

ESIA for Project Anma

Cumulative Impact Assessment

PREPARED FOR
Anma Offshore Wind Energy Co.,
Ltd.

DATE
18 July 2025

REFERENCE
0692794



DOCUMENT DETAILS

The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.

DOCUMENT TITLE	ESIA for Project Anma
DOCUMENT SUBTITLE	Cumulative Impact Assessment
PROJECT NUMBER	0692794
DATE	18 July 2025
VERSION (delete field if unneeded)	Final
AUTHOR	Suho Song (SS), Boeun Yih
CLIENT NAME	Anma Offshore Wind Energy Co., Ltd.

DOCUMENT HISTORY

				ERM APPROVAL TO ISSUE		
VERSION	REVISION	AUTHOR	REVIEWED BY	NAME	DATE	COMMENTS
Draft	1.0	SS	Joseph Park	Seung Hyun Kwak	31 Oct 2024	
Draft	2.0	SS	Joseph Park	Seung Hyun Kwak	17 Jan 2025	
Draft	3.0	Boeun Yih	Seungcheon Baek	Meehee Suk	12 Jun 2025	
Final	3.1	Boeun Yih	Seungcheon Baek	Meehee Suk	18 Jul 2025	

ESIA for Project Anma

Cumulative Impact Assessment

0692794



Suite 1310, Block A, Munjeong Station SK V1,
128 Beobwon-ro, Songpa-gu, Seoul Korea
05854
Tel: 02-406-7888(Operator)

A handwritten signature in black ink, appearing to be 'Meehee Suk', written over a horizontal line.

Meehee Suk
Partner in Charge

CONTENTS

1.	INTRODUCTION	1
1.1	OVERVIEW	1
1.2	OBJECTIVE	1
1.3	SCOPE	2
1.4	LIMITATION	2
2.	PROJECT DESCRIPTION	3
2.1	THE PROJECT	3
3.	METHODOLOGY	4
3.1	APPROACH	5
3.2	CUMULATIVE IMPACT ASSESSMENT METHODOLOGY	5
3.3	CUMULATIVE IMPACT SIGNIFICANCE EVALUATION	6
4.	IDENTIFIED VECs	7
5.	IDENTIFICATION OF PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS	11
6.	PRESENT CONDITION OF VEC	16
6.1	MIGRATORY AND RESIDENT BIRDS (OFFSHORE AND COASTAL)	16
6.2	MARINE MAMMALS AND MARINE FISH	16
6.3	FISHERIES	16
6.4	COMMUNITIES	17
7.	CUMULATIVE IMPACT ASSESSMENT	19
7.1	VEC 1: BARRIER EFFECT, COLLISION RISK, HABITAT LOSS, AND DISTURBANCE TO MIGRATORY BIRDS	21
7.1.1	Key Stressor	21
7.1.2	Impacts from the Project	21
7.1.3	Impact from Other Operations and RFFAs	23
7.1.4	Summary of Cumulative Impacts to VEC1	24
7.2	VEC 2: UNDERWATER NOISE IMPACTS TO MARINE MAMMALS, MARINE FISH, AND BENTHIC SPECIES UNDERWATER NOISE AND COLLISION RISKS)	26
7.2.1	Key Stressor	26
7.2.2	Impacts from the Project	26
7.2.3	Impact from Other Operations and RFFAs	28
7.2.4	Summary of Cumulative Impacts to VEC2	29
7.3	VEC 3: FISHERIES	31
7.3.1	Key Stressor	31
7.3.2	Impact from the Project	31
7.3.3	Impact from Other Operations and RFFAs	32
7.3.4	Summary of Cumulative Impact to VEC3	32
7.4	VEC 4: COMMUNITIES	34
7.4.1	Key Stressor	34
7.4.2	Impact from the Project	34
7.4.3	Impact from Other Operations and RFFAs	34
7.4.4	Summary of Cumulative Impact to VEC4	35

8. ALTERNATIVES TO AVOID, MINIMISE, OR MITIGATE SIGNIFICANT CUMULATIVE IMPACTS	36
8.1 PROJECT SPECIFIC MITIGATION MEASURES	36

APPENDIX A PROJECT DESCRIPTION

APPENDIX B LIST OF SURROUNDING PROJECTS

LIST OF TABLES

TABLE 3-1	COMPARISON OF REGULATORY EIA AND CIA	4
TABLE 3-2	CIA STEPS	5
TABLE 4-1	SCOPING OF IMPACT	8
TABLE 6-1	ESTIMATED MANPOWER	17
TABLE 6-2	NUMBER OF EQUIPMENT DEPLOYED	18
TABLE 6-3	NOISE LEVEL DURING CONSTRUCTION PHASE	18
TABLE 7-1	CUMULATIVE IMPACT INDICATORS	19
TABLE 8-1	PROJECT SPECIFIC MITIGATION MEASURES	37

LIST OF FIGURES

FIGURE 3-1	CONCEPTUAL CIA PROCESS	4
FIGURE 5-1	LOCATION OF NEIGHBORING OFFSHORE WINDFARM PROJECTS	13
FIGURE 5-2	LOCATION OF NEIGHBORING ONSHORE WINDFARM PROJECTS	14
FIGURE 5-3	LOCATION OF NEIGHBORING ONSHORE SOLAR FARM PROJECTS	15
FIGURE 7-1	THE NO-NEVIGATION ZONE DESIGNATED DUE TO THE PROJECT	32

1. INTRODUCTION

Anma Offshore Wind Energy Co., Ltd. (AWC or the “Client”) is developing an offshore wind farm project located adjacent to Anma-do, Yeonggwang-gun, Jeollanam-do, Republic of Korea (the “Project”). The Project is managed by special purpose company AWC, which is owned by Equis Wind (Korea) Holdings Pte.

The Project has undertaken the Regulatory Environmental Impact Assessments (EIAs) in accordance with the Environmental Impact Assessment Act, however, assessment of cumulative impact under the Regulatory EIA was not in full alignment with the internationally recognised environmental and social (E&S) standards that the Project is adopting. The standards that the Project is adopting are as follow (the “Applicable Standards”):

- International Finance Corporation (IFC) Performance Standards (PS) (2012);
- IFC General Environmental, Health, and Safety (EHS) Guideline (2007);
- IFC EHS Guideline for Wind Energy (2015);
- IFC EHS Guideline for Electric Power Transmission and Distribution (2007); and
- Equator Principle (EP) 4 (2020).

Therefore, this stand-alone Cumulative Impact Assessment (CIA) has been undertaken to bridge the gap in conformance with the Applicable Standards.

1.1 OVERVIEW

According to the desk-based research and search on the Regulatory EIA online platform management by the Ministry of Environment, Environmental Impact Assessment Support System (EIASS), there are currently a total of 13 proposed offshore wind farm developers, around the Project off the coast of Yeonggwang-gun.

The assessment of cumulative impacts builds on the direct/indirect impact assessments of the Project undertaken during the assessment process. Cumulative impacts are generally considered as those that are additive or interactive in nature, arising when an impact from the Project interacts with an impact from another activity to create an intensified effect. The results of the direct/indirect assessments are considered in combination with other past, present, and reasonably foreseeable future actions (RFFA) potentially affecting resources and receptors.

1.2 OBJECTIVE

The ultimate objective of the CIA is to capture the total effects of many actions over time, from past, existing, and realistically future actions or projects that may be inadvertently missed by evaluating each action individually. To encourage informed decision-making, the relative contribution of the Project and other related projects to the overall cumulative effects was assessed. The CIA describes the additive or combined result of the alternatives as they potentially interact with actions external to the Project and other past, existing, and reasonably foreseeable future projects. It is critical to focus the CIA on meaningful cumulative impact issues rather than on all conceivable impact relationships.

1.3 SCOPE

The CIA has been undertaken in accordance with the Applicable Standards, as well as by referring to the IFC's Good Practice Handbook: Cumulative Impact Assessment and Management Guidance for Private Sector in Emerging Markets (the IFC Handbook).

1.4 LIMITATION

It should be noted that no site visit or stakeholder consultation was conducted for the development of this CIA. Additionally, there is limited publicly available data on other RFFAs, such as construction timelines, and significant uncertainties remain regarding the project due to factors like EBL receive, financing, and resident's issues. Given these limitations, a quantitative assessment was not feasible, and the CIA has been conducted using a qualitative approach to best account for the available information.

Furthermore, it should be noted that while this CIA primarily focuses on cumulative environmental impacts, cumulative impacts related to social aspects are evaluated in greater detail within the separate Social Impact Assessment (SIA) report. Therefore, for a comprehensive understanding of cumulative social impacts, please refer to the SIA report.

2. PROJECT DESCRIPTION

2.1 THE PROJECT

The Project Description, including the project's background (location, milestones, facilities and components, summary of EPC construction activities) is provided in Appendix A.

It has been developed as a standalone document to be read in conjunction with the main ESIA report. This ensures optimal coherence of the information through the updates and revisions.

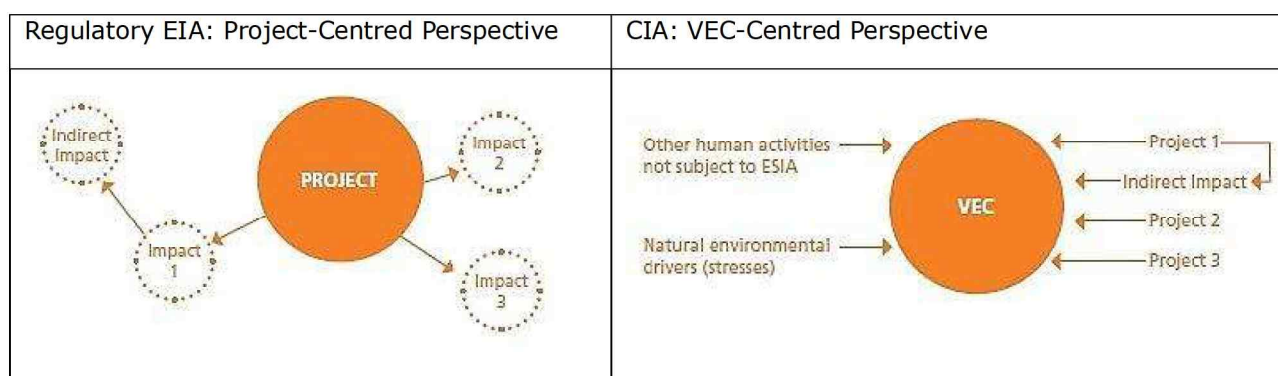
This assessment is focusing on five (5) major Project components:

- Wind Turbine Generators (WTGs);
- Offshore Substation (OSS);
- Offshore Export Cable: within this report, when referring to Offshore Export Cable it is included the Inter Array Cable (IAC) as the implications related to physical risks are the same;
- Onshore Substation (ONS); and
- Onshore Export Cable.

3. METHODOLOGY

Unlike the impact assessments undertaken under the Regulatory EIA, which focuses on the assessment of adverse impact from the source (i.e. the proposed project) to the receptors, in the project-centered perspective, a CIA focuses the Valued Environmental and Social Components (VECs) as the receptors of impacts from different projects nearby, and their activities (refer to Table 3-1). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.

TABLE 3-1 COMPARISON OF REGULATORY EIA AND CIA



Source: IFC, 2013

This CIA has been undertaken in accordance with the IFC Handbook. The handbook calls for a six-step process as shown in Figure 3-1, which focuses on the identification and evaluation of cumulative impacts on VECs. This process is iterative and flexible, with some steps having to be revisited in response to the results of others. More details on the process applied during this CIA study is provided in Section 3.1.

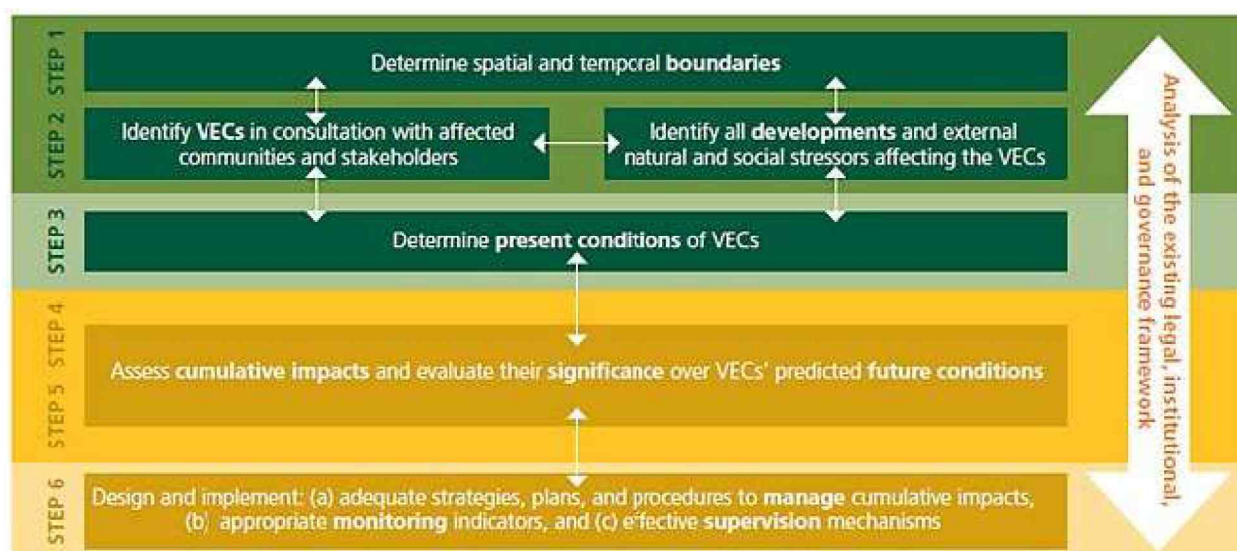


FIGURE 3-1 CONCEPTUAL CIA PROCESS

3.1 APPROACH

The CIA follows a stepwise process based in the IFC Handbook. The overall CIA steps are described in Table 3-2.

TABLE 3-2 CIA STEPS

Step
Step 1: Identify CIA study boundaries Determine the temporal and spatial boundaries (Study Area) of the CIA.
Step 2: Identify VECs Identify the VECs by considering the nearby developments, and external natural/social stressors within the Study Area. The identified VECs will be the ultimate focus of the CIA.
Step 3: VEC baseline Collect information/data on the VECs and define the baseline for the VECs, their spatial and temporal extent, existing conditions, sensitivity to change, resilience/recovery time, existing stressors and trend in condition. VEC indicators and thresholds will be refined during this step. This assessment will be informed by available information from stakeholder consultation and literature review.
Step 4: Identify all developments and natural and social stressors that may affect the VECs Based on findings from the literature review, identify past and present actions which have influenced the current condition of the resources or VECs within the CIA study area, as well as RFFA.
Step 5: Cumulative impact assessment Assessment of the cumulative impacts arising from interactions between the project, other projects, and other stressors and the VECs. Evaluation of the significance of predicted cumulative impacts to the viability/ sustainability of the affected VECs.
Step 6: Design and implementation of management and mitigation measures In addition to the measures identified in the EIA, further targeted actions, reflecting current cumulative impact assessment outcomes, will be developed and implemented. These actions will focus not only on impacts within the Project's direct control but also involve consultation and collaboration with government officials and third parties to effectively manage and mitigate impacts beyond the Project's immediate scope.

3.2 CUMULATIVE IMPACT ASSESSMENT METHODOLOGY

The focus of this CIA is to predict to what extent the Project may contribute, in combination with the other RFFAs screened into the assessment, to cumulative impacts on the selected VECs.

Whitin the assessment of cumulative effects, it is necessary to consider intra and inter-project effects as described below:

- **Intra-project effects:** these occur where a single VEC is affected by more than one source of impact arising from different aspects of a proposed development. An example of an intra-project effect would be where species are affected by change in water quality, noise disturbance and habitat loss during the construction of a scheme, with the result being a greater nuisance than each individual effect alone.
- **Inter-project effects:** these effects occur as a result of a number of developments, which individually might not have significant effects, but when considered together could create a significant cumulative effect on a shared VEC and will include developments separate from and related to a proposed development.

3.3 CUMULATIVE IMPACT SIGNIFICANCE EVALUATION

The significance of cumulative impacts is not evaluated in terms of the magnitude of change, but instead in terms of VEC response and the resulting condition and sustainability. If cumulative impacts do not exceed the VEC threshold, the development of the project under assessment is considered acceptable. Determining the VEC threshold includes the consideration of factors such as the prevailing baseline condition of the VECs to 'absorb' the effect and the distribution of the VEC.

In this Study, cumulative impacts are categorized by priority using the following definitions:

- **High Priority:** The VEC is expected to be or is currently being adversely impacted by other projects and/or external drivers and the future addition of the Project could incrementally contribute to the potential adverse impact. Given the existing or anticipated cumulative impacts on this VEC from other projects and external drivers, immediate (short-term) actions are recommended. These actions reflect both the urgency associated with current or projected impacts and the sensitivity of the VEC to ensure effective mitigation of adverse cumulative impacts.
- **Medium Priority:** The VEC could potentially be impacted by other projects and/or external drivers, and the Project could potentially incrementally contribute to the adverse impact. Actions should be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC.
- **Low Priority:** The VEC is not expected to be potentially impacted by other projects and/or external drivers, and therefore the Project impacts would not be expected to contribute to an adverse cumulative impact. No actions are required to mitigate potential adverse cumulative impacts on the VEC beyond Project mitigation measures.

To determine the significance of cumulative impacts, some limits of acceptable change, to which incremental impacts of an action may be compared, are needed. Cumulative Impact Indicators must be prepared based on the VEC identified in Section 4.

4. IDENTIFIED VECs

VECs are defined as E&S receptors that are likely to be the most sensitive to the impacts of a proposed project or the cumulative impacts of several projects, and the impacts could be potentially significant. Together with the findings from the literature review and comments from comprehensive stakeholder engagement, including formal public consultations, field surveys, in-depth interviews with local communities, fishery groups, and regulatory bodies as detailed in the updated Stakeholder Engagement Plan (SEP) and Social Impact Assessment (SIA), the key E&S concerns related to the offshore wind farm developments are summarised below.

- Collision risk to migratory birds (note: barrier effect explicitly not assessed due to low overlap with key migratory paths) key impact pathways selected based on scoping and assessment of anticipated significance;
- Underwater noise impacts and associated habitat loss affecting marine mammals, fish, and benthic species;
- Livelihood impacts to the fisheries; and
- Communities within landfall and onshore export cable area.

Table 4-1 presents the outcomes of scoping, based upon identified VECs, assessed the Project impacts, the identified external projects. Cumulative impacts that are not considered significant for the E&S aspects and were scoped out are not included in the assessment.

TABLE 4-1 SCOPING OF IMPACT

Impact Type	VEC's Likely to be Impacted	Assessment of the Potential Impacts	CIA Scope
Onshore Noise Generation	Local communities living along the coastal area.	The Regulatory EIAs of the Project and neighbouring projects provide assessment of noise impacts. Based on noise predictions for each type of equipment and typical operational conditions, it is estimated that noise levels during onshore export cable and substation construction experienced at the receptors will be within the relevant standard (i.e. Baseline Noise Standard under the Framework Act on Environmental Policy) Additionally, the onshore section is located within agricultural and production zones with no nearby residential areas or environmental protection zone, and the onshore cable export route is relatively short, approximately 1.5 km in length, with no know major developments planned at/near the route, resulting in an insignificant impact.	No further CIA is proposed and scoped out.
Visual Impacts	Local communities living along the coastal area.	According to the Regulatory EIA, offshore and onshore export cables are planned to be undersea and underground, therefore, there will be no alteration in the landscape. Regarding the Onshore Substation, the Regulatory EIA describes a series of mitigation measures that expect to eliminate/minimise visual impact through revegetation. It is not possible to assess the location of the onshore substations required for the other planned offshore wind power project. However, it is unlikely that these substations to be immediately adjust to the Project's onshore substation, and will not have a significant adverse impact on the landscape. The presence of offshore wind turbines will have a minor visual impact, as assessed by the Regulatory EIA. As the other planned offshore wind power projects are located further from the shore, it is assumed that the cumulative impact will be insignificant during operation.	No further CIA is proposed and scoped out.
Collision risk to migratory birds Barrier effect on migratory birds (scoped out)	Species of conservation significance known to inhabit the local area.	Considering an average operational lifespan of approximately 25 years for offshore wind farm projects, overlapping operational periods among proposed developments could cumulatively increase collision risks for migratory birds flying at rotor heights. Barrier effects have been scoped out for this Project, as no significant migratory flyways or habitat connectivity features intersect the offshore turbine layout.	As the detailed design of all projects is not yet known, the cumulative impacts of collision risks will be qualitatively assessed, reflecting their distinct mechanisms and sensitivities among migratory bird species.
Underwater noise impacts to marine mammals, fish, and benthic species	Species of conservation significance known to inhabit the local area.	The impact on underwater noise is described in the Regulatory EIA. Piling works for the installation of WTGs could generate underwater noise that may affect marine mammals, fish, and benthic species which could result in behavioral changes or displacement, communication and echolocation interferences. Considering that the Project is among the most advanced developments relative to neighboring offshore wind farm projects, and given that underwater noise impact from piling works will be relatively short-term and localized, significant cumulative impacts on marine mammals, fish, and benthic species are considered unlikely. Nonetheless, recognizing potential temporal overlaps between construction phases of nearby developments, a conservative qualitative CIA will be undertaken.	As the details of the design of all projects are unknown, a CIA will be undertaken in a qualitative manner.
Direct Impact of Offshore Vessel Traffic	Commercial and passenger/cruise ship operators	For the Project, Maritime Traffic Safety Assessment dated August 2023 prepared by Mokpo National Maritime University has concluded that the Project will not result in significant impact on any of the passenger/cruise ship operation, and therefore, impacts to passenger/cruise ship has been scoped out from the SIA. While there are a number of other offshore wind farm developments being proposed (refer to Figure 5-1), not all of them will reach construction, and they will also undertake Maritime Traffic Safety Assessment to assess the impacts to commercial and passenger/cruise ship operators, and adjust seaway upon consultation with the relevant stakeholders. With this regard, cumulative impact will not be significant to the commercial and passenger/cruise ship operators.	No further CIA is proposed and scoped out.
Livelihood Impact	Fishing Boat Crews	According to stakeholder interviews, most fishing boat captains are also the owners of the vessels, and their crews typically consist of family members or foreign migrant workers introduced through labor agencies. In cases where fishing activities in the WTG area are reduced, these foreign crew members are typically reassigned by their agencies to other fishing regions, and thus are not expected to experience long-term income loss directly due to the Project.	Given the comprehensive assessment provided in the updated SIA and LRP, additional detailed CIA specific to fishing boat crews is not proposed. However, cumulative livelihood impacts will be qualitatively monitored as part of ongoing

Impact Type	VEC's Likely to be Impacted	Assessment of the Potential Impacts	CIA Scope
Livelihood Impact	Fishers	No significant livelihood impacts have been identified to date for fishing boat crews, and therefore, specific livelihood restoration measures are not currently planned under the LP2. However, if disruptions to employment arise and workers request support, the Project will consider referral to alternative employment opportunities or other appropriate assistance, in line with IFC Performance Standards. As can be seen in Figure 5-1, while the fishers will be able to fish at the public waters not occupied by these offshore windfarm developments, their access to these areas will be controlled or limited, and their right to fish in the areas and subsequently their livelihood will be impacted. The magnitude of the impact will be determined via the FDIs to be undertaken by each of the developers, and the impacted fishers are expected to financially be compensated for their impacted livelihoods and rights.	stakeholder engagement and impact management efforts. As the details of the design of all projects are unknown, this CIA will be undertaken in a qualitative manner without involving the consideration of the likelihood or magnitude of impact.
Livelihood Impact	Communities within the landfall and onshore export cable area	As shown in Figure 5-2 and Figure 5-3 there are some small-scale onshore windfarms and solar farms present within the onshore direct Aoi. The impact by the Project is expected to be insignificant as the onshore export cable will be buried along the public road, with no intersection with the existing solar farms. It is expected that with other projects, cumulative impacts may be experienced by the communities if other projects to be installed to landfall and onshore export cable area. However, the Project is not informed of any new projects around the area up to date.	As the details of the design of all projects are unknown, this CIA will be undertaken in a qualitative manner without involving the consideration of the likelihood or magnitude of impact.

All of the above-mentioned key concerns are applicable to planned offshore wind farms of Study Area and thus each of the concerns could lead to cumulative impacts to biodiversity and social aspect. As such, the following VECs, categorised based on species groups, were selected for the CIA study:

- Birds (migratory and resident species at sea);
- Marine Mammals, Marine Fish, and Benthic Species;
- Fisheries; and
- Communities.

The proceeding sections of this CIA study will present the potential cumulative impacts, and mitigation and monitoring framework to manage impacts to the selected VECs.

During the 12 consecutive months surveys for bats, bats flying over the WTG Area areas have not been recorded. Therefore, bats are not included in the VEC.

5. IDENTIFICATION OF PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS

This Section identifies present actions, which have influenced the current condition of the resources or VECs at or around the Project Site, as well as RFFA. This CIA specifically focuses on renewable energy developments (offshore wind, onshore wind, and solar) due to their direct and similar impact pathways on key identified VECs (Migratory and Resident Birds, Marine Mammals, Fisheries, and Communities). Other types of developments (e.g., industrial complexes, port developments) are not considered here, as they are not expected to significantly contribute to cumulative impacts on these VECs.

The objective of this Section is to identify any activities/actions/developments and natural and social stressors that may affect the VECs. The actions presented have been compiled from desk-based research, review of the Regulatory EIA, Supplementary Regulatory EIA, Maritime Traffic Safety Assessment, Radio Impact Assessment and Cultural Heritage Surveys.

The information about near projects has been made publicly available through various platforms, including the EIASS, Yeonggwang-gun website, website of Electricity Regulation Commission (ERC) and the websites of other local governments.

Relevant projects included in this CIA have been identified based on the type of development (offshore wind, onshore wind, solar), anticipated construction timelines, current permitting and planning status, and geographic proximity to the Project site. A radius of 30 km was specifically selected considering the typical mobility range and migratory behavior of marine mammals and bird species, providing a robust spatial extent for assessing cumulative impacts. Within this defined radius, 13 offshore wind farm projects have been identified. Additionally, 12 onshore wind farm projects within 10 km and 54 onshore solar farm projects within 5 km from the onshore substation were also considered due to potential cumulative social impacts. Among these, 11 offshore wind farm projects are scheduled for completion by 2031. However, detailed information regarding the construction schedule and project scale for the Yeonggwang Chilhae 1 and 2 Offshore Wind Projects is currently unavailable, as these projects have not yet sufficiently advanced in the permitting process, limiting the publicly accessible information at this stage. More detailed descriptions, including distances to each relevant project, are provided in subsequent sections and appendices.

For the onshore wind farm projects, 10 have been completed as of 2022, while information on two projects could not be confirmed due to limited data.

As for the solar farm projects, 25 are currently in operation. Information regarding the other 29 projects, out of a total of 54 projects identified, could not be verified due to limited available data.

Appendix B and from Figure 5-1 to Figure 5-3 provides a detailed description of the status of these three (3) types of renewable development projects and locations of each project respectively.

From a biodiversity and social perspective, the 13 offshore windfarm projects are considered the most significant contributors to cumulative impacts due to strategic clustering driven by favorable conditions (consistent wind speed and shallow waters) and national policies, including the 10th Basic Plan for Electricity Supply and Demand and specific offshore wind promotion initiatives. Given this strategic positioning, it is anticipated that further offshore

wind developments will continue, potentially intensifying cumulative environmental and social impacts. Therefore, detailed and systematic consideration of impacts highlighted in the LESA review has been incorporated into this CIA.

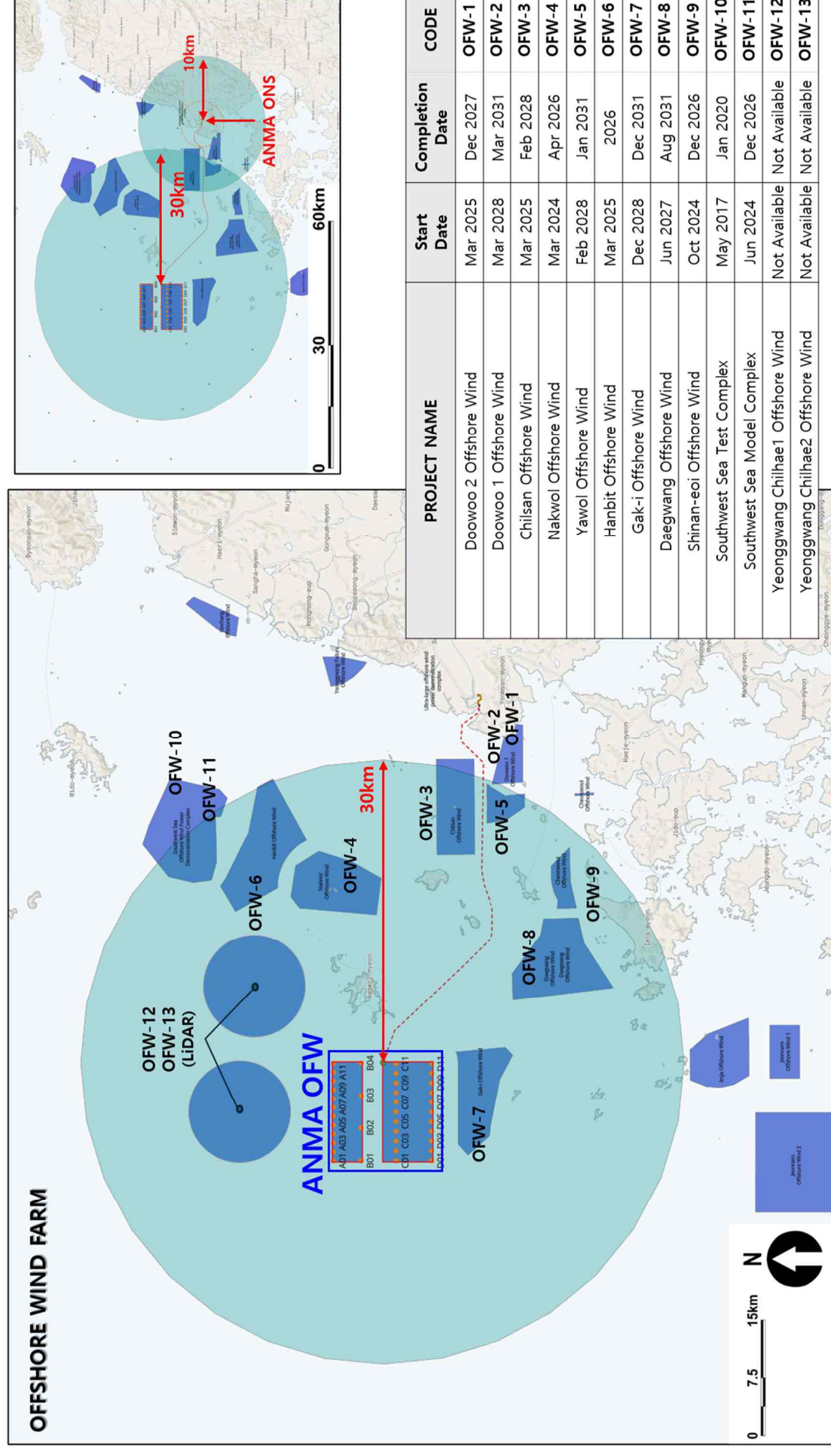


FIGURE 5-1 LOCATION OF NEIGHBORING OFFSHORE WINDFARM PROJECTS

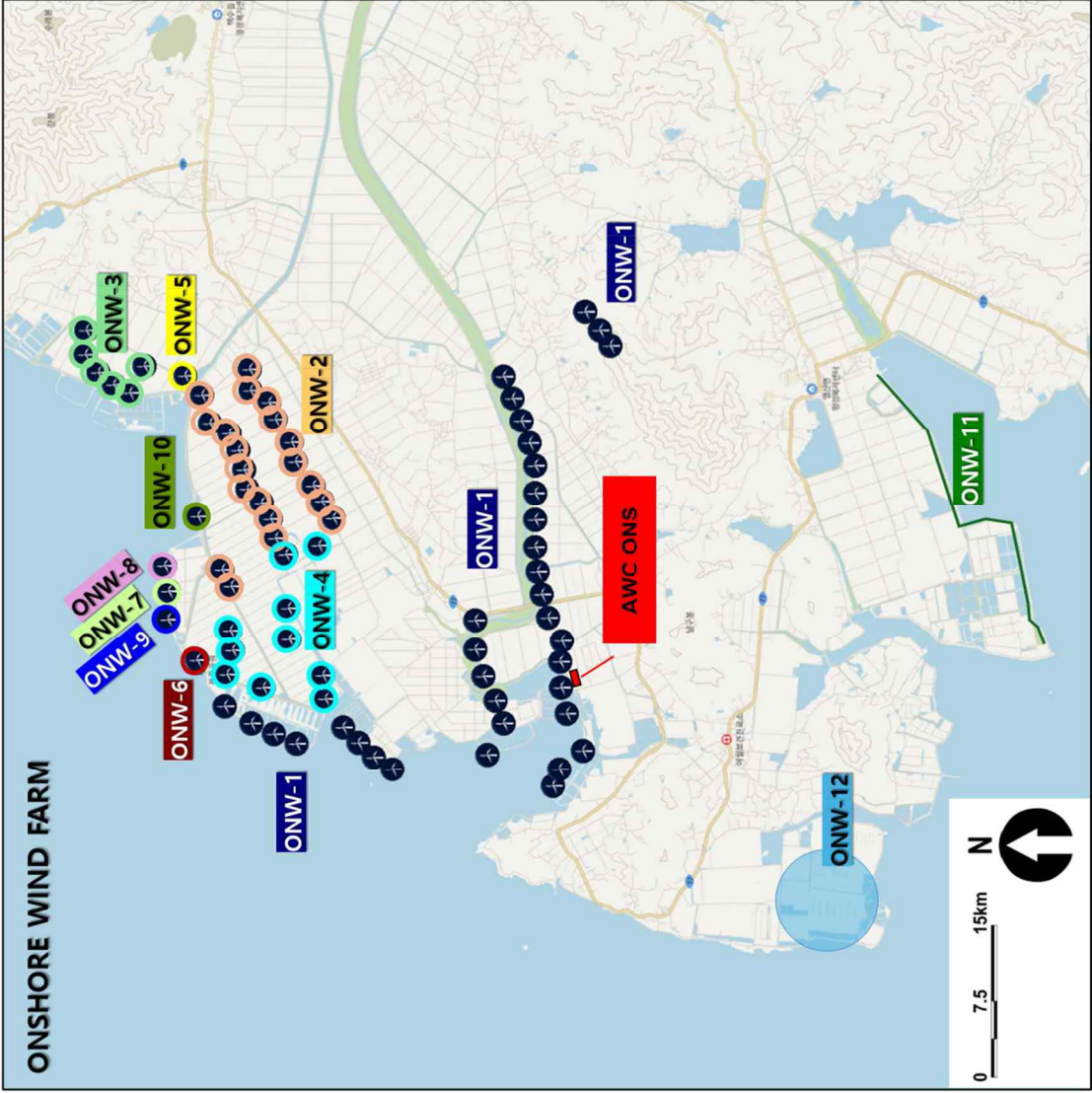
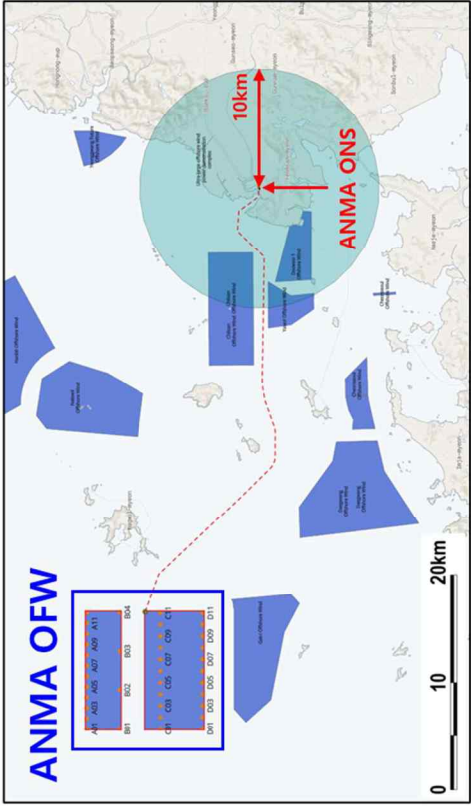
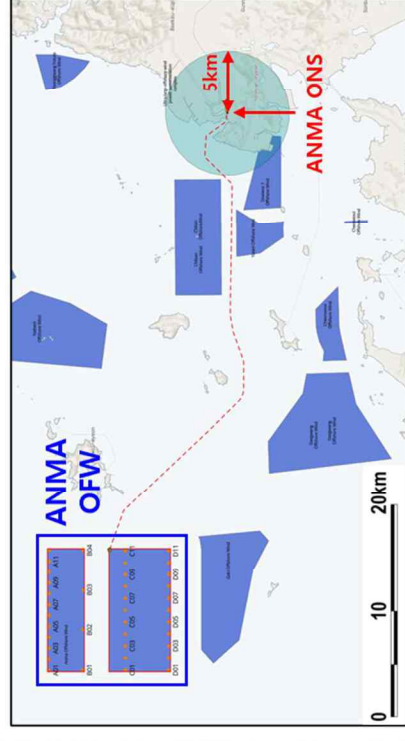
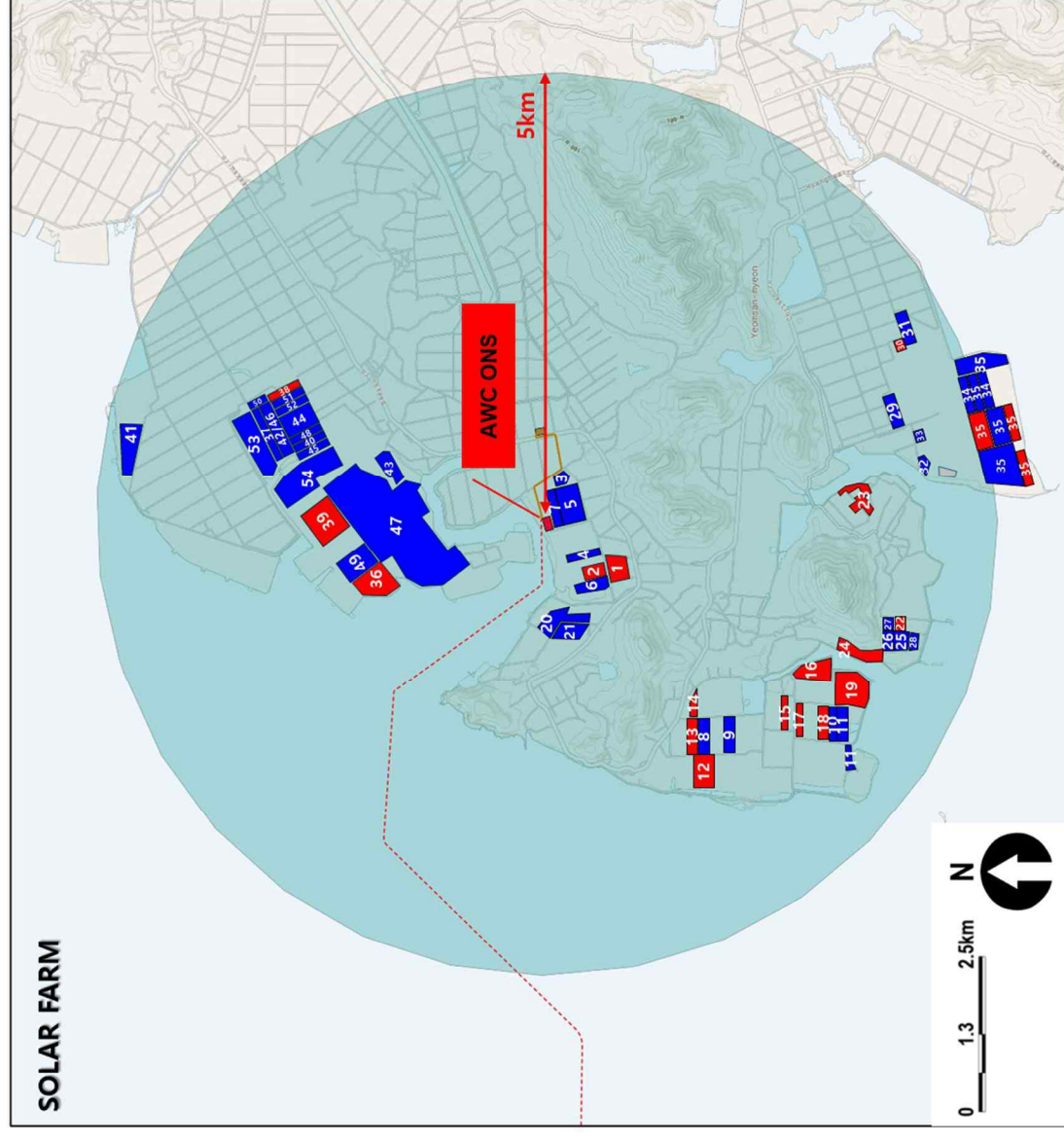


FIGURE 5-2 LOCATION OF NEIGHBORING ONSHORE WINDFARM PROJECTS



PROJECT NAME	Start Date	Completion Date	CODE
Yeonggwang Wind	Jan 2017	Jan 2019	ONW-1
Yeonggwang Baeksu Wind	Aug 2014	May 2015	ONW-2
Yeonggwang Yaksu Wind	Oct 2015	Nov 2016	ONW-3
Honam Wind	Mar 2013	Feb 2014	ONW-4
Yeonggwang Jisan Wind	Not Available	Jan 2013	ONW-5
Yeonggwang	Not Available	Jan 2019	ONW-6
Jeonnam Test Site 1	Not Available	2015	ONW-7
Jeonnam Test Site 2	Not Available	2016	ONW-8
Jeonnam Test Site 3	Not Available	2018	ONW-9
Jeonnam 4	Not Available	2022	ONW-10
Daemyung Energy	Not Available	-	ONW-11
Yeomsan Wind	Not Available	Not Available	ONW-12



■ Installed
■ EIA approved but not installed
■ Installed but can't find document

Start Date	Completion Date	CODE
Under Operation	Under Operation	7, 8, 9, 10, 12, 13, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 45, 46, 47, 48, 49, 50, 54
Not Available	Not Available	1, 2, 3, 4, 5, 6, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 32, 38, 39, 40, 41, 42, 43, 44, 51, 52, 53

FIGURE 5-3 LOCATION OF NEIGHBORING ONSHORE SOLAR FARM PROJECTS

6. PRESENT CONDITION OF VEC

This Section provides description of the current condition of the VEC (i.e. the baseline of the marine mammals, marine birds, and fisheries). The intension of this Section is to provide a recapitulation of the baseline in the context of cumulative impact. Refer to Biodiversity Impact Assessment Report for biodiversity and Social Impact Assessment Report for social section.

6.1 MIGRATORY AND RESIDENT BIRDS (OFFSHORE AND COASTAL)

A comprehensive 12-month snapshot survey undertaken at the WTG Area effectively documented the seasonal diversity of avian species within the project area. While providing valuable insights into bird presence and seasonal variations, certain methodological constraints mean the surveys may not fully quantify the abundance of migratory bird populations, and thus the assessment is complemented by qualitative evaluations.

The Transect Survey, conducted from March 2023 to February 2024, identified 31 bird species and 680 individual birds. Among the recorded species, two are listed as NT on the IUCN Red List (2024-1), including Streaked Shearwater [*Calonectris leucomelas*; NT (IUCN v.2024-1)], Swinhoe's Storm-petrel [*Oceanodroma monorhis*; NT (IUCN v.2024-1)].

The Island survey, conducted over the same period, recorded 122 bird species and 2,283 individual birds. Notably, the Hooded Crane [*Grus monachal*; VU (IUCN v.2024-1)] was identified. Additionally, nine species, including Hooded Crane, were categorized as Vulnerable (VU) on the Korean Red List. However, Hooded Crane was not individually assessed in the BIA due to the Project area's limited overlap with this species' primary habitats and migratory routes.

6.2 MARINE MAMMALS AND MARINE FISH

Marine mammal surveys for EIA were conducted from August 2020 to August 2022, with supplementary surveys carried out between March 2023 and February 2024. Additionally, marine fish species were assessed through both the Regulatory EIA and supplementary surveys to comprehensively evaluate cumulative impacts on marine biodiversity.

The Regulatory EIA surveys identified only the Narrow-ridged finless porpoise [*Neophocaena asiaeorientalis sunameri*; EN (IUCN v.2024-1)], with a total of 137 individuals recorded. Similarly, the supplementary surveys observed only the Narrow-ridged Finless Porpoise, capturing a total of 58 individuals. Although additional marine mammal species were identified by the IBAT report within 50km of the Project, these species were not observed during site-specific surveys conducted for this assessment, and thus were not individually assessed.

6.3 FISHERIES

In 2021, Yeonggwang-gun's marine fishing population included 7,002 individuals across 3,362 households. Among these households, 26% (873 households) were engaged in full-time saltwater fishing, while the remaining 74% (2,489 households) participated as a secondary occupation. The total number of fishery workers was 8,125, averaging 2.1 workers per household. A fishing household refers to family members or cohabitants living with the fishery business owner, while fishery workers are those involved in activities such as capturing, gathering, or breeding aquatic species.

In Nakwol-myeon, four fishing village societies are officially registered in Sangnakwol-ri, Hanakwol-ri, Songi-ri, and Wolchon-ri, with a total of 164 registered fishers. Among these, Sangnakwol-ri, Hanakwol-ri, and Songi-ri manage communal fishing rights over areas of 270 ha, 44.5 ha, and 500 ha, respectively. In contrast, Wolchon-ri focuses on aquaculture, operating 13 abalone farms spanning 100 ha.

As of 2022, Yeonggwang-gun had six designated fishing ports. Fishing activities in the region primarily involve vessel-based operations. These include coastal fishing, which uses small boats for fishing in nearby areas, offshore fishing with larger vessels designed for day-long trips, and inland water fishing conducted in rivers and lakes.

In 2019, 49 offshore fishery licenses were issued, covering inshore jigging (14.3%), inshore gillnet fishing (69.4%), Korean stick-held dip net fishery (2.0%), and inshore longline fishing (14.3%). By 2022, Yeonggwang-gun had issued 71 fishing licenses covering 3,474 ha, approved 137 aquaculture cases spanning 414.5 ha, and recorded 783 cases of vessel-based fishing, including 37 inshore and 746 coastal fishing cases.

6.4 COMMUNITIES

Large-scale development projects often pose various community health, safety, and security risks. The sudden flux of the workers may have adverse health impact through the communicable diseases. The Project is not planning to operate any construction camp or worker's accommodation facilities to avoid the risks of the communicable disease. Table 6-1 shows the current forecast of the manpower during the peak with expected duration.

TABLE 6-1 ESTIMATED MANPOWER

Activities	Expected Peak Manpower	Expected Peak Weeks	Expected Start of the Week in Peak
Pin-pile	200	10	2Q 2027
Jacket	200	10	2Q 2027
Inter Array Cable	Transport and Installation Vessel Crew: 80 to 100 Office Support/ Management Teams 20 to 60	40	1Q 2027
WTG	200	30	Q1 2028~Q3 2028
Export Cable	Transport and Installation Vessel Crew: 150 to 200 Office Support/ Management Teams 20 to 60	30	1Q 2027
Offshore Substation	200	16	4Q 2027
Onshore Substation & Export Cable	70 ~ 100	16	2Q~3Q 2027
Transition Joint Bay (Offshore Works)	Site Team: 10 to 20 Office Support/ Management Team: 5 to 10	8	1Q 2027

During the construction phase, the use of vehicles such as dump trucks is expected, which may have potential adverse impacts on nearby communities. Table 6-2 provides a summary of the anticipated number of equipment and vehicles to be used during the construction period. As shown in the table, the number of equipment and vehicles expected to be deployed is not significantly high. This suggests that the overall impact, such as air emissions, noise, and traffic congestion, is expected to be insignificant.

TABLE 6-2 NUMBER OF EQUIPMENT DEPLOYED

Construction	Equipment	Specification	No. of Deployed
Transmission Line	Excavator	0.7m ³	1
	Roller	1.0ton	1
Substation	Backhoe	0.7m ³	1
	Roller	15ton	1
	Dump Truck	1.0ton	1
	Loader	3.5m ³	1
	Grader	3.6m	1

Source: Final Regulatory EIA dated January 2023

Table 6-3 presents the results of the noise impact assessment conducted as part of the Regulatory EIA. The assessment assumes that all deployed equipment operates simultaneously at the shortest distance from the facility and from a single location, representing a worst-case scenario for direct noise impacts.

TABLE 6-3 NOISE LEVEL DURING CONSTRUCTION PHASE

Noise-Sensitive Facility	Distance (m)		Expected Noise Level				Environmental Target Standard dB(A)
	Onshore Export Cable	Onshore Substation	Onshore Export Cable		Onshore Substation		
			SPL ₁	SPL ₂	SPL ₁	SPL ₂	
Residential Area 1	391	303	45.9	46.7			Under 65
Residential Area 2	-	421	-	-	54.4	54.3	
Livestock Facility 1	500	-	43.7	44.8	-	-	
Livestock Facility 2	351	-	46.8	47.5	-	-	
Office (Yeomsan-wind Power Plant)	38	-	66.1	64.7	-	-	
Shrimp Farm	268	212	49.2	49.7	57.5	57.0	

Source: Final Regulatory EIA dated January 2023

The assessment concluded that noise levels at the identified receptors or communities will remain below the Environmental Target Standard of 65 dB(A), as stipulated under the Framework Act on Environmental Policy.

7. CUMULATIVE IMPACT ASSESSMENT

The following VECs have been identified as discussed in Section 4, including:

- VEC 1: Barrier Effect and Collision Risk to Migratory Birds;
- VEC 2: Underwater Noise Impacts to Marine Mammals, Marine Fish, and Benthic Species;
- VEC 3: Fisheries; and
- VEC 4: Communities.

The RFFAs provided under Figure 5-1 to Figure 5-3 are discussed in relation to their potential impacts to the VECs. Discussion of these VECs is provided in this section framed in terms of the following parameters:

- Known or suspected impacts by the project and RFFAs;
- Known cumulative impact issues in the region; and
- Concerns generally recognized as important on the basis of scientific concerns.

Determining the significance of cumulative impacts requires establishing limits of acceptable change, which serve as benchmarks against which the incremental impacts of an action can be compared. Theoretically, if the combined effects of all actions within a region do not exceed a defined limit or threshold—beyond which an impact becomes a concern—then the cumulative impacts of an action are considered acceptable. The indicators used to assess the future condition of VEC in terms of cumulative impacts are presented in Table 7-1.

TABLE 7-1 CUMULATIVE IMPACT INDICATORS

VEC	Potential Impacts	Cumulative Impact Indicators
Migratory Birds	• Collision risk • Barrier effect • Potential behavioral disturbance due to habitat loss, lighting, and construction-related disturbances (qualitatively assessed)	• Number of bird collisions recorded • Species affected and collision frequency • Changes in bird migration routes observed • Behavioral changes in bird movement patterns • Observed changes in bird behavior patterns (qualitative observations) • Area of habitat potentially affected by project activities • Qualitative assessments from field surveys • Note: General indicators such as habitat loss area, movement patterns, and species population rates are acknowledged as relevant in broader cumulative assessments but have not been explicitly assessed or quantified in this CIA.
Marine Mammals, Marine Fish, and Benthic Species	• Habitat loss and disturbance (including potential changes to food resources and foraging success) • Temporary loss of habitat and disturbance for the construction of export cables	• Area and duration of temporary habitat loss (due to cable installation and • WTG foundations) • Observable behavioral changes or displacement patterns (due to increased underwater noise, EMF, marine traffic)

VEC	Potential Impacts	Cumulative Impact Indicators
	- Barrier creation - Change in Water Quality - Increased Marine Traffic - Increased Underwater Sound - Disturbance through anthropogenic electromagnetic fields (EMF) and heat emission - Note: The specific impacts listed (e.g., habitat loss, barrier creation, change in water quality, increased marine traffic) are detailed assessments linked explicitly to the broader VEC groups identified in Section 4 and further elaborated in Table 4.1.	Potential changes in availability of food resources and foraging success (qualitatively assessed)
Fisheries	- Changes in fish catch volumes attributable to cumulative impacts - Reduction or alteration of accessible fishing areas (qualitatively and quantitatively assessed through Fishery Damage Investigations) - Economic impacts on fishery livelihoods (quantified through financial compensation measures and livelihood restoration plans)	Economic impacts on Permitted Fishery holders
Communities	- Noise disturbances from construction vehicles - Health risks from communicable diseases	- Level of noise disturbances experienced by communities (qualitative assessments based on complaints/grievances) - Community health risk assessment (monitoring incidents of communicable diseases and related health complaints during construction) - Temporary socioeconomic disruptions (qualitative monitoring via stakeholder engagement and grievance mechanisms)

7.1 VEC 1: BARRIER EFFECT, COLLISION RISK, HABITAT LOSS, AND DISTURBANCE TO MIGRATORY BIRDS

7.1.1 KEY STRESSOR

Key stressors and potential impacts to migratory birds at sea within the Project Site include:

- The Project and other offshore wind farms: disturbance and/or displacement of birds, barrier creation, collision risks; and
- Coastal developments: loss of habitat associated with land clearing for coastal infrastructure development, disturbance and/or displacement of birds, creating barrier affecting movement patterns for these species.

7.1.2 IMPACTS FROM THE PROJECT

The potential impacts to marine birds at sea from the Project during construction and operation phases are described as follows.

Construction Phase

- **Habitat Loss and Disturbance:** The Project will cause a permanent loss of open water and subtidal habitats due to the construction of wind turbine foundations and offshore stations, along with temporary disturbances to subtidal coastal habitats during the installation of Inter-Array and Offshore Export Cables (as explicitly assessed in the BIA, including sediment disturbance, increased turbidity, and associated mitigation measures). These habitat losses could potentially reduce the abundance and diversity of both terrestrial and marine species in the area. Specifically, impacts to marine mammals, fish, and benthic species have been explicitly assessed in the BIA, identifying potential habitat loss, increased turbidity, sediment disturbance, and implementing appropriate mitigation measures such as turbidity controls, phased trenching, and monitoring programs.
- Chilsan-do, an uninhabited island group consisting of seven islands near the project site, serves as an important habitat for various bird species, including the Black-Faced Spoonbill, Chinese Egret (*Egretta eulophotes*), and Eurasian Oystercatcher (*Haematopus ostralegus*). Among these islands, Yuksan-do is specifically recognized as a critical breeding habitat for these bird species.

Since Yuksan-do is located approximately 30 km away from the wind farm, the project's impact on these bird populations is not expected to be significant. However, some individuals may still be affected if they migrate to the open sea for wintering. As a result, the loss of open waters within the project site is expected to have some impact on bird populations.

- **Increased disturbance/noise impact during construction:** Impacts on birds may arise from potential disturbance and increased noise due to piling for turbine foundations and the installation of subsea cables. However, these impacts are expected to be limited due to the temporary nature and localized extent of the construction activities. Studies cited in the Biodiversity Impact Assessment (BIA), along with recognized international guidelines (e.g., IFC EHS Guidelines for Wind Energy, 2015), generally indicate minimal significant disturbance to bird species from noise during typical offshore wind construction practices. Nonetheless, considering the specific bird species identified in the Project area, including sensitive species listed in the BIA, mitigation measures such as noise monitoring,

restricted timing of particularly noisy activities, and regular construction monitoring will be strictly implemented to ensure these potential impacts remain low.

- **Reduction of Fisheries Resources for Bird Foraging:** The Project may result in some disturbance to a small area of marine habitats during the installation of wind turbine and the subsea cables, however, such impact is expected to be temporarily and insignificant in its nature based in the result from the Regulatory EIA.

The installation of offshore export and inter-array cables, along with WTGs, may temporarily elevate suspended solids and disturb seabed habitats, potentially causing short-term reductions in fishery resources that serve as prey for birds in the area.

Once construction is complete, fish populations are expected to be restored, especially around the installed substructures, which is expected to act as artificial reefs. Additionally, the presence of wind turbines could reduce fishing pressure in the Project Area. As a result, the overall impact on bird foraging, due to the temporary loss of a small portion of feeding grounds in marine habitats where fish serve as bird prey, is expected to be negligible.

Operation Phase

- **Barrier effect to bird movement and Collision risk:** It has been reported that wind turbines may act as barriers to bird movement, such that instead of flying between the turbines, birds may fly around the outside of the turbine cluster¹. This may consequently displace bird movement and disrupt the ecological links between feeding, foraging, breeding, and roosting areas. The spacing of turbines may alleviate this barrier effect by allowing wide corridors. It has been reported that gulls are able to regularly fly between turbines spaced 200 meters apart². A recent study using a thermal animal detection system installed on offshore wind turbines in the UK also revealed that seabirds exhibited avoidance behaviour and changed their flight path to avoid the turbines³. While this suggests birds generally detect and avoid turbines, a residual risk of collision or displacement remains, and this impact has been qualitatively considered within the BIA, with ongoing monitoring and adaptive management measures planned to mitigate these risks. Another study reviewed wind farm projects in Europe and North America and concluded that the risk that a bird is killed at a wind turbine is probably small compared to other anthropogenic activities (e.g. habitat destruction)⁴. Based on this information, it is anticipated that the barrier effect due to the operation of the wind turbines will not cause any significant impacts to the migratory bird species.
- **Collision Risk:** Mortality due to collisions between birds and wind farm structures remains a major concern in impact assessments, though actual collision rates tend to be low in operating wind farms due to birds' natural avoidance behaviours. This risk is species-dependent, site-specific, and influenced by weather conditions. Evidence suggests that the

¹ BirdLife International (2003) Windfarms and Birds : An analysis of the effects of windfarms on birds, and guidance on environmental assessment criteria and site selection issues. Paper presented in Convention On The Conservation of European Wildlife And Natural Habitats.

² Painter, S., Little, B. & Lawrence, S. (1999) Continuation of Bird Studies at Blyth Harbour Wind Farm and the Implications for Offshore Wind Farms. ETSU W/13/00485/00/00. Contractor: Border Wind Limited.

³ Skov H, Heinänen S, Norman T, Ward RM, Méndez-Roldán S, Ellis I (2018). ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. United Kingdom. 247 pp.

⁴ Rydell J, Engstrom H, Hedenstrom A, Larsen JK, Pettersson J, Green M (2013). The effect of wind power on birds and bats – A synthesis. Swedish Environmental Protection Agency

risk increases during periods of poor weather and reduced visibility⁽⁵⁾⁽⁶⁾. Additionally, bird collisions are more likely during migration seasons, when large numbers of birds fly across the sea at night and at low altitudes⁷.

According to the Bird Collision Risk Modelling (CRM) conducted for the Project, the highest expected mortality rate has been estimated at 12 individuals per annum for *Larus crassirostris*, a resident species of Least Concern. This result specifically applies to species for which sufficient flight data were available, and does not quantitatively represent collision risks for migratory or vulnerable bird species. Collision risks for migratory and sensitive bird species have therefore been qualitatively assessed within the BIA, and appropriate mitigation measures and monitoring programs are planned to address these risks.

A modelling study conducted on marine bird collisions with offshore wind turbines in the UK and Europe suggested that deploying fewer but larger turbines, rather than many smaller ones, could minimize bird collisions⁸. In the case of Daeryuk-do and Wangdeung-do, which are located close to the offshore wind farm and serve as stopovers for migratory birds, construction activities and the presence of vessels during the main migration seasons are expected to have an impact. To mitigate this, construction will be minimised as much as possible during peak migration periods. However, concerns remain regarding potential impacts on species such as the Chinese Crested Tern, an internationally endangered species, and other migratory birds.

To reduce collision risks, the Project plans to paint turbine blades with a white tint, and aviation lights and blade colours will be applied in accordance with Ministry of Land, Infrastructure and Transport (MoLIT) regulations to enhance visibility and avoidance for birds. With these mitigation measures in place, the overall impact of the Project on bird collisions is expected to be negligible.

7.1.3 IMPACT FROM OTHER OPERATIONS AND RFFAS

The potential cumulative impacts on marine birds, particularly migratory species, from the Project combined with RFFAs, such as the phased development of additional offshore wind farms in the region, could present broader challenges to bird populations. While the Project itself includes mitigation measures to reduce impacts on birds, the introduction of multiple offshore wind farms in proximity could compound issues like habitat loss, barrier effects, and collision risks. The loss of open water and subtidal habitats from both the Project and surrounding developments may further reduce available feeding, breeding, and stopover areas for migratory species such as the Black-faced Spoonbill and the critically endangered Chinese Crested Tern. These birds, which rely on specific habitats like Yuksan-do and Chilsan-do, may experience increased disturbances as multiple projects disrupt their ecological connections.

Additionally, the cumulative presence of wind turbines across various sites may intensify the barrier effect on bird movement, altering migratory pathways and potentially displacing species from key feeding and breeding grounds. While the risk of bird collisions is expected to

⁵ BirdLife International (2003) Op cit.

⁶ Rydell J, Engstrom H, Hedenstrom A, Larsen JK, Pettersson J, Green M (2013). Op cit.

⁷ Hüppop O, Dierschke J, Exo KM, Fredrich E, Hill R (2006) Bird migration studies and potential collision risk with offshore wind turbines. Ibis 148: 90–109

⁸ Johnston A, Cook ASCP, Wright LJ, Humphreys EM, Burton NHK (2013) Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. J. Appl. Ecol. 51, 31–41.

be low for the Project due to birds' avoidance behaviours and planned mitigation measures like painting turbine blades, the cumulative risk may increase as other projects come online. This risk is particularly heightened during migration seasons and periods of poor weather when birds are more vulnerable to collisions.

Although the individual impacts of the Project on birds are expected to be negligible, the cumulative effects of other RFFAs in the area may vary, with potential to either result in impacts on bird populations or have no significant effect.

In addition to renewable energy developments, other RFFAs such as port expansion, dredging, coastal reclamation, and industrial facilities may also contribute to cumulative impacts on coastal and intertidal habitats that support key bird species. These types of non-renewable projects, if located within or adjacent to sensitive coastal ecosystems, may result in further loss or degradation of stopover, foraging, or nesting habitats for migratory and resident birds.

At the time of this assessment, no specific non-renewable projects with confirmed locations or timelines have been identified within the Project's coastal or intertidal AoI. However, the CIA acknowledges the need to consider such developments should additional information become available in the future.

Currently, as the Project is the most advanced in the region, detailed cumulative impact assessments conducted by neighbouring offshore wind farm projects are not yet available. Therefore, this CIA qualitatively assesses potential cumulative impacts based on publicly accessible planning information and clearly recognizes this limitation.

7.1.4 SUMMARY OF CUMULATIVE IMPACTS TO VEC1

The potential cumulative impacts on marine birds, particularly migratory species, from the Project and RFFAs, such as additional offshore wind farm developments, are expected to be insignificant. The Project's construction and operation phases will involve habitat loss and disturbances, but these impacts are largely mitigated through planned measures and are not expected to significantly affect critical bird habitats, such as Chilsan-do and Yuksan-do, which support important species like the Black-Faced Spoonbill and the critically endangered Chinese Crested Tern.

During the construction phase, temporary disturbances to marine habitats will occur due to the installation of wind turbine foundations and subsea cables. However, these effects are considered manageable and temporary. The implementation of seabed disturbance reduction techniques and the short installation period for wind turbine generators further limit the potential for long-term habitat disruption. As a result, fish populations, which provide critical foraging resources for birds, are expected to recover after construction, especially around the installed substructures that will act as artificial reefs.

In the operation phase, potential impacts include the barrier effect on bird movement and collision risks. However, evidence from previous studies suggests that the risk of bird collisions with wind turbines is low due to birds' natural avoidance behaviours. The Project includes additional mitigation measures which further reduce the likelihood of collisions. Despite these measures, the cumulative presence of wind farms in the region could amplify risks like habitat loss and movement disruption, particularly during migration seasons or poor weather conditions when birds are more vulnerable.

Considering that the Project will be implementing the mitigation measures committed under the Regulatory EIA with respect to bird collision, and that the neighbouring offshore wind farms will be requested to implement similar or more stringent measures during their Regulatory EIA to be undertaken, and the low sensitivity of the nearby ecological receptors, given the mitigation measures committed under the Regulatory EIA and expected similar measures for future developments, the cumulative impact of the Project and other RFFAs on marine bird populations is currently anticipated to be manageable. However, recognizing existing uncertainties and the limited availability of detailed cumulative assessments from neighbouring developments, this conclusion remains preliminary. Ongoing monitoring, coordinated adaptive management, and additional evidence-based assessments will be essential to ensure impacts remain at acceptable levels.

If authorities request the offshore wind farm developers to collectively consider additional mitigation measures on e.g. bird collision subsequently, AWC will review such request and work with other developers to adopt to such request, as appropriate.

7.2 VEC 2: UNDERWATER NOISE IMPACTS TO MARINE MAMMALS, MARINE FISH, AND BENTHIC SPECIES UNDERWATER NOISE AND COLLISION RISKS)

7.2.1 KEY STRESSOR

Key stressors and potential impacts to marine mammals, marine fish, and benthic species of the areas at/around the Project Site include:

- The Project and other offshore wind farms: disturbance and/ or displacement of marine mammals and marine fish due to increased underwater sound, risk of collision with vessels for marine mammals and fish due to increased marine traffic, and displacement or habitat alteration for benthic species caused by shifting fishing activities towards coastal areas; and
- Coastal developments: habitat loss affecting marine mammals, marine fish, and benthic species associated with land clearing for coastal infrastructure development, disturbance and/or displacement of marine mammals and fish, and changes in water quality impacting marine mammals, fish, and benthic communities.

7.2.2 IMPACTS FROM THE PROJECT

According to the Anma Offshore Windfarm Consolidated Programme dated September 2024, the installation of WTGs is expected to last for nine months. The potential impacts to Marine mammal during construction and operation phases are described as follows.

Construction Phase

- **Habitat loss and disturbance:** The construction of WTG foundations for the Project will result in the permanent loss of open water/subtidal habitats affecting marine mammals (including Finless Porpoise), marine fish, and benthic species. This habitat loss is located outside the proposed Major Wildlife Habitat designated specifically for the Finless Porpoise.
- **Temporary Loss of Habitat and Disturbance Due to the Construction of Offshore Cables:** Temporary habitat loss or a temporary decrease in the abundance of marine mammals, marine fish, and benthic species may occur due to vessel operations transporting construction materials for the WTGs, offshore substations, and inter-array and export cables. Additionally, temporary habitat impacts are expected during cable-laying activities, particularly involving cable jetting in intertidal and subtidal sections. Although these impacts are generally expected to be temporary and limited in duration due to the relatively short installation period, some permanent habitat loss will also occur specifically at the locations of WTG foundations.
- **Change in Water Quality:** Water quality in the western sea, particularly off Yeonggwang-gun, may be temporarily degraded due to an increase in suspended solids from marine construction activities, such as cable laying, offshore substation installation, export cable installation, and piling operations for WTG foundations. Increased suspended solids could potentially lead to habitat degradation and reduced availability of fish resources. Although marine mammals such as the Narrow-ridged Finless Porpoise primarily rely on echolocation for hunting rather than visual cues, indirect impacts on their foraging ability could still occur if prey availability or prey detection is significantly affected by habitat changes or elevated underwater noise levels associated with construction activities.

- **Increased Marine Traffic:** Although the exact number of vessels required for the export cable installation is yet to be finalized, vessel operations will traverse habitats used by marine mammals (including the Narrow-ridged Finless Porpoise), marine fish, and benthic species. This increased vessel traffic creates a potential collision risk, which could lead to injury or mortality particularly for marine mammals. However, according to the Maritime Traffic Safety Assessment, vessel transit will be managed and restricted during both construction and operational phases. Consequently, with these measures in place, significant adverse impacts on marine mammals, marine fish, and benthic species from increased marine traffic are not anticipated.
- **Increased Underwater Sound:** Some construction activities for the Project, such as piling, will emit high levels of underwater sound. Specifically, underwater piling noise generates considerable hydroacoustic energy that radiates from the piles into the surrounding water.

During the baseline surveys for marine mammals, the only protected marine mammal species observed near the Project site was the Finless Porpoise [*Neophocaena asiaeorientalis*; EN (IUCN v.2024-1)].

Uncontrolled underwater noise may cause behavioural changes in marine mammals, such as temporary displacement. The noise may also displace their prey, indirectly impacting cetaceans.

For the jacket pile driving activities, a hammer with an energy capacity of 2,000 to 3,000 kilojoules (KJ) is expected to be used, with piles anticipated to have a diameter of approximately 3.5 meters. The source noise level for the sound exposure level (SEL) per strike has been estimated based on this pile diameter.

According to the Underwater Noise Modelling report dated October 2024, predicted noise exposure impact zones were assessed using worst-case environmental and installation scenarios. The Permanent Threshold Shift (PTS) impact zones extend up to 500 meters. Calculations indicate that PTS thresholds for hearing damage may be exceeded within a maximum distance of 0.5 km for Phocid pinnipeds, while other marine mammal groups are expected to fall below this threshold distance.

To mitigate the impact of piling noise, the Project will implement measures such as deploying Marine Mammal Observers (MMOs), using Acoustic Deterrent Devices (ADDs), and employing a soft-start technique. These measures aim to minimise potential adverse impact to marine mammals, marine fish, and benthic species in the vicinity of the pile-driving operations.

Operation Phase

- **Increased/Displacement of Fishing Activities:** Restrictions on fishing within the wind farm areas may shift fishing activities to other regions, potentially increasing fishing pressure in those areas. This heightened fishing activity in habitats used by marine mammals, including the Finless Porpoise and other cetaceans, marine fish, and benthic species, could lead to increased competition for fish resources, possibly reducing food availability for these species. Additionally, displaced fishing efforts may elevate the risk of marine mammal entanglement in fishing gear, potentially leading to injuries or mortality. However, the substructures of wind turbines can provide surfaces for colonization by marine organisms, enhancing habitat availability and serving as a supplementary food source for marine animals. Despite these positive effects, due to uncertainties associated

with the full extent of direct and indirect impacts resulting from displaced fishing activities, further detailed assessment and ongoing monitoring are necessary to ensure impacts remain within acceptable levels.

- **Increased Marine Traffic:** Marine mammals, including the Finless Porpoises and other cetaceans, may face an increased risk of collisions with operation and maintenance vessels, potentially resulting in injury or mortality. However, project vessels will primarily follow predefined marine transportation routes. As a result, the impact on marine mammals, including cetaceans, is expected to be minimal and not significant.

7.2.3 IMPACT FROM OTHER OPERATIONS AND RFFAS

During the baseline survey for marine mammals, Finless Porpoise were observed. Due to the sensitivity of these species, the cumulative impacts of cable installation for offshore wind farms could have been a concern if all the construction works to happen simultaneously.

Simultaneous activities could affect water quality, increase marine traffic (e.g. use of crew transfer vessel and or installation vessels etc.), and elevate underwater noise levels, and lead to displacement of fishing activities, all of which could disrupt marine mammal habitats, however, considering that the Project is well advanced compared with other proposed offshore wind development, the impact is expected to be insignificant.

Currently, 13 confirmed and planned projects are expected to be developed near the project area. Most of the construction activities for these RFFAs, including offshore wind farm developments, are projected to be completed by 2031. However, project delays are possible due to ongoing negotiations with local fishing communities and internal operational issues.

A primary concern associated with these projects is the underwater noise generated during piling activities for jacket type foundations, as sound can travel long distances underwater. High levels of underwater noise pose a risk of temporary and permanent threshold shifts for marine mammals such as the Finless Porpoise. Similarly, elevated underwater noise levels may affect marine fish, leading to altered behavior, stress responses, displacement, and potential disruption of spawning activities. Benthic species, although less sensitive to acoustic disturbance compared to marine mammals and fish, may still be indirectly impacted due to habitat disturbances associated with installation activities. Additionally, noise from these activities may displace fish populations, reducing prey availability for marine mammals.

According to the Underwater Noise Modelling report dated October 2024, predicted noise exposure impact zones were assessed using worst-case environmental and installation scenarios. The PTS impact zones extend up to 500 meters. Calculations indicate that PTS thresholds for hearing damage may be exceeded within a maximum distance of 0.5 km for Phocid pinnipeds, while other marine mammal groups are expected to fall below this threshold distance. To mitigate the impact of piling noise, the Project will implement measures such as deploying MMOs, using ADDs, and employing a soft-start technique.

These measures aim to minimize potential harm to marine mammals in the vicinity of the pile-driving operations. Also to provide benefit to marine fish by reducing stress responses and displacement.

The cumulative impact of increased marine traffic during the construction and operation phases, including work vessels moving between ports and offshore wind farms, is expected to be insignificant. While an increase in marine traffic is anticipated, vessels will generally follow

predefined marine transport routes, reducing the risk of collisions with marine mammals. Marine fish and benthic species are also expected to experience minimal disturbance from increased vessel traffic, as routes will avoid sensitive habitats where feasible, and water quality impacts are anticipated to be minor and short-term.

While construction activities, particularly piling, may pose potential adverse mainly during the piling to the marine mammals, the duration of piling will be temporary. Given that this Project is among the most advanced developments, piling is unlikely to occur simultaneously with neighbouring projects. However, sequential piling across multiple offshore wind projects in the region could extend the total duration of disturbances, potentially resulting in longer-term cumulative impacts on marine mammals. Therefore, ongoing monitoring and coordinated management strategies will be necessary to ensure that cumulative impacts remain within acceptable levels.

Furthermore, the presence of wind farms is anticipated to bring positive effects during the operational phase as the wind turbines and their foundations are expected to act as 'artificial reefs,' attracting the growth of organisms that provide food, habitat, and shelter for fish, thereby enhancing fish populations within and around the wind farm areas. Benthic species diversity is also expected to benefit, as turbine foundations will provide additional hard substrates for colonization by various organisms, leading to increased habitat complexity and biodiversity. The use of steel foundations with scour protection will increase niche diversity and promote community development, supporting the recovery of ecosystems after predation or storm events. The armour layer used for scour protection around turbine foundations will also contribute to ecological benefits by enhancing reproductive health for plankton, providing surfaces for attachment organisms, and offering shelter and recovery zones for fish species.

In conclusion, minimal cumulative impacts from construction activities (e.g. underwater noise and increased marine traffic) is expected considering the progress of the neighbouring projects, and the overall significance of these impacts is considered insignificant. The implementation of mitigation measures committed by the Project during the Regulatory EIA (e.g. ADD, MMO and soft-start) will minimise the potential adverse impacts. Considering that the neighbouring offshore wind farm developments will be requested to implement similar or more stringent measures, cumulative impacts on marine mammals, marine fish, and benthic species will not be significant.

7.2.4 SUMMARY OF CUMULATIVE IMPACTS TO VEC2

Cumulative impacts from activities like cable installation for offshore wind farms and nearby developments raise concerns due to their potential to disrupt water quality, marine traffic, and increase underwater noise, all of which may adversely affect marine mammals, marine fish, and benthic species.

Among these, underwater noise generated from piling activities during wind turbine foundation construction is a primary concern. This noise poses a risk to marine mammals by potentially causing threshold shifts in hearing and reducing the availability of fish, which are crucial for their foraging. Similarly, elevated underwater noise levels may also disrupt marine fish behavior and spawning activities, while benthic species could experience indirect impacts from habitat disturbances associated with installation activities. To assess the impact, estimated noise levels and impact zones were identified through the underwater noise modelling. However, mitigation measures such as the use of ADD and deployment of MMO are anticipated

to reduce these impacts to acceptable levels, benefiting not only marine mammals but also marine fish.

Furthermore, the cumulative impact of increased marine traffic is expected to be insignificant. Predefined shipping routes will help lower the risk of collisions with marine mammals, and reduce potential disturbances to marine fish and benthic species habitats, thereby minimizing potential threats to their populations. Additionally, the establishment of wind farms during the operational phase may yield ecological benefits, such as functioning as artificial reefs, fostering biodiversity, and enhancing fish populations in the region. The wind farm structures are also expected to support the recovery and growth of benthic species by providing additional substrates and habitats.

In conclusion, minimal cumulative impacts from construction activities (e.g. underwater noise and increased marine traffic) are expected considering the progress of the neighbouring projects, and the overall significance of these impacts is considered insignificant. The implementation of mitigation measures committed by the Project during the Regulatory EIA (e.g. ADD, MMO and soft-start) will minimise the potential adverse impacts, and considering that the neighbouring offshore wind farm developments will be requested with similar or more stringent measures (although it is currently expected that overlap of the key construction activities such as piling will be minimal), the cumulative impacts to the marine mammal, marine fish, and benthic species will not be significant, leading to an overall classification of the cumulative impacts on marine mammals as **Low Priority**.

If authorities request the offshore wind farm developers to collectively consider additional mitigation measures with respect to cumulative impacts on marine mammals, marine fish, and benthic species in subsequent stage, AWC will review such request and work with other developers to adopt to such request, as appropriate.

7.3 VEC 3: FISHERIES

7.3.1 KEY STRESSOR

Key stressors and potential impacts to the fishers will include:

- Presence of the Project and other offshore wind farms (i.e. operation phase): Limited or controlled access to the areas where WTGs will be present; and
- Temporary reduction of fish catch (i.e. during construction phase): Temporary impact to amount of fish catch may be impacted due to construction activities which may result escalated suspended solids and/or generation of noise etc.

7.3.2 IMPACT FROM THE PROJECT

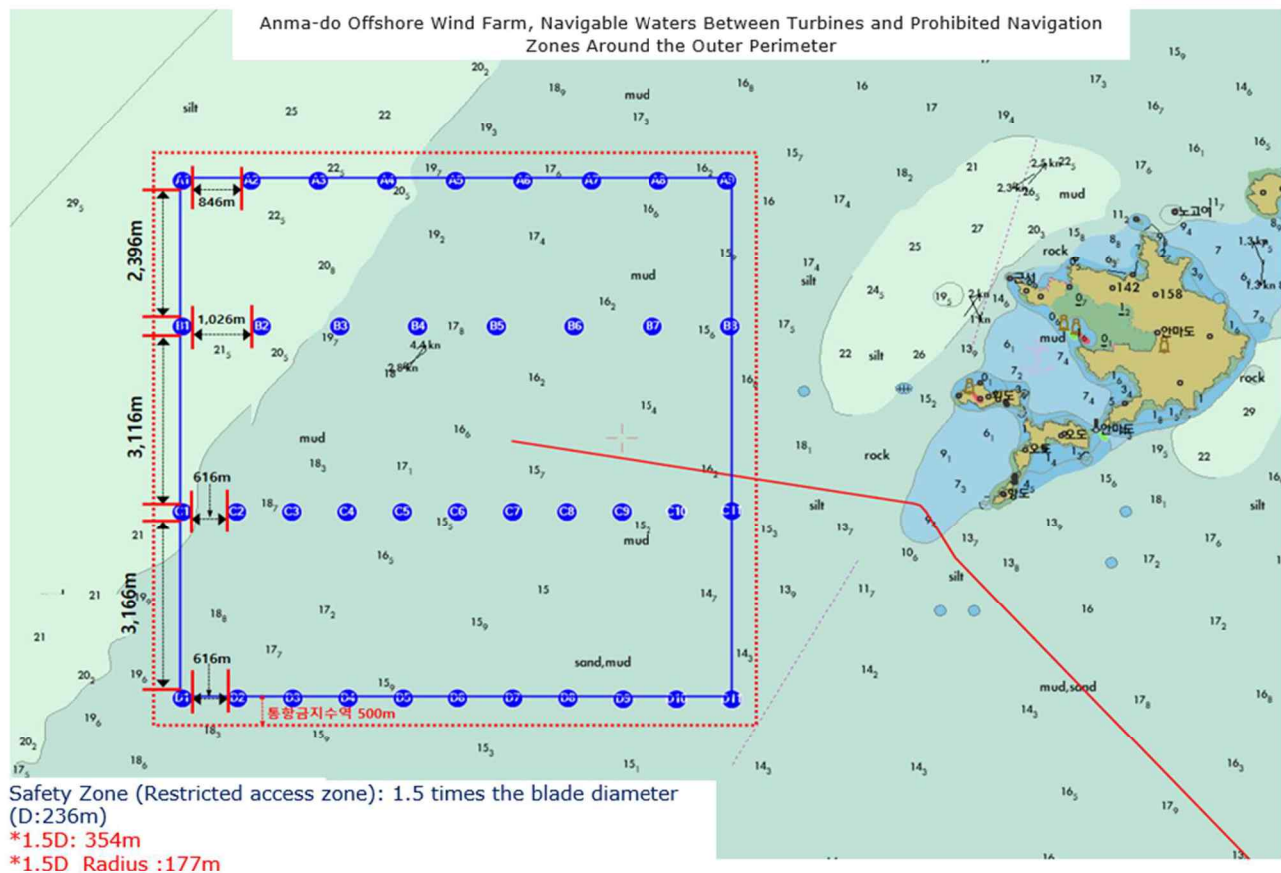
Among the offshore areas of the Project, fishers operating within the WTG Area are expected to experience disruptions to their fishing activities due to access restrictions as per the Figure 7-1. To address this, the Project will implement FDI to provide compensation, ensuring that affected fishers are identified and supported. It is anticipated that those receiving compensation will continue their fishing activities in the surrounding waters.

Furthermore, as described in the SEP, AWC has prioritized communication with the fisheries to ensure the smooth implementation of FDI and subsequent compensation, from the Public-Private Council and continuing through efforts after its disbandment.

Additionally, the MTSA is expected to help mitigate the reduction in accessible fishing areas by supporting local fishers in maintaining their operations in adjacent waters.

Fishing boat crews working under Permitted Fisheries may be indirectly affected by the Project. While the regulatory Fishery Damage Investigation (FDI) provides compensation only to permit holders, IFC Performance Standard 5 recommends that all individuals whose livelihoods may be impacted—regardless of employment status or legal standing—be given appropriate consideration. In the Project context, fishing crews are commonly composed of family members or foreign migrant workers who are assigned through registered labor agencies. If access to the Wind Turbine Generator (WTG) Area becomes restricted during construction and operation, some crews may need to adjust fishing routes or operate in less favorable zones. This could result in increased travel time or operational costs, indirectly affecting crew incomes. Although these crew members are protected under the Seafarers Act, which provides safeguards such as employment contracts and compensation for termination due to unavoidable causes, the Project recognizes that such legal provisions may not fully address all forms of economic disruption. Therefore, fishing boat crews have been scoped into this SIA as a group potentially experiencing indirect livelihood impacts. AWC will explore livelihood restoration support, such as employment referral, vocational services, or other appropriate assistance, as part of the LRP in line with IFC Performance Standard 57.

With these existing measures in place, the potential effects on fishers are expected to be managed within an appropriate framework, ensuring that fishing activities can continue with necessary adjustments.



Source: Anma Offshore Windfarm Maritime Traffic Safety Assessment report submitted on April 2024

FIGURE 7-1 THE NO-NEVIGATION ZONE DESIGNATED DUE TO THE PROJECT

7.3.3 IMPACT FROM OTHER OPERATIONS AND RFFAS

The size and scale of the neighbouring offshore wind farm developments are publicly available, however access to detailed information is limited and therefore it is challenging to assess exact impact, however the potential cumulative social impact on fishers from the Project combined with the RFFA (refer to Figure 5-1) and cannot be ruled out.

Although the WTG areas for these proposed offshore wind farm developments are expected to limit or control the fishing boat/vessel access, the fishers will be able to fish at the public water not occupied by the WTGs. Furthermore, they will be financially compensated by not being able to fish within the WTG areas or limited access to in WTG areas, through the FDIs of respective developments (i.e. their livelihood, if impacted, will be restored through the local framework).

7.3.4 SUMMARY OF CUMULATIVE IMPACT TO VEC3

While exact impacts are yet to be assessed through respective FDIs, the cumulative social (livelihood) impacts on the fishers by the Project and the RFFA are not expected to be significant, as the fishers will be able to fish at the public water not occupied by the WTGs, and they will be financially compensated by not being able to fish within the WTG areas or limited access to in WTG areas, through the FDIs of respective developments (i.e. their livelihood, if impacted, will be restored through the local framework).

Considering above, the overall cumulative impact of the Project and other RFFA on the fisheries is classified as **Medium Priority**.

As medium-term mitigation measures, the Project will establish the LRP, and continue to engage with the local fisheries as part of their stakeholder engagement plan. If the RFFA are realised, and the authority request the Project to work with other offshore wind farm developers to form a wider, Yeonggwang-gun level committee, AWC will consider such request, and participate as appropriate.

7.4 VEC 4: COMMUNITIES

7.4.1 KEY STRESSOR

Key stressors and potential impacts to the communities within the landfall and onshore export cable area (i.e. onshore direct AoI) will include:

- Traffic impact: Adverse impact from the temporary increased traffic (and if overlaps, cumulative impact);
- Noise/air quality impact: Adverse impact from the temporary construction noise and air emission (and if overlaps, cumulative impact); and
- Community health impact: Adverse health impact (e.g. communicable diseases) from the proposed projects/workers (and if overlaps, cumulative impact).

7.4.2 IMPACT FROM THE PROJECT

The construction vehicles such as dump trucks are expected to use during the construction phase that may have adverse impact to the nearby community. Table 6-2 summarises the anticipated number of equipment and vehicles in use during the construction period. As the number indicates, the anticipated equipment to be deployed are not significantly high in number. Table 6-3 are the noise impact assessment result of the Regulatory EIA. The assessment was conducted assuming that all deployed equipment operates at the shortest distance from the facility and from the same location simultaneously, that expects to have direct noise impacts. The result of the noise impact assessment concluded that the noise levels at the receptors or communities will be below the Environmental Target Standard of 65 dB(A) that are stipulated under the Framework Act on Environmental Policy.

Furthermore, the influx of workers may pose health risks through communicable diseases. However, as the Project will not operate construction camps or worker accommodations, this risk is expected to be minimized. Additionally, the Project Employer's Requirements will be implemented through contractors to ensure worker health and safety, as well as to safeguard the health and safety of the community and local residents. Given these measures, along with the existing health and safety conditions in Yeonggwang-gun and the projected peak manpower and expected duration shown in Table 6-1, no significant impact is anticipated.

7.4.3 IMPACT FROM OTHER OPERATIONS AND RFFAS

The size and scale of the currently operating onshore wind farms and solar farms are publicly available, but limitations to details are leading it challenging to assess the exact impacts, however the potential cumulative social impact on communities from the Project combined with the RFFA (refer to Figure 5-2 and Figure 5-3) cannot be ruled out.

Considering the onshore wind farms and solar farms are expected to be small in scale, and typical operation method, it is expected most of them will be unmanned operation, and therefore, the traffic, noise, or air quality impacts will be minimal.

For those projects that are yet to be developed/constructed, their footprints, impacts or involved construction activities are not expected to be significant considering their size and scale.

7.4.4 SUMMARY OF CUMULATIVE IMPACT TO VEC4

While exact impacts from the proposed developments at/around the onshore component of the Project, the cumulative social impacts on the communities by the Project and the RFFA are not expected to be significant, as the onshore wind farms and solar farms at/around the onshore component of the Project are all small in size and scale, and are mostly expected to be unmanned operation, and the involved construction activities for those yet to be developed are not expected to be large.

Considering the Project's significance of all potential impacts to communities were assessed to be minor (Refer to Social Impact Assessment Report Section 7.1.3) as the onshore export cable will be buried, and of short distance, the incremental impacts are also expected to be insignificant.

Considering above, the overall cumulative impact of the Project and other RFFA on the communities is classified as **Low Priority**.

No action is required; however, the Project will continue to engage with the local communities as part of their stakeholder engagement plan as an international good practice.

8. ALTERNATIVES TO AVOID, MINIMISE, OR MITIGATE SIGNIFICANT CUMULATIVE IMPACTS

The mitigation measures described in Section 8.1 address the Project specific mitigation and monitoring measures for the Project from the key documents reviewed for this assessment. This section includes the recommended mitigation measures in the Regulatory EIA. Mitigating similar impacts from similar activities in the same region should increase the overall efficacy of project impact mitigation. Section 8.1 details the Project's potential contribution to broad-scale impact mitigation in the region.

8.1 PROJECT SPECIFIC MITIGATION MEASURES

Based on the Regulatory EIAs, the project specific mitigation measures related to the VECs are discussed in Table 8-1.

TABLE 8-1 PROJECT SPECIFIC MITIGATION MEASURES

Nature of Impact		Overview of Proposed Project-Specific Mitigation Measures		Review and Suggestions
VEC 1: Barrier Effect and Collision Risk To Migratory Birds				
Potential collision risk to birds		It is planned to survey birds in project site 6 times per year in a qualitative and quantitative manner.		The frequent monitoring schedule provides a solid framework for assessing potential impacts. This mitigation measure is considered sufficient to monitor bird activities effectively.
		White-tint colour is planned to be painted to the blades.		This measure enhances bird visibility of turbines, effectively minimizing collision risk. The approach is deemed adequate for collision avoidance.
		Paint will be used that can reflect UV in very range so that bird species that are sensitive to UV can identify WTG		The compliance with regulatory lighting and coloration standards supports bird avoidance. These measures are considered adequate to mitigate collision risks.
		Aviation light and blade colours will be applied in accordance with MoLIT regulations for better visibility and avoidance for birds.		
VEC 2: Underwater Noise Impacts to Marine Mammals				
Impact due to the underwater noise during construction activities		During the pile driving, potential impacts on marine mammals will be minimized by taking their behavioural patterns and ecological cycles into account. Where practical, piling activities will be reduced or minimized during peak breeding periods of marine mammals, recognizing that complete avoidance may not be feasible given the anticipated nine-month duration of piling activities.		Reducing or minimizing work during peak breeding seasons, where feasible, aligns with efforts to reduce impacts on critical life stages. This approach is considered effective for mitigating behavioural disturbances within practical constraints of the construction schedule.
		Prior to commencement of construction activities, qualified Marine Mammal Observers (MMOs) will conduct visual monitoring to confirm the absence of marine mammals within a predefined exclusion zone around the construction site. Monitoring will be conducted before initiating pile-driving or other noise-intensive activities. If marine mammals are detected within the exclusion zone, construction activities will be immediately postponed and will only resume after MMOs have confirmed that all marine mammals have left the exclusion zone.		This detailed monitoring and exclusion zone protocol minimizes direct exposure of marine mammals to underwater noise, effectively reducing potential immediate impacts. The measure, including clear criteria for observation duration and activity resumption, is assessed as robust and adequate.
		Marine mammals and fish will be proactively encouraged to leave the immediate vicinity of construction activities by deploying Acoustic Deterrent Devices (ADDs) as a warning alarm. ADDs will be activated prior to the initiation of noise-intensive construction activities, such as piling, to allow sufficient time for marine life to vacate the area. This procedure effectively reduces the likelihood of direct exposure to harmful noise levels, minimizing potential impacts on marine fauna.		Acoustic deterrent devices (ADDs) provide an effective additional layer of protection by actively prompting marine mammals and fish to vacate construction areas prior to noise-intensive activities. This measure significantly reduces the risk of exposure to harmful noise levels, and is therefore considered sufficient to minimize underwater noise impacts
VEC 3: Fisheries				
Fisheries		FDIA provided area that may be impacted by the Project and FDI will provide adequate amount of compensation measure in which to restore the fisheries livelihood.		FDIA identifies impacted areas, and FDI provides adequate compensation to restore fisheries livelihoods. From a cumulative impact standpoint, these measures are deemed sufficient to address potential effects.
		Project will establish LRP and continue to engage with the local fisheries as part of stakeholder engagement plan.		From a cumulative impact perspective, the establishment of the LRP and continued engagement with local fisheries under the Stakeholder Engagement Plan are considered sufficient to address potential impacts, and no additional mitigation measures are deemed necessary.
VEC 4: Communities				
Communities		The Project will continue to engage with local communities as part of the stakeholder engagement plan.		The proposed mitigation measures are considered sufficient, and no additional measures are required.
General				
General Mitigation Enhancement (Cumulative)		Investigate cooperative mitigation measures with adjacent offshore wind farms, including shared training programs for offshore personnel to safely handle and transport injured seabirds or other marine fauna.		Collaborative mitigation measures, including personnel training for wildlife handling and transport, can significantly enhance overall mitigation effectiveness. Investigating cooperation with neighbouring projects is recommended to address cumulative impacts comprehensively.

APPENDIX A PROJECT DESCRIPTION



ESIA for Project Anma

Project Description

7 October 2024

Project No.: 06927940692794

Document details	
Document title	ESIA for Project Anma
Document subtitle	Project Description
Project No.	0692794
Date	7 October 2024
Version	Final
Author	Various
Client Name	Anma Offshore Wind Energy Co., Ltd;

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	B	Var.	Joseph Park (JP)	Mark Watson		
Draft	C	Var.	JP	Mark Watson		
Final	1.0	Var.	JP	Mark Watson	7 September 2023	
Final	2.0	Var.	JP	Seung Hyun Kwak	7 October 2024	

Signature Page

7 October 2024

ESIA for Project Anma

Project Description

Seung Hyun Kwak
Partner

ERM Korea Ltd.,
12F Samhwa Tower
16, Eulji-ro 5-gil
Jung-gu, Seoul, Korea

© Copyright 2024 by The ERM International Group Limited and/or its affiliates ('ERM'). All Rights Reserved. No part of this work may be reproduced or transmitted in any form or by any means, without prior written permission of ERM.

CONTENTS

1.	OVERVIEW.....	1
2.	PROJECT LOCATION	2
3.	PROJECT HISTORY	3
3.1	Key Milestones	3
3.2	Versions and Alterations	3
4.	PROJECT FACILITIES AND COMPONENTS	6
4.1	Wind Turbine Generator	6
4.2	Inter-array Cables (IAC) and Offshore Export Cables (EXC)	8
4.3	Offshore Substation (OSS)	8
4.4	Onshore Export Cable	8
4.5	Onshore Substation (ONS)	9
4.6	Military Radar.....	9
4.7	Bird Monitoring Radar.....	9
4.8	Operation and Maintenance (O&M).....	9
5.	SUMMARY ON CONSTRUCTION ACTIVITIES.....	10
5.1	Foundations (FOU)	10
5.1.1	Pin-pile	10
5.1.2	Jacket	10
5.2	Inter Array Cable.....	11
5.3	Offshore Export Cable	11
5.4	Offshore Substation	13
5.5	Onshore Substation (ONS) & Onshore Cable.....	13
5.6	WTG	14
5.7	Transition Joint Bay (TJB).....	14
5.8	Operation and Maintenance (O&M).....	14
5.9	Military Radar.....	15
5.10	Bird Monitoring Radar.....	15
6.	EPC SCHEDULE.....	16

List of Tables

Table 2.1	Coordinate for the WTGs	2
Table 3.1	History of Project Components	4
Table 4.1	WTG details	7
Table 4.2	Offshore Substation Details	8

List of Figures

Figure 3.1	Location of Project Site	5
Figure 4.1	Conceptual Figure of the WTG	7
Figure 6.1	Anma Offshore Wind Power Project Master Plan.....	16

Acronyms and Abbreviations

AWC	Anma Offshore Wind Energy
AZE	Alliance for Zero Extinction
BAP	Biodiversity Action Plan
bgs	below ground surface
CCRA	Climate Change Risk Assessment
CHA	Critical Habitat Assessment
CPS	Cable Protection System
CRM	Collision Risk Modelling
EBL	Electric Business License
E&S	Environmental and Social
EAAF	East Asian–Australasian Flyway
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EP	Equator Principles
EPAP	Equator Principles Action Plan
EPC	Engineering, Procurement and Construction
EPFI	Equator Principles Financial Institutions
ERM	ERM Korea Ltd.
EN	Endangered
ESAP	Environmental and Social Action Plan
ESDD	Environmental and Social Due Diligence
ESG	Environmental Social Governance
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental and Social Standards
EXC	Export Cable
FA	Fisheries Act
FDA	Fishery Damage Assessment
FDIA	Fishery Damage Impact Assessment
FOU	Foundation
FTEs	Full Time Employees

GHG	Greenhouse Gas
GPS	Geotechnical Information Portal System
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
H&S	Health and Safety
HR	Human Resources
IAC	Inter Array Cable
IBA	Important Bird Areas
IBAT	Integrated Biodiversity Assessment Tool
ID	Identity
IESC	Independent E&S Consultant
IFC	International Finance Corporation
IPA	Important Plant Areas
ISO	International Organisation for Standardisation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
KEPCO	Korea Electric Power Corporation
kV	kilovolt
LC	Least Concern
LIDAR	Laser Imaging, Detection And Ranging
LRP	Livelihood Restoration Plan
LURIS	Land Use Regulation Information Service
MEMA	Marine Environment Management Act
MoE	Ministry of Environment
NGIC	National Groundwater Information Center
NGO	Non-Governmental Organisation
OHS	Occupational, Health and Safety
ONS	Onshore Substation
OSS	Offshore Substation
OPPW	Occupancy Permit of Public Waters
PDCA	Plan-Do-Check-Act
PFDIA	Preliminary Fishery Damage Impact Assessment
PS	Performance Standard
PWMRA	Public Waters Management and Reclamation Act

Q	Quarter
RAP	Resettlement Action Plan
SEP	Stakeholder Engagement Plan
SGRE	Siemens Gamesa Renewable Energy
SOP	Standard Operating Procedure
TJB	Transition Joint Bay
TMS	Tele-Monitoring System
VU	Vulnerable
WBG	World Bank Group
WGS	World Geodetic System
WTG	Wind Turbine Generator
XLPE	Cross-linked polyethylene

1. OVERVIEW

The Project consists of two (2) phases - Phase 1 and Phase 2 - corresponding to Electricity Business Licences (EBL 1 and EBL 2). The Project will utilise Siemens Gamesa Renewable Energy's (SGRE) SG DD-236 14.0 MW wind turbine generators (hereinafter as "WTGs"). Phase 1 consists of 16 WTG units with a permitted total capacity of 224 MW and Phase 2 consists of 22 WTG units with a permitted total capacity of 308 MW. The Project's wind turbines area will take up a total area of 80 km² of public waters.

The WTGs will be connected via 66kV Inter-Array submarine cables (hereinafter as "IACs" - Phase 1: circa 51 km and Phase 2: circa 69 km) to the Offshore Substation (hereinafter as "OSS") (125°56'32.86"E, 35°19'44.00" N¹).

230kV export submarine cables (hereinafter as "EXCs") will then be routed to the Onshore Substation (hereinafter as "ONS"). And then, using 154kV onshore cables, electricity will be connected to the West Yeonggwang (or Seoyeonggwang) KEPCO onshore substation operated by KEPCO.

¹ WGS 84

2. PROJECT LOCATION

The area proposed for installation of the Project WTGs (the Site) is situated in the Yellow Sea (or West Sea) West of Anma Island, Yeonggwang-gun, Jeollanam-do, South Korea. The coordinates of the WTGs, as well as the Project location and its surrounding areas are presented in Table 2.1 and Figure 3.1 respectively.

Table 2.1 Coordinate for the WTGs

WTG ID for Phase 1	Coordinate (WGS 84)		WTG ID for Phase 2	Coordinate (WGS 84)	
	Longitude ±dddmmss.ss	Latitude ±ddmmss.ss		Longitude ±dddmmss.ss	Latitude ±ddmmss.ss
A01	125°50'4.5"	35°22'24.1"	C01	125°50'5.1"	35°19'2.58"
A02	125°50'39.6"	35°22'24.1"	C02	125°50'43.46"	35°19'2.59"
A03	125°51'14.7"	35°22'24.1"	C03	125°51'21.86"	35°19'2.63"
A04	125°51'49.7"	35°22'24.0"	C04	125°52'0.23"	35°19'2.63"
A05	125°52'24.8"	35°22'24.0"	C05	125°52'38.63"	35°19'2.65"
A06	125°52'59.9"	35°22'24.0"	C06	125°53'17.03"	35°19'2.68"
A07	125°53'34.9"	35°22'24.0"	C07	125°53'55.39"	35°19'2.7"
A08	125°54'10.0"	35°22'23.9"	C08	125°54'33.79"	35°19'2.72"
A09	125°54'45.1"	35°22'23.9"	C09	125°55'12.15"	35°19'2.73"
A10	125°55'20.1"	35°22'23.8"	C10	125°55'50.55"	35°19'2.75"
A11	125°55'55.2"	35°22'23.8"	C11	125°56'28.91"	35°19'2.79"
A12	125°56'30.3"	35°22'23.8"	D01	125°50'5.56"	35°17'8.65"
B01	125°50'5.4"	35°20'55.2"	D02	125°50'43.94"	35°17'8.59"
B02	125°52'13.8"	35°20'55.2"	D03	125°51'22.33"	35°17'8.56"
B03	125°54'22.3"	35°20'55.0"	D04	125°52'0.67"	35°17'8.53"
B04	125°56'30.7"	35°20'54.9"	D05	125°52'39.05"	35°17'8.49"
			D06	125°53'17.4"	35°17'8.46"
			D07	125°53'55.78"	35°17'8.41"
			D08	125°54'34.17"	35°17'8.4"
			D09	125°55'12.51"	35°17'8.35"
			D10	125°55'50.9"	35°17'8.33"
			D11	125°56'29.24"	35°17'8.27"
Offshore Substation	125°56'32.86"	35°19'44.00"			

Source: AWC dated 18 July 2023

3. PROJECT HISTORY

3.1 Key Milestones

The achieved milestones of the Project have been summarized below:

- October 2017: Installation of a wind condition measuring instrument (Hoeng-do onshore LiDAR) for preparation of electric business license (EBL) for Phase 1;
- April 2019: Acquired EBL for Phase 1;
- May 2019: Installation of wind condition gauge (offshore LiDAR) for preparation of EBL for Phase 2;
- July 2020: Acquired EBL Alteration for Phase 1, and acquired EBL for Phase 2;
- April 2022: Submission of draft Environmental Impact Assessment for Anma Project (hereinafter Draft Regulatory EIA);
- December 2022: Submission of Final Regulatory EIA (updated January 2023);
- June 2023: Submission of Supplementary Regulatory EIA;
- July 2023: Obtained EIA agreement;
- August 2023: Marine Traffic Safety Assessment approved.

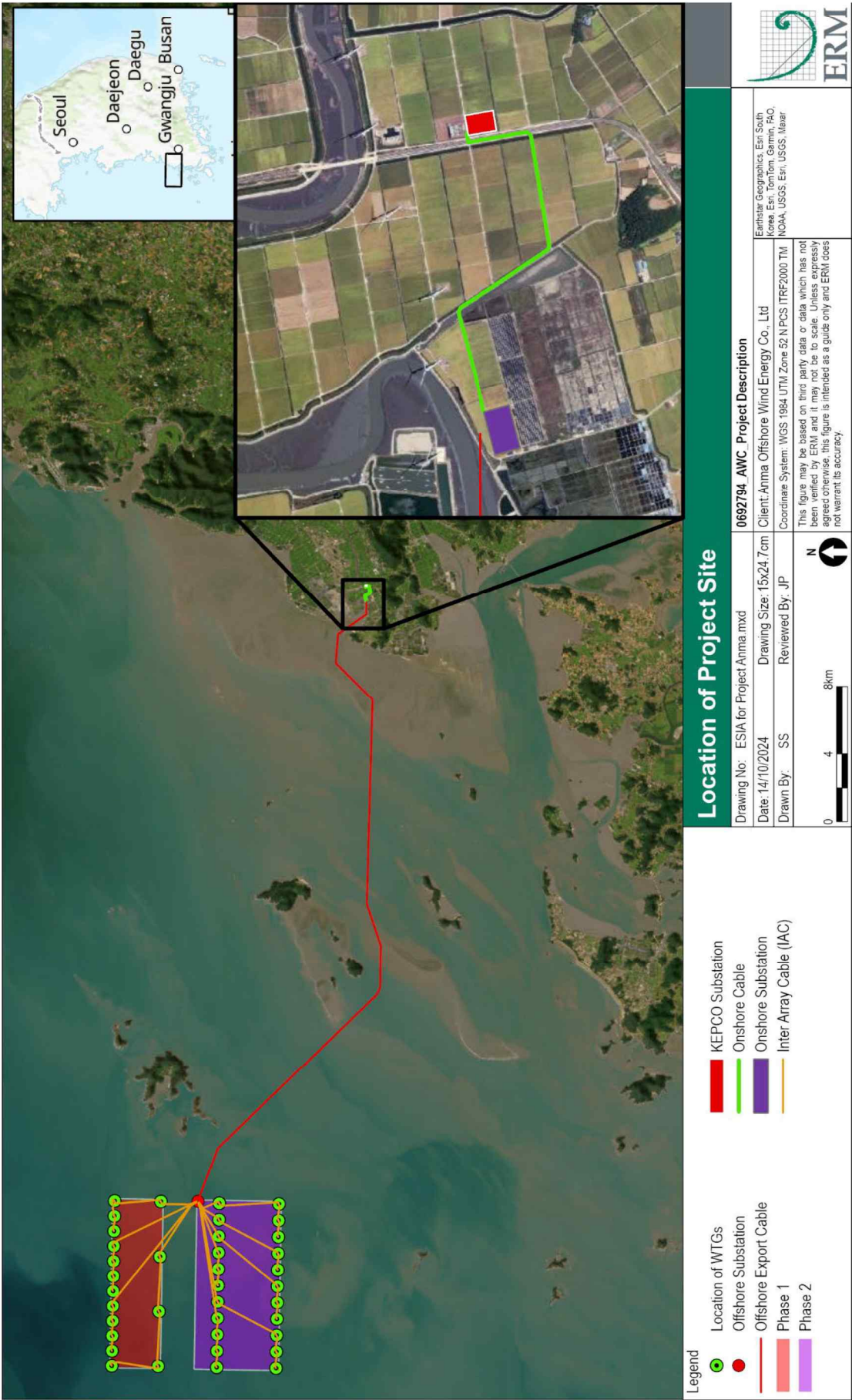
3.2 Versions and Alterations

- Version 1: Draft Regulatory EIA, dated April 2022;
- Version 2: Final Regulatory EIA, dated December 2022 and Supplementary Regulatory EIA, dated June 2023; and
- Version 3: As of August 2023, it is anticipated that the preferred components, layouts and selected construction methods that are incorporated into this ESIA will result in an update process in the EIA and all necessary permits (hereinafter Version 3 AWF).

Table 3.1 History of Project Components

	WTGs numbers & capacity	WTGs type	OSS location & type	IAC location & type	EXC location & type	ONS location & type	Onshore cable location & type	Other
Version 1	528 MW 66 WTGs- 8 MW	WinDS8000 Doosan	Juk-do onshore substation	66 kV Phase 1: 43.3 km (3 strands) Phase2: 57.8km (4 strands)	154kV XLPE 800 mm ² 3-core, (approx. 40.4km)	1508-1 Jisan-ri, Baeksu-eup, Yeonggwang-gun, Jeollanam-do	154kV XLPE 800 mm ² single core, 12 wires (about 7.6km)	Songji-do overhead line: approx. 1.5 km
Version 2	546 MW 39 WTGs- 14 MW	SG DD-236 SIEMENS Gamesa	Offshore substation 125°53'55.2"E 35°19'45.45"N	66 kV Phase 1: approx. 32.0 km Phase2: approx. 36.2 km	154kV XLPE 800 mm ² 3-cores, (approx. 44.9km)	286-3 Songam-ri, Yeomsan- myeon, Yeonggwang-gun, Jeollanam-do	154kV XLPE 2000 mm ² single core, (approx. 1.1km x 6 strands)	No overhead line
Version 3	532 MW 38 WTGs- 14 MW	No change	Offshore substation 125°56'32.86"E 35°19'44.00"N	66 kV Phase 1: approx. 51 km Phase 2: approx. 69 km	230kV XLPE 3-core Approx.41.6 km route length	No change	154kV XLPE single core Approx. 1.5 km route length	No change

Source: Draft Regulatory EIA /Final and Supplementary Regulatory EIA / Version 3 AWF



Note: Some final designs are still under validation process and thus will be updated in relevant documents later.

Source: Version 3 AWF

Figure 3.1 Location of Project Site

4. PROJECT FACILITIES AND COMPONENTS

The main Project components as per the Final Regulatory EIA is summarized below:

- A wind turbines area divided in 2 areas (i.e. Phase 1 and Phase 2), comprised of 38 WTGs with a permitted total capacity of 532 MW;
- 38 SGRE's SG DD-236 14.0 MW WTGs comprised of the tower, foundation, nacelle, hub, rotor, and rotor blades;
- circa 120 km of 66 kV Inter-Array Cables (total for both Phase 1 and Phase 2);
- One (1) Offshore Substation (converting 66 kV to 230 kV);
- Two circuits, each circa 42 km of 230kV offshore export cable (connecting from Offshore Substation to the mainland);
- A Transition Joint Bay at the landing point, receiving the 230kV offshore export cable;
- Two circuits, circa 150m each of 230kV onshore cable (connecting the Transition Joint Bay to the Onshore Substation);
- One (1) Onshore Substation (converting 230 kV to 154kV);
- Two circuits, each circa 1.5 km of 154 kV onshore cable (connecting from the Onshore Substation to the KEPCO substation being the grid connection point); and
- One (1) Korea Electric Power Corporation (KEPCO) substation (owned and operated by KEPCO).

For clarity:

One circuit of offshore export cable refers to one (1) cable, each with three (3) power conductors within the cable.

One circuit of onshore cable refers to three (3) cables, each with one (1) power conductor within the cable.

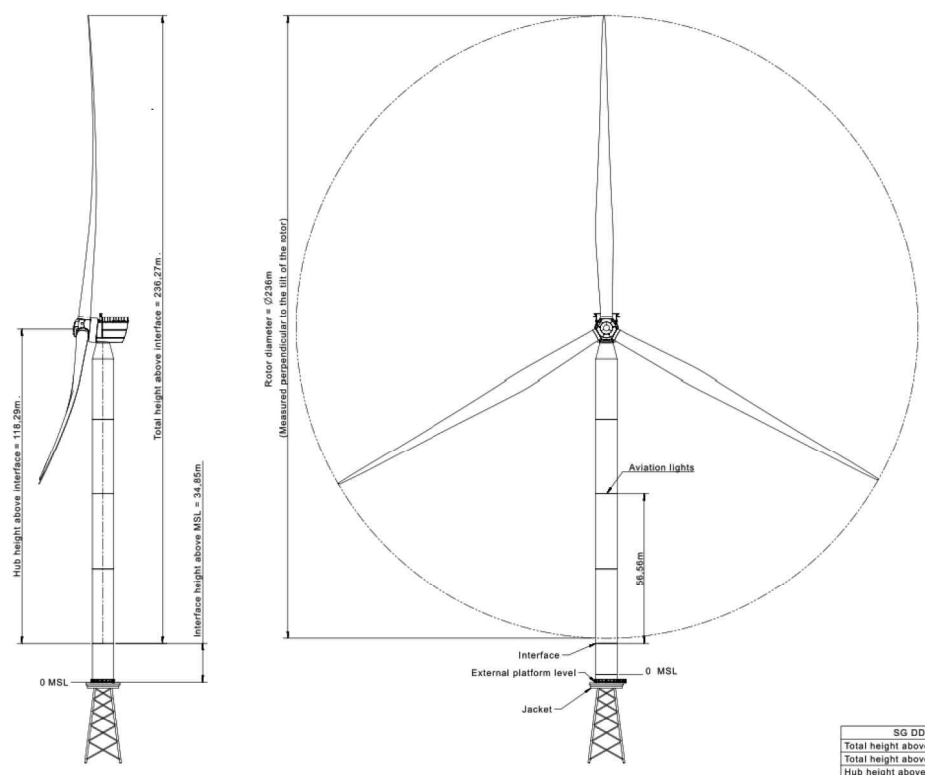
4.1 Wind Turbine Generator

The Version 3 configuration of wind turbines layout has been developed with 38 WTGs of 14 MW nominal capacity. Given the geographical context of the project site within the 'Northeast Asia-Oceania' Migratory Bird Flyway (EAAF) and its proximity to the breeding habitats of various marine bird species (such as Chilsan Island), a decision was made to curtail the number of WTGs and accordingly modify their arrangement. Elaborated information pertaining to the individual WTGs can be found in Table 4.1.

Table 4.1 WTG details

WTG Components	Parameter	Specifications
WTG	Type Class	SG DD-236
ROTOR	Type	3-bladed, horizontal axis
	Position	Upwind
	Diameter (m)	236
	Length of blade (m)	115
	Swept area (m ²)	43,500
TOWER	Type	Cylindrical and tapered tubular
	Hub height (m)	153
	Total height from Mean Sea Level (MSL) (m)	270
OPERATION DATA	Cut in Wind speed (m/s)	3
	Nominal Power (m/s)	at 12
	Cut out wind speed (m/s)	28

Source: Final and Supplementary Regulatory EIA / Version 3



Source: AWC dated 4 August 2023

Figure 4.1 Conceptual Figure of the WTG

4.2 Inter-array Cables (IAC) and Offshore Export Cables (EXC)

The Version 3 design entails all the IAC being concentrated to an Offshore Substation, and then, offshore export cables that directly connects with the mainland. The Version 3 plan is for all the inter array submarine cables to be 66 kV cross linked polyethylene cable (XLPE) submarine cable, the length of which is circa 51 km and 69 km for Phase 1 and Phase 2 respectively, and two (2) circuits of 230kV offshore export cables, each with a length of circa 42 km.

Detailed location of IAC and Offshore EXC are presented above in Figure 3.1.

The IACs will be installed to a target burial depth of between 3.0m to 3.5m, utilising a Jet Trencher for post lay burial operations.

The EXCs will be installed to a target burial depth of between 2.0m to 3.5m, depending on the water depth along the export cable route, where deeper water sections would have a deeper target burial depth. Burial operations for the EXCs will be performed by a Jetting Sled, through simultaneous lay and bury operations.

The EXC will be installed at landfall within a Horizontal Directional Drill (HDD) duct, approximately 120m in length under the sea. Upon exiting the HDD, the EXC will be held in situ via permanent beach clamps which horizontally hang off the cable and permanently secure them in position. The EXC will be terminated externally into a GIS arrangement as fitted to the ONS within a joint bay with land cable connections into the ONS GIS Building alternatively they will be pulled and terminated directly into the ONS GIS.

4.3 Offshore Substation (OSS)

An offshore substation is selected instead of installing it in Juk-do as the final design to avoid civil complaints and to reduce the overall impact to the environmental damage and the fisheries. Compared to the onshore substation, the offshore option will involve fewer external cables, resulting in relatively less environmental and fishing impacts. The opinions on the review of the offshore substation design were collected during the information session for residents as part of Draft Regulatory EIA and are documented therein. Insights and viewpoints concerning the assessment of the offshore substation design were obtained during a resident information session, a pivotal aspect of the Draft Regulatory EIA.

Currently the Offshore Substation is planned to transform the 66kV transmission voltage from the wind turbines into 230kV export transmission voltage. Table 4.2 shows the detail specification and location of OSS.

Detailed location of OSS is presented above in Figure 3.1.

Table 4.2 Offshore Substation Details

Parameter	Specification
Size	Topside: 32 m (Width) x 37 m (Depth) x 30 m (Height) Jacket: 23 m (Bottom Width) x 19 m (Top Width) x 55 m (Height) Pile: 73 m (Depth) x 12 EA
Location	125°56'32.86" E, 35°19'44.00" N

Source: Final Regulatory EIA / Version 3

4.4 Onshore Export Cable

The current landfall is in Yeomsan-myeon, Yeongwang-gun, Jeollanam-do. AWC plans to construct a 154 kV buried onshore cable route from their Onshore Substation to KEPCO onshore substation (West Yeonggwang KEPCO onshore substation). Most of the onshore underground cable route is expected

to be routed along existing roads, or then through rice paddies having been acquired and close other renewable power plants.

4.5 Onshore Substation (ONS)

The power that is generated (690 V) by the WTG will be boosted by the primary boosting transformer (690 V/66 kV) and then transmitted by the IAC (66 kV) to the Offshore Substation. The power will then be directed to the secondary step-up transformer (66 kV/154 kV) at the Offshore Substation, which will be connected to the grid connection point; Seoyeonggwang substation operated by KEPCO.

The AWC Onshore Substation will be in 286-3 Songam-ri, Yeomsan-myeon, Yeonggwang-gun, Jeollanam-do. The area is planned to be 1,550.41 m². The station will consist of three (3) buildings which include a substation, an office, and a warehouse. The office will consist of a three-story building, while the substation and warehouse will consist of one-story building each.

Figure 3.1 above shows the detail location of project site for onshore area.

4.6 Military Radar

The Project will install two radars structures upon request of Ministry of Army to compensate the obstruction generated by the WTGs once installed. The details and the localizations of the two structures shall be kept confidential due to the nature of the facilities. One radar shall be operating offshore and one radar shall be operating onshore.

The offshore radar will comprise a foundation and a top-side structure. The foundation type is yet to be determined and the dimensions of the top-side structure is expected to be no greater than 10mx10mx7.5. The construction is expected to start no earlier than Q1 2026. A maximum of 20 staff is estimated at peak time of installation phase and operation shall be unmanned.

The onshore radar will be installed on Imja island in Sinan province. The structure is estimated to comprise a steel tower measuring 5x5x10 meters. The construction is expected to earlier than May 2025 and the duration of the construction shall not exceed 6 months. A maximum of 7 persons shall be estimated during civil works and a maximum of 4 persons during steel tower installation. Operation phase planned to be unmanned.

4.7 Bird Monitoring Radar

As stipulated in the Final Regulatory EIA, a bird monitoring radar is scheduled to be established on Hoeng-do for a duration of one (1) year. The installation of the 2D Terma Scanner-5000 Radar is anticipated. The cabinet housing the monitoring system is approximately 3 meters in height, 3 meters in depth, and 3 meters in width. The antenna's height is estimated to be around 5.5 meters.

The exact placement and specifications of the monitoring equipment are currently pending finalization. Comprehensive details concerning this aspect will be provided at a later stage once they are confirmed.

4.8 Operation and Maintenance (O&M)

The project encompasses two distinct O&M harbour alternatives. One existing facility and one other location are matching the requirements for O&M harbour, however, the location of the O&M harbour is not available before lease contract execution due to high competition risk.

5. SUMMARY ON CONSTRUCTION ACTIVITIES

The purpose of this section is to provide a comprehensive overview of the high-level description of the EPC Package components and the EPC Schedule for the Project.

The EPC Package consists of various components essential for the successful execution of the Project. These components are designed to ensure optimal efficiency and adherence to project requirements. The detailed breakdown of each component, along with its specific role in the Project, is outlined below.

5.1 Foundations (FOU)

5.1.1 Pin-pile

The supplier responsible for the pin-pile has not been determined. The piling process involves several essential steps, including fabrication, transportation, and pile driving. The detailed description of each process involved in the piling work is outlined below:

1. Fabrication of piles;
2. Load out of piles onto vessel or barge;
3. Transport to offshore site; (In parallel prepare noise mitigation measures if required)
4. Upending of piles by installation vessel;
5. Lower piles to ground and wait until self-penetration is reached;
6. Lower hammer on top of pile;
7. Start pile driving activities until target depth is reached; and
8. Once done, lift hammer back to installation vessel, move to next location

Their primary activities are scheduled to commence in the third quarter of 2024, with the peak of their operations anticipated in the second quarter of 2025. At its peak, the estimated number of staff required will be approximately 200, and this period is expected to last for approximately 10 weeks. It is projected that around 10% of the workforce will consist of foreign workers, and the planned worker's accommodation is estimated to accommodate around 100 individuals.

5.1.2 Jacket

Jacket will be installed on the pin-pile after completion of pin-pile installation. The supplier responsible for the fabrication and installation of the windfarm jacket has not been finalized. The installation process of the windfarm jacket can be described as follows:

1. Fabrication of jacket;
2. Load out of Jacket onto vessel or barge;
3. Transport to offshore site lift jacket from barge and insert into pre-installed pin piles;
4. Start grouting to finalize connection between jacket and grout; and
5. Move to next location

The main activities of the Project are scheduled to commence in the fourth quarter of 2024, with the peak of their activities anticipated in the first quarter of 2026. During this peak period, it is estimated that approximately 200 staff members will be involved, and the activity is expected to last for approximately 10 weeks. It is anticipated that around 10% of the workers will be foreign workers.

5.2 Inter Array Cable

Installation of Inter Array Cable (IAC) will commence after completion of jacket installation. The contractor responsible for the installation of IAC has not been finalized. The main activity for the IAC installation is scheduled to begin by mid 2026. The IAC installation will involve the following key activities.

■ Site Preparation

1. Preparation of equipment for pull-in at the WTG foundation / OSS Jacket;
2. Pre-lay grapnel run on the seabed following the cable route; and
3. Pre-lay survey.

■ Installation

1. Mobilization of installation vessels and crew accommodations;
2. Cable loading from factory onto the installation vessel;
3. Removal of J-tube covers;
4. Cable pull-in (1st Cable End) including Cable Protection System (CPS) installation;
5. Cable surface laying;
6. Cable pull-in (2nd Cable end) including CPS installation;
7. Post lay survey;
8. Post lay burial, with jet trencher;
9. Post lay burial survey;
10. Remedial burial (if necessary only) with a jet trencher;
11. Remedial burial survey; and
12. Installation of rock bags on CPS at the WTG/ OSS (if necessary only).

During the peak period of their activities, which is expected to span from March 2026 to January 2027, the IAC installation team will consist of an estimated total of 100 - 160 staff members. These staff members will be further divided into two main groups. The first group, known as the Office Support / Management Teams, will comprise approximately 20 - 60 staff members. They will be responsible for providing support and managing various aspects of the IAC installation project. For their convenience, these team members will be accommodated in either major cities or locations near / around the port area depending on their function and role.

The second group is the Transport and Installation Vessel Crew, which will consist of approximately 80 - 100 staff members. This group will play a direct and hands-on role in the actual installation of the IAC. During their construction activities at sea, they will be accommodated either on the cable laying vessel (CLV) and a Service Operations Vessel (SOV).

Throughout the peak period, AWC expects that 10 - 30% of the workers in both groups may be foreigners. As the Project progresses and specific roles and requirements become clearer, further details regarding staffing and accommodation arrangements will be finalized and communicated accordingly.

5.3 Offshore Export Cable

Export Cable installation will occur almost in parallel to IAC installation. The contractor responsible for the installation of the offshore export cable has not been determined yet. The preparation of the offshore export cable route (such as HDD and TJB construction) is scheduled to begin in October

2024, with the actual cable installation set to commence in February 2026. The process of offshore export cable installation is described below:

■ Site Preparation

1. Construction of HDD;
2. Set up of silt curtains at excavation sites;
3. Excavation of Shore end landing approach;
4. Set up of pre-excavated trench wall stabilisation measures;
5. Set up of cable rollers in the pre-excavated trench;
6. Preparation of equipment for pull-in at the OSS Jacket and at the TJB area at the ONS;
7. Pre-lay grapnel run on the seabed following the cable route; and
8. Pre-lay survey.

■ Installation

1. Mobilization of installation vessels with cable storage and cable handling equipment;
2. Laying of cable section 1 of 2, on Circuit 1
 - a. Cable loading from factory onto the installation vessel;
 - b. Transit of the installation vessel from the factory to the near shore section near the mainland;
 - c. Cable shore end landing / beach pull-in (1st Cable End);
 - d. Backfilling of pre-excavated trenches of Circuit 1
 - e. Simultaneous lay and bury of the cable with a jetting sled towards the OSS;
 - f. Lay down of cable end at the middle of the route (near Gagi Island);
 - g. Return to the submarine cable factory;
3. Laying of cable section 1 of 2, on Circuit 2
 - a. Cable loading from factory onto the installation vessel;
 - b. Transit of the installation vessel from the factory to the near shore section near the mainland;
 - c. Cable shore end landing / beach pull-in (1st Cable End);
 - d. Backfilling of pre-excavated trenches of Circuit 2;
 - e. Simultaneous lay and bury of the cable with a jetting sled towards the OSS;
 - f. Lay down of cable end at the middle of the route (near Gagi Island);
 - g. Return to the submarine cable factory;
4. Laying of cable section 2 of 2, on Circuit 1
 - a. Cable loading from factory onto the installation vessel;
 - b. Transit of the installation vessel from the factory to the OSS;
 - c. Cable pull-in (1st Cable End) at the OSS;
 - d. Simultaneous lay and bury of the cable with a jetting sled towards the middle of the route;
 - e. Lay down of cable end at the middle of the route (near Gagi Island);
5. Laying of cable section 2 of 2, on Circuit 2
 - a. Cable loading from factory onto the installation vessel;

- b. Transit of the installation vessel from the factory to the OSS;
- c. Cable pull-in (1st Cable End) at the OSS;
- d. Simultaneous lay and bury of the cable with a jetting sled towards the middle of the route;
- e. Lay down of cable end at the middle of the route (near Gagi Island);
6. Cable joint assembly, deployment and protection of both Circuits 1 and 2 offshore joints;
7. Post installation survey;
8. Remedial burial (if necessary only) with a jet trencher; and
9. Installation of rock bags on CPS at the OSS (if necessary only).

During the peak of construction activities, expected to span from March to November 2026, approximately 170 to 260 staff will be involved in the installation process. These personnel will be divided into two main groups: the Office Support / Management Teams and the Transport and Installation Vessel Crew.

The Office Support / Management Teams, comprising about 20 to 60 staff, will be accommodated either in major cities or near / around the port depending on their function and role. Their primary responsibilities will be overseeing and managing various aspects of the installation, ensuring efficient coordination, and addressing any operational challenges.

On the other hand, the larger portion of the workforce, consisting of approximately 150 to 200 staff, will be the Transport and Installation Vessel Crew. These workers will be accommodated onboard the vessels (Cable Laying Barge, Support Barges, Jointing Jack Up Barge, etc.) during their activities.

5.4 Offshore Substation

The supplier responsible for the installation of offshore substation has not yet been determined. Installation of pin-pile and jacket will commence by end of 2026, and topside installation will follow. The process of offshore substation installation is described below:

1. Fabrication of substation components from outside of Korea (Singapore, Indonesia, or India);
2. Transportation of the assets (jacket, pin piles and topside) to site; and
3. Jacket installation, piling, topside installation and commissioning.

Estimated number of staff during installation and commissioning of Offshore Substation is approximately 12 – 24, 20% of whom are expected to be South Korean nationals, with the remainder foreign passport holders. Peak of their activities is expected to be December 2025 and January 2026 then September and October 2026. And all staff will be accommodating in vessel during their activities.

5.5 Onshore Substation (ONS) & Onshore Cable

The supplier responsible for the installation of onshore substation and Onshore Cable has not yet been determined. Their main construction activities will commence November 2024. The process of Onshore Substation and Export Cable installation are described below:

1. Installation of Onshore Cable between TJB and Onshore Substation;
2. Transmission cable installation between ONS - KEPCO substation;
3. Civil work: piling, foundation etc;
4. Electrical work: mesh grounding;
5. ONS building construction;
6. Electrical system installation;

7. Commissioning; and
8. KEPCO inspection.

The peak of construction activities is expected to be Q1 (construction) and Q3 (installation of electrical system) 2026 with each peak period expected to be 10 weeks respectively. Estimated number of staff during the peak will be approximately 70 - 100 (including vessel crew) who will be accommodated in Yeonggwang or Gwangju during their activities.

5.6 WTG

Siemens Gamesa Renewable Energy has been appointed as the WTG supplier for the Project. Their main construction activities are scheduled to commence around January 2027. The assembly and installation process of WTG are described below:

1. Transport of WTG components to the pre-assembly harbour;
2. Pre-assembly works (e.g. assembly of tower sections final preparation of blades and nacelles);
3. Transport of pre-assembled main components to the offshore windfarm;
4. WTG installation;
5. WTG commissioning and testing; and
6. Hand over to the Operations and Maintenance.

During the peak period of their activities, which is expected to span from Q2 to Q3 2027 (approximately 16 - 25 weeks), Siemens Gamesa Renewable Energy will conduct commissioning and installation processes concurrently. The estimated number of staff during this phase will be around 150 - 170 personnel, which includes the vessel crew. These staff members, predominantly foreigners, will be lodged in general accommodation such as hotels and motels in Mokpo, Gwangju, and the vessels while carrying out their tasks.

5.7 Transition Joint Bay (TJB)

However, it is planned that the transition joint bay installation will be incorporated as part of the Offshore Export Cable installation. The process of transition joint bay installation is described below:

1. Set up access roads, site fencing, site offices, etc;
2. HDD;
3. Excavate TJB Location;
4. Construction of TJB;
5. Install accessories and appliances inside the TJB;
6. Backfill of surrounding location; and
7. Reinstatement of condition (i.e. removal of fencing, site offices, access roads etc.).

During the peak of construction activities, which is expected to last approximately eight (8) weeks, the estimated number of staff will be around 15 to 30 individuals. Most of these staff members are expected to be South Korean nationals. To support their activities, suitable accommodations will be provided in either Yeonggwang or Gwangju.

5.8 Operation and Maintenance (O&M)

For the O&M, there might be modification work to the expected site. The following modification would be anticipated:

Onshore

1. Ground clearing and excavation works;
2. Laying of reinforced concrete (specifically for the warehouse and parking area);
3. Office building and warehouse construction (as per above dimensions);
4. Installation of water, electrical and sewage connectivity, depending on existing infrastructure; and
5. Car parking gravel and road gravel (depending on existing infrastructure).

Offshore

1. Development and re-paving of the existing quayside, including potential excavation and laying of reinforced concrete;
2. Marine dredging and construction of pontoons;
3. Installation of quayside crane;
4. Installation of water, electrical and sewage connectivity, depending on existing infrastructure; and
5. Car parking gravel and road gravel (depending on existing infrastructure).

5.9 Military Radar

The onshore radar tower is expected to have a height of approximately 14 meters and an area of 47.0 m². However, due to the confidentiality of military radar operations, specific details regarding the location and specifications will be updated at a later stage once they are finalized.

5.10 Bird Monitoring Radar

The installation of the 2D Terma Scanner-5000 Radar is anticipated. The cabinet housing the monitoring system is approximately and maximum 3 meters in height, 3 meters in depth, and 3 meters in width. The antenna's height is estimated to be around 5.5 meters.

The exact placement and specifications of the monitoring equipment are currently pending finalization. Comprehensive details concerning this aspect will be provided at a later stage once they are confirmed.

6. EPC SCHEDULE

Figure 6.1 shows the general EPC schedule planned. The EPC Schedule is a vital component of the Project plan, serving as a comprehensive roadmap that outlines the timeline and sequence of activities for the successful execution of the Project.

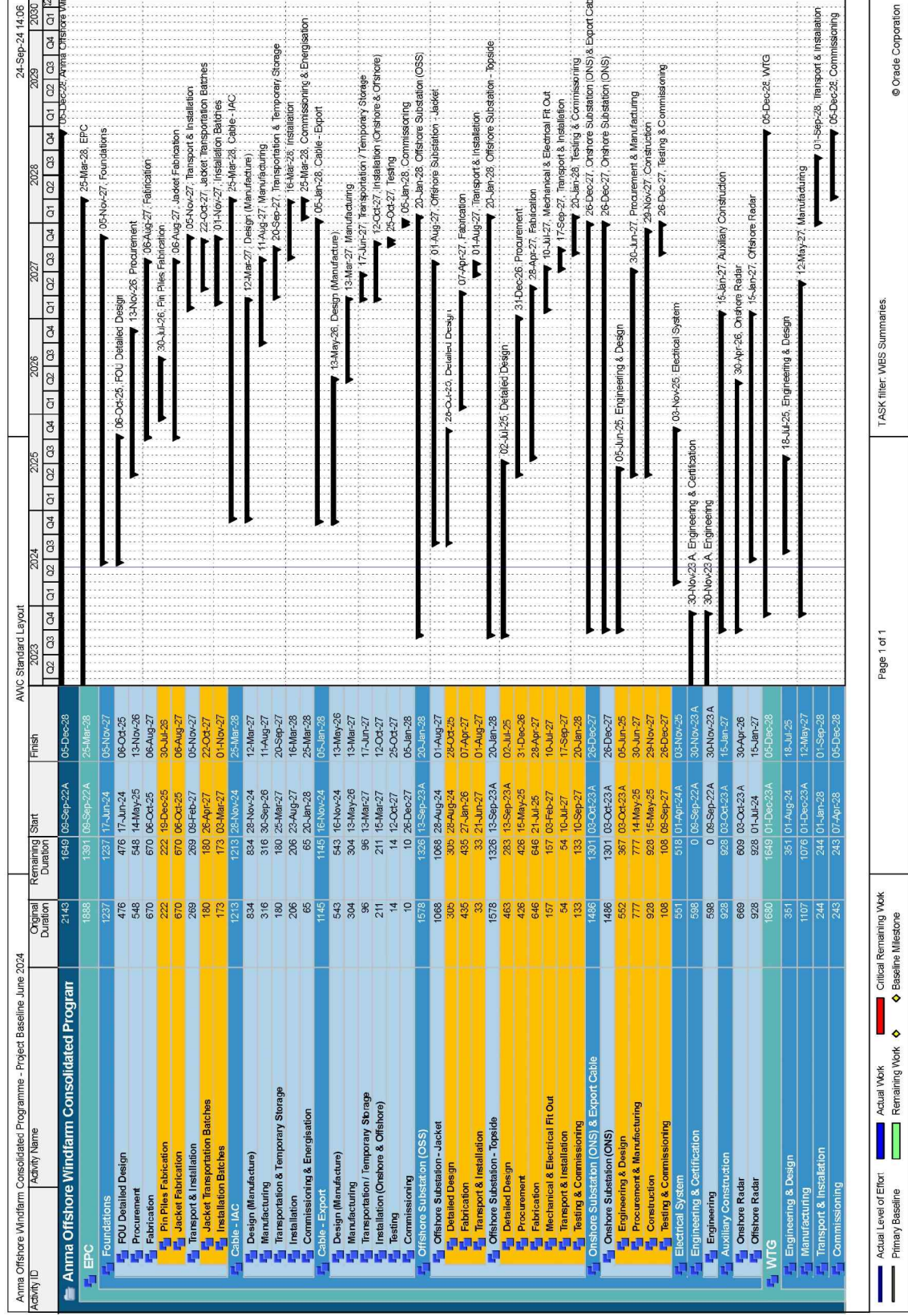


Figure 6.1 Anma Offshore Wind Power Project Master Plan

APPENDIX B LIST OF SURROUNDING PROJECTS

No	Name	Capacity(kW)	Expected Construction Start Date	Expected Construction Completion Date	Commercial Operation
Offshore Wind Farm Project					
1	Doowoo 2 Offshore Wind	10,000	Mar 2025 (Plan) (Source: nondisclosure)	Dec 2027 (Plan) (Source: nondisclosure)	Not Available
2	Doowoo 1 Offshore Wind	49,800	Mar 2028 (Plan) (Source: KPX Status of Power Plant Construction Projects report 2024.1Q)	Mar 2031 (Plan) (Source: KPX Status of Power Plant Construction Projects report 2024.1Q)	Not Available
3	Chilsan Offshore Wind	151,200	March 2025 (Plan) (Source: Sep 2023 Resident briefing presentation material)	Feb 2028 (Plan) (Source: Sep 2023 Resident briefing presentation material)	Until Feb 2048 (20 years) (Source: Sep 2023 Resident briefing presentation material)
4	Nakwol Offshore Wind	364,800	Mar 2024 (Source: Yeonggwang County Notice (영광군 공고 제 2024-431 호))	Apr 2026 (Plan) (Source: Yeonggwang County Notice (영광군 공고 제 2024-431 호))	Until Nov 2046 (20 years) Source: Nakwol Website
5	Yawol Offshore Wind	104,000	Feb 2028 (Plan) (Source: KPX Status of Power Plant Construction Projects report 2024.1Q)	Jan 2031 (Plan) (Source: KPX Status of Power Plant Construction Projects report 2024.1Q)	Until Oct 2047 (20 years) (Source: Feb 2024 EIA Draft Summary report)
6	Hanbit Offshore Wind	344,000	March 2025 (Plan) (Source: Hanbit Website) 2023 (Plan) (Source: Feb 2024 EIA Draft Summary report)	2026 (Plan) (Source: Feb 2024 EIA Draft Summary report)	20 years (Source: May 2023 EIA Draft Resident opinion result report)
7	Gak-i Offshore Wind	400,000	Dec 2028 (Plan) (Source: nondisclosure)	Dec 2031 (Plan) (Source: nondisclosure)	Not Available
8	Daegwang Offshore Wind	400,000	June 2027 (Plan) (Source: nondisclosure)	Aug 2031 (Plan) (Source: nondisclosure)	Not Available
9	Shinan-eoi Offshore Wind	99,000	Oct 2024 (Plan) (Source: nondisclosure)	Dec 2026 (Plan) (Source: nondisclosure)	Not Available
10	Southwest Sea Test Complex	60,000	May 2017 Source: Korea Offshore Wind Power(Developer Website)	Jan 2020 Source: Korea Offshore Wind Power(Developer Website)	O from Jul 2019 Operated by: Korea Midland Power(한국중부발전주)
11	Southwest Sea Model Complex	400,000	Jun 2024 (Plan) Source: Oct 2022 EIA resident opinion result	Dec 2026 (Plan) Source: Oct 2022 EIA resident opinion result	Until Jan 2047 (20 years) Source: Oct 2022 EIA resident opinion result
12	Yeonggwang Chilhae1 Offshore Wind	510,000	Not Available	Not Available	Not Available
13	Yeonggwang Chilhae2 Offshore Wind	510,000	Not Available	Not Available	Not Available
Onshore Wind Farm Project					
1	Yeonggwang Wind	79,600	Jan 2017 Source: https://www.yna.co.kr/view/AKR20190402082900054	Jan 2019 Source: "New&Renewable Energy Guide" Website	O Operated by: Korea East-west Power(한국동서발전주)
2	Yeonggwang Baeksu Wind	40,000	Aug 2014	May 2015 Source: "New&Renewable Energy Guide" Website	O Operated by: Korea East-west Power(한국동서발전주)

No	Name	Capacity(kW)	Expected Construction Start Date	Expected Construction Completion Date	Commercial Operation
3	Yeonggwang Yakksu Wind	19,800	Oct 2015 Source: https://www.epj.co.kr/news/articleView.html?idxno=11393	Nov 2016 Source: KOMIPO Website	O Operated by: Korea Midland Power(한국중부발전㈜)
4	Honam Wind	20,000	Mar 2013 Source: https://www.ikdd.kr/news/articleView.html?idxno=34757	Feb 2014 Source: http://www.keaj.kr/news/articleView.html?idxno=2684	O Operated by: Korea East-west Power(한국동서발전㈜)
5	Yeonggwang Jisan Wind	3,000	Not Available	Jan 2013 Source: http://www.yg21.co.kr/news/articleView.html?idxno=25409	O Operated by: Korea East-west Power(한국동서발전㈜)
6	Yeonggwang	2,000	Not Available	Jan 2019 Source: https://www.busan.com/view/busan/view.php?code=2020072013115317370	Not Available
7	Jeonnam Test Site 1	2,300	Not Available	2015 Source: Korea Energy Agency	Not Available
8	Jeonnam Test Site 2	3,000	Not Available	2016 Source: Korea Energy Agency	Not Available
9	Jeonnam Test Site 3	4,300	Not Available	2018 Source: Korea Energy Agency	Not Available
10	Jeonnam 4	8,000	Not Available	2022 Source: Korea Energy Agency	Not Available
11	-	38,400	Not Available	-	Not Available
12	Yeomsan Wind	50,400	Not Available	Not Available	Mar 2023 (25 years) Source: Nov 2022 EIA
Onshore Solar Farm Project					
1	Unknown	4,500	Not Available	Not Available	Not Available
2	Unknown	1,998	Not Available	Not Available	Not Available
3	Unknown	3,887	Not Available	Not Available	Not Available
4	Unknown	1,995	Not Available	Not Available	Not Available
5	Unknown	14,996	Not Available	Not Available	Not Available
6	Unknown	5,998	Not Available	Not Available	Not Available
7	Seoyoung Scholarship Foundation Solar Power Plant	996	Under Operation	Under Operation	Mar 2019 (Source: https://www.data.go.kr/data/15113332/fileData.do)
8	Songam No.2 Solar Power Plant	996	Under Operation	Under Operation	Feb 2019 (Source: https://www.data.go.kr/data/15113332/fileData.do)
9	Songam No.1 Solar Power Plant	996	Under Operation	Under Operation	Feb 2019 (Source: https://www.data.go.kr/data/15113332/fileData.do)

No	Name	Capacity(kW)	Expected Construction Start Date	Expected Construction Completion Date	Commercial Operation
10	Unknown	3,996	Under Operation	Under Operation	Sep 2021 (Source: https://www.data.go.kr/data/15113332/fileData.do)
11	Unknown	3,996	Not Available	Not Available	Not Available
12	Unknown	1,998	Under Operation	Under Operation	Sep 2021 (Source: https://www.data.go.kr/data/15113332/fileData.do)
13	Unknown	7,392	Under Operation	Under Operation	Sep 2021 April 2022 March 2023 (Source: https://www.data.go.kr/data/15113332/fileData.do)
14	Unknown	14,000	Not Available	Not Available	Not Available
15	Unknown	4,008	Not Available	Not Available	Not Available
16	Unknown	2,373	Not Available	Not Available	Not Available
17	Unknown	2,483	Not Available	Not Available	Not Available
18	Unknown	7,450	Not Available	Not Available	Not Available
19	Unknown	3,348	Not Available	Not Available	Not Available
20	Unknown	5,575	Not Available	Not Available	Not Available
21	Unknown	11,267	Not Available	Not Available	Not Available
22	Yangseong Solar Power Plant Wonsul Solar Power Plant Myeongseong Solar Power Plant	8,904	Not Available	Not Available	Not Available
23	Changwoo Solar Power Plant	5,394	Not Available	Not Available	Not Available
24	Unknown	2,393	Not Available	Not Available	Not Available
25	Unknown	3,000	Not Available	Not Available	Not Available
26	Unknown	4,669	Not Available	Not Available	Not Available
27	Unknown	2,748	Under Operation	Under Operation	Aug 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
28	Unknown	1,526	Under Operation	Under Operation	Aug 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
29	Unknown	1,221	Under Operation	Under Operation	Aug 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
30	Unknown	1,526	Under Operation	Under Operation	Aug 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
31	Unknown	2,997	Under Operation	Under Operation	Aug 2022 Sep 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
32	Unknown	1,494	Not Available	Not Available	Not Available
33	Unknown	2,983	Under Operation	Under Operation	Dec 2021 (Source: https://www.data.go.kr/data/15113332/fileData.do)

No	Name	Capacity(kW)	Expected Construction Start Date	Expected Construction Completion Date	Commercial Operation
34	Unknown	831	Under Operation	Under Operation	Dec 2021 (Source: https://www.data.go.kr/data/15113332/fileData.do)
35	Unknown	881	Under Operation	Under Operation	Dec 2017 (Source: https://www.data.go.kr/data/15113332/fileData.do)
36	Unknown	7,978	Under Operation	Under Operation	April 2019 Oct 2019 Feb 2021 Dec 2021 Jan 2022 (Source: https://www.data.go.kr/data/15113332/fileData.do)
37	- Daehan Solar Power Plant - Jangsu Solar Power Plant - Shinhwa Solar Power Plant - Jinseon Solar Power Plant - Jimyeong Solar Power Plant - Myungwoo Solar Power Plant - Jaewon Solar Power Plant - SY Energy Solar Power Plant - Jeongnam Yeomsan Solar Power Plant - Cheongam Solar Power Plant - Jungsook Yeomsan Solar Power Plant - Seonghwan Yeomsan Solar Power Plant - S&P Solar Power Plant	3,000	Under Operation	Under Operation	Feb 2020 https://www.data.go.kr/data/15029803/fileData.do
38	Bundeung Solar Power Plant	9,000	Not Available	Not Available	Not Available
39	- Baeksu Saok No.1 Solar Power Plant - Baeksu Yeondo No.1 Solar Power Plant - Baeksu Goi No.1 Solar Power Plant	6,931	Not Available	Not Available	Not Available
40	Unknown	3,994	Not Available	Not Available	Not Available
41	- Namu Solar Power Plant - Jayou Solar Power Plant - Bada Solar Power Plant - Uri Solar Power Plant - Ujbyeol Solar Power Plant - Pocari Solar Power Plant - Doil Phase 1 Solar Power Plant - Haenaem No.10 Solar Power Plant - Bitgoeul Solar Power Plant - Power Solar Power Plant - Geumbit Solar Power Plant - Haneul Solar Power Plant - Isul Solar Power Plant - Jangsu Solar Power Plant	33,647	Not Available	Not Available	Not Available
42	Baeksu Sinchu No.1 Solar Power Plant	2,998	Not Available	Not Available	Not Available
43	Yeonggwang Sanghasari Solar Power Plant	25,000	Not Available	Not Available	Not Available

No	Name	Capacity(kW)	Expected Construction Start Date	Expected Construction Completion Date	Commercial Operation
44	- Danu Solar Power Plant - Seogoji Solar Power Plant - Eodeumi Solar Power Plant - Samam Solar Power Plant - Hwatae Solar Power Plant	6,513	Not Available	Not Available	Not Available
45	- Jisan 2-ri Residents Solar Power Plant - Yaksu Residents Solar Power Plant - Shinseong Residents Solar Power Plant - Sanghasa Residents No.1 Solar Power Plant - Sanghasa Residents No.2 Solar Power Plant - Domin No.1 Solar Power Plant - Yeomjeon Village Residents Solar Power Plant	8,185	Under Operation	Under Operation	Nov 2020 (Source: https://www.data.go.kr/data/15113332/fileData.do)
46	-	10,565	Under Operation	Under Operation	Aug 2020 Aug 2021 (Source: https://www.data.go.kr/data/15113332/fileData.do)
47	Unknown	2,490	Under Operation	Under Operation	Aug 2020 (Source: https://www.data.go.kr/data/15113332/fileData.do)
48	- Dura Solar Power Plant - Hamgumi Phase 1 Solar Power Plant	1,989	Under Operation	Under Operation	Under Operation
49	Unknown	93,976	Under Operation	Under Operation	Jan feb 2020 https://www.data.go.kr/data/15029803/fileData.do
50	Unknown	2,997	Under Operation	Under Operation	Aug 2020 (Source: https://www.data.go.kr/data/15113332/fileData.do)
51	Unknown	12,999	Not Available	Not Available	Not Available
52	Unknown	992	Not Available	Not Available	Not Available
53	Unknown	2,997	Not Available	Not Available	Not Available
54	Unknown	2,990	Under Operation	Under Operation	Jul 2017 https://www.data.go.kr/data/15029803/fileData.do