassing mitigation, adaptation, governance, financing, and scientific research. These goals are further divided into objectives and specific directions, each with corresponding performance indicators to track progress.

The contribution of the PV and BESS projects to the Egypt's National NCCS 2050 include:

- Contribution to Renewable Energy Goals: PV and BESS projects are expected to significantly contribute to the national goal of increasing the share of renewable energy in the energy mix. The strategy aims to increase the contribution of renewable energy sources to 42% of the total electrical energy produced by 2035.
- Enhancing Climate Resilience: These projects are to integrate climate resilience into their design and operations. These would include measures to withstand extreme weather conditions, such as high temperatures and flash floods, which are common in regions like Qena governorate.
- Reducing GHG Emissions: By transitioning to renewable energy sources, PV and BESS projects contribute to reducing GHG emissions associated with fossil fuel consumption if the same amount of energy were generated from conventional power plants.
- Supporting Sustainable Development Goals: PV and BESS projects should align with Egypt's Vision 2030 and support sustainable economic growth with low-emission development.

▪ **Nationally Determined Contribution (NDC)**

After Egypt signed the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement on the 22nd of April 2016 and ratified it on the 29th of June 2017, the Intended Nationally Determined Contribution (INDC) was considered Egypt's first NDC.

Egypt's updated NDC to the UNFCCC. It outlines Egypt's commitments to reducing GHG emissions and adapting to the effects of climate change between 2020 and 2030.

The NDC highlights Egypt's national circumstances, including its vulnerability to climate change impacts, especially in the Nile Delta, and its ambitious economic development goals. It presents a series of mitigation actions, focused on energy, oil and gas, transport, industry, buildings and urban cities, waste management, and tourism, with projected emission reductions for each sector.

In June 2023, Egypt revised its NDC. As part of its second revised NDC, Egypt has committed to reducing GHG emissions in the oil and gas sector by 2030 from 2,575 GgCO₂-eq under a business-as-usual (BAU) scenario to 0,89 GgCO₂-eq under a mitigation scenario. Egypt intends to reach this target through improving access to clean fuel in households and increasing the production and use of alternative green fuels (such as biofuels).

▪ **Egypt's National Strategy for the Empowerment of Egyptian Women 2030:**

Launched in 2017, this comprehensive strategy aims to advance women's empowerment across political, economic, and social domains, aligning with national and international development goals. Key pillars include:

- Political Empowerment: Increasing women's representation in leadership and decision-making positions.
- Economic Empowerment: Expanding economic opportunities for women through improved employment prospects and support for female entrepreneurship.
- Social Empowerment: Enhancing women's access to quality education, healthcare, and social services.
- Protection and Response: Preventing and addressing violence against women through multi-stakeholder efforts.

4.4 International Conventions

i. Biodiversity

Egypt has a long-standing commitment to biodiversity conservation through participation in several international conventions, including the Convention on the Conservation of African-Eurasian Migratory Waterbirds (AEWA, 1995), the United Nations Convention on Biological Diversity (UNCBD, 1992), the Convention on the Conservation of Migratory Species of Wild Animals (CMS, 1979), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973), and the African Convention on the Conservation of Nature and Natural Resources (1968).

These agreements collectively require the protection of migratory species and wetlands, conservation of biodiversity and ecosystem services, regulation of international wildlife trade, sustainable management of natural resources, and prevention of land degradation and pollution.

ii. Climate change

- **Paris Agreement for strengthening global response to climate change threats, 2016**

Brings together nations to fight climate change and adapt to it while helping developing countries to do so without ignoring their national objectives. It globally aims to keep an overall temperature rise of less than 2° C this year and to pursue more efforts to lower the increase of rise even further by 1.5 ° C. Although the agriculture sector is not mentioned explicitly in the agreement, it does mention efforts to adapt to climate change and resilience in a manner that do not hinder food production. Egypt signed the agreement on the 22nd of April 2016 and ratified it on the 29th of June 2017.

- **United Nations Framework Convention on Climate Change, 1992**

It provides an intergovernmental framework to face climate change issues. Recognizing that the climate is a common shared resource affected by anthropogenic human emissions. It recognizes the importance of marine environments as well as terrestrial ones in acting as reservoirs for Carbon and GHG. It also emphasizes the importance of scientific, economic and practical sectors in tackling climate change problems and the importance of continuous monitoring and assessment. In addition, it promotes the diffusion and transfer of technologies that reduce anthropogenic emissions of GHG in sectors including

agriculture and industry. Egypt signed this convention on the 9th of June 1992 and ratified it on the 5th of December 1994. It entered into force on the 5th of March 1995.

- **Kyoto Protocol setting internationally binding emission reduction targets, 1997**

The protocol aims to commit its joined parties to specific international emission targets and aims to strengthen the global response to the temperature rise. It recognizes that currently developed countries are the main cause of the presently high emissions of GHG in the atmosphere, a result of 150 years. It provides flexibility on how the countries reach their target (e.g., increase in forests to compensate for their emissions). In addition, the protocol requires parties to promote sustainable agriculture practices while taking into consideration the climate change factor. Egypt signed this protocol on the 15th of March 1999 and ratified it on the 12th of January 2005. It entered into force on the 12th of April 2005 as an agreement to the UNFCCC convention.

iii. Cultural Heritage

- **Convention for the Safeguarding of the Intangible Cultural Heritage, 2003**

The Convention for the Safeguarding of the Intangible Cultural Heritage is a United Nations Educational, Scientific and Cultural Organization UNESCO treaty adopted by the UNESCO General Conference on 17 October 2003, which entered into force in 2006. The “intangible cultural heritage” means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts, and cultural spaces associated therewith – that communities, groups, and in some cases, individuals recognize as part of their cultural heritage. The purposes of the convention are: (a) to safeguard the intangible cultural heritage; (b) to ensure respect for the intangible cultural heritage of the communities, groups, and individuals concerned; (c) to raise awareness at the local, national, and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; and (d) to provide for international cooperation and assistance. Egypt ratified the convention on 3 August 2005. Article 13 of the convention states that “to ensure the safeguarding, development, and promotion of the intangible cultural heritage present in its territory, each State Party shall endeavor to adopt a general policy aimed at promoting the function of the intangible cultural heritage in society, and at integrating the safeguarding of such heritage into planning programs”.

- **Convention for the Protection of the World Cultural and Natural Heritage, 1972**

The General Conference of the UNESCO meeting was held in Paris from 17 October to 21 November 1972, at its seventeenth session.

- Egypt ratified the convention on the 7th of February 1974.
- The convention sets guidelines for parties to help them identify locations that can be world heritage sites and means to conserve them.
- The convention provides management guidelines and possibly financial assistance.
- Moreover, raising awareness and education is also encouraged to improve the protection of those sites.

iv. Work Environment

The ILO conventions are international standards that complement national labor laws. The following international standards are crucial in creating a safe, fair, and non-discriminatory work environment that respects and protects the rights of all workers.

Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87):

This convention guarantees workers and employers the right to form and join organizations of their choosing without prior authorization.

Right to Organise and Collective Bargaining Convention, 1949 (No. 98):

This convention provides protection against anti-union discrimination and promotes voluntary negotiations between employers and workers to determine wages and working conditions through collective bargaining.

Forced Labour Convention, 1930 (No. 29) and its 2014 Protocol:

This convention aims to suppress all forms of forced or compulsory labour. The 2014 Protocol strengthens the measures to prevent forced labour and provides protection and remedies for victims.

Abolition of Forced Labour Convention, 1957 (No. 105):

This convention calls for the immediate and complete abolition of forced or compulsory labour in all its forms, particularly for political coercion, economic development, labour discipline, or racial, social, national, or religious discrimination.

Minimum Age Convention, 1973 (No. 138):

This convention sets the minimum age for admission to employment and work, ensuring that children are not exposed to work environments that can harm their health, safety, or morals.

Worst Forms of Child Labour Convention, 1999 (No. 182):

This convention focuses on eliminating the worst forms of child labour, including slavery, forced labour, trafficking, prostitution, and any work that is likely to harm the health, safety, or morals of children.

Equal Remuneration Convention, 1951 (No. 100):

This convention mandates equal remuneration for men and women workers for work of equal value, aiming to reduce gender pay gaps and promote economic justice.

Discrimination (Employment and Occupation) Convention, 1958 (No. 111):

This convention seeks to eliminate discrimination in employment and occupation based on race, color, sex, religion, political opinion, national extraction, or social origin.

Occupational Safety and Health Convention, 1981 (No. 155):

This convention aims to ensure that occupational safety and health measures are in place to protect workers from workplace hazards and promote safe working environments.

Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187):

This convention provides a framework for continuously improving occupational safety and health systems to prevent workplace accidents and diseases, fostering a culture of prevention.

4.5 Institutional Framework

Several governmental entities have regulatory and oversight responsibilities for the project, including:

- **Egyptian Environmental Affairs Agency (EEAA):** Responsible for reviewing and approving the ESIA and monitoring environmental compliance.
- **New and Renewable Energy Authority (NREA):** Responsible for land allocation and oversight of renewable energy developments.
- **Egyptian Electricity Transmission Company (EETC):** Responsible for grid connection arrangements and electricity transmission infrastructure.
- **Ministry of Electricity and Renewable Energy (MoERE):** Provides strategic oversight of the electricity sector and renewable energy development.
- **Ministry of Labour:** Responsible for enforcement of labour and occupational health and safety requirements.
- **Minya Governorate and Local Authorities:** Responsible for local administrative coordination and permitting requirements.

Ministry of Tourism and Antiquities (MOTA): Responsible for the protection of archaeological and cultural heritage resources.

4.6 International Standards and Guidelines

In addition to complying with Law 4/1994, the ESIA study has been prepared in accordance with the requirements of international financial institutions, particularly the EBRD and the AfDB for projects seeking funding.

The sections below provide a summary of the International E&S Requirements.

4.6.1 African Development Bank Group's Operational Safeguards (AFDB OS)

The Bank has defined the E&S Operational Safeguards (OSs), as part of its Integrated Safeguards System (ISS 2023), which are designed to maximize positive impacts and to avoid, minimize, reduce, mitigate or compensate for the adverse E&S risks and impacts of projects, including those related to climate change.

OS1: Assessment and Management of Environmental and Social Risks and Impacts

It addresses how the borrower will address the environmental and social risks and impacts of the project throughout the project life cycle to meet the requirements of the Environmental and Social Safeguards (ESSs) in a manner and within a time frame acceptable to the Bank.

This safeguard is applicable to most projects and applies to the proposed project.

OS2: Labor and Working Conditions

It recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Also, the importance of treating workers in the project fairly and providing safe and healthy working conditions and respect of workers' rights to promote sound worker-management relationships and enhance the development

benefits of a project.

This safeguard is applicable to the proposed project during the construction and operation phases.

OS3: Resources Efficiency and Pollution Prevention and Management

It recognizes that economic activities often cause air, water, and land pollution and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels. It sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle in a manner consistent with GIIP.

This safeguard is applicable on the construction and operation phases of the project.

OS4: Community Health, Safety and Security

It recognizes that projects, activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to a project or activities. It addresses the health, safety, and security risks to and impacts on project-affected communities and the corresponding responsibility of the Borrower to avoid or minimize them.

This safeguard is applicable on the construction and operation phases of the project.

OS5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement

It recognizes that involuntary resettlement should be avoided, and where involuntary resettlement is unavoidable, it will be minimized, and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.

This safeguard does not apply to the proposed project since the Project comprises a BESS facility and shared substation within the Dandara PV Project area and an OHTL route traversing government-owned desert land. Based on the current Project design, no physical or economic displacement, restrictions on access to land or natural resources, or other involuntary resettlement impacts have been identified.

OS6: Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources

It recognizes the importance of protecting biodiversity, maintaining ecological functions, and sustainably managing living natural resources, including consideration of climate resilience and livelihoods.

The Project is located within the Dandara PV Project area in Qena Governorate and comprises a BESS facility, a shared 33/220 kV substation, and an approximately 1 km overhead transmission line route. Biodiversity surveys undertaken as part of the ESIA did not identify any protected areas, critical habitats, or biodiversity features of significant conservation value

within the Project footprint or Area of Influence.

This Operational Safeguard is applicable to the Project, as construction activities will take place within a desert environment and may result in limited impacts on local ecological receptors. However, no significant impacts on biodiversity or living natural resources are anticipated, provided that the proposed mitigation measures are implemented.

OS7: Vulnerable Groups

OS7 requires assessment and mitigation of impacts on vulnerable groups, including women, children, the elderly, and indigenous peoples. It contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being.

This safeguard is applicable on the construction and operation phases of the project.

OS8: Cultural Heritage

It sets out measures designed to protect cultural heritage throughout the project life cycle.

In case of chance finds, the procedures outlined in the Egyptian Antiquities Law No. 117 of 1983 will be followed.

Although no cultural heritage components are anticipated within the project site, the archaeological sites near the proposed project location will be addressed in the ESIA.

OS9: Financial Intermediaries

It recognizes that strong domestic capital and financial markets, and access to finance are important for economic development, growth, and poverty reduction. Also, it addresses the E&S requirements associated with intermediated financing through financial and nonfinancial institutions.

This safeguard is not applicable to the present project.

OS10: Stakeholder Engagement and Information Disclosure

It recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.

This safeguard is applicable to the project. Stakeholder engagement activities will be undertaken in a manner proportionate to the nature, scale, and potential environmental and social risks and impacts of the Project. Information disclosure and stakeholder consultation will be conducted in accordance with the requirements of OS10 and applicable national regulations, and a grievance mechanism will be established to receive and address stakeholder concerns throughout the Project lifecycle.

A gap analysis between the applicable African Development Bank (AfDB) Operational Safeguards (OSs) under the Integrated Safeguards System (ISS, 2023) and the relevant Egyptian environmental and social regulatory framework is presented in Annex (1)

4.6.2 EBRD Environmental and Social Requirements

The Project will comply with the European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (2024). In accordance with the EBRD Environmental and Social Policy, the Project will be screened and categorized by EBRD based on its environmental and social risks and impacts. The applicable EBRD Environmental and Social Requirements (ESRs) are summarized below.

Below summarizes the relevance and applicability of each EBRD Environmental and Social Requirement (ESR) to the proposed project.

ESR 1: Assessment and Management of Environmental and Social Risks and Impacts

This requirement establishes the overarching framework for identifying, evaluating, and managing environmental and social risks. It mandates the development of an Environmental and Social Management System (ESMS), supported by an ESIA and Environmental and Social Management Plan (ESMP). Stakeholder engagement and application of the mitigation hierarchy are fundamental components.

This requirement is relevant to most projects and applies to the current one.

ESR 2: Labour and Working Conditions

This ESR emphasizes the relation between the economic growth and the well-being of a company in one side and establishing a relationship with the workers as a valuable asset that requires a healthy and safe work environment as well as protection for basic rights of workers. It also recognizes the need for employment creation and income generation as an approach for economic growth. It pertains to issues around labour and working conditions, occupational health and safety, migrant labour, etc.

This ESR applies to the proposed project during the different phases; more specifically regarding employment opportunities as well as ensuring the safe environment of the workplace. The PR also addresses suppliers and contractors monitoring. In this respect, companies should identify the roles, impacts, and risks associated with their supply chain concerning labour issues (child and forced labour and significant occupational health and safety risks).

ESR 3: Resource Efficiency and Pollution Prevention and Control

This ESR promotes pollution prevention, efficient resource use, and adherence to Good GIIP. It addresses air and water emissions, waste management, and greenhouse gas mitigation.

The requirement applies to the potential emissions and wastes (solid and liquid) from different sources during the construction and operation phases and their potential impacts.

ESR 4: Health, Safety, and Security

This ESR recognizes that the project activities and infrastructure can increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failure, and releases of hazardous materials. Impacts may also occur from exposure to diseases and the use of safety and security personnel. Additionally, the EBRD requires addressing the

potential gender-based violence and harassment (GBVH), recognizing its severe impact on women's health and wellbeing. This includes identifying and mitigating risks related to physical, mental, or sexual harm and ensuring safe, inclusive working conditions.

The proposed Project comprises a utility-scale Battery Energy Storage System (BESS), a shared 33/220 kV substation, and an approximately 1 km overhead transmission line (OHTL) located within the Dandara PV Project area in Qena Governorate. The Project will be implemented within a controlled project area, and no physical displacement or land acquisition affecting local communities has been identified. Interaction with surrounding communities during construction and operation is expected to be limited and indirect.

Potential health, safety, and security risks to workers, nearby communities, and road users may arise during construction and operation, including traffic-related risks, electrical hazards, fire and thermal runaway risks associated with battery storage systems, and risks associated with OHTL construction and operation. However, these risks are expected to be localized and manageable through appropriate engineering design, operational controls, emergency preparedness measures, security management procedures, and Good International Industry Practice (GIIP).

Accordingly, no significant community health, safety, or security impacts are anticipated. Nevertheless, the ESIA assesses these risks and identifies appropriate mitigation measures in accordance with national requirements and EBRD Environmental and Social Requirements.

ESR5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement

This ESR ensures that any displacement is minimized and that affected individuals are compensated fairly. It mandates meaningful consultation and livelihood restoration where applicable.

The provisions of this requirement do not apply to the proposed project, as no physical or economic displacement, land acquisition from private users, or restrictions on access to land or natural resources have been identified. Based on the current Project design, no involuntary resettlement impacts are anticipated.

ESR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This performance requirements addresses how projects can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources.

As a significant part of the ESIA, the biological baseline of the Project Site has been assessed. The Project is located within the Dandara PV Project area in Qena Governorate and comprises a BESS facility, a shared 33/220 kV substation, and an approximately 1 km overhead transmission line route. The biodiversity assessment confirmed that the Project Site is situated within a highly arid desert environment characterized by limited ecological value and an absence of sensitive biodiversity features. No protected areas, Key Biodiversity Areas, critical habitats, or biodiversity features of significant conservation importance were identified within the Project footprint or Area of Influence.

Accordingly, the ESIA describes the general environmental context of the surrounding desert and industrial landscape and evaluates potential project-related impacts on biodiversity where relevant.

ESR 7: Indigenous Peoples

This performance requirement aims at preventing adverse impacts of the projects on communities of Indigenous Peoples and to provide opportunities for development benefits.

Provisions of this ESR do not apply to the proposed project since there are no indigenous communities in the area.

ESR8: Cultural Heritage

The objective of this performance standard is to protect the cultural heritage from the adverse impacts of the project activities and support its preservation.

There are no registered antiquities or cultural heritage sites within the Project Site or its Area of Influence. Accordingly, no impacts on known cultural heritage resources are anticipated. However, *chance find procedures will be implemented during construction.*

ESR9: Financial Intermediaries

Applies to projects involving Financial Intermediaries (FIs), where financing is provided through a financial institution that subsequently finances or invests in sub-projects.

ESR9 is not applicable to the proposed Project.

ESR10: Information Disclosure and Stakeholder Engagement

Sets out the principles and requirements for meaningful stakeholder engagement throughout the lifecycle of a project. It aims to ensure transparency, inclusivity, and responsiveness by requiring the early disclosure of relevant project information, ongoing consultation with affected communities and stakeholders, and the establishment of accessible grievance mechanisms.

ESR10 is applicable to the Project. Stakeholder engagement activities will be undertaken throughout the Project lifecycle in a manner proportionate to the nature, scale, and potential environmental and social risks and impacts of the Project. Information disclosure, stakeholder consultation, and grievance management will be implemented in accordance with the requirements of ESR10 and applicable national regulations.

- **European Investment Bank (EIB)**

The European Investment Bank (EIB) applies eleven Environmental and Social Standards (2023) to ensure that projects it finances are environmentally sound, socially responsible, and aligned with EU and international commitments.

Standard 1: Environmental and Social Impacts and Risks

This Standard promotes an integrated approach to impact assessment and risk management, ensuring environmental, climate, social, and human rights considerations are addressed in decision-making. It mandates the establishment of an ESMS by the promoter. The process

involves: Identifying and assessing likely significant effects, including direct, indirect, secondary, cumulative, and transboundary effects. Applying the mitigation hierarchy (avoid, prevent, reduce, and, if necessary, remedy/compensate) to manage adverse effects. Integrating human rights risks into the assessment. Ensuring consistency with the "Do Not Significant Harm" (DNSH) and "Minimum Safeguards" (MS) principles. Projects likely to have significant impacts must undergo an EIA (in the EU) or ESIA (in the rest of the world).

This standard is relevant to most projects and applies to the proposed project.

Standard 2: Stakeholder Engagement

This Standard recognizes the importance of stakeholder engagement for effective assessment, management, and monitoring of risks, enhancing project sustainability. It outlines the promoter's responsibility for transparent and continuous engagement. The core objectives are: Adopting an inclusive and systematic approach to engaging constructively with affected persons and communities. Ensuring stakeholders have timely access to information about project risks/impacts in a culturally appropriate and understandable manner. Promoting meaningful and free participation in decision-making. Providing rights-holders with effective grievance and remedy mechanisms. The nature and extent of engagement must be commensurate with the project's likely impacts and risks.

This Standard is applicable to the proposed project.

Standard 3: Resource Efficiency and Pollution Prevention

This Standard promotes the goal of zero pollution and transitioning to a circular economy. The primary responsibility is ensuring an integrated approach to resource efficiency and control of emissions (air, water, land, noise). Key areas of focus include: Assessing the effectiveness and efficiency of resource use (materials, land, soil, water, energy). Promoting waste prevention, reuse, and recycling in accordance with the waste hierarchy. Using Best Available Techniques (BAT). Establishing management systems for Emergency Prevention, Preparedness and Response to major accidents (e.g., related to dangerous substances). Ensuring the sound management of hazardous substances and materials.

The standard applies to the project during the construction and operation phases.

Standard 4: Biodiversity and Ecosystems

This Standard focuses on protecting and conserving biodiversity and maintaining ecological functions. It recognizes the link between ecosystem degradation and disproportionate impacts on vulnerable communities. The objectives are: Applying the precautionary approach to avoid irreversible impacts. Applying the mitigation hierarchy (avoid, minimize, restore, compensate) to achieve No Net Loss or a Net Positive Impact (NPI) on biodiversity where required. Promoting the use of an ecosystem-based approach. Prohibiting project-related activities in areas of critical habitat unless rigorous conditions are met, ensuring no measurable adverse impacts or net reduction in vulnerable species population.

This Standard applies to the proposed project.

Standard 5: Climate Change

This Standard addresses the urgency of combating climate change through mitigation (reducing GHG emissions) and adaptation (building resilience). It promotes alignment with the Paris Agreement goals. Promoter responsibilities include: Assessing project-related GHG emissions and alignment with low-carbon pathways. Assessing the project's resilience to physical climate risks (acute and chronic hazards). Where a project is at risk, carrying out a Climate Risk and Vulnerability Assessment (CRVA) to identify commensurate adaptation measures. Ensuring consistency with the "Do No Significant Harm" (DNSH) principle to climate objectives.

This Standard applies to the proposed project.

Standard 6: Involuntary Resettlement

This Standard applies to displacement—both physical displacement (loss of residence) and economic displacement (loss of income/livelihood)—resulting from involuntary land acquisition or use restriction. The primary goals are: To avoid or minimize involuntary resettlement. To avoid any forced evictions (which are considered a gross violation of human rights). To improve or at least restore displaced persons' livelihoods and living standards to pre-project levels. Mandating timely compensation for loss of assets at the full replacement cost. Planning documents must be prepared, such as a Resettlement Action Plan (RAP) or Livelihood Restoration Plan (LRP).

This standard does not apply to the proposed project.

Standard 7: Vulnerable Groups, Indigenous Peoples and Gender

This Standard addresses individuals and groups who may be disproportionately affected by risks due to systematic discrimination, marginalisation, and/or exclusion based on socioeconomic characteristics (e.g., gender, age, disability, ethnicity). The objectives are: To address inequalities and facilitate equitable access to mitigation and benefits. Requiring promoters to adopt a gender-responsive approach to identifying, managing, and monitoring impacts. For Indigenous Peoples: Ensuring respect for their rights, identity, culture, and livelihoods. In required cases (e.g., impacts on customary lands or cultural resources), promoters must obtain Free, Prior and Informed Consent (FPIC).

Provisions of this standard do not apply to the proposed project since there are no indigenous communities in the area.

Standard 8: Labour Rights

This Standard establishes minimum requirements aligned with the principles of the ILO Fundamental Conventions and the European Pillar of Social Rights. It applies to direct workers, third-party workers (contractors/intermediaries), and supply chain workers. Key requirements include: Ensuring non-discrimination and equal opportunity in employment decisions. Implementing zero tolerance for forced labor and child labor. Respecting the rights to freedom of association and collective bargaining. Establishing a written employment contract for all workers. Setting up an effective, gender-responsive grievance mechanism for workplace concerns.

This standard applies to the proposed project during the different phases; more specifically regarding employment opportunities as well as ensuring the safe environment of the workplace.

Standard 9: Health, Safety and Security

This Standard covers occupational and public health, safety, and security risks arising from project activities. It requires promoters to put in place a Health and Safety Management System (HSMS). The objectives focus on: Protecting the health, safety, and security of project workers (including third parties and considering gender-specific risks). Managing risks to project-affected people and communities (including sexual harassment, exploitation, and abuse). Ensuring the use of public or private security forces is consistent with international human rights standards (e.g., the UN Voluntary Principles on Security and Human Rights)

This Standard applies to the proposed project.

Standard 10: Cultural Heritage

This Standard emphasizes the protection and conservation of both tangible and intangible cultural heritage. The core objective is the application of a precautionary approach to managing and protecting cultural heritage. Key actions include: Avoiding significant adverse impacts on cultural heritage; if unavoidable, minimizing them and providing compensation as a last resort. Engaging professionals to compile a baseline inventory and assess cultural significance. Establishing chance finding procedures for unexpected discoveries during implementation. Ensuring equitable sharing of benefits when commercializing cultural resources used by local communities

This Standard applies to the proposed Project. Although there are no registered antiquities or cultural heritage sites within the Project Site or its immediate vicinity, the nearest identified archaeological site (Hur) is located approximately 9.5 km northwest of the Project Site. Relevant cultural heritage receptors within the wider study area are nevertheless considered in this ESIA, and a Chance Find Procedure will be implemented during construction activities.

Standard 11: Intermediated Finance

This Standard applies when EIB financing is channeled through Financial Intermediaries (FIs) to support smaller sub-projects. The FI's process for assessing, managing, and monitoring ECS risks must be commensurate with the sub-project's risk level. General requirements for FIs include: Respecting their own employees' labour rights and providing a safe working environment. Requiring final beneficiaries to comply with applicable national and EU legislation (or EIB ESS outside the EU). Operating processes to screen sub-projects against the EIB's excluded activities list. Ensuring rights-holders have access to stakeholder engagement and grievance mechanisms.

This Standard does not apply to the proposed Project, as the Project is not financed through a Financial Intermediary and does not involve intermediary lending arrangements.

4.6.3 IFC Performance Standards on Environmental and Social Sustainability

PS1: Assessment and Management of Environmental and Social Risks and Impacts

This Performance Standard establishes the importance of:

- i. Integrated assessment to identify the environmental and social risks, impacts, and opportunities associated with a project;
- ii. Effective stakeholder engagement through the disclosure of project-related information and consultation with stakeholders on matters that may affect them;
- iii. The establishment and maintenance of an Environmental and Social Management System (ESMS) to manage environmental and social risks and impacts throughout the project lifecycle.

This PS applies to the Project, as it establishes the requirements for the assessment and management of environmental and social risks and impacts and for stakeholder engagement throughout the project lifecycle.

PS2: Labor and Working Conditions

This performance standard emphasizes the relation between the economic growth and the well-being of a company in one side, and establishing a relationship with the workers as a valuable asset that requires a healthy and safe work environment as well as protection for basic rights of workers. It also recognizes the need for employment creation and income generation as an approach for economic growth.

This PS applies to the current project; more specifically related to the creation of job opportunities as well as ensuring the safe environment of the workplace.

PS3: Resource Efficiency and Pollution Prevention

This performance standard recognizes that industrial activities often generate increased levels of pollution to air, water, and land, which can have a potential adverse impact on the surrounding environment.

This Performance Standard is applicable to the project, as it addresses the prevention and management of potential pollution sources during construction and operation.

PS4: Community Health, Safety, and Security

This performance standard recognizes that the project activities and infrastructure can increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failure, and releases of hazardous materials. Impacts may also arise from exposure to diseases and the use of safety and security personnel.

This PS applies to the proposed project during the construction and operation phase of the project.

PS5: Land Acquisition and Involuntary Resettlement

This performance standard recognizes that the project design minimizes economic and physical displacement, balancing social, environmental, and financial costs and benefits.

The Project comprises a BESS facility and a shared 33/220 kV substation located within the Dandara PV Project area, together with an approximately 1 km OHTL route traversing government-owned desert land. Based on the current Project design, no physical or

economic displacement of communities, households, businesses, or other land users is anticipated. In addition, no land acquisition-related impacts, restrictions on access to land or natural resources, or livelihood impacts have been identified.

Accordingly, no involuntary resettlement or economic displacement impacts are expected as a result of the Project.

PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This performance standard addresses how projects can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources.

The biodiversity assessment undertaken as part of the ESIA confirmed that the Project Site and Area of Influence are located within a highly arid desert environment and do not contain any critical habitats, protected areas, or other biodiversity features of significant conservation value.

Accordingly, while PS6 is applicable to the Project, no significant impacts on biodiversity or living natural resources are anticipated. The Project will implement the biodiversity-related mitigation and monitoring measures included in the ESMP to ensure that potential impacts during construction and operation are appropriately managed.

PS7: Indigenous Peoples

This performance standard aims at preventing adverse impacts of the projects on communities of Indigenous peoples and to provide opportunities for development benefits.

This PS does not apply to the proposed project since there are no indigenous communities in Egypt.

PS8: Cultural Heritage

The objective of this performance standard is to protect the cultural heritage from the adverse impacts of the project activities and support its preservation.

No recorded archaeological sites or known cultural heritage resources have been identified within the Project site. Therefore, significant impacts on cultural heritage are not anticipated. However, chance find procedures will be developed and implemented during construction in accordance with national requirements and IFC PS8.

PS9: Financial Intermediaries

This Performance Standard recognizes the environmental and social responsibilities of Financial Intermediaries (FIs) and establishes requirements for managing environmental and social risks associated with FI financing activities.

This PS does not apply to the proposed Project, as the Project is not being developed or financed through a Financial Intermediary and does not involve FI subprojects.

4.6.4 World Bank Group Environmental, Health, and Safety (EHS) Guidelines

The World Bank Group members are committed to abiding by the general EHS Guidelines for different projects where they are involved. These are complemented by industry-specific guidelines for complex projects.

The EHS Guidelines are technical reference documents with general and industry-specific examples of GIIP. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines include performance measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

IFC Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission and Distribution

The EHS Guidelines for Electric Power Transmission and Distribution ⁷ outline key EHS issues related to electric power transmission, distribution and substation with a focus on those arising during the construction and operation phases of a facility. Recommendations for effectively addressing these issues were also included. Additionally, further guidance on managing environmental impacts during the construction and decommissioning phases of power transmission and substation systems could be found in the General EHS Guidelines.

Battery Energy Storage System (BESS) Good International Industry Practice

The Project has considered relevant Good International Industry Practice (GIIP), including NFPA 855: Standard for the Installation of Stationary Energy Storage Systems, IEC 62933 (Electrical Energy Storage Systems), IEC 62619 (Safety Requirements for Lithium Batteries Used in Industrial Applications), UL 9540 (Energy Storage Systems and Equipment), and UL 9540A (Thermal Runaway Fire Propagation Testing of Battery Energy Storage Systems). These standards provide guidance on battery system design, fire and life safety, emergency preparedness and response, thermal runaway prevention, and operational safety.

⁷ <https://www.ifc.org/content/dam/ifc/doc/2000/2007-electric-transmission-distribution-ehs-guidelines-en.pdf>

5. Analysis of Alternatives

The analysis of alternatives assesses feasible project options during the conceptual and pre-feasibility design phases. The assessment considers technical, economic, environmental, and social factors to ensure that the selected option is viable, environmentally sound, socially acceptable, and compliant with applicable Egyptian laws and regulations, as well as relevant international requirements.

5.1 No Project Alternative

The “no project” alternative assumes that the proposed BESS and shared substation and the overhead transmission lines (OHTLs) will not be developed.

Under this alternative, the intended benefits of the project would not be realized. These benefits include enhanced grid stability and reliability through energy storage, improved operational flexibility of the electricity network, increased capacity to integrate renewable energy generation, and strengthened transmission infrastructure to support efficient power evacuation and distribution within the national grid. In addition, the Project would not generate the anticipated socioeconomic benefits, including employment opportunities, local procurement, and economic activity during the construction and operation phases.

From an environmental perspective, the implementation of the “No project” alternative would avoid the localized and temporary environmental and social impacts associated with the construction and operation of the BESS facilities and associated transmission infrastructure. However, it would also eliminate the wider environmental benefits associated with improved energy system efficiency, enhanced renewable energy integration, and the optimization of existing electricity transmission infrastructure.

Considering the project’s industrial location, limited footprint, and limited environmental and social impacts, as well as its role in supporting national energy system performance, *the “no project” alternative is not considered a suitable alternative for this project.*

5.2 Site Selection Alternatives

The site selection process considered the need to locate the BESS in close proximity to the Dandara PV Power Plant, the planned shared 33/220 kV substation, and the existing transmission network. Key selection criteria included land availability, land use compatibility, distance to the point of interconnection, constructability, avoidance of sensitive receptors, avoidance of known environmentally sensitive areas, minimization of land take, access for construction and operation, and compatibility with existing and planned electrical infrastructure.

Alternative sites outside the Dandara PV Power Plant area were considered less favorable because they would require longer electrical connections, additional land acquisition or permitting, potentially greater construction disturbance, and reduced efficiency in sharing substation and grid connection infrastructure. The selected site benefits from its location

within an area already designated for renewable energy development and associated electrical infrastructure, thereby reducing the need for new linear infrastructure and limiting incremental environmental and social impacts.

5.3 Project Design Alternatives

Project design alternatives were considered during the conceptual and pre-feasibility stages to confirm that the selected configuration provides the required storage capacity, grid support functions, operational reliability, and environmental and social performance. The assessment considered the arrangement of the BESS containers, power conversion systems, transformers, internal access roads, fire protection systems, drainage, control systems, and interface with the shared 33/220 kV substation. The preferred design adopts a modular containerized BESS arrangement using lithium iron phosphate battery chemistry, supported by integrated battery management, thermal management, fire detection and suppression, and supervisory control systems. This configuration was selected because it allows reduced construction complexity, improved maintainability, and separation between units to support operational safety and emergency response.

Alternative design layouts involving more compact container spacing, dispersed BESS blocks, or reliance on non-standardized equipment were not retained because they would either increase operational safety risks, complicate cable routing and maintenance access, extend the construction schedule, or reduce flexibility for future augmentation and replacement. The selected project design is therefore considered the most appropriate option as it balances technical performance, safety, constructability, environmental control, and long-term operability.

5.4 System-Level Alternatives

At the system level, alternatives were reviewed to determine whether the project objectives could be achieved through options other than a utility-scale BESS. The principal system-level alternatives considered included grid reinforcement without storage, curtailment of renewable energy generation, conventional dispatchable generation, demand-side management, and energy storage.

Grid reinforcement alone would improve transmission capacity but would not provide rapid response, frequency support, ramp-rate control, or short-duration flexibility.

Curtailment would reduce operational stress on the grid but would also reduce renewable energy utilization and would not support the wider objective of increasing clean energy integration.

Conventional generation could provide dispatchability but would introduce fuel consumption, greenhouse gas emissions, air emissions, and higher operating costs.

Demand-side management may provide useful flexibility but cannot independently deliver the scale, response time, and operational certainty required for this project.

A BESS was retained as the preferred system-level option because it provides fast-response flexibility, supports renewable energy integration, enhances grid stability, and can be installed within a relatively limited footprint and construction period. The selected option also avoids the continuous emissions associated with fossil-fuel-based alternatives and is compatible with the planned renewable energy and transmission infrastructure in the project area.

5.5 Grid Connection Alternatives

Grid connection alternatives were reviewed to identify the most technically feasible and least-impact option for evacuating and injecting power to the national grid. The alternatives considered included direct connection to a more distant substation, construction of a new independent grid connection corridor, underground cable connection, and connection through a Loop-In-Loop-Out arrangement to the existing 220 kV transmission line connecting Nagaa Hammadi Industrial Zone Substation and Obelisk Substation.

Direct connection to a more distant substation or development of a new independent corridor would increase route length, require additional towers and foundations, increase land disturbance, and create additional construction interfaces. Underground cabling would reduce visual impacts but would require extensive trenching, higher capital cost, longer installation duration, more complex fault detection and repair, and greater temporary disturbance to soils and access routes. The selected LILO arrangement was retained because it provides a technically robust connection to the existing 220 kV network while minimizing route length, land requirements, construction disturbance, and the number of new transmission structures.

5.6 BESS Alternatives

- *Lithium-Ion Containerized Batteries*

Lithium-ion Battery Energy Storage Systems consist of multiple electrochemical cells assembled into modules, racks, and containerized units. Each cell contains a positive electrode (cathode), negative electrode (anode), and electrolyte, enabling the storage and release of electrical energy through reversible electrochemical reactions, as shown in Figure 5-1 below.

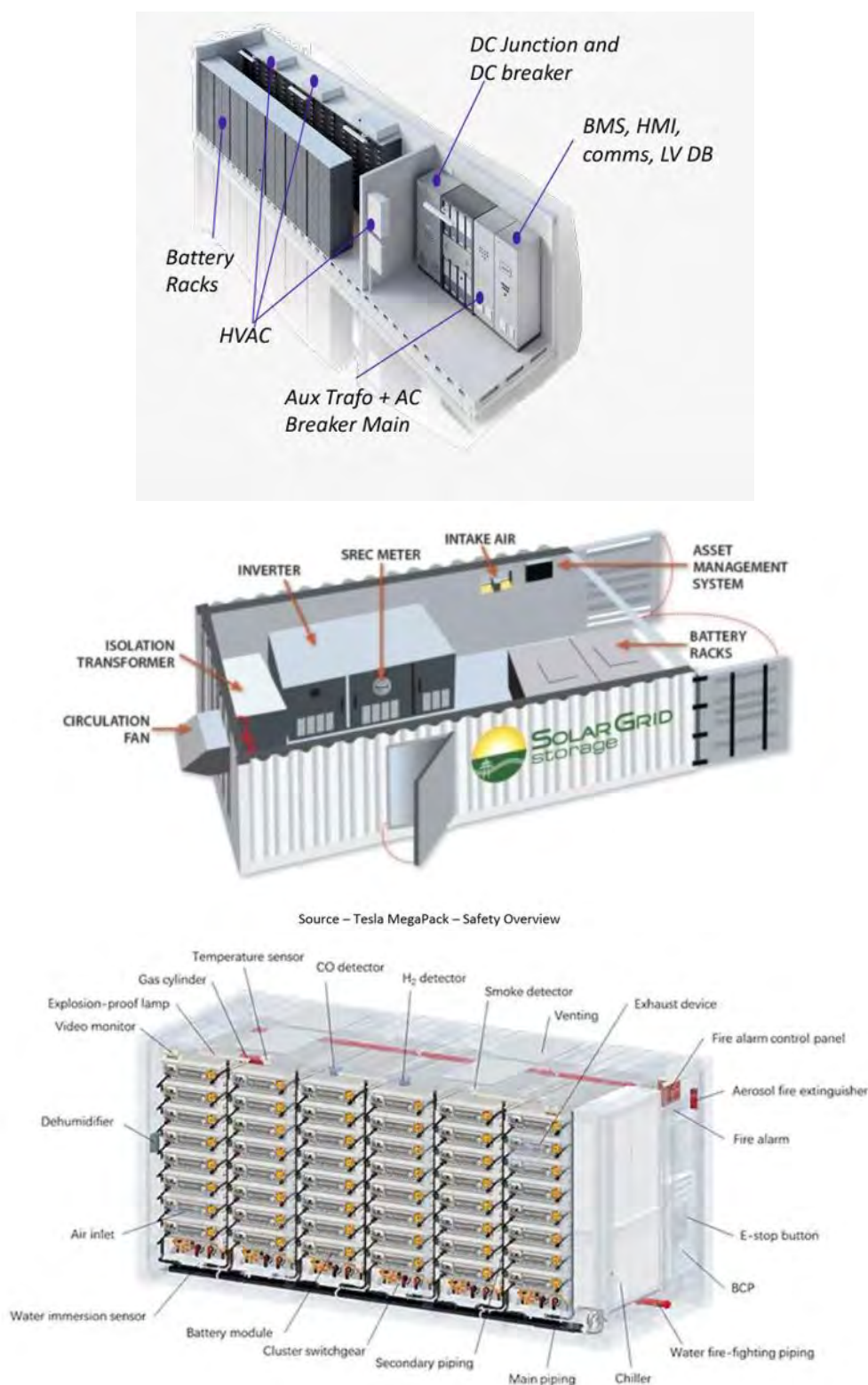


Figure 5-1: BESS systems

The possibility of thermal runaway potentially resulting from improper operation, such as increased battery temperature, overcharging, or discharging. Li-Ion battery technologies have different chemistries, among the most promising ones are: lithium-ion titanate (LTO), lithium iron phosphate (LiFePO₄), and lithium nickel manganese cobalt (NMC).

Several lithium-ion chemistries are commercially available for grid-scale applications, including:

- Lithium Iron Phosphate (LFP)
- Lithium Nickel Manganese Cobalt Oxide (NMC)
- Lithium Titanate (LTO)

Among these:

- LFP batteries provide high thermal stability, lower fire risk, long cycle life, and comparatively lower cost, although with lower energy density.
- NMC batteries provide higher energy density and balanced performance, but with higher thermal runaway risk and greater material criticality.
- LTO batteries provide very long cycle life and rapid charging, but significantly lower energy density and higher cost, limiting grid-scale deployment.

- **Vanadium Redox Flow Batteries (VRFB)**

Vanadium redox flow batteries store energy in liquid electrolytes contained in external tanks, requiring:

- Significantly larger land area due to low energy density
- Management of corrosive liquid electrolytes and spill risk

Given the site footprint constraints and hazardous liquid handling considerations, VRFB technology was not selected.

- **Molten Metal Batteries**

Molten metal batteries operate at elevated temperatures requiring:

- Continuous heating to maintain molten state
- Permanent auxiliary energy consumption
- Increased thermal and operational safety considerations

Due to energy inefficiency and operational complexity, this technology was not selected.

- **Sodium-Ion / High-Temperature Sodium Batteries**

High-temperature sodium-based batteries require operating temperatures of approximately 300–400 °C, necessitating:

- Continuous heating systems
- Elevated fire and safety risks
- Additional energy consumption and maintenance

Accordingly, this technology was not considered suitable for the Project.

based on technical feasibility, safety performance, environmental risk profile, land requirements, lifecycle cost, and alignment with Good International Industry Practice, as well as lifecycle environmental and social considerations including battery safety, end-of-life management, recyclability, and supply chain considerations, the Project has selected containerized lithium-ion Battery Energy Storage Systems using Lithium Iron Phosphate (LFP)

chemistry as the preferred and implemented technology. LFP technology was preferred due to its high thermal stability, lower thermal runaway risk, long operational life, and reduced reliance on critical minerals compared to certain alternative lithium-ion chemistries.

5.7 Cooling System Alternatives

Thermal management is a critical design element of BESS, as battery performance, safety, and service life are strongly influenced by operating temperature. In accordance with Good International Industry Practice (GIIP), cooling system selection depends on factors such as system size, heat generation rate, ambient conditions, and operational requirements. For BESS applications, the most commonly considered cooling approaches are air cooling and liquid cooling.

- **Forced Air-Cooled Systems**

Forced air-cooled systems use fans to circulate ambient air within battery enclosures to remove heat generated by battery modules. These systems have a relatively simple design, do not require liquid coolant, and generally involve lower installation costs.

However, air cooling is less effective at maintaining uniform battery temperatures, particularly in large containerized BESS and under high ambient temperature conditions. The low thermal conductivity of air limits its ability to dissipate high heat loads, which may result in temperature gradients within battery modules. Continuous fan operation may also increase auxiliary power consumption and noise levels.

Air-cooled systems are therefore more suitable for small-scale or low heat-load applications and are not considered optimal for utility-scale BESS installations requiring reliable and consistent thermal control.

Given the site's climatic conditions and the need for reliable thermal management, air-cooled systems were not selected.

- **Open-Loop Liquid Cooling Systems**

Open-loop liquid cooling systems involve the intake of water or another liquid for cooling purposes, followed by discharge after use. Such systems are not commonly applied in containerized BESS projects and are not consistent with GIIP, as they introduce environmental risks related to water abstraction, wastewater generation, and potential contamination, in addition to increased regulatory requirements.

- **Closed-Loop Liquid Cooling with Water-Based Heat Rejection**

This option transfers heat from the battery coolant to a secondary water circuit through liquid-to-liquid heat exchangers. While technically feasible, it requires a reliable source of clean cooling water and introduces water consumption, potential discharge, and additional permitting and operational complexity. Such systems are typically applied in industrial facilities with established cooling water infrastructure.

The cooling process will require water pre-treatment and brine discharge, increasing the project's cost. Given the project's objective to avoid process water use and discharge, this option was excluded from the project design and not retained for further consideration.

- ***Closed-Loop Liquid Cooling with Air-Based Heat Rejection (dry coolers)***

In this configuration, a liquid coolant circulates in a closed loop through cooling plates or heat exchangers in direct thermal contact with the battery modules. Heat absorbed by the coolant is rejected to the ambient environment through air-assisted heat exchangers (dry coolers) equipped with fans. The cooled liquid is then recirculated back to the battery modules. This system provides uniform temperature control across battery cells, which is essential for battery performance, safety, and lifespan. The closed-loop design avoids process water consumption and wastewater generation and is widely adopted in containerized, utility-scale BESS projects.

Based on the above assessment and consistent with GIIP, the project will utilize a closed-loop liquid cooling system with air-based heat rejection using dry coolers. Other cooling alternatives were not retained for further consideration. This conclusion is considered technically justified and feasible for the Project, as the selected system provides reliable and uniform thermal control for utility-scale containerized BESS while avoiding the environmental and permitting constraints associated with process water abstraction, water treatment, wastewater discharge, and brine management. It also addresses lender expectations by demonstrating that the preferred option has been selected through a comparative assessment of practicable alternatives, reduces key environmental and social risks, supports operational reliability and battery safety under local climatic conditions, and remains compatible with the Project's design, cost, implementation schedule, and long-term maintainability.

6. Assessment of Environmental and Social Risks/Impacts and Mitigation Measures

6.1 Methodology

The environmental assessment was carried out to identify and assessing potential risks and impacts of the project on the environment as well as impacts of the environment on the project. The assessment was carried out in four main steps, as follows:

1. Delineation of the Area of Influence;
2. Identification and classification of impacts into irrelevant (scoped out), positive, and negative;
3. Assessment of negative impacts in terms of their significance;
4. Identifying and proposing suitable mitigation measures for minimizing the effects of negative impacts;
5. Evaluation of residual impacts.

The main cumulative impacts have also been assessed using the same methodology applied for evaluating potential negative impacts, incorporating contributions from other existing and foreseeable projects within the Area of Influence

Delineation of the AOI

Aoi may be defined as “such area where significant risks and impacts caused by the project performance are evident on the physical, biotic, social and socioeconomic components of the environment. The expression of these risks and impacts must be objective and, to the extent possible, quantifiable, provided this is feasible, in line with the available methodologies”.

For the proposed Project, the Aoi has been defined proportionate to the nature and scale of construction and operational activities, as described in Chapter 2.

During construction, the Aoi includes the Project Site as well as transportation routes and nearby areas that may experience temporary and localized impacts, such as construction-related traffic and noise.

During operation, the Aoi is limited to the Project footprint, given the controlled nature of activities, the limited operational workforce, and the absence of air emissions.

• ***Identification and Classification of Impacts***

Interaction between the different project activities and the environmental receptors, identified through the baseline information, was carried out. Such interactions may result in negative or positive impacts. The different types of impacts were identified.

Based on the analysis of the baseline environmental conditions and the nature of the receiving environment, some aspects were found to be irrelevant to specific activities of this particular project. These are identified as "scoped out impacts”.

Potentially relevant aspects were subject to a process of impact evaluation, based on the

analysis of the proposed project components and activities, in order to determine the significance of the different impacts. The evaluation process takes into account the information collected in the field, available in the literature and/or based on the professional judgment of the consulting team and public consultation.

Aspects evaluation is based on pre-set criteria including, aspect magnitude, duration, planned mitigation measures, regulatory standards and the susceptibility of environmental receptors.

• **Assessment of Negative Impacts**

The procedure to assess the "significance" of negative impacts is outlined below. It should be noted that the significance of each potential negative impact is determined before and after implementing the mitigation measures and/or applying mitigation, management and monitoring practices (i.e. residual impacts).

The magnitude of an aspect will be determined according to the following criteria:

- The temporal scale or timeframe within which the aspect can occur;
- The spatial scale or size of the aspect; and
- The severity scale or intensity of the aspect.

Temporal scale + spatial scale + intensity scale = Magnitude of aspect

The overall significance of the risk/impact considers the magnitude of an aspect in combination with the susceptibility/vulnerability/value of the receptor or resource, in the absence of quantified standards, as shown in the following table.

Assessment of the overall significance of impacts			
Magnitude of aspect	susceptibility / Vulnerability / Value of Resource / Receptor		
	Low	Medium	High
Negligible	Insignificant	Insignificant	Insignificant
Small	Insignificant	Minor	Moderate
Medium	Minor	Moderate	Major
Large	Moderate	Major	Extreme

• **Mitigation Measures**

The mitigation of impacts follows a hierarchy of actions, referred to as the "Mitigation Hierarchy", which comprises the following sequential steps:

- **Avoidance:** actions taken to fully prevent impacts, such as relocating a project or changing its spatial layout to prevent impacts in specific locations;
- **Minimization:** actions taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided;
- **Restoration:** actions taken to assist in the recovery of a feature that has been degraded, damaged, or destroyed; and
- **Offset:** measurable outcomes resulting from actions designed to compensate for significant residual adverse impacts arising from project development and persisting after appropriate avoidance, minimization, and restoration measures have been taken. These could be applied in both biodiversity conservation (e.g., restore and protect areas degraded by impacts unrelated to the planned development or avert the loss of

biodiversity from impacts unrelated to the planned development) and pollution loads (e.g., by investing in pollution abatement in an adjacent industrial facility emitting pollutants in the same air shed).

Mitigation measures are either incorporated as integral part of the project design or through management and monitoring measures. By implementing mitigation measures, the residual impacts, which are those potentially, remaining after implementing the mitigation measures, should be minimal and acceptable.

Based on the impact identification and evaluation process, mitigation measures are proposed for significant impacts, while minor impacts are usually integrated within the management plans of the project. As much as possible, the avoidance and prevention of impacts is favoured over minimization, restoration or offset.

- **Residual Impacts**

Residual impacts have been evaluated, and their significance is stated in this chapter after the implementation of relevant mitigation measures.

6.2 Impacts and Risks Identification

Interaction between the different activities and the environmental and social receptors, identified through the baseline information, was carried out. Such interactions may result in negative or positive impacts. The different types of risk and impacts were identified.

Based on the analysis of the baseline environmental and social conditions and the nature of the receiving environment, some aspects were found to be irrelevant to the specific activities of this particular project. These are identified as "scoped out impacts".

Potentially relevant aspect was subject to a process of impact evaluation, based on the analysis of the proposed project components and activities, to determine the significance of the different impacts. The evaluation process takes into account the information collected in the field, available in the literature, and/or based on the professional judgment of the consulting team and public consultation. Impact evaluation is based on pre-set criteria including, impact magnitude, duration, planned mitigation measures, regulatory standards, and susceptibility of environmental receptors.

- **Scoped Out Impacts**

The potential impacts of the project were identified based on the analysis of impacts of surrounding environment and social aspects. This step would facilitate eliminating and scoping out irrelevant impacts, taking into consideration the following:

- Type of project
- Location
- Characteristics of the surrounding environment.
- Receptor susceptibility or importance depends on its nature, value, scarcity, etc.

Examination of the environmental setting of the area and the operational processes has shown that the impact on the following resources/receptors is irrelevant:

Impact on land Acquisition/Resettlement

The Project will be developed within the allocated Dandara PV Project area and does not require the acquisition of additional land. No physical or economic displacement is anticipated.

Accordingly, impacts related to land acquisition and involuntary resettlement are not anticipated and are scoped out of further assessment.

- **Positive Impacts**

Environmental Impacts

1. Support for the integration of renewable energy into the national grid.
2. Reduction of indirect greenhouse gas emissions across the electricity grid through improved energy balancing and reduced dispatch of fossil-fuel based peak generation.
3. No operational air emissions (no combustion processes).
4. Avoidance of new land disturbance by locating the project within Dandara PV Project area.
5. Reduces reliance on fossil-fuel-fired power plants during periods of high electricity demand.

Socio Economic Impacts

1. The project supports electricity consumers through improving availability of electricity during periods of high demand, and improves grid stability and operational flexibility, by acting as a reliable emergency power source during grid disruptions or blackouts, ensuring critical infrastructure remains operational. The enhanced power system reliability will benefit households, commercial establishments and industrial users.
2. Contributes to reducing the risk of power supply shortages during peak consumption periods.
3. Captures energy from solar and releases it when generation drops (e.g., at night or on cloudy days).
4. Storing renewable energy that would otherwise be rejected by a saturated grid.
5. Temporary employment opportunities during construction.
6. Development of technical skills and capacity in energy storage systems.
7. The project will create temporary employment opportunities during the construction phase and contractors will be contractually bound to maximize the local content. Similar maximization of local content will take place during the operational phase, as much as practically feasible.
8. Supports national energy transition objectives and enhances energy security.
9. Enhances local workforce skills in advanced energy storage systems and grid integration technologies.

6.3 Assessment of Potential Negative Impacts and Proposed Mitigation Measures

6.3.1 Potential Impacts during Construction Phase

In general, mitigation measures at the construction phase of any project depend mainly on environmental management procedures, which include preventive maintenance procedures

for construction equipment, and material transport trucks, proper waste management procedures, continuous monitoring, supervision and follow-up procedures.

A. Potential Risks and Impact on the Physical Environment

• **Potential Impacts and risks on Air Quality**

Potential impacts on air quality during the construction phase are mainly associated with exhaust emissions from construction vehicles and mobile equipment operating on-site during site preparation, excavation, foundation works, equipment installation, and material transportation activities. Exhaust emissions may include nitrogen oxides (NO_x), carbon monoxide (CO), sulphur oxides (SO₂), hydrocarbons (HC), and particulate matter. In addition, particulate emissions may occur from the handling of construction materials and temporary stockpiling of imported materials. These emissions are expected to be intermittent.

Construction activities will be carried out within the project footprint including BESS, shared substation and OHTL. The aspects during construction phase are expected to be of short-term duration (20 month) and largely confined to the project site and its immediate surroundings.

Based on the short-term temporal scale, localized spatial extent, and slight intensity, the overall magnitude of the air quality impact is assessed as **SMALL**.

The surrounding environment is predominantly characterized by developed and modified land uses with separation distances limiting exposure beyond the immediate project boundary. Therefore, air quality in the surrounding area is considered to have **LOW** susceptibility to construction-related emissions. Accordingly, the overall significance of the impact on air quality impacts during the construction phase is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the project will implement the following mitigation measures.

- Minimize idling times of construction vehicles and machinery.
- Maintain vehicles and construction equipment in good working condition.
- Cover trucks that transporting fine or loose materials.
- Implement good housekeeping practices across the construction site.

Residual Impacts

No residual impacts.

• **Potential Impacts on Ambient Noise**

Surrounding land uses consist primarily of vacant desert land to the north, east, and west, with an industrial zone located further to the south. The nearest residential settlement, Al-Baraka village, is situated approximately 2.8 km north of the site. Considering the limited footprint of the project, its location within an existing substation, and the temporary nature of construction activities, construction-related noise is expected to attenuate rapidly with distance and remain largely confined to the project boundary and its immediate surroundings.

Based on the short-term duration, localized spatial extent, and moderate intensity of construction noise sources, the overall magnitude of impact on ambient noise levels is assessed as **SMALL**.

The project site is located within an existing industrial and utility development area where background noise levels are influenced by ongoing industrial and electrical infrastructure activities. Sensitive receptors are located at considerable distances from the construction works. Therefore, the susceptibility of surrounding receptors to temporary construction noise is considered **LOW**. Accordingly, the significance of construction-phase noise impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the following mitigation measures will be included in the contracts of the construction contractors:

- Ensure regular maintenance of construction equipment and machinery to minimize noise emissions.
- Use low-noise machinery and equipment where possible.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Provide hearing protection equipment to workers exposed to high noise levels.

Residual Impacts

No residual impacts

• **Potential Impacts on Soil**

Potential impacts on soil during the construction phase are mainly associated with earthworks and excavation activities, management of domestic wastewater, construction waste handling, and the potential for accidental spills or leaks of fuels, oils, lubricants, and other chemicals from construction vehicles and equipment operating within the site.

Construction activities are expected to result in localized and temporary soil disturbance, primarily related to excavation and backfilling, compaction, and handling of excavated material. Given the controlled nature of construction activities, and the absence of long-term soil-intensive uses, the likelihood of soil contamination requiring future remediation or clean-up is considered low.

The potential impacts on soil are expected to be localized and short-term, limited to the construction phase. The intensity of the impact is considered moderate. Accordingly, the overall magnitude of the impact is assessed as **SMALL**.

The soil receptor susceptibility is considered **Medium**, given the previously disturbed condition of the site and its location within an industrial area. Therefore, the overall significance of construction-phase impacts on soil is assessed as **MINOR**.

Mitigation Measures

The following mitigation measures will be implemented to manage and minimize potential impacts:

- Conduct maintenance of vehicles, trucks, and construction equipment off-site where practicable, to minimize on-site spills and effluents.
- Implement spill prevention and response measures, including the availability of spill kits on-site.
- Collect and dispose of any spillages or contaminated materials through licensed and authorized waste contractors.
- Develop and implement a spill management plan as part of the site ESMP.
- Maintain good housekeeping practices to ensure a clean and orderly construction site.
- Provide sealed tanks for collection of domestic wastewater and transport it off-site via authorized contractors for proper disposal, preventing soil contamination.
- Collect solid waste at designated collection points and store it in appropriate containers following regulations.
- Ensure proper handling of hazardous materials and wastes and provide secondary containment for hazardous material/waste storage areas
- Use only licensed contractors for the collection and disposal of non-hazardous and hazardous wastes.
- Establish marked and physically separated storage areas for hazardous waste.

Residual Impacts

B. With the implementation of the above mitigation measures, the residual impacts of construction activities on soil are expected to be **INSIGNIFICANT**.

C. Risks and Impacts on the Biological Environment

The Project Site is located within the Dandara PV Power Plant Project area in Qena Governorate. The site is situated within a desert environment characterized by sparse vegetation and limited habitat value. No protected areas, critical habitats, or other ecologically sensitive features have been identified within the Project footprint or its immediate vicinity.

• ***Disturbance to wildlife***

Construction activities, including site preparation, equipment operation, vehicle movement, and increased human presence, may result in temporary disturbance to wildlife present in the surrounding area. However, given the predominantly disturbed nature of the Project area, the absence of sensitive habitats, and the limited footprint of the proposed development, any disturbance is expected to be localized and temporary.

Potential impacts on wildlife are therefore considered slight in intensity and short-term in duration. Accordingly, the impact magnitude is assessed as **SMALL**.

Receptors are of **LOW** vulnerability, as no sensitive species or habitats have been identified within the Project Site or its Area of Influence. Accordingly, the overall significance of the impact is assessed as **INSIGNIFICANT**.

Mitigation Measures

To avoid attraction of species the following measures will be implemented following:

- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to avoid attraction of vermin and the potential consumption of waste from opportunistic species;
- Provide awareness to the workers to prevent disturbance to any wildlife that may occur in the wider surroundings. Also provide training on the identification and avoidance of sensitive biodiversity features.
- Ensure proper housekeeping practices are followed.
- Ensure the proper maintenance of construction equipment and any other equipment with high noise and vibration potential.
- Prohibit hunting, trapping, collection, or intentional disturbance of wildlife by project personnel.

Residual Impacts

No residual impact.

• **Habitat**

Construction activities at the BESS and shared substation site include site clearance, excavation for foundations, concrete works, installation of equipment, and limited grading within a defined footprint. In addition to the limited construction activities associated with the OHTL that include Right-of-Way (RoW) demarcation, excavation for tower foundations of about 9 towers, concrete pouring, and limited grading. The disturbance will occur within a fixed and confined site boundary, along with 0.5 km linear alignment of the OHTL.

The habitat within the BESS, shared substation, and OHTL footprint consists primarily of bare desert soil. No ecologically sensitive areas, wetlands, or biodiversity hotspots are present within or adjacent to the site. Permanent habitat loss will occur within the BESS, shared substation footprint and the tower's foundation; however, the overall footprint is small relative to the surrounding desert.

Considering the short construction duration, confined spatial extent, and low to moderate intensity of habitat removal. Receptor susceptibility is **LOW** due to the degraded and low-productivity nature of the habitat and absence of conservation-priority features. Accordingly, the overall impact significance is **MINOR**.

Mitigation Measures

Although permanent habitat loss associated with BESS and shared substation footprint as well as tower foundations footprint cannot be fully mitigated, the following measures will be implemented to minimize the spatial extent of disturbance:

- Restrict construction activities strictly to the defined tower footprints and approved working areas.
- Utilize existing tracks and previously disturbed corridors wherever possible.
- Prohibit uncontrolled off-road driving and restrict vehicle movement to designated access routes, avoiding any vegetation patches identified during pre-construction inspections.
- Clearly demarcate construction boundaries prior to work to prevent unnecessary ground disturbance.

- Minimize the footprint of temporary working areas and material storage locations.

Residual Impacts

Following implementation of the above measures, residual impacts on habitat are expected to remain localized, very limited in extent, and of **LOW** significance, and are therefore considered **INSIGNIFICANT**.

- ***Attraction of pests and propagation of invasive species***

Solid waste and sewage wastewater mismanagement may create conditions favorable for the accumulation of standing water and the growth of opportunistic vegetation, which may in turn attract pests (such as insects and rodents), which may be disease vectors. This impact is *slight* in intensity, of short term and at the *study area* level. The magnitude is considered **SMALL** as this is not a continuous and persistent impact and with a low probability of occurrence. Given the **LOW** ecological value of the site, this impact is deemed **INSIGNIFICANT**.

Mitigation Measures

Mitigation measures will mainly include the following:

- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species;
- Ensure proper housekeeping practices are followed; and
- Provide awareness to the workers on the negative impacts of improper solid waste and wastewater management.

Residual Impacts

No residual Impacts.

D. Impact on Cultural Heritage

As indicated in chapter 3 of this ESIA, there are no registered antiquities or cultural heritage sites within the Project Site. The nearest identified archaeological sites are located several kilometers from the site boundary, including Abu Amuri (approximately 10 km north), Hur (approximately 8 km northwest), and Hiw (approximately 9 km northwest). The UNESCO World Heritage Site “Ancient Thebes and its Necropolises” is located approximately 36 km south of the Project Site.

The project site is located on previously disturbed land, and no surface indicators of archaeological remains were identified during the site visit.

Accordingly, no impacts on cultural heritage are expected; however, a Chance Find Procedure will be developed and implemented during construction as a precautionary measure, indicating the actions to be taken in case of any significant findings during site leveling and construction activities.

E. Impacts on Socio Economic Environment

• **Worker Influx**

The construction phase will require a temporary workforce comprising both skilled and unskilled labor. The project will prioritize local employment where feasible, while specialized roles may be filled by non-local workers if necessary. No permanent workers' camps will be established within or near neighboring communities, and most workers are expected to commute daily from their existing places of residence using transportation provided by the project company.

Given the small number of workforce and the and since local workers form the majority of workers, the influx of non-local workers will be minimal. Accordingly, there will be no pressure on local housing, water supply, food availability, and public services. The potential for social disruption, rental inflation, or strain on local infrastructure is therefore considered slight. Given the limited workforce requirements, the absence of worker accommodation facilities, and the anticipated reliance on local labor, the potential for adverse community impacts associated with worker influx, including pressure on local services, social conflict, Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH), is expected to be low. Nevertheless, appropriate management measures will be implemented in accordance with international good practice.. Accordingly, the aspect is localized and short-term with a **SMALL** magnitude.

Sensitive receptors include nearby activities. Considering the limited interaction between the temporary workforce and surrounding activities, receptor susceptibility is **LOW**. Therefore, the overall significance of worker influx impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

Although the impacts before mitigation are insignificant, the project will implement the following mitigation measures.

- Prioritize hiring local workers where possible to minimize need for accommodation in villages.
- Prepare a plan for managing worker influx
- Prohibit informal or speculative hiring ("hiring at the gate").
- Develop and Implement a Labour Management Plan and Workers' Code of Conduct.
- Raise awareness among workers regarding local customs, social norms, and appropriate behavior.
- Establish a worker grievance mechanism.
- Establish a community grievance mechanism accessible to affected stakeholders and capable of handling grievances related to gender based (BGV) violence and sexual exploitation, abuse, and harassment (SEAH).
- Ensure the development and implementation of a stakeholder engagement plan that includes
- Provide training on GBV and SEAH
- Ensure contractor management plans include provisions for worker accommodation and influx, grievance mechanisms, etc and monitor these requirements

Residual Impacts

No residual impacts.

- **Impact of site security**

Security services will be provided by a licensed security company contracted to safeguard the project site. Security personnel will operate on a shift basis and will be responsible for controlling access to the fenced premises.

The presence of security personnel may result in minor interactions with nearby communities, workers and road users. If not properly managed, inappropriate behavior could potentially result in community concerns. However, the impact is expected to be localized and short-term, with a **SMALL** magnitude

Sensitive receptors include nearby communities, site workers, and road users. Given the limited nature of interactions and the controlled security arrangements, receptor susceptibility is considered **LOW**. Accordingly, the overall significance of the impact is assessed as **MINOR**.

Mitigation Measures

- Ensure security personnel are adequately trained on Code of Conduct, human rights principles, use-of-force requirements, conflict de-escalation techniques, cultural awareness and are informed of grievance mechanism.
- Ensure compliance with applicable national laws and human rights principles.
- Implement and maintain a grievance mechanism accessible to workers and community members.
- Establish and implement documented procedures for reporting, recording, investigating, and responding to all security-related incidents or complaints, including allegations of misconduct, use of force, or community complaints.
- Clearly define roles, responsibilities, reporting lines, and accountability mechanisms for security personnel and contractors.
- Ensure that the project grievance mechanism is accessible to workers, contractors, local communities, and other stakeholders, including vulnerable groups.
- Publicize grievance channels through multiple communication methods and in locally appropriate languages.
- Include specific procedures for receiving, documenting, investigating, and resolving security-related grievances confidentially and without retaliation.

Residual Impacts

With the above measures, residual impacts related to site security are expected to be **INSIGNIFICANT**.

- **Change in Land Use**

The BESS, shared substation, and OHTL are located within desert land that is not currently used for residential, agricultural, commercial, recreational, or other productive purposes. No physical or economic displacement of people, businesses, or livelihoods will occur as a result of the Project. Accordingly, no significant land use impacts are anticipated during the construction phase.

• **Construction Traffic**

Construction activities will require periodic transportation of equipment, materials, and personnel to and from the Project Site using the existing road network, including the Giza–Luxor Road and the secondary access road serving the substation. Traffic volumes are expected to vary over the construction period but remain limited in scale.

The impact is localized and short-term. The magnitude of traffic aspect is assessed as **SMALL**.

The susceptibility of receptors (road users) is **Medium**. Therefore, the overall significance of traffic impacts during construction is assessed as **MINOR**.

Mitigation Measures

- Develop and implement a Traffic Management Plan.
- Schedule material deliveries in coordination with local traffic conditions to minimize disruption to road users.
- Ensure safe vehicle operation and speed limits within and near the site.
- Ensure all drivers are appropriately licensed and trained.
- Inspect vehicles regularly to ensure roadworthiness.
- Install appropriate warning signage at construction entrances.
- Coordinate oversized equipment deliveries where applicable.

Residual Impacts

With mitigation measures implemented, residual traffic impacts are expected to be **INSIGNIFICANT**.

F. Occupational health and safety

OHS Risks

Construction activities present typical occupational health and safety risks, including accidents involving heavy machinery during site preparation and foundation works; crushing and lifting hazards associated with the delivery and installation of prefabricated BESS containers; and slips, trips, and falls within active work areas.

Additional risks include working at heights during transmission tower erection and conductor stringing activities associated with the OHTL, electrical hazards during installation, testing, and commissioning of electrical systems, electrocution risks associated with energized equipment, vehicle and equipment interaction, manual handling and ergonomic injuries, heat stress and dehydration due to outdoor working conditions, and fire hazards associated with electrical installation activities..

These risks are inherent to construction activities and are expected to occur within the project site boundary during the construction period. The impacts are localized, short-term, and of moderate intensity. Accordingly, the overall magnitude of occupational health and safety risk is assessed as **MEDIUM**.

Sensitive receptors include construction workers and on-site personnel. Given that the identified risks are confined to routine construction activities within a controlled work environment, receptor susceptibility is considered **Medium**. Therefore, the overall

significance of occupational health and safety impacts is assessed as **MODERATE** prior to the implementation of mitigation and control measures.

Mitigation Measures

To effectively manage and mitigate OHS risks during the construction phase, Contractors shall develop, implement, and maintain an OHS Management Plan .

The OHS Management Plan shall include a detailed OHS Risk Assessment covering all construction activities, clearly defined mitigation and control measures, incident reporting and investigation procedures, and emergency preparedness and response plans addressing medical emergencies, fire incidents, electrical hazards, and extreme weather conditions. As part of the implementation of the OHS Management Plan:

- Ensure that contractual obligations are in place for contractors to include the development and implementation of the construction environmental and social management plan (CESMP) for approval prior to commencement of construction activities
- Implement OHS Management Plan, as part of the CESMP.
- Conduct regular safety training and toolbox talks.
- Enforce site speed limits and equipment inspections.
- Ensure that only approved working at height (particularly for OHTL) and lifting plans for BESS installation are adopted. Ensure robust HSSE measures as applied throughout those activities.
- Establish exclusion zones during crane and lifting operations.
- Maintain safe access routes and control slip, trip, and fall risks.
- Provide shaded rest areas, hydration, and implement heat stress management measures.
- Provide appropriate personal protective equipment (PPE).
- Apply lock-out/tag-out procedures and restrict electrical works to qualified electricians.
- Permit-to-work system for high-risk activities.

Residual Risks

With mitigation measures in place, residual occupational health and safety risks are expected to be **MINOR**.

Workplace Noise

The predominant sources of noise during the construction phase will arise from the operation of construction machinery and equipment, including excavators, loaders, backhoes, cranes, concrete works, and vehicle movement within the site. Noise may also be generated during foundation works and other civil activities associated with the installation of BESS components.

Table 6-1 shows typical noise levels, in decibels, expected at various distances from construction machinery.

Table 6-1: Average Noise Levels from Construction Equipment

Equipment Type	Distance from Noise Source (dBA)		
	10m	50m	100m
Ramming Machines ⁸	100	88	80
Bulldozer	74	60	54
Generator	76	62	56
Backhoe	79	65	59

These noise-generating activities will occur within the BESS project boundary, covering a limited area of approximately 0.04 km², over a short-term duration corresponding to the construction period of the BESS project. The intensity of noise impacts is considered moderate, as noise levels from heavy equipment can be noticeable within the immediate work area but will reduce significantly with distance.

Based on the combination of short-term temporal scale, localized spatial extent, and moderate intensity, the overall magnitude of construction-phase noise impacts is assessed as **SMALL**.

The primary receptors are the on-site construction workforce, whose susceptibility is considered **MEDIUM**, given occupational exposure and the availability of protective measures. Accordingly, the significance of construction-phase noise impacts is assessed as **MINOR**.

Mitigation Measures

- Compliance with the requirements of Law 4/1994 regarding the exposure period to different levels of noise, whether continuous or intermittent;
- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Workers shall be provided with adequate PPE (earplugs), and ensuring that workers are always wearing PPE while working near equipment that emit high noise levels.

Residual impacts

With mitigation measures in place, residual noise impacts are expected to be **INSIGNIFICANT**.

Community Health, and Safety

Construction activities associated with the BESS, shared substation, and OHTL will be undertaken within a defined and controlled work area. Access to construction sites will be restricted through fencing, signage, and security controls. Traffic associated with the transport of materials, equipment, and personnel will utilize existing road networks and is expected to be temporary and limited in scale. Similarly, interactions between workers and local communities are anticipated to be infrequent due to the remote location of the Project Site and the limited workforce requirements.

The potential impacts are expected to be localized, short-term, and of **slight** intensity. Accordingly, the overall magnitude of community health, safety, and security impacts is assessed as **SMALL**.

⁸ [Noise Reduction System - IQIP](#)

Sensitive receptors include nearby communities, road users, visitors, and other third parties that may access areas surrounding the Project Site. Given the temporary nature of construction activities and the limited interaction between project activities and surrounding receptors, receptor susceptibility is considered **MEDIUM**. Therefore, the overall significance of community health, safety, and security impacts is assessed as **MINOR** prior to the implementation of mitigation measures.

Mitigation Measures

- Restrict public access to construction areas through appropriate fencing, barriers, and warning signage.
- Implement a Traffic Management Plan covering vehicle routing, speed limits, driver requirements, and traffic safety measures.
- Ensure that all drivers are appropriately licensed and trained and that project vehicles are operated in accordance with applicable traffic regulations.
- Maintain effective communication with local stakeholders regarding construction activities and potential temporary disruptions.
- Implement a Code of Conduct for all project personnel addressing worker behavior, community interactions, and respect for local customs and traditions.
- Ensure security personnel are adequately trained on professional conduct, community relations, and the appropriate use of force.
- Establish and maintain a grievance mechanism accessible to community members and other stakeholders.
- Investigate and address community complaints in a timely manner.
- Maintain adequate site security and access control measures throughout the construction period.

Residual impacts

With mitigation measures in place, residual community health, safety and security impacts are expected to be **INSIGNIFICANT**.

Table 6-2 shows the risk and impact assessment matrix for the construction

Table 6-2: The Impact Assessment Matrix for the Construction Phase

Impacts /Risks		Without Mitigation					Significance of Residual Impacts after Mitigation
		Temporal scale	Spatial Scale	Intensity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor	Significance of Impact before Mitigation
Construction Phase (20 months)							
Air Quality		<u>Short term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>
Ambient Noise		<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Low</i>	<i>No residual impact</i>
Soil		<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Medium</i>	<i>Insignificant</i>
Waste Management		<u>Short Term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>
Biological Environment	Disturbance to Wildlife	<u>Short term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>
	Attraction of Pests and Propagation of Invasive Species	<u>Short term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>
Socio economic	Worker Influx	<u>Short term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>
	Site security	<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Low</i>	<i>Minor</i>
	Traffic	<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>
Occupational Health and Safety	OHS Risks	<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Medium</i>	<i>Medium</i>	<i>Moderate</i>
	Workplace Noise	<u>Short term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>
Community Health and Safety	Community HSS Risks	<u>Short term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>

6-3-2 Potential risks and impacts during the Operation Phase

A. Potential risks and impact on the Physical Environment

Impacts on Air Quality

The operational phase of BESS and shared substation will have emissions mainly due to the transport of people and supplies for periodical inspection and maintenance activities. Potential emission from SF₆, if utilized for insulation of the switchgear. SF₆, a GHG, is the most used insulation material in medium and high voltage systems.

In this respect, SF₆ containing equipment is designed to avoid emitting any of this gas into the atmosphere mainly during maintenance and servicing, and decommissioning. However, although small amounts of SF₆ may escape the atmosphere, these could be controlled through cost-effective operational improvements and equipment upgrades. No GHG will result in the case of using air insulation systems.

The aspect has a slight intensity as it occurs intermittently and is long-term for the project operation lifetime. This aspect will be localized within the immediate surroundings of the substation; the magnitude of the aspect is **SMALL**. The susceptibility of receptors is **MEDIUM**. In this context, the potential impact on air quality can be considered **MINOR**.

Mitigation Measures

If SF₆ is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair, use proper chamber vacuums during filling the SF₆ into the GIS, and employee education/training.

Residual Impacts

By implementing the above mitigation measures, the residual impacts on the air quality will be **INSIGNIFICANT**

Potential Impacts on Ambient Noise

Noise will be generated by transformers, power conversion systems (PCS/inverters), battery cooling systems, and, to a lesser extent, corona discharge from overhead transmission lines under certain atmospheric conditions. Noise generation will be continuous throughout the operational life of the Project but will remain localized within the BESS, shared substation, and OHTL corridor. Typical sound power levels for these components are presented in Table 6.3 below.

Table 6-3: Typical Sound Power Levels of Main BESS Operational Noise Sources⁹

Equipment / Source	Typical Sound Power Level, LW (dB)
Power transformer	60–71
Power Conversion System – Inverter (≈3 MVA)	92.6
Cooling equipment for 40-ft battery container (fans, pumps, chillers)	~73

⁹ Similar BESS in Boa Vista Island, Cabo Verde: CABEOLICA EXPANSION PROJECT – Component 5, Boa Vista Island, Cabo Verde

Noise generation during operation will occur within the fenced BESS project boundary and will be localized, covering the limited project footprint. Operational activities are continuous over the long term, corresponding to the operational life of the facility.

Based on the localized spatial extent, long-term temporal scale, and slight intensity, the overall magnitude of operational noise impacts is assessed as **SMALL**.

Potential ambient noise receptors include surrounding industrial land uses and the nearest residential settlement, Al-Baraka village, is situated approximately 2.8 km north of the site. Given the distance to residential receptor, the susceptibility of the ambient receptors is considered **LOW**. Accordingly, the significance of operational-phase ambient noise impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

No specific mitigation measures are required. However, good operational practices including routine maintenance of transformers, cooling systems, and electrical equipment will be implemented to prevent abnormal noise emissions.

Residual Impacts

No residual impacts

Potential Impacts on Ambient Noise

During operation, the primary noise source is transformer operation, which generates continuous low-frequency hum as well as noise from buzzing or humming from high-voltage power lines producing corona.

The noise source will be localized within BESS/ shared substation and OHTL locations and its immediate surroundings, and long-term due to long operation period. The intensity of aspect is expected to be slight; thus, the magnitude of the aspect is considered **SMALL**.

Given that the nearby community is at a distance from the proposed project, the susceptibility of the receptors is **LOW**. Thus, the impact is considered **INSIGNIFICANT**.

Mitigation Measures

No mitigation measures are required. However, the following management measures are proposed

- Regular maintenance of transformers and cooling fans to prevent incompliant noise levels.
- Prompt repair or replacement of faulty components causing excessive hum or vibration.

Residual Impacts

The implementation of management measures will ensure that impact remain **INSIGNIFICANT**.

Potential Impacts on Workplace Noise

Within the project site, operational noise exposure may occur for operation and maintenance during routine inspection and periodic maintenance activities near operating equipment.

Based on the localized spatial extent, long-term temporal scale, and slight intensity, the overall magnitude of operational noise impacts is assessed as **SMALL**.

Given the limited number of personnel present during routine operation and the largely automated nature of BESS operation, including remote monitoring of the PCS and battery systems, workplace exposure to operational noise is expected to be infrequent., and the controlled nature of activities, as the Power Conversion System (PCS/inverters) is remotely monitored and operates automatically mainly during charging and discharging; therefore, the susceptibility of workplace receptors is considered **Medium**, accordingly, the significance of operational-phase workplace noise impacts is assessed as **MINOR**.

Mitigation Measures

The following mitigation measures will be applied during the operation phase:

- Routine maintenance of cooling systems, transformers, and electrical equipment to ensure proper functioning and minimize noise emissions.
- Use equipment installed within sound-insulated housings, designed for continuous operation, as relevant, to reduce operational noise levels.
- Implement occupational health and safety procedures, including provision of hearing protection where required during maintenance activities.

Residual Impacts

With the implementation of the above measures, the residual impacts of operation-phase workplace and ambient noise associated with the BESS and step-up substation are expected to be **INSIGNIFICANT**.

Electromagnetic fields

Construction and operation of the shared substation and overhead transmission line (OHTL less than 1km length) will generate electric and magnetic fields (EMF) associated with the transmission and distribution of electricity. During the construction phase, temporary EMF exposure may occur during installation, testing and commissioning activities involving energized electrical equipment. During operation, EMF will be generated continuously by energized electrical equipment within the shared substation and along the OHTL corridor.

Potential receptors include construction workers, operation and maintenance personnel, and any third parties accessing areas adjacent to the Project facilities. The OHTL is less than 1 km in length and traverses a desert environment with no residential communities located in close proximity.

EMF levels decrease rapidly with increasing distance from electrical equipment and transmission infrastructure. Given the limited length of the OHTL, the absence of nearby sensitive receptors, the controlled nature of worker access, and the expected compliance of electrical equipment with applicable national and international standards, potential EMF impacts are expected to be localized and limited.

The impact is assessed as short-term during construction and long-term during operation, localized in spatial extent, and slight in intensity. Accordingly, the overall magnitude of the impact is assessed as **SMALL**.

The susceptibility of receptors is considered **LOW** due to the remote location of the Project, restricted access to electrical facilities, and the absence of nearby residential or other sensitive receptors. Therefore, the significance of EMF impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

The following mitigation measures will be implemented:

- Design, construct and operate the OHTL and shared substation in accordance with applicable Egyptian regulations and recognized international good practice, including relevant exposure guidelines for EMF.
- Restrict access to energized electrical equipment and high-voltage areas to authorized personnel only.
- Install warning signs and maintain appropriate physical barriers around electrical installations.
- Implement lock-out/tag-out procedures and safe systems of work for maintenance activities involving energized equipment.
- Provide training to workers regarding electrical hazards, EMF awareness and safe working distances.
- Maintain electrical equipment in accordance with manufacturer specifications and preventive maintenance schedules.

Residual Impacts

With implementation of the above mitigation measures, residual impacts associated with electromagnetic field exposure are expected to remain **INSIGNIFICANT**.

Potential Impacts on Soil

During the operation phase, potential impacts on soil are very limited, as all Battery Energy Storage System (BESS) units, cooling systems, and step-up substation components are installed on engineered foundations and concrete bases, which effectively isolate the underlying soil from operational activities.

Potential soil contamination may result from accidental leakage of transformer insulating oil, lubricants used during maintenance activities.

Based on the localized spatial extent, long-term temporal scale, and Slight intensity of potential soil impacts, the overall magnitude of soil impacts during operation is assessed as **SMALL**.

The susceptibility of the soil receptor is considered **LOW**. Considering the low likelihood of spills and the limited extent of maintenance activities, and the physical isolation provided by engineered foundations, the potential impact on soil remains limited, accordingly, the significance of operational-phase soil impacts is assessed as **MINOR**.

Mitigation Measures

- Implement proper storage and handling procedures for oils, and lubricants.
- Conduct maintenance activities in designated areas.
- Provide spill response materials and train staff in spill management.
- Inspect transformers and oil-containing equipment regularly.
- Maintain secondary containment systems and drainage controls around oil-filled equipment.

Residual Impacts

With the implementation of the above measures, the residual impacts on soil during operation are expected to be **INSIGNIFICANT**.

Potential Impact on Groundwater

During operation, potential contamination sources may include transformer insulating oil, lubricants associated with electrical equipment, and other maintenance-related chemicals. Given the depth to groundwater, the limited quantities of hazardous materials expected to be present on-site, the predominantly controlled industrial setting, and the localized nature of potential spill events, migration of contaminants to groundwater is considered unlikely. Nevertheless, in the absence of appropriate containment and response measures, a significant spill could potentially infiltrate through the soil profile and adversely affect groundwater quality.

The potential impact is therefore considered to be localized in spatial extent and of low probability, but potentially moderate in consequence should contamination reach the groundwater resource. Accordingly, the aspect is assessed as a risk requiring specific prevention and control measures.

Mitigation Measures

The following mitigation measures will be implemented:

- Store fuels, oils, lubricants and other hazardous materials in designated areas with appropriate secondary containment capable of containing at least 110% of the largest container volume.
- Ensure transformers are installed within bunded areas designed to contain potential oil leaks and spills.
- Develop and implement a Spill Prevention and Response Plan as part of the ESMP.
- Maintain spill response equipment and spill kits at locations where hazardous materials are stored or handled.
- Train workers in spill prevention, emergency response and reporting procedures.
- Inspect hazardous material storage areas regularly to identify leaks or deterioration.
- Collect and dispose of contaminated soil, absorbent materials and other spill residues through licensed waste contractors.
- Prohibit uncontrolled discharge of wastewater, oils or chemicals to the ground surface.
- Ensure prompt clean-up and remediation of any spill incidents.

Residual Risks

With implementation of the above measures, the residual risk of groundwater contamination is expected to be LOW.

- **Solid Waste**

Non-hazardous waste generated during the operation phase will be limited to small quantities associated with routine site activities and the presence of operational staff. This includes domestic waste (e.g. food waste, paper, plastic) from office and control facilities, as well as minor packaging waste from spare parts and consumables used during routine maintenance.

No routine hazardous waste generation is expected during operation of the BESS or step-up substation. Hazardous waste generation is expected to be limited and intermittent, mainly associated with non-routine maintenance activities. Potentially hazardous waste streams may include used absorbent materials, contaminated rags, filters, empty chemical containers, or small quantities of waste oils.

Based on the localized spatial extent, long-term duration, and slight intensity of waste generation during operation, the overall magnitude of waste-related impacts is assessed as **SMALL**.

Considering the industrial setting of the site, the limited quantities involved, and the use of licensed waste management services, the susceptibility of receptors is considered **LOW**. Accordingly, With the implementation of appropriate waste segregation, storage, and disposal measures in accordance with applicable regulations and Good International Industry Practice, the residual impacts of both hazardous and non-hazardous waste generation during operation are assessed as **INSIGNIFICANT**.

Mitigation Measures

A Project Waste Management Plan will be implemented covering segregation, storage, transport, and disposal of hazardous and non-hazardous waste in accordance with applicable regulations and Good International Industry Practice, except for routine maintenance.

Residual Impacts

No residual impacts

B. Risks and Impacts on Biological Environment

- ***Attraction of pests and propagation of invasive species***

Domestic and other waste may attract pests (such as insects and rodents), which are potential disease vectors. This impact is *slight* in intensity, of long term and localized to areas of potential improper waste disposal. The magnitude is considered **SMALL** as this is not a continuous and persistent impact. Overall, impact is deemed **INSIGNIFICANT**.

Mitigation Measures

Mitigation measures will mainly include the following:

- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species;
- Ensure proper housekeeping practices are adopted; and
- Provide awareness to the workers on the negative impacts of improper solid waste disposal.

Residual Impacts

No residual impacts.

• **Birds electrocution risks**

Electrocution of birds passing by the OHTL may occur. Given the impact assessment of the avifaunal activity and current project environment, the magnitude is considered SMALL as this is not a continuous and/or persistent impact. Overall, impact is deemed INSIGNIFICANT.

Mitigation Measures

Mitigation measures will mainly include the following:

- Increase the number of insulators where conductors connect to each tower (to increase the gap between the conductor and the tower), using insulators that prevent birds from landing on them.
- Cover the crossarms with insulating materials such as PVC strips to ensure that birds are not earthed when perched

Residual Impacts

No residual impacts.

• **Bird collision risks**

Bird collisions may occur where birds fail to detect overhead conductors during flight. Collision risks are generally highest in areas supporting large concentrations of birds, migration corridors, wetlands, Important Bird Areas, or habitats regularly used by large-bodied and flocking species.

The Project Site is located within a desert environment of low ecological value and is not situated within or near an Important Bird Area, protected area, wetland, major migratory flyway concentration area, or other avian-sensitive habitat. Furthermore, the OHTL length is limited to approximately 0.5 km and therefore represents a very limited obstacle within the wider landscape.

Given the low abundance of birds recorded within the Project area, the absence of sensitive avifaunal receptors, and the limited length of the OHTL, the likelihood of bird collision is considered low. The impact is expected to be localized, of slight intensity, and of SMALL magnitude.

Receptor susceptibility is considered LOW. Accordingly, the overall significance of bird collision impacts is assessed as INSIGNIFICANT.

Mitigation Measures

Given the low baseline risk and absence of sensitive bird receptors, no specific collision mitigation measures are considered necessary. Nevertheless, the Project will undertake periodic inspections of the OHTL during routine maintenance activities and record any evidence of bird mortality. Should unexpected collision incidents be identified, additional mitigation measures, such as installation of bird flight diverters, will be evaluated and implemented as necessary.

Residual Impacts

Residual bird collision impacts are expected to remain INSIGNIFICANT.

C. Risks and Impacts on Social Environment

Impact of site security

For security measures, the project will assign an annually contracted security company to provide security services for the site premises. Security guards will be stationed on site and will operate on a shift basis to control access and protect project assets and personnel.

and will continue throughout the footprintSecurity activities are Localized to the project long-term operational period the intensity is considered Slight; therefore, the magnitude of site security impacts is assessed as **SMALL**.

Sensitive receptors include onsite workers and nearby communities. Given the controlled nature of security arrangements and the limited interaction with external receptors, susceptibility is considered **LOW**. Therefore, the overall significance of site security impacts is assessed as **INSIGNIFICANT**.

Mitigation measures

The security personnel will be adequately trained on proper conduct toward workers and community in accordance with local laws, lender performance requirements and ILO guidelines. Furthermore, a grievance mechanism will be developed and maintained to allow the potentially affected community to express concerns about the security arrangements and acts of security personnel .

Residual impacts

No residual impacts

Operation-phase Traffic

During the operational phase, the BESS and shared substation will be monitored and maintained by a very limited number of personnel, with no regular delivery of materials or heavy vehicle movements expected.

Traffic effects are confined to the study area, comprising the project area and its immediate surroundings, and persist throughout the long-term operational period. Due to the absence of regular vehicle movements and the very low level of traffic activity, the proposed development is not expected to adversely affect the surrounding system or parties; therefore, the impact intensity is considered to be slight, and the magnitude of operational traffic impacts is assessed as **SMALL**.

Sensitive receptors include onsite workers and nearby communities. Receptor susceptibility is considered **LOW**. Therefore, the overall significance of operational traffic impacts is assessed as **INSIGNIFICANT**.

Mitigation Measures

No mitigation measures are required

Residual Impacts

No residual impacts

D. Occupational Health and Safety

Impacts on workplace during operation are primarily associated with electrical hazards and maintenance activities, including inspection or replacement of modules, converters, and transformers etc. However, the probability of replacement of these units is considered as minor due to their expected lifetime.

Additional risks include electrical hazards such as arc flash during maintenance, inspection and replacement of transformers, converters and battery modules, fire risks associated with Battery Energy Storage System (BESS) units including potential thermal runaway events, and exposure to energized equipment during troubleshooting and commissioning activities. These risks are inherent to electrical energy storage and high-voltage systems and require strict operational controls.

These aspects are confined to the project site and occur throughout the long-term operational period. The impact intensity is considered slight; therefore, the magnitude of operational occupational health and safety impacts is assessed as **SMALL**.

Sensitive receptors include operation and maintenance personnel working within the facility. Given the controlled working environment and medium susceptibility of exposed personnel, the overall significance of occupational health and safety impacts during operation is assessed as **Minor**.

Mitigation measures

- A health and safety policy will be implemented and maintained for all operational activities.
- Compliance with applicable national occupational health and safety legislation (Labour Law 14/2025) and Good International Industry Practice will be ensured.
- A Permit-to-Work system will be applied for all maintenance activities, including electrical works, energization/de-energization, and working at height.
- Workers shall be trained in electrical safety, arc flash hazards, and BESS-specific risks, including battery fire and emergency response procedures.
- Appropriate PPE shall be provided, including arc-rated clothing where applicable.
- Emergency preparedness and response plans will be implemented, including fire detection and suppression systems for BESS facilities.
- Safety exclusion zones will be established during maintenance of energized equipment.
- Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers

Residual impacts

By implementing the above mitigation measures, the residual impacts are **INSIGNIFICANT**.

Table 6-3 shows the impact assessment matrix for the operation phase.

E. Potential Fire and Thermal Runaway Risks

During operation of the BESS facility, there is a potential risk of fire resulting from battery system failure, including thermal runaway events. Thermal runaway refers to a rapid and uncontrolled increase in battery temperature that may result in the release of heat, smoke, and gases, and in extreme cases may lead to fire.

The likelihood of such events is considered low due to the incorporation of battery management systems, continuous monitoring systems, fire detection systems, fire suppression systems, and emergency response procedures as part of the Project design and operation. In addition, the BESS will be designed and operated in accordance with applicable international industry standards and manufacturer requirements.

The impact is expected to be localized and limited to emergency situations. The intensity of the impact is considered Slight due to the low likelihood of occurrence and the incorporation of multiple preventive and protective measures. Accordingly, the magnitude of the impact is assessed as **SMALL**.

The sensitivity of nearby receptors is considered Medium. Therefore, the significance of the impact is assessed as **MINOR**.

Mitigation Measures

- Implement battery management and monitoring systems.
- Maintain fire detection and suppression systems in accordance with manufacturer requirements.
- Develop and implement emergency preparedness and response procedures.
- Conduct periodic inspection and maintenance of battery systems and associated safety equipment.

Residual Impacts

With implementation of the above mitigation measures, residual impacts are expected to be **INSIGNIFICANT**.

F. Hazardous Waste

Hazardous waste during the operation phase may include limited quantities of waste oils, electrical components, spent chemicals, and end-of-life lithium-ion batteries .

Waste generation will be continuous but low in volume, localized within designated storage areas, and managed through licensed contractors and authorized treatment or recycling facilities. Given the controlled handling, and limited quantities, the intensity of the hazardous waste generation is considered **slight**, the overall magnitude is **SMALL**, and

soil susceptibility is **LOW**. Accordingly, the overall significance of waste generation impacts during operation is assessed as **INSIGNIFICANT**.

Management Measures

No specific mitigation measures are required given the low volumes of waste generated during operation. However, the following management measures are implemented :

- Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors.
- Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors.
- End-of-life batteries will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available.

Residual Impacts

With proper waste management in place, residual impacts related to both hazardous and non-hazardous waste are assessed as **INSIGNIFICANT**.

G. Potential Impacts during decommissioning

The anticipated impacts during the decommissioning phase are similar to the impacts assessed during the construction phase particularly with respect to:

- Soil and surface water, due to potential risks associated with improper handling of waste streams;
- Air quality and noise, resulting from dismantling activities and equipment movement;
- Occupational health and safety, related to electrical isolation, dismantling of equipment, and handling of batteries and substation components.

Decommissioning activities will involve removal of battery containers, electrical equipment, and substation infrastructure, including end-of-life batteries and transformer components, which may generate hazardous and non-hazardous waste streams.

The mitigation measures for the potential impacts during decommissioning are also similar specifically related to proper management and disposal of non-hazardous and the hazardous waste. Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase in particular without the need to reiterate.

H. Cumulative Impacts

The Project is located within an area already designated for energy and industrial development and occupies a relatively small footprint. Potential cumulative effects during construction may arise from the simultaneous implementation of nearby projects, particularly with respect to traffic movements, workforce demand, noise generation, air emissions from construction equipment, waste generation, and community health and safety. However, construction activities associated with the Project are temporary in nature, involve a relatively small workforce, and are expected to generate limited vehicle movements compared to larger industrial and utility developments in the area.

Potential cumulative traffic impacts on regional road networks, including the Giza–Luxor Road and associated access roads, may occur where construction activities overlap with those of the Dandara, Obelisk and any industrial developments within the Nagaa Hammadi Industrial Zone. However, the available road infrastructure has been developed to support industrial and utility activities, and the Project's contribution to overall traffic volumes is expected to be limited. Implementation of the Traffic Management Plan, scheduling of deliveries, and coordination with relevant stakeholders will further reduce the potential for cumulative traffic effects.

Potential cumulative impacts on air quality and noise may result from concurrent construction activities associated with nearby projects. Nevertheless, these impacts are expected to remain localized, temporary, and limited due to the dispersed nature of the developments, the large separation distances available within the desert environment, and the relatively small scale of the Project. Similarly, cumulative impacts associated with waste generation, resource consumption, and worker influx are expected to be minor given the limited workforce requirements, the prioritization of local employment where feasible, and the implementation of project-specific waste management and environmental management measures.

From a biodiversity perspective, the Project is located within a desert landscape characterized by low ecological value and limited habitat sensitivity. The Project footprint, including the BESS, shared substation, and short OHTL connection, represents a negligible addition to the overall disturbance associated with existing energy infrastructure in the area. Consequently, significant cumulative impacts on biodiversity receptors are not anticipated.

Considering the industrial and energy-related character of the surrounding area, the limited scale of the Project, the temporary nature of construction activities, and the implementation of mitigation measures described in this ESIA, the Project is not expected to make a material contribution to significant cumulative environmental or social impacts associated with existing developments or the wider Energy Valley Programme.

Table 6-4: Impact assessment matrix for the operation phase

Impacts/Risks		Without Mitigation					Level of Residual Impacts after Mitigation	
		Temporal scale	Spatial Scale	intensity	Magnitude	Susceptibility / Vulnerability / Value of Resource / Receptor		Level of Impact Before Mitigation
Operation Phase								
Ambient Noise		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Work place Noise		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>	<i>Insignificant</i>
Soil	Potential spills	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Minor</i>	<i>Insignificant</i>
	Solid waste	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Groundwater	Potential Spills	<u>Short-term</u>	<i>Localized</i>	<i>Moderate</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>	<i>Insignificant</i>
Electromagnetic Field (EMF) Exposure		<u>Long-term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>Insignificant</i>
Biodiversity	Attraction of pets and propagation of invasive species	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
	Bird Electrocutation Risk	<u>Long Term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>Insignificant</i>
	Bird Collision Risk	<u>Long Term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>Insignificant</i>
Social Environment	Waste Generation (hazardous &non-hazardous)	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>Insignificant</i>
	Traffic	<u>Long term</u>	<i>Study Area</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
	Site Security	<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Low</i>	<i>Insignificant</i>	<i>No residual Impact</i>
Occupational Health and Safety		<u>Long term</u>	<i>Localized</i>	<i>Slight</i>	<i>Small</i>	<i>Medium</i>	<i>Minor</i>	<i>Insignificant</i>

6.4 Risks and Impacts of the Environment on the project

- ***Climate and Meteorological Conditions***

The Project Site is located in Qena Governorate, which is characterized by hot summers, mild winters, high solar radiation, low annual rainfall, and moderate wind speeds. The area receives high levels of solar radiation, with daily averages ranging between 6.0–6.2 kWh/m²/day. The annual average wind speed is approximately 12 km/h, predominantly from the northern sector. Rainfall is very limited, with an annual average of approximately 1.6 mm.

Potential environmental risks to the BESS, shared substation and OHTL are primarily associated with high ambient temperatures, elevated solar radiation, and occasional rainfall events that may result in limited surface water runoff. Considering the arid climate and the location of the facility within an existing substation, the overall risk posed by climatic and meteorological conditions to the Project is assessed as LOW.

Mitigation measures

The BESS will comprise prefabricated, weatherproof containerized lithium-ion battery units equipped with integrated cooling systems. All systems will operate through centralized control and monitoring (SCADA and BMS). Routine inspection and preventive maintenance procedures will be implemented during operation to ensure system integrity and reliability.

7. Stakeholders Consultation

Consultation with the community and stakeholders is an important element of the ESIA process. This chapter presents a summary of stakeholder engagement activities relevant to the Energy Valley Naga Hammadi BESS, shared substation and OHTL Project.

The consultation methodology followed for the proposed Project is aligned with national requirements, as outlined in the ESIA Procedures Guidelines issued by the Egyptian Environmental Affairs Agency (EEAA), and with international good practice, including the requirements of international lenders regarding information disclosure and stakeholder engagement.

The consultation approach for the Naga Hammadi component has been designed in a manner proportionate to the nature, scale and expected impacts of the Project. The Project comprises a relatively limited-footprint BESS, shared 33/220 kV substation and short 220 kV OHTL connection located within / adjacent to the Dandara PV Project area and existing utility / transmission infrastructure. The nearest settlement is Baraka Village, located approximately 2.8 km northwest of the Project Site. Given the limited footprint, relatively small workforce requirements, absence of physical or economic displacement, and the location within a desert / utility development setting, stakeholder engagement has been targeted and proportionate rather than based on a large-scale public scoping meeting.

The consultation process included:

- Identification of relevant stakeholders based on the Project's Area of Influence, nearby communities, local authorities, neighbouring projects and facilities, and potential receptors;
- Ongoing engagement through Scatec / Energy Valley's existing presence in the Naga Hammadi area, including community liaison arrangements associated with nearby projects, namely; Obelisk; and, Dandara.
- Targeted consultations with local representatives, government stakeholders, industrial zone representatives, local mayors and community representatives;
- Disclosure of Project information during ongoing engagement activities and subsequent engagement stages;
- Recording of stakeholder feedback and incorporation of relevant issues into the ESIA, ESMP and SEP, as applicable.

The Project will continue stakeholder engagement throughout the Project lifecycle, including pre-construction, construction, operation and, where relevant, decommissioning. Engagement activities will be implemented in accordance with the Project-wide Stakeholder Engagement Plan (SEP) prepared for the Energy Valley Project.

E&S Scoping and Engagement Activities

Stakeholder identification and engagement were undertaken in parallel with the ESIA preparation process and the broader Energy Valley stakeholder engagement programme. The Project's Area of Influence, associated infrastructure, anticipated impacts and potential cumulative interfaces with neighbouring projects were considered to identify relevant stakeholders.

Stakeholder groups relevant to the Naga Hammadi component include:

- Qena Governorate and relevant local administrative authorities;
- Markaz Naga Hammadi and relevant local units;
- Local mayors and community representatives;
- Baraka Village and surrounding communities;
- Representatives of Naga Hammadi Industrial Zone;
- Neighbouring project stakeholders, including Dandara and Obelisk interfaces;
- Local labour-related stakeholders;
- Emergency service providers and Civil Defense;
- Workers, contractors and subcontractors; and
- Vulnerable groups, where relevant.

No separate large-scale public scoping meeting was undertaken for the Naga Hammadi component. This is considered proportionate given the smaller scale of the Project, limited workforce, limited land footprint, absence of displacement impacts, and the existing ongoing community interface in the area through Scatec / Energy Valley and nearby Obelisk Project liaison channels.

Two company community liaison officers (CLOs) are available at the project location (the three projects; Obelisk, Dandara and Energy Vally are adjacent, at more-or-less the same location) and are in continuous communication with all stakeholders. The community was already informed about the project prior to the commencement of the ESIA activities. Jobs and subcontracting opportunities for Dandara and Energy Valley were repeatedly discussed several months before commencing the ESIA activities.

Project information was shared during the engagement phases as part of continuous engagement with local stakeholders.

All consultations were conducted in Arabic, and stakeholders had the opportunity to raise questions, concerns and recommendations regarding the Project.

Table 7-1: Summary of Stakeholder Engagement Activities (Disclosure Phase) – Naga Hammadi

Date / activity	Stakeholders consulted	Key issues discussed and outcomes
17–18 June 2026 – Consultations with Naga Hammadi stakeholders	Community representatives, local mayors, government officials, representatives of the industrial zone, heads of local families and other relevant Naga Hammadi stakeholders.	The Project was introduced as part of the Energy Valley programme, including its BESS, shared substation and OHTL components. Stakeholders expressed a generally positive perception of Scatec and welcomed continued investment in the Naga Hammadi area. Given the limited scale of activities planned for the Naga Hammadi component, stakeholder interest was relatively low compared with larger renewable energy projects. Employment opportunities were the main topic of interest, with stakeholders emphasizing the importance of fair and transparent access to job opportunities for qualified candidates from surrounding communities. No major concerns, objections or project-related grievances were raised. Continued periodic engagement and information-sharing were recommended to keep stakeholders informed about Project scope, timing and potential employment opportunities.

Key Issues Raised by Stakeholders

The key issues raised during engagement with Naga Hammadi stakeholders are summarized below.

General feedback on the Project

Stakeholders generally expressed positive views regarding Scatec / Energy Valley's continued presence and investment in the area. The Project was viewed as part of broader renewable energy and electricity infrastructure development supporting national energy objectives.

Employment opportunities

Employment was the main area of interest. Stakeholders indicated that local interest in the Project would increase if job opportunities are available during construction or operation. Stakeholders requested that recruitment be fair, transparent and accessible to qualified candidates from nearby communities.

Local procurement and community benefits

Given the limited scale of the Naga Hammadi component, stakeholders did not expect major local procurement or community development benefits at this stage. However, they expressed interest in being kept informed of any opportunities that may become available through contractors or service providers.

Worker influx and community interaction

No major concerns were raised regarding worker influx. The Project workforce is expected to be limited, and workers are expected to commute daily from nearby urban centres / communities, with no permanent workers' camp expected near local communities. The ESIA and ESMP nevertheless include measures related to local hiring, worker Code of Conduct, worker transport and grievance management.

Land use and access

No concerns were raised regarding land ownership, land access or displacement. The Project is located within / adjacent to the Dandara PV Project area and government-owned desert / utility land. No physical or economic displacement is anticipated. OHTL right-of-way safety restrictions will be communicated to relevant stakeholders where needed.

Community health, safety and emergency preparedness

No major concerns were raised during consultations. However, given the BESS and substation components, the ESMP includes measures for emergency preparedness, BESS fire safety, coordination with Civil Defence, site security, access control and grievance management.

Incorporation of Stakeholder Feedback into the ESIA and ESMP

Stakeholder feedback received to date has been incorporated into the ESIA and ESMP as follows:

- The ESIA confirms the limited social footprint of the Naga Hammadi component and the absence of physical or economic displacement.
- The ESMP includes measures to prioritize local employment where feasible and prohibit informal "hiring at the gate".

- The ESMP requires contractors to implement a Labour Management Plan and Workers' Code of Conduct.
- The ESMP includes a community grievance mechanism and worker grievance mechanism.
- The ESMP includes measures for worker-community interaction, GBV/SEA/SH prevention, security conduct and community health and safety.
- The ESMP includes coordination requirements with neighbouring projects / facilities, including Dandara and Obelisk interfaces, where relevant.
- Ongoing engagement will continue through the Project-wide SEP and the Project CLO / site focal points.

ESIA Disclosure

According to the national EIA classification, the Naga Hammadi BESS, shared substation and OHTL component is treated as a Scoped-B project under the Egyptian EIA system. Therefore, a formal public disclosure meeting is not required under national requirements. However, in line with lender expectations and the Project-wide SEP, stakeholder engagement will continue in a proportionate manner throughout the Project lifecycle and the project ESIA will be disclosed on Company and lender(s') websites.

Further engagement approach for the Naga Hammadi component will include:

1. **Targeted engagement to relevant stakeholders**

Engagement will focus on local authorities, community representatives, nearby communities, neighbouring project / facility representatives, emergency service providers, labour-related stakeholders and other relevant parties.

2. **Continued engagement**

Engagement will continue during pre-construction, construction and operation, particularly in relation to employment, construction schedule, traffic, worker conduct, emergency preparedness, security conduct, and grievance management.

The outputs and results of stakeholder engagement activities, including stakeholder feedback, will be maintained in the Project stakeholder engagement records and annexed to the SEP / ESIA, as applicable.

8. Environmental and Social Management Plan

This ESMP has been developed in accordance with national laws and international standards for the proposed BESS & OHTLs project.

The project's ESMP consists of a set of mitigation and monitoring measures that will be considered during the construction, operation phases and decommissioning to ensure the sound environmental and social performance of the project. The plan also includes the actions needed to be taken to implement these measures.

Decommissioning considerations are integrated into the overall environmental and social management framework, ensuring that potential impacts are minimized throughout the project lifecycle, from initial construction to final site restoration.

The purpose of the project's ESMP is to:

- Ensure continuing compliance with the relevant legislation and laws;
- Outline the ways in which the potential impacts identified in this ESIA report will be managed;
- Provide assurance to regulators and other stakeholders that the local requirements with respect to environmental and social performance are being met;
- Ensure that appropriate monitoring is undertaken, including the establishment of a monitoring plan; and
- Provide a framework for the compliance auditing programs that ensures the efficient environmental and social performance of the Project.

In general, the project's ESMP consists of the following components:

- **Summary of Impacts and Mitigation Measures** as identified in Chapter (6) of the ESIA.
- **Environmental and Social Organizational Arrangements** to identify the components of the Environmental and Social Management System (ESMS), as well as the roles and responsibilities for its implementation.
- **Environmental and Social Management Plans** to ensure environmental protection and maintain efficient environmental and social performance and compliance with the relevant legislation, laws and international E&S standards.
- **Environmental Monitoring Plan** during project implementation to provide information of the key environmental aspects of the project.

8.1 Summary of Risks and Impacts, and Mitigation Measures

Table 8-1 below summarizes the social and environmental aspects, mitigation measures, and residual impacts as assessed for the different project phases.

Table 8.1: Summary of the social and Environmental Aspects, Mitigation Measures, and Residual risks and Impacts (this table will be updated according to the modifications of chapter 6)

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Construction phase			
Air quality			
exhaust emissions from construction vehicles and mobile equipment operating on-site	Insignificant	- Minimize idling times of construction vehicles and machinery. - Maintain vehicles and construction equipment in good working condition. - Cover trucks transporting fine or loose materials. - Implement good housekeeping practices across the construction site.	No Residual Impact
Ambient noise			
- Equipment and machinery - Vehicle Movement - Power Generators	Insignificant	- Ensure regular maintenance of construction equipment and machinery to minimize noise emissions. - Use low-noise machinery and equipment where possible. - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels. - Provide hearing protection equipment to workers exposed to high noise levels.	No Residual Impact
Soil			
- Earthworks - Excavation activities - Management of domestic wastewater - Construction waste handling	Minor	- Conduct maintenance off-site to minimize spills and effluents. - Adopt spill prevention measures and make on-site spill kits available. - Proper collection of spills and disposal via licensed contractors. - Develop and implement Spill Management Plan (within ESMP). - Apply good housekeeping practices on-site. - Provide sealed tanks for collection of domestic wastewater. Dispose domestic wastewater off -site via licensed contractors.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Collect solid waste at designated locations and ensure segregation processes are applied. - Ensure proper handling of hazardous materials and wastes and provide secondary containment for hazardous material/waste storage areas - Utilize only licensed contractors for waste and hazardous waste disposal. - Establish marked and physically separated storage areas for hazardous waste.	
Biological Environment			
Disturbance to wildlife	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Provide awareness to the workers to prevent disturbance of wildlife that may occur in the wider surroundings. Also provide training on the identification and avoidance of sensitive biodiversity features; - Ensure proper housekeeping practices are followed; - Ensure the proper maintenance of construction equipment and any other equipment with high noise and vibration potential.	No residual Impacts.
Habitat loss	Minor	- Restrict construction activities strictly to the defined OHTL tower footprints and approved working areas. - Utilize existing tracks and previously disturbed corridors wherever possible. - Prohibit uncontrolled off-road driving and restrict vehicle movement to designated access routes, avoiding any vegetation patches identified during pre-construction inspections. - Clearly demarcate construction boundaries prior to work to prevent unnecessary ground disturbance.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Attraction of pests and propagation of invasive species	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Ensure proper housekeeping practices are followed; - Provide awareness to the workers on the negative impacts of improper solid waste and wastewater management.	No residual Impacts.
Socio Economic Environment			
Worker Influx*	Insignificant	- Prioritize hiring local workers where possible. - Prohibit informal or speculative hiring (“hiring at the gate”). - Implement a Labour Management Plan and Workers’ Code of Conduct. - Raise awareness among workers regarding local customs, social norms, and appropriate behavior. - Establish a worker grievance mechanism. - Establish a community’ grievance mechanism . accessible to affected stakeholders and capable of handling grievances related to gender based (BGV) violence and sexual exploitation, abuse, and harassment (SEAH) - Ensure the development and implementation of a stakeholder engagement plan that includes - Provide training on GBV and SEAH - Ensure contractor management plans include provisions for worker accommodation and influx, grievance mechanisms, etc and monitor these requirements	No Residual Impact
Site security	Minor	Ensure security personnel are adequately trained on on Code of Conduct, human rights principles, use-of-force requirements, conflict de-escalation techniques, cultural awareness and are informed of grievance mechanism.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		• Ensure compliance with applicable national laws and human rights principles. • Implement and maintain a grievance mechanism accessible to workers and community members. • Establish and implement documented procedures for reporting, recording, investigating, and responding to all security-related incidents or complaints, including allegations of misconduct, use of force, or community complaints. • Clearly define roles, responsibilities, reporting lines, and accountability mechanisms for security personnel and contractors. • Ensure that the project grievance mechanism is accessible to workers, contractors, local communities, and other stakeholders, including vulnerable groups. • Publicize grievance channels through multiple communication methods and in locally appropriate languages. • Include specific procedures for receiving, documenting, investigating, and resolving security-related grievances confidentially and without retaliation.	
Change in land use	Insignificant	• The OHTL routes, BESS and substation locations are in desert and unoccupied land with no existing agriculture, residential purposes, commercial activities, or other productive land uses. No risk is anticipated in this regard	No residual Impact
Construction Traffic*	Minor	• Develop and implement a Traffic Management Plan. • Coordinate material deliveries to avoid peak traffic hours where feasible. • Ensure safe vehicle operation and speed limits within and near the site.	Insignificant
Occupational health and safety			
OHS risks	Moderate	• Ensure that contractual obligations are in place for contractors to include the development and implementation of the construction environmental and social management	Minor

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		plan (CESMP) for approval prior to commencement of construction activities • Implement OHS Management Plan, as part of the CESMP. • Provide appropriate PPE. • Conduct safety training and toolbox talks. • Enforce speed limits and equipment inspections. • Ensure that only approved working at height (particularly for OHTL) and lifting plans for BESS installation are adopted. Ensure robust HSSE measures as applied throughout those activities. • Establish crane/lifting exclusion zones. • Maintain safe access and control slip/trip risks. • Provide shaded rest areas and implement heat stress measures. • Restrict access to work zones; mark excavations. • Apply lock-out/tag-out procedures and restrict electrical works to qualified electricians	
Workplace Noise	Minor	• Comply with Law 4/1994 on noise exposure limits. • Conduct regular maintenance of equipment to reduce noise. • Schedule high-noise activities to avoid overlap. • Provide and enforce use of hearing PPE (earplugs).	Insignificant
Cultural Heritage	Minor	• Develop and implement Chance Find Procedures, indicating the actions to be taken in case of any significant findings during site leveling and construction activities. • Notify the Ministry of Tourism and Antiquities (MOTA) if an archaeological artifact is discovered during excavation.	Insignificant
Operation phase			
Ambient Air			
• Transport of people and supplies for maintenance	Minor	• If SF6 is used as an insulator instead of air insulation, the mitigation measures will include leak detection and repair,	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Potential emission of SF6, if utilized for insulation of the switchgear.		use proper chamber vacuums during filling the SF6 into the GIS, and employee education/training.	
Ambient noise			
- Noise (buzzing or humming) from high-voltage power lines producing corona - Operation of the transformer and other components of the substation	Insignificant	No mitigation measures are required; however, the following management measures are proposed - Regular maintenance of transformers and cooling fans to prevent in compliant noise levels. - Prompt repair or replacement of faulty components causing excessive hum or vibration.	Insignificant
Workplace noise			
- Operations - routine inspection and periodic maintenance	Minor	- Routine maintenance of cooling systems, transformers, and electrical equipment to ensure proper functioning and reduce noise emissions. - Use equipment with sound-insulated housings, specifically designed for continuous industrial operation, as relevant, to lower operational noise levels. - Implement occupational health and safety procedures, including provision of hearing protection during maintenance activities.	Insignificant
Electromagnetic fields			
Operation of the shared substation and overhead transmission line	Minor	- Design, construct and operate the OHTL and shared substation in accordance with applicable Egyptian regulations and recognized international good practice, including relevant exposure guidelines for EMF. - Restrict access to energized electrical equipment and high-voltage areas to authorized personnel only.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Install warning signs and maintain appropriate physical barriers around electrical installations. - Implement lock-out/tag-out procedures and safe systems of work for maintenance activities involving energized equipment. - Provide training to workers regarding electrical hazards, EMF awareness and safe working distances. - Maintain electrical equipment in accordance with manufacturer specifications and preventive maintenance schedules.	
Soil			
Potential spills	Minor	- Implement proper storage and handling procedures for oils, and lubricants. - Conduct maintenance activities in designated areas. - Provide spill response materials and train staff on spill management.	Insignificant
Solid waste	Insignificant	- Prepare waste management plans for routine maintenance activities. - Develop and implement a Project Decommissioning Plan	No residual impacts
Groundwater			
Potential contamination sources	Minor	- Store fuels, oils, lubricants and other hazardous materials in designated areas with appropriate secondary containment capable of containing at least 110% of the largest container volume. - Ensure transformers are installed within bunded areas designed to contain potential oil leaks and spills. - Develop and implement a Spill Prevention and Response Plan as part of the ESMP. - Maintain spill response equipment and spill kits at locations where hazardous materials are stored or handled. - Train workers in spill prevention, emergency response and reporting procedures.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Inspect hazardous material storage areas regularly to identify leaks or deterioration. - Collect and dispose of contaminated soil, absorbent materials and other spill residues through licensed waste contractors. - Prohibit uncontrolled discharge of wastewater, oils or chemicals to the ground surface. - Ensure prompt clean-up and remediation of any spill incidents.	
Biological Environment			
Attraction of pests and propagation of invasive species	Insignificant	- Develop, implement and update a solid waste, hazardous waste and wastewater management plan to include waste collection, storage, transport and disposal in an environmentally sustainable manner to avoid attraction of vermin and the potential consumption of waste from opportunistic species; - Ensure proper housekeeping practices are adopted; - Provide awareness to the workers on the negative impacts of improper solid waste disposal.	No residual impacts
Birds Electrocuting Risks	Minor	- Increase the number of insulators where conductors connect to each tower (to increase the gap between the conductor and the tower), using insulators that prevent birds from landing on them. - Cover the crossarms with insulating materials such as PVC strips to ensure that birds are not earthed when perched.	Insignificant
Birds Collision Risk	Minor	For bird collision risk, no mitigation measures are recommended. Nevertheless, the Project will undertake periodic inspections of the OHTL during routine maintenance activities and record any evidence of bird mortality. Should unexpected collision incidents be identified, additional mitigation measures, such as installation of bird flight diverters, will be evaluated and implemented as necessary	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
Social environment			
Site security	Insignificant	- Train security personnel on proper conduct toward workers and community, in accordance with local laws, lender performance requirements and ILO guidelines. - Develop and maintain a grievance mechanism for the community to report concerns about security arrangements and personnel actions.	No residual impacts
Operation-phase Traffic	Insignificant	No mitigation measures are required	No residual impacts
Potential Fire and Thermal Runaway			
Potential BESS fire from BESS failure, including thermal runaway events	Minor	- Implement battery management and monitoring systems. - Maintain fire detection and suppression systems in accordance with manufacturer requirements. - Develop and implement emergency preparedness and response procedures. - Conduct periodic inspection and maintenance of battery systems and associated safety equipment.	Insignificant
Hazardous Waste			
Waste oils, electrical components, spent chemicals, and end-of-life lithium-ion batteries	Minor	- Collection of non-hazardous waste at designated points in appropriate containers and disposal through licensed contractors. - Establishment of segregated, clearly marked storage for hazardous waste, with collection and disposal by licensed contractors. - End-of-life batteries will be returned to suppliers or sent to authorized recycling facilities, following sustainable recycling strategies where available.	Insignificant
Occupational Health and Safety			
- Electrical hazards - Maintenance activities	Minor	A health and safety policy will be applied.	Insignificant

Environmental and social aspect	Significance of Impact before Mitigation	Mitigation measures	Significance of Residual Impacts after Mitigation
		- Abide by all national occupational health and safety regulations; Labour Law 14/2025. - Provide suitable PPE and apply a robust permit-to-work system. - Ensure that the maintenance workers are properly trained, especially for working at height training - Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers.	
Community Health, and Safety			
- Construction Traffic and Road Safety - Unauthorized Access to Construction Sites - Community–Worker Interactions - Site Security Arrangements	Minor	- Restrict public access to construction areas through fencing, barriers, and warning signage. - Implement a Traffic Management Plan covering vehicle routing, speed limits, driver requirements, and traffic safety measures. - Ensure drivers are appropriately licensed and trained. - Maintain communication with local stakeholders regarding construction activities and temporary disruptions. - Implement and enforce a Worker Code of Conduct. - Ensure security personnel are trained in community relations and appropriate use of force. - Establish and maintain a community grievance mechanism. - Maintain adequate site security and access control throughout the construction period.	Insignificant

*Due to the small labour force requirement, project footprint and limited components during the construction phase in comparison to the neighbouring Dandara and Obelisk projects, impacts related to worker influx and traffic are not expected to result in a significant increase/cumulative impacts. Moreover, labour requirements are planned to be maximized to the highest extent possible from the nearby villages.

8.2 Environmental and Social Organisational Arrangements

8.2.1 Environmental and social management systems

Energy Valley has an established Environmental and Social Management System (ESMS) that applies to all Energy Valley employees and projects. The ESMS is aligned with international good practice and incorporates corporate-level environmental and social policies that define Energy Valley's commitments to environmental protection, social responsibility, and risk management. The ESMS provides a structured framework for identifying, assessing, managing, and monitoring potential environmental and social risks and impacts, with the objective of avoiding, minimizing, mitigating, and, where feasible, enhancing positive impacts.

For the BESS, substation &OHTLs Project, Energy Valley will implement the ESMS, according to the nature and scale of the Project, throughout the project lifecycle, including the construction, operation, and decommissioning phases .

During the construction phase, The EPC contractors will be required to establish, implement, and maintain a construction-phase ESMP that is consistent with international Requirements and aligned with ENEGRY VALLEY's corporate ESMS.

During the operation and maintenance (O&M) phase, Energy Valley will implement and maintain its corporate ESMS, adapted as necessary to address Project-specific risks and impacts. The ESMS will comprise, at a minimum: (i) environmental and social policies; (ii) procedures for the identification and assessment of environmental and social risks and impacts; (iii) management plans and operational controls; (iv) organizational capacity and defined roles and responsibilities; (v) training and competency requirements; (vi) grievance management mechanisms; (vii) emergency preparedness and response; and (viii) monitoring, reporting, and corrective action processes.

International standards require a clear definition of roles and responsibilities for the implementation and oversight of the Project's ESMS. According to the nature and scale of the project, an HSSE supervisor will be appointed for the project.

The HSSE personnel will be responsible for daily safety work (walks-over) at the site, for inspecting safety, housekeeping, personal protection, controlling unsafe practices/conditions, updating the environmental register, and assessing the environmental performance of the facility. When construction and operation work pose a high risk that threatens the workers' safety and health, the HS officer has the right to end the activity in order to prevent a potential hazard. The HSEE Officer will also be responsible for follow-up on compliance with labour issues as part of their role regarding contractors' monitoring and management.

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8.2.2 Staff Responsibilities

The HSSE personnel will be responsible for daily safety work (walks-over) at the site, for inspecting the safety, housekeeping, personal protection, controlling unsafe practices/conditions, updating the environmental register, and assessing the environmental performance of the facility. When construction and operation work pose a high risk that

threatens the workers' safety and health, the HSSE officer has the right to end the activity in order to prevent a potential hazard. The HSSE/Labor Compliance Officer (LCO) will also be responsible for follow-up on compliance with labour issues as part of their role regarding contractors' monitoring and management.

- **Site Manager/HSSE personnel**

- Responsible for the implementation of the HSE management system and providing the necessary resources for the implementation of the system;
- Responsible for the implementation of correction plans.
- Reports on HSSE matters to company management and is part of the annual management review process
- Inclusion of HSSE / E&S requirements in contractor contracts

- **HSSE Team**

- Implementation of the HSE management system.
- Ensures that contractors and subcontractors adhere to the HSE management system
- Provides training, help, and support for workers and ensures that contractors and subcontractors provide similar training to their workers;
- Provides the necessary support and determines any deficiency and disparity in the HSE procedures;
- Attends weekly and/or monthly HSE meetings;
- Updates and manages correction plans.
- Audits the implementation of the contractor's HSE plan;
- Analyses reports and corrects potential HSE issues;
- Organizes and completes all relevant HSE introductory training and awareness for workers;
- Reports any accident/incident on site and investigates the reason of accident/incident;
- Records and updates HS statistics, and submits monthly reports;
- Prevents and corrects potential safety risk behaviour;
- Updates the environmental register;
- Resolves all environmental issues on site; and
- Plans and supervises all environmental monitoring aspects and proposes potential corrective actions.
- Responsible for attending to and closing worker grievances

- **Community Liaison Officer**

- Maintaining dialogue with the communities and relevant stakeholders as per the stakeholder engagement plan
- Responsible for attending to community grievances
- Identification of local communities for the sourcing of labour and contractors

E&S Corporate team •

- Periodic reporting on E&S matters to lenders
- Following up on the closure of worker and community grievances
- Auditing the site during the construction and operation & maintenance phases
- Provide on-site training on E&S matters

- **Environmental and Social Reporting to AfDB**

Energy Valley shall establish and implement a periodic Environmental and Social (E&S) reporting mechanism throughout the construction and operation phases of the Project. The reporting process shall document the implementation status of mitigation measures, environmental and social monitoring results, stakeholder engagement activities, grievance management, occupational health and safety performance, incidents and accidents, corrective actions, and compliance with applicable national requirements and lender standards.

E&S Team of Energy Valley shall be responsible for the preparation of the reports, while the E&S Manager shall review and approve the reports prior to submission.

Periodic E&S performance reports shall be submitted to AfDB in accordance with the reporting requirements specified in the Financing Agreement and applicable AfDB requirements. In addition, any significant environmental, social, health and safety incidents shall be reported to AfDB promptly in accordance with lender notification requirements.

8.2.3 Environmental and Social Policy

An overarching policy will be developed defining the environmental and social (E&S) objectives and principles to achieve a sound E&S performance. The E&S policy may include environmental and social commitments of the project, such as compliance with international protocols or industry-specific codes of practice.

In this context, the outline of the E&S policy requirements is summarized as follows:

- Ensuring that all HS personnel responsible are properly trained and competent to fulfill their respective duties.
- Ensuring the availability of adequate resources and continuous support from top management.
- Communicating the E&S policy to all employees and other relevant stakeholders.
- Ensuring the provision of safe working conditions for all employees.
- Evaluating HS risks and taking appropriate action to minimize potential risks.
- Setting up objectives with the aim of reducing and eliminating HS related incidents.
- Ensuring that all labor rights stipulated in Egyptian laws, as well as the ILO requirements and the international PSs are fulfilled for all employees. This, in addition to implementing a grievance mechanism for all workers.
- Ensuring the continuous monitoring and assessment of HS performance, both internally and through third-party external audits/monitoring.

8.2.4 Risk assessment and hazard identification

The Contractor and the Subcontractors performing construction work shall carry out risk assessments prior to the commencement and during the construction works.

The risk assessments shall form part of the HS plan to be implemented on the site and shall include at least:

1. The identification of the risks and hazards to which workers may be exposed;
2. The analysis and evaluation of the risks and hazards identified;

3. A documented plan of safe work procedure to mitigate, reduce, or control the risks and hazards that have been identified;
4. A monitoring plan.

Hazards shall be eliminated when possible and can be minimized through awareness training, engineering controls, the use of personal protective equipment, and/or monitoring devices.

Workers shall be familiar with the risk assessment, use the existing controls and preventive measures while performing the tasks, and provide input to their supervisors to ensure that the risk assessment procedures reflect all hazards identified.

A pre-task risk assessment must be completed prior to the start of any job/task by those involved in the task.

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8.2.5 Assessment of Egypt Institutional Capacity Responsible for Environmental and Social Compliance

This qualitative assessment represents the expert opinion of the ESIA team based on a review of the applicable regulatory framework, publicly available institutional information, previous interactions with the relevant authorities, and experience from comparable projects in Egypt. The Egyptian environmental oversight system can be considered adequate to strong for environmental regulation and compliance monitoring, with a mature legal framework, experienced national institutions, established regional offices, and growing digital monitoring systems. However, capacity is constrained by staffing and resource limitations, resulting in a monitoring approach that is generally risk-based rather than continuous. Social oversight capacity is comparatively less developed and often relies on coordination among multiple agencies.

The responsible authorities in Nagaa Hammadi possess sufficient institutional capacity to review, monitor, and enforce environmental compliance requirements, particularly when supplemented by project-specific environmental and social management systems. Nevertheless, periodic support through independent monitoring, lender supervision, or third-party audits would typically be considered good international practice for large or complex projects.

The following table presents a high-level rating of the capacity on both the country and Nagaa Hammadi levels

Aspect	National Level	Qena / Nagaa Hammadi
Environmental regulatory framework	High	High
EIA review capability	High	Moderate to High
Environmental inspection capacity	Moderate to High	Moderate
Environmental monitoring infrastructure	Moderate to High	Moderate
Enforcement capability	Moderate	Moderate
Social oversight capacity	Moderate	Moderate to Low
Stakeholder grievance management	Moderate to High	Moderate
Experience with large-scale infrastructure projects	High	Moderate to High

8.3 Environmental and Social Management Plans (ESMPs)

Within its commitment to ensure environmental protection and maintain efficient environmental performance as well as social integrity, the company will develop various environmental and social management plans addressing the different E&S aspects and impacts of the project during its construction, operation and decommissioning phases.

Decommissioning considerations are integrated into the overall E&S management framework, ensuring that potential impacts are minimized throughout the project lifecycle, from initial construction to final site restoration.

In accordance with Law No. 4/1994 and its Executive Regulations, as amended, the Project will be subject to routine and ad hoc environmental inspections by the Egyptian Environmental Affairs Agency (EEAA) and relevant competent authorities to ensure compliance with the environmental permit conditions and applicable national environmental regulations during all project phases.

In this regard, the ESMPs to be developed will address:

8.3.1 EMPs During the Construction Phase

An overarching construction environmental and social management system will be prepared prior to commencement of construction activities. Each subcontractor will prepare its own set of construction environmental and social management plans (CESMPs). The requirement for developing CESMPs will be included as a commitment in contractual arrangements of the subcontractors. Each subcontractor will be required to submit its CESMPs on the company document review system for review and approval prior to commencing its construction activities.

The main objectives of the Construction Environmental and Social Management Plan (CESMP) are to:

- Address environmental, cultural and social issues identified as part of the present ESIA study and any additional issues considered to be important;
- Minimize the residual environmental impacts of construction activities;
- Prepare an achievable environmental management plan for implementation;
- Detail management and monitoring tasks to be completed;
- State the timing for implementation of each task;
- Provide details of reporting requirements;
- Identify roles and responsibilities for ensuring that relevant tasks are completed;
- Provide contingency plans that can be followed in an event of non-compliance or complaint; and
- Detail registers and standard reporting forms for documenting complaints, non-compliances, unplanned exceedances and discharges, etc.

For each plan, the following structure will be followed:

- Scope and objective of the ESMP;
- Compliance Requirements and regulatory requirements;
- Roles and Responsibilities;

- Communication, training and awareness;
- Record Keeping;
- Monitoring;
- Reporting.

8.3.1.1 OHS Management Plan

A comprehensive OHS Management Plan will be developed and implemented for the construction phase by the Contractor, based on detailed task-specific risk assessments. This plan will be separate from, but aligned with, the Construction Environmental and Social Management Plan (CESMP), which focuses on broader environmental and social mitigation measures.

The OHS Management Plan will specifically address risks associated with working at height, electrical installations, lifting operations, excavation works, confined spaces (where applicable), battery storage system installation, fire hazards, thermal runaway events, heat stress, and construction traffic.

The Plan will establish a structured management framework to ensure the protection of workers' health and safety throughout all construction activities. It will, inter alia::

- Identification, assessment, and control of construction-related occupational health and safety risks;
- Definition and enforcement of OHS requirements applicable to contractors and subcontractors;
- Workforce health and safety arrangements, including training, supervision, and provision of appropriate PPE;
- Safe management of activities undertaken in close proximity to workers, including the storage, handling, and use of hazardous substances and materials; and
- Emergency preparedness and response procedures for construction-related incidents.

All contractors and subcontractors will be informed of, and required to comply with, the provisions of the OHS Management Plan. The Project HSE Manager will be responsible for overseeing contractor compliance, monitoring OHS performance, and ensuring that construction activities are conducted in a safe and environmentally sound manner. Contractors will also be required to regularly report on OHS performance as part of the periodic construction progress reporting process, enabling continuous monitoring and improvement throughout the construction phase.

8.3.1.2 Air management

- Restrict unnecessary idling of construction vehicles and mobile equipment through site rules and supervision.
- Ensure all construction vehicles and machinery are regularly inspected and maintained in accordance with manufacturers' specifications to minimize exhaust emissions.
- Use well-maintained, low-emission equipment that complies with applicable national air quality and emission standards.
- Cover trucks transporting fine, loose, or friable materials to prevent dust dispersion during transport.
- Implement effective material handling and storage practices, including minimizing drop heights and limiting the size and duration of temporary stockpiles.

- Apply good housekeeping measures across the site, including regular cleaning of work areas and prompt removal of excess materials and waste.
- Limit vehicle speeds within the construction site to reduce dust generation.
- Conduct periodic visual inspections to identify excessive exhaust emissions or dust generation and implement corrective actions as required.

8.3.1.3 Noise Management

- Compliance with the requirements of Law 4/1994 regarding the exposure period to different levels of noise, whether continuous or intermittent;
- Ensuring regular maintenance of construction equipment and machinery to minimize noise emissions.
- Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels.
- Workers shall be provided with adequate PPE (earplugs), and ensuring that workers are always wearing PPE while working near equipment that emit high noise levels.

8.3.1.4 Solid waste management

Construction waste will be collected in a separate onsite location and periodically disposed off-site by the contractor and will be safely transported to officially designated sites. Recyclable waste will be reused by the contractor.

Solid waste management will be conducted in accordance with the requirements of laws 4/1994 and 202/2020.

8.3.1.5 Hazardous waste management

The following briefs the management plan concerning hazardous waste (HW) of the proposed project.

HW generation

Potential hazardous waste during the construction phase may include batteries, solvents, paints, and other chemicals associated with construction activities.

HW segregation and on-site storage

HW will be separated from other types of non-hazardous waste. Proper identification of hazardous waste forms a basis for waste segregation. It is therefore essential that all personnel are familiar with waste identification.

HW will be stored in the storage area in a specifically categorized zone (e.g. labelled HW zone, providing secondary containment where necessary), which would be provided with suitable fire extinguishers and other safety equipment. Furthermore, each HW type will have color-coding and will be labelled with the container's content and the required precaution instructions.

End-of-life Batteries shall be inspected and classified according to condition and hazard status. Damaged batteries shall be isolated and managed in accordance with manufacturer emergency procedures. Temporary storage areas shall be secure, covered, ventilated, and protected from heat sources and ignition risks. Appropriate fire prevention and emergency

response measures shall be maintained. Personnel involved in battery removal and handling shall receive appropriate training.

HW disposal

The HW will be transported to a WMRA/EEAA licensed facility, such as El Nassreya HW landfill in Alexandria, via a certified contractor.

End-of-life batteries will be returned to suppliers or sent to authorized recycling or hazardous waste disposal facilities for disposal. The management hierarchy shall be based on:

- Life Extension and Reuse: Assessment of batteries for refurbishment, repurposing, or secondary-use applications where technically feasible.
- Recycling and Material Recovery: Preference shall be given to licensed facilities capable of recovering I valuable materials.
- Treatment and Disposal: Where recycling is not feasible, batteries shall be treated and disposed of through licensed hazardous waste facilities in accordance with applicable regulations.

In absence of specific local regulations regarding end-of-life battery management, the process will be based on:

- Egyptian Environmental Law No. 4 of 1994 and its amendments.
- Waste Management Law No. 202 of 2020 and implementing regulations.
- Requirements of the Waste Management Regulatory Authority (WMRA).
- Applicable EEAA requirements for hazardous waste management and transportation.
- Relevant provisions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (where international shipment is required).
- Applicable lender requirements (e.g., IFC Performance Standards, EBRD Performance Requirements, or Equator Principles, where relevant).
- Manufacturer-specific requirements for battery handling, storage, transport, and recycling.

8.3.1.6 Spill Prevention Management Plan

The Spill Prevention Management Plan will address spill prevention, preparedness, and response requirements to ensure the safe and effective management of accidental spills, leaks, or releases of fuels, lubricants, and other hazardous substances associated with diesel generators and construction equipment during the construction phase. The Plan aims to prevent spills where possible and, in the event of an incident, to promptly contain and remediate releases in order to minimize adverse impacts on the environment and protect the health and safety of workers.

8.3.1.7 Emergency Response Plan

The contractors will have a written Emergency Response Plan to respond to and mitigate any incident to minimize its impact on employees, community, and environment. Employees will be trained on the implementation of the plan and on response activities that could be required in the event of an emergency.

The Project also includes a utility-scale Battery Energy Storage System (BESS). Under abnormal operating conditions, lithium-ion batteries may experience thermal runaway, which

could result in localized fire events and the release of smoke and combustion gases. However, such events are expected to be rare due to the incorporation of battery management systems, thermal monitoring systems, fire detection and suppression systems, and compliance with recognized international standards for battery system safety and fire protection. Thermal runaway is therefore considered a potential operational risk requiring specific emergency preparedness and response measures rather than a routine source of GHG emissions.

The project company will ensure that the contractors have developed preparedness program to respond to and mitigate any emergency situation to minimize the impact on employees, community, and environment according to national laws and the international EHS guidelines.

The contractor will be committed to the following:

- A knowledgeable, highly trained, and motivated employee group;
- A safety and accident record;
- Preparation and training for emergency response and mitigation measures;
- Awareness among the workforce through education and training.

In addition, the written emergency plan will be prepared to address the following phases:

- Preparedness: the activities that are communicated for rescuing and minimizing damage.
- Response: the actions necessary to minimize loss of life and property damage and provide emergency assistance.
- Recovery: short- and long-term activities which restore the construction activities and help return it to its normal state.
- Mitigation: the activities that eliminate or reduce the probability of disaster.

8.3.1.8 Chance Find Procedure

As indicated in chapter 3 above, there are no registered antiquities or cultural heritage sites within the project site based on the Egyptian Archeological Map (2022) and the UNESCO World Heritage List of Egypt. However, chance find procedures will be developed to address potential cases of encountering cultural heritage components during the project's construction activities.

The chance find procedure defines the actions to be taken in case of any finds during the construction activity excavations. Such finds could include Non-archaeological/Natural/Cultural Find, Insignificant Chance Finds, Potentially Significant Archaeological Finds or Human remains and/or Burial-related Material.

In general, the Ministry of Tourism and Antiquities (MOTA) has the responsibility for the discovery and exploration of antiquities across Egyptian territory. According to Law No. 117 of 1983, as amended by Law No. 3 of 2010, any person who discovers an unregistered archaeological artifact is obligated to notify the MOTA. The artifact shall be considered state property, and the MOTA must take the necessary measures to preserve it. Within three months, the MOTA must either remove the artifact found on private property or take the necessary procedures to expropriate the land on which it was found, or leave it in place and register it following the provisions of this law.

8.3.1.9 Staff Training and Awareness

Construction workers will be trained and educated according to their respective responsibilities and assigned tasks. A workers' training program will involve training staff on safe handling of equipment, waste, and on the use of equipment. Moreover, they will be trained in the safe operation of equipment and spill clean-up. They will also be trained in the use of fire hose reels and fire extinguishers. The training program will also tend to increase workers' awareness of the potential environmental impacts of various construction activities. Awareness will also include issues related to GBVH / SEAH, and developing measures for reporting these cases needs to be established.

The project will undertake an induction program to advise contractors and site visitors of basic health, safety, and emergency procedures, such as emergency signals and evacuation routes. Contractors and vendors on short-term assignments that do not have safety and emergency response training will work under the supervision of the Company staff.

8.3.2 Environmental Management Plans During the Operation Phase

The company will be responsible for the preparation, implementation, and monitoring of the environmental management plan during the operation phase. The management plan will also comply with the world Bank E&S "General Environmental, Health, and Safety Guidelines".

The following shows the minimum set of environmental management procedures that the facility operator will establish and follow.

- **Environmental Register**

During the operation phase, an Environmental Register will be developed for the project activities and the compliance status. The Environmental Register and the Hazardous Materials and Waste Register will be prepared in accordance with the requirements of Annex 3 of the ERs of Law 4/1994 and its amendments, as relevant to the project nature and activities.

8.3.2.1 OHS Management Plan

During the operation phase, the company will implement an OHS Management Plan to ensure the health and safety of all employees, contractors, and visitors. The plan will be aligned with the international Standards, and applicable national legislation.

The OHS Management Plan will be based on hazard identification and risk assessment for operational activities, including electrical works, work at height, routine and non-routine maintenance, waste handling, and emergency situations. It will define safe operating procedures, permit-to-work systems where required, and the mandatory use of task-specific PPE.

The plan will also include OHS training and induction, incident and near-miss reporting, emergency preparedness coordination, and periodic inspections to monitor compliance. Overall responsibility for implementation and monitoring will rest with project's designated OHS/HSE Officer.

8.3.2.2 Hazardous Wastes (HW) Management

Hazardous wastes generated from maintenance activities of the proposed project will be collected by an authorized contractor to be disposed of in designated safe disposal sites. HW will be stored in a specific storage area until safe disposal.

HW will be recorded in the hazardous wastes register in accordance with the legal requirements stipulated in Article 33 of the Environment Law 4/1994.

8.3.2.3 Solid Wastes Management

Solid waste generation will be limited and mainly associated with routine site activities. This includes small quantities of domestic waste generated by operational staff, as well as packaging waste such as cardboard, plastic wrapping, and wooden pallets arising from the delivery of spare parts and routine maintenance materials.

8.3.2.4 Preventive and corrective maintenance

The main objective of maintenance is to maximize the utilization of the equipment in its proper operating conditions.

Planned maintenance

Maintenance will be carried out in accordance with:

- Equipment manufacturers' suggested requirements.
- Scheduled inspections according to good maintenance practices.
- Maintenance programs and procedures developed by the company.

Preventive Maintenance

The preventive maintenance guidelines are based on:

- A general maintenance plan according to which all maintenance activities are scheduled.
- Regular visual inspections will be conducted for the BESS modules, transformer switchgear, the electric system, the monitoring system, and the security system to detect existing and potential defects. It is particularly important to inspect all plant equipment exposed to the weather.

Corrective Maintenance Plan and Response Times

Preventive maintenance reduces the frequency of breakdowns but cannot avoid them. Unplanned maintenance involves corrective maintenance and emergency repairs resulting from equipment problems, required because of equipment breakdowns or deficiencies. Once a problem occurs, the plant maintenance staff is trained enough to carry out the repairs in a quick response time to return to normal operation levels. Corrective maintenance may involve the participation of specialized maintenance contractors.

8.3.2.5 Spill Prevention Management Plan

The plan will address the spill prevention, preparedness, and response requirements to support the safe response to accidental spills, leaks, or releases of both hazardous and non-hazardous materials to the environment to eliminate or minimize the adverse effects should a spill occur and to protect the health and safety of employees.

8.3.2.6 Training and Capacity Building

To ensure the competence of the project's employees in undertaking the environmental management procedures and plans, training will be delivered by the HSSE supervisor to the maintenance personnel according to their particular responsibilities.

A workers' training program will involve key thematic areas such as Occupational Health and Safety (OHS), safe handling of equipment and material, waste management, and the use of protective equipment, emergency preparedness and response, fire safety (including use of fire hose reels and fire extinguishers), environmental awareness, etc. Workers will be informed of any potentially harmful health effects related to the BESS, substation and OHTL operations. Training plans will be put in place to:

- Ensure that all visitors and site personnel undergo a site-specific HSE Induction training session;
- Ensure that all records of attendance are kept on file.
- Ensure that all visitors and personnel are issued with an access card as proof of site induction.
- Provide a list of site-specific hazards identified.
- Train, inform, communicate, and instruct all workers regarding World Bank Equator Principles, worker rights, as well as workplace hazards and risks before any work commences and thereafter at regular intervals as the risks change and as new risks develop. This training will be carried out in the form of risk assessment and toolbox talks. A record of attendance will be kept on file, and
- Ensure that Sub-Contractors will conduct their own task-specific risk assessments and keep records in the Health and Safety file.

8.3.2.7 Battery Fire and Thermal Runaway Management Plan

A dedicated Battery Fire and Thermal Runaway Management Plan shall be developed for the Project due to the inherent risks associated with lithium-ion battery energy storage systems. The plan shall be aligned with applicable international good practice and lender requirements and will include, at a minimum:

- Fire prevention measures, including design considerations, spacing, and temperature control systems
- Continuous battery monitoring systems (BMS) for early detection of abnormal conditions
- Gas detection systems for identification of off-gassing and early thermal runaway indicators
- Emergency isolation procedures for rapid disconnection of affected battery containers or strings
- Firefighting arrangements, including appropriate suppression systems and response equipment
- Coordination protocols with local civil defense and emergency responders
- Defined thermal runaway response procedures, including escalation and containment measures

8.3.2.8 Emergency response plans

Identify specific risks

The identification of risks includes potential risks related to equipment, devices, materials, buildings, and operation procedures. Risk identification is carried out to estimate the type, quantity, and magnitude of risks that could induce fire, personnel fatality, or building collapse.

The Project also includes a utility-scale Battery Energy Storage System (BESS). Under abnormal operating conditions, lithium-ion batteries may experience thermal runaway, which could result in localized fire events and the release of smoke and combustion gases. However, such events are expected to be rare due to the incorporation of battery management systems, thermal monitoring systems, fire detection and suppression systems, and compliance with recognized international standards for battery system safety and fire protection. Thermal runaway is therefore considered a potential operational risk requiring specific emergency preparedness and response measures rather than a routine source of GHG emissions.

These risks include the following:

- Activities that may pose risks to the workers;
- Quantities and types of hazardous materials/wastes used or stored; and
- Potential failure of the safety measures and procedures
- Potential BESS-related incidents, including thermal runaway, localized fire events, and the release of smoke and combustion gases.

Preparedness

Identify human, administrative, and organizational resources, as well as equipment and sites needed to combat risks. The following activities will be carried out:

- Identify the required training for staff and implementation schedule;
- Identify the essential tools/procedures for the protection of individuals and groups, and also determine the requirements for rescue and medical treatment;
- Prepare maps and detailed plans that include gathering points and escape routes, and evacuation plans in case of emergency, and determine the timeline for implementation;
- Identify the affected parties and stakeholders, provide the emergency support and services, and determine the type of assistance needed; and
- Determine fire prevention and control requirements.

Implementation

The plan should include the level of implementation carried out by individuals or groups according to the following steps:

Warning and alarm plan

The selected warning method should be effective in terms of communicating the warning message to all employees of the site and making sure that they are aware of the nature of the risk and provide them with the opportunity to confront or escape from it. The alarm must be visible and audible to reach all employees on the site.

Response

Responses are carried out according to the type, rate of spread, damages and consequences of the hazard through trained personnel, either directly or manually, using smart devices or through offsite control.

Medical assistance and services

A communication line for access to ambulance shall be available to provide medical care for the potential injured workers and transfer them immediately to hospitals, if needed.

Documentation

A record/report including time, duration of implementation, cost, expenditure, efficiency, effectiveness, and responsible personnel of each of the above measures shall be maintained. The company will develop a reporting system for accidents, including injuries, damage to property, and environmental damage. The information and records mentioned will be used to improve response procedures and to decrease and control potential hazards. General information to be recorded is as follows:

- Date, place of incident or emergency;
- The affected individual or groups;
- Description of the situation and conditions surrounding the site;
- Identify and assess the magnitude of injury, loss, damage or pollution;
- Actions taken to reduce the severity and degree of the situation; and
- Record the treatment or cleaning procedures that have been carried out.

Follow-up procedures

Once the hazard is managed, a throughout survey of the affected site must be carried out to ensure that the hazard is eliminated, and that the situation is restored to its original state. Follow-up procedures include the following:

- Identify the causes of the emergency.
- Assess the efficiency of emergency response procedures;
- Propose corrective action and remedial measures necessary to prevent recurrence of such incidents; and
- Identify the level of need to implement any treatment and/or monitor procedures to restore the site to its original state;

Update the emergency response plan and staff training program

The emergency plan will be updated every year or at the event that needs improvement of the plan and the staff training program.

Biodiversity Management

The Project will ensure that personnel are aware of the importance of the biological environment. Strict measures will be in case of non-compliance with the laws and regulations.

In order to raise the awareness of the onsite personnel with regards to issues relevant to the protection and preservation of biodiversity, the following activities will be carried out:

- Display posters demonstrating the Project's commitment to the conservation of biodiversity throughout the site;
- Increase the number of insulators to prevent birds from landing on conductors and forcing birds to perch on crossarms only.
- Cover the crossarms of pylons with insulating materials to ensure that birds are not earthed.

8.3.3 Social Management Plan During Construction and Operation Phases

It is of key importance for the company to have close and proactive communication with the local community and to disclose the project information for transparency and to enhance

credibility. A detailed stakeholder engagement and management plan (SEP) will be developed for the project. Main aspects of the plan are summarized in the following sections.

a. Labour and Working Conditions

Recruitment procedures for the Energy Valley project will be implemented by contractors in accordance with principles of equal opportunity, transparency, and non-discrimination, promoting local employment and female inclusion where feasible. During Construction, the Project will ensure that contractors apply appropriate occupational health and safety measures and fully prohibit forced, compulsory, and child labour during construction. During operation, labour and workplace health and safety practices will comply with Egyptian Labour Law No. 14/2025 and relevant international occupational health and safety guidelines.

The Project shall ensure compliance with applicable national legislation and international standards regarding labour and working conditions. The framework shall include:

- Establishment and maintenance of a workers' grievance mechanism accessible to all employees and contractors
- Enforcement of a non-retaliation principle to protect complainants and whistleblowers
- Application of equal opportunity and non-discrimination principles in recruitment and employment
- Implementation of measures to prevent and address Gender-Based Violence and Sexual Exploitation and Abuse (GBVH/SEAH)

A dedicated grievance mechanism for workers shall be maintained throughout both construction and operation phases to ensure timely resolution of complaints.

b. Site Security Management

Site security during the construction phase will be provided by a licensed contractor-appointed security company under the supervision of the Energy Valley, while responsibility during operation will rest with Energy Valley through an annually contracted licensed security provider. Security personnel will control access to the fenced premises and operate on a shift basis. Although interactions with workers, nearby communities, and road users are expected to be limited and localized, inappropriate conduct could create community concerns if not properly managed. Accordingly, all security personnel will receive training on professional conduct, community relations, applicable national laws, and relevant human rights principles consistent with GIIP.

c. Grievance Management

Minimizing grievances is realized through managing impacts and through pre-emptive stakeholder engagement designed to anticipate and address potential issues before they become grievances.

A grievance is defined as an issue, concern, problem or claim (perceived or actual) that an individual or community group wants a company or contractor to address and resolve. In alignment with the EBRD PRs (2019), the Grievance Mechanism (GM) will "seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the

party that originated the issue of concern”¹⁰. The mechanism will also allow for anonymous complaints to be raised and addressed.

The process covers all components and activities of the Project, including those activities undertaken by contractors and subcontractors on behalf of the Project. A detailed Stakeholders engagement plan including details of the GRM has been prepared for the overall Energy Valley project.

Figure 8–1 shows the proposed project's grievance mechanism system.

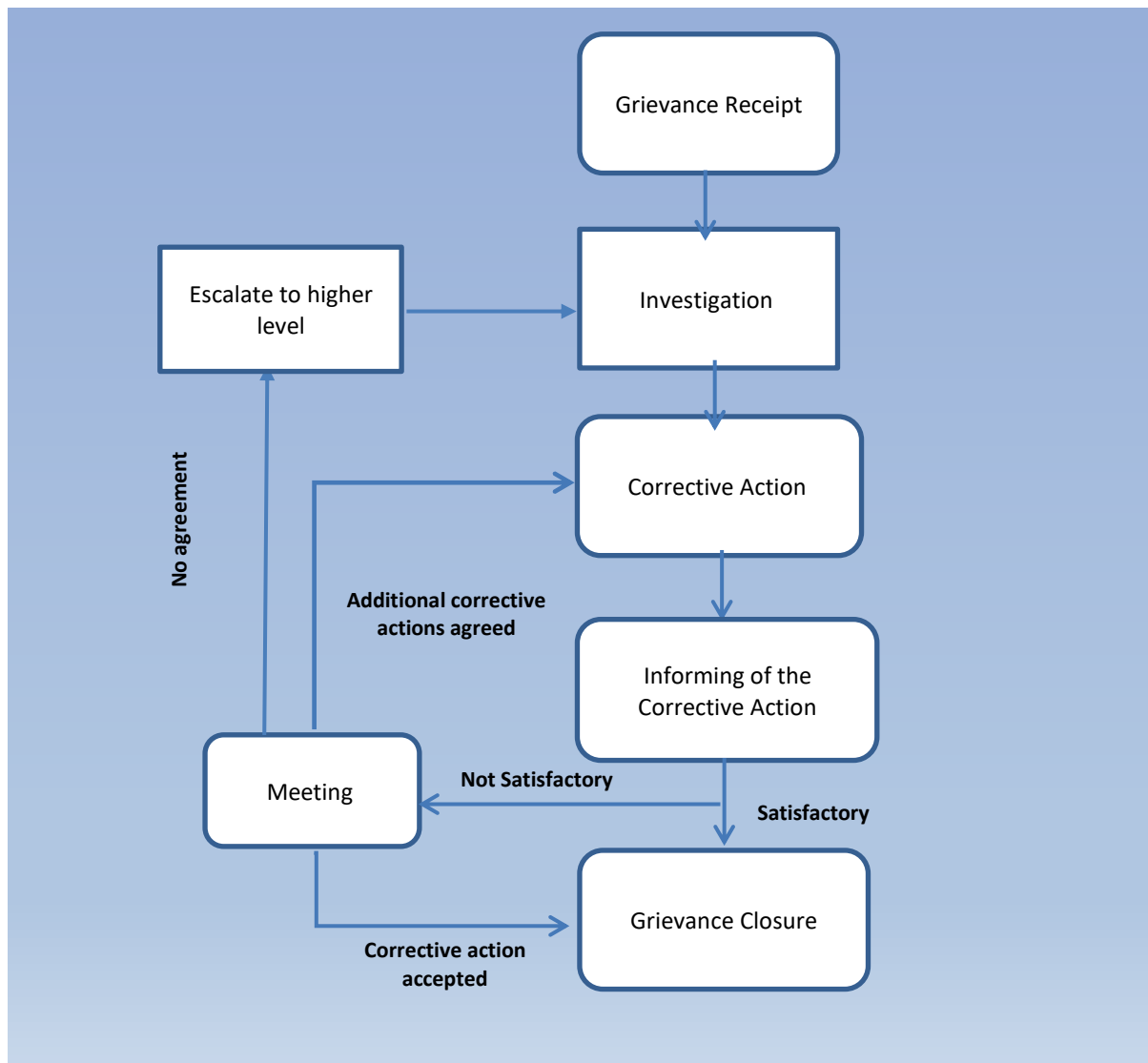


Figure 8–1: Proposed grievance mechanism system

- Grievances can be lodged in writing or verbally through grievance boxes or the company online grievance platform, as appropriate.
- Grievances may also be lodged anonymously: grievance boxes will be placed at different locations as well as construction site to allow community members, if any, and project staff to post written grievances.

¹⁰ IFC PS 2012, para. 35 (Grievance Mechanism for Affected Communities)

- A Grievance form will be disclosed at key locations as well as on the company website. The Grievance form will inform the complainants (workers or community) on how and where to submit a grievance.
- All grievances will be recorded in the grievance register, indicating details of the grievant, status and address of the person, type of stakeholder, the date on which the grievance happened and was recorded, a brief description of the grievance, detail on whether the grievance is a once-off or ongoing / repeated matter, and the outcome that is being sought;
- Grievance investigation will be recorded.
- After the grievance has been resolved, the resolution will be communicated to the grievant. The date on which the matter was resolved and a summary of the resolution will be recorded in the grievance register. Should the complainant still be dissatisfied, the complainant may appeal.
- The GRM will be communicated to all stakeholders.
- On a monthly basis, the grievance register will be reviewed to ensure all grievances are captured, and responded to. Implementation of the measures proposed to address the grievance should be checked and the close-out of the grievance monitored.

8.4 Monitoring

The community liaison officer will monitor community grievances, while the HSSE/labour compliance officer will handle labour grievances. Corporate E&S compliance team will monitoring all community and labour grievances.

The GRM will be monitored through regular stakeholder engagement meetings. During these meetings, community members will be asked for feedback on the stakeholder engagement program. The indicators that will be used to monitor the implementation of the GRM will include, but not be limited to the following:

- Issues raised by NGOs and other Stakeholders, actions agreed and status of those actions
- Number of grievances received from affected people and from external stakeholders
- Number of community grievances (i) open, (ii) open during more than 30 days, (iii) resolved, (iv) closed, and (v) number of responses that satisfied the complainants, during the reporting period disaggregated by category of grievance, gender, age and location of complainant.
- Categorization of grievances (by topic – e.g. noise/ safety), disaggregated by complainant's gender
- Number of grievances raised by workers, disaggregated by gender of workers and worksite
- Number of workers grievances (i) opened, (ii) open during more than 30 days, (iii) resolved, (iv) closed, and (v) number of responses that satisfied the workers, during the reporting period disaggregated by category of grievance, gender, age of workers and worksite.

d. Socio-economic Monitoring

The project will monitor the following socio-economic aspects on a regular basis:

- Satisfaction of the local community with the project activities;
- GM is fully understood by the local community; and

- Any unsolved grievances;

8.4.1 Project Decommissioning Plans

Decommissioning is defined as the closure of operations, the removal of process equipment, buildings, and structures, and carryout site cleanup and remediation, if required. The expected lifetime of the project ranges between 25 to 30 years, which will be renewable as long as the proper predictive maintenance measures are taken, and all the necessary revamps and upgrades are done.

A detailed Decommissioning Plan will be developed by energy valley prior to the end of the operational phase, in accordance with applicable national legislation and internationally recognized good practice.

The following are the main issues addressed by the facility's decommissioning plan:

- Preparation of detailed procedures for safe dismantling and removal of all above-ground infrastructure, including mounting structures, inverters, transformers, cabling, and auxiliary facilities Safe disassembly, handling, and removal of BESS components (including batteries), ensuring appropriate risk controls for hazardous materials where applicable Prioritization of reuse, recycling, and recovery of materials to the maximum extent practicable, and environmentally sound disposal of residual waste through licensed facilities;
- Management of hazardous materials and wastes in accordance with applicable legal requirements and good international industry practice;
- Assessment and implementation of site restoration and rehabilitation measures, including soil stabilization and re-vegetation where required to restore pre-project land conditions or agreed post-closure land use;
- Health and safety management plans for decommissioning workers and contractors, including risk assessment, training, and emergency preparedness;

8.4.2 Summary of ESMP

Below provides a comprehensive overview of the project management plan, including potential environmental aspects identified in the ESIA for both the construction and operation phases of the project, as well as the proposed mitigation measures designed to minimize these impacts. It also includes indicative budget that developed based on the current Project scope. The budget figures are preliminary and intended to provide an indication of the resources required for implementation. Actual expenditures may vary depending on Project implementation schedules and any additional requirements identified during Project execution. The budget will be reviewed periodically and updated, as necessary, throughout the Project lifecycle.

Table 8.2: A comprehensive overview of the project management plan

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
Air Quality	Dust emissions	- Reduce idling times for vehicles and machinery; - Maintaining machinery and vehicles in good working order - Speed restriction on sites; - Ensuring workers are aware of safe driving and maintaining good practices in machinery usage; and - Periodic measurements for stacks of generators	Construction contractor	- Monitoring plan - Air quality measurements	3,000 – 4,000 / year	Throughout the construction phase period
	working conditions of machinery	- Ensure good working conditions through frequent inspection of all construction equipment - Implementation of OHS plans	Construction contractor	Maintenance logs OHS plan	10,000 – 14,000 (included in EPC O&M allowance)	
Noise Level	working conditions of machinery	- Regular maintenance of construction equipment - Use low-noise equipment, where possible; - Schedule high-noise activities to avoid simultaneous operations that could amplify noise levels; - Schedule high-noise activities to take place in morning hours - Implementation of OHS plans	Construction contractor	OHS plan Noise measurements and Maintenance logs	2,000 – 3,000 / year	Throughout the construction phase period
	Provision of PPEs	- Providing necessary PPE for workers	Construction contractor		4,000 – 8,000 (PPE supply - total project period)	
Soil	housekeeping practices	- Develop and implement site management plan, solid waste management and wastewater management plans and spill prevention plan	Construction contractor Developer (include provisions in the construction contracts. Developers to ensure	- Waste and wastewater management plans - Solid/hazardous waste and	1,000 – 16,000 (depends on waste volume)	Throughout the construction phase period
	Waste/wastewater management					

Aspect	Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
		- Proper collection, containment, and disposal of sanitary wastewater - Proper collection, containment, and disposal of sanitary wastewater - hazardous materials storage and handling according to the WBG General EHS Guidelines, - Transportation and disposal to be carried out through authorized waste contractors - Develop and implement a Project Decommissioning Plan	contractors' compliance)	wastewater management contract - Contractor follow-up documents - Contracts with authorized waste contractors		
Occupational Health and Safety	Site Staff and Workplace Safety	- Developing OHS plan and HSE procedures according to national requirements and international standards	Contractor	OHS plan and procedures HSE provisions in the construction contracts	12,000 – 14,000	Before construction activities
Emergency Response plans	Site Staff and Workplace Safety	- Develop procedures for emergency control	Contractor	Emergency response plan	6,000 – 14,000	Before project commissioning
Waste management	Worker's health	- Developing a solid and hazardous waste management plans in line with the WBG General EHS Guidelines." - Developing OHS plans - Different types of waste to be stored in designated waste areas, and transported by licensed contractors	Construction contractor	Solid waste management contract with authorized contractors Waste manifest OHS plan	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)	Throughout the construction phase period
Biological Environment	Pests and invasive species	- Good housekeeping and proper waste management	Construction contractor	Waste management contract	2,000 – 5,000 (one-time)	Throughout the construction phase

Aspect		Issues of concern	Actions	Party Implementing the Action	Indicator of completion	Estimated Cost (USD)	Required Completion Date
		Disturbance to wildlife	- Awareness (toolbox talks and awareness signs) - Implementation of mitigation measures - Supervision and implementation of deterring measures	Construction contractor	Requirements specified in contracts		Throughout the construction phase
Social Environment		Workers influx	- Prioritize hiring local workers - Implement and maintain a community grievance mechanism; and, - Selection of labour accommodation, away from existing communities, as possible. - Develop HR policies including GBV and SEAH plans	Developer/Construction contractors	Labour management plan, workers accommodation inspection checklist GBV and SEAH policies Workers Awareness	10,000 – 30,000 / year	Throughout the construction phase period
		Community health, safety and security- risks from road traffic accidents	- Develop Traffic Management Plan (TMP) and associated procedures	Construction contractors	TMP and procedures	8,000 – 20,000	
		Cultural heritage	- develop chance find procedure	Developer/Construction contractors	Developed procedures	1,000 – 5,000	Before construction activities
Total Estimated Cost	(USD)					≈ 130,000 USD	
	(EGP)		-			≈ 6,500,000 EGP	

8.5 Environmental and Social Monitoring Plan

8.5.1 Environmental Monitoring

Although most potential impacts can be mitigated through management procedures, the monitoring plan is an essential element for the environmental management scheme of the project. It provides data for periodic review and necessary adjustments to the environmental management plan, ensuring environmental protection through the early detection of negative impacts.

The project will develop and implement a monitoring program for various environmental aspects during both the construction and operation phases. Monitoring results will inform the decision-making process, triggering corrective actions to maintain compliance with environmental laws and regulations, ensure environmental protection and workplace safety, and ensure the effective operation of mitigation measures and management plans.

According to Law 4/1994, establishments should maintain an environmental register to track the environmental aspects of their activities during the operational phase. This register will be updated annually. Moreover, a detailed monitoring plan will be made available by the company at the beginning of the operation phase.

It is worth mentioning that environmental monitoring is a dynamic process. Consequently, regular updates and modifications, as needed, shall be carried out based on the results of the first monitoring round. Moreover, as mentioned in Chapter (5), if different standards for the same parameter are mentioned, the project shall adopt the most stringent standard.

- **Air Quality Monitoring During Construction**
Workplace air monitoring of equipment exhaust will be performed quarterly. Emissions are generated from exhaust from construction equipment and motor vehicles, and particulates during site works. Monitoring results will be compared with the allowable limits of Law 4/1994 provided in Chapter (5) of this study.

The following parameters shall be measured:

- Carbon monoxide, CO
- Sulfur dioxide, SO₂
- Nitrogen oxides, NO_x
- PM₁₀

- **Workplace Monitoring**
Labour Audit

Labour audits are the most common spot-check mechanism used to monitor labour standards during both the construction and operation phases. Essentially, they serve as tools to ensure and support the application of labour standards through a thorough formal examination of the labour practices at a specific workplace or company, based on corroborated evidence.

The purpose of an audit is to evaluate these practices against a defined standard, and it will extend to the supply chain, in accordance with Scatec Human Rights policy, EBRD PR2,

ILO and relevant guidelines and Egyptian Labour law. Additionally, monitoring will include tracking grievances received from workers and external stakeholders, as well as documenting how these grievances were resolved.

Workplace Noise

During Construction

During construction, the project will ensure that the noise level from all construction equipment would not exceed the allowable limit set by Law 4/ 1994 for 8 hours duration shift (90 dB). In case the noise levels exceeded this limit, the exposure periods will be carried out according to those indicated in Annex (7) of Law 4/1994. Moreover, ear plugs will be provided for the workers at the locations generating increased noise levels. Noise level measurement will be carried out quarterly.

During Operation

Sources of noise result mainly from transformers and inverters. The measured noise levels will be compared to the levels set in Annex (7) of Law 4/1994. In case the noise exceeded the maximum limit of 90 dB, exposure periods will be proceeded as stipulated in Law 4/1994.

- *Solid and Hazardous Wastes*

Non-hazardous solid wastes will be recorded in the Environmental register of the plant. On the other hand, according to Law 4/1994, a register will be prepared for hazardous wastes. Information on the HW register should include types and quantities of hazardous wastes, storage means, and disposal.

An independent consultant would be hired to carry out the monitoring activities. The following Table 8–3 provides the proposed monitoring plan. The costs only cover analysis and field measurements. However, they do not include specific sample collection costs.

- *Biodiversity monitoring*

Visual inspection will be conducted on a daily basis. This inspection will cover aspects related to the status of biodiversity and the presence of potential hazards to wildlife and habitats. The inspection will also check to ensure proper implementation of measures outlined in this ESIA to minimize potential risks associated with day-to-day activities.

A basic fauna encounter procedure will be established and implemented to keep records of animal sightings, including dead animals due to vehicle collisions or other reasons. A Fauna Encounter Form will be developed and distributed to selected onsite staff. A form will be filled for each encountered species and will contain basic information, including:

- Name of the animal;
- Brief description;
- Sighting location(s) (including coordinates, if possible);
- Number of sightings;
- Number of sighted animals;
- Notable behaviour;
- Interaction with the project; and
- Photos of the animal.

All compiled forms will be kept in a register and used for the development of monthly reports.

Moreover, visual inspection carried out by onsite project staff will be sufficient to monitor aspects that could attract vermin and pests (such as water accumulation, unsafe disposal of solid waste and wastewater) and assess the potential presence of pests (rodents, insects, etc.).

In addition, the visual inspection and Fauna Encounter Procedure will also report the potential occurrence of any species alien to the area.

Electromagnetic Field (EMF)

Workers may be exposed to higher levels of electromagnetic fields (EMF) compared to the general public due to proximity to energized components within the substation and along OHTL corridors. However, such exposure is expected to be intermittent and limited to specific activities, primarily during inspection, maintenance, and operational access within restricted zones.

To ensure protection of workers and compliance with international good practice, EMF exposure shall be managed in accordance with internationally recognized guidelines, including those issued by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Access control measures, work procedures, and time limitations within high-field areas shall be implemented as part of the occupational health and safety management system.

If deemed necessary, EMF measurements shall be conducted following commissioning of the substation and OHTL infrastructure to establish baseline operational levels. Thereafter, monitoring shall be undertaken periodically and/or in response to significant operational changes or maintenance activities to confirm continued compliance with ICNIRP occupational and public exposure limits. Monitoring results shall be documented and used to verify the effectiveness of control measures and update risk management procedures where necessary.

Table 8–3: Proposed Environmental Monitoring Plan

Receptors / Source of impact/risk	Type of monitoring		Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Construction phase									
Workplace and neighbouring industrial area	Noise measurements		Project site	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD PR4; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	Relevant contractors and subcontractors, supervised by Scatec	Third party (research entity or certified lab)	~10,000 EGP
	Air emissions		Project site	Compliance with air emission standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Measurement at two locations quarterly	Relevant contractors and subcontractors, supervised by Scatec	Third party (research entity or certified lab)	~ 35,000 EGP
	Biodiversity	Habitats and biodiversity	Project site and Vicinity (Aol)	- Absence of hazards to wildlife and habitats - Proper implementation of mitigation measures	Law No. 4/1994; IFC PS6; EBRD PR6; AfDB OS3; EIB ESS3	Daily	Relevant contractors and subcontractors, supervised by Scatec	Energy Valley Company and EHS personnel	10,000 – 25,000
		Fauna		- Number of fauna encounters - No or reduced number of fatalities (such as road mortalities)		Chance encounters			
		Pests		- Good housekeeping - Absence of pests		Daily			

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Social management	Waste management	Project site and waste storage areas	Proper management of the different types of waste	Waste Management Law No. 202/2020; Law No. 4/1994; IFC PS3; EBRD PR3; AfDB OS4; EIB ESS3	Regular	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contractors EHS personnel	200 – 600 EUR/ton (hazardous waste) 80 – 150 EUR/ton (non-hazardous)
	Wastewater management	Project site	- Good housekeeping Absence of alien vegetation		Regular	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contractors EHS personnel	10,000–30,000 / year (mainly contractor fees)
	Workers influx	Project site and offsite accommodation	Number of community grievance	Egyptian Labour Law No. 14/2025; IFC PS2; EBRD PR2; AfDB OS5; EIB ESS8	Regular	Relevant contractors and sub-contractors, supervised by the Energy Valley company	Energy Valley Company and contractors' EHS personnel	Inhouse
	Traffic management	Project site and Vicinity (Aol)	- No road accidents - No community grievances Proper implementation of traffic management plan	IFC PS4; EBRD PR4; AfDB OS4; EIB ESS9	Regular during construction phase	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contractors EHS personnel	In house

Receptors / Source of impact/risk	Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Operation phase								
Workplace	Noise measurements	Transformers and inverters are	Compliance of noise intensity with standards	Law No. 4/1994 (Annex 7); IFC/WBG General EHS Guidelines; EBRD PR4; AfDB OS4; EIB ESS3	Annually	Energy Valley company	Third party (research entity or certified lab)	~10,000 EGP
Emergency generators stacks	Exhaust measurements	Stacks of emergency generators (SO ₂ , NO ₂ , CO, PM ₁₀)	Compliance with point source air emissions standards	Law No. 4/1994 (Annex 6); IFC/WBG General EHS Guidelines; EBRD PR3; AfDB OS4; EIB ESS3	Annually	Energy Valley company	Third party (research entity or certified lab)	~ 35,000 EGP
Project site and vicinity	Biodiversity (same as for the construction phase)	Same as for the construction phase	Same as for the construction phase	Law No. 4/1994; IFC PS6; EBRD PR6; AfDB OS3; EIB ESS3	Same as for the construction phase	Energy Valley company	Project personnel	10,000 – 25,000
Overall Project E&S Performance	Independent Environmental and Social Performance Audit	Project site and associated facilities	– Compliance with ESMP commitments. – ESMS requirements. – lender requirements. – corrective actions. – stakeholder engagement. – Grievance management. – OHS performance.	AfDB Integrated Safeguards System (ISS); AfDB OSs; IFC Performance Standards; EBRD PRs; Applicable National Legislation	Annually	Energy Valley company	Independent external E&S consultant/auditing firm	USD 10,000–20,000 per audit

Receptors / Source of impact/risk		Type of monitoring	Monitoring location	Target / Indicators	Reference Standard / Requirement	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
				– incident management and applicable legal requirements					
Consolidated Estimated Annual Environmental and Social Monitoring Budget									
		Construction Phase			Operation Phase				
Estimated Total Annual Cost*	(USD)	Approx. USD 4,000–9,000			Approx. USD 10,000–20,000				
	(EGP)	Approx. EGP 65,000–100,000			Approx. EGP 55,000–70,000				

*The above costs are indicative estimates intended to provide an order-of-magnitude assessment of environmental and social monitoring expenditures

8.5.2 Social Management Plan

The main aspects of the social management plan are summarized in the following sections.

- Labour and Working Conditions

During construction, the project will ensure that contractors are implementing suitable health and safety measures, and that workers are not exposed to forced or compulsory labour, including child labour.

During operation, the project will adhere to the requirements of Law 14/2025 and the general international workplace health and safety guidelines.

- On-going Consultation

Scatec has already undertaken various activities to communicate and engage with key stakeholders and is willing to continue its engagement activities.

- Information Disclosure

Information regarding the Project shall be publicly available on an ongoing basis and updated semi-annually at a minimum. Information will be at an appropriate level of detail and presented in an accessible manner (e.g., in Arabic with infographics used where beneficial).

This information is expected to include, but not be limited to, project progress updates; proposed future engagement and grievance mechanism; information about project activities; key contacts for the project; and other information, as needed.

- Grievance Management

A project grievance management plan will be developed will include external and internal grievance mechanisms.

Handling grievances related to GBV, SEAH will be undertaken in accordance with the requirements set within the AfDB11 ISS Best Practice Note addressing SEAH, GBV, and EBRD12 Good Practice: Addressing Gender-Based Violence and Harassment. For grievances related to the above, the steps to be undertaken will be in compliance with the project SEP.

- Socio-economic Monitoring

The project will monitor the following socio-economic aspects on a regular basis:

- Satisfaction/concerns of the neighbouring communities/activities with the project;
- Local community's needs (healthcare, water, etc.);
- Grievance mechanism is fully understood by the local community, and
- Any unsolved grievances;

¹¹ https://www.afdb.org/sites/default/files/borrower_guidance_note_on_gender_in_es_safeguards.pdf

¹² EBRD, Emerging Good Practice for the Private Sector Addressing Gender-Based Violence and Harassment, <https://www.ebrd.com/news/2020/new-guidance-for-private-sector-on-addressing-risks-of-genderbased-violence-and-harassment.html>

The grievance mechanism will also entail a process for monitoring community grievances related to GBV and SEAH.

- **Management Plan Review**

The ESMPs will be reviewed to reflect any potential E&S changes, and procedures will be reissued, as/if needed. The Site Manager will be responsible for ensuring that the workforce is complying with procedures, informing the staff of any changes, and ensures that the personnel are aware of changes before starting any work.

Table 8–4: Proposed Social Monitoring Plan

Receptors / Source of impact/risk	Monitoring location	Target / Indicators	Frequency of monitoring	Responsibility	Implementation	Approximate annual costs
Labour and Working Conditions	Project site	Health and safety measures No instances of forced or child labour reported.	Ongoing during construction and operation	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries
Information Disclosure	Project's Disclosure channels	– Publicly available information. – Semi-annual updates provided. – Information in Arabic with infographics where beneficial.	On-going basis during construction and operation and updated semi-annually	Energy Valley company	Energy Valley Company EHS personnel	Included in staff salaries
Grievance Management	Project site	– Grievance management plan developed for internal and external grievances. – Compliance with EBRD good practice for GBV and SEAH grievances.	Ongoing during construction and operation	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries
Socio-economic Monitoring	Project site and Aol	– Regular monitoring of community concerns and needs. – Grievance mechanism understanding assessed. – Monitoring of unresolved grievances.	On regular basis (quarterly)	All contractors and sub-contractors, supervised by Energy Valley company	Energy Valley Company and contactors EHS/HR personnel	Included in staff salaries

9. Conclusion

The Environmental and Social Impact Assessment (ESIA) has assessed the potential environmental and social impacts associated with the construction, operation, and eventual decommissioning of the proposed Battery Energy Storage System (BESS) and associated substation. The Project is expected to provide significant benefits by enhancing grid reliability and flexibility, supporting the integration of renewable energy sources, improving electricity supply stability, and contributing to Egypt's energy transition and decarbonization objectives.

The assessment identified a range of potential environmental and social impacts, the majority of which are localized, temporary, and reversible in nature. Key impacts during construction relate to dust and noise emissions, waste generation, traffic movements, occupational health and safety risks, and temporary disturbance to nearby receptors. During operation, the principal risks are associated with battery safety, fire hazards, hazardous materials management, waste management, and community health and safety. To address these risks, the Project will implement a comprehensive Environmental and Social Management Plan (ESMP) that includes, among other measures, dust suppression and noise control practices, waste segregation and disposal through licensed contractors, hazardous materials management procedures, biodiversity protection measures, traffic management controls, stakeholder engagement and grievance mechanisms, worker health and safety programs, emergency preparedness and response procedures, battery fire prevention and suppression systems, and a dedicated battery end-of-life management framework. The total estimated budget for implementation of the environmental and social measures, as developed in the ESMP, is approximately USD 130,000. This budget covers the implementation of E&S mitigation, monitoring, management plans, training, emergency preparedness, waste management, community and labour measures, and related reporting requirements.

The Project will also establish environmental and social monitoring programs, contractor management procedures, training and awareness programs, and incident reporting mechanisms to ensure the effective implementation of mitigation measures throughout the Project lifecycle. Ongoing engagement with stakeholders and affected communities will be maintained to ensure that concerns are identified and addressed in a timely and transparent manner.

Based on the findings of the ESIA, and assuming the effective implementation of the proposed mitigation and monitoring measures, the Project is not expected to result in any significant adverse residual environmental or social impacts. The residual impacts are generally assessed as low to moderate and acceptable within the applicable national regulatory framework and international good practice. Accordingly, the Project is considered environmentally and socially viable and can be developed in a manner consistent with sustainable development principles and good international industry practice.

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Annex (1): Gap analysis between AfDB Operational Safeguards (OSs) and the National Regulation

**National and AfDB's Environmental and Social
Operational Safeguards Requirements Gap Analysis**
Updated in Accordance with the AfDB Integrated Safeguards System (ISS) 2023

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
OS 1: Assessment and Management of Environmental and Social Risk and Impact			
Environmental and Social Assessment (ESA)	An integrated ESA shall be conducted for the project encompassing direct, indirect, and cumulative E&S risks and impacts throughout the project life cycle (OS1, para. 19). The ESA must address all relevant OSs (OS1–OS10), including climate change vulnerability, gender inequalities, and impacts on vulnerable groups. The updated ISS 2023 expands the ESA scope to include: contextual risk assessment covering human rights, SEAH/GBV risks, labour influx, and conflict dynamics (OS1, Annex 1). For high-risk (Category 1) projects, independent specialists must conduct the ESA (OS1, para. 21).	According to Law 4/1994 and its Amendments Law 9/2009 and Law 105/2015, an Environmental Impact Assessment (EIA) should be prepared before project execution to assess the potential impacts resulting from the project.	The national EIA framework is largely aligned with the basic requirement for pre-project assessment. However, significant gaps remain: (i) national law does not require explicit assessment of cumulative or indirect impacts; (ii) climate change vulnerability assessment is not mandated; (iii) gender and vulnerability screening are not required under national law; (iv) contextual risk assessment covering SEAH/GBV, labour influx, and human rights is not addressed by Egyptian legislation. The updated ISS 2023 strengthens these requirements beyond what is captured in national law.
Environmental and Social Management Systems (ESMS)	An ESMS shall be in place to address E&S issues across the project life cycle (OS1, para. 12). ESMS requirements shall be incorporated into third-party contracts. The updated ISS 2023 requires the ESMS to include procedures addressing SEAH, GBV, modern slavery, and labour influx risks (OS1, Annex 2). Contractor	--	The national laws do not obligate facilities to develop a documented ESMS. Such systems are usually voluntarily developed by facilities aiming to obtain international quality management certification (e.g. ISO). The updated ISS 2023 adds new requirements for the ESMS to explicitly address SEAH, GBV,

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	compliance shall be monitored against contractual conditions.		and modern slavery — areas not covered by Egyptian law. This gap is significant for projects with large contracted workforces.
Environmental and Social Policy	An overarching E&S policy shall be in place to define the environmental and social objectives and principles guiding the project's E&S performance. This policy shall be communicated to all employees. The updated ISS 2023 requires the policy to explicitly address non-discrimination, gender equality, and protection from SEAH/GBV (OS1, para. 12; OS2).	--	The national laws do not obligate facilities to develop an E&S policy. However, such policies are usually developed for facilities seeking international quality management certification. The updated ISS 2023 adds a specific requirement to address SEAH/GBV and gender equality in E&S policies — a gap relative to Egyptian national requirements.
Environmental and Social Management Plans (ESMP)	An ESMP shall be developed to address identified environmental and social risks and impacts, appropriate to the nature and scale of the project. The ESMP is binding and referred to in the financing agreement (Bank Policy, para. 54). It shall include: mitigation and monitoring measures, climate adaptation measures, and measures to address SEAH/GBV and labour influx risks. Requirements shall be communicated to all levels of the organization including contractors.	According to the Egyptian Guidelines for EIA (EEAA, 2009), an ESMP should be developed as an essential part of the EIA. The ESMP should consist of a set of mitigation, monitoring and institutional measures to be performed during different phases of the project. Responsibilities for mitigation and monitoring should be clearly defined in the ESMP.	There is no binding law requiring communication of the ESMP to all workers, and no penalties in national law for non-compliance. The updated ISS 2023 adds new ESMP requirements covering climate adaptation and SEAH/GBV management — areas not addressed by Egyptian law. Since the ESMP is part of the EIA, environmental approval implies approval of the ESMP from the competent authority, but enforcement mechanisms remain weak.
Organizational E&S Capacity and Commitment	Specific in-house personnel with clear lines of responsibility and authority shall be designated for E&S issues. The E&S representative shall possess the requisite	Articles 1, 2 of Decree 134/2003 of Labour Law 14/2025 set the required number of responsible personnel for managing H&S aspects. Article 5 of	No national requirements for assigning specific personnel for environmental issues. The updated ISS 2023 adds the requirement for E&S personnel to receive

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	knowledge, skills, and experience. Relevant training programmes shall be conducted, including on SEAH/GBV prevention (updated ISS 2023).	Decree 134/2003 requires facilities employing more than 50 employees to establish a Safety Committee. Articles 14, 15, and 16 of Decree 134/2003 address qualifications of HSE responsible persons.	training on SEAH/GBV prevention and response — a gap not addressed by Egyptian law.
Contextual Risk Assessment	The updated ISS 2023 introduces a new requirement for a contextual risk assessment to complement ESDD (OS1, Annex 1). This assessment covers: political economy dynamics; SEAH and GBV risks; labour influx and conflict risks; limitations on free speech and reprisal risks; corruption and rule of law issues; and land access and tenure conflicts.	--	There is no national legislative requirement for a contextual risk assessment covering SEAH/GBV, political economy, reprisal risks, or labour influx dynamics. This is an entirely new requirement introduced by the updated ISS 2023 that is not reflected in Egyptian environmental or social law. Projects will need to conduct this assessment as an additional step beyond national EIA requirements.
Supply Chain Management	Where there is a high risk of significant E&S issues in the supply chain (child labour, forced labour/modern slavery, significant OHS risks, biodiversity), primary suppliers shall be required to introduce corrective measures. The updated ISS 2023 explicitly adds 'modern slavery' and 'human trafficking' as supply chain risks to be assessed and managed (OS2, paras. 41–44). Where remedy is not possible, the Borrower shall within a reasonable period shift to compliant suppliers.	--	Supply chain E&S management is not addressed by Egyptian national law. The updated ISS 2023 has strengthened this requirement by explicitly adding modern slavery and human trafficking — not covered in either the 2013 ISS or Egyptian legislation. This represents a significant new compliance obligation for projects with complex supply chains.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Project Monitoring and Reporting	Procedures shall be in place to track and evaluate E&S performance throughout the project life cycle. The Borrower shall promptly notify the Bank within three working days of any materially adverse E&S event (updated ISS 2023, OS2, para. 45). E&S performance information shall be periodically reported internally to senior management and, as appropriate, to investors and affected communities.	The Egyptian Environmental Law 4/1994 requires activities with potential environmental impacts to maintain records/registers and report on their environmental performance. Records must be available for inspection by the competent authority. The Egyptian Guidelines for EIA (EEAA, 2009) require the ESMP to include monitoring and reporting provisions.	No requirements exist for periodic reporting to affected communities. The updated ISS 2023 introduces a new mandatory requirement to notify the Bank within three working days of materially adverse events — a stricter standard than Egyptian law. National law also does not require a systematic ESMP compliance monitoring system for the operational phase.
OS 2: Labour and Working Conditions			
General	Working conditions shall comply with national labour and employment laws and the requirements of OS2. The updated ISS 2023 introduces new Labour Management Procedures (LMPs) as a mandatory management tool, replacing less structured approaches. LMPs shall cover all categories of workers including direct workers, contracted workers, community workers, and primary supply workers.	The Egyptian Labour Law No. 14/2025 addresses working conditions and management of worker relationships, covering rights, duties, and occupational health and safety requirements.	The national law is broadly aligned with the general requirement, but does not mandate the preparation of formal Labour Management Procedures (LMPs). The LMP concept is new to the updated ISS 2023 and represents a gap relative to both the 2013 ISS and Egyptian law.
Human Resources Policies	HR policies shall be consistent with national law and international standards, and shall be clearly accessible to all employees. Policies shall cover: protection from SEAH and GBV (new requirement under updated ISS 2023); non-discrimination; and management of third-party labour. Procedures shall be	According to Article 58 of Labour Law (14/2025), internal regulation lists shall be in place covering rules of work and disciplinary sanctions. Decree 185/2003 describes the work regulation policy components including workers' complaints.	The national laws do not specifically require development of procedures for managing and monitoring third-party employer performance. The updated ISS 2023 adds an explicit requirement for HR policies to address SEAH and GBV — a gap not covered by Egyptian labour law.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	implemented for managing and monitoring third-party employers.		
Working Relationships	Terms and conditions of employment shall be documented and communicated in understandable language to all workers. The updated ISS 2023 requires this to include community workers and workers in fragile or conflict contexts. All wages, social security benefits, and entitlements shall be paid on termination of employment (OS2, para. 13).	Book 2 of Labour Law 14/2025 includes requirements for working relationships. Article 32 addresses contracts specifying job type, hours, rest days, wages, and vacations. Decree 211/2003 requires notification to labour offices prior to subcontracting. Article 36 addresses minimum wages. Social insurance is regulated under Law 63/1964, amended by Law 148/2019.	--
Child Labour and Forced Labour / Modern Slavery	The HR policy shall clearly prohibit child labour and forced labour. The updated ISS 2023 explicitly adds 'modern slavery' and 'human trafficking' as prohibited practices (OS2, para. 23). Young workers (under 18) shall not be employed in hazardous work. Regular monitoring of young workers' health, conditions, and hours is required. LMPs shall specify the minimum age for employment (14 unless national law specifies higher).	Article 2 of Child Law 126/2008 and Article 98 of Labour Law 14/2025 define a child as a person under 18. Article 99 of Labour Law 14/2025 prohibits engagement of children under 14. Decree 118/2003 lists work prohibited for children under 16 and 18. Article 12 of the Egyptian Constitution 2014 prohibits forced labour.	National law addresses child and forced labour, which is broadly aligned. However, Egyptian law does not explicitly prohibit 'modern slavery' and 'human trafficking' in the labour context as introduced by the updated ISS 2023. This is a gap requiring specific policy and LMP provisions.
SEAH and GBV Prevention	The updated ISS 2023 introduces explicit requirements for the Borrower to protect workers and communities from Sexual Exploitation, Abuse and Harassment (SEAH) and Gender-Based Violence (GBV). This includes: developing a SEAH/GBV prevention and response plan;	--	There is no national legislative requirement in Egypt addressing SEAH and GBV in the context of project operations and labour management. This is an entirely new requirement introduced by the updated ISS 2023 and represents a significant compliance gap

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	integrating SEAH/GBV requirements into contractor contracts (OS1, Annex 2); training for workers; and establishing confidential reporting mechanisms (OS2; OS4).		relative to Egyptian law. Projects will need to develop specific SEAH/GBV prevention and response frameworks.
Non-Discrimination and Equal Opportunity	Employment decisions shall not be made on the basis of personal characteristics unrelated to job requirements. The updated ISS 2023 expands protected characteristics to explicitly include sexual orientation and gender identity (OS2; OS7). Gender-responsive approaches shall be adopted throughout project implementation.	Article 35 of Labour Law 14/2025 prohibits discrimination against employees on grounds of gender, origin, culture, politics, religion, or beliefs.	Egyptian law addresses basic non-discrimination but does not explicitly cover sexual orientation and gender identity as protected characteristics — a gap relative to the updated ISS 2023 requirements.
Workers' Organizations	Workers shall be allowed to form and join workers' organizations. The Borrower shall not interfere with or control these organizations, and shall engage with workers' representatives for collective bargaining. The updated ISS 2023 clarifies that the Borrower shall not discriminate against or retaliate against workers participating in unions (OS2, para. 20).	Article 4 of Law 213/2017 (amended by Law 142/2019) concerning trade union organizations states that workers have the right to form trade union organizations and freely join or withdraw from them.	--
Retrenchment	Prior to implementing collective dismissals, the Borrower shall carry out an analysis of alternatives to retrenchment. A retrenchment plan shall be developed based on non-discrimination principles, consultation with workers, and compliance with	Egyptian Labour Law provides for dismissal procedures and severance entitlements under Labour Law 14/2025.	While Egyptian law covers aspects of dismissal, it does not mandate a specific analysis of alternatives to retrenchment or a formal retrenchment plan as required by the updated ISS 2023. This represents a gap requiring additional management procedures.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	national law (OS2, para. 18). This is a new explicit requirement under the updated ISS 2023.		
Worker Accommodation	Worker accommodation shall be clean, safe, and meet basic needs, including water, sanitation, and medical care where appropriate. The updated ISS 2023 specifies that accommodation shall not restrict workers' freedom of movement or association, and shall provide segregated facilities for women and men (OS2, para. 14).	Article 221 of Labour Law 14/2025 requires projects in remote areas to provide accommodation and meals. Ministry of Labour Decree 200/2003 provides specifications.	Egyptian law addresses accommodation provisions in remote areas. The updated ISS 2023 adds requirements on non-restriction of freedom of movement and gender-segregated facilities — elements not explicitly covered by Egyptian law.
Grievance Mechanism (Workers)	A workers' grievance mechanism shall be in place, accessible to all project workers including contracted and non-employee workers, and shall be communicated at recruitment. The updated ISS 2023 requires the mechanism to operate without reprisal, independently and objectively, and to not impede access to judicial remedies (OS2, paras. 24–26).	According to Article 19 of Decree 185/2003, workers' complaints shall be raised to the head of department and then to management. All complaints shall be documented.	--
Labour Influx Management	The updated ISS 2023 introduces explicit provisions for managing the influx of project labour (OS4, paras. applicable). Where significant labour influx is anticipated, the Borrower shall prepare a Labour Influx Management Plan covering: community health impacts; SEAH/GBV risks; provision of services for incoming workers; and measures to avoid	--	Labour influx is not addressed in Egyptian national law. This is a new requirement introduced by the updated ISS 2023 that was not present in the 2013 ISS and is entirely absent from Egyptian legislation. For projects involving significant labour influx, a dedicated management plan will be required.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	conflicts between workers and host communities.		
Non-Employee Workers	Contractors shall have their own policies and procedures addressing non-employee workers aligned with OS2. Risks associated with non-employee workers shall be assessed. Contracted workers shall have access to a grievance mechanism. The updated ISS 2023 requires explicit contractual provisions for SEAH/GBV protection and modern slavery prevention for contracted workers.	According to Decree 162/2019, the employer using non-employee workers (including contractors such as carpenters, welders, electricians) shall notify the labour office within ten days of commencement of work.	--
Occupational Health and Safety	A safe and healthy work environment shall be provided. Workers shall receive PPE at no cost. OHS procedures shall be established per Good International Industry Practice (GIIP). The updated ISS 2023 requires workplace processes to allow workers to report unsafe conditions without reprisal, and prohibits retaliation against workers who remove themselves from imminent danger (OS2, para. 30). OHS records shall include injury rates, occupational diseases, and fatalities.	Article 1 of Decree 211/2003 requires safe working areas. Decree 126/2003 addresses incident investigation and reporting. Article 217 of Law 14/2025 requires hazard awareness and PPE provision. Article 1 of Decree 211/2003 requires owners and contractors to ensure OHS conditions.	--
Security Personnel Requirements	Where security personnel are engaged, contract provisions shall include guidelines on their interaction with communities. A grievance mechanism shall allow affected communities and	Law 86/2015 and its Executive Regulation 133/2016 define conditions for security personnel. Security companies are responsible for addressing grievances	--

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	workers to express concerns about security arrangements. The updated ISS 2023 additionally requires that security personnel training include provisions on the use of force, non-discrimination, and SEAH/GBV prevention.	and compensating potentially affected persons.	
OS 3: Resources Efficiency and Pollution Prevention and Management			
Resource Efficiency	Measures shall be adopted to minimize consumption and improve efficiency in the use of energy, water, and other resources. The updated ISS 2023 strengthens this requirement by linking it to climate change mitigation commitments and Sustainable Development Goals (SDGs). Use of resources and material inputs shall be tracked.	Articles 49 and 50 of Electricity Law No. 87/2015 concern annual energy efficiency planning and policies. No specific regulation for water resources efficiency exists, although a national water resources plan (2017) was developed. The Environmental Register required by Law 4/1994 requires facilities to record resource consumption.	--
Pollution Prevention and Control	Air, land, and water releases of pollutants shall be monitored. Procedures, practices, and techniques shall be introduced to avoid, or where avoidance is not feasible, minimize and/or control the intensity and mass flow of pollutant releases. The updated ISS 2023 requires explicit consideration of greenhouse gas (GHG) emissions as part of pollution management.	Law 4/1994 (amended by Laws 9/2009 and 105/2015) and its Executive Regulations (Decree 338/1995 and amendments) address pollution prevention to air, soil, and water. Law 93/1962 and Decree 44/2000 address discharge to public sewer networks.	No written management procedures are required by national law. The updated ISS 2023 adds an explicit requirement to account for GHG emissions — not addressed in Egyptian environmental law.
Waste Management	Procedures for storage, handling, and disposal of solid and hazardous wastes	Article 37 of Law 4/1994 (amended) and Articles 38 and 39 of its ERs address solid	No written management procedures are required by national law beyond

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	shall be in place. Third-party waste disposal contractors shall be reputable and licensed. Chain of custody documentation shall be maintained to the final destination. The updated ISS 2023 aligns waste management with the circular economy approach and SDGs.	waste management. Articles 30 and 28 address hazardous waste. Law 202/2020 and its ER 722/2022 regulate solid and hazardous waste management. Article 49 requires segregation and delivery to authorized collectors. Chapter Five and Articles 50–54 of ER 722/2022 regulate hazardous waste.	compliance with waste regulations. Waste management plans are not mandated.
Safe Use and Management of Hazardous Substances	Procedures for storage, handling, transportation, and use of hazardous materials shall be in place. The updated ISS 2023 references the Stockholm Convention and Rotterdam Convention as international benchmarks for hazardous substances management.	Articles 29–33 of Law 4/1994 (amended) and Article 31 of its ERs address hazardous materials. Article 34 of Decree 211/2003 requires selection of chemicals that reduce hazard risk.	No written management procedures are required by national law. International conventions (Stockholm, Rotterdam) referenced in the updated ISS 2023 have not been fully integrated into Egyptian regulatory requirements.
Greenhouse Gas (GHG) Emissions Assessment	The updated ISS 2023 introduces an explicit requirement to assess and quantify GHG emissions associated with the project, including indirect emissions (OS1, para. 24). This is consistent with the Bank's Climate Change and Green Growth Strategic Framework (2021) and aligns with Sustainable Development Goals.	--	There are no national legislative requirements in Egypt for GHG emissions quantification or reporting for project-level activities. This is a new requirement introduced by the updated ISS 2023 that creates a gap relative to Egyptian environmental law. Projects will need to develop GHG assessments as a supplementary requirement.
OS 4: Community Health, Safety and Security			
General Requirements for Health and Safety Management	Preventive measures and plans shall be prepared and implemented to manage health and safety risks using the mitigation hierarchy approach and Good	The Egyptian Civil Law 131/1948 addresses community safety and security. Law 4/1994 also addresses	No written management procedures are required by national law. The updated ISS 2023 expands the scope of community health and safety management to include

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	International Industry Practice (GIIP). The updated ISS 2023 adds requirements to address: risks from labour influx on community health (communicable diseases, SEAH/GBV); and risks from large-scale emergency/pandemic situations.	community safety aspects related to hazardous waste management.	labour influx risks and pandemic preparedness — areas not addressed by Egyptian law.
Community Health and Safety	Procedures shall be implemented to address community health and safety issues in the context of operations. Safety procedures shall deal with hazardous material release, transport, and disposal. The updated ISS 2023 adds an explicit requirement for Dam Safety Plans where applicable, and for community health risk management plans where labour influx could introduce communicable diseases.	Law 4/1994 requires projects to monitor pollutants to air and water to protect the surrounding environment and community. Article 34 of Decree 211/2003 requires selection of less hazardous chemicals.	No written management procedures required in national law to address community health and safety issues. The updated ISS 2023 introduces new requirements on dam safety and communicable disease management from labour influx — gaps not covered by Egyptian law.
Exposure to Hazardous Materials	Appropriate measures shall be taken to prevent or minimize potential worker and community exposure to hazardous materials released by the project.	Article 34 of Decree 211/2003 requires selection of less hazardous substances and evaluation of chemical risks with air concentration monitoring.	--
Traffic and Road Safety	Potential traffic and road safety risks shall be evaluated and monitored for workers and communities. The updated ISS 2023 requires this to include assessment of heavy vehicle traffic impacts on community roads and vulnerable road users.	Egyptian Guidelines for EIA (EEAA, 2009) require assessment of infrastructure use and traffic in the EIA.	No written management procedures required by national law. The updated ISS 2023 provides more detailed requirements for traffic management planning than current Egyptian requirements.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Exposure to Disease	Procedures shall deal with avoiding/minimizing communicable diseases (including those related to influx of project labour) that could result from the project. The updated ISS 2023 strengthens this to include epidemic and pandemic preparedness measures, informed by COVID-19 experience (OS1, para. 3; OS4).	--	Labour influx and disease exposure are not addressed in Egyptian national law. The updated ISS 2023 significantly expands this requirement — particularly regarding pandemic preparedness — creating a gap relative to Egyptian legislation.
Emergency Preparedness and Response	Emergency Preparedness and Response Plans (EPRPs) shall be developed considering risks and impacts from the project on local communities. The updated ISS 2023 requires EPRPs to include provisions for natural disasters, climate-related events, and pandemic situations as new explicit requirements.	Article 215 of Law 14/2025 and Article 3 of Decree 211/2003 require each facility to prepare an emergency response plan.	--
OS 5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement			
Avoid or Minimize Displacement	Plans/procedures shall be developed to avoid or minimize economic and physical displacement, considering alternative designs. The updated ISS 2023 maintains this principle and emphasizes avoiding displacement as the highest priority, with compensation at full replacement cost as a last resort (OS5).	Law 10/1990 (amended by Laws 1/2015 and 24/2018) enables land acquisition for public investment projects. Compensation is estimated at prevailing market prices plus 20% based on Law 24/2018. Article 8 of Law 10/1990 allows affected communities to object to compensation values. The Egyptian Survey Authority is responsible for land acquisition and compensation estimation.	National laws do not include requirements for developing a written Land Acquisition and Resettlement Management Plan. Procedures are handled by government authorities. Eligibility criteria differ — Egyptian regulations assume legal titles, while the updated ISS 2023 requires compensation for property AND livelihood, regardless of legal title. The 20% premium under Egyptian law falls short of the full replacement cost standard required by

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
			the ISS. The updated ISS 2023 strengthens requirements for vulnerable group consideration in resettlement — a significant gap.
Consultation in Resettlement	All relevant information shall be disclosed and affected persons consulted. The updated ISS 2023 requires that consultation be conducted in a safe environment, free of reprisal, and in a culturally appropriate manner (OS5; OS10). Particular attention shall be given to vulnerable groups in consultation design.	--	There is no explicit consultation requirement in Egyptian law for resettlement. However, affected communities are usually informed about the project. The updated ISS 2023 introduces stronger requirements on the quality and safety of consultation, free of coercion or reprisal — a gap relative to Egyptian law.
Socio-Economic Assessment and Census	A detailed census shall be carried out to: identify displaced persons; determine eligible persons for compensation; and develop an inventory of affected land and property. The updated ISS 2023 requires the census to include documentation of informal land rights and customary tenure arrangements.	--	Egyptian law provides for a census/inventory through the Survey Authority. However, informal land rights and customary tenure are not recognized in Egyptian law — a gap relative to the updated ISS 2023 requirements.
Compensation for Displaced Persons	Compensation for loss of assets shall be provided at full replacement cost. The updated ISS 2023 clarifies that 'full replacement cost' means the market value of the assets plus transaction costs, and shall not be reduced by depreciation or salvage value (OS5).	--	Compensation under Egyptian law is based on market prices plus 20% premium, which does not necessarily equal full replacement cost as defined by the updated ISS 2023. This gap is particularly relevant when market prices undervalue affected assets.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Income Restoration	Loss of income resulting directly from project implementation shall be compensated. The updated ISS 2023 requires income restoration programmes to bring affected persons to pre-displacement income levels or better.	--	Egyptian regulations do not specify income restoration allowances for losses of business income. This is a gap relative to the ISS requirements.
Cut-Off Date	A cut-off date is required to prevent opportunistic in-migration to the project area. The updated ISS 2023 maintains this requirement and specifies that it shall be communicated publicly and transparently.	--	There is no cut-off date mechanism under Egyptian law. This is a gap relative to ISS requirements.
Grievance Mechanism (Resettlement)	An effective grievance mechanism shall be established for affected communities, accessible to all including vulnerable groups. The updated ISS 2023 requires the mechanism to operate without reprisal and to be linked to the Bank's Independent Recourse Mechanism (IRM).	--	No specific resettlement grievance mechanism is required by Egyptian law. The updated ISS 2023 introduces additional requirements regarding the IRM linkage that are entirely absent from Egyptian law.
Vulnerable Groups in Resettlement	Special attention shall be given to vulnerable groups affected by resettlement. Differentiated measures shall be provided to ensure adverse impacts do not fall disproportionately on the vulnerable. The updated ISS 2023 expands the definition of vulnerable groups to include those marginalized on the basis of sexual orientation and gender identity.	--	Egyptian regulations have not addressed how vulnerable groups affected by expropriation should be treated. The updated ISS 2023 expands the definition of vulnerability and strengthens protection requirements — a significant gap relative to Egyptian law.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Resettlement Action Plan (RAP) / Livelihood Restoration Plan	A RAP (if physical displacement) or Livelihood Restoration Plan (if economic displacement) shall be developed. The updated ISS 2023 clarifies that RAP costs must be fully integrated into project costs and either bank-financed, co-financed, or confirmed as counterpart funding before disbursement (Bank Policy, para. 54 footnote).	--	National law does not require a RAP or Livelihood Restoration Plan. The updated ISS 2023 strengthens financial arrangements for resettlement cost coverage — a gap relative to Egyptian law and practice.
OS 6: Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources			
Assessment of Issues and Impacts on Biodiversity	Impacts on biodiversity shall be identified and assessed as part of the ESIA. The updated ISS 2023 requires assessment to include ecosystem services, and to consider climate change impacts on biodiversity (OS6). The Bank exercises a precautionary approach to biodiversity offsets (OS1, footnote 68).	According to the EIA guidelines issued in 2009, the biological environment shall be described in the baseline EIA, covering fauna and flora, terrestrial and marine. Law 102/1983 addresses protection of natural protectorates.	--
Biodiversity Conservation Requirements	Types of habitats shall be identified by in-house or external experts. The ESIA shall study alternatives and include mitigation measures. In the case of critical habitat, a Biodiversity Management Plan (BMP) or Biodiversity Action Plan shall be developed. The updated ISS 2023 maintains the distinction between natural habitat, modified habitat, and critical habitat, and aligns with CITES requirements.	Law 4/1994 (amended by Laws 9/2009 and 105/2015) addresses biodiversity protection. Article 28 (as amended) and Annex 4 of the ERs define wild animals and plants prohibited from hunting, killing, or capturing.	National laws do not require a written BMP or Biodiversity Action Plan. The updated ISS 2023 maintains this requirement and adds explicit reference to climate change impacts on biodiversity assessment — a gap relative to Egyptian law.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Ecosystem Services	The updated ISS 2023 introduces an explicit requirement to assess and manage impacts on ecosystem services that underpin human well-being (OS6). This includes provisioning services (water, food), regulating services (flood control, carbon sequestration), and cultural services.	--	Ecosystem services assessment is not required under Egyptian environmental law. This is a new requirement introduced by the updated ISS 2023 that creates an additional compliance obligation not reflected in national legislation.
OS 7: Vulnerable Groups			
Identification and Protection of Vulnerable Groups	As early as possible in project planning, the Borrower shall identify individuals and groups who might be vulnerable, including: female-headed households, the landless, the elderly, youth and children, persons with disabilities, groups marginalized by ethnicity, religion, language, sexual orientation, and gender identity, and Highly Vulnerable Rural Minorities (HVRM) (OS7, para. 5). The updated ISS 2023 significantly expands this OS, introducing a comprehensive framework for HVRM and Indigenous Peoples management, including FPIC requirements.	Egyptian law does not contain specific provisions for protecting vulnerable groups in the context of project development.	This OS was absent from the original Gap Analysis and represents a significant area where Egyptian law has no equivalent provisions. The updated ISS 2023 has substantially expanded OS7, introducing formal identification and management requirements for vulnerable groups — including women and girls, minorities, and HVRM. FPIC requirements for HVRM are entirely absent from Egyptian law.
Free, Prior, and Informed Consent (FPIC) for HVRM	Where Highly Vulnerable Rural Minorities (HVRM) are present in or have collective attachment to the project area, the Borrower shall obtain their Free, Prior and Informed Consent (FPIC) in three specific circumstances: (i) commercial	--	There are no FPIC requirements under Egyptian law. HVRM groups are not recognized as a legal category in Egyptian legislation. This is a comprehensive new requirement under the updated ISS 2023 with no national law equivalent.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	use of cultural resources; (ii) physical relocation; and (iii) significant adverse impacts on critical cultural heritage (OS7, para. 36 as referenced in OS7).		
Gender-Responsive Approach	The updated ISS 2023 requires the Borrower to adopt a gender-responsive approach to E&S impact management, explicitly addressing the differentiated burden of impacts on women and girls (OS7, objective). Gender assessments shall be carried out for every project (Bank Vision, para. 7). This is a significantly expanded requirement compared to the 2013 ISS.	--	Egyptian law does not require gender impact assessment or gender-responsive project management in the context of E&S safeguards. This represents a gap relative to the updated ISS 2023 requirements.
Vulnerable Group Plans	Where project impacts on vulnerable groups are identified, the Borrower shall prepare a Vulnerable Group Plan or equivalent management plan detailing measures to avoid, minimize, or mitigate adverse impacts and ensure equitable benefit-sharing.	--	No equivalent requirement exists under Egyptian law. Vulnerable group plans are an entirely new requirement with no national law basis.
OS 8: Cultural Heritage			
Assessment of Cultural Heritage	The ESIA shall include assessment of cultural heritage in the project area. The updated ISS 2023 expands the scope to include intangible cultural heritage (living heritage, traditional knowledge, cultural practices) in addition to physical/tangible heritage (OS8).	According to EIA guidelines (EEAA, 2009), the baseline environment including tourist attractions shall be described in the EIA.	--

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
Managing Impacts on Cultural Heritage	Where cultural heritage may be found, a Chance Find Procedure shall be established. The updated ISS 2023 expands requirements for cultural heritage management to include explicit protection of intangible heritage and traditional knowledge associated with project activities (OS8).	Law 117/1983 (amended by Law 3/2010) addresses protection of antiquities. It requires that works stop and the archaeological authority be promptly informed in case of chance finds.	--
OS 9: Financial Intermediaries (NEW STANDALONE OS — ISS 2023)			
Financial Intermediary (FI) ESMS	Where the Bank provides support to a Financial Intermediary (FI), the FI shall put in place and maintain an Environmental and Social Management System (ESMS) to identify, assess, manage, and monitor E&S risks and impacts of FI subprojects on an ongoing basis (OS9; Bank Policy, para. 38). The updated ISS 2023 has elevated FI requirements into a standalone OS (OS9), reflecting their increased importance. The ESMS must be in place and reviewed by the Bank before any lending takes place.	--	Financial Intermediary E&S requirements are not addressed in Egyptian national law. OS9 is a new standalone safeguard in the updated ISS 2023, representing a new compliance category not addressed in the original Gap Analysis document and absent from Egyptian legislation.
FI Subproject Risk Categorization	The FI shall develop and maintain a risk rating/categorization system for subprojects (high, moderate, low risk). Subprojects involving resettlement, adverse impacts on vulnerable groups, or significant biodiversity or cultural heritage impacts shall be categorized as	--	No equivalent requirement exists under Egyptian law.

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	high risk regardless of the FI's own system (OS9, para. 19).		
OS 10: Stakeholder Engagement and Information Disclosure			
Stakeholder Identification	The Borrower shall have a mechanism to identify stakeholders (project-affected parties and other interested parties). The updated ISS 2023 requires early identification of vulnerable individuals and groups who may require differentiated engagement approaches (OS10, para. 13). Stakeholder identification and analysis shall be sufficiently detailed to determine appropriate communication levels.	According to EIA Guidelines 2009, public involvement is mandatory for Category C projects through public consultation with concerned parties. Formal public consultation is not required for Category A or B projects.	Egyptian EIA requirements for public consultation are limited to Category C projects. The updated ISS 2023 requires comprehensive stakeholder engagement for all project categories — a significant gap relative to Egyptian law.
Stakeholder Engagement Plan (SEP)	The Borrower shall develop and implement a Stakeholder Engagement Plan (SEP) proportionate to project risks and impacts. The SEP shall be disclosed as early as possible and before appraisal. The updated ISS 2023 requires the SEP to include specific provisions for: safe consultation free of reprisal; engagement with vulnerable groups; and a sufficient budget for all stakeholder engagement activities throughout the project life cycle (OS10, para. 15).	--	Egyptian law does not require a Stakeholder Engagement Plan. The SEP concept with its detailed requirements on budget, vulnerable group engagement, and reprisal-free consultation is entirely new in the updated ISS 2023 and represents a gap relative to Egyptian legislation.
Information Disclosure	Relevant E&S information shall be disclosed to affected communities in a timely, understandable, accessible, and	EIA guidelines require publication of EIA results, but specific timelines for public	Egyptian disclosure requirements are less prescriptive than the updated ISS 2023, which specifies the 120-day advance

African Development Bank's Environmental and Social Operational Safeguards requirements	International Requirements (AfDB ISS 2023)	National Requirements	Gap Description
	appropriate manner. For high-risk (Category 1) projects, ESA documentation shall be disclosed at least 120 days before Board consideration (Bank Policy, para. 59). The updated ISS 2023 requires disclosure through the Integrated Safeguards Tracking System (ISTS).	disclosure are not clearly defined in national law.	disclosure requirement for high-risk projects and mandatory ISTS use. These requirements represent a gap relative to Egyptian law.
Grievance Redress Mechanism (Community)	The Borrower shall provide a grievance mechanism to receive and facilitate resolution of concerns from project-affected parties. The updated ISS 2023 links this to the Bank's Independent Recourse Mechanism (IRM) and requires the mechanism to operate safely, without reprisal (OS10; Bank Policy, paras. 73–75). The mechanism shall be communicated to communities clearly, including information on the IRM.	Egyptian law does not require a dedicated community grievance mechanism for project operations beyond general civil litigation recourse.	No written community grievance mechanism is required by Egyptian law. The updated ISS 2023 strengthens this requirement by: (i) requiring linkage to the Bank's IRM; (ii) mandating reprisal-free operation; and (iii) requiring communities to be informed of the IRM. All of these are gaps relative to Egyptian law.
Reprisal-Free Engagement	The updated ISS 2023 introduces an explicit requirement that all consultation and stakeholder engagement activities be conducted in an environment free of reprisal, intimidation, coercion, manipulation, or discrimination (OS10, para. 9). The Bank is committed to protecting all stakeholders against reprisals at any time during the project life cycle (Bank Policy, para. 27).	--	Protection against reprisals in the context of project consultations is not addressed by Egyptian law. This is a new explicit requirement in the updated ISS 2023 that creates an additional compliance obligation beyond Egyptian legal requirements.