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STATE OF CALIFORNIA

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
Application for Certification of the Pecho Energy Storage Center	)	Docket No. 21-AFC-01
	)	
Application for Certification of the Gem Energy Storage Center	)	Docket No. 21-AFC-02
	)	

JOINT RESPONSE OF THE PECHO ENERGY STORAGE CENTER AND THE GEM ENERGY STORAGE CENTER SUPPORTING EXEMPTION FROM THE NOI PROCESS AND REQUEST FOR COMMISSION ORDER AT MARCH 9, 2022 BUSINESS MEETING

Jeffery D. Harris
Samantha G. Neumyer
Ellison Schneider Harris & Donlan LLP
2600 Capitol Avenue, Suite 400
Sacramento, CA 95816
Telephone: (916) 447-2166
Email: jdh@eslawfirm.com
sgn@eslawfirm.com

Attorneys for Pecho LD Energy Storage, LLC and GEM A-CAES LLC

February 9, 2022

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JOINT RESPONSE OF

THE PECHO ENERGY STORAGE CENTER AND THE GEM ENERGY STORAGE CENTER

SUPPORTING EXEMPTION FROM THE NOI PROCESS

AND REQUEST FOR COMMISSION ORDER AT MARCH 9, 2022 BUSINESS MEETING

INTRODUCTION

In accordance with the California Energy Commission's ("Commission's") Order No. 22-0126-5[1] and Order No. 22-0126-6,[2] Pecho LD Energy Storage, LLC ("Pecho") and GEM A-CAES LLC ("Gem" (collectively, the "Applicants") submit this response demonstrating that the Pecho Energy Storage Center ("Pecho") and Gem Energy Storage Center ("Gem") are exempt from the notice of intent ("NOI") process set forth in the Warren Alquist Act.

Pursuant to Public Resources Code section 25540.6(a)(3), Pecho and Gem are exempt from the NOI process as facilities that are only technologically or economically feasible to site at or near the energy source. As facilities utilizing Advanced Compressed Air Energy Storage ("A-CAES") technology, Pecho and Gem are unique in that there are two types of energy sources that these facilities must be located at or near from a technological and economic basis to generate electricity: stored energy and electrical energy.

[1] TN#: 241290.

[2] TN#: 241291.

First, A-CAES projects generate carbon-free electricity through the expansion of compressed air that is stored in subsurface air storage caverns that are located below the project's surface facilities. Therefore, Pecho and Gem must be located above or near suitable geological formations required for the construction and operation of subsurface air storage caverns.[3] These energy storage caverns and related facilities can only be constructed in proper geological settings, such as those found at the proposed sites for the Pecho and Gem facilities.[4]

Second, Pecho and Gem must also be located at or near a robust physical grid location capable of both interconnecting the projects' full generation capacity as well as facilitating the full bidirectional power flow of the project (charging and discharging).[5] The energy source is locational, a specific location on the grid, not the mere use of system power.[6] This locational value is both technical and economic.[7] Charging of these facilities at these locations converts electrical energy, including excess renewable energy that exceeds daily peak needs, into stored energy, which is then ultimately used for generation to support grid reliability and renewable integration needs.[8] Target locations for interconnection for new energy storage projects are also assessed on the likely future economic value, or the forecast price differential between on-peak and off-peak power prices.[9]

Based on the plain statutory language of Section 25540.6(a)(3), Pecho and Gem qualify for exemption from the NOI process. In turn, the Commission should issue separate orders finding that the Pecho and Gem projects are exempt from the NOI process and should be evaluated pursuant to the AFC facility Certification process. Given that the projects are currently in the process of responding to Commission Staff's data adequacy recommendations, the Applicants request that the Committee issue a proposed decision for consideration by the Commission at the March 9, 2022 Business Meeting.

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[3] Declaration of Curt Hildebrand in Support of Joint Response of the Pecho Energy Storage Center and Gem Energy Storage Center Supporting Exemption from the NOI Process ("Hildebrand Decl."), ¶ 7.

[4] Hildebrand Decl., ¶ 7.

[5] Hildebrand Decl., ¶ 7, 15.

[6] Hildebrand Decl., ¶ 15, 16.

[7] Hildebrand Decl., ¶ 15.

[8] Hildebrand Decl., ¶ 12, 13.

[9] Hildebrand Decl., ¶ 12.

JOINT RESPONSE

I. PECHO AND GEM ARE EXEMPT FROM THE NOI PROCESS AS THE FACILITIES ARE ONLY TECHNOLOGICALLY OR ECONOMICALLY FEASIBLE TO SITE AT OR NEAR THE ENERGY SOURCE.

Section 25540.6 of the Public Resources Code exempts from the NOI process facilities that are only technologically or economically feasible to site at or near the energy source:

> 25540.6. Thermal powerplants on which commission must issue final decision on application within 12 months; site selection application discussion where project exempt from notice of intention requirement
>
> (a) Notwithstanding any other provision of law, no notice of intention is required, and the commission shall issue its final decision on the application, as specified in Section 25523, within 12 months after the filing of the application for certification of the powerplant and related facility or facilities, or at any later time as is mutually agreed by the commission and the applicant, for any of the following:
>
> * * *
>
> (3) A thermal powerplant *which it is only technologically or economically feasible to site at or near the energy source*. (Emphasis added.)

Pecho and Gem are unique in that there are two types of energy sources that these facilities must be located at or very near to generate electricity: stored energy (in a feasible geologic setting) and electrical energy.

As discussed in Section II below, the A-CAES technology used for both the Pecho and Gem projects is only technologically and economically feasible to site at or very nearby locations where the geological conditions allow for the construction and operation of the purpose-built compressed air storage caverns and related closed-loop systems which store and provide the energy sources for carbon-free electrical generation from the facility.

In Section III, we explain that Pecho and Gem must also be located at or near a robust grid physical position capable of bidirectional power flow, which provides the electrical energy that is converted and stored by the facilities as potential or stored energy. Based on these requirements to be sited at or near the two energy sources for the facilities, Pecho and Gem are exempt from the Commission's NOI process.

II. PECHO AND GEM MUST BE SITED ABOVE SUITABLE, ROBUST GEOLOGICAL FORMATIONS THAT ARE APPROPRIATE FOR THE CONSTRUCTION AND OPERATION OF THE SUBSURFACE AIR STORAGE CAVERNS, WHICH ACT AS THE ENERGY SOURCE FOR THESE FACILITIES.

Pecho and Gem generate carbon-free electricity through the use of energy produced by hydrostatically compensated air storage caverns and a thermal management system.[10] Although a more detailed description of the process is provided in the Application for Certification ("AFC") for each project, a brief description is provided here to explain the necessity of the subsurface storage caverns to electrical generation.

The subsurface storage caverns, which can only be technically and economically constructed in the proper geological setting, are the principle energy storage mechanism for the facilities. The A-CAES system stores compressed air in a purpose-built underground storage cavern.[11] During the Charge Cycle, electricity from the grid will be used to drive each facility's air compressors, converting the electrical energy into potential energy in the form of compressed air. The air is then stored within the subsurface caverns.[12] Heat energy from the air compression process is then captured and stored in the thermal energy management system.[13] To generate electricity (known as the "Discharge Cycle"), compressed air is discharged from the cavern.[14] The cool high-pressure air exiting the cavern is re-heated using the heat stored by the thermal management system and the same set of heat exchangers that were initially used to extract it.[15] The reheated compressed air is then used to drive air expansion turbine-generators which efficiently convert the stored potential energy back into carbon-free, on-demand electricity for the grid.[16] Thus, the stored potential energy acts as the energy source for the facilities, which is then utilized for on-demand carbon-free generation.

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[10] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2; Gem Energy Storage Center, Application for Certification, p. 2-10. TN #: 240751-3.

[11] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2; Gem Energy Storage Center, Application for Certification, p. 2-10. TN #: 240751-3.

[12] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

[13] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

[14] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

[15] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

[16] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

The storage caverns themselves have specific geological requirements. Specifically, the purpose-built air storage caverns must be built within certain volcanic or other hard rock rock formations:

> . . .adequate geologic characteristics for the underground facilities for compressed air storage, include[e], 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. (Pecho AFC, Section 1.1, Project Objectives, p. 1-2.)

The Gem project, located in Kern County, is also necessarily sited near similar existing volcanic geological conditions.[17] Gem is sited to the north and west of the prominent Willow Spring Butte and the community of Rosamond in unincorporated Kern County.[18] Less stable geological conditions make the A-CAES system technologically infeasible, as the compressed air cannot stay "compressed" in a porous or less structurally sound subsurface geological setting. The geologic setting must exhibit adequate structural integrity to remain intact over the life of the facility with repeated compression and decompression cycles.

In addition to the necessary geological conditions for the purpose-built compressed air storage cavern, the descending and ascending geological conditions must also be sufficiently robust to support the interconnecting conduits that enable the closed-loop system to charge and discharge compressed air. For example, the air conduit must be tightly sealed to facilitate cyclic injection/storage of compressed air and release of compressed air for power generation.[19] Likewise, the water conduit must be sealed and sufficiently robust geologically to facilitate inflow/outflow of hydrostatically compensating water to/from the surface reservoir and underground storage cavern.[20]

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[17] Gem Energy Storage Center, Application for Certification, p. 1-1 to 1-2. TN #: 240751-2.

[18] Gem Energy Storage Center, Application for Certification, Figure 1-3, p. 1-7. TN #: 240751-2.

[19] Pecho Energy Storage Center, Application for Certification, p. 1-4. TN#: 240712-1.

[20] Pecho Energy Storage Center, Application for Certification, p. 1-8. TN#: 240712-1.

In short, both the Pecho and the Gem projects are located in sites that have a very high probability of possessing the necessary geological qualities with sufficient structural integrity to construct, retain, and discharge the air used for this important long-duration storage facility. Due to the volcanic related geological conditions, these project sites are expected to present the ultra low hydraulic conductivity and permeability in the subsurface geologic formation to retain water and air under pressure within the excavated storage cavern and the 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 projects. The projects' surface generation and thermal facilities cannot be located at any significant distance from the subsurface caverns without a significant loss of overall round trip efficiency and a significant increase in the capital costs for the respective project. This is a direct result of the costs and losses associated with piping high pressure air and water over long distances as well as similar and significant thermal energy losses to remote facility locations. Just as geothermal power plants must be sited at or near a geothermal resource to efficiently and economically generate electricity, Pecho and Gem are only technologically and economically feasible to site at or very near the subsurface storage caverns.

Therefore, consistent with Section 25540.6(a)(3), Pecho and Gem are exempt from the Commission's NOI process as it is only technologically and economically feasible to site the projects at or very near the air storage caverns that serve as the energy source for carbon-free electric generation by the facilities.

III. PECHO AND GEM ARE EXEMPT FROM THE NOI PROCESS AS THE FACILITIES ARE ONLY TECHNOLOGICALLY OR ECONOMICALLY FEASIBLE TO SITE AT OR NEAR LOCATIONS WHERE THE ELECTRIC GRID ALLOWS THE FACILITIES TO ACT AS BOTH LOAD AND GENERATION ON A SCALE SUITABLE FOR LONG DURATION ENERGY STORAGE.

In addition to the potential energy stored in the air storage caverns and thermal management system described above, the A-CAES technology utilizes electrical energy through charging from the electrical grid as an energy source. During the "Charging Cycle," the facilities utilize electrical energy from the grid to drive the facility's air compressors, converting the electrical energy into potential energy in the compressed air, which is then stored within the caverns.[21] Peak daily generation on the

[21] Pecho Energy Storage Center, Application for Certification, p. 2-9. TN#: 240712-2.

grid, which typically coincides with the peak hours for solar power generation, means that the excess electric generating potential of solar generation can be efficiently utilized to charge the facilities.[22] The closer the A-CAES project is to the point of interconnection, the more efficiently the project can respond to grid reliability needs, both for withdrawing and storing excess renewable generation at peak generation hours, which would otherwise be curtailed and lost, as well as providing rapid response generation to stabilize the grid during transient events.

Both Pecho and Gem are sited on the grid at places in the transmission system where the A-CAES's unique characteristics can be utilized based both on the energy consumption (charging) and generation (discharging) from these facilities. The electrical interconnection point requires a robust grid physical configuration (400 megawatts ("MW") for Pecho and 500 MW for Gem) at a location capable of bidirectional power flow (charging and discharging). To be clear, the importance of the electrical energy source is locational, a specific location or market node on the grid; mere system power cannot be used. This locational value is both technically critical and economically important for the project.

For Pecho, the project will interconnect to the CAISO-controlled Morro Bay Switching Station.[23] This location will "facilitate the integration of onshore and offshore renewable energy development," by ensuring that Pecho is at or near these sources of electrical energy to charge the facility. For Gem, the project will interconnect to the "CAISO-controlled Southern California Edison (SCE) Whirlwind Substation, a major substation in or near the Tehachapi Renewable Wind Resource Area."[24] Similarly, this location will facilitate the more efficient integration and use of electricity from renewable energy resources to charge the facility.[25]

From an interconnection perspective, both Pecho and Gem are sited in places where they will function to facilitate efficient integration of geographically concentrated, variable renewable energy and take advantage of the unique grid interconnection conditions necessary for reliable electrical energy supply to and generation from these facilities.

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[22] Pecho Energy Storage Center, Application for Certification, p. 1-1. TN#: 240712-1.

[23] Pecho Energy Storage Center, Application for Certification, p. 1-4. TN#: 240712-1.

[24] Gem Energy Storage Center, Application for Certification, p. 1-1. TN #: 240751-.

[25] Pecho Energy Storage Center, Application for Certification, p. 1-1. TN#: 240712-1.

CONCLUSION

As a factual matter, Pecho and Gem qualify for exemption from the NOI process consistent with the express language set forth in Public Resources Code Section 25540.6(a)(3). Both Pecho and Gem are thermal powerplants which are "only technologically or economically feasible to site" at or near the energy source. The Pecho and Gem project must be located at or near two sources of energy: (1) potential energy stored in the air storage caverns and related facilities located in suitable, robust geological conditions and (2) electrical energy at locations where the electric grid allows the facilities to act as both load and generation on a scale suitable for long duration energy storage.

As a matter of sound public policy, the Legislative purpose for which the exemptions set forth in Section 25540.6 were adopted also supports the exemption of the Pecho and Gem projects from the NOI process. The exemptions from the NOI process set forth in Section 25540.6 were adopted in part to address concerns that the NOI process took too long and required unnecessarily excessive filing of information.[26] The exemptions also addressed other concerns that the two-phase NOI process posed an "insurmountable barrier" to the development of cogeneration and other projects that had "the potential for increasing the electric generation capacity in California in an environmentally acceptable manner."[27]

The Pecho and Gem projects are part of the urgently needed action to stem the tide of climate change by providing carbon-free solutions to California's grid reliability needs. Pecho is a nominal 400 MW, 3,200 Megawatt-hour (MWh), advanced energy storage center.[28] Gem provides even more long duration energy storage as a 500MW, 4,000 MWh, advanced energy storage center.[29] Long duration energy storage on this scale is both currently unavailable and decidedly necessary to decarbonize California's electric system. The two-phase NOI process poses an intractable, unnecessary barrier to the timely development and deployment of this technology to meet grid reliability needs and achievement of California's grid decarbonization goals.

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[26] Legislative history, Subcomittee on Energy Hearing on Powerplant Siting, SB 1085, p. LIS-4, LIS-6.

[27] Air Resources Board, *Cogeneration Technology and Resource Recovery Status Report*, pp. 1, 27 (August 28, 1980).

[28] Pecho Energy Storage Center, Application for Certification, p. 2-10. TN#: 240712-2.

[29] Pecho Energy Storage Center, Application for Certification, p. 2-10. TN#: 240712-2.

The NOI process is anachronistic, the creature of a bygone, regulated monopoly era where captive ratepayers, not merchant powerplants, bore the costs and risk of development. The NOI process is not necessary, an act of futility where, as here, more than two decades of post-monopoly Legislation has created competitive markets to fulfill the public purposes the NOI process once served, financial protection for the IOU's captive ratepayers. The NOI cannot, and should not, be a bar to the long duration storage required to decarbonize California's electric system

Therefore, the Commission should find the projects exempt from the NOI process pursuant to Public Resources Code Section 25540.6(a)(3), for the reasons discussed above. The Applicants respectfully request that the Committee propose, and the full Commission adopt at the March 9, 2022 Business Meeting, an order affirming the applicability of the exemption from the NOI process for the Pecho and Gem projects.

February 9, 2022

ELLISON SCHNEIDER HARRIS & DONLAN LLP

By: _____

Jeffery D. Harris
Samantha G. Neumyer
Attorneys for the Applicants

STATE OF CALIFORNIA

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
Application for Certification of the Pecho Energy Storage Center	)	Docket No. 21-AFC-01
	)	
Application for Certification of the Gem Energy Storage Center	)	Docket No. 21-AFC-02
	)	

DECLARATION OF CURT HILDEBRAND IN SUPPORT OF JOINT RESPONSE OF THE PECHO ENERGY STORAGE CENTER AND GEM ENERGY STORAGE CENTER SUPPORTING EXEMPTION FROM THE NOI PROCESS

DECLARATION OF CURT HILDEBRAND

I, Curt Hildebrand, declare as follows:

1. I am currently the Senior Vice President, Commercial Affairs for Hydrostor, Inc. I am a Professional Mechanical Engineer (CA Cert. No. 27324) with extensive experience siting thermal power plants before the California Energy Commission. I have personal knowledge of the facts set forth in this declaration and, if called upon as a witness, I can and will competently testify to these facts.

2. My responsibilities include managing and overseeing project development activities for Hydrostor in the United States, including the Pecho Energy Storage Center ("Pecho") and Gem Energy Storage Center ("Gem") projects.

3. Hydrostor is a long duration energy storage solutions provider that provides reliable and affordable utility integration of long duration energy storage, enabling grid operators to scale renewable energy and secure grid capacity. Hydrostor supports the green economic transition, employing the people, suppliers, and technologies from the traditional energy sector to design, build, and operate emissions-free energy storage facilities. Hydrostor has developed, deployed, tested, and demonstrated that its patented Advanced Compressed Air

Energy Storage ("A-CAES") technology can provide long duration energy storage and enable the renewable energy transition.

4. Pecho is a nominal 400 megawatt ("MW"), 3,200 megawatt-hour ("MWh"), advanced energy storage center. Gem provides even more long duration energy storage as a nominal 500MW, 4,000 MWh advanced energy storage center. Long duration energy storage on this scale is both currently unavailable and decidedly necessary to decarbonize California's electric system.

5. The approximately three year, two-phase NOI process poses a very significant barrier to the timely development and deployment of the A-CAES technology to meet urgent grid reliability needs and achievement of California's grid decarbonization goals.

6. As A-CAES projects, the Pecho and Gem projects will utilize two types of energy sources to generate carbon-free electricity: stored energy and electrical energy.

7. Pecho and Gem generate carbon-free electricity through the expansion of compressed air that is stored in subsurface air storage caverns located below the project's surface facilities. These energy storage caverns and related facilities can only be constructed and operated in proper geological settings, such as those found at the proposed sites for the Pecho and Gem facilities. Pecho and Gem must be located above or very near suitable geological formations required for the construction and operation of subsurface air storage caverns to be technologically and economically feasible.

8. Less stable geological conditions make the A-CAES system technologically infeasible, as the compressed air cannot stay "compressed" in a porous or less structurally sound subsurface geological setting. The geologic setting must exhibit adequate structural integrity to remain intact over the life of the facility with repeated compression and decompression cycles.

9. The Pecho and Gem projects are located in sites that have a very high probability of possessing the necessary geological qualities with sufficient structural integrity to construct, retain, and discharge the air used for this important long-duration storage facility. Due to the volcanic related geological conditions, these project sites are expected to present the ultra-low

hydraulic conductivity and permeability in the subsurface geologic formation to retain water and air under pressure within the excavated storage cavern and the 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 projects.

10. The projects' surface generation and thermal facilities cannot be located at any significant distance from the subsurface caverns without a significant loss of overall round trip efficiency and a significant increase in the capital costs for the respective project. This is a direct result of the costs and losses associated with piping high pressure air and water over long distances as well as similar and significant thermal energy losses due to remote facility locations.

11. The A-CAES technology also utilizes electrical energy through charging from the electrical grid as an energy source.

12. Charging of these facilities at these locations converts electrical energy, including excess renewable energy that exceeds daily peak needs, into stored energy, which is then ultimately used for generation to support grid reliability and renewable integration needs. Target locations for interconnection for new energy storage projects are also assessed on the likely future economic value, or the forecast price differential between on-peak and off-peak power prices.

13. Peak daily generation on the grid, which typically coincides with the peak hours for solar power generation, means that the excess electric generating potential of solar generation can be efficiently utilized to charge the facilities.

14. The closer the A-CAES project is to the point of interconnection, the more efficiently the project can respond to grid reliability needs, both for withdrawing and storing excess renewable generation at peak generation hours, which would otherwise be curtailed and lost, as well as providing rapid response generation to stabilize the grid during transient events.

15. Pecho and Gem must also be located at or near a robust physical grid location capable of both interconnecting the projects' full generation capacity as well as facilitating the

full bidirectional power flow of the project (charging and discharging). This locational value is both technical and economic.

16. Both Pecho and Gem are sited on the grid at places in the transmission system where the A-CAES's unique characteristics can be utilized based both on the energy consumption (charging) and generation (discharging) from these facilities. The electrical interconnection point requires a robust grid physical configuration (400 MW for Pecho and 500 MW for Gem) at a location capable of bidirectional power flow (charging and discharging). To be clear, the importance of the electrical energy source is locational, a specific location or market node on the grid; mere system power cannot be used.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct to the best of my knowledge and belief.

Executed this 9th day of February 2022 in Danville, California.

Curt Hildebrand

Curt Hildebrand
Senior Vice President, Commercial Affairs
Hydrostor, Inc.