Bash 52MW Wind Farm
Republic of Uzbekistan

Environmental & Social Impact Assessment: Volume 4 -Addendum to the Bash 500MW WF ESIA - Appendices

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APPENDIX A – CONCLUSIONS ON NATIONAL EIA (OVOS)

Berilgan xulosa reestrda ko‘rinmasa haqiqiy hisoblanmaydi

O‘ZBEKISTON RESPUBLIKASI EKOLOGIYA, ATROF-MUHITNI MUHOFAZA QILISH VA IQLIM O‘ZGARISHI VAZIRLIGI
DAVLAT EKOLOGIK EKSPERTIZASI MARKAZI

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DAVLAT EKOLOGIK EKSPERTIZASI XULOSASI

TARTIB RAQAM : 04-01/11-08-1569

HUJJAT TURI : Atrof-muhitga ta'sir to'g'risidagi ariza loyihasi

Davlat ekologik ekspertizasi buyurtmachisi: JURU ENERGY CONSULTING **ga berildi.**
STIR: 303454532
Davlat ekologik ekspertizasi obyekti: Buxoro viloyati G`ijduvon tumani **da joylashgan**
Loyiha ishlab chiquvchi nomi: OOO "JURU ENERGY CONSULTING"
STIR: 303454532
Davlat ekologik ekspertizasi mas’ul eksperti: Tusheva Larisa Gennadyevna

O‘zbekiston Respublikasi Vazirlar Mahkamasining 2020-yil 7-sentabrdagi 541-son qarori bilan tasdiqlangan 1-ilovaga muvofiq, ushbu davlat ekologik ekspertizasi obyekti **atrof-muhitga ta’sir ko‘rsatishning 1-Toifa bandiga mansub.**

O‘tkazilgan davlat ekologik ekspertizasi natijasi: **Ijobiy xulosa**

Davlat ekologik ekspertizasi xulosasining matnli ilovasi: varaqda

Davlat ekologik ekspertizasi xulosasi:

Berilgan sana : 22.08.2023

Amal qilish muddati : 21.08.2026

*Ekologik ekspertiza obyektining ekologik talablarga muvofiqligi, joylashuv nuqtalari koordinatalari, atrof-muhitni muhofaza qilish chora-tadbirlari, bajarilishi shart bo‘lgan talablar va boshqalar to‘g‘risida ilovada keltirilgan O‘zbekiston Respublikasi ekologiya, atrof-muhitni muhofaza qilish va iqlim o‘zgarishi vazirligining Davlat ekologik ekspertiza markazi va filiallarining ekspert xulosasi ushbu davlat ekologik ekspertizasi xulosasining **ajralmas qismi hamda unda belgilangan talablar** bajarilishi shart hisoblanadi.*

Izoh: Buyurtmachi tomonidan davlat ekologik ekspertizasi xulosasida nazarda tutilgan ekologik talablarga rioya etilmaganda, davlat ekologik ekspertizasi xulosasi qonunchilikda belgilangan tartibda bekor qilinadi.

Bosh direktor
G.A.Muxamedov

Номер специальной формы :

Давлат экологик экспертизаси хулосасига илова

Berilgan xulosa reestrda ko'rinmasa haqiqiy hisoblanmaydi

Государственная экологическая экспертиза

Экспертное заключение

Объект:	Оценка воздействия на окружающую среду увеличения производственной мощности до 580 МВт при строительстве ветровой электростанции с соответствующей инфраструктурой и высоковольтной линией электропередачи (ВЛЭП) 500
Заказчик:	ООО "JURU ENERGY CONSULTING"
ИНН	303454532
Категория	1 категория 32 пункт, ПКМ РУз № 541 от 07.09.2020 г.
Разработчик:	ООО "JURU ENERGY CONSULTING"
Эксперт:	Tusheva Larisa Gennadyevna

Генеральному директору ООО «JURU ENERGY CONSULTING» ИСМАИЛОВУ Ж.Ш.

копия: Управлению экологии, охраны окружающей среды и изменения климата Бухарской области

На государственную экологическую экспертизу представлены материалы увеличения производственной мощности до 580 МВт при строительстве ветровой электростанции (ВЭС) с соответствующей инфраструктурой и высоковольтной линией электропередачи (ВЛЭП) 500/220 кВ в Гиждуванском районе Бухарской области.

Ранее бы разработан проект ЗВОС на строительстве ветровой электростанции в Гиждуванском районе Бухарской области мощностью 500 МВт и получено заключение Государственной экологической экспертизы № 04-01/11-08-1612 от 24.09.2021 г. Проектом была предусмотрена установка ветротурбин - 111 ед. общей мощностью 500 МВт. Изменение проектных решений заключается в замене 32 турбин меньшей производительности на 8 турбин более высокой производительности с доведением общей суммарной мощности ветровой электростанции до 580 МВт. Таким образом, настоящим проектом предусмотрена установка 87 ветротурбин. Место установки турбин в пределах отведенной площади изменится; размещение инфраструктуры и ЛЭП изменению не подлежат. Проектная площадь участка составляет
285,1 га.

Основанием для разработки проекта является Постановление Президента № ПП-5003 от 23.02.2021 г.
«О мерах по реализации инвестиционного проекта «Строительство ветряной электростанции мощностью 500 МВт в Гиждуванском районе Бухарской области».

Проектная территория расположена в северо-восточной части Аякагитминской впадины в Гиждуванском районе Бухарской области. Большая часть участка представлена Южно-Кызылкумскими песчаными равнинами с сохранившимися не высокими горами (Тамдытау, Ауминьзатау, Кулджуктау). Территорию рассматриваемого участка пересекают: железная дорога, соединяющая г.Навои с г.Заравшан; параллельно железной дороге проходит грунтовая дорога; газопровод, проходящий через южную часть участка; надземные линии электропередачи.

В 1,26 км к юго- востоку от участка намечаемого строительства ВЭС расположена территория нефтяной базы с резервуарами для хранения топлива; в 4,5 км на юго-востоке расположена действующая подстанция. С северо-западной на удалении 0,9 км и с северо-восточной стороны на удалении 1,4 км от границы проектируемого участка расположены горнодобывающие участки – 2 ед.

Проектная площадка сезонно используется для выпаса скота. На территории, отведенной для реализации проекта, были выявлены 5 пастушьих поселений. Поселок Чулабад расположен на расстоянии 9550 м к северо-востоку от ВЭС, пос.Куклам в 1,65 км к юго-востоку от ВЭС, жилые постройки пос. Агитма находятся на удалении 5,4 км в западном направлении. Согласно представленному письму Службы санитарно-эпидемиологического благополучия и общественного здоровья Министерства здравоохранения Республики Узбекистан № 20-8/3066 от 12.04.2021 г., размер санитарно-защитной зоны (СЗЗ) для ВЭС при производстве электрической энергии мощностью 600 мВт и выше составляет 1000 м.

В соответствии с требованиями «Положения о порядке проведения общественных слушаний проектов оценки воздействия на окружающую среду», приложение № 3 к постановлению Кабинета Министров № 541 от 07.09.2020 г., до начала строительства ВЭС ООО «JURU ENERGY CONSULTING» было проведено общественное слушание при участии заинтересованных сторон: жителей пос Агитма, пос.Куклам, пос.Чулабад, представителя хокимиата Гиждуванского района и других представителей, где жителей близлежащих домов ознакомили с основными направлениями, целями и возможными экологическими последствиями строительства ВЭС. В результате проведения общественного слушания было принято решение об общественной поддержке намечаемой деятельности на рассматриваемой территории (представлен протокол и фотоматериалы от 15.04.2021 г.). Проектом не предусматривается снос жилых домов, в связи с чем, изменения условий проживания населения не ожидаются.

Особенности окружающей среды в районе расположения участка

Участок намечаемого проекта расположен в пустыне Кызылкум. В геоморфологическом отношении рассматриваемая территория приурочена к третьей надпойменной террасе реки Зеравшан и представляет собой слабоволнистую равнину.

В геолого-литологическом строении района исследований принимают участие отложения аллювиально-пролювиальные отложения Зарафшанско-Сукайтинского комплекса. Отложения представлены переслаивающимися супесями, суглинками, песками и глинами.

Согласно результатам топографических и геотехнических исследований, проведенных СП «UzAssystem» (филиал международной проектно-инженерной компании «Assystem»), в ходе буровых изысканий (16 скважин глубиной до 50 м) на площадке ВЭС грунтовые воды на глубине до 50 м не были обнаружены.

К востоку от участка строительства ВЭС, расположено коллекторно-дренажное озеро Аякагитма. Объемом воды в озере составляет 1,5 – 1,8 млрд.м3 (водоохранная зона 200-250 м), которое является важной орнитологической территорией. Озеро бессточное, его водосбор осуществляется за счет сбросных вод коллектора Агитма, атмосферных осадков и грунтового питания**.** Общая минерализация воды летом составляет 9.1- 10.0 г/л. В составе воды преобладают ионы хлоридов (до 842 мг/л) и сульфатов (до 695 мг/л). Фитопланктон состоит из диатомовых, синезеленых и зеленых водорослей.

Крайняя ветроустановка запроектирована в северном направлении от озера Аякагитма на расстоянии 2765 м; ближайшая установки запроектирована с востока от озера на расстоянии 2265 м, т.е. за пределами водоохранной зоны. В проекте представлено письмо Министерства водного хозяйства №01/17-2341 от 05.08.2021 г., об отсутствии на территории проектируемого ветропарка объектов водного хозяйства.

Почвы рассматриваемого района – пустынно-песчаные.

Растительность представлена травянистыми формами (солянками).

В результате весенних и летних ботанических исследований на проектной территории определены два краснокнижных вида растений: тюльпан Леманна и жузгун Закирова; а также виды пресмыкающихся (среднеазиатская черепаха, серый варан, песчаный удавчик, гладкий гекончик) и млекопитающих (длинноиглый лысый еж и джейран), которые занесены в Красную книгу Республики Узбекистан и Красный список Международного союза охраны природы. В соответствии с требованиями ст.17 Закона Республики Узбекистан «Об охране и использовании растительного мира» №ЗРУ-409 от 21.09.2016 г., **действия (бездействие), которые могут привести к сокращению численности или нарушению среды произрастания редких и находящихся под угрозой исчезновения видов дикорастущих растений, не допускаются.** Согласно ст. 24, 27 Закона Республики Узбекистан **«Об охране и использовании животного мира»** № ЗРУ-408 от 19.09.2016 г., основными требованиями по охране и использованию животного мира и среды его обитания являются: сохранение видового разнообразия и целостности сообществ и популяций диких животных в состоянии естественной свободы; сохранение среды обитания, мест размножения и путей миграции животных и др. При размещении, проектировании и строительстве предприятий, транспортных магистралей, линий электропередач и связи и других объектов, совершенствовании существующих и внедрении новых технологических процессов, **должны предусматриваться и осуществляться мероприятия по сохранению среды обитания, мест размножения и путей миграции диких животных, а также обеспечиваться неприкосновенность участков, представляющих особую ценность**
в качестве среды обитания диких животных.

В ходе мониторинга птиц на территории ВЭС были выявлены следующие виды птиц, включенные в анализ моделированя риска столкновений (осень-весна):

- *целевые виды уровня I*: степной орел, беркут, стервятник, балобан обыкновенный, дрофа-красотка;

- *целевые виды уровня II:* орел-карлик, болотный лунь, полевой лунь, ястреб-перепелятник, туркестанский тювик, обыкновенный канюк, курганник, белоголовый сип, черный гриф, розовый пеликан, серый журавль, обыкновенная пустельга, степная пустельга;

- *не целевые виды*: красная утка, серая утка, кряква, чирок-свистунок, лебедь-шипун, хохлатая чернеть, малый баклан, большой баклан и обыкновенная кваква.

По результатам исследований было проведено моделирование риска столкновения (МРС). Мониторинг птиц проводился с учетом сроков миграции и размножения целевых видов птиц в регионе. Анализ показывает, что частота столкновений всех *целевых видов уровня I* не будет превышать 1 раза за 61 год. Для целевых видов *уровня II* анализ МРС прогнозирует одно столкновение за три года для серых журавлей и 1 столкновение за 100 лет или реже для всех остальных видов этой группы. В целях минимизации воздействия на флору, фауну и орнитофауну по результатам исследования биоразнообразия для строительства будут выбраны участки, имеющие наименьшее значение для биоразнообразия.

Согласно представленного письма Бухарского регионального департамента культурного наследия, при Министерстве Культуры Республики Узбекистан №286 от 09.04.2021 г., в радиусе 5 км от территории проектируемого строительства ВЭС, отсутствуют объекты материального культурного и археологического наследия, находящиеся под государственной охраной.

Характеристика намечаемой деятельности

Проектом намечается установить ветротурбины GW165 - 5.6МВт – 87 ед. высотой 120 м со всеми вспомогательными зданиями и сооружениями.

На площадке ВЭС предусмотрены дополнительные и вспомогательные объекты инфраструктуры: вход на территорию объекта и здание службы безопасности; административное здание, офисы и помещения; центральный пост управления; склад и мастерские; резервный источник электроэнергии (дизель-генератор); система безопасности; система освещения; подъездные дороги между ветровыми установками.

Для установки на ВЭС Bash с максимальной мощностью 580 МВт предусмотрены ветровые турбины GW165-5.6 Goldwind (КНР) мощностью 5.6 МВт. Основные компоненты ветряной турбины включают следующие компоненты: конические трубчатые секции башен из стали; лопасти ротора, изготовленные из стекловолокна, армированной эпоксидной смолы и углеродных волокон - 3 ед.; гондола, в которой находится генератор и коробка передач; ротор - является центральной точкой, в которой три лопасти соединены с гондольной коробкой; генератор преобразует механическую энергию в электричество; коробка передач; преобразователь; трансформатор.

К дополнительным объектам относятся: станционная подстанция 33/500 кВ, высоковольтная линия электропередачи (ВЛЭП) напряжением 500 кВ.

Основные виды работ *при строительстве ВЭС*: разметка границ площадки, установка временного ограждения для защиты чувствительных мест обитания и создание строительной площадки для разгрузки материалов и компонентов; размещение временных административно-бытовых сооружений; расчистка площадки от растительности, снятие почвенно-растительного слоя и организация участков складирование снятого грунта; строительство внутриплощадочных дорог к турбинам и распределительной аппаратуре; проходка канав и прокладка силовых и связных кабелей; строительство фундаментов под турбины, включая выемку грунта; доставка на площадку и возведение турбинных башен, гондол и лопастей; строительство подстанции и здания управления, включая распределительную и измерительную аппаратуру; поэтапное восстановление площадки. Для монтажа ветроэнергетических установок (ВЭУ) предусматривается очистка территории строительства от растительности. Под строительство сооружений по возможности будут выбраны площадки с отсутствием растительного покрова.

С целью сохранения и восстановления почвенного плодородия и рационального использования земельных ресурсов перед началом строительных работ предусмотрено выполнение комплекса мер по *технической и биологической рекультивации*, включающих снятие верхнего гумусного и дерновинного слоя почвы, складирование его в отвал грунта рядом с местом проведения строительных работ и по завершении строительных работ – укладка его в качестве рекультивационного слоя. На участках разработки котлованов под установку опор ЛЭП плодородный слой снимается и вывозится в места, определённые землепользователем и в дальнейшем используется для улучшения и восстановления земельных угодий. По завершении строительства выкопанный грунт будет использован при планировке участка и при благоустройстве территории.

С целью снижения негативного воздействия при проведении строительных работ ВЭС предусматривается: проводить работы по установке ВЭУ вне периода размножения птиц, т.е. в осенне-зимний период; при монтаже ВЭУ, подведении и развитии инфраструктуры предусматривается очистка прилегающих территорий от строительного и другого мусора; использовать устройства освещения строительных площадок, отпугивающего животных; применять современные машины и механизмы с минимальным шумом и др.

С целью исключения проливов ГСМ на почву при дозаправке строительной техники запланирована бетонированная заправочная площадка размерами 3м*5м, с устройством по периметру лотков бетонированного зумпфа для сбора ливневых стоков.

При эксплуатации ветряные электростанции требуют ограниченной операционной деятельности, включающей: эксплуатацию и техническое обслуживание системы ВЭС; дистанционное отключение турбины при чрезмерной скорости ветра; управление операциями в отношении местных видов птиц и летучих мышей (летом и зимой) и миграционными периодами весной и осенью. Оборудование имеет электронную связь с расположенным за пределами площадки центром управления, который может полностью остановить систему при чрезмерно высокой (чтобы избежать повреждения оборудования) или низкой (когда выработка теряет экономическую целесообразность) скорости ветра. Трансформатор используется для повышения напряжения на выходе турбин до уровня, приемлемого для подстанции.

Топливная емкость установлена на этой же площадке, со всеми принятыми мерами предохранения попадания ГСМ на почво-грунты.

В период проведения строительных работ на территории площадки будет работать 100 человек.

Планируемая численность работающих при эксплуатации ВЭС составит 20 человек. Режим работы ВЭС на период эксплуатации – круглогодичный.

Анализ воздействия намечаемой деятельности на окружающую среду

Основными источниками воздействия на окружающую среду *в период строительства* будут: земляные, сварочные, окрасочные, погрузочно-разгрузочные работы; работа двигателей строительных машин, механизмов и автотранспорта, временное хранение топлива для дозаправки строительной техники.

Выброс загрязняющих веществ 8 наименований от 2 неорганизованных источников выбросов *в период строительства* составит 33,8366 т. Наибольший вклад в загрязнение атмосферного воздуха будет вносить оксид углерода (42,76%). Воздействие на атмосферный воздух загрязняющих веществ в период строительства будет иметь временный характер, максимальные концентрации загрязняющих веществ в приземном слое атмосферы по всем ингредиентам не превысят установленных квот.

Основными источниками воздействия на окружающую среду *в период эксплуатации* ВЭС будут: оборудования – 100 ед., содержащее масло общим объемом 276,565 т; дизель-генератор (резервный (аварийный) источник питания для подстанции).

Выброс углеводородов масла минерального происходит неорганизованно при эксплуатации маслонаполненного оборудования через его неплотности оборудования. В соответствии с представленными материалами, *в период эксплуатации* ВЭС общий выброс паров масла составит – 0,0084 т/год.

Анализ расчетов максимальных приземных концентраций углеводородов за пределами промплощадки не выявил превышения установленных норм (квот); концентрации не превысят 0,1 ПДК.

В период строительства будет использоваться вода на производственные нужды (полив территории с целью снижения пыления), хозбытовые нужды (питьевые).

Источником водоснабжения на производственные нужды и хозбытовые нужды запланирована привозная вода из ближайшего водовода.

Общее водопотребление в период строительства ВЭС составит: 9212 м3/год, в том числе: на производственные нужды – 87,0 м3/год; на хозбытовые нужды - 9125 м3/год.

Производственные стоки отсутствуют. Сброс образующихся хозбытовых сточных вод объемом 9125 м3/год, планируется во временно установленный накопитель (септик) с последующим вывозом на ближайшие очистные сооружения.

Воздействие в период строительных работ имеет локальный и кратковременный характер.

В период эксплуатации объекта предусматривается использование воды
на хозбытовые нужды (питьевые, душевые, уборка помещений, нужды столовой), полив территории общим объемом 1630 м³/год. Источником водоснабжения при эксплуатации *ВЭС* является привозная вода.

Технологический процесс выработки электрической энергии на ВЭС, процессы преобразования энергии на подстанции и передачи энергии посредством ВЛЭП, не сопровождаются изъятием воды на производственные нужды.

Водоотведение хозяйственно-бытовых стоков при эксплуатации ВЭС составит 1452,7 м3/год. Сброс хозбытовых стоков запланирован в биологический септик.

Сброс загрязненных стоков в водный объект и на рельеф местности не предусматривается.

В период *проведения строительства 87 ед. ВЭУ* будут образовываться отходы *IV и V класса опасности*, такие, как отходы бетона – 3262,5 т, арматуры – 2175 т, отходы строительного щебня – 2175 т, отходы песка строительного – 6525 т, отходы цементного раствора – 4350 т, огарки сварочных электродов – 0,05 т, деревянные элементы от опалубки – 0,2 т, отходы ЛКМ – 0,025 т, пластиковая тара из-под краски – 0,05 т, обтирочный материал (ветошь) - 0,1 т, строительный мусор – 0,5 т, бой кирпича – 0,2 т, ТБО – 50,0 т. Определены места складирования и способы утилизации.

В период эксплуатации объекта предусмотрено образование 12 видов отходов в количестве 351,4716 т/год, в том числе:

- *II класса опасности:* отработанное трансформаторное масло – 0,533 т/год, подлежит сдаче на регенерацию специализированным предприятиям;

- *III класса опасности*: лом цветных металлов – 0,2 т/год, подлежат сдаче на переработку во «Вторчермет»;

- *IV класса опасности:* отработанные лопасти ветрогенераторов – 274,48 т/год, подлежат сдаче на переработку заинтересованным организациям; отработанные светодиодные лампы – 0,1054 т/год, планируют передавать на переработку специализированным предприятиям; загрязненный обтирочный материал (содержание масла менее 15%) – 0,05 т/год, отработанный силикагель – 0,0202 т/год, твердые бытовые отходы (ТБО) – 1,0 т/год, мусор от уборки территории – 73 т/год подлежат вывозу на полигон ТБО;

- *V класса опасности:* лом черного металла – 0,5 т/год, отходы сварочных электродов - 0,008 т/год, подлежат сдаче на переработку во «Вторчермет»; макулатура - 0,035 т/год, подлежит сдаче в пункты приема вторсырья для переработки; пищевые отходы – 1,54 т/год планируют вывозить на корм скоту.

Воздействие на почвы и грунты в результате складирования отходов за пределами площадки не прогнозируется.

В период эксплуатации ВЭУ выделяют две категории шума: механический (шумы редукторов, мультипликаторов) и аэродинамический от лопастей. Согласно представленному анализу шумового воздействия при эксплуатации ВЭС, уровень шума в ночное время (с 23 час до 7 час) составит 45 дБ, в дневное время (с 7 час до 23 час) 55 дБ. Согласно государственного стандарта O'z DSt 1314:2017 «Возобновляемые источники энергии. Ветроэнергетика. Установки Ветроэнергетические. Общие технические требования», уровень звука, создаваемый одиночной ВЭУ на расстоянии 50 м от ВЭУ на высоте 1,5 м от уровня земли, не должен превышать 60 дБ. Анализ полученных результатов уровня шума не выявил превышения установленных норм в жилой застройке.

В период эксплуатации ВЭУ основным источником вибрации являются движущиеся части ВЭУ (лопасти ротора). Согласно представленным материалам, вибрации ощутимы на расстоянии 60 м от ВЭУ. В связи с тем, что ближайшие жилые постройки расположены на удалении 165 км, вибрационные колебания в жилой зоне не ощущаются.

В материалах ЗВОС представлен анализ аварийной ситуации *в период строительства,* которая может возникнуть при проливе ГСМ от неисправной техники.
С целью предотвращения пролива ГСМ на незащищенные грунты, предусмотрено размещение и заправка техники на гидроизолированной площадке с бетонированным зумпфом по периметру площадки.

В период функционирования ВЭС в материалах ЗВОС представлен анализ наиболее вероятной аварийной ситуации, связанной с обрушением башни ВЭУ результате неправильного монтажа системы крепления башни, при обледенении и способы их предотвращения, включающие: обеспечение безопасного расстояния между турбинами и жилыми строениями (не менее 300 м); проведение периодических осмотров лопастей и башен на выявление дефектов, которые могут повлиять на целостность лопасти и башен; своевременный ремонт и устранение неполадок и др.

Также рассматривается аварийная ситуация, связанная с возникновением пожара на трансформаторных подстанциях. В результате пожара концентрации загрязняющих веществ на границе промплощадки превысят установленные нормы (квоты). Для предотвращения пожара проектом предусмотрены противопожарные мероприятия: разрабатывается план пожаротушения с использованием противопожарных средств: воздушно-механическая и компрессионная пена, распыленная и тонкораспыленная вода, порошковые и газовые составы.

Согласно представленным материалам, аварийные риски на ВЭС после реализации проекта минимизированы, благодаря применению современной конструкционных решений и обеспечения автоматизированной системы управления и контроля за процессом производства электрической энергии.

Проектом ЗВОС предлагается комплекс мероприятий, направленных на предотвращение загрязнения окружающей среды *на этапе строительства,* включающих: техническую рекультивацию нарушенных земель; исключение движения техники вне подъездных путей; исключение проливов нефтепродуктов и др.
В материалах проекта ЗВОС представлен план проведения мониторинг состояниянием окружающей среды во время строительства по контролю за проведением подготовительных работ (мобилизация техники), строительных работ (земляных. сварочных, покрасочных) и др.

На этапе эксплуатации ВЭС предусматривается: исключение загрязнения грунтов и подземных вод в результате отсутствия сброса сточных вод на рельеф местности; установка улучшенной системы автоматики для слежения за производственным процессом, оснащение средствами пожарной сигнализации; организация бетонированной площадки для размещения на ней контейнеров для сбора отходов и их своевременный вывоз на ближайший полигон с целью исключения загрязнение почвенного и растительного покрова.

Выводы

Основными видами воздействия на окружающую среду при строительстве ветровой электростанции мощностью до 580 МВт с соответствующей инфраструктурой и высоковольтной линией электропередачи (ВЛЭП) 500/220 кВ в Гиждуванском районе Бухарской области являются: изъятие природных ресурсов (земельных, водных); загрязнение воздушного бассейна выбросами газообразных и взвешенных веществ; изменение рельефа территории; загрязнение территории землеотвода образующимися отходами и сточными водами.

Анализ характера воздействия работ показал, что масштабы существенного нарушения рельефа и недр обусловлены размерами площади строительно-монтажных работ, включающих расчистку строительной площадки, планировку рельефа, устройство подъездных дорог и т.д.

В соответствии с требованиями п.23 а), гл. 3 «Положения о государственной экологической экспертизе» приложение № 2 к постановлению Кабинета Министров № 541 от 07.09.2020 г., **разработать Заявление об экологических последствиях (заключительный этап процедуры оценки воздействия на окружающую среду), в котором ООО «JURU ENERGY CONSULTING» необходимо:**

- разработать нормативы всех видов воздействия (ПДВ, ПДО, ПДС) и природоохранные мероприятия, обеспечивающие снижение нагрузки на окружающую среду до нормативного уровня; уточнить расчеты выбросов загрязняющих веществ в атмосферный воздух, исходя из характеристик действительно установленного на объекте оборудования;

- в целях минимизации воздействия на флору, фауну и орнитофауну при строительстве ВЭС выбрать участки, имеющие наименьшее влияние на биоразнообразие;

- с целью соблюдения условий Концепции по охране окружающей среды Республики Узбекистан до 2030 года, утвержденной Указом Президента Республики Узбекистан №УП-5863 от 30.10.2019 г., **выявить приоритетные источники загрязнения атмосферного воздуха и предусмотреть оснащение их автоматическими системами мониторинга выбросов загрязняющих веществ в атмосферный воздух;**

- при размещении ВЭС на рассматриваемой территории обеспечить соблюдение водоохранной зоны озера Аякагитма, в соответствии с требованиями п. 18, гл.3 «Положения о порядке установления водоохранных зон и зон санитарной охраны водных объектов Республики Узбекистан», утвержденного Постановлением Кабинета Министров № 981 от 11.12.2019 г.;

- обеспечить сброс хозяйственно-бытовых стоков по системе, исключающей возможность попадания загрязняющих веществ на почву, в грунты и затем в подземные воды;

- обеспечить контроль за техническим состоянием оборудования при ведении строительных работ на площадке; оборудование, применяемое на участке строительства, должно быть в исправном состоянии, чтобы не допускать утечки горюче-смазочных материалов;

- в целях сохранения природной среды и улучшения экологической обстановки, для уменьшения воздействия на атмосферный воздух **выхлопных газов строительной техники и механизмов**, следует предусмотреть необходимые природоохранные мероприятия, включающие оборудование бетонированной площадки для стоянки и обслуживания автотранспортных средств;

- в целях дальнейшего совершенствования системы управления деятельностью в сфере обращения с бытовыми и строительными отходами в соответствии с приложением №1, гл.2, п.4 постановления Кабинета Министров Республики Узбекистан № 40 от 28.01.2021 г. «О мерах по дальнейшему совершенствованию порядка проведения работ, связанных со строительными отходами», **все виды строительных отходов должны быть направлены на рациональное повторное использование, захоронение и переработку сборщиками отходов, либо переданы (отданы) другим юридическим лицам и индивидуальным предпринимателям, осуществляющим сбор, транспортировку, захоронение и (или) переработку этих отходов;**

- в целях сохранения чистоты грунтов и окружающей поверхности организовать бетонированную площадку для размещения на ней контейнеров для сбора отходов и их своевременный вывоз на ближайший полигон; заключить договор с территориальным со специализированным предприятием для содержания ТБО на санкционированном полигоне;

- обеспечить проведение технической и биологической рекультивации нарушенных земель при строительстве ВЭС.

Государственная экологическая экспертиза проекта показала, что представленные материалы в достаточной степени **соответствуют** требованиям природоохранного законодательства, предъявляемым к первому этапу оценки воздействия на окружающую среду.

Министерство природных ресурсов Республики Узбекистан **согласовывает** Проект заявления о воздействии на окружающую среду увеличения производственной мощности до 580 МВт при строительстве ветровой электростанции с соответствующей инфраструктурой и высоковольтной линией электропередачи (ВЛЭП) 500/220 кВ в Гиждуванском районе Бухарской области **при выполнении природоохранных мероприятий, предусмотренных проектом ЗВОС и указанных в заключении.**

Согласно п.26, гл.3, п.47, гл. 6, и п. 57, гл. 7 «Положения о государственной экологической экспертизе», утвержденного постановлением Кабинета Министров Республики Узбекистан № 541 от 07.09.2020 г., **заказчик несёт ответственность за достоверность и правдивость представленных на государственную экологическую экспертизу документов и сведений;** заключение государственной экологической экспертизы о допустимости реализации проекта имеет юридическую силу в течение трех лет, в случае неосуществления проектируемых работ за этот период или изменений проектных решений следует разработать заново проект ЗВОС и представить на государственную экологическую экспертизу в установленном законодательством порядке; **действие заключения государственной экологической экспертизы прекращается в случаях: несоблюдения заказчиком указанных в заключении государственной экологической экспертизы требований, и иных случаях в порядке, установленном законодательством.**

Заключение государственной экологической экспертизы о допустимости реализации проекта не подменяет и не отменяет необходимость получения соответствующих разрешительных документов в установленном законодательством порядке.

Управлению природных ресурсов Бухарской области следует взять под контроль:

- выполнение требований природоохранного законодательства ООО «JURU ENERGY CONSULTING» по увеличению производственной мощности до 580 МВт при строительстве ветровой электростанции с соответствующей инфраструктурой и высоковольтной линией электропередачи (ВЛЭП) 500/220 кВ в Гиждуванском районе, предусмотренных проектом на территории с географическими координатами:

1. 40°32'15.53"С, 64°37'45.67"В; 2. 40°32'22.19"С, 64°43'22.66"В;

3. 40°34'18.69"С, 64°43'32.58"В; 4. 40°34'44.28"С, 64°44'26.45"В;

5. 40°35'53.37"С, 64°43'40.12"В; 6. 40°37'33.32"С, 64°43'48.19"В;

7. 40°37'28.45"С, 64°44'3.68"В; 8. 40°38'0.19"С, 64°45'10.83"В;

9. 40°38'43.21"С, 64°45'16.34"В; 10.40°40'4.97"С, 64°46'34.54"В;

11.40°42'15.55"С, 64°46'30.85"В; 12.40°42'20.28"С, 64°34'7.93"В;

13.40°41'46.09"С, 64°33'18.64"В; 14.40°40'19.16"С, 64°33'7.35"В;

15.40°40'2.73"С, 64°35'54.58"В; 16.40°37'56.85"С, 64°37'32.86"В;

- осуществление экологического мониторинга состояния окружающей среды в районе строительства ВЭС;

- проведение технической и биологической рекультивации нарушенных земель;

- своевременный вывоз отходов с проверкой документации, подтверждающей предусмотренные проектом методы их утилизации; заключение договора со специализированным предприятием для своевременного вывоза ТБО и содержания отходов на санкционированном полигоне.

На стадии разработки ЗЭП требуется провести обследование участка строительства ВЭС и прилегающих территорий на предмет реализации проектных решений и заложенных в проекте ЗВОС природоохранных мероприятий; результаты обследования представить в форме акта, заверенного представителем Управления экологии, охраны окружающей среды и изменения климата Бухарской области и руководителем предприятия.

Не следует допускать ввода объекта в эксплуатацию без положительного заключения на Заявление об экологических последствиях.

Генеральный директор **Г.Мухамедов**

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MINISTRY OF ECOLOGY, ENVIRONMENTAL PROTECTION AND CLIMATE CHANGE OF THE REPUBLIC OF UZBEKISTAN

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CONCLUSION OF THE STATE ECOLOGICAL EXPERTISE

NUMBER: 04-01/11-08-1569

DOCUMENT TYPE: Draft Environmental Impact Statement

The Client of the state environmental expertise: JURU ENERGY CONSULTING.
TIN: 303454532
Subject of the state environmental expertise: located in Giduvan district, Bukhara region
Name of the project developer: JURU ENERGY CONSULTING LLC
TIN: 303454532
Responsible expert of the state environmental expertise: Tusheva Larisa Gennadievna

According to Appendix 1, approved by Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 541 dd. September 7, 2020, **this subject of the state environmental expertise qualifies for Category 1of environmental impact.**

The result of the conducted state environmental expertise: **Positive conclusion**

Textual attachment of the conclusion of the state environmental expertise: on ___ sheets:

Conclusion of the state environmental expertise:

Issue date:	22.08.2023
Validity period:	21.08.2026

The attached expert conclusion of the State Environmental Expertise Center of the Ministry of ecology, environmental protection and climate of the Republic of Uzbekistan and its branches on compliance of the subject of ecological expertise with ecological requirements, coordinates of location points, environment protection measures, requirements that must be fulfilled, etc. is an integral part of this conclusion of the state environmental expertise and it is mandatory to fulfill requirements specified therein.

Note: If the Client does not comply with the environmental requirements stipulated in the conclusion of the state environmental expertise, the conclusion of the state environmental expertise shall be canceled in accordance with the procedure established by the laws.

G. A. Mukhamedov
General Director

Attachment to the Conclusion of the state environmental expertise

Number of the special form:

The issued conclusion shall not be valid unless it appears in the register

State ecological expertise
Expert conclusion

Subject:	**Environmental impact assessment of increasing production capacity to 580 MW during construction of a wind power plant with appropriate infrastructure and a high-voltage power line (OHL) 50**
Client:	JURU ENERGY CONSULTING LLC
TIN	303454532
Category	**Category** 1, p.32 of Decree of the Cabinet of Ministers No. 541 dd. 07.09.2020.
Developer:	Juru energy CONSULTING LLC
Expert:	Tusheva Larisa Gennadyevna

To: ISMAILOV J.Sh., General Director of JURU ENERGY CONSULTING LLC

Copy: Department of Ecology, Environmental Protection and Climate Change of Bukhara Region

The materials of increasing production capacity up to 580 MW during construction of the wind power plant (WPP) with appropriate infrastructure and a 500/220 kV Overhead Transmission Line (OHTL) in Gijduvan district of Bukhara region were submitted for the state environmental expertise.

Previously, the draft Nat EIA (Stage 1) was developed for construction of the wind power plant in Gijduvan district of Bukhara region with a capacity of 500 MW and conclusion of the State Ecological Expertise No. 04-01/11-08-1612 dd. 24.09.2021 was obtained. The project provided for installation of 111 wind turbines with a total capacity of 500 MW. The design decisions have been changed to replace 32 lower productivity turbines with 8 higher productivity turbines, bringing the total capacity of the wind power plant to 580 MW. Thus, this project provides for installation of 87 wind turbines. Location of turbine installation within the allotted area will change; location of infrastructure and OHL's are not subject to change. The project site covers 285.1 ha.

The basis for the project development is Decree of the President No. PP-5003 dd. February 23, 2021 "On measures for implementation of the investment project "Construction of the 500 MW wind power plant in Gijduvan district of Bukhara region."

The project area is located in the northeastern part of Ayakagitma depression in Gijduvan district of Bukhara region. Most of the site is represented by the South Kyzylkum sandy plains with preserved low mountains (Tamdytau, Auminzatau, Kuldjuktau). The proposed site is crossed by: the railway connecting Navoi with Zarafshan; a dirt road running in parallel to the railway; gas pipeline crossing the Site's southern part, and overhead power lines.

The oil terminal with fuel storage tanks is 1.26 km to the south-east of the Site of the planned WPP construction; the operating substation is located 4.5 km to the southeast. There are two mining sites, one to the north-west at 0.9 km and one to the north-east at 1.4 km from the intended Site border.

The project site is seasonally used for livestock grazing. Five shepherd settlements were identified at the project site. Chulabad settlement is 9,550 m to the north-east, Kuklam settlement - 1.65 km to the south-east, and residential buildings of Agitma settlement - 5.4 km to the west of the WPP. According to the submitted letter of the Service for Sanitary and Epidemiological Welfare and Public Health of the Ministry of Health of the Republic of Uzbekistan No. 20-8 / 3066 dd. April 12, 2021, the area of the sanitary protection zone (SPZ) for the WPP with a capacity of 600 MW and above during electrical power production comprises 1000 m.

In line with requirements of "The Regulations on the procedure for holding public hearings of environmental impact assessment projects", Appendix 3 to Decree of the Cabinet of Ministers No. 541 dd. July 07, 2020, prior to the WPP construction, JURU ENERGY CONSULTING LLC held a public hearing with participation of stakeholders: residents of Agitma, Kuklam and Chulabad settlements, representative of Gijduvan district khokimiyat and other representatives, where primary directions, goals and potential environmental impacts of the WPP construction were explained to residents of nearby houses. The public hearing resulted in a decision on public support for the proposed activities on the project site (the Minutes and photos dd. April 15, 2021 were submitted). The project does not provide for demolition of residential buildings, and therefore, changes in the living conditions of the population are not expected.

Environmental features of the site area

The proposed project site is located in the Kyzylkum desert. Geomorphologically, the proposed area is confined to the third floodplain terrace of the Zeravshan River and is a slightly undulating plain.

Alluvial-proluvial deposits of the Zarafshan-Sukaita complex take part in the geological and lithological structure of the survey area. The deposits are represented by interlaid sandy loams, loams, sands and clays.

According to the results of topographic and geotechnical surveys conducted by UzAssystem JV (a branch of Assystem, the international design and engineering company), during drilling surveys (16 wells up to 50 m deep) at the WPP site, no groundwater was detected at a depth of up to 50 m.

To the east of the WPP construction site, there is a collector and drainage lake Ayakagitma. The water volume in the lake is 1.5 - 1.8 billion m 3 (water protection zone is 200-250 m), which is an important ornithological area. The lake is endorheic, its water is collected with waste water from the Agitma collector, atmospheric precipitation and groundwater supply. The total mineralization of water in summer is 9.1-10.0 g/l. Composition of water is dominated by chloride ions (up to 842 mg/l) and sulfate ions (up to 695 mg/l). Phytoplankton consists of diatoms, blue-green and green algae.

The designed for the wind turbine is in a northerly direction from Lake Ayakagitma at a distance of 2765 m; the designed nearest installation is to the east of the lake at a distance of 2265 m, i.e. outside the water protection zone. The Ministry of Water Resources provided a letter No. 01/17-2341 dd. 05.08.2021 stating that there is no water infrastructure within the area of the projected WPP.

The soils of the proposed area are desert-sandy. Vegetation is represented by herbaceous forms (salt grass).

As a result of spring and summer botanical research, two Red Book plant species were identified within the project area: Lehmann's tulip and Zakirov's zhuzgun; as well as species of reptiles (Central Asian tortoise, Desert Monitor, Sand Boa, Southern Even-Fingered Gecko) and mammals (Brandt's hedgehog and Goitered Gazelle), which are listed in the Red Book of the Republic of Uzbekistan and the Red List of the International Union for Conservation of Nature. In accordance with requirements of Article 17 of the Law of the Republic of Uzbekistan "On Protection and Use of the Flora" No. ZRU-409 dd. September 21, 2016, **actions (omission) that may lead to a reduction in the number or disturbance of the habitat of rare and endangered wild plant species are prohibited.** According to Art. 24, 27 of the Law of the Republic of Uzbekistan "**On protection and use of wildlife**" No. ZRU-408 dd. September 19, 2016, the main requirements for protection and use of wildlife and its habitat are: maintain species diversity and integrity of communities and populations of wild animals in a state of natural freedom; preservation of the habitat, breeding sites and migration routes of animals, etc. When locating, designing and building enterprises, highways, power lines and communications and other facilities, improving the existing and introducing new technological processes, measures to **preserve the habitat, breeding sites and migration routes of wild animals, as well as ensuring inviolability of sites of particular value as a habitat for wild animals must be envisaged and implemented,**

During monitoring of birds within the WPP site, the following species of birds were identified, included in the analysis of collision risk modeling (autumn-spring):

- *Tier 1 target species*: Steppe Eagle, Golden Eagle, Egyptian Vulture, Saker Falcon, Houbara Bustard;
- *Tier 2 target species*: Booted Eagle, Marsh Harrier, Hen Harrier, Common Sparrowhawk, Shikra, Common Buzzard, Long-Legged Buzzard, Griffon Vulture, Black Vulture, White Pelican, Common Crane, Common Kestrel, Lesser Kestrel;
- *Non-target species*: Ruddy shelduck, Gadwall, Mallard, Ccommon Teal, Mute Swan, Tufted Duck, Pygmy Cormorant, Black Cormorant and Black-crowned Night Heron.

Collision risk modeling (CRM) was carried out based on the survey results. Bird monitoring was carried out taking into account the timing of migration and breeding of target bird species in the region. The analysis shows that the collision rate of all *Tier 1 target species* will not exceed 1 in 61 years. For *Tier 2 target species*, the CRM analysis predicts one collision per three years for common cranes and one collision per 100 years or less for all other species in this group. In order to minimize the impact on flora, fauna and avifauna, sites of the lowest biodiversity importance will be selected for construction based on biodiversity survey results.

According to the submitted letter of the Bukhara Regional Department of Cultural Heritage of the Ministry of Culture of the Republic of Uzbekistan No. 286 dd. 09.04.2021, there are no objects of material cultural and archaeological heritage under state protection within a radius of 5 km from the projected WPP construction site.

Description of the proposed activity

The project plans to install 5.6 MW GW165 wind turbines totaling 87 units, each 120 m high, along with all auxiliary buildings and structures.

Additional and auxiliary infrastructure facilities are provided for at the WPP site: entrance to the facility and security building; administrative building, offices and premises; central control post; warehouse and workshops; reserve electricity source (diesel generator); safety system; lighting system; access roads between wind turbines.

GW165-5.6 Goldwind wind turbines (China) with a capacity of 5.6 MW are provided for installation at the Bash WPP with a maximum power of 580 MW. The main components of a wind turbine include: conical tubular sections of steel towers; fiberglass rotor blades, reinforced epoxy resin and carbon fibers - 3 units; a gondola containing a generator and gearbox; rotor is the central point at which three blades are connected to the gondola box; generator converts mechanical energy into electricity; gear box; converter; transformer.

Additional facilities include: 33/500 kV station substation, 500 kV overhead transmission line (HVTL).

The main types of works *at the WPP construction stage*: marking of the site boundaries, installation of a temporary fence to protect sensitive habitats and arrangement of a construction site for unloading materials and components; placement of temporary administrative and amenity structures; vegetation cleaning, removal of topsoil and arranging areas for storing the removed soil; construction of on-site turbines and switchgear access roads; ditching and laying power and communication cables; construction of foundations for turbines, including excavation; delivery to the site and erection of turbine towers, nacelles and blades; construction of the substation and control building, including distribution and metering equipment; site phased restoration. The construction site will be cleared from vegetation in preparation for installation of wind driven generators. Where possible, sites with no vegetation cover will be selected for construction of the facilities.

In order to preserve and restore soil fertility and rational use of land resources, before the start of construction work, it is planned to carry out a set of *technical and biological reclamation* measures, including removal of the upper humus and turf soil layer, storing it in a soil dump near the construction site and upon completion of construction works - laying it as a reclamation layer. At the sites for pit excavation for installation of OHL towers, the fertile layer is removed and taken out to the places determined by the land user and subsequently used to improve and restore the lands. Upon completion of construction, the excavated soil will be used in site grading and landscaping.

In order to reduce the negative impact during the WPP construction, it is planned: to install wind driven generators in the non-breeding season of birds, i.e., in the autumn-winter period; during installation of the wind driven generators, laying and construction and infrastructure, it is planned to clean the adjacent territories from construction and other debris; use construction site lighting devices that scare away animals; use modern machines and mechanisms with minimal noise, etc.

In order to prevent spills of fuel and lubricants on the soil during refueling of construction equipment, a concrete filling site with dimensions of 3m x 5m is planned for construction, with a concreted sump around the trays perimeter for storm water collection.

During operation, the wind power plants require limited operational activities, including: operation and maintenance of the wind power plant system; remote turbine shutdown in case of excessive wind speed; management of operations for native bird and bat species (in summer and winter) and migratory periods in spring and autumn. The equipment has electronic communication with the off-site control center that can completely shut down the system if wind speeds are excessively high (to avoid damage to equipment) or low (when production becomes uneconomical). The transformer is used to increase the output voltage of turbines to a level acceptable for the substation.

The fuel tank is installed on the same site, with all the measures taken to prevent fuel and lubricants from getting into the soil. During the construction period, 100 people will be employed at the site.

During the WPP operation, 20 persons are expected to be employed. For the duration of its operation, the WPP will operate year-round.

Environmental impact analysis of the proposed activity

Main sources of environmental impact during the construction period will include: earthworks, welding, painting, loading and unloading works; operation of engines of construction machines, mechanisms and motor vehicles, temporary storage of fuel for construction equipment refueling.

Emission of 8 pollutants from 2 fugitive emission sources *during the construction stage* will total 33.8366 tons. Carbon monoxide will make the largest contribution to air pollution (42.76%). Impact of pollutants on the atmospheric air during the construction stage will be temporary, with the maximum concentrations of pollutants in the surface layer of the atmosphere for all ingredients not exceeding the established quotas.

The main sources of environmental impact *during the WPP operation* will include: equipment - 100 oil-containing units totaling 276.565 tons in volume; diesel generator (backup (emergency) power supply for the substation).

Mineral oil hydrocarbons are released in a disorganized manner during operation of oil-filled equipment due to its leakiness. During the operation, as per the given materials, WPP total emission of oil vapors will be 0.0084 t/year.

Analysis of calculations of the maximum surface concentrations of hydrocarbons outside the site did not reveal an excess of the established norms (quotas); concentrations will not exceed 0.1 MPC.

During the construction stage, water will be used for production needs (watering the territory in order to reduce dusting), household needs (drinking). It is planned that water supply for production needs and household needs will be sourced from the nearest water conduit.

Water consumption during the WPP construction will total 9,212 m3/year, including 87.0 m3/year - for production needs and 9,125 m3/year - for household needs.

There are no production effluents. The discharge of 9,125 m3/year of household wastewater is planned to a temporarily installed storage tank (septic tank). Impact during the construction period is local and short-term.

During the facility operation, a total of 1630 m³ of water will be used annually for household needs (drinking water, shower rooms, cleaning of premises, dining room needs) and watering the area. During the WPP operation, the tankered water is used as a source of water supply.

The technological process of electricity generation at the WPP, the processes of energy conversion at the substation and its transmission through HVTL are not accompanied by water withdrawal for production needs. During the WPP operation, 1452.7 m3 of domestic wastewater will be discharged annually, and as planned to - a biological septic tank.

Polluted effluents will not be discharged into a water body and onto the land.

Construction of 87 units of the wind-driven generators will generate *hazard class IV and V waste*, such as concrete waste – 3,262.5 tons, reinforcement – 2,175 tons, building rubble waste – 2,175 tons, building sand waste – 6,525 tons, cement mortar waste – 4,350 tons, welding electrode cinders – 0.05 t, wooden elements from formwork – 0.2 t, paint waste – 0.025 t, plastic paint containers – 0.05 t, cleaning material (rags) – 0.1 t, construction waste – 0, 5 tons, brick bats – 0.2 tons, MSW – 50.0 tons. Storage places and disposal methods have been determined.

During the facility operation, 351,4716 tons of 12 types of waste will be generated annually, including:

- *Hazard class II:* dielectrical oil waste - 0.533 t/year, will be delivered for regeneration to specialized enterprises;

- *Hazard class III:* non-ferrous metal scrap - 0.2 t/year, will be delivered for processing to specialized processing enterprises;

- *Hazard class IV*: used blades of wind turbines - 274.48 tons/year, will be delivered for processing to interested organizations; spent LED lamps - 0.1054 tons/year are planned to transfer for processing to specialized enterprises; contaminated cleaning material (oil content less than 15%) - 0.05 t/year, silica gel waste - 0.0202 t/year, municipal solid waste (MSW) - 1.0 t/year, waste from territory cleaning - 73 t/year are subject to removal to the MSW landfill;

- *Hazard class V:* ferrous metal scrap - 0.5 t/year, welding electrode waste - 0.008 t/year to be delivered for processing to specialized processing enterprises; waste paper - 0.035 t/year to be delivered to collection points for recycling; food waste - 1.54 tons/year is planned to be removed for livestock feeding.

Impacts on soils and grounds as a result of waste storage outside the site are not predicted.

Two categories of noise are distinguished for the operation period of the wind-driven generators: mechanical noise (noise of gearboxes, multipliers) and aerodynamic noise from the blades. According to of the noise impact analysis for the WPP operation period, the noise level at night (from 23:00 to 07:00) will be 45 dB and 55 dB during the day (from 07:00 to 23:00). According to the state standard O'z DSt 1314:2017 “Renewable energy sources. Wind power. Wind-driven generators. General technical requirements”, the sound level generated by a single wind-driven generator at a distance of 50 m from the wind-driven generator at a height of 1.5 m from the ground level, must not exceed 60 dB. The analysis of the noise level results revealed no excess of the established norms in the residential area.

During operation of the wind-driven generators, the main vibration source is the moving parts of the wind-driven generators (rotor blades). According to the submitted materials, vibrations are felt at a distance of 60 m from the wind turbine. As the nearest residential buildings are 165 kilometers away, vibrations in the residential area are not observed.

The National EIA (Stage 1) provides the analysis of emergencies *during the construction period*, which may occur as a result of a spill of fuel and lubricants from faulty equipment.

In order to prevent a spill of fuel and lubricants on unprotected soils, it is planned to place and refuel equipment on a waterproofed site with a concrete sump along the site perimeter.

The National EIA (Stage 1) provides the analysis of the most probable emergencies *during the WPP operation*, related to the collapse of the tower of the wind-driven generator as a result of improper installation of the tower fastening system and due to icing, and the ways to prevent them, including: ensuring a safe distance between the turbines and residential buildings (at least 300 m); undertake periodic inspections of blades and towers to identify defects that may affect blade and towers integrity; timely repair and troubleshooting, etc.

The analysis also reviews emergencies due to occurrence of a fire at transformer. As a result of the fire, concentrations of pollutants at the site boundary will exceed the established norms (quotas). To prevent a fire, the project provides for fire-fighting measures: a fire-fighting plan is being developed to use fire-fighting agents: air-mechanical and compression foam, atomized and finely atomized water, powder and gas compositions.

According to the presented materials, accidental risks at the WPP after implementation of the project have been minimized through employment of modern design solutions and provision of automated control and monitoring system for electricity generation process.

The draft EIS proposes a set of measures aimed at preventing environmental pollution during the construction phase, which includes: technical reclamation of the disturbed soils; exclusion of machines movement beyond the access roads; elimination of spills of oil products, etc.

The National EIA (Stage 1) provides the environment monitoring plan *for the construction stage* to control preparation works (mobilization of equipment), construction works (earthworks, welding, painting), etc.

At the WPP operation stage, it is envisaged to: exclude pollution of soils and groundwater through exclusion of wastewater land disposal; install the improved automation system for production process monitoring, install fire alarms; organize a concrete platform for placing waste containers and their timely removal to the nearest landfill in order to exclude contamination of soil and vegetation cover.

Conclusions

The main types of environmental impact during construction of the wind power plant with a capacity of up to 580 MW with the appropriate infrastructure and a 500/220 kV overhead power transmission line (OHTL) in Gijduvan district of Bukhara region include: withdrawal of natural resources (land, water); pollution of the air basin with emissions of gaseous and suspended substances; change in the area relief; pollution of the land allotment by generated waste and wastewater.

The analysis of the works impact nature showed that the scale of significant disturbance of the relief and subsoil is due to the size of the construction and installation works area, including clearing the construction site, leveling the relief, construction of access roads, etc.

In accordance with requirements of p.23 a), Ch. 3 of "The Regulation on the State Environmental Expertise", Appendix 2 to Decree of the Cabinet of Ministers No. 541 dd.07.09.2020, **to develop a Statement of Environmental Effects (the final stage of the environmental impact assessment procedure), in which Juru Energy Consulting LLC should:**

- develop Maximum Permissible concentrations (MPC) standards for all types of impact (air emissions, solid waste, water discharges) and environment protection measures to reduce environmental impact to the standard level; clarify calculations of pollutant emissions into the air, based on the properties of the equipment actually installed at the facility;

- in order to minimize the impact on flora, fauna and avifauna during the WPP construction, to select the sites with the least impact on biodiversity;

- in order to comply with the terms of the Concept for Environmental Protection of the Republic of Uzbekistan until 2030, approved by Decree of the President of the Republic of Uzbekistan No. UP-5863 dd. October 30, 2019, **identify priority sources of air pollution and provide for equipping them with automatic systems for monitoring emissions of pollutants into the atmosphere air;**

- when placing the WPP at the proposed area, ensure compliance with the water conservation district of Lake Ayakagitma, in accordance with requirements of p. 18, Ch. 3 of "The Regulation on the procedure for establishing water conservation districts and zones of sanitary protection of water bodies of the Republic of Uzbekistan", approved by Decree of the Cabinet of Ministers No. 981 dd. 11.12.2019;

- ensure that household wastewater is discharged through a system that excludes possibility of pollutants getting in the soil, ground and finally - groundwater;

- ensure control over technical condition of equipment during construction works on the site; equipment used at the construction site must be in good operating order to prevent leakage of fuels and lubricants;

- in order to preserve natural environment and improve the ecological situation and reduce the impact **of exhaust gases of construction equipment and mechanisms** on the atmospheric air, provide for necessary environmental measures, including arrangement of a concreted area for vehicle parking and maintenance;

- in order to further improve the system for managing activities in the field of handling household and construction waste in accordance with Appendix 1, Chapter 2, Clause 4 of Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 40 dd. January 28, 2021 “On measures to further improve the procedure of works related to construction waste”, **all types of construction waste must be delivered to waste collectors for rational reuse, disposal and recycling or transferred (given away) to other legal entities and individual entrepreneurs engaged in waste collection, transportation, disposal and (or) recycling;**

- in order to maintain cleanliness of the soil and surrounding surface, arrange a concrete platform for placing waste collection containers and their timely removal to the nearest landfill; conclude an agreement with a local specialized enterprise for keeping solid waste at an authorized landfill;

- ensure technical and biological reclamation of disturbed lands during the WPP construction.

The State Ecological Expertise of the project showed that the submitted materials sufficiently **comply** with requirements of environmental legislation to the first stage of environmental impact assessment.

The Ministry of Natural Resources of the Republic of Uzbekistan **approves** the National EIA (Stage 1) for increasing production capacity up to 580 MW during construction of the wind power plant with appropriate infrastructure and a 500/220 kV overhead power transmission line (HVTL) in Gijduvan district of Bukhara region **subject to implementation of environment protection measures provided for by the National EIA (Stage 1) and stated in the conclusion.**

According to p. 26, Ch.3, p. 47, Ch. 6, and p. 57, Ch. 7 of “The Regulation of the State Environmental Expertise”, approved by Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 541 dd. September 7, 2020, **the Client is responsible for accuracy and truthfulness of documents and information submitted for the state environmental expertise**; conclusion of the state environmental expertise on admissibility of the project implementation is valid for three years, in case of a failure to carry out the projected works during this period, or changes are made to the design decisions, a new draft EIS should be developed and submitted to the state environmental expertise in accordance with the procedure established by the laws**; the effect of the conclusion of the state ecological expertise is terminated in the following cases: the Client’s non-compliance with requirements specified in the conclusion of the state ecological expertise, and in other cases in the manner prescribed by the laws.**

The conclusion of the state environmental expertise on admissibility of the project implementation does not replace or cancel the need to obtain the relevant permits in the manner prescribed by the laws.

The Department of Bukhara region of Ministry of Ecology, Environmental protection and climate change of Republic of Uzbekistan (MEEOCC) to take control of:

- compliance by Juru Energy Consulting LLC with requirements of the environmental legislation to increase production capacity up to 580 MW during construction of the wind power plant with appropriate infrastructure and a 500/220 kV overhead power transmission line (OHTL) in Gijduvan district, provided for by the project in the territory defined with the geographical coordinates:

1. 40°32'15.53"N, 64°37'45.67"E; 2. 40°32'22.19"N, 64°43'22.66"E;

3. 40°34'18.69"N, 64°43'32.58"E; 4. 40°34'44.28"N, 64°44'26.45"E;

5. 40°35'53.37"N, 64°43'40.12"E; 6. 40°37'33.32"N, 64°43'48.19"E;

7. 40°37'28.45"N, 64°44'3.68"E; 8. 40°38'0.19"N, 64°45'10.83"E;

9. 40°38'43.21"N, 64°45'16.34"E; 10.40°40'4.97"N, 64°46'34.54"E;

11.40°42'15.55"N, 64°46'30.85"E; 12.40°42'20.28"N, 64°34'7.93"E;

13.40°41'46.09"N, 64°33'18.64"E; 14.40°40'19.16"N, 64°33'7.35"E;

15.40°40'2.73"N, 64°35'54.58"E; 16.40°37'56.85"N, 64°37'32.86"E;

- implementation of environmental monitoring of the environment state in the area of WPP construction;

- carrying out technical and biological reclamation of disturbed lands;

- timely removal of waste with verification of documentation confirming methods of their disposal provided for by the project; conclusion of an agreement with a specialized company for SMW timely removal and keeping the waste at an authorized landfill.

At the stage of development of the Statement of Environmental Consequences (Nat EIA, Stage 3), to conduct a survey of the WPP construction site and adjacent territories for implementation of design solutions and environment protection measures provided for in the Nat EIA; submit results of the survey in the form of an certificate certified by a representative of the Department of Ecology, Environmental Protection and Climate Change of Bukhara region and the head of the enterprise.

The facility must not be permitted for commissioning without a positive conclusion on the Statement of Environmental Effects.

G. Mukhamedov

General Director

Responsiple person Tusheva L.

Tel.: +998 71 203-00-22 (ext. 1006)

Expert of the State Ecological Expertise: Tusheva Larisa Gennadyevna

Tel: +998 71 203 00 22 (1022)

APPENDIX B – DRAFT LAND LEASE AGREEMENT (LLA)

Dated _____ 2023

Land Lease Agreement

relating to the
Green Hydrogen Project

between

[The Ministry of Energy of the Republic of Uzbekistan]
as Lessor

and

FE "ACWA Power UKS Green H2" LLC
as Lessee

Table of Contents

Page

1. Definitions and Interpretation....3
2. Term....8
3. Lease of the Project Site....8
4. Rent....9
5. Fixtures and Fittings....10
6. Utilities....10
7. Use....10
8. Breach and Termination....11
9. Decommissioning....14
10. The Lessee's Covenants....16
11. Covenants by the Lessor....18
12. Representations and Warranties....18
13. Confidentiality....19
14. Assignment and Transfer....21
15. Governing Law....21
16. Dispute Resolution....21
17. Waiver of Sovereign Immunity....24
18. Continuing Obligations....24
19. Notices....24
20. Miscellaneous....26

Schedule 1....29

Schedule 2....35

Schedule 3....36

Schedule 4....37

This **LAND LEASE AGREEMENT** (the "**Agreement**") is made on _____ 2023 by and between:

(1) **[THE MINISTRY OF ENERGY OF THE REPUBLIC OF UZBEKISTAN**, with its registered office at 21 Istikbol Str., Tashkent, 100047, the Republic of Uzbekistan] (the "**Lessor**"); and

(2) **FE "ACWA POWER UKS GREEN H2" LLC**, a limited liability company duly organised and existing under the laws of the Republic of Uzbekistan, with its registered office at Temur Street 88A, Yunusobod District, Tashkent City, the Republic of Uzbekistan and with registration number 2050941 (the "**Lessee**"),

together, the "**Parties**".

Whereas:

(A) the Lessee wishes to develop the Project Site (as defined below) at its own cost for the purposes of developing a wind power generation plant in the Gijduvon district, Bukhara region, Republic of Uzbekistan with a capacity of up to one hundred (100) MW (the "**Plant**") for the purposes of, among other things, supplying renewable energy to power a green hydrogen production facility with an approximately twenty (20) MW electrolyser, producing up to 3000 tons of green hydrogen per year, to be co-located with the existing ammonia plant owned and operated by JSC "Maxam-Chirchiq" in the Republic of Uzbekistan;

(B) on [●], the Lessee has entered into a power purchase agreement with JSC National Electric Grid of Uzbekistan (the "**Purchaser**") (as amended from time to time) (the "**Power Purchase Agreement**"), in relation to the implementation of the Project (as defined in the Power Purchase Agreement) and the sale of electricity dispatched from the Plant, and the Lessor has received a copy thereof;

(C) on [●], the Government of the Republic of Uzbekistan (the "**Government**"), represented by the Ministry of Investments, Industry and Trade of the Republic of Uzbekistan, ACWA Power Company (Saudi Listed Joint Stock Company) and the Lessee entered into an investment agreement under which the Government agrees to provide certain assistance and support to the Lessee in order to promote the implementation of the Project (the "**Investment Agreement**");

(D) by Presidential Resolution No. [●] dated [●] (the "**Presidential Resolution**"), the President of the Republic of Uzbekistan has authorized the lease by the Lessor to the Lessee of the Site (as defined below), the EF Site (as defined below) and the Project Laydown Area (as defined below) for the purposes of the Project;

(E) the title for the Site, the EF Site and the Project Laydown Area have been registered in the name of the Lessor pursuant to [●] issued by [●] No. [●] dated [●]; and

(F) the Lessor intends, upon the terms and conditions contained herein, to lease out the Site, the EF Site and the Project Laydown Area for the purpose of implementing the Project and the Lessee wishes to undertake the Project in accordance with the Power Purchase Agreement, the Electricity Supply Agreement (as defined in the Investment Agreement), the Hydrogen Purchase Agreement (as defined in the Investment Agreement), the Investment Agreement and this Agreement.

The Parties agree that:

1. Definitions and Interpretation

1.1 Definitions

In this Agreement, unless otherwise defined herein, capitalised terms shall have the meaning

given thereto in the Power Purchase Agreement.

In addition:

"**Abandonment**" has the meaning assigned to it in the Power Purchase Agreement.

"**Agreement**" means this land lease agreement with Recitals and Schedules.

"**Confidential Information**" has the meaning given to it in Clause 13(d) (*Confidentiality*).

"**Decommissioning**" means the decommissioning of the assets comprising the Plant and restoration of the Project Site to its initial condition (to the extent reasonably possible) as at the execution date of the Power Purchase Agreement (as captured and stored via inventory records, visual pictures, videos and other means), which (unless otherwise agreed by the Lessor) shall include the removal of all plant and equipment and all other above and below ground objects (including the removal of foundations in accordance with the applicable Laws of Uzbekistan), the re-landscaping of the Project Site and reclamation activities to restore vegetative cover, hydrologic function and control of erosion, as well as to minimise habitat loss and land alteration, and any other actions as may be required by the applicable Laws of Uzbekistan, and "**Decommission**" shall be construed accordingly.

"**Decommissioning Completion Date**" means, in relation to the Plant, the date falling within [●] months of the earliest to occur of:

(a) the PPA Expiry Date;

(b) the PPA Early Termination Date; and

(c) the Total Loss Date.

"**Decommissioning Program**" means a work program for the Decommissioning, developed and, if applicable, updated by the Lessee (at its own cost and expense), which complies with the requirements set out at Clause 9.1 (*Decommissioning Program*) and which has been approved by the Independent Engineer and, to the extent required by applicable Law of Uzbekistan, the relevant Government Authorities.

"**Decommissioning Security**" means an unconditional and irrevocable on-demand letter of credit procured by the Lessee in accordance with Clause 9.3 (*Decommissioning Security*) and issued:

(a) in favour of the Lessor, in form and substance satisfactory to the Lessor (acting reasonably), by an issuing bank acceptable to the Lessor; and

(b) for an amount equal to the Decommissioning Security Amount.

"**Decommissioning Security Amount**" means an amount in USD equal to [100] % of the aggregate amount of costs and expenses determined in accordance with the Decommissioning Program to complete the Decommissioning (such amount to be adjusted in accordance with Clause **Error! Reference source not found.** (*Decommissioning Program*) and from time to time to reflect inflation in the Republic of Uzbekistan).

"**Delivery and Acceptance Act**" means a conveyance deed substantially in the form attached hereto as Schedule 4 (*Delivery and Acceptance Act*).

"**Direct Agreement**" means a direct agreement to be entered into between the Lessor, the Lessee and the Financing Parties in relation to this Agreement, substantially in the form set out in Schedule 3 (*Form of Direct Agreement*).

"**Dispute**" has the meaning given to it in Clause 16 (*Dispute Resolution*).

"**EF Site**" means the land plot described as the "EF Site" in Schedule 1 *(Project Site Description)*, on which the NEGU Electrical Facilities (as defined in the Power Purchase Agreement) to be built by the Lessee and transferred to the Purchaser in accordance with the terms of the Power Purchase Agreement.

"**EF Site Term**" has the meaning given to it in Clause 2.2 (*Term*).

"**Encumbrance**" means any covenant, condition, restriction, obligation, lease, tenancy, licence or other right of occupation or possession, mortgage, lien, pledge, charge, assignment by way of security or any other security arrangement or agreement.

"**Environmental and Social Impact Assessment**" or "**ESIA**" means an environmental and social impact assessment required to be conducted by the Lessee in accordance with the terms of the Power Purchase Agreement.

"**Event of Loss**" has the meaning given to it in the Power Purchase Agreement.

"**Expiry Date**" means the date falling on the 25th anniversary of the Commercial Operation Date, which date shall be automatically extended for the period not less than the Term under the Power Purchase Agreement (if longer); and provided that such period shall also be extended for the applicable period required for the transfer of the Plant to the Purchaser or the Decommissioning of the Plant, as applicable, upon the expiry or early termination of the Power Purchase Agreement, or as may otherwise be required in accordance with the terms of this Agreement.

"**Financing Documents**" has the meaning given to it in the Power Purchase Agreement.

"**Financing Party(ies)**" has the meaning given to it in the Power Purchase Agreement.

"**Government Authority**" has the meaning given to it in the Power Purchase Agreement.

"**Gross Negligence**" means a negligent act or omission done with reckless disregard, whether consciously or not, for the foreseeable harmful consequences of the act or omission.

"**Independent Expert**" has the meaning given to it in Clause 16.2(b) (*Expert Determination*).

"**Insolvency Event**" means the occurrence of any of the following events:

(a) the passing of a resolution for the bankruptcy, insolvency, winding up, liquidation or other similar proceeding relating to the Lessee;

(b) the voluntary filing by the Lessee of a petition of bankruptcy, moratorium on debt payments, or other similar relief;

(c) the appointment of a liquidator, custodian or similar person in respect of the Lessee in a proceeding referred to in paragraph (a) above, which appointment has not been stayed or set aside within ninety (90) days of such appointment; or

(d) the making by a Government Authority of an order for the winding up or otherwise confirming the bankruptcy or insolvency of the Lessee, which order has not been set aside or stayed within ninety (90) days of such making.

"**Investment Agreement**" has the meaning given to it in Recital (C).

"**Lessor Parties**" means any of the Republic of Uzbekistan's present, former or future constituent subdivisions or agencies, any of the Republic of Uzbekistan's public officials, any legal entities (whether wholly or partially owned by the Republic of Uzbekistan), any of their respective employees, directors, officers, consultants, agents, trustees, representatives.

"**Material Land Dispute**" has the meaning given to it in Clause 16.1(c)(i) (*Amicable*

Resolution and Litigation).

"**NEGU Electrical Facilities**" has the meaning given to it in the Power Purchase Agreement.

"**Permitted Use**" means all activities required for the implementation of the Project, including activities required for Decommissioning.

"**Plant**" has the meaning given to it in Recital (A).

"**PLA Term**" has the meaning given to it in Clause 2 (*Term*).

"**Power Purchase Agreement**" has the meaning given to it in Recital (B).

"**PPA Early Termination Date**" means, upon the Closing Date having been achieved under the Power Purchase Agreement, the date of the early termination of the Power Purchase Agreement in relation to the Plant in accordance with the terms thereof, where the Purchaser is not obligated to purchase the Plant upon such early termination pursuant to the terms of the Power Purchase Agreement.

"**PPA Expiry Date**" means the date of expiry of the Power Purchase Agreement at the end of its term as provided for in clause 2.2 (*Term of Agreement*) of the Power Purchase Agreement, unless otherwise extended in accordance the terms of the Power Purchase Agreement.

"**Project**" has the meaning given to it in the Power Purchase Agreement.

"**Project Commercial Operation Date**" has the meaning given to it in the Power Purchase Agreement.

"**Project Laydown Area**" means the area described as the "Project Construction Laydown Area" as shown in Schedule 1 (*Project Site Description*) which is vacant on the Signature Date and which shall be for purposes of temporary storage of plant, equipment and materials during construction of the Plant.

"**Project Site**" means the plots of land, comprising the Site, the EF Site and the Project Laydown Area collectively, the boundaries of which are shown in the plan set out in Schedule 1 (*Project Site Description*).

"**Recipient**" has the meaning given to it in Clause 13(b)(i) (*Confidentiality*).

"**Registration Date**" means the date of the state registration of this Agreement with the relevant cadastral authority (or other Government Authority performing the state registration of real estate) in accordance with Clause 2.4 (*Term*).

"**Relevant Documents**" means any documents entered or to be entered into in relation to the implementation and operation of the Project.

"**Rent**" means payments in consideration for the lease of the Project Site to the Lessee by the Lessor payable in the amounts set out in Schedule 2 (*Rent*) and otherwise in accordance with this Agreement.

"**Representative**" means an employee, officer, adviser or consultant.

"**Security Agent**" means the entity appointed to act as security trustee or agent or in any similar capacity for and on behalf of the Financing Parties.

"**Signature Date**" means the date on which this Agreement is executed by the Parties.

"**Site**" means the land plot described as the "Site" in Schedule 1 *(Project Site Description)*, on which the Plant will be built, owned, operated, and (at the Government's request) transferred or decommissioned by the Lessee.

"**Term**" has the meaning given to it in Clause 2.1 (*Term*).

"**Total Loss Date**" means the date of the Event of Loss, which has been confirmed by the Independent Engineer un accordance of the terms of the Power Purchase Agreement.

"**Uzbek Soum**" means the lawful currency of the Republic of Uzbekistan.

"**Value Added Tax**" means the value added tax levied under the Laws of Uzbekistan.

"**Willful Misconduct**" means a deliberate act or omission of a Party in circumstances where it knew that the other Party (or its personnel or contractors) would, or would be reasonably likely to, suffer loss or damage as a consequence.

1.2 Interpretation

The following rules of construction and interpretation apply to this Agreement:

(a) a "person" includes any individual, company, corporation, firm, partnership, joint venture, association (whether a body corporate or an unincorporated association of persons) or any government institution, department or establishment and a person shall be construed as including a reference to its successors, permitted assigns and permitted transferees in accordance with their respective interests;

(b) an "employee" of any person includes any other person or agent who is engaged or has (within the period prescribed by applicable law for holding such person's employer, client or principal, as the case may be, responsible for his acts) been engaged directly or indirectly by such person as an employee, consultant, contractor or in any other capacity whatsoever;

(c) words importing the singular number include the plural and vice versa, and words importing a gender include the other gender;

(d) the descriptive headings in this Agreement, including the cover page and table of contents, are for convenience of reference only and not for purposes of construction or interpretation of its provisions;

(e) unless specifically provided otherwise, the words "herein" and "hereunder", and words of similar import, refer to the entirety of this Agreement and not only to the clause in which such use occurs;

(f) a reference to a "Clause" or "Schedule" is a reference to a clause or schedule of this Agreement;

(g) this Agreement is to be read and construed as a whole; anything mentioned in any of the documents comprising this Agreement shall be of like effect as if stated or mentioned in all of them. In the event of a conflict between the clauses and the schedules, the Parties shall endeavour, in the first instance, to resolve the conflict by reading this Agreement as a whole and the provision that is more specific to the subject matter shall govern. If, notwithstanding the Parties' good faith efforts to resolve the conflict as provided in the preceding sentence, the conflict continues to persist, the provision in the clauses shall govern;

(h) where an obligation of a Party to make payment under this Agreement, as a result of the calculation of time, falls on a day other than a Business Day, such time for performance shall be extended to the next Business Day;

(i) "including" or "includes" shall be deemed to be qualified by a reference to "without limitation";

(j) references to a provision of law are references to that provision as amended, extended or re-enacted and include all laws and official requirements made under or deriving validity from it or enacting such modification;

(k) reference to "this Agreement" or any other agreement or document shall be construed as a reference to such agreement or document as amended, modified or supplemented and in effect from time to time and shall include a reference to any document which amends, modifies or supplements it, or is entered into, made or given pursuant to or in accordance with its terms;

(l) a reference to time shall be a refine to local time in Uzbekistan (UTC+4); and

(m) a reference to any Party includes its successors in title, permitted assignees, and transferees.

2. Term

2.1 This Agreement shall come into full force and effect as of the Registration Date, and, unless earlier terminated in accordance with its terms, shall remain in full force and effect until the Expiry Date (the "**Term**"), except with respect to the EF Site and the Project Laydown Area.

2.2 With respect to the EF Site, this Agreement shall come into full force and effect from the Registration Date, and, unless earlier terminated in accordance with its terms, shall remain in full force and effect until the NEGU Electrical Facilities are transferred to the Purchaser in accordance with the Power Purchase Agreement (the "**EF Site Term**").

2.3 With respect to the Project Laydown Area, this Agreement shall come into full force and effect from the Registration Date and, unless earlier terminated in accordance with its terms, shall remain in full force and effect until the date falling ninety (90) days after the Project Commercial Operation Date (the "**PLA Term**").

2.4 The Lessee shall register this Agreement with the relevant cadastral authority, the National Geographic Informational System of the Republic of Uzbekistan or as otherwise may be required under the Laws of Uzbekistan, including making the appropriate applications with the relevant local cadastral department and the Lessor shall provide all assistance as may reasonably be required by the Lessee. Notwithstanding anything to the contrary in this Agreement, pursuant to Article 357 of the Civil Code of the Republic of Uzbekistan, the terms and conditions of this Agreement, including the obligations under Clause 4 (*Rent*), shall apply to the Parties' relations commencing on the Signature Date inclusive.

2.5 Subject to the Lessee's compliance with the terms of the Investment Agreement, the Power Purchase Agreement and this Agreement, the Lessor undertakes to provide reasonable assistance to the Lessee for compliance with procedural requirements necessary for the extension of the Term in accordance with the terms of this Agreement and the Laws of Uzbekistan.

3. Lease of the Project Site

3.1 Subject to the terms and conditions of this Agreement and in consideration of the Rent and the Lessee's covenants herein contained, on the Signature Date, the Lessor hereby covenants to execute and deliver to the Lessee a Delivery and Acceptance Act, pursuant to which the Lessor:

(a) leases, until the end of the PLA Term, the Project Laydown Area to the Lessee;

(b) leases, until the end of EF Site Term, the EF Site to the Lessee; and

(c) leases, until the end of the Term, the Site to the Lessee;

except, in each case, all minerals, oils and precious stones whatsoever upon or under the said land which shall be reserved for the exclusive use of the Lessor.

3.2 The Lessor agrees to grant to the Lessee a full, free, uninterrupted and unrestricted right of way for the purposes of access to and egress from the Project Site of its personnel, representatives or contractors with or without vehicles, machinery and implements of any kind in connection with the execution of the Project and the provision of utilities and other services to the Project Site.

3.3 The Lessee shall have full possession of the Project Site from the Signature Date for any construction activities.

3.4 The Lessor shall deliver possession of the Project Site to the Lessee from the Signature Date, free and clear of all Encumbrances, with such delivery being evidenced by a Delivery and Acceptance Act which shall include clear establishment of the borders on the territory, maps, drawing up plans and other documentation and formalities as per applicable Laws.

4. Rent

4.1 In consideration for the lease of the Project Site to the Lessee by the Lessor, the Lessee shall pay the Rent to the Lessor or, if directed by the Lessor and such payment is in accordance with the Laws of Uzbekistan, to any other Government Authority, in the amount and on such dates as set out in Schedule 2 (*Rent*). The payment by the Lessee of the Rent to a Government Authority as directed by the Lessor shall fully and completely discharge the Lessee with respect to such payment under this Agreement. Following the tenth (10^{th}) anniversary of the Project Commercial Operation Date the Rent payable may be subject to change during the Term, as applicable, in accordance with Schedule 2 (*Rent*) and the Laws of Uzbekistan.

4.2 The Lessee acknowledges that late payment of the Rent shall lead to the imposition of penalties in accordance with the Laws of Uzbekistan.

4.3 In addition to Rent payable by the Lessee pursuant to this Agreement, the Lessee is responsible for and shall be obliged to pay to the Lessor or, if directed by the Lessor and such payment is in accordance with the Laws of Uzbekistan, to any other Government Authority, any charges and fees (including any cadastral charges) that relate to the Project Site in accordance with the Laws of Uzbekistan (including any fees which the Lessor is required to pay in accordance with Laws of Uzbekistan).

4.4 The Rent shall be inclusive of land tax (if applicable).

If the Lessee becomes obliged to pay land tax in relation to the Project Site to any Government Authority (in addition to the Rent payable by the Lessee pursuant to this Agreement), the Rent shall be reduced by the amount of such land tax. If any Government Authority claims payment of any land tax in respect of the Project Site from the Lessee in respect of any period for which the Lessee has made payment of Rent pursuant to this Agreement, the Lessee shall be entitled to deduct such amount of land tax from any future Rent becoming due pursuant to this Agreement.

4.5 In the event this Agreement is terminated:

(a) in accordance with Clause 8.2(a) (*Termination*) the Lessor shall be entitled not to refund the amount of any unutilised Rent paid by the Lessee under this Agreement; and

(b) in accordance with Clause 8.2(b) (*Termination*) the Lessor shall, within sixty (60) days of the date of such termination, refund, without interest, the amount of any unutilised Rent paid by the Lessee under this Agreement unless there is any overdue Rent payable by the Lessee or otherwise for which the Lessor shall be entitled to make necessary

deductions or withhold the entire amount therefrom in addition to other remedies, if any, under this Agreement or pursuant to the Laws of Uzbekistan.

5. Fixtures and Fittings

5.1 From the Signature Date, the Lessee may, at its own cost, erect or install fixtures and fittings or make other improvements on the Project Site (including but not limited to backfilling and levelling of the site to make it suitable for construction of the Plant), as the Lessee may, in its discretion, consider fit and necessary in connection with the implementation of the Project.

5.2 All developments, regardless of the extent of such developments (including any movable and immovable assets installed or erected on the Site and/or the EF Site shall be, and shall remain, the property of the Lessee until the end of the Term and/or the EF Site Term accordingly, as such Term and/or the EF Site Term may be extended in accordance with this Agreement, as applicable (except as may otherwise be set out in the Power Purchase Agreement). All developments, regardless of the extent of such developments, on the Project Laydown Area shall be, and shall remain, the property of the Lessee (fixed and removable assets) until the end of the PLA Term.

6. Utilities

6.1 The Lessee shall, at its own cost, procure the supply of water and electrical power to the Project Site for the purposes of the implementation of the Project. The Lessee acknowledges and agrees that the Lessor shall have no obligation under this Agreement or otherwise to supply water and electrical power to the Project Site.

6.2 The Lessee shall install (or procure installation of) all requisite and adequate sewage and drainage systems for the Project.

6.3 Subject to the compliance by the Lessee with all of the requirements relating to the usage and maintenance of the utility systems, the Lessor shall, upon request from the Lessee and at the Lessee's own cost, assist the Lessee to obtain access to existing utility systems and provide reasonable assistance to enable the Lessee to lay down water and electrical power supply to, and to install adequate sewage and drainage systems on, the Project Site.

7. Use

7.1 The Lessee (including its personnel, representatives or contractors) shall use the Project Site for the Permitted Use only, save for with the prior written consent of the Lessor, and such consent shall not be unreasonably withheld.

7.2 Subject to the Lessee paying the Rent and other charges and fees set out in Clause 4.3 (*Rent*) and complying with the terms and conditions of, and performing its obligations under this Agreement, the Lessee shall have undisturbed use and quiet enjoyment and peacefully hold exclusive possession, of the Project Site, including:

(a) the Site for the Term;

(b) the EF Site for the EF Site Term; and

(c) the Project Laydown Area for the PLA Term,

without interference or any interruption from the Lessor or any person claiming under or in trust for the Lessor.

7A. Alterations and Additions

(a) The Lessee shall, without the prior written consent of the Lessor but subject to the terms of the Power Purchase Agreement and the Investment Agreement, for the Term have the right to undertake any renewals, alterations, and additions that the Lessee may think fit to the Plant (as appropriate).

(b) Any alterations or additions that the Lessee may make to the Project Site from time to time may have to be removed by it, at its cost, subject to and in accordance with Clause 9 (*Decommissioning*).

8. Breach and Termination

8.1 Breach

(a) The Lessee shall have breached this Agreement if:

(i) the Lessee fails to pay any Rent when due and does not make the overdue payment within one (1) month of the date on which the Rent is due;

(ii) an Abandonment occurs;

(iii) subject to any bona fide Dispute pursuant to Clause 16 (*Dispute Resolution*), the Lessee fails to perform or comply in any material respect with any of the other covenants or conditions of this Agreement applicable thereto and said failure continues for a period of thirty (30) days after receipt of written notice thereof from the Lessor; *provided*, *however*, that if the Lessee has commenced to cure, and diligently continues to cure, such failure that cannot reasonably be cured within the said thirty (30) day period, and so long as the Lessee continues to pay the Rent, the Lessee shall not be deemed in breach of this Agreement;

(iv) an Insolvency Event has occurred with respect to the Lessee; or

(v) an event that gives the Lessor the right under the Laws of Uzbekistan to terminate this Agreement has occurred.

(b) The Lessor shall have breached this Agreement if, subject to any bona fide Dispute pursuant to Clause 16 (*Dispute Resolution*), the Lessor fails to perform or comply in any material respect with any of the covenants or conditions of this Agreement applicable thereto and said failure continues for a period of ninety (90) days after receipt of written notice thereof from the Lessee; *provided*, however, that if the Lessor has commenced to cure, and diligently continues to cure, such failure that cannot reasonably be cured within the said ninety (90) day period, the Lessor will not be deemed in breach of this Agreement.

8.2 Termination

(a) In the event of:

(i) the Lessee's breach under Clause 8.1(a) (*Breach*); or

(ii) the termination of the Power Purchase Agreement by the Purchaser in accordance with clause 19.4 *(Termination upon Project Company or NEGU Event of Default)* of the Power Purchase Agreement other than if the Purchaser has terminated the Power Purchase Agreement for Project Company Event of Default but has not exercised its right to require transfer of the Project pursuant to the terms of the Power Purchase Agreement; or

(iii) the termination of the Power Purchase Agreement by the Purchaser in accordance with clause 19.3 *(Termination for Non-Fulfilment of Conditions Precedent to Closing Date)* of the Power Purchase Agreement,

the Lessor shall have the right to terminate this Agreement by giving to the Lessee prior written notice of termination which shall occur:

(i) in the event of termination pursuant to Clause 8.2(a)(iii) (*Termination*), no earlier than two (2) months after the date of such termination notice; or

(ii) in the event of termination pursuant to Clause 8.2(a)(i) or Clause 8.2(a)(ii) (*Termination*), on the date of termination of the Power Purchase Agreement, *provided that*, where the Lessee is required:

(A) to transfer the Project pursuant to the terms of the Power Purchase Agreement, the date of termination shall be on the date of transfer of the Project; and

(B) to decommission the Plant pursuant to the terms of the Power Purchase Agreement and this Agreement, the date of termination shall be on the date that is the earlier of (x) the date on which decommissioning of the Plant has been completed in accordance with clause 19.14 of the Power Purchase Agreement and this Agreement and (y) one (1) year from the date of termination of the Power Purchase Agreement.

Should the Lessee fail to dispute the termination of this Agreement prior to the expiration of the time fixed in the notice, such failure shall constitute the acceptance of and agreement with the termination of this Agreement by the Lessee and upon expiration of the time fixed in the notice, this Agreement and the rights, title and interest of the Lessee under this Agreement shall automatically terminate in the same manner and with the same force and effect as if the date fixed in the notice of termination were the date of the end of the Term.

(b) In the event of the Lessor's breach under Clause 8.1(b) (*Breach*), the Lessee shall have the right to terminate this Agreement by giving to the Lessor three (3) months' prior written notice of termination. Should the Lessor fail to dispute the termination of this Agreement prior to the expiration of the time fixed in the notice, such failure shall constitute the acceptance of and agreement with the termination of this Agreement by the Lessor and, upon expiration of the time fixed in the notice, this Agreement shall automatically terminate in the same manner and with the same force and effect as if the date fixed in the notice of termination were the date of the end of the Term, the EF Site Term or the PLA Term, as applicable.

(c) In the event the Power Purchase Agreement is terminated for a Project Company Event of Default or any other reason other than as set out in Clause 8.2(a) (*Termination*) above:

(i) if the Power Purchase Agreement expires or is terminated by the Purchaser for a Project Company Event of Default but the Purchaser has not exercised its right to require transfer of the Project as provided for in clause 19.8(a) (*Obligations Upon Termination or Expiry*) of the Power Purchase Agreement, the Lessee may terminate this Agreement by written notice to the Lessor; or

(ii) in any other circumstances either Party may terminate this Agreement by written notice to the other Party,

provided further that, if applicable, such date of termination is no earlier than the date of transfer of the Project or the date on which decommissioning of the Plant has been completed in accordance with clause 19.14 (*Decommissioning*) of the Power Purchase Agreement.

8.3 Consequences of Termination

(a) Upon the termination of this Agreement, the Project Site and the right of use thereof shall forthwith revert to the Lessor.

(b) The remedies given to the Lessor and the Lessee in this Agreement shall be cumulative, and the exercise of any one remedy shall not be to the exclusion of any other remedy.

(c) The Lessor acknowledges that in the event of the transfer of the right, title and interest in the Project to the Purchaser or the Government's nominee pursuant to the terms of the Power Purchase Agreement:

(i) the lease rights in relation to the Project Site pass to the Purchaser or the Government's nominee and the Lessee undertakes to take all such actions and execute such documents as may be required by the Laws of Uzbekistan to facilitate such transfer; and

(ii) the Lessee does not have any rights to claim from the Lessor any compensation for such transfer.

(d) The Lessee shall not be entitled to recover damages or obtain payment, reimbursement, restitution or indemnity more than once in respect of any one shortfall, damage, deficiency, breach or other set of circumstances which gives rise to one or more claims under this Agreement and the Power Purchase Agreement (no double recovery).

8.4 Expiry of Term or EF Site Term

Subject to the terms of the Investment Agreement and the Power Purchase Agreement, upon the expiry of the Term and/or the EF Site Term, as applicable, or early termination of this Agreement, the Lessee shall, if required by the Lessor, be obliged to remove the Plant and any fixtures, fittings, alterations, or additions erected or installed on the Site and/or the EF Site, as applicable, including restoration of the Site and/or the EF Site, as applicable, to its initial condition (to the extent reasonably possible) as at the date of the Power Purchase Agreement (as captured and stored via inventory records, visual pictures, videos and other means), in accordance with the Lessee's decommissioning obligations contemplated in the Power Purchase Agreement, *provided that*:

(a) the Term and/or the EF Site Term, as applicable, shall be extended until such removal and decommissioning work has been completed which must be completed within one (1) year from the date of expiry of the Term and/or the EF Site Term, as applicable, or early termination, it being understood that the extension of the Term and/or the EF Site Term, as applicable, shall be solely for the purpose of effecting such removal and decommissioning work; and

(b) any damage caused to the Site and/or the EF Site as a result of any such removal and decommissioning shall be made good by the Lessee at its expense (without limiting the Parties' separate obligations under the Investment Agreement and/or the Power Purchase Agreement).

8.5 Expiry of PLA Term

Subject to the terms of the Investment Agreement and the Power Purchase Agreement, upon the expiry of the PLA Term or early termination of this Agreement, the Lessee shall be obliged

to remove any fixtures, fittings, alterations, or additions erected or installed on the Project Laydown Area, including restoration of the Project Laydown Area to its initial condition (to the extent reasonably possible) as at the date of the Power Purchase Agreement (as captured and stored via inventory records, visual pictures, videos and other means).

9. Decommissioning

9.1 Decommissioning Program

(a) No later than the earliest to occur of:

(i) the date falling thirty (30) months prior to the PPA Expiry Date;

(ii) the date notified by the Lessor to the Lessee following the PPA Early Termination Date; and

(iii) the date falling within ninety (90) days from the Total Loss Date,

the Lessee shall deliver to the Lessor the Decommissioning Program approved by the Independent Engineer as being effective for the Decommissioning, *provided, however, that*, in the event the PPA Early Termination Date or the Total Loss Date, as applicable, occurs after the date set out in paragraph 9.1(a)(i) above, the Lessee shall deliver an updated Decommissioning Program pursuant to paragraph 9.1(a)(ii) or 9.1(a)(iii) above, as applicable.

(b) Each Decommissioning Program shall include the following elements:

(i) identification of measures to be taken to restore the Site to near pre construction conditions or a condition compatible with surrounding land use;

(ii) documented site specific health and safety plans and procedures to be followed, including provisions for training personnel accordingly;

(iii) specifications for demolition and reclamation, which shall serve as the basis for contractor bids for the decommissioning project;

(iv) disposal of materials in appropriate facilities for treatment/disposal or recycling;

(v) monitoring plans to control the execution of the Decommissioning and reclamation plan through Project oversight and quality assurance;

(vi) documentation of the implementation of the program and compliance with the Laws, Good Utility Practice and applicable international environmental and social standards;

(vii) an environmental site assessment to ascertain whether soil and/or groundwater contamination has occurred in the decommissioning project areas during construction/operation/decommissioning that needs to be remediated in accordance with applicable Laws, Good Utility Practice and international environmental and social standards. At first a walkover and a screening of potential contamination sources based on uses of each area, site evidence, and record of accidents, will indicate whether a full environmental site assessment is needed. The assessment shall be guided by applicable Laws, Good Utility Practice and relevant international environmental and social standards. If the results of the assessment indicate that remediation activities are required, the Project Company shall be responsible for implementing such activities and for the cost of the same;

(viii) the proposed Decommissioning Completion Date; and

(ix) the aggregate amount of costs and expenses required for the completion of the Decommissioning.

9.2 Decision to Decommission or Transfer

Within ninety (90) days of receipt of the Decommissioning Program (or, as applicable, the updated Decommissioning Program) pursuant to Clause 9.1 (*Decommissioning Program*), the Lessor shall notify the Lessee whether it shall require the Lessee to transfer its rights, title and interests in the Plant, as applicable, to the Purchaser (or a nominee) or to Decommission the Plant, at the Lessee's cost.

9.3 Decommissioning Security

(a) If the Lessor notifies the Lessee that it requires the Lessee to Decommission in accordance with the terms of this Agreement, the Lessee shall, by the earliest to occur of:

(i) the date falling twenty-four (24) months prior to the PPA Expiry Date;

(ii) such date as notified by the Lessor (acting reasonably) to the Lessee following occurrence of the PPA Early Termination Date; and

(iii) such date as notified by the Lessor (acting reasonably) to the Lessee following occurrence of the Total Loss Date,

deliver a Decommissioning Security to the Lessor.

(b) If any Decommissioning Security contains an expiry date which is earlier than the date on which it is required to be returned to the Lessee pursuant to Clause 9.4 (*Decommissioning*), the Lessee shall no later than thirty (30) days prior to such expiry date (i) procure an extension of such expiry date by providing to the Lessor written and signed confirmation from the issuer of the Decommissioning Security of such extension or (ii) deliver a replacement for the Decommissioning Security meeting the requirements of this Agreement.

(c) If the Lessee fails to procure such extension of, or replacement for, the Decommissioning Security by a date which is twenty (20) days prior to the expiry date of the Decommissioning Security, the Lessor may draw on the Decommissioning Security in full and hold the proceeds as cash security in a collateral account (the "**Decommissioning Cash Security**"). The Lessor shall be entitled to appropriate and apply the Decommissioning Cash Security in the same manner and for the same purpose that it would be entitled to with respect to the Decommissioning Security in accordance with this Agreement.

(d) Subject to the Lessor's right to have recourse to the Decommissioning Cash Security in accordance with this Agreement, the Decommissioning Cash Security shall be released to the Lessee promptly upon the Lessee delivering to the Lessor an extension of, or replacement for, the Decommissioning Security meeting the requirements of this Agreement.

9.4 Decommissioning

(a) If the Lessor elects to require the Lessee to Decommission in accordance with Clause 9.2 (*Decision to Decommission or Transfer*), the Lessee shall take such steps at the Lessee's cost as are required to comply with the Decommissioning Program and complete the Decommissioning, on or prior to the Decommissioning Completion Date, in accordance with applicable Laws of Uzbekistan, international environmental and

social standards and Good Utility Practice. The Independent Engineer shall determine whether and when the Lessee has completed the Decommissioning.

(b) If the Independent Engineer determines that the Lessee has completed the Decommissioning on or prior to the Decommissioning Completion Date, the Lessor shall return the uncalled balance of the Decommissioning Security to the Lessee within ten (10) days of the Independent Engineer's determination.

(c) If the Independent Engineer determines that the Lessee has failed to complete the Decommissioning on or prior to the Decommissioning Completion Date, the Independent Engineer shall calculate the costs that would be reasonably incurred by the Lessor in order to complete the Decommissioning in accordance with the Decommissioning Program and the Lessor shall be entitled to call on the Decommissioning Security for that amount and return the balance of the Decommissioning Security (if any) to the Lessee within ten (10) days of the Independent Engineer's determination.

9.5 Interrelationship with the Power Purchase Agreement

(a) The Parties acknowledge that, pursuant to clause 19.14 of the Power Purchase Agreement, the Lessee has obligations to the Purchaser that are substantially the same as those set out in this Clause 9 (*Decommissioning*) (including the Lessee's obligations in respect of the Decommissioning Security) and the Purchaser has rights in respect of the decommissioning of the Project that are substantially the same as the rights of the Lessor set out in this Clause 9 (*Decommissioning*) save that the Purchaser also has the right to require the Lessee to transfer the Project to it under the Power Purchase Agreement rather than decommissioning the Project.

(b) The performance by the Lessee of its obligations in favour of the Purchaser under clause 19.14 of the Power Purchase Agreement to decommission the Project shall discharge the Lessee's obligations to the Lessor under this Clause 9 (*Decommissioning*), including the Lessee's obligation to deliver a Decommissioning Security. Unless otherwise instructed by the Purchaser to the Lessee in writing, the requests of the Purchaser under the Power Purchase Agreement in respect of the Decommissioning (including in respect of the delivery of the Decommissioning Security) shall have priority for the Lessee over the requests of the Lessor under this Agreement.

(c) The Lessor shall not be entitled to exercise its rights under this Clause 9 (*Decommissioning*) to the extent the Purchaser has notified the Lessee under clause 19.14 of the Power Purchase Agreement that it requires the Lessee to transfer the Project to itself.

10. The Lessee's Covenants

10.1 The Lessee hereby covenants:

(a) to pay the Rent in accordance with the terms of this Agreement;

(b) to keep the Project Site and improvements thereon clean and in good working order at all times for the Term, the EF Site Term and the PLA Term, as applicable, in each case, in accordance with the requirements of the Relevant Documents;

(c) to construct, complete, operate and maintain the Project to be located on the Project Site in accordance with the requirements of the Relevant Documents;

(d) to assume responsibility for the administration, security and development of the Project

Site in accordance with the provisions of the Relevant Documents;

(e) to indemnify the Lessor and Lessor Parties against all claims, demands, proceedings, costs, liabilities and expenses arising from any loss, damage or injury to person or property on the Project Site, unless same is directly caused by the Lessor's or the relevant Lessor Parties' Gross Negligence or Willful Misconduct;

(f) subject to Clause 14 (*Assignment and Transfer*), not to assign or sublet the Project Site, or any part thereof, without the prior written consent of the Lessor;

(g) not to use or permit the Project Site, or any part of the Project Site, to be used for any purposes other than those set out in this Agreement;

(h) to comply with all the Laws of Uzbekistan affecting the Project, the Project Site and this Agreement;

(i) to install the Plant on the Project Site in accordance with the requirements of the relevant international environmental and social standards;

(j) to obtain and maintain all the necessary approvals as and when required for the Project;

(k) to transfer or decommission the Plant, as applicable, in accordance with the Power Purchase Agreement, this Agreement and any applicable Laws of Uzbekistan;

(l) not to Abandon the Project Site at any time during the Term. If the Lessee does Abandon the Project Site, any property belonging to the Lessee and left on the Project Site shall be deemed abandoned at the discretion of the Lessor to the extent permitted by the Laws of Uzbekistan and shall become the property of the Lessor upon the termination of this Agreement;

(m) to ensure that all applications and connections for necessary utility services on the Project Site shall be made in the name of the Lessee only. The Lessee shall, at its own cost, apply for, and be solely liable for, utility charges as they become due, including those for sewerage, refuse, water, gas, electricity and telephone services;

(n) to waive all claims against the Lessor for damages to the Project or the Lessee's property or for injuries to persons, arising from any cause at any time unless directly caused by the Lessor's Gross Negligence or Willful Misconduct;

(o) subject to the decommissioning provisions as set out in the Power Purchase Agreement, on the last day of:

(i) the Term to peaceably and quietly surrender and deliver the Site and the EF Site Term to peaceably and quietly surrender and deliver the EF Site to the Lessor, in each case free of any Encumbrances whatsoever; and

(ii) the PLA Term to peaceably and quietly surrender and deliver the Project Laydown Area to the Lessor free of any Encumbrances whatsoever;

(p) not to permit the Project Site to be used or occupied by others and not to pledge or transfer this Agreement to any person by operation of law or otherwise, without the prior written consent of the Lessor, except for a pledge or other security interest in all of the Lessee's rights and interest under this Agreement to the Financing Parties (or their nominees) or as permitted under the Direct Agreement in connection with the Lessee's financing arrangements for the Project;

(q) to give the Lessor access to the Project Site for the purpose of monitoring the Project Site, *provided that* (i) such access shall not interfere with the construction, installation, testing and commissioning of the Plant or expose any person on the Project Site to any

danger; and (ii) the Lessor complies with the Project Site visitor regulations at all times;

(r) to provide to the Lessor copies of the amendments to the Power Purchase Agreement in whatever form made related to the definitions incorporated into this Agreement by reference; and

(s) to comply with the Laws of Uzbekistan in connection with this Agreement.

10.2 Notwithstanding anything in this Clause 10 *(Lessee's Covenants)* to the contrary, for the purpose of financing of the Project the Lessee shall have the absolute right, from time to time during the Term, the EF Site Term and PLA Term (as applicable) without the Lessor's prior approval, written or otherwise and without affecting the Lessee's rights under this Agreement, to:

(a) create and assign any security interest over its rights and interests under or pursuant to this Agreement, the Project Site, the Plant and any portions thereof, fixtures, fittings, alterations, improvements, equipment, and other immovable and movable property;

(b) where the Financing Parties enforce their security over the Lessee's shares, enter into any transaction pursuant to which there is a change of control of the Lessee as directed by the Financing Parties; and

(c) to assign its rights and obligations under this Agreement to the Financing Parties in accordance with the provisions of Clause 14 (*Assignment and Transfer*).

11. Covenants by the Lessor

11.1 The Lessor hereby covenants:

(a) subject to the Lessor's monitoring rights provided under this Agreement not to interfere in the Lessee's exclusive possession and use of the Project Site;

(b) to indemnify the Lessee against all claims, demands, proceedings, costs, liabilities and expenses arising from any loss, damage or injury to person or property on the Project Site to the extent same is directly caused by the Lessor's Gross Negligence or Willful Misconduct;

(c) to notify the Lessee in writing prior to any transfer of ownership rights in the Project Site to any third party; and

(d) to comply with the Laws of Uzbekistan in connection with this Agreement.

11.2 The Lessor represents and warrants to the Lessee that (i) the Site and the EF Site are presently not subject to any zoning restrictions that would preclude the construction and operation of the Plant and (ii) the Project Laydown Area is presently not subject to any zoning restrictions that would preclude the temporary storage of plant, equipment and materials during construction of the Plant.

12. Representations and Warranties

12.1 Mutual Representations and Warranties

Each Party hereby represents and warrants that as at the Signature Date:

(a) the execution, delivery and performance of this Agreement have been duly authorized by all requisite action and do not violate any law by which it is bound or contravene any provision of, or constitute a default under, any other agreement or instrument to which it is a party or by which its property may be bound, in each case, which could

materially adversely affect its ability to perform its obligations under this Agreement;

(b) its obligations as expressed in this Agreement constitute its legal, valid, binding and enforceable obligations;

(c) all Approvals required to be obtained by it as of the Signature Date in order to perform its obligations under this Agreement have been obtained and remain in full force and effect, except where the absence of any such Approval could not materially adversely affect such Party's ability to perform its obligations under this Agreement or the Project; and

(d) there are no outstanding judgments or arbitral awards against it and to the best of its knowledge and belief (after due enquiry), there are no pending or threatened actions, claims, suits or proceedings against it, in each case, which could materially adversely affect its ability to perform its obligations under this Agreement or the Project.

12.2 The Lessee's Representations and Warranties

The Lessee hereby represents and warrants to the Lessor that as at the Signature Date:

(a) it is duly organised, validly existing and in good standing under the laws of the jurisdiction of its incorporation;

(b) it has fully investigated the Project Site and has satisfied itself as to the Project Site's adequacy and fitness for the purposes of the Project and for the performance of its obligations under this Agreement and the Relevant Documents (save that the Lessee makes no representation or warranty as to archaeological or paleontological remains on, in or under the Project Site which would not have been revealed by a soil investigation of the Project Site carried out by the Lessee); and

(c) the soil investigations of the Project Site carried out by the Lessee did not reveal any archaeological or paleontological remains or deposits of any natural resources on, in or under the Project Site, which would have been revealed by a soil investigation of similar scope conducted by an independent third party in accordance with Good Utility Practice.

12.3 The Lessor's Representations and Warranties

The Lessor represents and warrants to the Lessee that as at the Signature Date:

(a) the legal purpose of the Project Site would not preclude the implementation of the Project; and

(b) it has obtained Encumbrance waivers or releases of Encumbrances in relation to the Project Site that may have arisen prior to the execution of this Agreement.

12.4 Contractual Covenants

The Parties hereby acknowledge that all of their respective representations and warranties set out in this Agreement constitute their contractual covenants. A breach of any representation or warranty by the relevant Party shall constitute a breach of this Agreement in accordance with Clause 8.1 (*Breach*).

13. Confidentiality

(a) During the term of this Agreement and for a period of three (3) years after termination or expiration of this Agreement for any reason whatsoever each Party shall:

(i) keep the Confidential Information confidential;

(ii) not disclose the Confidential Information to any other person who is not a Party other than:

(A) with the prior written consent of the other Party to such disclosure; or

(B) in accordance with Clause 13(b) (*Confidentiality*); and

(iii) not use the Confidential Information for any purpose other than the performance of its obligations under this Agreement.

(b) During the term of this Agreement and for a period of three (3) years after termination or expiration of this Agreement for any reason, a Party may disclose or use the Confidential Information:

(i) in the case of the Lessor, to its officers and employees and any other Government Authority, and in the case of the Lessee, to its direct shareholders (each a "**Recipient**") to the extent necessary to achieve the purposes of this Agreement, provided that the disclosing Party shall procure that each Recipient is made aware of and complies with all the disclosing Party's obligations of confidentiality under this Agreement as if the Recipient was a party to this Agreement;

(ii) if, and only to the extent, required to disclose such information by judicial or administrative process or otherwise in accordance with any law or the rules of any recognised stock exchange applicable to the disclosing Party;

(iii) with the consent of the other Party (not to be unreasonably withheld), in the interests of attracting debt or equity financing for the Project;

(iv) to its legal, financial and/or technical advisors or pursuant to the Financing Documents, provided that prior to making such disclosure, the disclosing Party obtains an appropriate confidentiality undertaking from the person to whom the Confidential Information is to be disclosed;

(v) in a legal action or proceeding brought by the disclosing Party in pursuit of its rights or in exercise of its remedies;

(vi) in accordance with the requirements of the Investment Agreement; or

(vii) to its insurers.

(c) The obligations contained in Clauses 13(a) (*Confidentiality*) and 13(b) (*Confidentiality*) shall not apply to any Confidential Information which:

(i) is at the Signature Date in, or at any time after the Signature Date comes into, the public domain other than through breach of this Agreement;

(ii) can be shown by the disclosing Party to the reasonable satisfaction of the other Party to have been known to the disclosing Party independently without being in breach of its obligations under this Clause 13 (*Confidentiality*); or

(iii) on, before or after the Signature Date has come lawfully into the possession of the disclosing Party from a third party who is free to divulge the same and which was or is not obtained under any obligation of confidentiality.

(d) For the purposes of this Clause 13 (*Confidentiality*), "**Confidential Information**" means this Agreement and any Relevant Document and all information concerning the Project and the other Party (or its Affiliates) disclosed to it by the other Party in connection with this Agreement and any Relevant Document, whether:

(i) in writing, verbally or by any other means; or

(ii) directly or indirectly before or after the Signature Date.

14. Assignment and Transfer

(a) Save as provided in Clause 10.2(c) (*Lessee's Covenants*), no Party may directly or indirectly assign or transfer any of its rights, benefits and interests or its obligations under this Agreement, in each case, in whole or in part, to any person without the prior written consent of the other Party, such consent not to be unreasonably withheld or delayed. Any such purported action without prior written consent of the other Party shall be void and ineffective.

(b) Notwithstanding Clause 14(a) above, the Lessor acknowledges and agrees that the Lessee may grant security over its rights and interest under this Agreement to the Financing Parties (or their nominees, including the Security Agent) in connection with the Lessee's financing arrangements for the Project. The Lessee must provide written notice to the Lessor of any such grant of security in favour of the Financing Parties.

(c) Notwithstanding paragraph (a) above, the Lessee shall have the absolute right in accordance with the Laws of Uzbekistan, to assign its rights under this Agreement to any of the Financing Parties or to any third party security agent or trustee nominated by the Financing Parties and, upon the Lessee's request, the Lessor shall provide such reasonable assurances and other co-operation to the Financing Parties as may be requested by the Financing Parties, including providing acknowledgements and notices to the Financing Parties dealing with matters such as the respective rights and obligations of the Financing Parties and the Lessee under the Financing Documents, provided that:

(i) such assurances and co-operation and the terms of such acknowledgements and notices shall not (except as expressly provided in this Agreement) be interpreted as diminishing the Lessor's rights and entitlements under this Agreement; and

(ii) by providing such reasonable assurances and co-operation, the Lessor shall not assume (and shall not be deemed to be assuming) any obligations under the Financing Documents (other than under the Direct Agreement).

(d) The Lessor agrees to enter into the Direct Agreement with the Financing Parties in substantially the same form as set out in Schedule 3 (*Form of Direct Agreement*) in respect of this Agreement as the Lessee, or the Financing Parties, may reasonably request in connection with the financing or refinancing of the Project, provided that, in so doing, the Lessor shall not assume (and shall not be deemed to be assuming) any obligations under the Financing Documents (other than under the Direct Agreement).

15. Governing Law

This Agreement, and any non-contractual obligations arising out of or in connection with it, shall be governed by, and construed in accordance with, the Laws of Uzbekistan.

16. Dispute Resolution

16.1 Amicable Resolution and Litigation

(a) Any dispute, claim or difference of whatever nature arising under, out of or in

connection with this Agreement or any documents entered pursuant to it, including:

(i) any dispute, claim or difference concerning the initial or continuing existence of this Agreement or any provision hereof or as to whether this Agreement or any provision hereof is invalid, illegal or unenforceable (whether initially or otherwise);

(ii) any dispute relating to any non-contractual obligation arising out of or in connection with the matters provided for in this Agreement; and

(iii) any dispute or claim which is ancillary or connected, in each case in any manner whatsoever, to the foregoing;

shall be considered a dispute for the purposes of this Agreement (a "**Dispute**").

(b) In the event of a Dispute, any Party may provide a written notice of such Dispute to the other Party. The Parties shall have a period of thirty (30) days following the date of such notice within which to resolve such Dispute through amicable settlement negotiations and consultations between such Representatives and/or senior executives of the relevant Parties, in each such Party's opinion having sufficient seniority, experience, power, authority and knowledge in respect of this Agreement to resolve such Dispute.

(c) If such Dispute is not resolved within the thirty (30) days period as specified in Clause 16.1(b) above, or such longer period as the Parties may agree in writing, regardless of whether any attempt has been made to resolve such Dispute:

(i) where such Dispute relates to the Lessor commencing any legal proceeding in relation to this Agreement to:

(A) seek to restrict the use by the Lessee of the land which is the subject of this Agreement in order to prevent the performance by the Lessee of any of its obligations under any Relevant Document; or

(B) terminate this Agreement in whole or in part,

as a result of and/or in connection with any failure by the Lessee to carry out its obligations and/or satisfy its liabilities under or in connection with this Agreement (such Dispute a "**Material Land Dispute**"), such Material Land Dispute shall be referred to the Independent Expert pursuant to Clause 16.2 (*Expert Determination*); and

(ii) where:

(A) such Dispute is not a Material Land Dispute; or

(B) a Material Land Dispute is not resolved by the Independent Expert pursuant to Clause 16.2 (*Expert Determination*) or any Party does not agree with the decision of the Independent Expert in respect of a Material Land Dispute,

such Dispute shall be referred to and finally resolved exclusively by the courts of the Republic of Uzbekistan. Each of the Parties unconditionally and irrevocably agrees for now and hereafter to the binding submission of any Dispute to the exclusive authority of the courts of the Republic of Uzbekistan.

16.2 Expert Determination

(a) Pursuant to Clause 16.1(c)(i) (*Amicable Resolution and Litigation*), a Material Land

Dispute shall, at the request of either Party, be referred to an Independent Expert in accordance with this Clause 16.2 if the Parties are not able to agree under Clause 16.1(b) (*Amicable Resolution and Litigation*) on an amicable resolution to such Dispute.

(b) A Material Land Dispute shall be referred, at the request of either Party, to an independent person with appropriate qualifications and experience:

(i) agreed upon between the Parties to a Material Land Dispute (and unless otherwise agreed by the Parties, the Parties agree that the Independent Engineer (as may be appointed under the Power Purchase Agreement) shall serve as the Independent Expert within the scope of its appointment in accordance with the Independent Engineer Agreement entered into with the Independent Engineer as provided for in clause 12 of the Power Purchase Agreement, unless the Independent Engineer declines or is otherwise not available to serve as the Independent Expert); or

(ii) nominated by the International Centre for Expertise of the International Chamber of Commerce, in accordance with the provisions for appointment of experts under the Rules for Expertise of the International Chamber of Commerce, following a reference from either Party in the absence of an agreement as contemplated in paragraph (i) above, within fourteen (14) days of the initiation of the reference of a Material Land Dispute to the Independent Expert for determination in accordance with this Clause 16.2 (*Expert Determination*),

the "**Independent Expert**".

(c) The Parties shall request that the Independent Expert determine the Material Land Dispute as soon as practicable after receiving the reference.

(d) Except in respect of the determination of costs under this Clause 16.2 (*Expert Determination*), it is acknowledged and agreed that:

(i) any determination by the Independent Expert shall not be final or binding on the Parties in any way; and

(ii) nothing in this Clause 16.2 (*Expert Determination*) shall be regarded as:

(A) prejudicing or limiting a Party's right to refer a Material Land Dispute to the courts of the Republic of Uzbekistan in accordance with Clause 16.1(c)(ii) (*Amicable Resolution and Litigation*); or

(B) any limitations on the authority of the courts of the Republic of Uzbekistan to only matters on appeal or matters relating to manifest errors of fact or law, fraud, or failure by the Independent Expert to disclose any relevant interest.

(e) If the Independent Expert has been appointed, but is unable or unwilling to complete the reference to expert determination, another Independent Expert shall be appointed in accordance with the procedure set out in Clause 16.2(b) (*Expert Determination*).

(f) The Parties shall have the right to make representations and submissions to the Independent Expert. There shall be no formal hearing.

(g) The Independent Expert shall have power to request any Party to provide him with such statements (which shall be written unless otherwise specifically required) or documents or information within their control as they may determine necessary and the Parties

shall comply with any such request in accordance with the timeframes set out by the Independent Expert or in the absence of such timeframes, in a timely manner as required to enable the Independent Expert to determine the Material Land Dispute in accordance with Clause 16.2(c) (*Expert Determination*).

(h) The Independent Expert shall give his or her decision in writing.

(i) The Independent Expert shall determine how and by whom the costs of the determination, including the fees and expenses of the Independent Expert, are to be paid.

17. Waiver of Sovereign Immunity

(a) To the extent that any Party or any of its properties may in any state or jurisdiction claim or benefit from any immunity (whether characterised as state immunity, sovereign immunity, act of state or otherwise) from jurisdiction, suit, action, service, execution, attachment, set off, provisional measures or orders, or other legal process (whether in aid of execution, before award or judgment or otherwise), or to the extent that there may be attributed to any Party or any of its properties any such immunity (whether or not claimed), such Party hereby agrees not to claim, invoke or permit to be invoked on its or its properties' behalf or for its or its properties' benefit, and hereby waives, any such immunity, *provided that*:

(i) the Parties agree that neither of the Parties shall have the right to seek pre-judgment or pre-award attachment; and

(ii) in the case of the Lessor, such waiver of immunity shall not apply to:

(A) any assets, properties or other things of particular cultural or historical significance to the people of the Republic of Uzbekistan (or any region or group of people within the Republic of Uzbekistan) or part of the Republic of Uzbekistan's archives and not placed or intended to be placed on sale;

(B) property of the Central Bank of the Republic of Uzbekistan or other monetary authority of the Republic of Uzbekistan;

(C) premises of the diplomatic missions, consular premises, other diplomatic or consular property or assets, or other property or assets of the Republic of Uzbekistan used for such purposes;

(D) military or other defence-related property or assets, or property or assets of the Republic of Uzbekistan in relation to such military or other defence-related property or assets,

in each case, whether now owned or in the future acquired.

18. Continuing Obligations

Unless otherwise agreed in writing, the existence of a Dispute shall not relieve either Party from the performance of its obligations under this Agreement not the subject of the Dispute.

19. Notices

(a) Any notice or other communication from one Party to the other Party which is required or permitted to be made under the provisions of this Agreement shall be:

(i) made in the English language;

(ii) made in writing;

(iii) delivered personally (by hand delivery or by courier) to the address of the other Party which is shown below or to such other address as the other Party shall by notice require; and

(iv) marked for the attention of the person(s) designated below or to such other person(s) as the other Party shall by notice require.

(b) Any notice or other communication made by one Party to the other Party in accordance with paragraph (a) above shall be deemed to be received by the other Party on the day on which it is left at such Party's address.

In the case of the Lessor:

[THE MINISTRY OF ENERGY OF THE REPUBLIC OF UZBEKISTAN

Address: 12 Istikbol Str., Tashkent, 100047,
Republic of Uzbekistan

Attention: Minister of Energy

Facsimile: +998 71 231 1661 (7025)]

In the case of the Lessee:

FE "ACWA POWER UKS GREEN H2" LLC

Address: Temur Street 88A, Yunusobod District, Tashkent City, the Republic of Uzbekistan

Attention: [●]

Telephone: [●]

Facsimile: [●]

(c) Any Party may from time to time change its address, facsimile number or other information for the purpose of notices to such Party, by giving prior notice specifying such change to the other Party.

(d) A Party delivering any notice or other communication in accordance with this Agreement shall use reasonable endeavours to provide to the receiving Party, upon such receiving Party's reasonable request, an accurate translation thereof in Russian or Uzbek within five (5) Business Days after sending such notice or other communication in English; *provided, however, that* a Party shall not be required to provide a translation of any technical drawings or similar technical or engineering documents. In the event of any inconsistency between the English original and the Russian or Uzbek translation of any notice or other communication, the English version shall prevail over the Russian or Uzbek version. For the avoidance of doubt, failure to deliver a translation of a notice or other communication in accordance with this Clause 19(d) (*Notices*) shall not affect the effectiveness of such notice or other communication as established pursuant to this Clause 19 (*Notices*).

(e) Each Party shall provide all notices issued under or in connection with Clause 14 (*Assignment and Transfer*) to the Security Agent to the address communicated by the Security Agent to the Parties. Provisions of Clause 19 (*Notices*) shall apply *mutatis mutandis* to the notices issued to/ by the Security Agent.

20. Miscellaneous

20.1 Entire Agreement

This Agreement constitutes the entire agreement and understanding between the Parties with respect to the subject matter herein and the transactions contemplated herein, and any and all previous understandings, proposals, negotiations, agreements, commitments and representations, whether oral or written, are superseded hereby.

20.2 Obligation to Mitigate

(a) The Parties shall make all reasonable endeavours to mitigate any loss, cost or expense they may suffer as a result of any breach of the other Party's material obligations under this Agreement.

(b) Nothing in paragraph (a) above shall operate to limit or exclude any liability for fraud, Wilful Misconduct or Gross Negligence.

20.3 Non-Reliance

Each Party acknowledges and confirms that it has not entered into this Agreement on the basis of any representation, warranty, undertaking or other statement whatsoever, whether made negligently or innocently, by any person (whether a Party or not), other than expressly set out in this Agreement.

20.4 Survival

The expiry or termination of this Agreement shall be without prejudice to any accrued rights, remedies, obligations, or liabilities of the Parties existing at expiry or termination thereof. Clauses 1 (*Definitions and Interpretation*), 10.1(e) (*The Lessee's Covenants*), 10.1(n) (*The Lessee's Covenants*), 13 (*Confidentiality*), 15 (*Governing Law*), 16 (*Dispute Resolution*), 17 (*Waiver of Sovereign Immunity*), 19 (*Notices*) and 20.5 (*Rights of Third Parties*) shall continue in full force and effect notwithstanding the expiry or termination of this Agreement.

20.5 Rights of Third Parties

The terms and provisions of this Agreement are intended solely for the benefit of each Party and their respective successors or permitted assigns, and it is not the intention of the Parties hereto to confer third-party beneficiary rights upon any other person.

20.6 Waiver

Any term or condition of this Agreement may be waived at any time by the Party that is entitled to the benefit thereof, but no such waiver shall be effective unless set out in a written instrument duly executed by all Parties. The failure or delay of any Party to require performance by the other Party of any provision of this Agreement shall not affect its right to require performance of such provision unless and until such performance has been waived by such Party in writing in accordance with the terms hereof. No waiver by any Party of any term or condition of this Agreement, in any one or more instances, shall be deemed to be or construed as a waiver of the same or any other term or condition of this Agreement on any future occasion. All remedies, either under this Agreement or by the Laws of Uzbekistan or otherwise afforded, shall be cumulative and not alternative.

20.7 Variation

No modification or amendment of any provision of this Agreement shall be valid unless it is in writing and signed by all Parties.

20.8 Further Assurance

(a) The Parties shall at all times do all such further acts and execute and deliver such further documents as shall be reasonably required in order to perform and carry out the provisions of this Agreement (including execution of any documents required under Clause 14 (*Assignment and Transfer*)).

(b) A Party shall, and shall use its reasonable endeavours to procure that any necessary third party shall, from time to time, execute such documents and do such acts and things as any other Party may reasonably require for the purpose of giving the full benefit of this Agreement to the other Party.

(c) At the end of the Term, the EF Term and the PLA Term, as applicable, the Parties shall take all such actions and execute such documents as may be required by the Laws of Uzbekistan in connection with termination of the lease relationship between the Parties.

20.9 No Partnership or Agency

This Agreement shall not be interpreted or construed to create an association, joint venture, or partnership between the Parties or to impose any partnership obligation or liability upon any Party. None of the Parties shall have any right, power, or authority to enter into any agreement or undertaking for, to act on behalf of, to act as or be an agent or representative of, or to otherwise bind, the other Party.

20.10 Expenses

Each Party shall pay its own costs and expenses (including the fees and expenses of its Representatives) necessary for the negotiation, preparation, execution, delivery, performance of and compliance with this Agreement.

20.11 Invalidity

The Parties hereby agree to use good faith efforts to negotiate an equitable adjustment to any provision of this Agreement determined to be invalid or unenforceable with a view toward effecting the purposes of this Agreement, and the validity or enforceability of the remaining provisions of this Agreement shall not be affected thereby.

20.12 Language

This Agreement is being executed in the English language.

20.13 Binding Effect

This Agreement shall be binding upon and inure to the benefit of the Parties and their respective successors, legal representatives and permitted assigns.

20.14 Counterparts

The Parties may execute this Agreement in counterparts, which shall, in the aggregate, when signed by all Parties constitute one and the same instrument; and, thereafter, each counterpart shall be deemed to be an original instrument as against any Party who has signed it.

This Land Lease Agreement has been executed on the date first stated above.

Executed by **FE "ACWA POWER UKS GREEN H2" LLC** (as the **LESSEE**) acting by:

Name:
Title:
Place of signing (city, country):

Executed by [**THE MINISTRY OF ENERGY OF THE REPUBLIC OF UZBEKISTAN**] (as the **LESSOR**) acting by:

Name:
Title:
Place of signing (city, country):

Schedule 1

Project Site Description

(a) **Sketch and boundaries of the Site:**

[●]

Sketch and boundaries of the EF Site:

[●]

Sketch and boundaries of the Project Construction Laydown Area:

[●]

(b) **Coordinates of the Site:**

[●]

Coordinates of the EF Site:

[●]

Coordinates of the Project Construction Laydown Area:

[●]

Schedule 2

Rent

The Site

Period	Rent payable (UZS per year)	Due Date for Payment
From the Signature Date until the end of the Term	The land tax rate applicable to the Lessor or the Lessee as set out under the Laws of Uzbekistan, whichever is the greater.	On the earlier of: (a) the fifth (5th) day of the month in respect of which the Rent is payable; and (b) the date as set out under the Laws of Uzbekistan for the payment of the land tax rate applicable to the Lessor or the Lessee (as applicable).

The EF Site

Period	Rent payable (UZS per year)	Due Date for Payment
From the Signature Date until the end of the EF Site Term	The land tax rate applicable to the Lessor or the Lessee as set out under the Laws of Uzbekistan, whichever is the greater.	On the earlier of: (a) the fifth (5th) day of the month in respect of which the Rent is payable; and (b) the date as set out under the Laws of Uzbekistan for the payment of the land tax rate applicable to the Lessor or the Lessee (as applicable).

Project Laydown Area

Period	Rent payable (UZS per year)	Due Date for Payment
From the Signature Date until the end of the PLA Term	The land tax rate applicable to the Lessor or the Lessee as set out under the Laws of Uzbekistan, whichever is the greater.	On the earlier of: (a) the fifth (5th) day of the month in respect of which the Rent is payable; and (b) the date as set out under the Laws of Uzbekistan for the payment of the land tax rate applicable to the Lessor or the Lessee (as applicable).

Schedule 3

Form of Direct Agreement

[●]

Schedule 4

Delivery-And-Acceptance Act

This Delivery-And-Acceptance Act is made on _____ 2023 **between**:

(1) **THE MINISTRY OF ENERGY OF THE REPUBLIC OF UZBEKISTAN** (hereinafter called the "**Lessor**" and its successors and assignees in title); and

(2) **FE "ACWA Power UKS Green H2" LLC**, a limited liability company duly organised and existing under the laws of the Republic of Uzbekistan with its registered office at Amir Temur Street 88A, Yunusobod District, Tashkent City, the Republic of Uzbekistan, and with registration number 2050941 (hereinafter called the "**Lessee**" and its successors and assignees in title).

together, the "**Parties**".

1. The present act is to certify that in accordance with the Land Lease Agreement the Lessor has transferred and the Lessee has accepted the Project Site, having the following characteristics at the moment of its delivery/acceptance:

   in relation to the Site:

   Land area (in hectares): [●]
   Encumbrances: [●]
   Condition: [●]
   Existing objects on the site (if applicable): [●]

   in relation to the EF Site:

   Land area (in hectares): [●]
   Encumbrances: [●]
   Condition: [●]
   Existing objects on the site (if applicable): [●]

   in relation to the Project Laydown Area:

   Land area (in hectares): [●]
   Encumbrances: [●]
   Condition: [●]
   Existing objects on the site (if applicable): [●]

2. The present act is drawn up in duplicate, having an identical juridical validity, one copy for each of the Parties.

3. In this Delivery-And-Acceptance Act, unless otherwise defined herein, capitalised terms shall have the meaning given thereto in the Land Lease Agreement.

[signature page is following]

Signatures of the Parties:

Executed by the [**MINISTRY OF ENERGY OF THE REPUBLIC OF UZBEKISTAN]** **(**as the **LESSOR**) acting by:

by: _____
Name:
Title:
Place of execution:

Executed by **FE "ACWA POWER UKS GREEN H2" LLC** (as the **LESSEE**) acting by:

by: _____
Name:
Title:
Place of execution:

APPENDIX C – COLLISION RISK MODELLING (CRM)

Bird Collision Risk Modelling Analysis

Bash 52 MW Wind Energy Project

Consulting Firm:

Juru Energy Ltd
Suite 1, One George Yard, London,
United Kingdom, EC3V 9DF
www.juruenergy.com

Prepared for:

5 Capitals Environmental & Management Consulting
Shiekh Zayed Road,
Dubai, UAE, P.O. Box 119899
www.5capitals.com

Document Information

Project Name	ESIA for 52 MW Wind Energy Project
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Client	5 Capitals
Juru's Project Manager	Umida Rozumbetova
Juru's Project Director	Jushkinbek Ismailov

Document Control

Version	Date	Description	Authors	Reviewer	Approver
1	April 20, 2023	CRM report	Caleb Gordon	Viktoriya Filatova	Umida Rozumbetova

Disclaimer

The CRM Report (the "Report") has been prepared by Juru Energy. Whilst the information contained in the Report reflects the current status, Juru Energy makes no representation or warranty, express or implied, as to the accuracy of the information set forth in this Report and accepts no liability for any information that may have been misstated or omitted.

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Table of Contents

1 Introduction 4
2 Model Input Data 6
3 Turbine and wind farm data 7
4 Data on Physical and Observational Characteristics of Birds 7
5 VP Survey Data Used to Derive Bird Density 9
6 Collision Avoidance Parameter 12
7 Eagles in the genera Aquila, Clanga, and Hieraaetus 13
7.1 White-tailed Eagle 14
7.2 Egyptian Vulture 14
7.3 Eurasian Griffon and Cinereous Vulture 14
7.4 Saker Falcon 14
7.5 Eurasian and Lesser Kestrels 15
7.6 Harriers (genus Circus) 15
7.7 Hawks in the genus, Accipiter 15
7.8 Long-legged and Common Buzzards 15
7.9 Bustards, Cranes, Ducks, Cormorants, and Herons 15
7.10 Mute Swan 15
8 Results and Conclusions 16
8.1 Collision Risk in Tier 1 Target Species 16
8.2 Collision Risk in Tier 2 Target Species 17
8.3 Collision Risk in Other Species 18
9 Literature Cited 24

1 Introduction

Collision Risk Modeling (CRM) using the model developed and refined by William Band, has become a standard method in international industry practice for obtaining quantitative predictions of estimated fatality rates of birds at wind farms, where suitable field observation data from Vantage Point (VP) surveys have been collected, conforming to the data input assumptions of the Band (2012) model, and following the guidance for such surveys and subsequent CRM promulgated by Scottish Natural Heritage (SNH 2017). The Band CRM predicts the expected collision rates of particular bird species or species groups at a given wind farm based on the specific dimensions and physical characteristics of the rotors, the birds, the wind farm, and the density of bird flights recorded in the wind farm area. The latter parameter is termed "bird density" and is derived from the VP survey data, further differentiated with regard to the altitude of the birds' flights relative to the rotor swept altitudes of the rotors. While the basic mechanism of the Band model does not incorporate the ability or tendency of birds to alter their flight paths in response to the presence of wind turbines (avoidance), such behavior is believed to be a very important dynamic influencing actual bird collision rates at wind farms (Cook et. al. 2012), hence a "collision avoidance rate" parameter is typically applied for each bird species or species group when conducting CRM for wind farms using the Band model (Whitfield and Madders 2006a, 2006b, Garvin et al. 2011, Band 2012, SNH 2014, Whitfield and Urquhart 2015).

We conducted CRM using the Band (2012) model for the purpose of obtaining quantitative predictions of collision risk during migratory, wintering, and breeding seasons for target bird species, as well as selected additional species, based on their observed patterns of seasonal abundance and use of airspace at the site, as described by observations gathered during VP surveys. We performed this analysis separately for each of four seasons, using VP survey data gathered at the B52WEP site during the corresponding season. Seasons were defined based on general timing of migratory, wintering, and breeding periods for target bird species within the region as follows:

Spring (migration): March 16[1]-May 15, 2020

Summer (breeding): May 16-August 31, 2020

Autumn (migration): September 1-November 23[2], 2020

Winter: December 1, 2021 – March 8, 2022

The VP survey protocols were developed with guidance from Xenops, and intended to conform with SNH (2017) recommendations, in order to provide input data suitable for performing CRM with the Band (2012) model. In addition to guidance in the form of an initial set of recommendations, Xenops also reviewed and commented on a draft workplan, geospatial information regarding the selection and placement of a suitable number of VP survey locations (9), and quarterly VP survey summary reports. Furthermore, Xenops also provided templates for the VP field survey data sheet and a data compilation spreadsheet, and instructions for monthly and quarterly VP survey reporting for use by the local ornithologists, Alisher Atakhodjaev (2020 surveys), Maksim Mitropolskiy and Luiza Mardonova (2021-2022 surveys), as well as requests for additional species-specific data inputs necessary for the CRM, based on field observations and expert judgment of the ornithologists who conducted the VP surveys. While this communication provides some assurance that the input data used for this CRM effort conforms to SNH guidance and the model's input assumptions, the reliability of the results of this CRM is ultimately dependent on the qualifications and diligence of the field observers, as well as the veracity of their results, as they were reported to Xenops by the Uzbek ornithologists.

[1] VP surveys were initiated at the site on March 14, 2020, and the distinction between March 14 and March 16 is not significant relative to available information on species-specific migration and breeding phenology in the region, hence data for the Spring season CRM were inclusive of the period from March 14-May 15.

[2] End date reflects the actual last day in which VP surveys were conducted during the autumn season.

The species for which CRM was conducted included all primary and secondary "target" bird species, as defined within the B52WEP bird and bat baseline survey workplan, for which at least one observation occurred during the VP surveys. The list of such species was developed with input from regional bird experts, and was intended to include all potentially high- or moderate- sensitivity bird species that could occur at the site, including all species of raptors and vultures, and all species with any elevated conservation status at the national (Uzbekistan Federal Government 2019) or international (IUCN Red List of Threatened Species) levels. Furthermore, certain target species that were not observed during the VP survey effort were, nonetheless, modeled using a hypothetical scenario in which one individual was observed flying within rotor swept altitudes in the N + 1 hour of survey effort, where N is the number of hours of VP survey effort actually conducted during a given season. The purpose of these modeled hypothetical scenarios was to generate an upper bound collision risk estimate or "worst case" scenario for certain high-sensitivity species, given the observed result of zero observations for such species in the actual VP Survey effort. Finally, we also modeled collision risk for selected non-target species of large-bodied water birds that were observed at least one time during the VP survey effort. The species included within the CRM for the B52WEP are shown in Table 1, along with their national and international conservation status, their Project-specific priority level[3], and the total number of VP survey observations that were included within the CRM analysis for each season[4].

Table 1: Summary of conservation/sensitivity status and numbers of VP survey observations in each season for each bird species included within the Collision Risk Modeling analysis for the Bash 52 MW Wind Energy Project. Conservation/protected status are as follows: EN = Endangered; VU = Vulnerable; NT = Near Threatened; (blank) = Least Concern (IUCN) or not-listed nationally. Color-coding of species' project-sensitivity classification is as follows: pink = tier 1 target species; yellow = tier 2 target species; green = other (non-target) modeled species.

Scientific Name	English Common Name	Uzbek status[5]	IUCN status[6]	VP Observations			
				Spring	Summer	Autumn	Winter
Chlamydotis macqueenii[7]	Houbara Bustard	VU	VU	0 (1)	0 (1)	0 (1)	0 (1)
Neophron percnopterus	Egyptian Vulture	VU	EN	32	29	1	
Clanga clanga	Greater Spotted Eagle	VU	VU				2
Aquila nipalensis	Steppe Eagle	VU	EN	8	5	12	9
Aquila chrysaetos	Golden Eagle	VU		12	2		3
Haliaeetus albicilla	White-tailed Eagle	VU					7
Falco cherrug[8]	Saker Falcon	NT	EN	0 (1)	0 (1)	0 (1)	0 (1)

[3] Project-specific priority levels are defined in the Project's workplan, and are based on consideration of likely susceptibility to wind farm impacts and likelihood of occurrence at the site, as well as national and international conservation (protected) status.

[4] Note that observations that were recorded outside of the maximum reliable observation radius were regarded as "incidental" observations, and were excluded from the analysis.

[5] Uzbekistan Federal Government, 2019. Uzbekistan Red List of Threatened Species

[6] IUCN Red List of Threatened Species, accessed 18 April, 2023

[7] Houbara Bustard was included in the CRM in spite of zero in-flight observations during the VP survey effort because of the high level of Project-specific priority for this species, because this species was observed on the ground on several occasions during the VP surveys, because the species was observed in flight during an incidental observation near the Project site, in the vicinity of Lake Ayakagytma, and because it is known to breed at the Project site. It was modeled under the hypothetical assumption that a single bird was seen flying within rotor swept height during the N+1 hour of VP survey observations in each season, where N = the number of hours of survey effort actually conducted in that season.

[8] Saker Falcon was included in the CRM in spite of zero in-flight observations during the VP survey effort because of the high level of Project-specific priority for this species, and because this species is known to have nested historically in the vicinity of the Project area, recorded nesting

Scientific Name	English Common Name	Uzbek status[5]	IUCN status[6]	VP Observations			
				Spring	Summer	Autumn	Winter
Tetrax tetrax	Little Bustard	VU	NT				1
Grus grus	Common Crane			236		372	
Pelecanus onocrotalus	Great White Pelican	VU				30	
Aegypius monachus	Cinereous Vulture	NT	NT			14	4
Gyps fulvus	Eurasian Griffon	VU		1		1	
Hieraaetus pennatus	Booted Eagle	VU		1			
Circus aeruginosus	Eurasian Marsh-Harrier			18	19	17	3
Circus cyaneus	Hen Harrier			32	18	14	2
Accipiter badius	Shikra			1			
Accipiter nisus	Eurasian Sparrowhawk			10	2		1
Buteo buteo[9]	Common Buzzard					15	11
Buteo rufinus	Long-legged Buzzard			33	14	8	5
Falco naumanni	Lesser Kestrel	NT			20		
Falco tinnunculus	Eurasian Kestrel			15	25	53	13
Cygnus olor	Mute Swan					52	26
Tadorna ferruginea	Ruddy Shelduck				3	35	
Anas strepera	Gadwall					76	
Anas platyrhynchos	Mallard					188	
Anas crecca	Green-winged Teal					7	
Aythya fuligula	Tufted Duck					260	
Phalacrocorax pygmaeus	Pygmy Cormorant				8	24	
Phalacrocorax carbo	Great Cormorant					26	
Nycticorax nycticorax	Black-crowned Night-Heron				34	19	

2 Model Input Data

Data inputs for the CRM analysis were derived from the results of the VP surveys, as well as various additional sources, depending on the type of information needed. Specific sources and pertinent assumptions for each type of input data used in the CRM are described further below.

in the Ayakagytma cliffs as recently as 2011. It was modeled under the hypothetical assumption that a single bird was seen flying within rotor swept height during the N+1 hour of VP survey observations in each season, where N = the number of hours of survey effort actually conducted in that season.

[9] Includes observations assigned to "upland buzzard" and "eastern buzzard," as these forms are sometimes considered conspecific with Common Buzzard.

3 Turbine and wind farm data

Specific physical parameters of the turbines, towers, and wind farm used for the CRM are based on the specifications and layout provided by 5 Capitals Consulting in April, 2023, and are detailed and explained in Table 2.

Table 2: Model input data on physical characteristics of the turbines, towers, and wind farm configuration used in the Collision Risk Modeling for the Bash 52MW Wind Energy Project, along with notes and explanations of each.

Parameter	Value(s) used in Modeling	Explanation
Turbine model	Envision EN 171/6.5	Provided by developer
# blades	3	from manufacturer's specifications
Rotation speed (rpm)	7.5	Representative intermediate value from range provided by developer
Rotor radius (m)	85.5	from manufacturer's specifications
Hub height (m)	100	Provided by developer
Percent of time operational	Monthly values ranging from 63.8% to 84.6%	Project specific data not available, representative values taken from SOSS example
Maximum blade width (m)	4.5	Calculated using proportion of blade length to blade width from similar turbine
Pitch (degrees)	47.5	From manufacturer's specifications
# turbines	8	Provided by developer
latitude	40.6	Approximate midpoint of B52WEP area
Rotor swept altitude range (risk height, m)	14.5-185.5	Based on rotor diameter and hub height

4 Data on Physical and Observational Characteristics of Birds

In addition to bird densities derived from VP survey data, CRM using the Band model requires certain data on the physical and observational characteristics of each modeled species of bird. Input values used in the CRM analysis are presented in Table 3. As a general rule, data on physical dimensions of birds were derived from Cornell Lab of Ornithology's Birds of the World[10], while information specific to the VP survey observations, such as typical flight speeds, flight styles, and maximum effective radius of observation/identification were provided by the local ornithologists, based on their observations at the site and expert judgment.

Table 3: Physical and observational characteristics of each bird species included within the Collision Risk Modeling analysis for the Bash 52MW Wind Energy Project. Color-coding of species' project-sensitivity classification is as follows: pink = tier 1 target species; yellow = tier 2 target species; green = other (non-target) modeled species.

[10] https://birdsoftheworld.org/bow/home, accessed 5-9 August, 2020 and 4-14 January, 2021

Scientific Name	English Common Name	Length (m)	Wingspan (m)	Flight type[11]	Flight speed (m/sec)[12]	Detection distance (km) [13]
Chlamydotis macqueenii	Houbara Bustard	0.65	1.5	flapping	11.10	0.1
Neophron percnopterus	Egyptian Vulture	0.62	1.6	gliding	13.90	2
Clanga clanga	Greater Spotted Eagle	0.65	1.68	Gliding	18.06	0.5
Aquila nipalensis	Steppe Eagle	0.70	1.9	gliding	18.06	0.5
Aquila chrysaetos	Golden Eagle	0.77	2.03	gliding	18.06	0.5
Haliaeetus albicilla	White-tailed Eagle	0.83	2.19	Gliding	16.67	1
Falco cherrug	Saker Falcon	0.51	1.12	flapping	22.20	0.4
Tetrax tetrax	Little Bustard	0.44	1.1	Flapping	11.1	0.3
Grus grus	Common Crane	1.08	1.9	flapping	16.67	0.5
Pelecanus onocrotalus	Great White Pelican	1.56	2.93	flapping	15.60	2
Aegypius monachus	Cinereous Vulture	1.1	2.73	gliding	19.40	1
Gyps fulvus	Eurasian Griffon	1.01	2.52	gliding	19.40	1
Hieraaetus pennatus	Booted Eagle	0.47	1.26	flapping	16.67	0.5
Circus aeruginosus	Eurasian Marsh-Harrier	0.48	1.3	gliding	11.10	0.8
Circus cyaneus	Hen Harrier	0.46	1.1	gliding	11.10	0.5
Accipiter badius	Shikra	0.35	0.58	flapping	19.40	0.3
Accipiter nisus	Eurasian Sparrowhawk	0.34	0.67	flapping	19.40	0.2
Buteo buteo	Common Buzzard	0.46	1.23	gliding	16.70	0.4
Buteo rufinus	Long-legged Buzzard	0.53	1.3	gliding	16.70	0.4
Falco naumanni	Lesser Kestrel	0.31	0.66	flapping	13.90	0.2
Falco tinnunculus	Eurasian Kestrel	0.31	0.68	flapping	13.90	0.2
Cygnus olor	Mute Swan	1.4	2.2	flapping	16.20	2
Tadorna ferruginea	Ruddy Shelduck	0.66	1.3	flapping	22.20	1
Anas strepera	Gadwall	0.52	0.9	flapping	22.20	0.4
Anas platyrhynchos	Mallard	0.58	0.88	flapping	22.20	0.4
Anas crecca	Green-winged Teal	0.37	0.61	flapping	22.20	0.4
Aythya fuligula	Tufted Duck	0.44	0.69	flapping	22.20	0.4
Phalacrocorax pygmaeus	Pygmy Cormorant	0.5	0.85	flapping	15.20	0.5

[11] The model does not permit inclusion of multiple flight styles, hence only the most prevalent flight type was used for each species, based on the observations of A. Atakhodjaev

[12] Estimated for some species by A. Atakhodjaev, based on his observations during the VP survey effort. Some species flight speeds derived from Alerstam et. Al. (2007).

[13] Maximum reliable detection distance estimated for each species by A. Atakhodjaev based on his observations during the VP survey effort, and accounting not only for the distance at which each species could be reliably *observed*, but also the distance at which each species could be reliably *distinguished from other species* (identified)

Scientific Name	English Common Name	Length (m)	Wingspan (m)	Flight type[11]	Flight speed (m/sec)[12]	Detection distance (km) [13]
Phalacrocorax carbo	Great Cormorant	0.9	1.45	flapping	15.20	1
Nycticorax nycticorax	Black-crowned Night-Heron	0.62	1.09	flapping	13.90	0.5

5 VP Survey Data Used to Derive Bird Density

Bird density inputs in CRM analysis represent the density of birds flying within the surveyed area at any given moment in time. These values are calculated based on the observations gathered during the VP surveys, and then further differentiated based on the percent of such flights that occurred within "risk height" equivalent to the range of altitudes swept by the turbines to be installed. The effective survey area is based on the area covered in a single VP survey, but varies among species based on the maximum effective detection radius (Table 3). For tier 1 target species and select tier 2 species, the paths and altitudes of each individual birds' flights were plotted every 15 seconds while the birds were inside of the specified observation radius (up to 2 km from the observer). For these species, the bird density was calculated by dividing the total number of fractional minutes of the birds' presence flying within the specified observation radius, by the total number of minutes of VP survey observation for the period, and then dividing that by the effective survey area, as function of the species-specific maximum reliable detection radius. For observations of most tier 2 target species and "other" species, only a single, representative flight height was recorded for each observation of an individual or flock observed flying within the specified observation radius during the VP surveys. In order to calculate the number of "observation minutes" for such species, we estimated representative observation durations by calculating the time it would take a bird to transit the entire diameter of the surveyed area, defined by species-specific detection distances, at species-specific flight speeds (Table 3). Summaries of the VP survey data used to calculate bird density values in each season are presented in Tables 4-7. Note that these tables show cumulative values for each season, but in the CRM analysis, the data are broken down further by month.

Table 4: Observational data from the Vantage Point surveys used to derive bird density inputs for the spring season Collision Risk Modeling analysis for the Bash 52MW Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 291 hours, or 17,460 minutes of VP survey effort conducted at the Project during the spring season. Color coding of species by project-specific priority level follows that of Tables 1 and 3.

Scientific Name	English Common Name	Number of observations[14]	% at rotor swept height	Total bird minutes	Effective survey area (km^2)
Chlamydotis macqueenii	Houbara Bustard[15]	1	100	0.25	0.0314
Neophron percnopterus	Egyptian Vulture	32	100	80	12.6
Aquila nipalensis	Steppe Eagle	8	100	4	0.785
Aquila chrysaetos	Golden Eagle	12	100	6.25	0.785

[14] Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

[15] Note, this species was not actually observed during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 292nd hour of survey.

Scientific Name	English Common Name	Number of observations[14]	% at rotor swept height	Total bird minutes	Effective survey area (km^2)
Falco cherrug	Saker Falcon[16]	1	100	0.25	0.503
Grus grus	Common Crane	236	47.5	141	0.785
Gyps fulvus	Eurasian Griffon	1	100	1.25	3.14
Hieraaetus pennatus	Booted Eagle	1	100	0.5	0.785
Circus aeruginosus	Eurasian Marsh-Harrier	18	67.3	21.6	2.01
Circus cyaneus	Hen Harrier	32	49.2	24.0	0.785
Accipiter badius	Shikra	1	100	0.258	0.283
Accipiter nisus	Eurasian Sparrowhawk	10	75	1.72	0.126
Buteo rufinus	Long-legged Buzzard	33	92.7	13.2	0.503
Falco tinnunculus	Eurasian Kestrel	15	88.4	3.60	0.126

Table 5: Observational data from the Vantage Point surveys used to derive bird density inputs for the summer season Collision Risk Modeling analysis for the Bash 52MW Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 438 hours, or 26,280 minutes of VP survey effort conducted at the Project during the summer season. Color coding of species by project-specific priority level follows that of Tables 1 and 3.

Scientific Name	English Common Name	Number of observations[17]	% at rotor swept height	Total bird minutes	Effective survey area (km^2)
Chlamydotis macqueenii	Houbara Bustard[18]	1	100	0.25	0.0314
Neophron percnopterus	Egyptian Vulture	29	100	78.8	12.6
Aquila nipalensis	Steppe Eagle	5	100	2.75	0.785
Aquila chrysaetos	Golden Eagle	2	100	1.75	0.785
Falco cherrug	Saker Falcon[19]	1	100	0.25	0.503
Circus aeruginosus	Eurasian Marsh-Harrier	19	67.3	22.8	2.01
Circus cyaneus	Hen Harrier	18	49.2	13.5	0.785
Accipiter nisus	Eurasian Sparrowhawk	2	75	0.344	0.126
Buteo rufinus	Long-legged Buzzard	14	92.7	5.60	0.503
Falco naumanni	Lesser Kestrel	20	76.1	4.80	0.126
Falco tinnunculus	Eurasian Kestrel	25	88.4	6.00	0.126
Tadorna ferruginea	Ruddy Shelduck	3	100	2.25	3.14

[16] Note, this species was not actually observed during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 292nd hour of survey.

[17] Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

[18] Note, this species was not actually observed during the summer VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 439th hour of survey.

[19] Note, this species was not actually observed during the summer VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 439th hour of survey.

Scientific Name	English Common Name	Number of observations[17]	% at rotor swept height	Total bird minutes	Effective survey area (km²)
Phalacrocorax pygmaeus	Pygmy Cormorant	8	25	4.39	0.785
Nycticorax nycticorax	Black-crowned Night-Heron	34	100	20.4	0.785

Table 6: Observational data from the Vantage Point surveys used to derive bird density inputs for the autumn season Collision Risk Modeling analysis for the Bash 52MW Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 366 hours, or 21,960 minutes of VP survey effort conducted at the Project during the autumn season. Color coding of species by project-specific priority level follows that of Tables 1 and 3.

Scientific Name	English Common Name	Number of observations[20]	% at rotor swept height	Total bird minutes	Effective survey area (km²)
Chlamydotis macqueenii	Houbara Bustard[21]	1	100	0.25	0.0314
Aquila nipalensis	Steppe Eagle	12	100	6.75	0.785
Neophron percnopterus	Egyptian Vulture	1	100	2.75	12.6
Falco cherrug	Saker Falcon[22]	1	100	0.25	0.503
Grus grus	Common Crane	372	47.5	186	0.785
Pelecanus onocrotalus	Great White Pelican	30	100	64.1	12.6
Aegypius monachus	Cinereous Vulture	14	100	12.0	3.14
Gyps fulvus	Eurasian Griffon	1	100	0.860	3.14
Circus aeruginosus	Eurasian Marsh-Harrier	17	67.3	20.4	2.01
Circus cyaneus	Hen Harrier	14	49.2	10.5	0.785
Buteo buteo	Common Buzzard	15	100	6.00	0.503
Buteo rufinus	Long-legged Buzzard	8	92.7	6.80	0.503
Falco tinnunculus	Eurasian Kestrel	53	88.4	12.7	0.126
Cygnus olor	Mute Swan	52	100	107	12.6
Tadorna ferruginea	Ruddy Shelduck	35	100	26.3	3.14
Anas strepera	Gadwall	76	100	22.8	0.503
Anas platyrhynchos	Mallard	188	100	56.5	0.503
Anas crecca	Green-winged Teal	7	100	2.10	0.503
Aythya fuligula	Tufted Duck	260	100	78.1	0.503
Phalacrocorax pygmaeus	Pygmy Cormorant	24	25	13.2	0.785

[20] Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

[21] Note, this species was not actually observed during the autumn VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.

[22] Note, this species was not actually observed during the autumn VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.

Scientific Name	English Common Name	Number of observations[20]	% at rotor swept height	Total bird minutes	Effective survey area (km^2)
Phalacrocorax carbo	Great Cormorant	26	100	28.5	3.14
Nycticorax nycticorax	Black-crowned Night-Heron	19	100	11.4	0.785

Table 7: Observational data from the Vantage Point surveys used to derive bird density inputs for the winter season Collision Risk Modeling analysis for the Bash 52MW Wind Energy Project. For all species, the total duration of observations was equivalent to the total of 315 hours, or 18,900 minutes of VP survey effort conducted at the Project during the winter season. Color coding of species by project-specific priority level follows that of Tables 1 and 3.

Scientific Name	English Common Name	Number of observations[23]	% at rotor swept height	Total bird minutes	Effective survey area (km^2)
Chlamydotis macqueenii	Houbara Bustard[24]	1	100	0.25	0.0314
Clanga clanga	Greater Spotted Eagle	2	100	0.923	0.785
Aquila nipalensis	Steppe Eagle	9	91.2	6	0.785
Aquila chrysaetos	Golden Eagle	3	100	2	0.785
Haliaeetus albicilla	White-tailed Eagle	7	85.7	7	3.14
Falco cherrug	Saker Falcon[25]	1	100	0.25	0.503
Tetrax tetrax	Little Bustard	1	100	0.45	0.283
Aegypius monachus	Cinereous Vulture	4	100	4.36	3.14
Circus aeruginosus	Eurasian Marsh-Harrier	3	69.0	3.60	2.01
Circus cyaneus	Hen Harrier	2	48.4	1.50	0.785
Accipiter nisus	Eurasian Sparrowhawk	1	69.2	0.172	0.126
Buteo buteo	Common Buzzard	11	100	4.40	0.503
Buteo rufinus	Long-legged Buzzard	5	93.3	2.00	0.503
Falco tinnunculus	Eurasian Kestrel	13	88.0	3.12	0.126
Cygnus olor	Mute Swan	26	100	53.5	12.6

6 Collision Avoidance Parameter

Published, validated collision avoidance (CA) parameters are not available for most of the target species we modeled at the B52WEP, yet the CA parameter is well-known to be a very important parameter in Band CRM analysis, with outcomes very sensitive to slight variation in CA (Cook et. al., 2012). For each species included within the CRM analysis for the B52WEP, we developed a "most realistic" CA parameter value, bounded by a

[23] Observations of birds that were further from the observer than the maximum detection distance are regarded as incidental observations, and were not included in the CRM analysis

[24] Note, this species was not actually observed within the maximum reliable observation radius during the winter VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 316th hour of survey.

[25] Note, this species was not actually observed during the winter VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 316th hour of survey.

"conservative" low parameter estimate, and a high estimate, reflecting an upper bound, based on a comprehensive review of available literature, interpreted with species- and site-specific information. The values used for each species are presented in Table 8, and then a brief explanation/justification is presented for each species below.

Table 8: Collision avoidance parameters used in the bird Collision Risk Modeling analysis for the Bash 52 MW Wind Energy Project (see text for explanation and justification). Color coding of species by project-specific sensitivity categories follows that of previous tables.

Scientific Name	English Common Name	Lower bound value	Most realistic value	Upper bound value
Chlamydotis macqueenii	Houbara Bustard	0.95	0.99	0.995
Neophron percnopterus	Egyptian Vulture	0.99	0.9958	0.999
Clanga clanga	Greater Spotted Eagle	0.981	0.9958	0.999
Aquila nipalensis	Steppe Eagle	0.981	0.9958	0.999
Aquila chrysaetos	Golden Eagle	0.981	0.9958	0.999
Haliaeetus albicilla	White-tailed Eagle	0.95	0.975	0.99775
Falco cherrug	Saker Falcon	0.995	0.998	0.999
Tetrax tetrax	Little Bustard	0.95	0.99	0.995
Grus grus	Common Crane	0.95	0.99	0.995
Pelecanus onocrotalus	Great White Pelican	0.95	0.99	0.995
Aegypius monachus	Cinereous Vulture	0.98	0.99	0.995
Gyps fulvus	Eurasian Griffon	0.98	0.99	0.995
Hieraaetus pennatus	Booted Eagle	0.981	0.9958	0.999
Circus aeruginosus	Eurasian Marsh-Harrier	0.95	0.99	0.999
Circus cyaneus	Hen Harrier	0.95	0.99	0.999
Accipiter badius	Shikra	0.99	0.995	0.999
Accipiter nisus	Eurasian Sparrowhawk	0.99	0.995	0.999
Buteo buteo	Common Buzzard	0.978	0.995	0.999
Buteo rufinus	Long-legged Buzzard	0.978	0.995	0.999
Falco naumanni	Lesser Kestrel	0.873	0.969	0.999
Falco tinnunculus	Eurasian Kestrel	0.873	0.969	0.999
Cygnus olor	Mute Swan	0.98	0.997	0.998
Tadorna ferruginea	Ruddy Shelduck	0.95	0.99	0.995
Anas strepera	Gadwall	0.95	0.99	0.995
Anas platyrhynchos	Mallard	0.95	0.99	0.995
Anas crecca	Green-winged Teal	0.95	0.99	0.995
Aythya fuligula	Tufted Duck	0.95	0.99	0.995
Phalacrocorax pygmaeus	Pygmy Cormorant	0.95	0.99	0.995
Phalacrocorax carbo	Great Cormorant	0.95	0.99	0.995
Nycticorax nycticorax	Black-crowned Night-Heron	0.95	0.99	0.995

7 Eagles in the genera Aquila, Clanga, and Hieraaetus

The Golden Eagle (*Aquila chrysaetos*) has been the subject of several empirical research studies designed toward the objective of defining the most appropriate Collision Avoidance (CA) parameters for use with this species in modeling its risk of colliding with wind turbines, using the Band CRM. The low bound CA parameter value of 0.981 selected for the present analysis, corresponds to the lowest CA value estimated for Golden Eagles in Whitfield and Madders, 2006a, based on their analysis of data from wind farms in California. This value is likely to be conservative, underestimating the true extent of Golden Eagles' avoidance of collisions with wind turbines,

as Whitfield and Madders (2009) suggested that a CA parameter of 0.99 is "precautionary" for this species. The CA value selected as "most likely" for the present analysis, 0.9958, corresponds to the mean adjusted CA estimate for Golden Eagles at the Altamont Wind Facility in California, USA, presented by Whitfield and Madders (2009), and is very close to the median CA value for this species of 0.995, presented by Whitfield and Madders (2006a), and the value of 0.99 recommended by SNH (2018). The upper bound CA value of 0.999 for Golden Eagles was selected based on the upper bound of 100% CA presented for Golden Eagles by Whitfield and Madders (2006a). No published estimates of CA were available for Steppe Eagle (*Aquila nipalensis*), or Greater Spotted Eagle (*Clanga clanga*) so we used the same CA values for these species as we did for Golden Eagle, based on the similarity of these three similar species in terms of size, shape, behavior, and flight morphology. Although the Booted Eagle (*Hieraaetus pennatus*) is considerably smaller in size, we also used the same CA values for this species, in the absence of published CA estimates specific to Booted Eagles. This choice was justified both based on the generally similar ecology and flight morphology of *Aquila* and *Hieraaetus* eagles, and also based on a similar proportion of wind turbine collision events for Booted Eagles in relation to numbers of flights, and "at risk" flights, in a three-year aggregate dataset from 13 wind farms in northern Spain, discussed in Whitfield and Madders (2006a).

7.1White-tailed Eagle

For the White-tailed Eagle (*Haliaeetus albicilla*), a species whose behavior around, and risk of collisions with wind turbines has been extensively studied at the Smøla Wind Farm in coastal Norway, we used the value of 0.95 CA recommended by SNH (2018) as a lower bound, with values of 0.975 and 0.99775 for the most realistic, and upper bound CA values, respectively, based on empirically derived CA parameter values presented in May et. al. (2011) on the basis of satellite telemetry studies.

7.2 Egyptian Vulture

No published CA values were available for this species. However, the aggregate dataset from northern Spain discussed in Whitfield and Madders (2006a) indicates that this species has a strong tendency to avoid collisions with wind turbines, as zero collisions were detected in datasets containing 134 observations of Egyptian Vultures at wind farms, including 30 "at risk" flights. Based on this evidence, and the overall similar size and flight morphology between Egyptian Vulture and *Aquila* eagles, we applied the same CA values for Egyptian Vulture as we did for the *Aquila* eagles, with the exception of applying the slightly higher lower bound value of 0.99, described as a "precautionary" CA value for Golden Eagles by Whitfield and Madders (2009).

7.3 Eurasian Griffon and Cinereous Vulture

To represent the CA values for these two closely-related, morphologically and ecologically similar species, we used a range of values following the recommendations of Vasilakis et. al. (2016), who generated empirically-based estimates of 0.99 and 0.995 CA parameters for Cinereous Vulture in a study comparing flight behaviors and wind farm collision fatality rates at wind farms in eastern Mediterranean Europe. We used these two values as the median and upper bound CA values, respectively for these two species. Vasilakis et. al. (2016) also suggested that the CA value for Cinereous Vulture could be as low as 0.98 taking into account potential sources of error and uncertainty in their analysis, hence we used this as our lower bound CA parameter value for these two vulture species.

7.4 Saker Falcon

No published CA values were available for this species. To fill this gap, we used values empirically derived by Whitfield and Madders (2006a) for the ecologically similar congeneric species, Prairie Falcon (*Falco mexicanus*), with 0.995 representing the low bound, 0.998 representing the median CA value, and 0.999 substituted for 1 (100% avoidance) as the upper bound.

7.5 Eurasian and Lesser Kestrels

We represented these two kestrel species in the model using a range of CA values developed for the congeneric American Kestrel (*Falco sparverius*) based on the analysis of Whitfield and Madders (2006a), with 0.873 representing the lower bound CA value, 0.969 representing the median value (close to the value of 0.95 recommended for kestrels by SNH [2018], and 0.999 substituted for 1 (100% avoidance), as the upper bound CA value.

7.6 Harriers (genus Circus)

We used published CA values empirically derived for the Hen Harrier (*Circus cyaneus*) to represent the collision avoidance tendencies of both of the *Circus* species observed during the spring VP surveys at the B52WEP. In their review of wind farm impacts to Hen Harriers, Whitfield and Madders (2006b) concluded that a CA value of 0.95, used by some authors for this species, was "too low," suggesting that a value of 0.99 was "more realistic." Accordingly, we used the value of 0.95 as a lower bound CA value, and 0.99 as our most likely value, also noting that SNH (2018) recommends using a value of 0.99 for Hen Harrier. We used a CA value of 0.999 as the upper bound for modeling harrier collision risk in our analysis, corresponding to the median CA value for *Circus cyaneus* presented in Whitfield and Madders (2006a).

7.7 Hawks in the genus, Accipiter

No published CA values were available for either of the species in this genus that were recorded during the spring VP surveys at the B52WEP. For the purpose of the modeling effort, we based our hypothesized CA values for these species on very limited data on susceptibility of *Accipiter* species (including *Accipiter nisus*) to wind farm collisions presented in Whitfield and Madders (2006a), as well as the results of Garvin et al. (2011), which indicated a very strong tendency for *Accipiter* hawks to avoid collisions with wind turbines (100% avoidance), selecting CA values of 0.99, 0.995, and 0.999 to represent the low bound, most likely, and upper bound parameter estimates, respectively, for both of the *Accipiter* species we modeled.

7.8 Long-legged and Common Buzzards

No published CA values were available for these two species, hence we relied on CA values empirically derived for a congener, the Red-tailed Hawk (*Buteo jamaicensis*) by Whitfield and Madders (2006a), as follows: lower bound – 0.978; median value (or "most likely" in our analysis) – 0.995; upper bound – 0.999 (substituted for the value of 1, or 100% avoidance, presented as the upper bound CA value by Whitfield and Madders [2006a]).

7.9 Bustards, Cranes, Ducks, Cormorants, and Herons

No published CA values were available for the species included within our analysis, hence we based our hypothesized CA values for these species on the recommendations of Cook et. al. (2012), who suggested using 0.95, 0.99, and 0.995 as a range of CA values to represent species for which no species-specific information is available, which is generally consistent with the 2018 SNH recommendation to use a value of 0.98 for species whose CA parameters have not been empirically characterized. We note that all of these birds are large-bodied birds, and that this set of CA values is generally similar to, and a bit conservative in relation to CA values that have been empirically derived for a variety of morphologically similar species, such as swans, geese, and cormorants (Cook et. al. 2012).

7.10 Mute Swan

To represent the CA value of Mute Swan, we used published CA values from a study of wind turbine collision avoidance in Bewick's Swans (Whitfield and Urquhart 2015) to represent the most realistic and upper bound values (0.997 and 0.998, respectively), with a lower bound value of 0.98 deriving from results for Whooper Swans, presented in SNH (2010). This range encompasses, and is generally consistent with the SNH (2018) recommendation to use a value of 0.995 for swans.

8 Results and Conclusions

The results of the CRM analysis for the B52WEP are summarized in Tables 9-13. Tables 9-12 present each of the single season CRM results for each modeled species, and Table 13 presents the cumulative collision risk predictions of the CRM analysis for the entire, 12-month survey period. The cumulative results were generated by adding the values for the four seasons together for each species, hence preserving the natural between-season variation in risky flight behavior deriving from the empirical data.

Overall, the results of the CRM analysis indicate that the B52WEP has a low level of collision risk for sensitive bird species. No tier 1 target bird species are predicted to experience an annual collision frequency greater than one fatality per 47 years under the empirically-based, most likely collision avoidance rate scenarios modeled (Table 13). Three tier 2 target species were predicted to experience greater than one fatality per 10 years (Eurasian Kestrel – 0.739 collisions/year; Common Crane – 0.226 collisions/year; Lesser Kestrel 0.133 collisions/year) under the most realistic collision avoidance rate scenarios modeled (Table 13). Additional collision rates above 1 per 10 years were predicted for some tier 1 and tier 2 target species under hypothetical, or most conservative collision avoidance scenarios modeled, as well as for some non-target bird species that were modeled, but no species were predicted to have collision rates greater than 1/year under the most realistic collision risk scenarios. More detailed discussions of bird collision risk for species in each of the Project's sensitivity categories are presented below.

8.1 Collision Risk in Tier 1 Target Species

The CRM analysis predicts that none of the tier 1 target species are likely to experience collision frequencies greater than 1 per 47 years (Steppe Eagle, Table 13), based on the CRM results for empirical scenarios using the most likely CA parameter values. *At this level of predicted collision risk, we conclude that the B52WEP has a low likelihood of generating severe, or population-level impacts to any of these species*. However, we note that predicted fatality rates greater than one fatality per 100 years (Egyptian Vulture, White-tailed Eagle) or per 131 years (Golden Eagle, Table 13) may be considered a significant concern, particularly for slow-reproducing, highly sensitive species that are known to be, or suspected of being susceptible to collisions with wind turbines, such as the three species named above. The strength and certainty of this conclusion are limited by the uncertainties inherent in predicting bird fatality rates using CRM, compounded in this case by the fact that species-specific CA parameter values have not been published for most of the high sensitivity bird species that could occur within the B52WEP area.

For Houbara Bustard, the modeled scenario with the most likely CA parameter predicted a collision rate of 0.124 collisions per year, or one collision roughly every 8 years. However, it is important to note that this modeled scenario was based on hypothetical observations. In the actual VP data set, no observations of flying Houbara Bustards were recorded within the maximum reliable observation radius, hence the actual modeled collision risk for Houbara Bustard based on the empirical data set is zero. The hypothetical scenario modeled for this species (one observation of a single bird flying for 15 seconds within rotor swept height in the N+1 hour of observation in each season, where N is the number of hours of VP survey actually conducted in each season) was included to provide an upper bound to possible collision risk for this species, given the strength of the sampling effort in the VP survey data set. To illustrate this point with another hypothetical example, if zero observations of a species had been recorded for a species, but only one hour of VP survey effort had been conducted, then the addition of one observation in the N+1 hour of survey effort would lead to a prediction of a very high collision rate, indicating that the actual data set, while predicting zero fatalities, does not eliminate the possibility of high collision risk for the species. It is interesting to note that there is a large difference between the predicted collision rates for the Houbara Bustard and Saker Falcon, the other tier 1 target species that was not actually observed during the VP survey effort, but was modeled under the same hypothetical scenario. The model predicted a much higher collision rate for the former than for the latter with identical survey effort, and identical sets of (4) hypothetical observations. This difference illustrates the importance of the other model inputs, including the CA parameter,

flight speed, effective survey area, body length, and wingspan, most of which increase the overall collision susceptibility of the bustard in relation to the falcon. In the end, although both of these tier 1 target species are known to occur in the Project area or vicinity, hence collision risk must be regarded to be greater than zero, the results of the hypothetical scenarios modeled indicate that the 1410-hour VP survey effort was substantial enough to provide a positive indication that collision risk is truly very low for Saker Falcon, and reasonably low for Houbara Bustard, as well.

Among tier 1 target species that were documented during the VP surveys, Greater Spotted Eagle, Steppe Eagle, Golden Eagle, White-tailed Eagle, and Egyptian Vulture, the CRM predicted fatality rates ranging from one per 47 years (Steppe Eagle) to one per 819 years (Greater Spotted Eagle), under the most realistic CA parameter values, suggesting that collision risk is low for all of these species. Under the most conservative modeled scenarios, the CRM predicts that collision rates could be as high as 0.0945 collisions per year, equivalent to one fatalities roughly every 10 years (Steppe Eagle, Table 13). Though these predicted fatality levels suggest that collision risk is low for all tier 1 target species, the substantial numbers of observations of four tier 1 species at the Project site (Egyptian Vulture, Steppe Eagle, Golden Eagle, White-tailed Eagle, Table 1), as well as the known susceptibility of Golden Eagles to collisions with wind turbines (AWWI 2019), and the presumed susceptibility of the other eagle species, based on their similar size, flight morphology, and behavior, indicate that potential impacts to these species should be considered an important risk factor to be monitored and managed for the Project. It is also worth noting that the effective survey area modeled for Egyptian Vulture was roughly 16x larger than it was for Steppe Eagle and Golden Eagle (Tables 4-7) based on the maximum reliable observation (and identification) radius of 2km for Egyptian Vulture, compared with 0.5 km for these two eagle species, reported by the local ornithologist who performed the surveys. This difference had the effect of neutralizing the effect of the considerably larger number of observations of Egyptian Vultures (62 observations) compared with Steppe Eagle (34 observations) or Golden Eagle (17 observations, Table 1). While we do not discount the difference in maximum observation radius among these species reported by the local ornithologist, we note that in light of the inherent residual uncertainty in CRM, the raw observational data (Table 1) contains an indication that of the tier 1 target species, Egyptian Vultures are the most prevalent in the area during the Spring through Fall seasons, the most likely to be breeding within the vicinity of the Project area, and potentially the most likely to be impacted by the Project.

8.2 Collision Risk in Tier 2 Target Species

For tier 2 target species, the CRM analysis predicts collision rates of 0.739 Eurasian Kestrel fatalities/year, 0.226 Common Crane fatalities/year, and 0.133 Lesser Kestrel fatalities/year (Table 13), with predicted fatality rates below one per 10 years for all other tier 2 target species under the most realistic collision avoidance scenarios modeled (Table 13). *At this level of predicted collision risk, the B52WEP does not raise a concern about potentially severe, or population-level impacts to any of these species*. It should be noted that although classified as tier 2 target species, the upper bounds of predicted impacts to Common Cranes or Eurasian Kestrels would not represent a significant conservation concern or serious impact of concern for the Project, as both of these species are very abundant, widespread species with very large global populations, and neither is classified with an elevated protected/conservation status at either the national or international levels. Nonetheless, we note that the predicted collision rates for tier 2 target species, as with tier 1 species, could be viewed as a concern. Furthermore, for both tier 1 and tier 2 species, the conclusion of low collision risk resulting from the present analysis must be tempered by acknowledgment of the inherent limitations and uncertainties of predicting collision fatality rates using CRM, compounded in this case by a lack of published CA parameter value estimates for most of the species modeled. For this reason, the possibility that some target species could experience concerning levels of collision fatality from the Project cannot be eliminated, and should be monitored and verified through operations-phase fatality monitoring. We also note that some species classified as tier 2 target species, including Cinereous Vulture, Eurasian Griffon, and Booted Eagle, have elevated conservation/protected status at the national and/or international levels (Table 1), and all pertain to taxonomic groups with known susceptibility

to wind turbine collisions, hence they could be considered at a similar level of priority to the species presently classified as tier 1 target species. Of these three species, the highest predicted fatality rate was for Cinereous Vulture, with a prediction of one collision every 84 years under the most realistic collision avoidance rate scenario (Table 13), while the other two species were very rare, with predicted fatality rates of one per 1500 years or rarer (Table 13).

8.3 Collision Risk in Other Species

For other (non-target) modeled bird species, the CRM analysis predicts collision rates of 0.269 collisions per year for Mallard, 0.218 per year for Tufted Duck, 0.0950 per year for Gadwall, and 0.102 per year for Black-crowned Night-Heron, using the most realistic CA parameter values (Table 13). These four species are all very abundant, widespread species with large global and national populations, and no elevated conservation/protected status at national or international levels, hence these predicted collision rates do not raise a serious conservation concern or risk issue. Predicted collision rates for all other species under most realistic CA scenarios are below one per 60 years (Table 13). *At this level of predicted collision risk, the B52WEP does not raise significant concerns for potential impacts to any of these species*. As with collision rate predictions for target species, it must be noted here that the collision rates predicted for the non-target species we included within our analysis are subject to the uncertainties inherent to the enterprise of predicting collision risk using CRM. The predictions of low risk should be validated through operations-phase fatality monitoring, as very little is currently known about the susceptibility of birds to wind turbine collisions in Uzbekistan, and as fatalities to any species could constitute a significant risk issue if fatality rates are high enough.

Table 9: Estimated rates of collisions per spring season for bird species at the Bash 52MW Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision
Houbara Bustard[26]	0.256	3	0.0511	19	0.0256	39
Egyptian Vulture	0.0154	64	0.00699	143	0.00154	649
Steppe Eagle	0.0261	38	0.00577	173	0.00138	724
Golden Eagle	0.0181	55	0.00402	248	0.000960	1040
Saker Falcon[27]	0.00172	581	0.000691	1440	0.000345	2890
Common Crane	0.490	2	0.0978	10	0.0490	20
Eurasian Griffon	0.000729	1370	0.000365	2730	0.000182	5490
Booted Eagle	0.00243	411	0.000537	1860	0.000128	7810
Eurasian Marsh-Harrier	0.0728	13	0.0146	68	0.00146	684
Hen Harrier	0.122	8	0.0243	41	0.00244	409

[26] Note, this species was not actually observed in flight during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 292nd hour of survey.
[27] Note, this species was not actually observed during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 292nd hour of survey.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision	Collisions/ spring	Years to 1 spring collision
Shikra	0.000936	1060	0.000468	2130	0.0000936	10600
Eurasian Sparrowhawk	0.0225	44	0.0112	89	0.00225	444
Long-legged Buzzard	0.0987	10	0.0225	44	0.00451	221
Eurasian Kestrel	0.460	2	0.112	8	0.00357	280

Table 10: Estimated rates of collisions per summer season for bird species at the Bash 52MW Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ summer	Years to 1 summer collision	Collisions/ summer	Years to 1 summer collision	Collisions/ summer	Years to 1 summer collision
Houbara Bustard[28]	0.0632	15	0.0126	79	0.00631	158
Egyptian Vulture	0.0104	96	0.00441	226	0.00104	961
Steppe Eagle	0.0126	79	0.00277	361	0.000659	1510
Golden Eagle	0.00543	184	0.00121	826	0.000286	3490
Saker Falcon[29]	0.000427	2340	0.000170	5880	0.0000851	11700
Eurasian Marsh-Harrier	0.0559	17	0.0112	89	0.00112	892
Hen Harrier	0.0501	19	0.0101	99	0.00101	990
Eurasian Sparrowhawk	0.00227	440	0.00112	892	0.000226	4420
Long-legged Buzzard	0.0429	23	0.00978	102	0.00194	515
Lesser Kestrel	0.528	1	0.129	7	0.00415	240
Eurasian Kestrel	0.928	1	0.227	4	0.00730	136
Ruddy Shelduck	0.00484	206	0.000969	1030	0.000484	2060

[28] Note, this species was not actually observed in flight during the summer VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 439th hour of survey.
[29] Note, this species was not actually observed during the summer VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 439th hour of survey.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ summer	Years to 1 summer collision	Collisions/ summer	Years to 1 summer collision	Collisions/ summer	Years to 1 summer collision
Pygmy Cormorant	0.0113	88	0.00228	438	0.00113	884
Black-crowned Night-Heron	0.349	2	0.0698	14	0.0349	28

Table 11: Estimated rates of collisions per autumn season for bird species at the Bash 52MW Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ autumn	Years to 1 autumn collision	Collisions/ autumn	Years to 1 autumn collision	Collisions/ autumn	Years to 1 autumn collision
Houbara Bustard[30]	0.146	6	0.0292	34	0.0146	68
Egyptian Vulture	0.000197	5070	0.0000829	12000	0.0000198	50500
Steppe Eagle	0.0205	48	0.00451	221	0.00107	934
Saker Falcon[31]	0.000987	1010	0.000393	2540	0.000196	5100
Common Crane	0.637	1	0.127	7	0.0709	14
Great White Pelican	0.0711	14	0.0142	70	0.00791	126
Cinereous Vulture	0.0143	69	0.00714	140	0.00143	699
Eurasian Griffon	0.000603	1650	0.000301	3320	0.000151	6620
Eurasian Marsh-Harrier	0.0417	23	0.00836	119	0.000836	1190
Hen Harrier	0.0346	28	0.00694	144	0.000695	1430
Common Buzzard	0.0440	22	0.00998	100	0.00200	500

[30] Note, this species was not actually observed in flight during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.
[31] Note, this species was not actually observed during the autumn VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ autumn	Years to 1 autumn collision	Collisions/ autumn	Years to 1 autumn collision	Collisions/ autumn	Years to 1 autumn collision
Long-legged Buzzard	0.0163	61	0.00370	270	0.000740	1350
Eurasian Kestrel	1.66	<1	0.404	2	0.0131	76
Mute Swan	0.0483	20	0.00723	138	0.00483	207
Ruddy Shelduck	0.0696	14	0.0139	71	0.00696	143
Gadwall	0.476	2	0.106	9	0.0476	21
Mallard	1.35	<1	0.269	3	0.135	7
Green-winged Teal	0.0285	35	0.00568	176	0.00285	350
Tufted Duck	1.09	<1	0.218	4	0.109	9
Pygmy Cormorant	0.0232	43	0.00464	215	0.00232	431
Great Cormorant	0.0718	13	0.0143	69	0.00719	139
Black-crowned Night-Heron	0.165	6	0.0329	30	0.0164	60

Table 12: Estimated rates of collisions per winter season for bird species at the Bash 52MW Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ winter	Years to 1 winter collision	Collisions/ winter	Years to 1 winter collision	Collisions/ winter	Years to 1 winter collision
Houbara Bustard[32]	0.118	8	0.0236	42	0.0118	84
Greater Spotted Eagle	0.00550	181	0.00122	819	0.000290	3440
Steppe Eagle	0.0309	32	0.00683	146	0.00163	613
Golden Eagle	0.00894	111	0.00197	507	0.000471	2120

[32] Note, this species was not actually observed in flight during the spring VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.

English Common Name	Using lower bound CA value		Using most realistic CA value		Using upper bound CA value	
	Collisions/ winter	Years to 1 winter collision	Collisions/ winter	Years to 1 winter collision	Collisions/ winter	Years to 1 winter collision
White-tailed Eagle	0.0235	42	0.0117	85	0.00105	952
Saker Falcon[33]	0.000795	1250	0.000318	3140	0.000159	6280
Little Bustard	0.0216	46	0.00430	232	0.00216	462
Cinereous Vulture	0.00863	115	0.00431	232	0.00216	462
Eurasian Marsh-Harrier	0.0117	85	0.00261	383	0.000234	4270
Hen Harrier	0.0124	80	0.00247	404	0.000247	4040
Eurasian Sparrowhawk	0.00261	383	0.00131	763	0.000261	3830
Common Buzzard	0.0371	26	0.00844	118	0.00169	591
Long-legged Buzzard	0.0173	57	0.00394	253	0.000788	1260
Eurasian Kestrel	0.590	1	0.144	6	0.00465	215
Mute Swan	0.0234	42	0.00350	285	0.00234	427

Table 13: Estimated rates of collisions per year (12-months) for bird species at the Bash 52MW Wind Energy Project, predicted by Band Collision Risk Modeling analysis, under a range of Collision Avoidance (CA) parameter values (see Tables 9-12 for predicted seasonal collision rates; see Table 8 for specific CA values for each species, and see text for explanation and justification of each). Color coding of species by project-specific sensitivity level follows that of other tables.

English Common Name	Using lower bound CA values for each season		Using most realistic CA values for each season		Using upper bound CA values for each season	
	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision
Houbara Bustard[34]	0.619	1	0.124	8	0.0619	16
Egyptian Vulture	0.0260	38	0.0103	97	0.00260	384

[33] Note, this species was not actually observed during the autumn VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the 367th hour of survey.

[34] Note, this species was not actually observed in flight within the maximum reliable observation radius during the VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the final hour of survey in each of the four seasons.

English Common Name	Using lower bound CA values for each season		Using most realistic CA values for each season		Using upper bound CA values for each season	
	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision
Greater Spotted Eagle	0.00550	181	0.00122	819	0.000290	3440
Steppe Eagle	0.0945	10	0.0209	47	0.00497	201
Golden Eagle	0.0343	29	0.00760	131	0.00181	552
White-tailed Eagle	0.0235	42	0.0117	85	0.00105	952
Saker Falcon[35]	0.00417	239	0.00167	598	0.000833	1200
Little Bustard	0.0216	46	0.00430	232	0.00216	462
Common Crane	1.12	<1	0.226	4	0.112	8
Great White Pelican	0.0711	14	0.0142	70	0.00715	139
Cinereous Vulture	0.0240	41	0.0119	84	0.00370	270
Eurasian Griffon	0.00133	751	0.000666	1500	0.000333	3000
Booted Eagle	0.00243	411	0.000537	1860	0.000128	7810
Eurasian Marsh-Harrier	0.195	5	0.0391	25	0.00391	255
Hen Harrier	0.235	4	0.0470	21	0.00470	212
Shikra	0.000936	1060	0.000468	2130	0.0000936	10600
Eurasian Sparrowhawk	0.0293	34	0.0146	68	0.00293	341
Common Buzzard	0.0844	11	0.0191	52	0.00384	260
Long-legged Buzzard	0.187	5	0.0426	23	0.00853	117
Lesser Kestrel	0.542	1	0.133	7	0.00426	234
Eurasian Kestrel	3.87	<1	0.739	1	0.0305	32
Mute Swan	0.0753	13	0.0113	88	0.00753	132
Ruddy Shelduck	0.0745	13	0.0149	67	0.00745	134
Gadwall	0.476	2	0.0950	10	0.0476	21
Mallard	1.35	<1	0.269	3	0.135	7
Green-winged Teal	0.0285	35	0.00568	176	0.00283	353
Tufted Duck	1.09	<1	0.218	4	0.109	9
Pygmy Cormorant	0.0345	28	0.00692	144	0.00338	295
Great Cormorant	0.0718	13	0.0144	69	0.00719	139

[35] Note, this species was not actually observed in flight within the maximum reliable observation radius during the VP surveys, but in order to characterize a "worst case" scenario, we modeled a hypothetical scenario in which a single bird is observed for 15 seconds, flying at rotor swept height during the final hour of survey in each of the four seasons.

English Common Name	Using lower bound CA values for each season		Using most realistic CA values for each season		Using upper bound CA values for each season	
	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision	Collisions/ year	Years to 1 collision
Black-crowned Night-Heron	0.419	2	0.102	9	0.0513	19

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APPENDIX D – NOISE MODELLING ASSESSMENT REPORT

Green Hydrogen 100MW Wind Farm, Bash, Uzbekistan

Noise Assessment

July 2023

Green Hydrogen 100MW Wind Farm, Bash, Uzbekistan

Noise Assessment

Revision	Date	Notes	Author	Checked	Approved
Ver. 7	28-07-23	E3535	Sunil Patel 	Nick Davey 	Nick Davey 

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CONTENTS **PAGE**

1	Introduction	1
2	Noise Assessment Criteria	2
3	Noise Surveys	6
4	Noise Assessment	12
5	Conclusions	18

APPENDIX A – Introduction to Noise 19
APPENDIX B – Wind Farm Layout 21
APPENDIX C – Noise Maps 25

1 INTRODUCTION

1.1 ACWA Power in partnership with Uzkimyosanoat (UKS), the national holding company for chemicals in Uzbekistan, is to produce green hydrogen with the use of renewable energy as part of Uzbekistan's commitment to decarbonisation. The proposals promote the use of 15 wind turbines within the consented Bash 500 MW Wind Farm. However, only eight of the proposed fifteen wind turbines will be commissioned and installed. The project will then have the capacity to generate an additional 100MW.

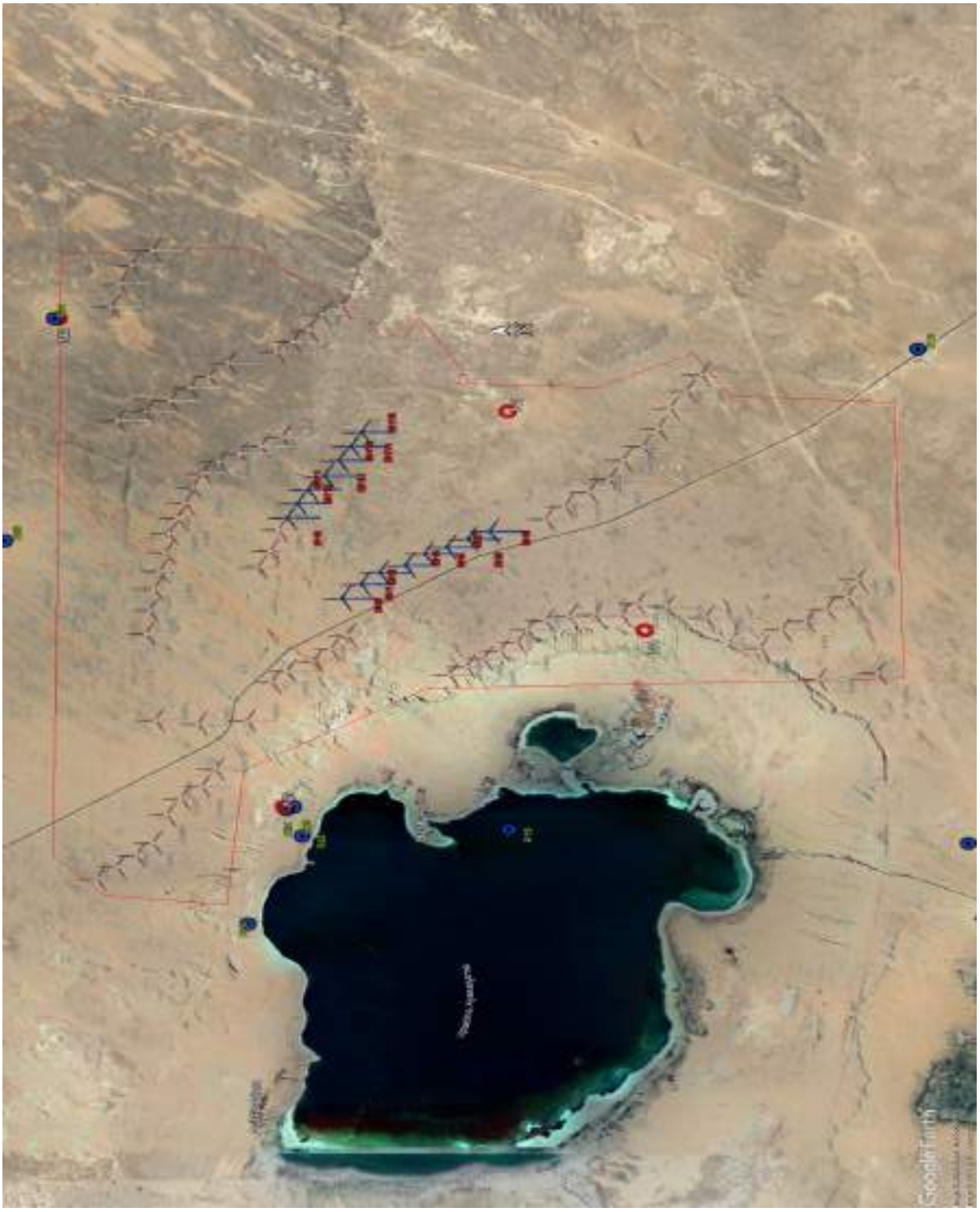
1.2 Entran Ltd have been commissioned to provide a noise assessment for the additional 15 wind turbines as well as the cumulative effects for the project. This report considers the worst-case scenario of fifteen wind turbines of which only eight turbines will be installed. The project site is in the Gijduvon district of the Bukhara region of Uzbekistan. This report presents the results of the noise model constructed to identify potential effects at nearby noise sensitive receptors for both the 15-turbine project as well as the consented scheme.

1.3 This noise assessment has been undertaken in accordance with the World Bank Group/International Finance Corporation's (IFC) environmental guidelines on Wind Energy projects.

1.4 The project, in addition to consented 79 wind turbines, will comprise, for the purposes of this assessment, 15 Envision EN171 (6.5MW) turbines and ancillary equipment. The general site location is presented in Figure 1 and the receptors are presented in Table 1.1. It is noted that herders who used to graze within the project boundaries were relocated and compensated under the Bash 500MW WF Resettlement Action Plan.

1.5 This Report is necessarily technical in nature and contains terminology relating to acoustics and noise. Therefore, a glossary together with a brief introduction to the subject of noise has been provided in Appendix A.

Figure 1 Bash Wind Farm Project, Locations of new Wind Turbines (red labels), noise survey locations and Receptors



1.6 For the purposes of this study all nearby human settlements and ecological sites that are considered to be noise sensitive as shown in Table 1.1.

Table 1.1 Identification of Sensitive Receptors

Receptor	Location WGS84 (Zone41N) UTM	Nearest Green Hydrogen WTG	Distance to Nearest WTG, m	Ground height at receptor, m	Description
R12	647529.2, 4488617.6	BH6	10654	263	Kuklam Village
R15	633497.1, 497330.4	BH3	7524	155	Ecological Use, Lake Ayakagitma
R22	648054.6,4507580.7	BH11	7594	271	Residential use by herders (just outside project site)
R23	641626.9,4508563.8	BH9	6425	256	Residential use by herders
R24	633986.1,4502241.9	BH3	6235	185	Residential use by herders
R25	633224.3,4501879.8	BH3	6924	159	Residential accommodation by fishermen at Lake Ayakagitma
R28	630664.3,4503025.3	BH3	9648	168	Ecological Use (water-well for livestock)
R29	634069.3,4502084.4	BH3	6122	179	Ecological Use (water-well for livestock)
R30	633302, 4487227	BH6	13717	221	Residential use by herders

2 NOISE ASSESSMENT CRITERIA

World Bank Group/International Finance Corporation

2.1 The Environmental, Health and Safety' Guidelines for Wind Energy (2015) sets the following screening criteria for wind farms:

> *"Preliminary modelling should be carried out to determine whether more detailed investigation is warranted. The preliminary modelling can be as simple as assuming hemispherical propagation (i.e., the radiation of sound, in all directions, from a source point). Preliminary modelling should focus on sensitive receptors within 2,000 meters of any of the turbines in a wind energy facility."*
>
> *"If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an* ***LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m height*** *during day and night times, then this preliminary modelling is likely to be sufficient to assess noise impact; otherwise it is recommended that more detailed modelling be carried out, which may include background ambient noise measurements.".*

2.2 The EHS Guidelines for Wind Energy (2015) do not provide a noise limit other than the screening limit and therefore the general IFC guidance has be applied in common with other such projects.

2.3 The IFC / World Bank Environmental, Health, and Safety General Guideline (1.7 Noise (2007) is therefore applied for the Bash Wind Farm project and presented below in Table 2.1.

Table 2.1 IFC/World Bank Group Noise Level Guideline (adopted from WHO guidance)

Receptor	$L_{Aeq,T}$ (dB)	
	Daytime 07:00 – 22:00	Night time 22:00 – 07:00
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

2.4 The above guideline values are expressed in terms of $L_{Aeq,T}$ and for the comparison with the $L_{A90,T}$ parameter used for the preliminary assessment, a correction of -2 dB has to be applied (the limit for residential use is therefore 53 dB $L_{A90,T}$ during the day and 43 dB $L_{A90,T}$ during the night).

2.5 The above noise limits can be revised to allow for a 5 dB increase over ambient noise levels in the following manner:

- Daytime: The higher of 53 dB(A) or 5 dB(A) above the prevailing day-time background noise level;
- Night-time: The higher of 43 dB(A) or 5 dB(A) above the prevailing night-time background noise level. Good practice is not to normally exceed the absolute noise criteria or the background noise level.

Uzbekistan National Standards

2.6 Given the proximity of the nearby communities, it is expected that the applicable residential standards will be applicable to the Project. SanPiN No. 0339-16 “Sanitary rules and norms of planning and development of settlements of Uzbekistan provides criteria for noise levels at residential areas.

2.7 The guideline criteria for residential areas are set out in Table 2.2 below.

Table 2.2 National Noise Standards

Receptor	Uzbekistan, SanPiN No. 0325-16.	
	Daytime (07:00 to 23:00) $L_{Aeq,T}$ dB	Night-time (23:00 to 07:00) $L_{Aeq,T}$ dB
Residential, institutional, educational	55	45
Industry, commercial	75	70

2.8 For sensitive locations (e.g., residential use buildings), the noise limits for the Uzbekistan's National guidance are the same as the IFC guidance.

2.9 The above guideline values are expressed in terms of $L_{Aeq,T}$ and for the comparison with the $L_{A90,T}$ parameter used for the preliminary assessment, a correction of -2 dB has to be applied.

2.10 The calculation methodology for assessment purposes is outlined in International Standard ISO 9613-2:1996 ('Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation'). The standard specifies an engineering method for calculating noise at a known distance from a variety of sources under meteorological conditions favourable to sound propagation. The standard defines favourable conditions for light downwind propagation where the wind blows from all the turbines to the receiver(s) within an angle of +/-45 degrees from a line connecting each turbine to each receiver, at wind speeds between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground. Equivalently, the method accounts for average propagation under a well-developed moderate ground based thermal inversion. In this respect, it is noted that at the wind speeds relevant to noise levels from wind turbines, atmospheric conditions do not favour the development of thermal inversions throughout the propagation path from the source to the receiver.

2.11 The general calculation method considers the following attenuation corrections:

- Geometric divergence
- Air absorption
- Reflecting obstacles
- Screening
- Vegetation
- Ground reflections

2.12 Attenuation due to the above factors is applied to the sound power levels of the noise sources to derive the resulting noise levels at the receptors.

2.13 Wind turbines are sound sources with special characteristics, such as wind speed dependent sound power levels, high source heights etc., which require special considerations. These parameter adjustments are chosen in combination (see Table 2.3) to give a more reliable calculation methodology.

Table 2.3 ISO9613 Parameters used in the Preliminary Noise Assessment.

Calculation Parameter ISO 9613	Observation
Agr = -3 (Geometrical divergence)	Normal correction for wind farms
Cmet = 0 (Metrological corrections)	Normal correction for wind farms (downwind propagation)
Terrain obstacles correction = 0 (site specific)	Normal correction for wind farms (site specific for a worst-case assessment)
Temperature = 10^0 C; Relative Humidity = 70%	Normal correction for a worst-case assessment for sound propagation.
Correction of results from $L_{Aeq,T}$ to $L_{A90,T}$ by -2dB.	Normal correction in the UK and some other countries but not universally applied by all countries.
For propagation of turbine sound to a receptor across a valley with a concave profile, a correction of +3 dB must be applied.	Normal correction for wind farms.
Ground Absorption Factor, G=0.5	The normal correction for wind farms in the UK, Germany, NZ and Australia is G=0.5.

3 NOISE SURVEYS

3.1 Noise surveys were undertaken for the Bash 500MW project and are utilised here for the Green Hydrogen associated turbines. As mentioned earlier in this report, criteria based upon the ambient noise levels at reference speeds (e.g. 10 m/s at 10m) are routinely applied with an allowance of 5 dB above the prevailing noise level or the criteria presented in Tables 2.1 and 2.2 (whichever is the highest).

3.2 Background noise monitoring was conducted by contractors employed by 5C Limited at four proxy locations (N1 to N4) in lieu of the human settlements/ecological sites shown in Figure 1. The monitoring survey duration was between 10th August 2021 and 9th September 2021. Survey details are published elsewhere. Ten-minute intervals were recorded, with the $L_{A90,10min}$ readings synchronised with the site's wind mast data to determine background noise levels.

3.3 It is understood that all acoustic measurement equipment used during the noise surveys conformed to Type 1 specification of British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications.* The noise measurement equipment used during the surveys were calibrated at the start and end of the measurement period. No significant drift in calibration was found to have occurred on the sound level meter.

3.4 The regression analysis of the monitored noise levels is presented below (for a standardised wind speed at 10m/s and a height of 10m). As observed over the course of the monitoring survey, it was evident that there was, apart from wind noise, an absence of any other significant noise source(s). Therefore, to gather sufficient data for the regression analysis, daytime and evening periods were aggregated to the period 0700 to 2300 hrs (as per the adopted criteria). The night-time period remains between 2300 to 0700 hrs.

3.5 The regression analysis is presented below in Figures 3.1 to 3.8.

Figure 3.1 Daytime Noise Levels for Survey Location N1

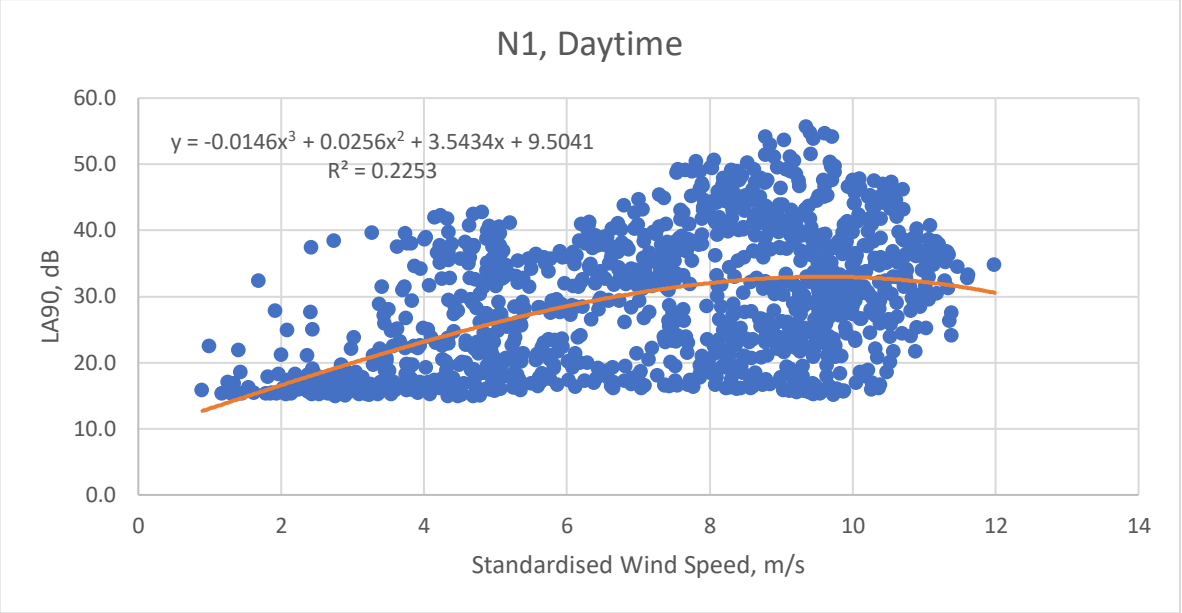


Figure 3.2 Night-time Noise Levels for Survey Location N1

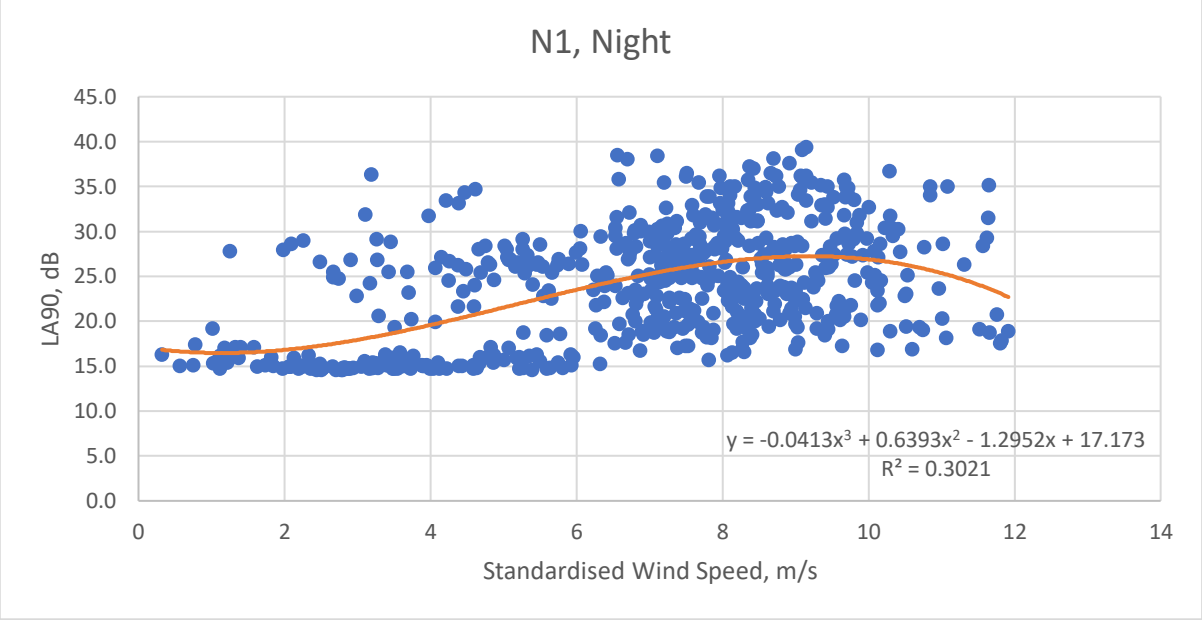


Figure 3.3 Daytime Noise Levels for Survey Location N2

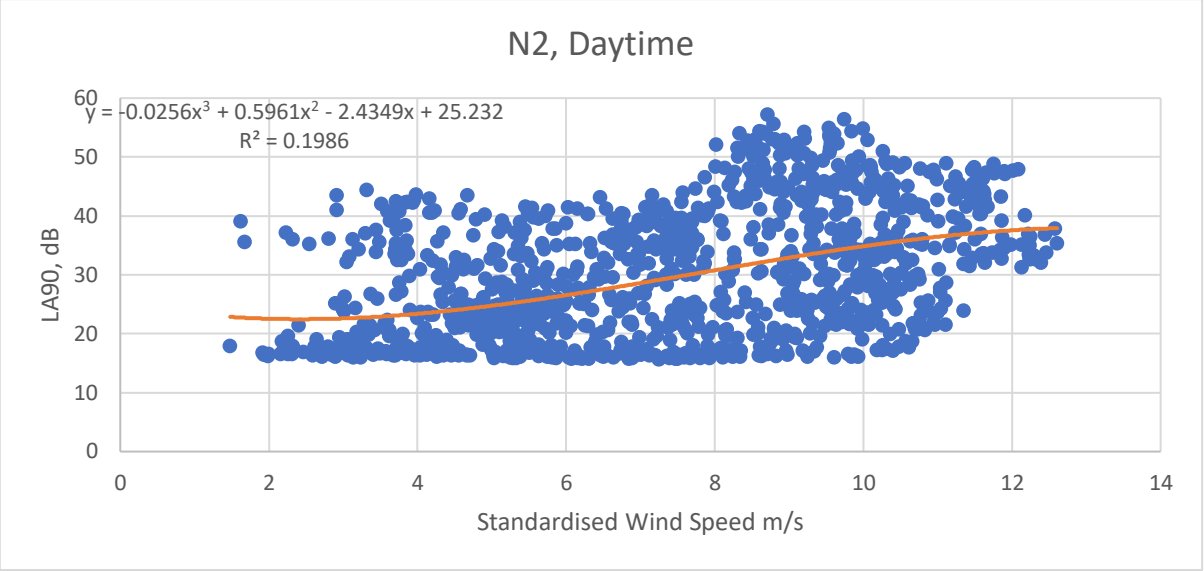


Figure 3.4 Night-time Noise Levels for Survey Location N2

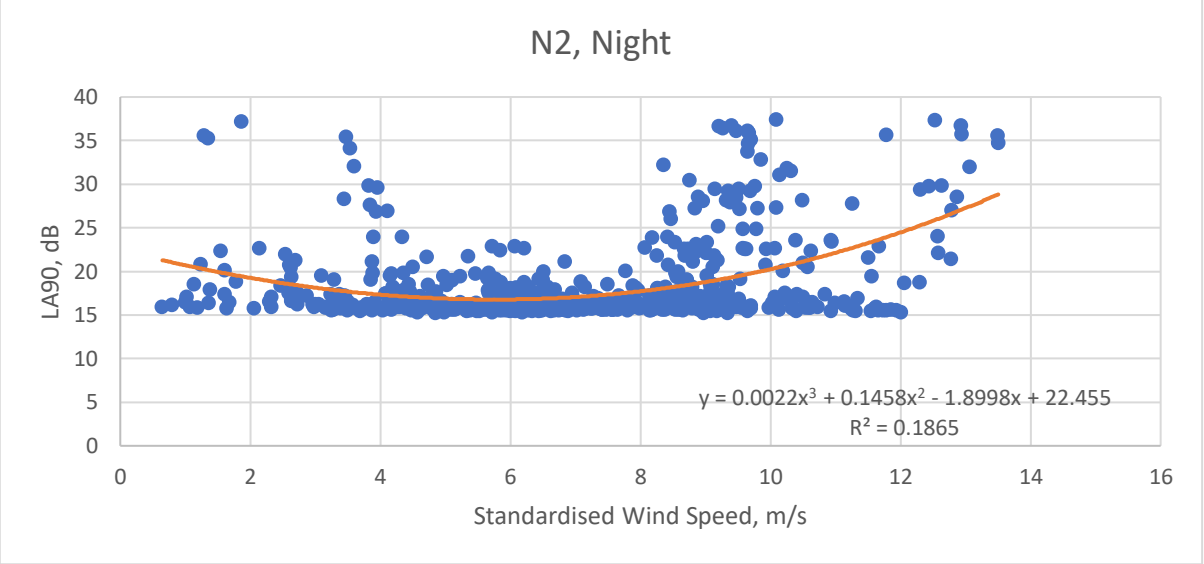


Figure 3.5 Daytime Noise Levels for Survey Location N3

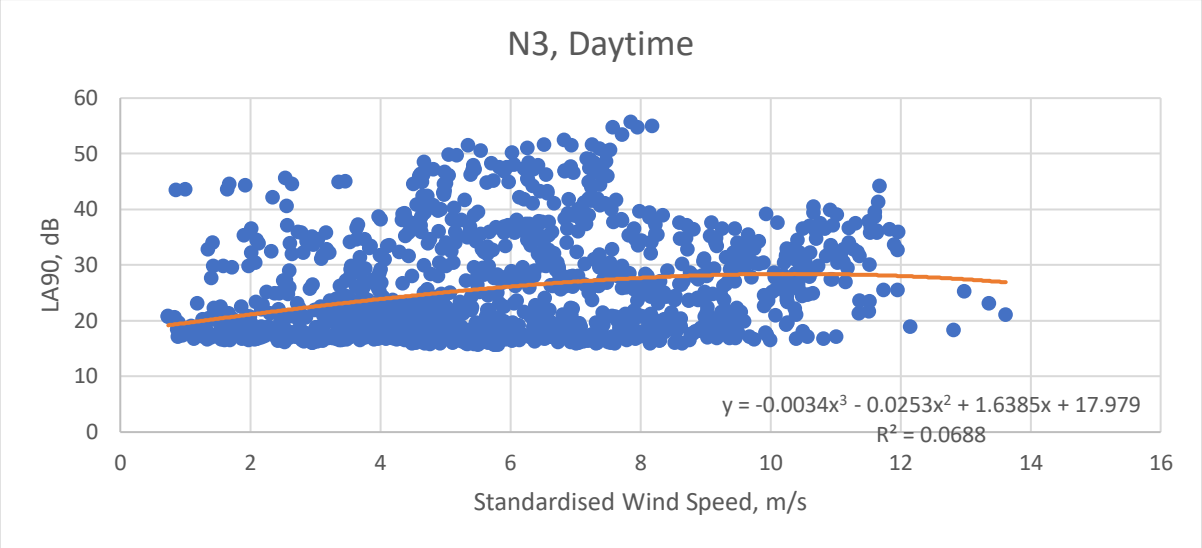


Figure 3.6 Night-time Noise Levels for Survey Location N3

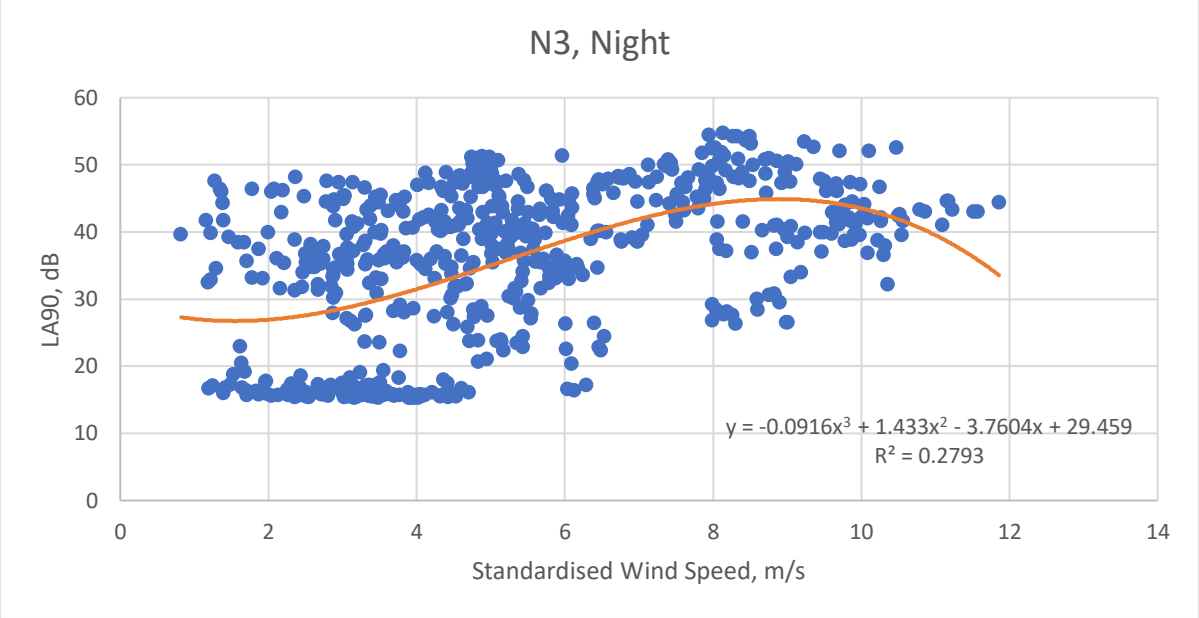


Figure 3.7 Daytime Noise Levels for Survey Location N4

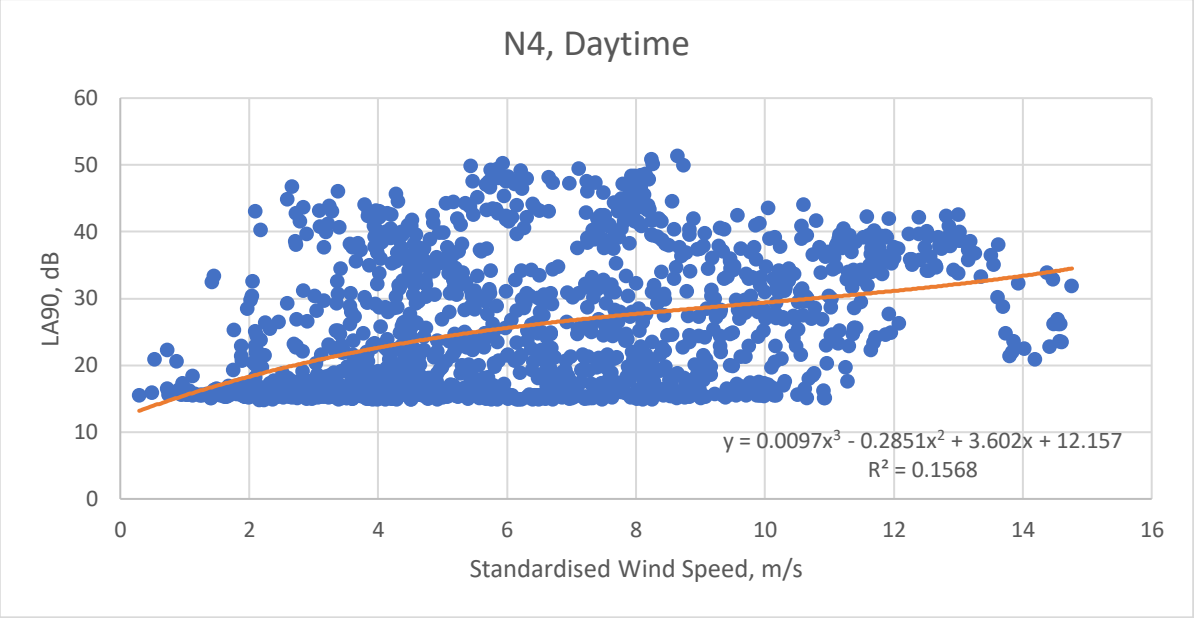
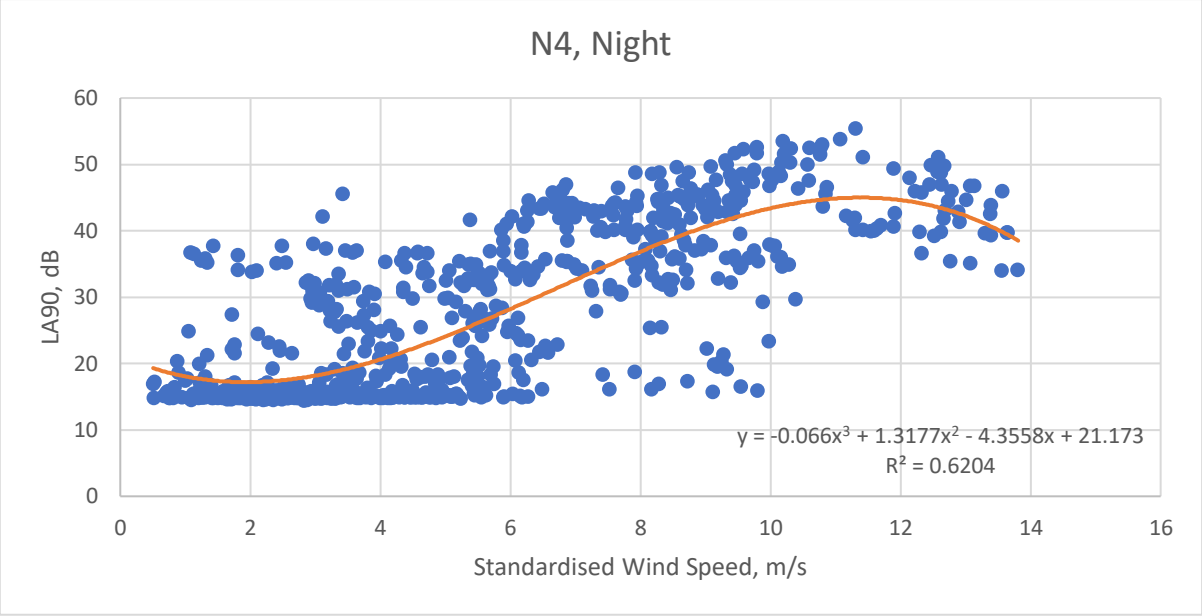


Figure 3.8 Night-time Noise Levels for Survey Location N4



3.6 The derived background noise limits are shown below. Survey location N1 is a proxy site for receptor R12 (herder use). Location N2 is a proxy site for receptor R22 and R26 (herder use). Location N3 is a proxy site for R24 (herder use), R25 (fishermen accommodation), R28 and R29 (ecological use). Location N4 is a proxy site for R30 (herder use) and R15 (ecological use). As noted above during the noise surveys, it was evident that there was, apart from wind noise, an absence of any other significant noise source(s).

Table 3.1 Derived Background Noise Limits

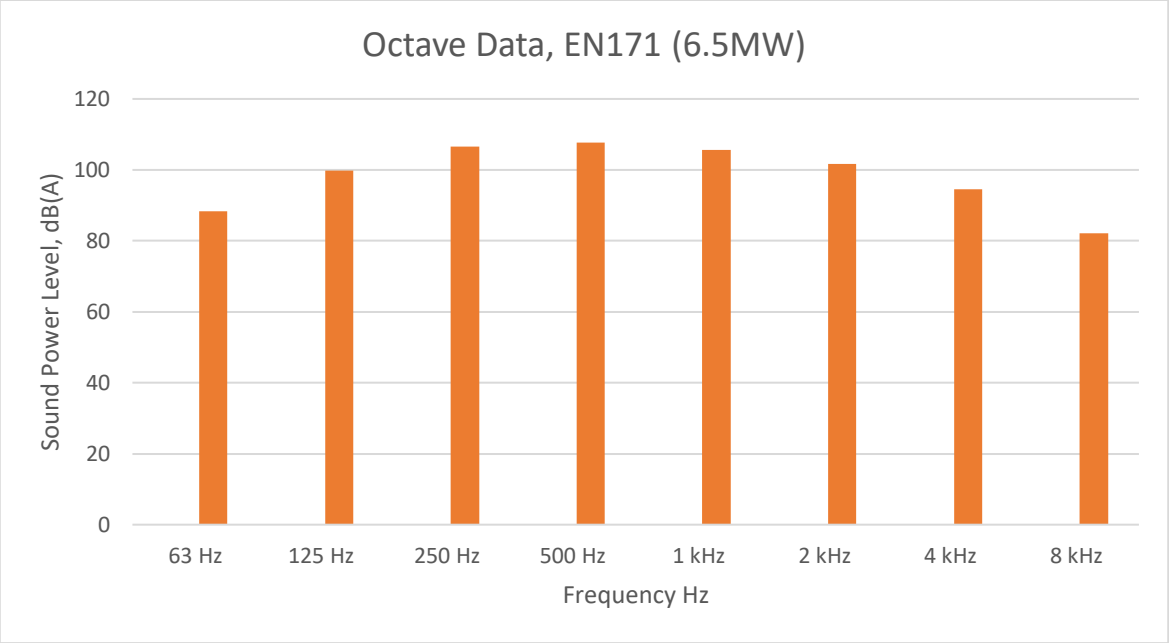
Location	Noise Level at Standardised Wind Speed (10 m/s at 10m), $L_{A90,T}$ dB Day/Night	Derived Criteria based on Background Noise levels, $L_{A90,T}$ dB (10 m/s). See Paragraph 2.5. Day/Night
R12	33/27	53/43
R15	29/43	53/43
R22	29/43	53/43
R23	29/43	53/43
R24	28/39	53/43
R25	28/39	53/43
R28	28/39	53/43
R29	28/39	53/43
R30	29/43	53/43

4 NOISE ASSESSMENT

Turbine Data

4.1 The sound power levels of the turbines in octave bands are presented below in Figure 4.1 for the hub height wind speed of 10m/s. The hub heights of the EN171 turbine are at 100m relative to the ground. The layout details are presented in Appendix B.

Figure 4.1 Octave Data for the turbines (hub height, 10m/s, not adjusted for uncertainty)



4.2 All the above sound power levels are not guaranteed by the manufacturer and therefore, for the purposes of noise modelling, an uncertainty of +2 dB has been applied for a worst-case assessment. The +2 dB addition to the sound power levels is in accordance with good practice guidance and is routinely applied for wind farm projects where there is no manufacturer's warranty.

Other Acoustic Considerations

4.3 The IFC guidance does not consider other factors such as tonality. It is understood from the turbine manufacturers' advice that tonality will not be an issue for receptors beyond 300m from the nearest turbine. For receptors within 300m of a turbine, a tonal penalty of 5 dB is applied as per normal international guidance.

Calculation of Noise Levels at Receptors

4.4 Noise levels at the receptors has been calculated using the noise-modelling suite IMMI30 (recognised by the European Union and the UK Government), in accordance with the ISO 9613 prediction methodology (applied with the above-mentioned calculation modifications).

4.5 In addition to the uncertainty adjusted turbine sound power levels used in the calculations, the model also considers the effects of the topographical conditions throughout the area as well as applying a light downwind propagation correction to represent worst case. The model considers the noise 'emission' of each turbine and calculates the accumulative noise level at each receptor in accordance with the ISO9613 methodology discussed in Table 2.3.

4.6 The topography model was obtained from the (Space) 'Shuttle Radar Topography Mission', (SRTM), at 30m resolution. The turbine layout supplied by the client is presented in Appendix B. Noise levels have been calculated at the first-floor height (4m above ground). None of the receptors fit the 'concave' profile and therefore further corrections have not been added.

4.7 The results of the noise model (Green Hydrogen associated turbines) are shown below in Table 4.1. The difference in ground level to the first floor is not significant due to the high noise sources and therefore long slant distances as well as long horizontal distances as well as the limitations imposed on the ISO9613 methodology set out in Table 2.3. Noise contours for receptor areas at wind speeds 5 m/s and 10 m/s are presented in Appendix C.

Table 4.1 Noise Levels at Receptors (Green Hydrogen only) - First Floor (4m above ground)

Receptor	Location	Nearest Turbine	Distance to Nearest Turbine	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s
			(m)	$L_{A90,T}$ dB					
R12	647529.2, 488617.6	BH6	10654	7.3	9.4	12.8	15.6	17.0	17.3
R15	633497.1, 497330.4	BH3	7524	12.7	15.0	18.3	21.2	22.6	22.9
R22	648054.6,4507580.7	BH11	7594	8.5	10.9	14.3	17.1	18.5	18.8
R23	641626.9,4508563.8	BH9	6425	11.1	13.4	16.8	19.6	21.0	21.3
R24	633986.1,4502241.9	BH3	6235	13.6	15.9	19.2	22.1	23.5	23.8
R25	633224.3,4501879.8	BH3	6924	12.6	15.0	18.4	21.2	22.6	22.9
R28	630664.3,4503025.3	BH3	9648	8.1	10.4	13.8	16.6	18.0	18.3
R29	634069.3,4502084.4	BH3	6122	13.8	16.1	19.5	22.3	23.7	24.0
R30	633302, 4487227	BH6	13717	3.6	5.8	9.1	12.0	13.4	13.7

4.8 For the Green Hydrogen associated wind turbine project, compliance with the relevant criteria is set out in Table 4.2.

Table 4.2 Compliance with IFC/Uzbekistan Assessment Limits (10m/s) (Green Hydrogen only)

Receptor	Compliant with the Initial IFC 35 dB $L_{A90,T}$ criterion	Compliant with the IFC General / Uzbekistan Daytime 53 dB criteria?	Compliant with the IFC General / Uzbekistan Night-time 43 dB criteria?	Receptor Classification
R12	Y	Y	Y	Kuklam Village
R15	Y	Y	Y	Ecological Use, Lake Ayakagitma
R22	Y	Y	Y	Residential use by herders (just outside project site)
R23	Y	Y	Y	Residential use by herders
R24	Y	Y	Y	Residential use by herders
R25	Y	Y	Y	Residential accommodation by fishermen at Lake Ayakagitma
R28	Y	Y	Y	Ecological Use (water-well for livestock)
R29	Y	Y	Y	Ecological Use (water-well for livestock)
R30	Y	Y	Y	Residential use by herders

4.9 As can be seen from Table 4.2, all receptors comply with the WBG/IFC General guidelines as well as the Uzbekistan National Standards and therefore mitigation measures are not required.

Cumulative Effects

4.10 The Green Hydrogen associated wind turbines (worst-case scenario of 15 Envision EN171 (6.5MW) turbines and ancillary equipment) are located within the site boundary of the 500MW Bash Wind Farm.

4.11 The results of the noise modelling of the 500MW Bash Wind Farm (79 Envision EN171 turbines only) are shown below in Table 4.3 and associated compliance assessment is presented in Table 4.4.

Table 4.3 Noise Levels at Receptors (500MW Bash Wind Farm only) - First Floor (4m above ground)

Receptor	Location	Nearest Turbine	Distance to Nearest Turbine	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s
			(m)	$L_{A90,T}$ dB					
R12	647529.2, 488617.6	BAS71	4720	18.8	21.2	24.6	27.4	28.8	29.1
R15	633497.1, 497330.4	BAS49	4605	22.1	24.6	27.9	30.8	32.2	32.5
R22	648054.6,4507580.7	BAS1	1434	30.0	32.4	35.8	38.6	40.0	40.3
R23	641626.9,4508563.8	BAS19	3696	25.3	27.8	31.1	34.0	35.4	35.7
R24	633986.1,4502241.9	BAS40	1804	30.3	32.7	36.1	38.9	40.3	40.6
R25	633224.3,4501879.8	BAS39	2492	27.6	30.0	33.4	36.2	37.6	37.9
R28	630664.3,4503025.3	BAS35	3015	25.0	27.4	30.8	33.6	35.0	35.3
R29	634069.3,4502084.4	BAS40	1882	29.8	32.3	35.6	38.5	39.9	40.2
R30	633302, 4487227	BAS68	5236	16.5	18.9	22.3	25.1	26.5	26.8

Table 4.4 Compliance with IFC/Uzbekistan Assessment Limits (10m/s) (500MW Bash Wind Farm only)

Receptor	Compliant with the Initial IFC 35 dB $L_{A90,T}$ criterion	Compliant with the IFC General / Uzbekistan Daytime 53 dB criteria?	Compliant with the IFC General / Uzbekistan Night-time 43 dB criteria?	Receptor Classification
R12	Y	Y	Y	Kuklam Village
R15	Y	Y	Y	Ecological Use, Lake Ayakagitma
R22	N	Y	Y	Residential use by herders (just outside project site)
R23	N	Y	Y	Residential use by herders
R24	N	Y	Y	Residential use by herders
R25	N	Y	Y	Residential accommodation by fishermen at Lake Ayakagitma
R28	N	Y	Y	Ecological Use (water-well for livestock)

R29	N	Y	Y	Ecological Use (water-well for livestock)
R30	Y	Y	Y	Residential use by herders

4.12 For the 500MW Bash Wind Farm, only three receptors comply with the WBG/IFC's initial 35 dB $L_{A90,T}$ criterion and further detail studies including noise surveys have undertaken for these and other receptors. After considering the background noise surveys, it is shown that all considered receptors comply with the WBG/IFC General guidelines as well as the Uzbekistan National Standards and therefore further mitigation measures are not considered.

Cumulative Noise effects of both the 500MW Bash Wind farm and the 100MW Green Hydrogen Project

4.13 The cumulative noise effects of both the consented 500MW Bash Wind Farm and the worst-case scenario of 15 Envision EN171 turbines are presented in Table 4.5 and the compliance assessment is presented in Table 4.6.

Table 4.5 Noise Levels at Receptors (Cumulative) - First Floor (4m above ground)

Receptor	Location	Nearest Turbine	Distance to Nearest Turbine	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s
			(m)	$L_{A90,T}$ dB					
R12	647529.2, 488617.6	BAS71	4720	19.1	21.5	24.9	27.7	29.1	29.4
R15	633497.1, 497330.4	BAS49	4605	22.6	25.0	28.4	31.2	32.6	32.9
R22	648054.6,4507580.7	BAS1	1434	30.0	32.4	35.8	38.6	40.0	40.3
R23	641626.9,4508563.8	BAS19	3696	25.5	27.9	31.3	34.1	35.5	35.8
R24	633986.1,4502241.9	BAS40	1804	30.4	32.8	36.2	39.0	40.4	40.7
R25	633224.3,4501879.8	BAS39	2492	27.8	30.2	33.6	36.4	37.8	38.1
R28	630664.3,4503025.3	BAS35	3015	25.1	27.5	30.9	33.7	35.1	35.4
R29	634069.3,4502084.4	BAS40	1882	29.9	32.4	35.7	38.6	40.0	40.3
R30	633302, 4487227	BAS68	5236	16.7	19.2	22.5	25.4	26.8	27.1

4.14 The change in noise levels for the cumulative noise effects in comparison to the consented 500MW Bash Wind farm is presented in Table 4.6 and the compliance assessment is presented in Table 4.7.

Table 4.6 Change in Noise Levels (Cumulative effects comparison with the 500MW Bash Wind Farm - First Floor (4m above ground)

Receptor	Location	Nearest Turbine	Distance to Nearest Turbine	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s
			(m)	$L_{A90,T}$ dB					
R12	647529.2, 488617.6	BAS71	4720	0.0	0.0	0.0	0.0	0.0	0.0
R15	633497.1, 497330.4	BAS49	4605	0.2	0.1	0.2	0.1	0.1	0.1
R22	648054.6,4507580.7	BAS1	1434	0.1	0.1	0.1	0.1	0.1	0.1
R23	641626.9,4508563.8	BAS19	3696	0.2	0.2	0.2	0.2	0.2	0.2
R24	633986.1,4502241.9	BAS40	1804	0.1	0.1	0.1	0.1	0.1	0.1
R25	633224.3,4501879.8	BAS39	2492	0.1	0.1	0.1	0.1	0.1	0.1
R28	630664.3,4503025.3	BAS35	3015	0.3	0.3	0.3	0.3	0.3	0.3
R29	634069.3,4502084.4	BAS40	1882	0.5	0.4	0.5	0.4	0.4	0.4
R30	633302, 4487227	BAS68	5236	0.2	0.3	0.2	0.3	0.3	0.3

Table 4.7 Compliance with IFC/Uzbekistan Assessment Limits (10m/s) (Cumulative)

Receptor	Compliant with the Initial IFC 35 dB $L_{A90,T}$ criterion	Compliant with the IFC General / Uzbekistan Daytime 53 dB criteria?	Compliant with the IFC General / Uzbekistan Night-time 43 dB criteria?	Receptor Classification
R12	Y	Y	Y	Kuklam Village
R15	Y	Y	Y	Ecological Use, Lake Ayakagitma
R22	N	Y	Y	Residential use by herders (just outside project site)
R23	N	Y	Y	Residential use by herders
R24	N	Y	Y	Residential use by herders
R25	N	Y	Y	Residential accommodation by fishermen at Lake Ayakagitma
R28	N	Y	Y	Ecological Use (water-well for livestock)
R29	N	Y	Y	Ecological Use (water-well for livestock)
R30	Y	Y	Y	Residential use by herders

4.15 As shown above in Tables 4.4, 4.6 and 4.7, the additional 15 Envision Turbines (Green Hydrogen) do not have an influence on the 500MW Bash Wind Farm compliance assessment.

5 CONCLUSIONS

5.1 ACWA Power in partnership with Uzkimyosanoat (UKS), the national holding company for chemicals in Uzbekistan, is to produce green hydrogen with the use of renewable energy as part of Uzbekistan's commitment to decarbonisation. The proposals promote the use of 15 wind turbines within the consented Bash 500 MW Wind Farm. However, only eight of the proposed fifteen wind turbines will be commissioned and installed. The project will then have the total capacity to generate an additional 100MW.

5.2 Entran Ltd have been commissioned to provide a noise assessment for the additional 15 wind turbines as well as the cumulative effects of the Bash 500MW Wind Farm (which includes 79 EN171 wind turbines). It should be noted that this report considered the worst-case scenario of fifteen wind turbines of which only eight turbines will be installed.

5.3 Noise levels at a sample set of receptors was calculated using a modified version (for wind farms) of ISO 9613-2:1996, for each of the turbine options and assessed against the criteria outlined by World Bank Group/International Finance Corporation's environmental guidance on Wind Energy projects. The WBG/IFC guidance is considered in two parts; part one is for the initial study to ascertain whether any of the receptors are above a threshold value of 35 dB $L_{A90,T}$ and part two is the assessment of receptor noise levels against the general guidance criteria of, for example, residential receptors, 55 dB $L_{Aeq,day}$ or 45 dB $L_{Aeq,night}$ (corrected to 53 dB $L_{A90,day}$ and 43 dB $L_{A90,night}$). Similarly, national Uzbekistan guidance also outlines the noise limits 55 dB $L_{Aeq,day}$ and 45 dB $L_{Aeq,night}$ for sensitive areas.

5.4 The noise assessment demonstrates that all receptors comply with the initial IFC guideline value of 35 dB $L_{A90,T}$ as well as WBG/IFC General Guidelines and the Uzbekistan national guidelines.

5.5 The cumulative effects of both the Green Hydrogen associated wind turbines and the 500MW Bash Wind Farm has also been assessed. It has been shown that the additional 15 Envision Turbines (Green Hydrogen) for the worst-case assessment do not have an influence on the 500MW Bash Wind Farm compliance assessment (as the noise increases are less than 0.4 dB).

APPENDIX A – INTRODUCTION TO NOISE

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB.

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs. For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest.

The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}. This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Table A1: Glossary of Terms

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).

APPENDIX B – WIND FARM LAYOUT

Turbine Layout

Green Hydrogen Project Turbines

Turbine Id	UTM X-co-ord	UTM Y- co-ord	Absolute Height, m
BH1	640838	4500139	270
BH2	640501	4500539	271
BH3	640085	4500956	269
BH4	641067	4499579	265
BH5	641404	4499165	264
BH6	642074	4497750	259
BH7	641596	4498683	261
BH8	641846	4498221	257
BH9	642380	4502196	296
BH10	642795	4501979	300
BH11	643205	4501749	292
BH12	643600	4501398	293
BH13	644058	4501093	288
BH14	644464	4500832	286
BH15	644875	4500612	283

500MW Bash Wind Farm Turbines

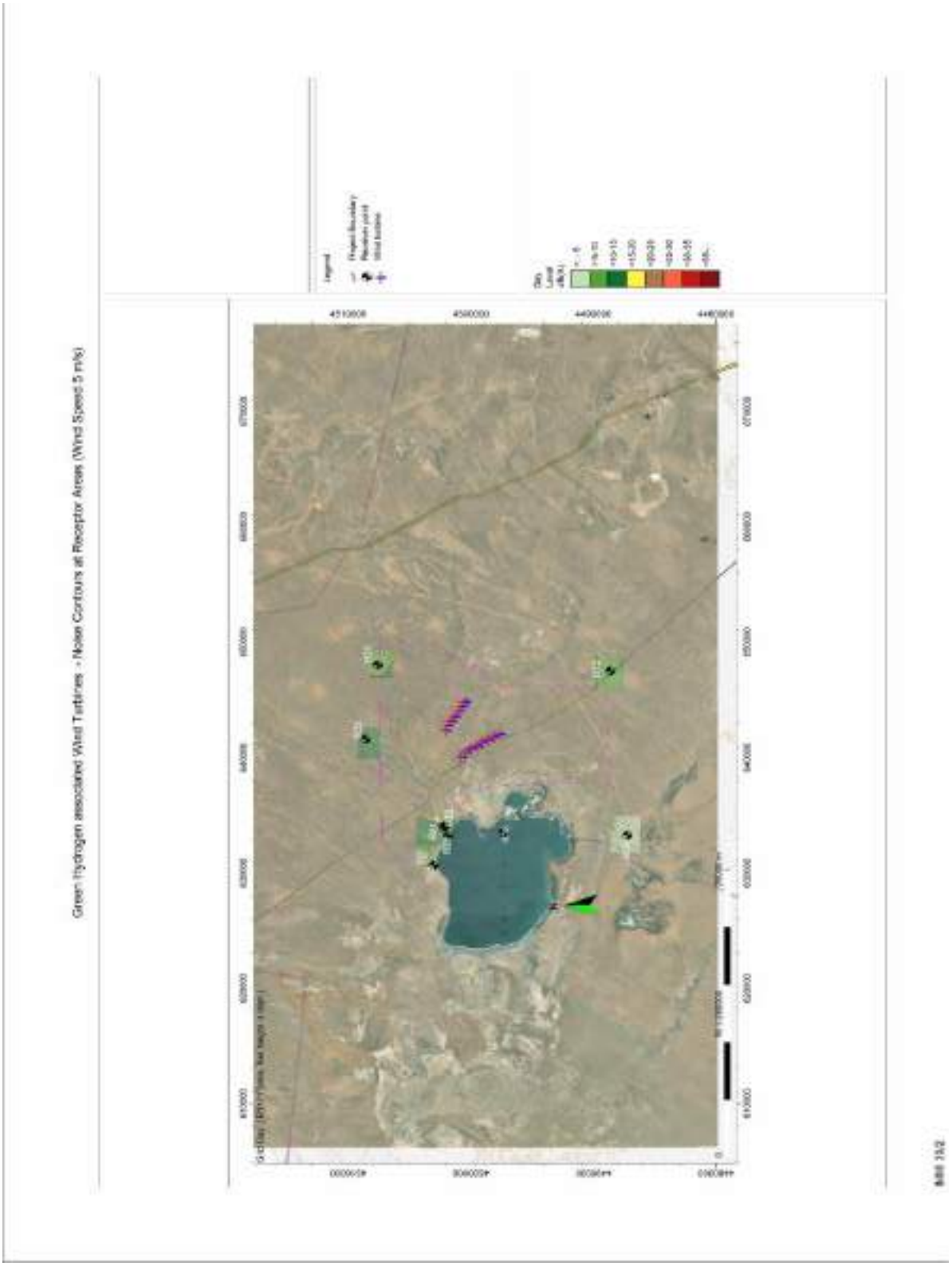
Turbine Id	UTM X-co-ord	UTM Y- co-ord	Absolute Height, m
BAS1	648373	4506185	298
BAS2	649045	4506020	304
BAS3	649597	4505755	311
BAS4	650015	4505307	306
BAS5	648500	4501127	318
BAS6	648244	4501558	315
BAS7	647793	4501840	316
BAS8	647452	4502178	318
BAS9	647142	4502536	313
BAS10	646808	4503590	325
BAS11	646403	4503988	333
BAS12	646069	4504406	336
BAS13	645698	4504834	330
BAS14	645368	4505369	324

BAS15	645106	4505987	305
BAS16	638995	4505245	299
BAS17	639665	4505171	307
BAS18	640283	4505084	315
BAS19	640795	4504970	314
BAS20	641343	4504845	318
BAS21	641886	4504779	324
BAS22	642325	4504612	338
BAS23	642773	4504448	347
BAS24	643226	4504282	341
BAS25	643626	4504073	339
BAS26	643968	4503730	335
BAS27	644203	4503278	327
BAS28	644429	4502820	319
BAS29	644688	4502362	313
BAS30	642034	4502391	301
BAS31	641422	4502557	301
BAS32	640946	4502822	306
BAS33	631909	4506191	270
BAS34	632255	4505763	273
BAS35	632598	4505334	277
BAS36	632967	4504976	281
BAS37	633786	4504691	270
BAS38	634270	4504385	271
BAS39	634615	4503943	272
BAS40	635118	4503644	271
BAS41	636510	4504989	297
BAS42	636416	4504050	284
BAS43	636529	4502987	264
BAS44	637653	4502459	266
BAS45	637967	4502130	265
BAS46	638274	4501543	269
BAS47	638630	4501177	262
BAS48	639042	4500835	261
BAS49	637933	4498563	265
BAS50	638172	4498197	265
BAS51	638418	4497824	263
BAS52	638656	4497458	263
BAS53	638891	4497090	264
BAS54	639268	4496882	264
BAS55	639530	4496487	264
BAS56	639677	4495981	263
BAS57	639726	4495417	262

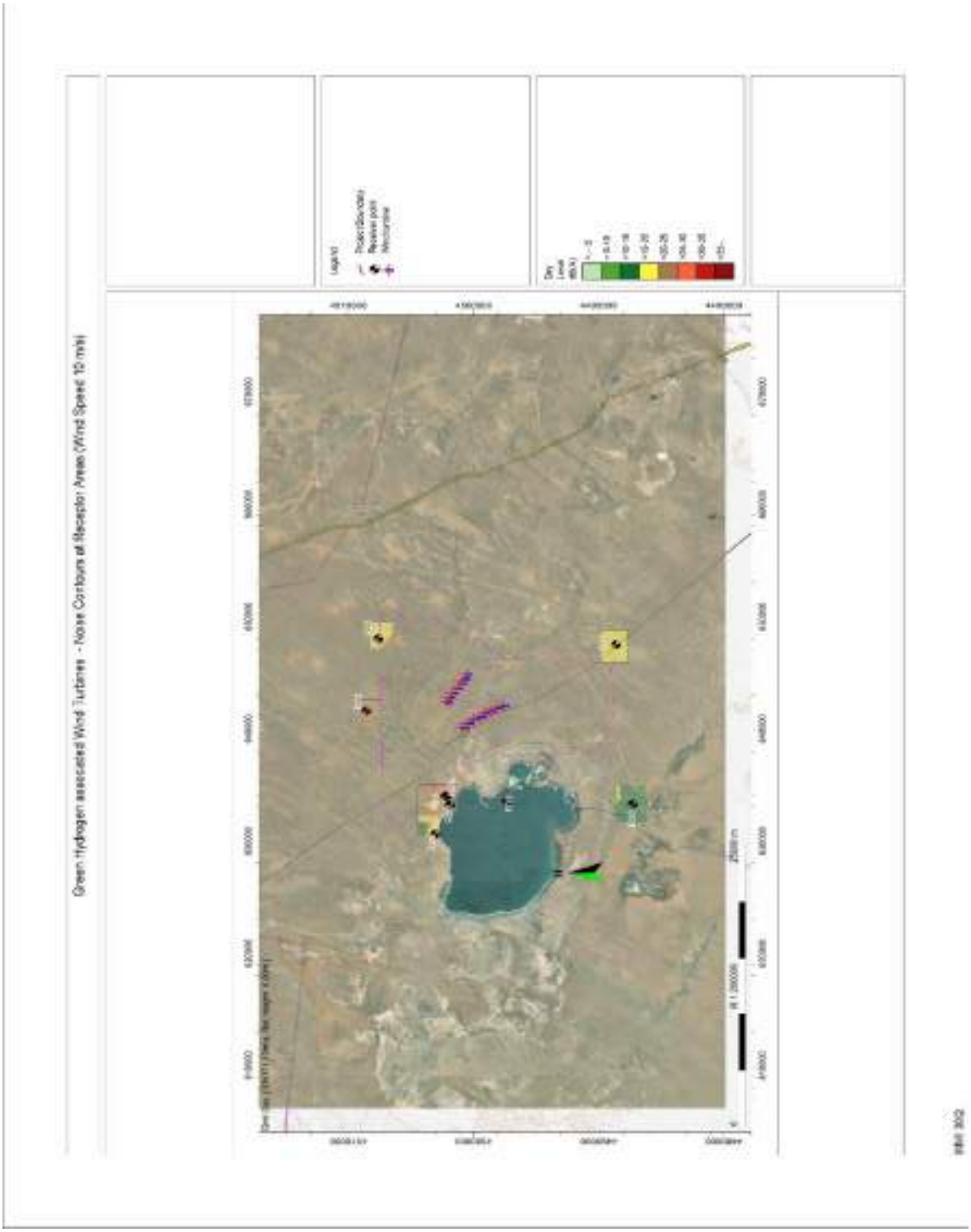
BAS58	639738	4494819	258
BAS59	640050	4494488	259
BAS60	639989	4493841	259
BAS61	639696	4492978	257
BAS62	638847	4491758	259
BAS63	639379	4491292	260
BAS64	639626	4490771	263
BAS65	639993	4490329	265
BAS66	640331	4489887	268
BAS67	640839	4489660	266
BAS68	638159	4489177	263
BAS70	637950	4490476	264
BAS71	646678	4493206	259
BAS72	646210	4493511	260
BAS73	645705	4493870	255
BAS74	645118	4494123	261
BAS75	644589	4494447	260
BAS76	644186	4494874	261
BAS77	643628	4495173	260
BAS78	643244	4495601	262
BAS79	642835	4496125	260
BAS80	642460	4496544	261

APPENDIX C – NOISE MAPS

Noise Contours at Receptors Areas (Wind speed, 5m/s)



Noise Contours at Receptor Areas (Wind speed, 10m/s)



APPENDIX E – SHADOW FLICKER MODELLING

Green Hydrogen 100MW Wind Farm, Bash, Uzbekistan

Shadow Flicker Assessment

July 2023

Green Hydrogen 100MW Wind Farm, Bash, Uzbekistan

Shadow Flicker Assessment

Revision	Date	Notes	Author	Checked	Approved
Ver. 8	28-07-23	E3535	Sunil Patel 	Nick Davey 	Nick Davey 

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CONTENTS **PAGE**

1	Introduction	1
2	Shadow Flicker Assessment criteria	2
3	Shadow Flicker Modelling	3
4	Shadow Flicker Results	6
5	Conclusions	8

APPENDIX A – Wind Farm Layout 9

1 INTRODUCTION

1.1 ACWA Power in partnership with Uzkimyosanoat (UKS), the national holding company for chemicals in Uzbekistan, is to produce green hydrogen with the use of renewable energy as part of Uzbekistan's commitment to decarbonisation. The proposals promote the use of 15 wind turbines within the consented Bash 500 MW Wind Farm. However, only eight of the proposed fifteen wind turbines will be commissioned and installed. The project will then have the capacity to generate an additional 100MW.

1.2 Entran Ltd have been commissioned to provide a 'Shadow Flicker' assessment for the additional 15 wind turbines as well as the cumulative effects for the project. This report considers the worst-case scenario of fifteen wind turbines of which only eight turbines will be installed. The project site is in the Gijduvon district of the Bukhara region of Uzbekistan. This report presents the results of the shadow flicker model constructed to identify potential effects at nearby receptors for both the 15-turbine project as well as the consented scheme.

1.3 This 'Shadow Flicker' assessment has been undertaken in accordance with the World Bank Group/International Finance Corporation's environmental guidelines on Wind Energy.

1.4 The project, in addition to consented 79 wind turbines, will comprise, for the purposes of this assessment, 15 Envision EN171 (6.5MW) turbines and ancillary equipment. The general site location is presented in Figure 1 and the receptors are presented in Table 1.1. It is noted that herders who used to graze within the project boundaries were relocated and compensated under the Bash 500MW WF Resettlement Action Plan.

1.5 Wind turbines can cause 'Shadow Flicker' when the sun passes behind a moving blade and casts a shadow on the window of nearby premises. Shadow flicker for the purposes of assessment is described as:

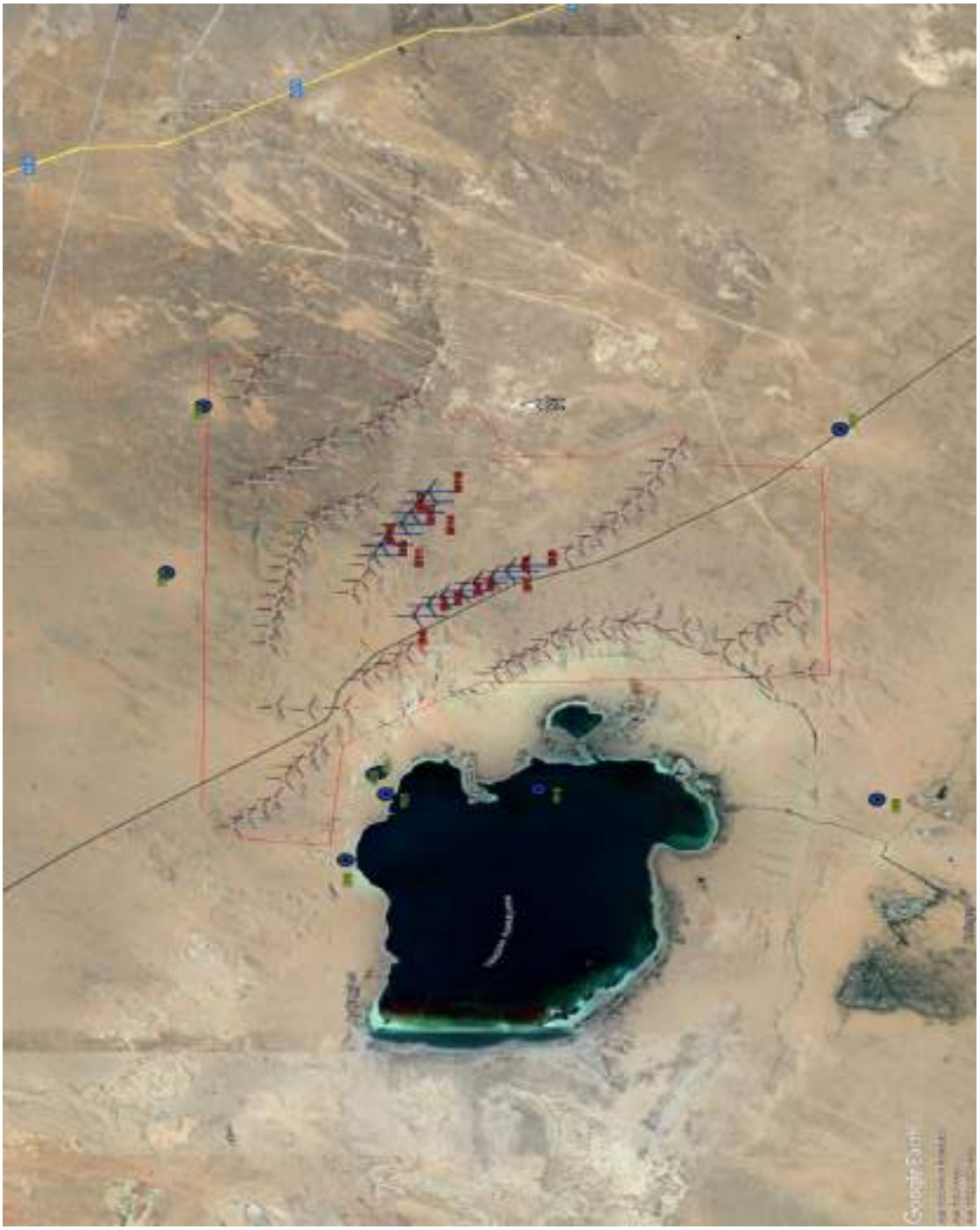
> *the flickering effect caused when rotating wind turbine blades periodically cast a shadow over neighbouring properties as they turn, through constrained openings such as windows. The magnitude of the shadow flicker effect varies both spatially and temporally and depends on a number of environmental conditions coinciding at any particular point in time, including, the position and height of the sun, wind speed and direction, cloudiness, and proximity of the turbine to a sensitive receptor.*

1.6 Shadow flicker will depend on the following variables:

- The turbine hub height and rotor diameter;
- The distance from the turbines;
- The direction of the residence relative to the turbines;
- The time of year and wind direction;
- The proportion of daylight hours in which the turbines operate; and
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon).

1.7 This report considers the shadow flicker of all turbines at a specific receptor(s) at any given time and therefore considers the potential increase of the shadow flicker intensity or frequency.

Figure 1 Bash Wind Farm Project, Turbine & Receptor Locations



1.8 The assessment of receptors potentially susceptible to shadow flicker (e.g. human settlements) within a distance of ten rotor diameters from proposed turbine locations is internationally considered to be an acceptable distance limit for the shadow flicker studies. However, for a robust approach, all human settlements within a 6,500m radius of any given turbine location have been included for analysis.

Table 1.1 Identification of Sensitive Sites

Receptor	Location WGS84 (Zone41N) UTM	Nearest WTG	Distance to Nearest WTG, m	Ground height at receptor, m	Description
R23	641626.9,4508563.8	BH9	6425	256	Residential use by herders
R24	633986.1,4502241.9	BH3	6235	185	Residential use by herders
R29	634069.3,4502084.4	BH3	6122	179	Ecological Use (water-well for livestock)

2 SHADOW FLICKER ASSESSMENT CRITERIA

World Bank Group/International Finance Cooperation Guidelines

2.1 The Environmental, Health and Safety' Guidelines for Wind Energy (2015) sets the following screening criteria for wind farms:

> *If it is not possible to locate the wind energy facility/turbines such that neighbouring receptors experience no shadow flicker effects, it is recommended that the predicted duration of shadow flicker effects experienced at a sensitive receptor not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario.*
>
> *In order to assess compliance with the recommended limits, shadow flicker should be modelled and predicted based on an astronomical worst-case scenario, which is defined as follows:*
>
> - *There is continual sunshine and permanently cloudless skies from sunrise to sunset.*
> - *There is sufficient wind for continually rotating turbine blades.*
> - *Rotor is perpendicular to the incident direction of the sunlight.*
> - *Sun angles less than 3 degrees above the horizon level are disregarded (due to likelihood for vegetation and building screening).*
> - *Distances between the rotor plane and the tower axis are negligible.*
> - *Light refraction in the atmosphere is not considered.*

2.2 In addition to the above recommended scenario, an assessment has also been made to consider actual site conditions based upon long-term sunshine statistics at the nearest metrological station (Tashkant) which also considers cloud/wind data.

3 SHADOW FLICKER MODELLING

3.1 Turbine shadow flicker was modelled using 'WindPRO' (v3.6), an industry-leading software package for the design and planning of wind energy projects. The model software considers the sun's path with respect to every turbine location during every minute over a complete year. Any shadow flicker caused by each turbine is then aggregated for each receptor for the entire year.

3.2 The input parameters for the model include:

- the turbine locations and dimensions;
- the receptors location;
- the size of windows on each receptor and the direction that the windows face; and
- the topography model obtained from the (Space) 'Shuttle Radar Topography Mission', (SRTM), at 30m resolution.

3.3 The turbine locations are presented in Appendix A.

3.4 The relevant turbine data is presented in Table 3.1.

Table 3.1 Turbine Details

Turbine Model	Rotor Diameter, m	Hub Height, m	Rotor tip height, m	Rotor Swept Area, m^2	Rotor Speed Range, rpm
EN171 (6.5MW)	171	100	-	22964	7.1 – 9.94

3.5 The following scenarios are considered:

- As per IFC's worst-case; and
- A realistic scenario based upon site data (e.g., long term average sunshine hours rather than the worst-case IFC scenario of constant sunshine).

3.6 For the IFC worst-case scenario, the following is considered:

- there is a clear sky 365 days per year;
- the turbine blades were assumed to be rotating for 365 days per year;
- The effect of shadow flicker was not calculated where the sun lies less than 3 degrees above the horizon;
- the receptor is occupied at all times;
- no screening (from either trees or man-made obstacles) is taken into account; and
- all receptors have a 2 m x 2 m window facing directly towards the turbine. The WindPro utilises the concept of 'Green House' mode which allows for shadow flicker effects to be evaluated for each receptor in every direction for the nearest group of WTGs.

3.7 These assumptions result in a robust but conservative estimation, due to:

- unlikely to have clear skies all year around;
- screening (structures, trees or any other obstacle that may obstruct sight lines between the turbines and the receptor) can mask shadows from the turbines;
- all the turbines may not be operational all year (calm conditions/maintenance etc);
- turbine blades will not face the shadow receptor all year (as blades will face the direction of wind to be fully efficient);
- receptors may not be occupied during a shadow flicker event; and
- the intensity of any shadow flicker event will be diminished by the intervening distance.

3.8 For a more realistic consideration, long term weather conditions were obtained from Tashkant meteorological dataset (approximately 385 km distant) and the sunshine probability used for the model is set out in Table 3.2. Other meteorological sites in the immediate vicinity do not have a complete set of the required data.

Table 3.2 Sunshine Hours for Realistic Scenario

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
3.43 Hrs	4.40 Hrs	5.12 Hrs	7.24 Hrs	9.40 Hrs	11.89 Hrs	12.23 Hrs	11.73 Hrs	10.01 Hrs	7.16 Hrs	4.87 Hrs	3.07 Hrs

3.9 However, as the geographical extent of the study is large, screening (trees or man-made obstacles) has not been considered for the realistic scenario.

4 SHADOW FLICKER RESULTS

4.1 The following shadow flicker effects will result for the receptors under consideration:

Table 4.1 Shadow Flicker Occurrence at Each Receptor (Green Hydrogen associated Turbines)

Receptor	Location	IFC Worst-case Shadow hours per year	Realistic Shadow hours per year	IFC Max Shadow hours per day
		(h/year)	(h/year)	(h/day)
R23	641626.9,4508563.8	00:00	00:00	00:00
R24	633986.1,4502241.9	00:00	00:00	00:00
R29	634069.3,4502084.4	00:00	00:00	00:00

4.2 As can be seen from Table 4.1, all receptors under consideration comply with both the IFC criteria (30 hours per year or less than 30 mins per day) for the WBG/IFC worst-case scenario as well as the realistic scenario. Mitigation measures are therefore not required.

Cumulative Effects

4.3 The Green Hydrogen associated wind turbines (worst-case of 15 Envision EN171 (6.5MW) turbines and ancillary equipment) are located within the site boundary of the 500MW Bash Wind Farm.

4.4 The results of the shadow flicker modelling of the 500MW Bash Wind Farm (79 Envision EN171 turbines only) are shown below in Table 4.2.

Table 4.2 Shadow Flicker Occurrence at Each Receptor (500MW Bash Wind Farm Only)

Receptor	Location	IFC Worst-case Shadow hours per year	Realistic Shadow hours per year	IFC Max Shadow hours per day
		(h/year)	(h/year)	(h/day)
R23	641626.9,4508563.8	00:00	00:00	00:00
R24	633986.1,4502241.9	00:00	00:00	00:00
R29	634069.3,4502084.4	00:00	00:00	00:00

4.5 As can be seen from Table 4.2, all receptors under consideration for the 500MW Bash Wind Farm comply with both the IFC criteria (30 hours per year or less than 30 mins per day) for the WBG/IFC worst-case scenario as well as the realistic scenario.

Cumulative shadow flicker effects of both the 500MW Bash Wind farm and the 100MW Green Hydrogen Project

4.6 The cumulative shadow flicker effects of both the consented 500MW Bash Wind Farm and the 15 Envision EN171 turbines are presented in Table 4.3.

Table 4.3 Shadow Flicker Occurrence at Each Receptor (Cumulative)

Receptor	Location	IFC Worst-case Shadow hours per year	Realistic Shadow hours per year	IFC Max Shadow hours per day
		(h/year)	(h/year)	(h/day)
R23	641626.9,4508563.8	00:00	00:00	00:00
R24	633986.1,4502241.9	00:00	00:00	00:00
R29	634069.3,4502084.4	00:00	00:00	00:00

4.7 As can be seen from Table 4.3, all receptors under consideration for both the 100MW Green Hydrogen associated turbines and 500MW Bash Wind Farm comply with both the IFC criteria (30 hours per year or less than 30 mins per day) for the WBG/IFC worst-case scenario as well as the realistic scenario.

5 CONCLUSIONS

5.1 ACWA Power in partnership with Uzkimyosanoat (UKS), the national holding company for chemicals in Uzbekistan, is to produce green hydrogen with the use of renewable energy as part of Uzbekistan's commitment to decarbonisation. The proposals promote the use of 15 wind turbines within the consented Bash 500 MW Wind Farm. However, only eight of the proposed fifteen wind turbines will be commissioned and installed. The project will then have the total capacity to generate an additional 100MW.

5.2 Entran Ltd have been commissioned to provide a shadow flicker assessment for the additional 15 wind turbines as well as the cumulative effects of the Bash 500MW Wind Farm (which includes 79 EN171 wind turbines). It should be noted that this report considered the worst-case scenario of fifteen wind turbines of which only eight turbines will be installed.

5.3 A shadow flicker assessment has been undertaken in accordance with the World Bank Group/International Finance Corporation's guidelines for Wind Energy. The Shadow flicker effects have been considered by using by the software suite 'WindPRO' (v3.6). The project will consist of 15 Envision EN171 turbines (6.5MW) (of which only eight wind turbines will be installed).

5.4 The assessment concludes that for the 100MW Green Hydrogen associated wind farm project, all considered receptors comply with the WBG/IFC guidelines (30 hours per year or less than 30 mins per day) for the IFC worst-case scenario.

5.5 The cumulative effects of both the Green Hydrogen associated wind turbines and the 500MW Bash Wind Farm has also been assessed. Again, it has been shown that, for the cumulative effects, all considered receptors comply with the WBG/IFC guidelines (30 hours per year or less than 30 mins per day) for the IFC worst-case scenario.

APPENDIX A – WIND FARM LAYOUT

Turbine Layout

100MW Green Hydrogen Project Turbines

Turbine Id	UTM X-co-ord	UTM Y- co-ord	Absolute Height, m
BH1	640838	4500139	270
BH2	640501	4500539	271
BH3	640085	4500956	269
BH4	641067	4499579	265
BH5	641404	4499165	264
BH6	642074	4497750	259
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BH11	643205	4501749	292
BH12	643600	4501398	293
BH13	644058	4501093	288
BH14	644464	4500832	286
BH15	644875	4500612	283

500MW Bash Wind Farm

Turbine Id	UTM X-co-ord	UTM Y- co-ord	Absolute Height, m
BAS1	648373	4506185	298
BAS2	649045	4506020	304
BAS3	649597	4505755	311
BAS4	650015	4505307	306
BAS5	648500	4501127	318
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BAS7	647793	4501840	316
BAS8	647452	4502178	318
BAS9	647142	4502536	313
BAS10	646808	4503590	325
BAS11	646403	4503988	333
BAS12	646069	4504406	336
BAS13	645698	4504834	330
BAS14	645368	4505369	324

BAS15	645106	4505987	305
BAS16	638995	4505245	299
BAS17	639665	4505171	307
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BAS20	641343	4504845	318
BAS21	641886	4504779	324
BAS22	642325	4504612	338
BAS23	642773	4504448	347
BAS24	643226	4504282	341
BAS25	643626	4504073	339
BAS26	643968	4503730	335
BAS27	644203	4503278	327
BAS28	644429	4502820	319
BAS29	644688	4502362	313
BAS30	642034	4502391	301
BAS31	641422	4502557	301
BAS32	640946	4502822	306
BAS33	631909	4506191	270
BAS34	632255	4505763	273
BAS35	632598	4505334	277
BAS36	632967	4504976	281
BAS37	633786	4504691	270
BAS38	634270	4504385	271
BAS39	634615	4503943	272
BAS40	635118	4503644	271
BAS41	636510	4504989	297
BAS42	636416	4504050	284
BAS43	636529	4502987	264
BAS44	637653	4502459	266
BAS45	637967	4502130	265
BAS46	638274	4501543	269
BAS47	638630	4501177	262
BAS48	639042	4500835	261
BAS49	637933	4498563	265
BAS50	638172	4498197	265
BAS51	638418	4497824	263
BAS52	638656	4497458	263
BAS53	638891	4497090	264
BAS54	639268	4496882	264
BAS55	639530	4496487	264
BAS56	639677	4495981	263
BAS57	639726	4495417	262

BAS58	639738	4494819	258
BAS59	640050	4494488	259
BAS60	639989	4493841	259
BAS61	639696	4492978	257
BAS62	638847	4491758	259
BAS63	639379	4491292	260
BAS64	639626	4490771	263
BAS65	639993	4490329	265
BAS66	640331	4489887	268
BAS67	640839	4489660	266
BAS68	638159	4489177	263
BAS70	637950	4490476	264
BAS71	646678	4493206	259
BAS72	646210	4493511	260
BAS73	645705	4493870	255
BAS74	645118	4494123	261
BAS75	644589	4494447	260
BAS76	644186	4494874	261
BAS77	643628	4495173	260
BAS78	643244	4495601	262
BAS79	642835	4496125	260
BAS80	642460	4496544	261

APPENDIX F – PERMIT FROM UZENERGOINSPECTION

ELEKTR ENERGETIKADANAZORAT INSPEKSIYASI

(“Ўзэнергоинспекция” Навоий ҳудудий бўлими)

Хулоса

“Karmana Dizayn” МЧЖ **томонидан ишлаб чикилган** “CHINA ENERGY INTL CAS” МЧЖ га карашли Конимех тумани “Зафаробод” МФЙ худудида жойлашган “Ишчилар дам олиш маскани” нинг лектр таъминоти лойиҳа келишилганлиги тўғрисида.

Юқорида кўрсатилган лойиҳа кўриб чиқиш натижалари бўйича рухсат беришга доир талаблар ва шартларга мувофиқ келади ва “Ўзэнергоинспекция” Навоий худудий булими билан келишилган ҳисобланади.

Энергия таъминоти лойиҳасининг техник тавсифлари ушбу хулосага иловала белгиланган ва хулосанинг ажралмас кисми бўлиб хисобланади.

“Ўзэнергоинспекция” Навоий худудий бўлими бошлиғи в.б **Б.Шомуродов**

01-21/ДХ-651-сонли хулоса. Берилган сана 29.12.2022 йил.

01-21/ДХ-651-сонли хулосага илова

"CHINA ENERGY INTL CAS" МЧЖ га қарашли "Ишчилар дам олиш маскани" нинг электр таъминоти лойиҳасининг техник тавсифлари.

Лойиҳа ижрочиси – "Karmana Dizayn" МЧЖ

Техник шартлар "Навоий ХЭТК" АЖ томонидан 19.09.2022й. № 10/4452-сон билан 1700,0 kW қувватга берилган.

Лойиҳа бўйича истеъмолчи электр таъминоти ишончлигининг III-тоифасига киритилган.

Лойиха "Навоий ХЭТК" АЖ томонидан 28.12.2022 йилда № 10/6210-сонли хати билан ва "Навоий МЭТ" филиали томонидан 26.12.2022 йилдаги №02-26/01-03/1726-сонли хати билан куриб чикилган.

Ҳисобланган қуввати – 850,0 kW.

Лойиҳада қуйидагилар кўзда тутилган:

электр таъминоти 6 kV кучланишда "Навоий МЭТ" филиалига қарашли 220/35/6 кВли "А" НС нинг 6 кВ томонидга алохида ячейка ўрнатиб ячейкадан узунлиги 0,165 км бўлган 3(АПвПу-1х120) мм^2 русумли кабел электр узатиш тармогини ётқизилиши ва узунлиги 17,605 км бўлган АС-3х95 мм^2 русумли хаво электр узатиш тармоғи тортилиши орқали амалга оширилиши;

қуввати 2х1000 кВАли трансформатор ўрнатилиши;

ПР8503с-1081-21 русумли тақсимлаш қурилмаси ўрнатилиши;

2 дона 6 кВли ячейкалар К-59 ўчиргичлар ўрнатилиши;

Реактив энергияни компенсация қилиш учун қуввати 2х225 кВАр ли комденсатор қурилмасини ТП нинг ёнида ўрнатилиши;

электр энергия сарфини ҳисобга олиш электр энергияни тижорат ҳисобини олишни автоматлаштирилган тизимига (АСКУЭ) мос электр ҳисоблагичини лойҳалаштирилган 6 кВли тарқатиш қурилмасида (КРУН-6 кV) 200/5 ток-трансформаторлари орқали уланиши билан амалга оширилиши;

электр энергиясини қабул қилувчи ускуналар – сув насоси электр двигателлар, совутгичлар, маиший жихозлар ва энергия тежамкор ёритгичлар.

Энергия самарадорлигини ошириш мақсадида илгари фойдаланган генератор ускуналари, кучланишни пасайтирувчи трансформаторлар, электр двигателлар, шунингдек, энергия самарадорлиги "D" тоифадаги энергия сарфловчи ускуналарни ўрнатилиши ман этилади.

"Ўзэнергоинспекция" Навоий ҳудудий бўлими бошлиғи в.б Б.Шомуродов

бажс: С.Джураев
Тел: 79 224-04-96

APPENDIX G – NOTES OF MEETING & CONCLUSIONS FROM ASIATRANSGAS

ASIA TRANS GAS

Бухарское Отделение по Управлению Магистральным Газопроводом
Bukhara Main Gas pipeline Management Center

Республика Узбекистан, Бухарская обл.
Каганский район, пос. Разани
Тел.: (998 65) 222 99 22 (2015)
Факс: (998 65) 222 99 22 (2201)

Razani village, Kagan region
Bukhara province, Republic of Uzbekistan
Tel.: (998 65) 222 99 22 (2015)
Fax: (998 65) 222 99 22 (2201)

LETTER / ПИСЬМО

№: ATGBM-OTHER-PS-LO-22-42

To:	«China Energy Intl Group CAS» CEEC	**Кому:**	«China Energy Intl Group CAS» CEEC
Attn.:	Mr. Tan Faming Project Manager	**Вниманию:**	Г-ну Тан Фамин Руководителю проекта
Date:	October 31, 2022	**Дата:**	31 октября 2022г.

□Urgent /Срочно □Reply required/Для ответа □For Action/К исполнению □ For Info/Для информации □Others/Прочее

Subject: Regarding reply to the letter

Dear Sir,

In response to your letter, we have no objection to the construction of the planned 6 kV power line to supply the labor camp with electricity in order to implement the investment project for the construction of a 500 MW wind power plant in Gijduvon district, Bukhara region.

At that, we would like to remind you that within the protected zone and directly on the crossings over the main land gas pipeline **IS PROHIBITED**:

a) Parking cars and special vehicles;
b) Carry out filling of vehicles with POL;
c) Start -up fire;
d) Litter;
e) Crossing of the gas pipeline at unequipped (unauthorized) places.

Based on this, you are kindly requested to observe all safety requirements at crossing Uzbekistan-China gas pipeline and send us the list of vehicles

Тема: Касательно ответа на письмо

Согласно вашему письму о предоставление вам разрешение на строительства планируемой воздушной линии электропередачи напряжением 6 кВ для электроснабжения вашего трудового лагеря в целях реализации инвестиционного проекта строительства ветроэлектростанции мощностью 500 МВт в Гиждувонском районе Бухарской области.

При этом, хотим вас уведомить, что в пределах охранной зоны и непосредственно на переходах через магистральный газопровод **ЗАПРЕЩЕАЕТСЯ**:

a) стоянка автомобилей и спецтехники,
b) произвести заправку автомашин горюче-смазочными материалами,
c) разведение огня,
d) разбрасывания мусора
e) переезд через необорудованные (неположенные) места.

Исходя из этого, просим Вас соблюдать все требования безопасности при пересечении через МГУК, а также направить список

which will be crossing the gas pipeline (indicating state number plates of the vehicles).	пересекаемой спецтехники (с указанием государственного регистрационного номера).
Hope for further fruitful cooperation and mutual understanding.	Надеемся на дальнейшее плодотворное сотрудничество и взаимопонимание.
Respectfully,	С уважением,

Mr. Cai Jian / Г-н Цай Цзянь
General Manager for Operation – BMGMC Director of JV "Asia Trans Gas" LLC /
Генеральный менеджер по эксплуатации – Начальник Бухарского ОУМГ СП ООО "Asia Trans Gas"

Minutes #2of the community grievance meeting

19.01.2023 Kuklam village

Present: villages inhabitants

Chairman: Community Liaison and Permit Officer, Acwa Power Rakhmanov A.

Secretary Ecologist Sokhibnazarov R.

AGENDA:

1. Introduction of the project.
2. Construction of 6 kV OHTL line to connect TSF, batching plant and GSM towers.
3. 3. Grievance mechanism.

Rakhmanov A. introduced the Acwa Power BASH project to the local community representatives.

He informed the local Kuklam community representatives about connection of the power lines from the substation to future TSF, batching plant and GSM towers. He also informed them about the grievance mechanism which is available at present time and will be available during construction and operation periods. He asked the participants to share with their actual concerns and problems which they would like to share with. The participants of the meetings thanked for the shared information and expressed no objection or question about the subject.

Photo enclosure to Minutes of the meeting #2 dated 19.01.2023

Chairman: A. Rakhmonov

Secretary Sokhibnazarov R.

Minutes #1of the community grievance meeting

23.12.2022 Kokcha LLC

Present: villages inhabitants

Chairman: Community Liaison and Permit Officer, Acwa Power Rakhmanov A.

Secretary Ecologist Sokhibnazarov R.

AGENDA:

1. Introduction of the project.
2. Construction of 6 kV OHTL line to connect TSF, batching plant and GSM towers.
3. 3. Grievance mechanism.

Rakhmanov A. introduced the Acwa Power BASH project to the Kokcha LLC representatives.

He informed the Kokcha LLC representatives about connection of the power lines from the substation to future TSF, batching plant and GSM towers. He also informed them about the grievance mechanism which is available at present time and will be available during construction and operation periods. He asked the participants to share with their actual concerns and problems which they would like to share with. The participants of the meetings thanked for the shared information and expressed no objection or question about the subject.

Photo enclosure to Minutes of the meeting #1 dated 23.12.2022

Chairman: A. Rakhmonov

Secretary Sokhibnazarov R.