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6.0 ALTERNATIVES

This section discusses alternatives to the proposed Pecho Energy Storage Center (Pecho / PESC). These include the "no project" alternative, site alternatives, transmission line route alternatives, technology alternatives, water supply alternatives, and excavated rock recycling or disposal alternatives.This discussion focuses on alternatives that could feasibly accomplish most of the basic objectives ofthe project and could avoid or substantially lessen one or more of the potential impacts.

The California Environmental Quality Act (CEQA) requires consideration of "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 ofthe project and evaluate the comparative merits of the alternatives" (Title 14, California Code of Regulations [CCR] 15126.6[a]).

Thus, the focus of an alternatives analysis should be on alternatives that "could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects" (Title 14, CCR 15126.6[c]). The CEQA Guidelines further provide that "among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure tomeet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts."

The Energy Facilities Siting Regulations (Title 20, CCR, Appendix B) guidelines titled Information Requirements for an Application require the following:

> *A discussion of the range of reasonable alternatives to the project, including the no project alternative… 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 an evaluation of the comparative merits of the alternatives.*

The data adequacy regulations also require the following:

> *A discussion of the applicant's site selection criteria, any alternative sites considered for the project, and the reasons why the applicant chose the proposed site.*

A range of reasonable alternatives are identified and evaluated in this section, including the "no project"alternative (i.e., not developing a new power generation facility), alternative site locations for constructing and operating the Pecho project, alternative project design features (including transmission line routes, \ water supply sources, and excavated rock recycling/disposal options), and various technology alternatives. This section also describes the site selection criteria used in determining the proposed location of the Pecho project.

6.1 Project Objectives

Pecho has been designed to deliver up energy and reliability services with no fossil fuel combustion or related air quality impacts. The project will be one of the first commercial applications of Hydrostor's A-CAES technology at this scale. Pecho will combine dispatchable, operationally flexible, and efficient energy generation with state-of-the-art A-CAES technology to facilitate the integration of variable renewable energy on the grid and to meet California and regional needs for reliability services.

On July 14, 2021, U.S. Secretary of Energy Jennifer M. Granholm announced the U.S. Department of Energy (DOE)'s new goal to reduce the cost of grid-scale, long-duration energy storage by 90 percent within the decade. The second target within DOE's Energy Earthshot Initiative, "Long Duration Storage Shot" sets bold goals to accelerate breakthroughs that store clean electricity to make it available anytime, anywhere and support more abundant, affordable, and reliable clean energy solutions. “We’re going to bring hundreds of gigawatts of clean energy onto the grid over the next few years, and we need to be able to use that energy wherever and whenever it’s needed,” said Secretary Granholm. “That’s why DOE is working aggressively toward cheaper, longer duration energy storage to reach President Biden’s goal of 100 percent clean electricity by 2035” (US Department of Energy 2021). The Biden Administration has established a target of 30 gigawatts (GW) of installed offshore wind energy by 2030, and on May 25, 2021, announced plans to open the California coast to offshore wind development and allow wind power projects to be built in an area northwest of Morro Bay (The White House 2021). Multiple State agencies and the Bureau of Ocean Energy Management have been coordinating for a least the last year to ensure that future development of these resources is done responsibly and consistent with State and National objectives. According to recent public comments by California Energy Commission (CEC) Commissioner Douglas at the September 9, 2021 California Coastal Commission Informational Briefing and Public Comment on Offshore Wind: “the State will need to add between 4 – 6 gigawatts per year of renewable energy and storage starting now” to meet the State’s ambitious goal of zero carbon emissions by 2045 (California Coastal Commission 2021). On June 24, 2021, the California Public Utilities Commission (CPUC) adopted Decision 21-06-035 recognizing the need for long lead time, long-duration energy storage resources, such as the Pecho project. Among other things, the CPUC decision requires “at least 1,000 megawatts (MW) of long-duration storage (able to deliver at maximum capacity for at least eight hours from a single resource)” by June 2026 (CPUC 2021). The Pecho project’s capabilities are completely aligned with this objective.

On June 22, 2021, the San Luis Obispo (SLO) County Board of Supervisors unanimously approved Resolution 2021 – 134, Recognizing the Potential of Renewable Wind Power Generation for, and Clean Energy Infrastructure, As Long-Term Economic Benefits to San Luis Obispo County (SLO County 2021). The resolution acknowledges SLO County’s support for Federal and State initiatives aimed at developing wind, energy storage, and other forms of renewable energy needed to offset the loss of the 2.2 GW carbon-free Diablo Canyon Nuclear Power Plant, and advocacy for state and federal funding to advance feasibility studies for locating a clean energy port and supporting infrastructure in SLO County for the development of offshore wind energy as may be planned by the Federal Government and the State of California.

Enhanced stability of the electrical grid will allow for further integration of renewable resources, such as the extensive planned offshore wind development off the central California coast northwest of Morro Bay announced by the Biden Administration and supported by SLO County. The Pecho project is consistent with Resolution 2021-134 and CPUC will provide a wide range of operational capabilities including the crucial flexible capacity to support electrical system stability and reliability during periods of rapidly changing renewable energy output, as well as a local response to other instances of grid instability.

Pecho’s basic project objectives include the following:

1. Provide 400 MW of quick-starting, flexible, controllable generation with the ability to ramp up and down through a wide range of electrical output to facilitate the integration of the renewable energy into the electrical grid in satisfaction of California’s Renewable Portfolio Standard (RPS) and climate objectives, by displacing older and less efficient generation.

2. Interconnect the project to CAISO-controlled Morro Bay Switching Station or Diablo Canyon Substation, both major substations in the central California coastal region, provided adequate interconnection capacity exists at a feasible cost, to help offset the loss of generation from Diablo Canyon Nuclear Power Plant decommissioning, and to facilitate the integration of onshore and offshore renewable energy development.

3. Implement a proven sustainable energy storage technology that provides improved technological diversity, non-combustible energy storage, minimal residual hazardous waste at asset retirement, long term commercial lifespan of 30 years or greater and non-degrading energy storage.
4. Use advanced compressed air energy storage (A-CAES) technology to provide dispatchable long-duration storage and energy delivery for a minimum 8 hours, fossil fuel and greenhouse gas emissions-free operation, flexible capacity with minimal response time, peaking energy for local contingencies, voltage support and primary frequency response including synchronous power output to support grid resiliency without the need for fossil fuel, superior transient response attributes including synchronous power output, and superior round trip thermodynamic efficiency.
5. Locate on a site with adequate geologic characteristics for the underground facilities for compressed air storage, including, suitable overburden characteristics (limited thickness, constructable soil type); deep subsurface geological formation of sufficient quality and definition at the required depth for construction of the excavated storage cavern; ultra low hydraulic conductivity and permeability in deep subsurface geological formation to retain water and air under pressure within the excavated storage cavern; and competent geological structural integrity to sustain an excavated storage cavern at depth intact indefinitely, allowing for repeated compressed air injection and discharge cycles over the life of the project without eroding or collapsing.
6. Site the project in close proximity to an adequate fresh water supply.
7. Site the project on flat land and with adequate access and size for construction of aboveground facilities, at least 60 acres.
8. Identify a site that is available to provide adequate site control, through long-term lease or purchase.
9. Minimize additional supporting infrastructure needs and reduce potential environmental impacts by locating the facility near existing and planned infrastructure, including access to an existing substation with available transmission capacity and avoiding lengthy generation tie lines.
10. Create jobs in San Luis Obispo County and the State of California through both construction and operation of the facility.
11. Assist the County of San Luis Obispo meet its long-term energy objectives as outlined in the Board of Supervisors Resolution adopted unanimously in 2021; the Resolution reads in part:

    > ***NOW, THEREFORE, BE IT RESOLVED AND ORDERED*** *that the Board of Supervisors of the County of San Luis Obispo, State of California, support Federal and State initiatives aimed at developing wind, energy storage and other forms of renewable energy needed to offset the loss of the Diablo Canyon Nuclear Power Plant, and advocate for state and federal funding to advance feasibility studies for locating a clean energy port and supporting infrastructure in SLO County for the development of offshore wind energy as may be planned by the Federal Government and the State of California that includes an analysis of the economic impact to the commercial fishing industry. (*Resolution 2021 – 134).

12. Be a good corporate citizen and respected member of the community through the lifecycle of the project.

6.2 The "No Project" Alternative

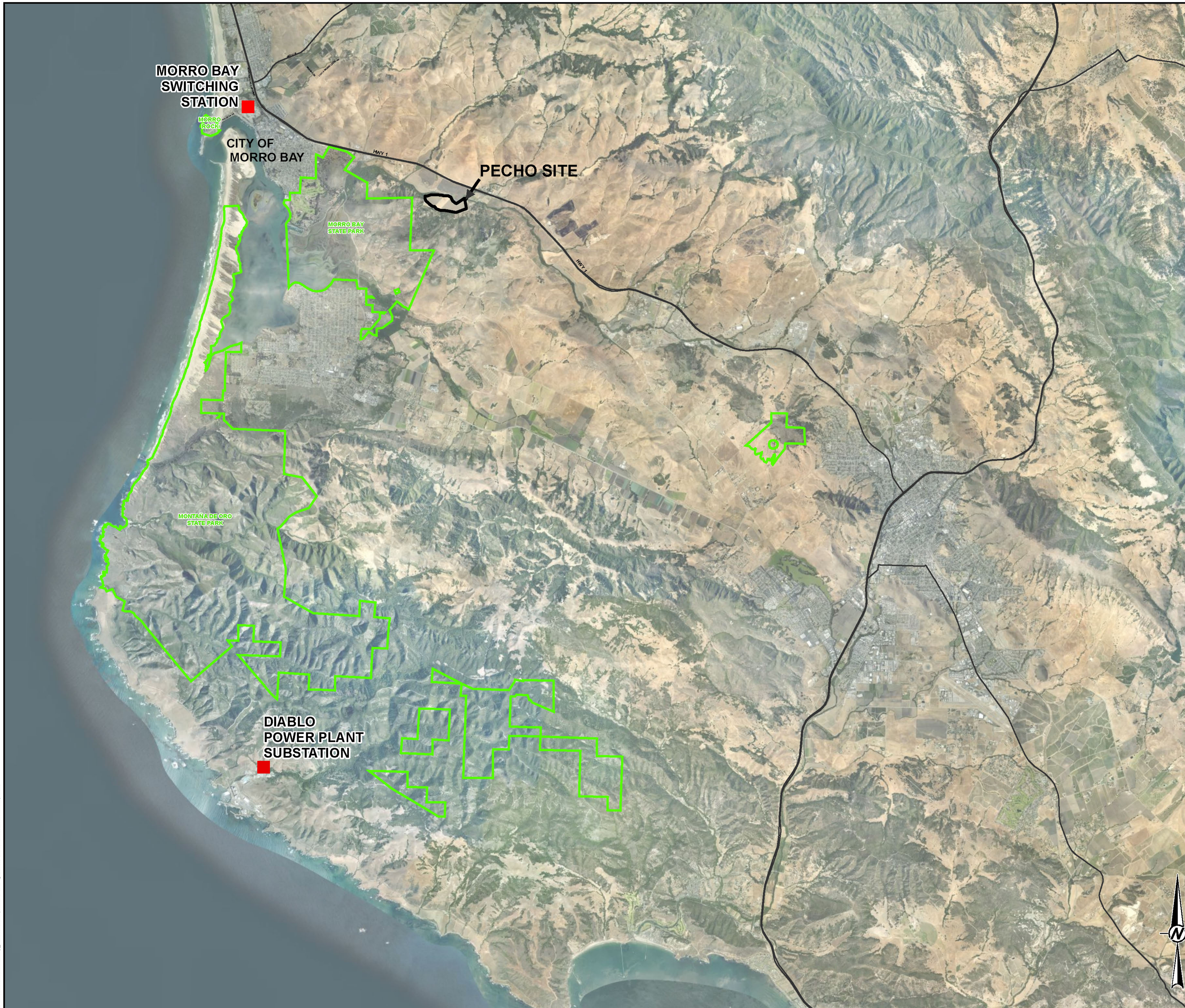
If the project were not constructed, the Pecho basic project objectives would not be met, and the grid reliability, and environmental and policy benefits, as identified above, from this highly dispatchable and flexible project, would not be realized. The Pecho project would provide a significant carbon-free contribution to the State's ambitious renewable energy and storage needs and the no project alternative would deprive the State and the area of this significant contribution. The no-project alternative would also not be consistent with SLO County's support for clean, renewable energy storage to offset the loss of 2.2 GW of carbon-free generation from Diablo Canyon, or with California's environmental policy goals of encouraging development and deployment of long lead time, long-duration energy storage resources, such as the Pecho project, as articulated in the CPUC Decision 21-06-035.

The no project alternative could result in inadequate system reliability (more blackouts), greater fossil fuel consumption, greenhouse gas emissions, air pollution, climate change, and other environmental impacts in the state because older, less efficient plants or emergency generation facilities with higher air emissions would continue to supply transitional power instead of being replaced with cleaner, more flexible, and more efficient energy storage such as Pecho. The no-project alternative would also deprive the area of a significant multi-year construction employment opportunity with associated purchases of local goods and services, as well as permanent jobs associated with the operation of the facility, and ongoing property tax revenue, and other community benefits. Therefore, because the no project alternative would not satisfactorily meet the project objectives, the no project alternative was rejected in favor of the proposed project.

6.3 Power Plant Site Alternatives

The project owner considered multiple sites for the Pecho project. Finding available real estate on which to site an A-CAES facility such as Pecho, is a significant hurdle in almost any area under consideration. Coupled with the objective of locating the facility in an area with competent deep hard rock geology and proximity to a major point of interconnection on the California central coast, quickly reduced site options to three site alternatives. The search for sites meeting the combined requirements of suitable geology, adequate land space, availability for sale or lease, and reasonable length of interconnection (within 10-15 miles) significantly reduced the number of candidate sites. A large portion of the central California coast in proximity to Diablo Canyon and Morro Bay is designated state or regional park land or rugged terrain that is not suitable for development. These alternatives (including the project site) are shown in Figure 6-1.

The project site and two alternate sites are discussed below followed by an alternative site summary section.



LEGEND

- ROADS
- PECHO SITE
- PARK BOUNDARIES
- ALTERNATE SITE

2 0 2 Miles

REFERENCE

COORDINATE SYSTEM: NAD 1983 STATEPLANE CALIFORNIA V FIPS 0405 FEET

CLIENT
HYDROSTOR, INC.

PROJECT
PECHO ENERGY STORAGE CENTER (PESCO)

TITLE
PECHO ALTERNATIVE SITES MAP

CONSULTANT

GOLDER MEMBER OF WSP

YYYY-MM-DD	2021-10-07
PREPARED	XX
DESIGN	XX
REVIEW	XX
APPROVED	XX

PROJECT No.	CONTROL	Rev.	FIGURE
21465954	---	---	**6-1**

6.3.1 Proposed Project Site

The Pecho project will be located in unincorporated San Luis Obispo (SLO) county approximately 1.4 miles east of the City of Morro Bay (Figure 1.3, Introduction). The site is located in an area that is zoned Agricultural (San Luis Obispo County AG zoning district according to Title 23 of the San Luis Obispo County Code). The site is actively farmed, and the property has been regularly disturbed in support of that activity. Land uses surrounding the site include other agricultural uses or open space (Morro Bay State Park). Pecho anticipates the ability to work with SLO County to establish the conformity of the proposed use.

The geology underlying the site is expected to consist of hard rock at a depth that is compatible with the design of the A-CAES cavern storage system. The site is adjacent the Morro Hill – Islay Hill volcanic intrusive complex. volcanic intrusive complex forms a series of shallow (hypabyssal) plugs and lava domes between Morro Bay and San Luis Obispo. The locations of plugs and domes are well known and easily observable on the surface (e.g., Cerre Cabrillo, Hollister Peak). This igneous rock at this location is expected to be strong and the presence and size of these outcroppings suggests the igneous formation is likely to be deep and massive. Therefore, the decline and cavern can likely be developed completely within the igneous formation. In addition, the overburden is not expected to be a constructability issue because the bedrock is outcropped at this location.

The approximately 80-acre project site is located on an approximately 300-acre parcel that has adequate access and space for construction of all the aboveground Pecho facilities and the property will be available for long-term lease from the landowner.

Pecho will interconnect with PG&E's Morro Bay Switching Station via a new 3.4-mile-long tie-line that will parallel the existing PG&E right of way, as described in Section 3, Electrical Transmission. PG&E 230 kilovolts (kV), 115 kV, and 60 kV transmission lines run adjacent to the western portion of the property. The Morro Bay Switching Station is one of two major points of interconnection to the grid on the central California coast.

Process water supply will be available in adequate quantity and quality from onsite groundwater wells to be constructed for the project and possibly supplemented by reclaimed water that would be trucked from the nearby Morro Bay Water Reclamation Facility.

The proposed Pecho site is not expected to result in any environmental effects that cannot be either avoided or mitigated to insignificant levels.

The Pecho site, therefore, meets the project objectives.

6.3.2 Alternative 1 – Morro Bay Switching Station

There is an approximately 25-acre parcel directly adjacent to the Morro Bay Switching Station (MBSS) near the intersection of Embarcadero and Coleman Drive in Morro Bay. This location adjacent to MBSS is ideal from the standpoint of minimizing the length of the interconnection.

The MBSS site is owned by Vistra and is part of the former tank farm for the decommissioned Morro Bay Power Plant. The site has been cleared and is currently an open portion of the decommissioned Vistra Power Plant. The site would present challenges from a land use compatibility standpoint given its prominent location on the coast, near Morro Rock and the City of Morro Bay's vision for the redevelopment of the area articulated in its current General Plan.

Although the site appears to exhibit appropriate underlying hard geological characteristics that are compatible with A-CAES technology (as evidenced by the Morro Rock outcropping), the thickness of the overburden at this location as well as its proximity to the ocean would present challenging construction and operational issues. The immediate subsurface appears to be composed of Quaternary sand deposits (dune sand and beach sand) that may be 60 to 65 deep that have been partially replaced with engineered fill to support the construction of the power plant. The bedrock below the sand is expected to be composed of shale and sandstone deposits of the Franciscan Complex. The overburden thickness is a concern that may require significant structural support for the portal and proximity to the ocean shoreline may present water inflow concerns.

Additionally, the site is not large enough to accommodate the Pecho surface facilities and it is not available from the landowner, who has proposed a development project for the site.

Consequently, this site does not meet many key project objectives and was rejected.

6.3.3 Alternative 2 – PG&E Diablo Canyon Substation

Hydrostor had originally proposed the Pecho project at the Diablo Canyon Power Plant. The site is located approximately 9 miles north of Avila Beach on the coast. There is a reasonable likelihood that the underlying geology at the site is feasible for Hydrostor's A-CAES technology requirements.

However, at the initial Scoping Meeting with the California Independent System Operator (CAISO) and PG&E for the interconnection requests, it was noted that the Diablo Canyon 230 kV Substation would need to be completely rebuilt to accommodate the Pecho project, as there is no room to expand the substation given its location atop a hill. Rebuilding the entire substation was considered to likely be cost-prohibitive. In addition, the majority of the property surrounding the substation is complex terrain that would present challenging and extraordinarily costly construction considerations.

The site is also undergoing significant decommissioning planning in preparation for its announced 2024-2025 shutdown. The Pecho project construction as an overlay to planned decommissioning activities was also expected to present coordination challenges.

In addition, the majority of the land in the vicinity of the site is owned by PG&E, and negotiations to achieve site control were expected to be challenging with no guarantee of a successful outcome. Hydrostor did not identify any suitable property within 15 miles of the Diablo Canyon that would satisfy the combined constraints of constructability, availability, and adequate size.

For these reasons, a project site near Diablo Canyon was rejected as not being viable and consistent with project objectives.

6.3.4 Alternative Site Summary

Key conclusions of the alternative site attributes are compared in Table 6-1. Only the Pecho site meets all the project objectives.

While the other alternate sites would meet some of the project objectives, both alternative sites fail to meet several key objectives that are considered fatal flaws.

Table 6-1: Alternative Site Summary

Project Objective[a]	Proposed Pecho Site	Alternative 1 – Morro Bay Switching Station	Alternative 2 – Diablo Canyon Substation
1 – 400 MW of quick-starting, flexible, controllable generation	Yes	Yes	Yes
2 – Interconnect to Morro Bay Switching Station of Diablo Canyon Substation provided adequate capacity exists	Yes	Yes	No – cost prohibitive rebuild of substation needed
3 – Sustainable energy storage technology	Yes	Yes	Yes
4 – Fossil-fuel and GHG emissions-free long duration (>8 hour) A-CAES technology	Yes	Yes	Yes
5 – Adequate geological characteristics for A-CAES technology	Yes	No – overburden depth, soil type and proximity to ocean are problematic	Reasonable likelihood to be feasible
6 – Close, adequate fresh water supply	Yes	Uncertain – current site uses ocean water; viable City of Morro Bay fresh water supply would need validation	Uncertain – current site uses ocean water; viable, proximate fresh water supply would need to be located and validated
7 – Flat land with adequate size (>60 acres) and access	Yes	No – site is flat but is too small (~25 acres)	No – site is in rugged, complex terrain with high and variable slopes
8 – Site available for long-term lease or purchase	Yes	No – existing owner has other plans for the site	No
9 – Minimize additional infrastructure, including avoiding lengthy gen-tie to minimize environmental impacts	Yes – 3.4-mile interconnection	Yes – interconnection would be adjacent to the site	No – Lengthy transmission (>10-15 miles) required
10 – Create jobs for SLO county and California	Yes	Yes	Yes
11 – Clean energy infrastructure consistent with SLO County Resolution 2021-134	Yes	Yes	Yes
12 – Good corporate citizenship	Yes	Yes	Yes

[a] See Section 6.1 for the complete description of each of the numbered project objectives

6.4 Alternative Project Design Features

This subsection addresses alternatives to some of Pecho's project design features such as the linear facility routing, interconnection location, water supply source, excavated rock recycling, and/or disposal alternatives.

6.4.1 Electrical Transmission Line Route Alternatives

The facility will connect with PG&E's Morro Bay Switching Station via an approximately 3.4-mile-long generation tie-line (designated the Preferred Route). This is the shortest and most direct interconnection route that parallels the existing PG&E 230kV Morro Bay – Mesa and 115 kV Morro Bay - Foothill transmission line corridor to the Morro Bay Switching Station. Alternatives to the Preferred Route are shown in Figure 1-4 (see Section 1, Introduction).

Alternate 1 would be approximately 3.65 miles in length. It would parallel the PG&E 60 kV Goldtree – Baywood transmission line north, overcross Highway 1, turn west approximately 0.6 miles parallel to Highway 1, then follow the Preferred Route for the final 2.2 miles of the route. This alternative would add about 0.6 miles of additional 230 kV transmission line along Highway 1 to the Preferred Route with 4 to 5 additional transmission structures that would be set back but may be visible to motorists traveling along Highway 1, resulting in a possible incremental but insignificant additional visual impact relative to the Preferred Route. All other environmental impacts associated with Alternate 1 are nearly identical to the Preferred Route. Alternate 1 may also result in relatively small additional construction costs relative to the Preferred Route.

Alternate 2 would be approximately 4 miles in length. It would follow the same route as Alternate 1 across Highway 1, then turn west approximately 1200 feet parallel to Highway 1, turn north parallel to the PG&E 60 kV Baywood – Cayucos transmission lines for approximately 1 mile, turn west parallel to the PG&E 230 kV Morro Bay- Midway transmission corridor for approximately 1.5 miles, then follow the Preferred Route for the last approximately 0.6 miles into Morro Bay Switching Station. This route alternative would add slightly more transmission structures (approximately 6 to 8) in the north-south direction than the Preferred Route and would setback the east-west portion of the transmission line further to the north where it would be less visible. All other environmental impacts associated with Alternate 2 are nearly identical to the Preferred Route. Alternate 2 may also result in additional construction costs relative to the Preferred Route due to its additional length and structures relative to the Preferred Alternative.

In addition to the route alternatives, there may be an opportunity to interconnect the Pecho project at the prospective Pearl Energy Storage Center (Pearl), a 100 MW battery energy storage system (BESS) site that is being developed by an affiliated entity at a location very close to the Preferred Route. If the Pearl BESS project is approved by the City of Morro Bay and built, Pecho may have the option of interconnecting at the Pearl site via a ring bus switching station that would include a single combined Pearl and Pecho 230 kV transmission interconnection to Morro Bay Switching Station. This option would shorten the length of the Preferred Route by approximately 0.6 miles, obviate the need for two separate interconnections at Morro Bay Switching Station for the Pearl BESS and Pecho, and reduce the environmental impacts and combined cost of interconnection for both projects.

Another alternative to the Preferred Alternative would be to run a radial tap into the PG&E 230 kV Morro Bay – Mesa transmission line that runs adjacent to the Pecho site. Under this option, the Pecho project could be interconnected using a ring bus switching station at the Pecho site with a relatively short radial tap, obviating the need for a separate 3.4 miles long 230 kV line interconnecting the Pecho project. The environmental impacts associated with the construction of the 3.4-mile interconnection would be eliminated but this would be offset by the environmental impacts associated with a slightly larger site footprint to accommodate the PG&E switching station at Pecho. Preliminary discussions with PG&E regarding site interconnection options ruled out this alternative as being unacceptable.

6.4.2 Water Supply Source Alternatives

The Pecho project proposes to use new and/or existing groundwater wells installed on-site or in the vicinity of the site as the primary source of water supply for construction, with the initial filling of the surface compensation reservoir being the primary component of the construction water demand. To the extent available and necessary, this groundwater supply may be supplemented with reclaimed water purchased from the Morro Bay Water Reclamation Facility being constructed near the Pecho site at the intersection of Teresa Road and South Bay Boulevard. Once the Pecho project commences operation, it is expected to be a net producer of water and would not require either groundwater or reclaimed water to operate.

6.4.2.1 Ocean Water

The Pacific Ocean is located approximately 1.5 miles from the project site and would be another possible water source. Use of ocean water would require the construction of a new ocean intake, desalination facility at an industrial location along the local coast, and a pipeline to bring the desalinated water to the Pecho site, at least 1.5 miles away, and a brine discharge that would need to be discharged (most likely back to the ocean) or treated in a zero liquid discharge system. Furthermore, the desalinization process is energy-intensive, which makes it expensive to operate and contributes to greenhouse gas emissions. This alternative would result in an extraordinary cost for a water supply that may only be required during construction and would likely cause adverse marine biota impacts at the water intake and brine discharge as well as a variety of adverse environmental impacts associated with the construction of the desalination plant and project pipeline (biological, air quality, noise, visual resources, etc.). For these reasons, this alternative was not considered further.

6.4.2.2 Reclaimed Water

The Morro Bay Water Reclamation Facility (WRF) is in construction and is expected to be operational in spring 2022, before the commencement of construction of the Pecho project. Objectives of the WRF include producing tertiary disinfected wastewater following California Code of Regulations Title 22 requirements for unrestricted urban irrigation and producing reclaimed wastewater to augment the City’s water supply, by either direct or indirect means. Once operational, the city would decommission its existing wastewater treatment plant. The WRTF would include injection of treated, reclaimed water into the local aquifer to recharge and as an offset for future groundwater pumping. Pecho would need to establish whether the WRF has sufficient excess capacity to meet its project objectives and provide reclaimed water to Pecho. The WRF construction plans do not currently include a pipeline that could be used to provide service to the Pecho site. Accordingly, either a pipeline to the Pecho site would need to be constructed at considerable cost, to be used to support Pecho water requirements for the construction period, or Pecho may be able to purchase reclaimed water directly from the facility for delivery to the site by truck. The latter option would result in lower cost but would involve the potential traffic and air quality impacts associate with water truck movements to/from the site. Due to uncertainty regarding the availability of surplus reclaimed water, this alternative is currently considered a supplementary backup to Pecho’s primary water supply.

6.4.2.3 Local Groundwater from City of Morro Bay Well Fields

An alternative to the proposed water supply would be to purchase local groundwater produced by the City of Morro Bay (City). The City operates two well fields in the vicinity of the Pecho site that have sufficient capacity to meet the needs of the Pecho project during construction. The safe yield from the Chorro Valley Groundwater Basin is estimated at 2,210 acre-feet per year (AFY). The city has an entitlement to pump up to 1,142 AFY from the basin in its current groundwater permit. The City is contracted to purchase State Water Project (SWP) until 2035, which is expected to continue to reduce its use of local groundwater while SWP water is available. This may create an opportunity for Pecho to purchase City groundwater during the construction period that would otherwise remain unused. The city well fields are connected to a water main that runs parallel to Highway 1. Currently, there is no water service connection to the project site. An approximately 2,000-foot water pipeline would need to be constructed to bring the water to the Pecho site from the city water main, including a pipeline crossing at Chorro Creek.

The site is not currently within the City's water service territory and a water supply agreement would need to be negotiated with and approved by the City of Morro Bay to facilitate this supply. Construction of the pipeline would result in additional land disturbance and biological resources impacts at the creek that could likely be mitigated to less than significant levels but are not a part of the current project. In addition, this alternative would require additional costs for the construction of the pipeline that may only be needed during project construction. For these reasons, this alternative was not selected.

6.4.2.4 Water from State Water Project

The SWP provides water to the City of Morro Bay via the Chorro Valley Pipeline that runs parallel to Highway 1. The city has an entitlement to receive 1,313 AFY plus an additional 174 percent drought buffer of approximately 2,290 AFY from the SWP. The City's water demand is projected to range between 1,977 to 2,013 AFY between 2025 and 2030. The difference between the City's SWP entitlement and the projected City water demand between 2025 and 2020 would be more than sufficient to meet the water demand of the Pecho project during construction. To access SWP water, Pecho could either contract with the City to receive a portion of its entitlement or contract directly with the SWP for excess water during the construction period. An approximately 2,000-foot water pipeline would need to be constructed to bring the water to the Pecho site from the Chorro Valley pipeline, including a pipeline crossing at Chorro Creek.

Construction of the pipeline would result in additional land disturbance and biological resources impacts at the creek that could likely be mitigated to less than significant levels but are not a part of the current project. In addition, this alternative would require additional costs for the construction of the pipeline that may only be needed during project construction. For these reasons, this alternative was not selected.

6.4.3 Excavated Rock Recycle or Disposal Alternative

Construction of the Pecho project would result in the excavation of approximately 880,000 cubic yards of waste rock that is expected to be of aggregate quality. As a result, the project intends to recycle approximately 50 percent of the excavated material for site grading and construction of the earthen berms for the surface compensation reservoir. The preferred alternative is for the remaining 50 percent of excavated to be hauled offsite to the Lehigh Hanson Santa Margarita quarry where it would be repurposed to the extent possible for beneficial use such as aggregate. The hauling of excavated material will result in air quality and greenhouse gas emissions as well as traffic impacts that are discussed in Sections 5.1, Air Quality and 5.12, Traffic and Transportation. Alternatives to this plan for the excavated material are discussed below.

6.4.3.1 Recycle for Additional Onsite Beneficial Use

Instead of hauling the estimated 440,000 cubic yards of material that is expected to be surplus, Pecho could use the excess material to raise the entire site or provide additional site contouring or visual screening. Spreading 440,000 cubic yards of material uniformly across the approximately 80-acre site would raise the site by approximately 4.3 feet. Additional testing of site-specific core material would need to be conducted to establish whether the material has appropriate engineering qualities to be used for this purpose. Raising the site would result in the structures being slightly taller and thus slightly more visible from key observation points. However, given the scale of the facility, this additional visual impact would not be expected to be significant. Elevating the facility may also result in slightly greater noise impacts at nearby receptors that would need to be evaluated but mitigation measures would likely be available to reduce these incremental impacts to insignificant levels. With appropriate onsite stormwater management, raising the site by this amount would not be expected to result in a significant change to stormwater management requirements to ensure that offsite drainage patterns remain unimpacted by the project. This alternative would also result in the avoidance of truck traffic and emissions associated with hauling the material offsite.

6.4.3.2 Disposal at Adjacent Abandoned Quarry Site

Directly to the south of the project site is an abandoned quarry site that was created when improvements were made to Highway 1 many years ago. The quarry site is visible to residents and from the trails leading up to Cerro Cabrillo. Very preliminary estimates indicate that filling the abandoned quarry site would require approximately 100,000 cubic yards of material. Rather than hauling all the excess excavated rock from the site, a portion of the material could be used to fill in the abandoned quarry site, which would then require revegetation. This would result in some incremental temporary disturbance, fugitive dust, and emissions during the quarry filling and revegetation process but would eliminate the traffic and emissions associated with hauling the material offsite for beneficial reuse and would ultimately improve the visual appearance of the slope by residents and hikers on the Cerro Cabrillo trail. Additional studies would be required to establish whether the excavated material would exhibit appropriate slope stability properties to render this a viable alternative.

6.4.3.3 Disposal at Offsite Landfill

Another alternative for the excavated rock would be to dispose of the material at a nearby landfill. This alternative would likely result in truck traffic and emissions impacts like the preferred alternative (recycling to Lehigh Hanson as aggregate) but without the beneficial reuse. Disposal at a local landfill would also consume valuable landfill capacity and be inconsistent with the State’s objectives to recycle waste material to the extent possible. For these reasons, this alternative is less preferred.

6.5 Technology Alternatives

6.5.1 Conventional and Renewable Generation Technology Alternatives

Conventional generation technologies such as combined cycle or peak load (simple cycle) combustion turbine-based power plants as well as power plants are developed that would generate comparable power output but would not meet basic project objectives of providing long-term energy storage or fossil-fuel and greenhouse gas emissions-free operation and therefore were not considered further. Renewable energy generation technologies such as wind or solar are dependent on available wind and sun, have variable power output profiles that would not provide dispatchable long-term energy storage with synchronous generation response capability. Biomass-fired power plant technology also does not meet basic project objectives including dispatchable energy storage and greenhouse gas emissions-free operation. As such, renewable energy technologies do not meet the basic project objectives and were not considered further.

6.5.2 Energy Storage Alternatives

6.5.2.1 Battery Storage Systems

Battery-based energy storage technology offers some similar attributes to Hydrostor's A-CAES technology, including ancillary service provision and fossil-fuel-free generation. Battery energy storage on the other hand is typically much shorter duration (typically ranging from 2-to- 4 hours) and lower capacity energy storage. Battery storage systems are more limited in lifespan (typically requiring replacement within 10 years) and exhibit performance degradation starting early in their lifespan and declining nearly linearly thereafter. Additionally, battery based energy storage technologies present an operation risk due to potential for chemical fire and a hazardous waste disposal requirement at the end of life. Performance is also materially impacted by environmental factors like temperature. Batteries, therefore, serve an important distributed, smaller-scale role with excellent frequency response applicability and provide very different grid services, with batteries primarily focused on distributed, behind-the-meter applications and frequency response, whereas A-CAES can deliver grid services like capacity, voltage support, and synchronous inertia much like conventional generating sources.

Recent market reception to Hydrostor's long-term storage capability has indicated the desirability and importance of long duration storage (more than 8-to-10-hour duration) to be able to provide reliable capacity to the grid when it is required. As a mechanical storage technology, A-CAES performance is not significantly impacted by time (minimal performance degradation over project life), amount of cycling, or environmental factors like temperature. It is, therefore, a very reliable long-term, long-duration storage that is highly cost-effective at scale, and able to directly replace synchronous generation with similar operating characteristics. For these reasons, the battery energy storage systems do not meet basic project objectives and were rejected in favor of Hydrostor's A-CAES technology.

6.5.2.2 Pumped Hydro Storage

Pumped hydro storage uses water released by gravity from an upper reservoir through turbine generating equipment into a lower reservoir separated by at least several hundred to several thousand feet or more of elevation to generate electricity. Typically, power is generated during peak power demand periods or when needed to address system reliability. During off-peak periods, water from the lower reservoir is pumped back up into the upper reservoir to "recharge" the system. Pumped hydro storage shares many positive characteristics with A-CAES, including a long lifespan (50+ years), long storage durations, and the provision of synchronous generation (including rotational inertia) to the grid (including similar performance characteristics). Pumped hydro storage would require much larger reservoirs and surface elevation differentials than are required for A-CAES technology. The creation of large reservoirs would require inundation of a much larger area than the proposed Pecho project and may result in much greater land use, biological and visual resources impacts than the proposed project. Viable sites near major points of interconnection on the Central CA coast would be difficult to find. The technology is also much more capital intensive per installed MW than the A-CAES technology. Finally, pumped hydro would not meet a basic project objective of deploying Hydrostor's A-CAES technology. For these reasons, this alternative was rejected as not meeting key project objectives.

6.5.2.3 Traditional Compressed Air Energy Storage

Traditional compressed air energy storage (CAES) is similar to A-CAES in that a compressor is used to convert electrical energy into high pressure compressed air that is stored in this increased energy state, typically by injecting the compressed air into existing, deep salt caverns or depleted gas reservoirs that can store compressed air and retain it in the formation for long periods. When electricity is required, the compressed air is expanded through a turbine generator, converting the stored energy back into electricity. Because the expansion process results in significant cooling of the expanding air stream, heat is added back into the compressed air before to avoid unacceptably low temperatures for continuing operation of the turbine. A key difference between CAES and A-CAES is that the addition of heat to the expansion process generally requires the combustion of significant quantities of fossil fuel with associated emissions including criteria and toxic air contaminants as well as significant emissions of greenhouse gases.

Hydrostor's technology deploys a heat transfer and storage system that extracts and stores the heat from air compression and uses it to heat the expanding air during the generation portion of the process without the need to burn fuel of any kind. Hydrostor's A-CAES process, therefore, operates no emissions of greenhouse gases or other air pollutants. Because the technology involves emissions of greenhouse gases and other air pollutants traditional CAES technology is not compatible with key project objectives.

6.6 References

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