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HRPI Comments re TN # 256064

Additional submitted attachment is included below.

Cyrq
Hudson Ranch

June 12, 2024

Eric Veerkamp
Project Manager
California Energy Commission

Via e-comment

Re: Morton Bay Geothermal Project, docket number 23-AFC-01

Dear Mr. Veerkamp,

Hudson Ranch Power 1 LLC hereby submits the attached comment relating to TN# 256064, the "Responses to Informal Data Request Geothermal" submitted by Jacobs on behalf of the Morton Bay Geothermal Project.

Sincerely,

HUDSON RANCH POWER 1 LLC

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HRPI comments on Morton Bay Geothermal LLC's "Responses to Informal Data Request" (TN# 256064)

June 12, 2024

Executive Summary

Morton Bay Geothermal LLC and its agent, Jacobs, (together: Applicant) have provided significant new information describing the development of the Morton Bay Geothermal Project (Morton Bay). TN# 256064 includes proposed geothermal well paths and additional information describing the numerical reservoir simulation underpinning the previously docketed resource adequacy report. In TN# 256064, Applicant states that the previously undisclosed well paths will result in an acceptable power density at Morton Bay, that provided calibration data validate the reservoir simulation underlying the resource adequacy report, and that the Morton Bay developers have acted as collaborative partners to stakeholders in the region. The owners of the existing Hudson Ranch Power I (HRPI) geothermal power plant do not believe that Applicant has evidenced that construction of Morton Bay as proposed, would preserve the ability of the Salton Sea Geothermal Resource to support current and future clean electricity production in the region.

Applicant's evaluations continue to leave HRPI's concerns of over-concentrated production of the Salton Sea Geothermal Resource unresolved. The power density (capacity) estimate provided by Applicant is based on an area of development that is more likely to be an optimistic maximum, rather than a "conservative" estimate, as claimed. The reservoir simulation underpinning the adequacy report remains inscrutable to stakeholders (and regulators) except Applicant, as the subsurface distribution of permeability is not disclosed, the prediction's results are only broadly located, and the model is unavailable to interrogate issues of concern. Applicant's proposed wellfield plan still places the HRPI production field between the Morton Bay injection field and Morton Bay producers, risking degradation of the geothermal resource accessible to HRPI. Finally, on the issue of resource development, high level invitations to discuss and address the concerns raised by HRPI have not been accepted. For these reasons, HRPI continues to seek resolution to its concerns for the Salton Sea Geothermal Resource in the public forum. In short, the new information submitted by Applicant does not evidence no harm, does not establish compliance with general health and welfare, and does not prove avoidance of waste.

1. Salton Sea Geothermal Resource Sustainability (IDR 1)

<u>Directional Drilling.</u>

In TN# 256064, Applicant shows the path of its proposed directionally drilled wells (previously referenced in passing, without well path information, on one page, 5.11-17, of Applicant's 506-page Application for Certification). HRPI appreciates that most of the proposed well paths are directed away from HRPI, and, if the Morton Bay Geothermal Project is approved, HRPI respectfully recommends a Condition of Approval that the path of trajectories not be changed because it is not unusual for trajectories to change or side tracks with significantly different paths to be drilled during the drilling program.

Power Density (Capacity).

Applicant argues that if one correctly applies the power density method of Wilmarth and Stimac (2015) and has the benefit of knowing the true footprint of Morton Bay, then Moton Bay's power density is only 28.7 MW/km2, well within the current published estimate of approximately 33 MW/km2 for the Salton Sea Geothermal Resource.

With regard to the calculation ("Power Density = Power (net megawatts) / Area (square kilometers)"), Applicant first considers the Power component. Applicant argues the megawatt value in the power density calculation should be based on net generation for the purpose of comparison with Wilmarth and Stimac (2015). While the argument is valid, its adoption results in a minor change to the calculation, since the flash plants in the Salton Sea, like HRPI's, have net power better than 90% of gross power. It is the technical position of HRPI that net values confound power plant limitations with resource limitations in the power density calculations, and the use of gross power is an improvement that should be made to the method to describe the resource without confounding the results with highly variable inefficiencies in plants.

With regard to the Area component, it is in Applicant's interest to expand the square kilometers included in the denominator. Applicant does so in two ways: by revealing the directional well paths and by adding a 500-meter buffer. The newly articulated proposed well paths that mostly deviate away from HRPI's existing production wellfield significantly expand the assumed resource area to be developed. As now proposed, the bottom hole locations of all Morton Bay wells are roughly 0.5 mi or greater in spacing. HRPI agrees that, with this new information, the power density number put forward by Applicant in TN #256064 is mathematically valid as a large end member estimate of the resource area to be developed. However, unless the flowing zones of the resource are encountered at the total depth (bottom) in every well, the area of developed resource will shrink from Applicant's estimated power density, making the stated "correct" power density estimate an optimistic end member. The 500-meter buffers used in Applicant's analysis is valid due to its consistency with the approach undertaken by Wilmarth and Stimac (2015), which is indeed the reference publication for this method. However, Wilmarth and Stimac (2015) also observed that the 500-meter buffer has pitfalls. While they used a 500-meter buffer for the sake of consistency, they also noted that a 500-meter buffer may not be appropriate for estimating the power density of every resource. This is because every unique geologic setting has a different distribution and magnitude of permeability governing the safe distance that wells may be spaced in order to minimize interference to a

practical level for development. This is the very reason that HRPI demonstrated in its Screening Study (TN# 254691) that the radius of influence of wells in the Salton Sea Geothermal Resource can be greater than 0.5 mi. based on radial flow models. HRPI's radial flow models use the reservoir parameters derived from well testing in the Salton Sea Geothermal Resource at the HRPI field. The intent of those models was not to predict specific pressure draw down or enthalpy changes, as those factors will be affected by injection. The intent of HRPI's models was to demonstrate that permeability in the Salton Sea Field is high, and interference of planned wells can occur over large distances, thus requiring greater spacing to achieve sustainable production. The issue of well spacing must be studied carefully to mitigate degradation of existing generation.

HRPI's point remains unchanged: in order to generate 157 MW, Morton Bay will need to produce and inject approximately 11,200 kilo pounds per hour (kph) of deeply sourced brine from the Salton Sea Geothermal Resource. Applicant has chosen to locate this ambitious project adjacent to HRPI's existing geothermal power plant, which also produces and injects deeply sourced brine from the Salton Sea Geothermal Resource. HRPI is less concerned about the overall capacity of the entire Salton Sea Geothermal Resource. Instead, HRPI is concerned about the local power density arising from the juxtaposition of Morton Bay with the existing HRPI development. The power density resulting from the current proposal will be some value between the estimate provided by the Applicant (28.7 MW/km2) which is optimistic, and the estimate HRPI derived using the assumption of vertical wells, which is pessimistic (84 MW/km2). Since the power density can only be revised upward from the Applicant's estimate by encountering the resource shallower in the proposed well paths, the risk for overdevelopment of the resource remains high. This issue could be directly addressed by reducing the production target (the numerator in the power density equation) with fewer wells and spacing them based on the Salton Sea Geothermal Resource's reservoir parameters (rather than a generic 500m) leading to a "right sized" development with a distribution of power density outcomes centered on the currently accepted value of 33 MW/km2.

<u>Monitoring / Sustainable Use of the Resource.</u>

CEC Staff essentially asked Applicant to propose a monitoring plan to demonstrate, once Morton Bay is in operation, that well placement and well interactions are yielding sustainable use of the Salton Sea Geothermal Resource. Applicant essentially responds that it is CalGEM's responsibility (i.e., not Applicant's) to ensure that the drilling, operation, maintenance, and abandonment of geothermal resource wells "encourage the greatest ultimate economic recovery of geothermal resources, to prevent damage to life, health, property, and natural resources, and to prevent damage to, and waste from, the underground geothermal deposits" and to collect information regarding geothermal resource wells to advise well operators "as to the best means of protecting geothermal resource deposits." As for monitoring, Applicant proposes to do no more than meet the applicable statutory and regulatory requirements. Again, Applicant places the burden on CalGEM to perform annual project reviews with geothermal well owners and thereby ensure that the Salton Sea Geothermal Resource is

utilized in accordance with the State's established policies regarding the development of geothermal resources. HRPI finds this answer unsatisfying. Surely in the Application for Certification process an Applicant bears the burden of making its case.

2. Industry Practices and Standards (IDR 2)

CEC Staff essentially asked Applicant to explain how current industry practices and standards could offset or reduce potential adverse impacts on neighboring users or on the general over-utilization of the geothermal resource. Applicant responded that it made a model, which confirms adequate resources, and it will follow the applicable statutory and regulatory requirements. It is obvious to HRPI that the applicable statutory and regulatory requirements are insufficient to offset or reduce potential adverse impacts on neighboring users or on the general over-utilization of the geothermal resource.

Applicant also cited to caselaw, *Mira Mar Mobile Community v. City of Oceanside*,[1] which is inapposite. The Mira Mar case involved complaints by neighbors about losing a view to a proposed new development. HRPI has shown that it has material concerns about losing thermal energy at wells adjacent to Morton Bay. Loss of thermal energy is an impact to the environment and to not to particular persons, like a view is. Moreover, Morton Bay's argument that "It is typical and standard in the geothermal power industry for the open-hole section of geothermal production wells to be re-drilled, or for make-up wells to be constructed to capture and access the geothermal resources needed to maintain generation output throughout the life of a geothermal facility" also is inapposite. It is not typical and standard in the geothermal power industry for an established geothermal facility to drill new wells because a new neighboring geothermal facility has caused reservoir pressure drawdown in the area of established geothermal facility's production wells due to imprudent well placement.

3. Resource Adequacy Report (IDR 3)

The magnitude of the enthalpy changes at HRPI's wellfield resulting from Morton Bay remain a chief concern, as the proposed development plan places HRPI directly between the Morton Bay injection and production fields. Applicant has not demonstrated the impacts of its development on enthalpy at HRPI, nor has it been specific about what locations it has extracted its enthalpy forecasts from. This could be problematic if the chosen extractions are not representative of developed or to-be-developed parts of the Salton Sea Geothermal Resource. Permeability in the HRPI unit is high, and we remain concerned that the current development plan will channel enthalpy reducing injectate into the existing production area, reducing generation output.

[1] 119 Cal. App. 4th 477 (2004).

To be clear, Applicant's model does not show any evidence or magnitude of a change to the area of the Salton Sea Geothermal Resource relied on by HRPI. This does not mean there is no impact.

The concerns raised by HRPI are indeed best addressed by a validated reservoir simulation that integrates as much geologic information as possible. It is unclear what assumptions have been made about the subsurface permeability in the model underlying Applicant's resource adequacy report. While docket item TN# 256064 provides additional calibration information and reservoir predictions from the reservoir simulation that do partially validate the results, no explanation of the subsurface fluid pathways has been presented, and specific predictions for existing and future wells are absent, obfuscating the impact of the development on generation.

4. Cooperative Measures (IDR 4)

CEC Staff asked Applicant to provide correspondence or describe cooperative measures. Applicant states that it "proactively contact[ed] Cyrq Energy to discuss the proposed MBGP prior to and after the resource adequacy determination." It would have been helpful for Applicant to produce the correspondence because the existing team at Cyrq Energy is unaware of any proactive attempts by Morton Bay Geothermal LLC or its affiliates or owners. Instead, we are aware of high level invitations to discuss and address the concerns raised by HRPI that have not been accepted.

The concerns raised by HRPI are indeed best addressed by a validated reservoir simulation that integrates as much geologic information as possible. It is unclear what assumptions have been made about the subsurface permeability in the model underlying Applicant's resource adequacy report. While docket item TN# 256064 provides additional calibration information and reservoir predictions from the reservoir simulation that do partially validate the results, no explanation of the subsurface fluid pathways has been presented.

Requests of the Commission

1. Defer action on Morton Bay until (a) Applicant demonstrates the subsurface permeability assumptions of its numerical simulation and that no degradation of the resource will occur in the HRPI unit resulting from its configuration of injectors and producers, or (b) failing to make reasonable assurances that no harm will come to existing production, relocates its injection and/or production wells to locations where it can prove no impact on the Salton Sea Geothermal Resource that harms HRPI; or (c) Morton Bay reduces its generation target to the point where it can prove no impact on the Salton Sea Geothermal Resource that harms HRPI.

2. If the Morton Bay project is approved:
   - Condition of Approval requiring a unified model of the Salton Sea Geothermal Resource using detailed data (such as tracer studies and production data) from both Applicant and

HRPI, and limiting Applicant to production and injection locations and volumes shown to be (i) sustainable for this area of the Salton Sea Geothermal Resource and (ii) not harmful HRPI.

- Condition of Approval that directional well trajectories not be changed from Figure IDR1.b-1 of 256064 without consent from HRPI.
- Condition of Approval that upon HRPI's demonstration of reduced resource capacity resulting from Morton Bay (e.g. the well field no longer supports an average plant inlet of 330 PSI and 4400 KPH) Applicant must reduce Morton Bay generation and/or reduce flow to/from specific wells to allow recovery of the resource, and/or prevent its further decline.
- Condition of Approval that upon HRPI's proven permanent reduction in well field capacity resulting from Morton Bay, Applicant funds a new production well or pays liquidated damages equal to the amount of lost revenue for the life of the HRPI Power Purchase Agreement (PPA).

Conclusion

HRPI and Cyrq Energy encourage sustainable development of the Salton Sea Geothermal Resource. A healthy ecosystem of operators supports a robust supply chain and more reliable operations. The sustainability of existing generation in the wake of the proposed Morton Bay project, however, is still very much uncertain given: the lack of auditability of the reservoir simulation, the lack of specific predictions for existing wells compared to a baseline of non-development, the still potentially high density of wells, and the conceptually dangerous encircling of an existing development with new high flow injection and production on either side. HRPI requests that the Applicant demonstrate explicitly the subsurface permeability assumptions underlying their reservoir simulation and the implications of their model for production at the HRPI well field. If the assumptions and predictions cannot reasonably assure HRPI that no diminished generation relative to a baseline of non-development will result from the Morton Bay Project, then the proposal should be modified to reduce or relocate the resource extraction to result in sustainable generation for both HRPI and Morton Bay.