## 2.11 MASTER RESPONSE 11: ALTERNATIVES

*Many commenters expressed the opinion that the project site was not suitable for wind energy development due to environmental constraints and because the project would cause visual impacts. Several commenters provided recommendations for off-site locations that commenters considered to be better suited for wind energy development. Other commenters recommended that the project incorporate some combination of the alternative designs described in the DEIR and that the resulting hybrid alternative would reduce impacts without compromising the achievement of the project objectives.*

*Several commenters declared the project objectives were too narrowly defined and therefore constrained the full range of alternatives available for consideration. Commenters stated that if the County were to consider a broader formulation of project objectives, the decision-makers would be able to consider other renewable energy technologies along with efficiency and conservation. Examples of alternatives identified by commenters included 1) Community Solar Development, (2) Phased Development, (3) Alternative Wind Turbine Design Development, (4) Minimized Gen-Tie Disturbance, and (5) Offshore Wind Development.*

### a. DEIR Considers a Reasonable Range of Alternatives

The DEIR provides a reasonable range of alternatives sufficient to foster informed decision-making. Section 15126.6(a) of the CEQA guidelines describes the process for the selection of alternatives:

> *An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project and evaluate the comparative merits of the alternatives. The Lead Agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives. There is no ironclad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason.*

An EIR need not consider every conceivable alternative to a project (CEQA Guidelines Section 15126.6[a]). Nor does an EIR need to consider an alternative that is remote or speculative. What constitutes a "reasonable range" of alternatives will vary with the facts of each project and should be guided only by the purpose of offering substantial environmental advantages over the project proposal that may be "feasibly[1] accomplished in a successful manner" considering the economic, environmental, social and technological factors involved.

For specialized projects like a wind farm the range of choices is limited. The County of Humboldt, acting as the lead agency, selected four alternatives for analyses in the DEIR that would achieve the basic project objectives while avoiding or reducing its significant impacts, including impacts on biological resources, visual resources, and cultural resources. Alternatives that would have the same or greater impacts compared to the proposed project, or that would not meet most of the project objectives, were rejected from further consideration (State CEQA Guidelines, Section 15126.6[a]).

1 CEQA generally defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account environmental, social, technological, and legal factors."

The alternatives that were analyzed in the DEIR in comparison to the proposed project include:

- **Alternative 1: No Project** (represents continued use of land for grazing and timber production)

- **Alternative 2: Alternative Gen-Tie Alignment.** After conducting preliminary consultation with the National Marine Fisheries Service, the project applicant developed an alternative gen-tie alignment that would avoid the underground crossing of the Eel River and reduce potential impacts on special-status fish species associated with potential water contamination caused by a frac-out condition. Alternative 2 also includes an alternate access road alignment at the Jordan Creek staging area (the "realigned Jordan Creek access") to avoid impacts on a northern spotted owl activity center near Jordan Creek.

- **Alternative 3**: **Monument Ridge Avoidance** would reduce the total number of wind turbine generators (WTGs) from 60 to 23 and would avoid placing WTGs on Monument Ridge. Because the WTG count would be reduced, the WTGs selected would likely be the largest (600-foot maximum height). Fewer WTGs would provide greater spacing from sensitive areas identified in the project corridor. Based on a marbled murrelet risk assessment, this alternative would also likely reduce impacts on known marbled murrelet flyways. Alternative 3 would result in less ground disturbance and related impacts than the proposed project, and fewer visual impacts. This alternative is also expected to reduce the mortality of birds and bats from collisions with rotor blades, relative to the proposed project.

- **Alternative 4: Reduced Turbine Count** would place 31 WTGs within the same study corridor as the proposed project. Access to the WTG site would be provided from the planned road at the Jordan Creek Staging Area and the gen-tie would extend to the Bridgeville Substation using the same alignment as under the proposed project. Because the turbine count would be reduced, the WTGs selected for installation would be the largest (600-foot maximum height). Based on a marbled murrelet risk assessment, this alternative would likely reduce impacts on known marbled murrelet flyways. Compared to the proposed project, Alternative 4 would result in less ground disturbance during the placement of individual WTGs and fewer related impacts, and would place fewer WTGs in areas visible from surrounding lands. This alternative is also expected to reduce the mortality of birds and bats from collisions with rotor blades by avoiding areas with high concentrations of birds and bats. Alternative 4 would also reduce but not eliminate direct impacts to historic cultural landscapes and tribal cultural resources identified along Bear River Ridge.

- **Alternative 5: Bear River Ridge Avoidance** would reduce the total number of WTGs from 60 to 37 and avoid placing WTGs on Bear River Ridge. Because the turbine count would be reduced, the WTGs selected would likely be the largest (600-foot maximum height). Fewer WTGs would provide greater spacing from sensitive areas identified in the project corridor. This alternative would avoid impacts on Bear River Ridge, which is considered a tribal cultural resource, and would reduce indirect effects on the Scotia historic district. Alternative 5 would result in less ground disturbance and fewer related impacts than the proposed project, and fewer visual impacts. This alternative is also expected to reduce the mortality of birds and bats from collisions with rotor blades, relative to the proposed project.

It should be noted since the release of the DEIR, the project applicant has also informed the County that Alternative 5 needs to be revised from 37 turbines to 27 WTGs because that is the maximum number that can be physically accommodated on Monument Ridge. The chief reasons for this are wake effect, interference with existing microwave beam paths, and the steepness of the terrain. These factors are explained in more detail below.

In order to harness the free flow of wind on Monument Ridge, which is strong but inconsistent in direction, WTGs must be spaced at a greater distance apart to avoid waking and the loss of energy. In assuming 37 WTGs, Alternative 5 did not take wake effect into account.

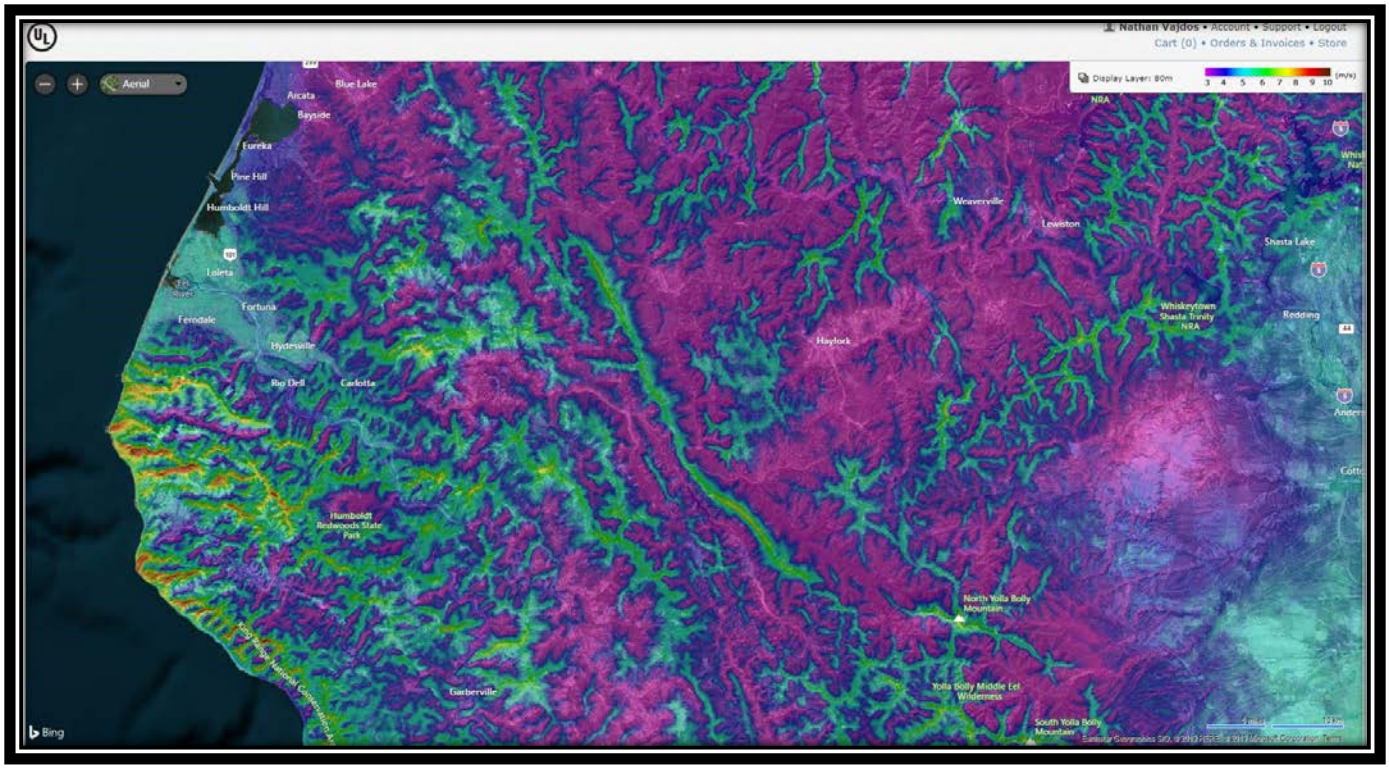
Monument Ridge also has 81 microwave paths that intersect the area. Twenty-three of these microwave paths cross near the proposed tower locations. Monument Ridge hosts nine different radio towers that contain the microwave path equipment. Any WTGs on Monument Ridge must be located at a significant distance from these microwave paths to avoid interfering with them. In assuming 37 turbines, Alternative 5 did not take microwave paths into account.

Finally, the steep terrain and extreme topography of Monument Ridge affords access to only 27 WTG locations. Access road geometry to more than 27 locations is not suitable for turbine component delivery. The horizontal and vertical curves needed to transport long WTG loads cannot be created for more than 27 pad sites on Monument Ridge.

> *Since the release of the DEIR for public review, the applicant has refined the project design to incorporate elements of Alternative 2 (realigned gen-tie and access road) and Alternative 4 (reduced turbine count). The result of the project refinement is a reduction in the development footprint from 900 total acres of disturbance, as presented in the DEIR, to a total of approximately 650 acres of direct disturbance. The applicant reduced the turbine count from 60 to 47, removing turbines from locations along Bear River Ridge that are known as high passage areas for marbled murrelets, and made other adjustments to the project footprint to minimize impacts on northern spotted owls and other sensitive biological resources. See Master Response 1, "Site Planning and Avoidance Measures," for details on the revisions.*

**b. Off-Site Alternatives**

California has a limited number of suitable sites for wind energy development. To be considered attractive for project development, a feasible wind project site requires consistently high wind speeds and uniform wind direction. To locate windy sites, the applicant relied on topographic maps, wind resource maps (including predicted wind speeds and prevailing directions), and offsite regional publicly available data. Humboldt Wind LLC initially identified southern Humboldt County generally as an area potentially suited for the development of a utility-scale wind energy project. Wind in southern Humboldt County, for example, is marked by consistently gusty winds and inconsistent wind direction. A visual depiction of the overall wind resources in Humboldt County, including wind speeds and prevailing direction, is depicted in the following Wind Speed Map and Wind Rose. It is apparent that the higher wind speeds, represented by the green, yellow and red colors, occur in limited areas and almost always on the ridgelines.




Source: AWS Truepower Wind Navigator

**Figure 2.11-1 Wind Speed Map Estimated at 80m @ 200m Resolution**

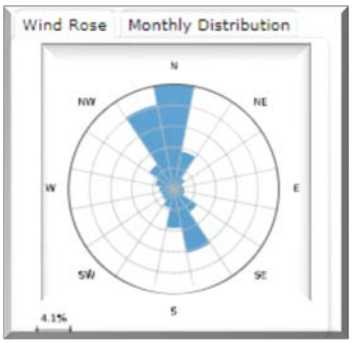



**Figure 2.11-2 Wind Rose**

Once the general area of interest was identified, meteorological towers and remote sensing equipment were installed to record conditions such as wind speed, wind direction, temperature, pressure, and other meteorological variables. This information, in combination with regional climatic reference station data, was used to characterize the long-term wind resource.

Based on this initial analysis, Humboldt Wind LLC installed five ground-mounted sodar units to gather site-specific data and confirm the preliminary analysis across Rainbow Ridge, Long Ridge, Bear River Ridge, Monument Ridge, Shively Ridge, and north of Bridgeville. After collecting over 14 months of data from the five sodar units and assessing the data collected, four locations were selected for further investigation, resulting in the installation of three meteorological towers on the area with the most robust wind speeds. These three meteorological towers were installed to collect above-ground wind data that could ensure the viability of the site-specific wind resource campaign. See Appendix B (*Humboldt Wind Energy Project–Wind Availability Analysis and Location of Project on Monument and Bear River Ridge*, prepared by Humboldt Wind, LLC, dated August 5, 2019) of this FEIR for information on wind conditions at the project site.

While meteorological conditions were evaluated for the area, the project applicant conducted a review of all substations in Northern California to determine where sufficient capacity would be available to support a utility-scale project (more than 100 MW) on the grid. The Bridgeville Substation was identified as having sufficient capacity to support a utility-scale project with only minor substation upgrades needed.

The applicant has informed the County that the fundamentals that drove the selection of Monument and Bear River Ridge as the Proposed Project Site include 1) the availability of high-quality wind resources in comparison to other sites in Humboldt County, 2) the ability to deliver turbines and other project components to the project site via Highway 101, 3) the accessibility of the site via existing access roads or after improvements are made to those roads, 4) the existing use of the property and associated disturbance given ongoing timber operations, 5) the ability to access transmission capacity at the Bridgeville Substation, and 6) the ability to obtain site control over a sufficiently large area. See Figure 2.11-3 for the location of offsite locations initially considered for the project.

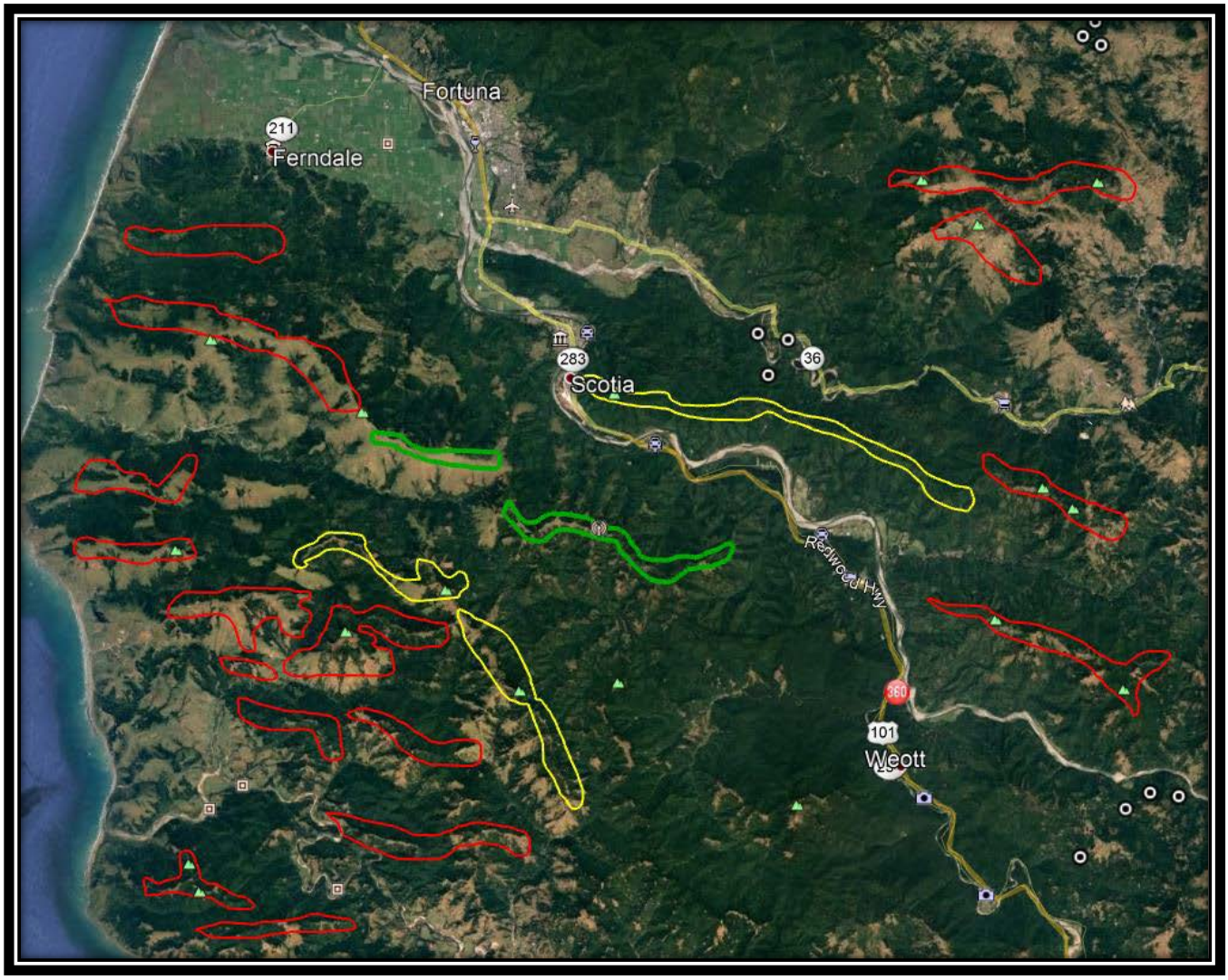



**Figure 2.11-3 Locations Studied for Siting of Humboldt Wind Project**

### c. Community Solar

A community distributed solar project was suggested as an alternative to the project. Consideration of a solar project of this type would not achieve most of the fundamental project objectives, nor did commenters indicate locations in Humboldt County where distributed solar panels could generate 155 MW of renewable energy. While an alternative cannot be rejected if it impedes to some degree the attainment of the project objectives, it need not be studied if it fails of achieve the project's "underlying

fundamental purpose."[2] CEQA Guidelines require that an EIR contain a "statement of objectives sought by the proposed project (14 CCR §15124[b])." In compliance with this provision, the objectives of the proposed project are provided in Chapter 2, "Project Description," of the EIR, and listed below. Project objectives identified by the applicant include:

- Contribute to a diversified statewide energy portfolio that will reduce exposure to price volatility associated with electricity and natural gas, while assisting the state in meeting the renewable-energy requirements established in Senate Bill (SB) 350 and SB 100, including assisting in directly achieving the state's Renewable Portfolio Standard of 100 percent zero carbon energy by 2045.

- Develop a wind project that is feasible to finance, construct, and operate.

- Develop a wind energy project that can meet the criteria to achieve the maximum federal tax credit requiring placement into operation by December 30, 2020, which is intended to decrease the cost of renewable energy generation and delivery, promote the diversity of the energy supply, and decrease the dependence of the United States on foreign energy supplies.

- Promote sustainable energy and utilization of alternative energy systems throughout the county in compliance with the Open Space and Conservation Element of the *Humboldt County General Plan*.

- Develop a wind energy facility as near as possible to existing transmission infrastructure.

- Develop a wind energy facility in Humboldt County that supports the economy by creating short- and long-term employment opportunities and increasing tax revenue.

- Displace emissions of approximately 372,000 metric tons per year of carbon dioxide (a greenhouse gas [GHG]) that would otherwise be required to generate the same amount of electricity as this 155-megawatt (MW) project.

Selection of a community-distributed solar alternative would fail to meet the underlying objectives of the project and is rejected from consideration for that reason.

**d. Phased Development**

The lead agency must consider the whole of an action, not simply its constituent parts, when determining whether it will have a significant environmental effect. (*Citizens Assoc. For Sensible Development of Bishop Area v. County of Inyo* (1985) 172 Cal.App.3d 151). Approval of a phased project could be considered as piecemealing or dividing a project into smaller parts in order to minimize the appearance of physical impacts.

In addition, the County must consider the constitutional concepts of proportionality and nexus when applying mitigation or avoidance measures (CEQA Guidelines Section 15041).

For these reasons, a phased development is rejected from the alternatives considered.

[2] In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings (June 5, 2008) 2008 Cal. LEXIS 6737.

**e. Alternative Turbine Design**

During the design of wind turbines, the strength, the dynamic behavior, and the fatigue properties of the materials and the entire assembly need to be taken into consideration. The wind turbines are built to catch the wind's kinetic energy. Modern wind turbines are not built with a lot of rotor blades. Turbines with many blades or very wide blades are subject to very large forces when the wind blows at high speed. To limit the influence of extreme winds and allow the turbines to rotate relatively quickly, wind developers generally prefer to build turbines with a few long and narrow blades. Specific factors influencing the design include the following:

**Fatigue Loads (forces)**: If the wind turbines are located in a very turbulent wind climate, they are subject to fluctuating winds and hence fluctuating forces. The components of a wind turbine, such as the rotor blades, may develop cracks from repeated bending and ultimately break. When designing a wind turbine, it is important to calculate in advance how the different components will vibrate, both individually and jointly. It is also important to calculate the forces involved in each bending or stretching of a component (structural dynamics).

Upwind wind turbines like those of the project have rotors that face the wind. The basic advantage of the upwind design is that it avoids the wind shade behind the tower. Most wind turbines are built according to this design. In contrast, downwind wind turbines have rotors that are located on the lee side of the tower.

**Number of blades:** Most modern wind turbines are three-bladed designs with the rotor position maintained upwind using electrical motors in their yaw mechanism. Most of the turbines sold in world markets have this design, including the proposed project. The two-bladed wind turbine designs have the advantage of saving the cost of one rotor blade and its weight. However, they tend to have difficulty in penetrating the market, partly because they require higher rotational speed to yield the same energy output.

**Mechanical and aerodynamic noise:** Sound emissions from wind turbines may have two different origins: mechanical noise and aerodynamic noise. The mechanical noise that originates from metal components moving or knocking against each other may originate in the gearbox, in the drive train (the shafts), and in the generator of a wind turbine. Sound insulation can be useful to minimize some medium- and high-frequency noise. In general, it is important to reduce the noise problems at the source, in the structure of the machine itself. The source of the aerodynamic sound emission is when the wind hits different objects at a certain speed, it will generally start making a sound. For example, rotor blades make a slight swishing sound at relatively low wind speeds. Careful design of trailing edges and very careful handling of rotor blades while they are mounted have become routine practice in the industry.

**f. Alternative Location (Offshore)**

There is currently an off-shore wind project in the early feasibility stage being explored off the Humboldt County Coast. One of the applicant's objectives is to "develop a wind project that is feasible to finance, construct, and operate." The applicant's experience and financing are related to the development of on-shore wind power and not off-shore wind power. Offshore wind power development is not feasible for the applicant to finance, construct, and operate. In 2009 there were five offshore wind projects being contemplated in the United States. Not one of these navigated the acquisition, permitting, and

construction processes needed for them to become operational. The first off-shore wind project in the United States became operational in December 2016 and provides 30 MW of power.

An offshore wind project is not considered feasible and is rejected as speculative. Offshore wind projects are more expensive to build and operate than those on land, requiring considerably greater capital outlays per MW installed. This is particularly true in California where deeper water requires additional design considerations.

The full environmental impact of off-shore wind power off California's coast has not been analyzed and locating wind turbines off shore can adversely impact commercial fishing. Trawlers cannot make sharp turns when nets are in the water. To keep the gear from collapsing, trawlers require a large turning radius, from half a mile to a mile, which is why the commercial fishing industry frequently raises concerns about off-shore wind power projects. Operating wind turbines can interfere with the signals received by radar and telecommunications systems, including aviation radar, radio, television, and microwave transmission. Off-shore wind power may not have some of the impacts that are related to on-shore wind projects, but there are other impacts that have not yet been adequately analyzed.

For these reasons, an alternative offshore location is rejected from the alternatives considered.